ABSTRACTS

Academy of Osseointegration's 2025 Annual Meeting

Controversies in Implant Dentistry: HOW TO MAKE IT EASY

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Seattle, Washington

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OC-1

Clinical And Radiographic Evaluation of the Influence of Implant Placement Depth and Soft-Tissue Features in Peri-Implant Bone Remodeling: An 11-Year Follow-Up of a Randomized Clinical Trial

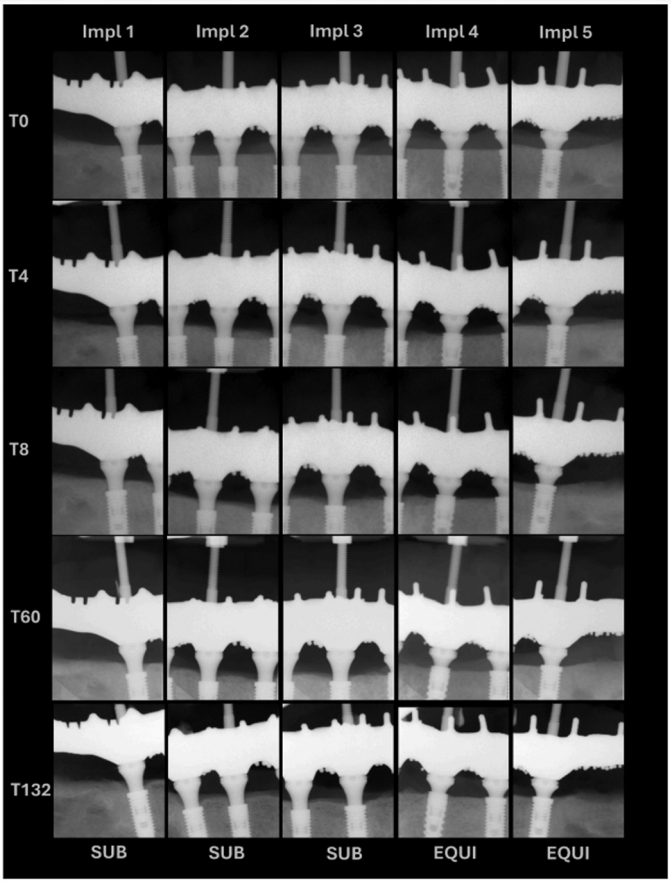
R.A. Siqueira*, J. César Schröder, I. Aparecida Mattias Sartori, P. Gustavo Freitas dos Santos

Introduction: Peri-implant marginal bone stability is one of the main criteria used to evaluate the long-term success of implant therapy and minimizing the marginal bone loss (MBL) around implants remains one of the main challenges in contemporary implant therapy. This 11-year follow-up of a randomized clinical trial aimed to evaluate the influence of implant placement depth and soft-tissue characteristics on peri-implant bone remodeling.

Method: Eleven edentulous patients with 28 implants placed equicrestally (Group E) and 27 implants placed subcrestally (Group S) were initially followed clinically and radiographically for five years. After 11 years (132 months), eight patients attended a follow-up visit (E = 20 implants and S = 20 implants). Clinical and radiographic data were obtained as well as measurements of the keratinized mucosa width (KMW), and vertical mucosa thickness (VMT). Abutment heights were also collected, and implants were clinically assessed for inflammation, pain, and mobility. Implant placement depth, KMW, VMT, and abutment height were evaluated with bone remodeling in both groups. ANOVA was used to analyze implant depth, considering a p-value < 0.05 for statistical significance.

Results: No implants exhibited pain or mobility, resulting in a 100% survival rate. Subcrestal implants (S) showed less bone remodeling (0.22 ± 0.15 mm) compared to those in Group E (0.31 ± 0.30 mm) but without statistically significant difference ($p > 0.05$). KMW, VMT, and abutment height did not show significance in crestal bone changes. Implant success was 90% at the implant-level and 50% at the patient-level utilzing a strict criteria for peri-impalant health by Dukka et al. 2021.

Conclusion: Although remodeling was less in the subcrestal implant group, the data did not show statistical significance. KMW, VMT, and abutment height did not influence peri-implant bone remodeling in this study. All subcrestal implants presented radiographic proximal bone levels at or above the implant platform level, which can be a protective factor for peri-implant diseases.



Standardized intraoral radiographs of equicrestal and subcrestal implants from baseline and controls at 4, 8, 60 and 132 months.

OC-2

The One-abutment One-time Protocol on Peri-implant Marginal Bone Maintenance: Results of Two Randomized Clinical Trials Up to 5 Years Follow-up With Clinical, Radiographic and Histological Analysis

J. Calatrava*, I. San-Sánchez, J. Bollain, A. Molina, C. Martín, M. Sanz

Introduction: The one-abutment one-time (OA-OT) protocol supports placing the final abutment during implant placement surgery, which aims to reduce peri- implant bone loss by avoiding repeated abutment disconnections. Our research team evaluated the clinical, radiographic, and histological effects of OA-OT vs. conventional loading protocols in two clinical trials, examining single or splinted implants at crestal or subcrestal levels over short (1 year) and long (5 years) periods.

Method: In the first study, 60 platform-switched implants were placed at the crestal level in 40 partially edentulous patients, randomized to receive either the OA-OT protocol or a single disconnection of the abutment. Clinical and radiographic data were collected at 1, 3, and 5 years, including the incidence of peri-implant diseases. In the second study, 80 subcrestal implants were placed in 40 patients, randomized to the OA-OT or three healing abutment disconnections. Data were collected up to 12 months, with additional histological analysis from a mucosal biopsy on the day of prosthetic loading.

Results: In the first study, 59 implants were followed up to 12 months. The OA-OT group showed significantly lower marginal bone loss (0.61 mm) than the control (1.24 mm) at 6 months ($p=0.027$), though this difference was not significant at 12 months ($p=0.12$). No significant differences in clinical parameters or PROMS were observed. After 5 years (51 implants), the control group had higher average marginal

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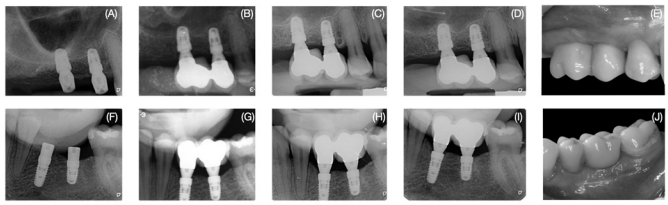
bone loss (0.97 mm vs. 0.53 mm), though not statistically significant (p=0.06). Peri-implant mucositis occurred in 51% of implants (25.5% control, 23.5% OA-OT), with one peri-implantitis case in the test group. In the second study, 74 implants in 37 patients were followed-up for 12 months. The OA-OT group exhibited significantly lower bone loss (0.13 mm vs. 0.61 mm at 6 months, and 0.01 mm vs. 0.53 mm at 12 months; p=0.008) compared to controls. No significant clinical or patient-reported differences were found. Histomorphometric and inmunohistochemical analysis revealed non-significant differences in inflammatory markers between groups.

Conclusion: Both studies indicate that the OA-OT protocol reduces marginal bone loss in early and long-term post-implant phases without compromising soft tissue health or patient satisfaction.



OC-3

Redefining Implant Placement Guidelines From Bone Level-Driven to Soft Tissue-Driven: A One-Year Randomized Control Trial

N. Mithia*, A. Tsigarida, L. Baldinger, L. Johnson, M. Syed, M. Malka, G. Kotsakis

Introduction: Presently, the prevailing paradigm of implant placement guidelines is bone-driven. This study attempts to justify the safe placement of implants using biological width-driven placement guidelines. The primary aim was to evaluate if implants placed 4mm apical to the gingival margin (soft-tissue driven) result in less bone loss than implants placed at the bone crest (bone-driven). The secondary aim was to test if using a one-abutment one-time approach will avoid alteration of the peri-implant gingival seal and allow both placement groups to have identical peri-implant health and tissue maintenance outcomes.

Method: This study was a multi-center prospective randomized controlled trial conducted at the University of Rochester and UT Health San Antonio. Subjects with edentulous spans of 1-3 teeth were restored with up to 2 implants and were followed for 1-year. The control group had implants placed at the bone level (BL Group). The test group had implants placed 4mm apical to the gingival margin (STL Group). All subjects received a one-time abutment at implant placement. The primary outcomes measured were changes in radiographic bone levels and probing depth (PD). Secondary outcomes included changes in bleeding on probing (BOP), keratinized tissue (KT), the modified papilla index, the pink and white esthetic score (PES) (WES), as well as the incidence of peri-implant mucositis or peri-implantitis. These metrics were evaluated at 4 months and 1-year post- loading.

Results: Thirty subjects were enrolled in the study. Data from the 4-month follow-ups are statistically significant in favor of the STL group for the change in bone level but not probing depth. Change in bone level at 4-months had a mean of 0.04mm and -0.07mm in the control and test group, respectively. Mean change in PD at 4 months was 0.22mm and 0.31mm between the control and test groups, respectively. At 12 months, there was statistical significance in both bone level and PD comparisons in favor of the STL group. The mean bone change at 12 months was -0.01mm and -0.18mm, and PD change was 0.5mm and -0.07mm in the control and test groups, respectively.

Conclusion: Preliminary results from this multi-center prospective RCT indicate that soft tissue level-driven implant placement with a one-time immediate abutment can be a protective factor in early periodontal tissue and bone remodeling.

OC-4

Risk Indicators for Peri-Implant Diseases and Peri-Implantitis Severity: A Cross-Sectional Study on Implants With 5 to 10 Years of Loading

J.M. Zimmer*, M. Saleh, H. Sabri, P. Kumar, H.L. Wang

Introduction: Early diagnosis of peri-implant diseases is crucial. Multiple risk indicators have been reported in the literature, but evidence is still inconclusive. The goal of the present investigation was to explore a variety of risk indicators for peri-implant mucositis and peri-implantitis, as well as their association with peri-implantitis severity.

Method: A total of 202 subjects and 405 implants that had been in function for 5 to 10 years were clinically and radiographically assessed. A wide range of patient-, implant-, and prosthetic-related factors were included in the assessment. Baseline data 1 year after implant loading was included. Peri-implantitis disease severity was categorized as mild, moderate, and severe based on peri-implant bone loss of <25%, 25-50%, and >50%, respectively. The independent variables were entered in a multinomial logistic regression model to explore their association with peri-implant health, peri-implant mucositis, and peri-implantitis.

Results: For peri-implant mucositis, multivariate regression showed a statistically significant association with interdental cleaning accessibility (OR = 6.7, 95% CI: 2.33-19.79, p < 0.001) and frequency of periodontal maintenance/prophylaxis appointments of less than once per year (OR = 3.5, 95% CI: 1.92-4.45, p < 0.02). For peri-implantitis, significant associations were found for depth of implant placement (OR = 4.2, 95% CI: 1.74-7.67, p < 0.001), abutment height <2 mm (OR = 3.9, 95% CI: 1.46-6.78, p = 0.03), and history of periodontitis (OR = 1.6, 95% CI: 1.22-3.57, p = 0.043). Subjects with Stage III or IV periodontitis showed a significantly increased risk for peri-implantitis (OR = 2.2, 95% CI: 1.62-4.32, p = 0.035). For peri-implantitis severity, shallow implant placement was positively associated with moderate (OR = 3.3, 95% CI: 2.23-7.67, p = 0.002) and severe (OR = 1.9, 95% CI: 1.92-5.43, p = 0.034) bone loss compared to mild peri-implantitis.

Conclusion: Our findings suggest that not only patient-related factors, but also implant- and restorative-related factors, such as accessibility for interproximal home care, abutment height, and depth of implant placement, are associated with peri- implant diseases. Abutment height < 2 mm and shallow supracrestal implant placement were associated with higher disease severity in peri-implantitis.

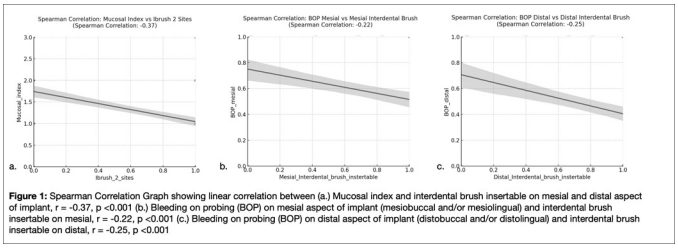


Figure 1: Spearman Correlation Graph showing linear correlation between (a.) Mucosal index and interdental brush insertable on mesial and distal aspect of implant, r = -0.37, p <0.001 (b.) Bleeding on probing (BOP) on mesial aspect of implant (mesiobuccal and/or mesiolingual) and interdental brush insertable on mesial, r = -0.22, p <0.001 (c.) Bleeding on probing (BOP) on distal aspect of implant (distobuccal and/or distolingual) and interdental brush insertable on distal, r = -0.25, p <0.001

OC-5

Tissue Changes After Immediate Tooth Replacement With and Without Socket-shield: 3 to 5 years Retrospective Follow-up

H. Liao*, J. Kan

Introduction: This study evaluates implant success rates and facial mucosal profile changes in maxillary single immediate implant placement and provisionalization with socket-shield (IIPP+SS) and without socket-shield (IIPP) technique in 3 to 5 years follow-up.

Method: Thirty dental implants in 24 patients were assigned to either the IIPP group (15 implants) or the IIPP+SS (15 implants) group. Clinical and radiographic outcomes were collected at pre-surgery (T_0), 2-week (T_1), 12-month (T_{12}), 36-month (T_{36}) and 60-month (T_{60}) post-surgical follow-ups. The implant success rate, marginal bone level changes, facial mucosal level changes, and papilla level changes were evaluated at different time points. Facial mucosal profile changes were assessed individually for hard and soft tissue zones and as a whole using volumetric analysis.

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Results: The study subjects were followed for at least 3 years (ranged 36 to 65 months). Two implants were excluded (1 subject dropped out and 1 implant failed) from the data analysis in this study, resulting in an overall cumulative implant success rate of 96.6% (28/29) after 3 years. Statistically significant less facial mucosal profile changes (hard tissue zone only [p= 0.04]) were noted in the IIPP+SS group than in the IIPP group. However, no statistically significant difference were found in the facial mucosal level changes (p=0.13) and papilla level changes (p = 0.67 for mesial papilla level and p = 0.49 for distal papilla level) changes between the IIPP and IIPP+SS groups.

Conclusion: Within the limitations of this 3-5 years retrospetive follow-up, IIPP+SS appears to maintain only the implant facial mucosal profile slightly better than IIPP alone. Both treatment modalities provide clinically satisfactory outcomes biologically, functionally, and esthetically.

OC-6

Esthetic and Colorimetric Assessment of Implant Sites Augmented With the Strip Gingival Graft Harvested From Buccal Soft Tissue or the Palate

S.D. Akhondi*, I. Urban, L. Mancini, L. Tavelli

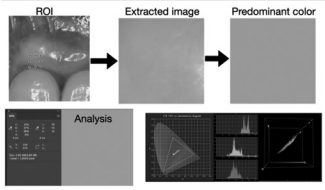
Introduction: The importance of keratinized mucosa (KM) in maintaining peri-implant health and esthetics is well established. The Strip Gingival Graft (SGG) technique, involving an apically positioned flap (APF) combined with an autogenous SGG and a xenogeneic collagen matrix (XCM), has demonstrated effectiveness in restoring KM width. However, it remains unclear whether grafts harvested from the palate (pSGG) or the buccal soft tissue (bSGG) result in superior esthetic outcomes. This study aimed to compare the esthetic outcomes of dental implants augmented with either bSGG + XCM or pSGG + XCM.

Method: This single-center retrospective study included 49 subjects who underwent peri-implant KM augmentation using either bSGG + XCM or pSGG + XCM. Colorimetric analysis was conducted using specific software to quantify the predominant color in the augmented peri-implant tissue, and the Pink Esthetic Score (PES) and Subjective Esthetic Score (SEE) were used to assess esthetic outcomes. Data were compared between the groups using independent t-tests and one-way ANOVA for colorimetric parameters.

Results: The colorimetric analysis did not show significant differences between sites augmented with pSGG + XCM, bSGG + XCM, or adjacent untreated sites. However, sites augmented with bSGG + XCM demonstrated significantly greater PES scores compared to pSGG + XCM in terms of mesial and distal papilla shape, soft tissue margin level, contour, and alveolar process anatomy. Additionally, the subjective esthetic evaluation showed higher scores for bSGG + XCM (7.25) compared to pSGG + XCM (6.48) (p=0.043).

Conclusion: While both pSGG + XCM and bSGG + XCM techniques provide satisfactory colorimetric results, bSGG + XCM yields superior professional and subjective esthetic outcomes. The results suggest that bSGG + XCM may be a more favorable option for esthetic regions, although further studies are necessary to validate these findings in larger cohorts.

Color scale	Color parameter	pSGG + XCM	bSGG + XCM	Untreated sites
RGB	R (mean ± SD) (unit)	177.83 ± 26.02	173.00 ± 14.11	176.94 ± 22.20
	G (mean ± SD) (unit)	136.54 ± 28.69	124.36 ± 19.36	127.77 ± 26.14
	B (mean ± SD) (unit)	128.75 ± 27.90	117.91 ± 16.20	120.00 ± 24.71
LAB	L (mean ± SD) (unit)	60.96 ± 10.53	57.45 ± 6.56	58.74 ± 9.13
	A (mean ± SD) (unit)	19.63 ± 5.21	23.64 ± 6.04	23.71 ± 5.37
	B (mean ± SD) (unit)	12.29 ± 3.07	13.55 ± 2.77	14.31 ± 3.04
CMYK	C (mean ± SD) (unit)	21.63 ± 9.37	22.36 ± 5.48	20.03 ± 6.65
	M (mean ± SD) (unit)	53.25 ± 14.49	59.00 ± 9.64	58.80 ± 12.90
	Y (mean ± SD) (unit)	44.46 ± 12.45	47.64 ± 6.33	48.26 ± 11.40
	K (mean ± SD) (unit)	4.00 ± 5.98	3.27 ± 3.00	4.11 ± 6.07



Esthetic system	Color parameter	pSGG + XCM	bSGG + XCM	p-value
PES	Mesial papilla (mean ± SD) (points)	0.89 ± 0.79	1.35 ± 0.59	0.025*
	Distal papilla (mean ± SD) (points)	0.79 ± 0.69	1.40 ± 0.50	<0.01*
	Level of the soft tissue margin (mean ± SD) (points)	0.82 ± 0.77	1.55 ± 0.60	<0.01*
	Soft tissue contour (mean ± SD) (points)	0.93 ± 0.66	1.40 ± 0.68	<0.01*
	Alveolar process (mean ± SD) (points)	1.21 ± 0.57	1.60 ± 0.50	0.014*
	Soft tissue colour (mean ± SD) (points)	1.46 ± 0.69	1.65 ± 0.59	>0.05
	Soft tissue texture (mean ± SD) (points)	1.29 ± 0.66	1.45 ± 0.51	>0.05
	Overall PES (mean ± SD) (points)	7.39 ± 2.87	10.40 ± 2.01	<0.001*
SEE	Overall esthetics (mean ± SD) (0-10 VAS, points)	6.48 ± 1.53	7.25 ± 1.07	0.043*

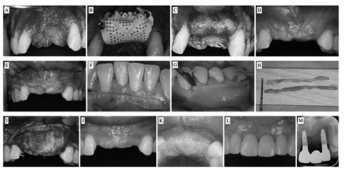


Table 1. Colorimetric analysis and comparison among sites augmented with the pSGG + XCM or bSGG + XCM technique, and untreated sites.

Table 2. Professional esthetic assessment at augmented implant sites using the Pink Esthetic Score (PES) and a subjective esthetic evaluation (SEE).

Figure 1. Buccal strip gingival graft approach for soft tissue augmentation in the anterior maxilla following bone reconstruction.

Figure 3. Colorimetric analysis of the augmented peri-implant soft tissue.

OC-7

5-year Evaluation of Crestal Bone Loss and Survival Rate of Extra-short (4-mm) Implants Retaining Mandibular Overdentures: A Randomized Clinical Trial

G.P. Sabatini*, R. Lidani, M. Lisboa, A. Cadore, T. Santos, A. Philippi, B. Yilmaz, L.A. Mezzomo

Introduction: Crestal bone stability is essential for the longevity of dental implants. The introduction of short and extra-short implants aims to rehabilitate patients with limited bone availability without compromising implant survival rates. This study evaluates the changes in the crestal bone level (CBL) of extra-short implants (4-mm) and conventional implants (≥8- and <12-mm) retaining mandibular overdentures over a 5-year period.

Method: Patients were randomized into two groups. In the test group, patients received a bar-clip overdenture on two conventional implants in the interforaminal region and two extra-short implants in the posterior region. In the control group, patients received the same type of prosthesis, but on only two conventional implants in the interforaminal region. After the delivery of the prosthesis, customized radiographs of the implants were obtained to evaluate the CBL. A radiographic examination was performed 5 years later. The difference between the CBL at baseline and 5 years, in millimeters, was calculated on the mesial and distal sides, for both conventional and extra-short implants.

Results: Out of 27 patients included in the initial study, 21 patients presented for the 5-year follow-up (7 men and 14 women), resulting in 42 conventional and 24 extra-short implants for the CBL evaluation. The overall survival rate (SR) of the implants was 96.9% at 5 years of follow-up. Two extra-short implants were lost before loading (SR: 91.6%), while no conventional implant was lost (SR: 100%). Considering only the follow-up period after prosthetic loading, the overall SR of the implants was 100%. The mean mesial CBL of the conventional implants was 0,104 ± 0,697, while 0,227±0,425 for extra-short implants. On the other hand, the mean distal CBL of the conventional implants was -0,048±1,3687, while 0,171±0,498 for extra-short implants. No difference was found between the CBL of conventional and extra-short implants, both in mesial and distal.

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Conclusion: Extra-short and conventional implants showed high survival rates at a follow-up of 5 years. There was no significant difference in crestal bone loss between conventional and extra-short implants, both in the mesial and distal areas. This suggests that extra-short implants may be a viable alternative to conventional implants in terms of long-term bone stability and maintenance.

OC-8

Immediate Implant Placement Versus Early Implant Placement in the Esthetic Area: Five-year Results of a Randomized Clinical Trial

K. Pala*, G. Gallucci, A. Nasseri, E.V. Narbute, T. Zvirblis, A. Puisys

Introduction: Immediate implant placement has emerged as an alternative to early implant placement for anterior maxillary teeth, aiming to minimize surgical interventions and maintain soft tissue morphology. Despite promising outcomes, concerns about gingival recession have been raised. This study compared immediate implant placement with immediate loading versus early implant placement with delayed loading, assessing long-term esthetic, clinical, and patient-reported outcomes.

Method: Eligible patients with failing anterior maxillary teeth were randomized after extraction. The test group received immediate implant placement with buccal gap augmentation, connective tissue graft (CTG), and immediate temporization; the control group received CTG with early implant placement, guided bone regeneration, and delayed loading. Exclusion criteria included severe deep bite, systemic diseases, and heavy smoking. Randomization used sealed envelopes, with final restorations placed after healing. The primary outcome was the pink esthetic score (PES); secondary outcomes included white esthetic score (WES), crestal bone changes (CBC), buccal bone thickness, soft tissue width and height, and orofacial esthetic scale (OES). Follow-up occurred at 1 and 5 years.

Results: 38 patients (22 test, 16 control) completed the 5-year follow-up, with both groups showing a 100% implant survival rate. Median PES values for the test group were 8.5 at 1 year and 8.0 at 5 years; the control group showed a median of 7.0 at both intervals, with no significant differences (p=0.288). WES values stayed stable at 9.0 across both groups. 5-year median OES was 64.5 (test) and 61.5 (control, p=0.171). CBC remained stable, with no significant differences between groups (p=0.374). After 5 years, the control group showed greater soft tissue width (3.71 mm vs. 2.52 mm, p=0.033), while the test group had higher buccal bone thickness at the implant shoulder (2.25 mm vs. 1.24 mm, p=0.031). No significant differences were found for probing pocket depth, bleeding on probing, or plaque index.

Conclusion: The findings suggest that both protocols are equally viable for anterior maxillary tooth replacement. Both immediate and early implant placement protocols yielded stable esthetic, clinical, radiological, and patient-reported outcomes after 5 years. Timing of implant placement did not show an influence on the results in this study.

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OS-1

Advancing Bone Augmentation Techniques Through Personalized Biodegradable Membranes

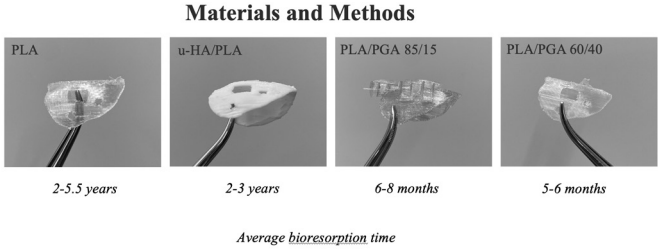
E. Zernitckaia*, J. Lozada

Introduction: Achieving optimal functional and aesthetic outcomes in implant dentistry requires precise 3D implant positioning. In cases where the residual bone width, height, and ridge contour are inadequate for ideal implant placement, scaffolds play a crucial role in guided bone regeneration. While prefabricated titanium scaffolds are commonly used, they often require intraoperative manual trimming to match the patient's specific defect size. Aim: To develop and compare unique compositions of biodegradable materials for 3D printing individual scaffolds for bone augmentation, which will biodegrade over the required number of months depending on the bone defect (from 3 to 9 months).

Method: 15 laboratory animals were included in this study. Membrane prototypes were created using various materials, including pure polylactide, polylactide supplemented with 15% hydroxyapatite nanoparticles, and Polylactic-co-glycolic acid with monomer ratios of 60:40 and 85:15. Membranes were designed using ZBrush software and then produced using a Prusa 3D printer through Fused Deposition Modeling (FDM) printing, followed by sterilization via gamma radiation (average dose: 25 kGy).

Results: Our findings indicate that cells can proliferate and undergo osteogenic differentiation in the presence of polymer meshes. Notably, the incorporation of hydroxyapatite particles in the matrices appears to influence the degree of osteogenic differentiation in cells. Moreover, alterations in the polymer composition ratios seem to impact both cell proliferation and osteogenic differentiation. However, it is essential to note that the degree of cell proliferation and the synthesis of calcified extracellular matrix in these polymer-based scaffolds are lower compared to control cells.

Conclusion: This approach enhances the management of surgical jawbone augmentation, contributing to more successful outcomes in bone defect regeneration. Titanium scaffolds offer simplified handling and the option for removal, providing stability with reduced handling time. In contrast, biodegradable scaffolds eliminate the need for additional surgery. Further research is required to evaluate the effects and advantages of scaffolds composed of various materials thoroughly.



OS-2

Osseointegrate and Vanish: Immunomodulation by Biodegradable Magnesium Implants Shapes Their Integration Into Bone

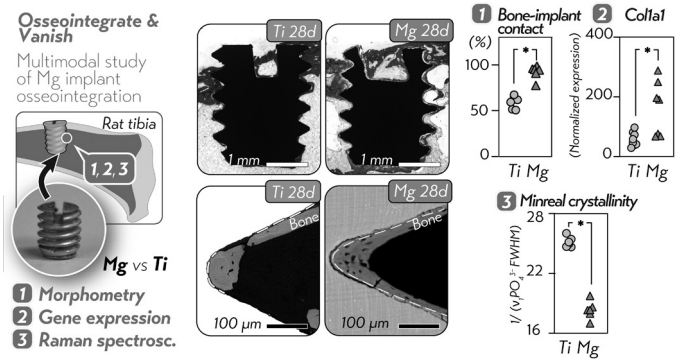
H. Ben Amara*, D.C. Martinez, L. Emanuelsson, B. Norlindh, A. Johansson Loo, T. Plocinski, W. Swieszkowski, F.A. Shah, A. Palmquist, O. Omar, P. Thomsen

Introduction: Titanium (Ti) implants are utilized with high predictability but may need removal after fulfilling their purpose, such as in osteosynthesis for bone fracture fixation. An attractive alternative is magnesium (Mg), a mechanically potent metal that degrades *in situ* upon contact with recipient tissues via corrosion, thus avoiding surgical re-entry and possible associated complications. This study investigated *in vivo* inflammation and regeneration of bone in response to Mg implants compared to Ti implants at the cellular and structural levels.

Method: Pure Mg and pure Ti screws were implanted into rat tibiae. After 3 d and 28 d, implants and associated bone were retrieved (n = 24/group/timepoint). Histomorphometry quantified new bone deposition at implant surfaces, while the cellular composition of the adjacent bone marrow was determined via digital pathology tools. Quantitative polymerase chain reaction (qPCR) and immunohistochemistry analyzed gene and protein expression of cells at the bone–implant interface and in the surrounding bone marrow. Electron microscopy and micro-Raman spectroscopy analyzed the composition of the new bone matrix interfacing with the implants.

Results: Mg implants increased bone-implant contact by 55% (Mg = 92.2±7% *vs* Ti = 59.5±7%) at 28 d. In parallel, qPCR indicated that the expression of osteogenic genes osteocalcin (*Oc*) and collagen 1a1 (*Col1a1*) was twice as high in bone associated with Mg compared to Ti implants at 28 d. qPCR and immunohistochemistry revealed that this regenerative response was preceded by a transient activation of inflammatory cytokines, proinflammatory macrophage (M1), osteoclastogenesis, and neoangiogenesis in response to Mg *vs* Ti implants. Moreover, micro-Raman spectroscopy showed that new bone at Mg implant surfaces had ~30% decreased matrix mineralization and ~45% increased organic content compared to Ti, indicative of 'younger' bone characteristics.

Conclusion: Mg implants elicit immunomodulation in the bone milieu through transient activation of inflammation. This promotes reparative osteogenesis at their surface and reinforces integration in bone. However, given the degradable nature of these implants, bone deposited at their surface appears compositionally different with features of a 'younger' tissue, raising questions on inherent mechanical implications on the bone-implant interface under loading conditions in patients.



OS-3

Prioritizing Genomic Research in Peri-implant Disease: A BERT-Based Framework for Drug and Disease Insights

S. Sharma*, P.K. Yadalam

Introduction: Peri-implant disease, characterized by inflammation and subsequent loss of supporting bone around dental implants, poses significant challenges in dental practice and patient outcomes. Peri-implant inflammatory genes are crucial in understanding the biological processes involved in peri-implant diseases. Researchers are using data mining and bioinformatics to predict gene ontology annotations related to inflammatory response drugs and diseases. This knowledge can lead to drug targets, predictive biomarkers, and personalized treatment for peri-implant diseases, bridging the gap between genomic research and clinical applications. The study proposes a BERT-based framework to prioritize genomic research on peri-implant inflammatory genes' role in drugs and diseases, aiming to bridge the gap between genomic research and clinical applications. So, our aim is BERT-based classification for drugs and diseases associated with peri-implant inflammatory genes.

Method: The study identifies and retrieves genes from literature, and Enrichr, a web-based tool, was used to analyze the retrieved genes, focusing on gene ontology like DSigDB DisGeNET. DSigDB provides gene expression signatures linked to drug treatments, aiding drug target identification and understanding pathway molecular mechanisms. The Drug Signatures Database and gene-disease associations were used

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for preprocessing and sentiment analysis. The model was optimized using a binary classification model with a maximum sequence length of 128 tokens, batch size of 16, 3 epochs, 2e-5 learning rate, and 80% training and 20% testing split.

Results: The model achieved an accuracy of 98.73%, showing high precision, recall, and F1 scores for both sentiment classes. The loss curve showed a consistent decrease, indicating effective learning. The BERT-based sentiment analysis model showed high accuracy with 98.73% across positive and negative sentiment classes. It learned efficiently, showed potential for gene-related text domain analysis, and showed minimal overfitting. The model's performance improved rapidly, with a sharp decrease in loss from the first to the third epoch.

Conclusion: The BERT-based sentiment analysis model successfully identified and prioritized peri-implant inflammatory genes, achieving 98.73% accuracy, enhancing understanding of gene interactions and enabling personalized treatment strategies.

OS-4

Integrating Auto-distribution of Implant Fixtures (ADIF) With Prosthesis- Implant Arch Area Ratio (PIAAR): A Geometric Framework to Enhance Precision and Efficiency in Guided Implant Surgery

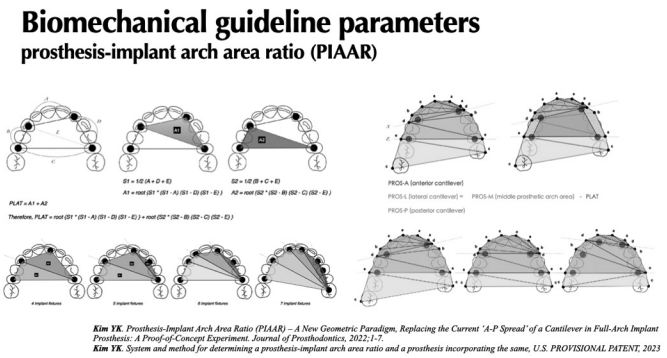
Y.K. Kim*

Introduction: In modern computer-assisted guided implant surgical protocols, precise fixture planning requires considerable time and effort in the non-clinical arena. This presentation introduces the integration of Auto-Distribution of Implant Fixtures (ADIF) with Prosthesis-Implant Arch Area Ratio (PIAAR). Using PIAAR's geometric metrics to support ADIF's automated positioning, this model aims to ease the planning process and improve workflow efficiency in guided implant surgery.

Method: This approach leverages the synergy between ADIF and PIAAR. ADIF utilizes a patent-pending AI-driven machine-learning algorithm to automate fixture distribution by assessing anatomical and prosthetic data for automated positioning. PIAAR provides the geometric foundation for ADIF, using metrics from Heron's formula to coordinate dimensional acquisitions. Together, ADIF and PIAAR form a cohesive model designed to enhance fixture positioning in guided implant surgery.

Results: Preliminary applications indicate that PIAAR's geometric support enables ADIF to enhance planning executions and practicality. ADIF's automation feature reduces manual adjustments, while PIAAR's metrics provide the ideal range of prosthetic access hole positions with fixture allocations. This integrated model anticipates increased efficiency and minimal procedural time in guided implant workflows.

Conclusion: The ADIF-PIAAR integration offers a theoretically robust, geometry-based approach to optimize guided implant surgery. This framework supports a prosthetically aligned workflow, providing a systematic pathway for fixture positioning. Future studies will focus on empirical validation to confirm its clinical impact and refine implant positioning practices.



PIAAR

OS-5

Predicting Future Sinus Augmentation Procedure Using Deep Learning From CBCT Scans

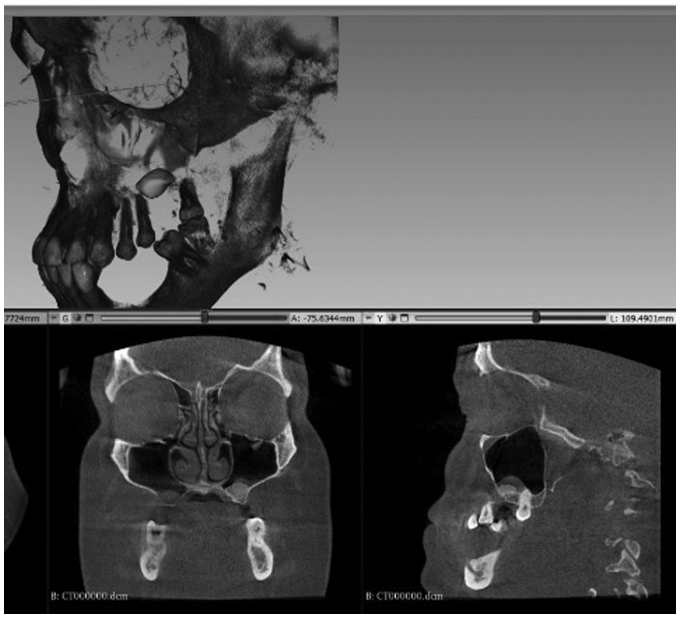
E. Zernitckaia*, J. Lozada

Introduction: While CBCT is essential for diagnosing bone deficiencies and planning sinus floor elevation, it has limitations in fully predicting surgical challenges. AI technologies are now being integrated to enhance diagnosis and surgical planning, offering more accurate predictions of bone graft needs and potential complications. By combining CBCT with AI, clinicians can achieve more precise treatment plans, improving outcomes and reducing risks in complex implant cases. Aim: The accurate prediction of future sinus augmentation procedures and bone grafting volume is crucial for preoperative planning in oral and maxillofacial surgery. Current manual methods are time-consuming and subjective. We aim to address this problem by leveraging deep learning techniques to automate and improve the accuracy of these predictions.

Method: This study included 200 CBCT scans from patients who underwent sinus augmentation procedures. Scans were acquired using J Morita 3D Accuitomo and NewTom Giano HR 3D systems, with parameters set to under 100 kVp and 9 mA, voxel size 0.3 × 0.3 × 0.3 mm. The CBCT scans were stored in DICOM format and anatomical landmarks were identified using 3D Slicer software. A convolutional neural network (CNN) was developed for medical image segmentation. The dataset was divided into training (70%), validation (15%), and test (15%) sets, with data augmentation techniques applied to enhance model generalization.

Results: The deep learning model achieved an accuracy of 92% in predicting bone graft volumes from CBCT scans. Validation across the test set showed strong performance, with a mean absolute error of 0.5 mm between estimated and actual intraoperative graft volumes. Data augmentation techniques improved model generalization, particularly in cases with variations in image quality. The model demonstrated reliable performance in diverse patient cases, including those with challenging anatomical features.

Conclusion: This study demonstrates that AI-based models can accurately predict bone graft volumes in sinus augmentation procedures using CBCT scans. The model's high accuracy and generalizability suggest its potential as a valuable tool for improving preoperative planning and outcomes in dental implantology. Further research could refine these techniques and explore their application in other maxillofacial procedures.



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OS-6

Spectrometric Analysis of Implant-bone Interface in Dense Bone Utilizing Standardized and Non-tapping Protocol

Y. Garaev*, K. Butt, R. Delgado-Ruiz, G. Romanos

Introduction: The release of titanium nanoparticles may induce inflammatory responses, interfere with osseointegration, and compromise the long-term stability of the implant. Titanium accumulation in the surrounding tissues could exacerbate bone resorption, highlighting the need for improved techniques and materials to mitigate these risks. The objective of this study was to examine the presence of titanium nanoparticles at the bone-implant interface during implant placement utilizing the tapping drills.

Method: Artificial Type III bone, slices (3mm thick) were securely held in place with a vice. Two groups of pure titanium implants (grade 4) were placed. 12 total implants were placed: 6 Nobel Parallel 3.75 x 10 mm implants and 6 Nobel Replace 3.5 x 13mm implants. Group I: Test group implants were placed utilizing tapping drills (recommended protocol). Group II: Control group implants were placed under standard protocol with no tapping drills. Implants were placed in parallel between bone slices held in the vice. Upon the placement of the implants, the blocks were separated, and the peri-implant bone interface was quantitatively evaluated for titanium presence using X-ray-fluorescence spectrometry (XFS) at the coronal, middle, and apical thirds of osteotomies. Descriptive statistical analysis showing the mean values (+/-SD) of titanium nanoparticles was performed.

Results: Titanium nanoparticle release was significantly lower in the test group (tapping drills) compared to the standard group ($p < 0.05$). The titanium nanoparticles release was not only significantly lower but also not detectable at most tested sites (please refer to chart below).

Conclusion: Our results indicate that implementation of tapping drills in dense bone significantly lowers the titanium particle release during implant placement in vitro.

Table 1

	Control Implant 1	Control Implant 2	Control Implant 3	Control Implant 4	Control Implant 5	Control Implant 6
Coronal 1	6060 ppm	12500 ppm	9200 ppm	10700 ppm	8770 ppm	9680 ppm
Middle 1	3270 ppm	7140 ppm	7400 ppm	8860 ppm	7230 ppm	8790 ppm
Apical 1	3420 ppm	3740 ppm	3680 ppm	8550 ppm	5040 ppm	8550 ppm
Coronal 2	6040 ppm	10200 ppm	6330 ppm	8660 ppm	9390 ppm	7740 ppm
Middle 2	4550 ppm	7100 ppm	3620 ppm	8490 ppm	8780 ppm	5440 ppm
Apical 2	5860 ppm	11000 ppm	4060 ppm	3380 ppm	3680 ppm	5940 ppm
	Test Implant 1	Test Implant 2	Test Implant 3	Test Implant 4	Test Implant 5	Test Implant 6
Coronal 1	3780 ppm	3360 ppm	6870 ppm	4410 ppm	5210 ppm	5420 ppm
Middle 1	2430 ppm	2690 ppm	5410 ppm	3640 ppm	4300 ppm	4140 ppm
Apical 1	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
Coronal 2	0 ppm	0 ppm	0 ppm	4520 ppm	4140 ppm	4200 ppm
Middle 2	0 ppm	0 ppm	0 ppm	3480 ppm	3240 ppm	2050 ppm
Apical 2	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm

OS-7

Effect of 3D-printed Biocomposite Scaffolds on Vascularisation and New Bone Formation

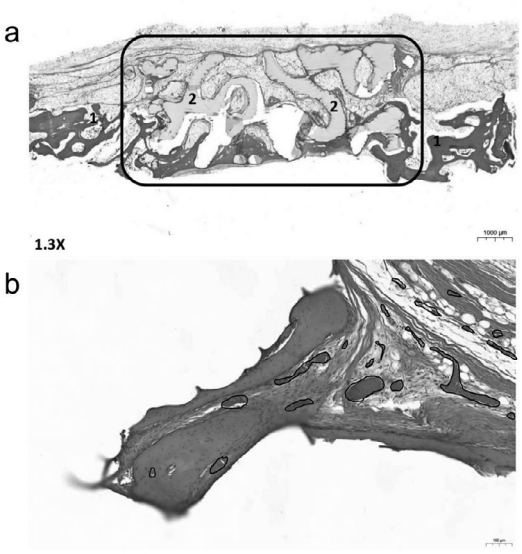
M. Vitosyte*, S. Galinauskaite, E. Simoliunas, M. Alksne, C.M. Martinez, V. Rutkunas, I. Gendviliene

Introduction: Bone is the second most widely transplanted tissue in the world, with over 2 million surgeries performed each year. 3D-printed bone scaffolds are a promising regeneration technique that could reduce the time and scope of surgery. The research study evaluated the bone regenerative capability of 3D-printed biocomposite scaffolds containing poly(lactic acid), poly(ε-caprolactone), hydroxyapatite, and calcium-deficient hydroxyapatite.

Method: There were 4 groups in the study (n=5/gp): negative control, xenogenous bone, autogenous bone and PLA/PCL/(HA/CDHA) composite scaffolds with gyroid structure and interconnecting 3D pores. All materials were implanted in New Zeland rabbit'scalvarial critical-size defect *in vivo* model to evaluate materials' osteoregenerative and vascularisation potential. The defects were evaluated by micro-CT and histological analysis eight weeks after surgery. All procedures were approved by License of Animal Research Ethics Committee No B1-437, 2022-06-08.

Results: Histological evaluation showed no significant differences in new vessels and bone formation between the groups, except between positive control / scaffold group and negative control group ($p<0.01$). More new blood vessels were formed in the PLA/PCL/(HA/CDHA) group (0.17±0.23 mm^2) than in the autogenous (0.11±0.87 mm^2) and xenogenous (0.08±0.14 mm^2) groups. Immunohistochemistry revealed no histopathological indications of specimen rejection; Geistlich Bio-oss® Group had the highest infiltration (2+) of macrophages. In the PLA/PCL/(HA/CDHA) group bone formation was observed throughout the scaffold, with the most significant regeneration concentratingat the defect edges, while in other groups bone regeneration initiated from the margins. Micro-CT results showed no significant difference between groups, scaffolds displayed poorer results (2.19±0.90 mm^3) in new bone formation than autogenic and xenogenous groups.

Conclusion: 3D-printed PLA/PCL/(HA/CDHA) scaffolds demonstrated excellent biocompatibility and significantly enhanced vascularization, indicating strong potential for supporting bone regeneration. While bone formation was less than in the autogenous and xenogenic groups, the scaffold's ability to promote new blood vessel growth makes it a promising candidate for future advancements in regenerative bone therapies.



Histological sections of calvarial bone defects at 3 months post-implantation: (a) Hematoxylin and eosin staining at the defect center, highlighting typical findings: (1) native bone and (2) PLA/PCL/(HA/CDHA) scaffold; (b) Higher magnification of the vascular surface of the PLA/PCL/(HA/CDHA) scaffold, showing integration with new blood vessels.

OS-8

Effect of Erythritol Air-Polishing on Titanium Surfaces: An In Vitro Study

G. Brunello*, S. Sivolella, E. Lotta, M. Stocchero, R. Meneghello, P. Brun

Introduction: The success of peri-implant mucositis and peri-implantitis therapy largely depends on bacterial recolonization and biofilm formation on the treated implant surfaces. Aim of this *in vitro* study was to investigate the effect of erythritol air-polishing on implant surface topography and bacterial colonization.

Method: Titanium dental implants characterized by a hybrid design, with a coronal machined surface and an acid-etched apical portion, were divided into 3 groups: erythritol air-polishing for 1 minute (E1), 5 minutes (E5), or no treatment (control). Implant surfaces were observed using scanning electron microscope (SEM) and surface roughness (Ra and Rz) was measured with a profilometer. To evaluate the influence of surface treatment on bacterial biofilm growth, 5 implants per group were utilized and E1- and E5-treated implants were sterilized prior to

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the experiments. Samples were incubated in monoculture of *S. aureus, K. pneumoniae, S. mutans,* and *S. sanguinis* and colony counting was carried out. Kruskal Wallis test and ANOVA were performed for roughness and microbiological data, respectively, followed by post-hoc analysis in case of significance ($p<0.05$).

Results: At SEM analysis the morphology of both machined and acid-etched surface appeared unmodified by erythritol air-polishing and showed increasing amount of residues depending on the treatment duration. Machined surfaces exhibited no significant differences in roughness parameters between the groups. On acid-etched surfaces, E5 presented significantly higher Ra (vs E1 and control) and Rz (vs control) values. The count of colonies was significantly lower for all tested bacterial strains on treated implants as compared to control, with no differences between E1 and E5, being equally capable to reduce by 1.5 log the bacteria growth on implant surface.

Conclusion: The proposed erythritol air-polishing protocols did not alter the morphology of the investigated implant surfaces, while discouraging the subsequent bacterial adhesion. The efficacy of implant surface decontamination remains to be assessed.

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CI-1

Clinical Innovation of Bone Tissue Regeneration for Dental Implants by Cell Therapy Using Dental Pulp Stem Cells

Y. Yamada*, W. KATAGIRI, S. Yamada

Introduction: Regenerative medicine, which noninvasively restores lost healthy tissue through the application of stem cells, is gaining clinical application, but it is not yet widely used. Dental pulp stem cells (DPSCs) have been identified as a useful population of stem cells that have the capacity of self-renewal and multilineage differentiation including osteogenic differentiation. We have conducted the clinical study with DPSCs and platelet rich plasma (PRP) following the Japan government's law Act on Securing Safety of Regenerative Medicine. The aim of this clinical study was the evaluation of the safety and the efficacy of bone regeneration therapy using DPSCs for osseointegrated dental implants.

Method: The clinical study was conducted according to the principles of the Declaration of Helsinki and the Japanese guidelines of human stem cell clinical research Act on Securing Safety of Regenerative Medicine. DPSCs obtained from patients were cultured in Cell Processing Center (CPC) based on good manufacturing practice (GMP). Their characteristics were examined for clinical use. The mixture of DPSCs and PRP solution that was combined with human thrombin and calcium chloride were injected to the bone resorption area. The safety and efficacy of clinical application were evaluated.

Results: The DPSCs were expanded enough to use for clinical application and expressed surface epitopes of mesenchymal stem cell markers including CD29, CD44, CD73. The safety test of the final cell product showed no bacterial, fungal, mycoplasma, or endotoxin contamination. The clinical and laboratory evaluations including blood tests, urine analysis, and electrocardiogram demonstrated no adverse events or toxicity. The DPSCs/PRP with stem cells showed the early bone formation clinically, which it upregulated the radiopaque. The histomorphologically analysis also showed well-formed mature bone formation. The clinical course remained favorable outcome.

Conclusion: These results demonstrated that DPSCs/PRP by stem cell therapy have the ability to regenerate bone, and their activity was useful for treatment with dental implants. Since regenerative medicine with DPSCs can be obtained noninvasively and easily from unnecessary teeth such as third molar and deciduous teeth, this innovative application using DPSCs to regenerate bone for dental implants might provide substantial advantages over a conventional technique.

CI-2

3D Printed Customized Bone Graft Compared With Autogenous Bone Graft in the Regeneration of Atrophic Maxilla

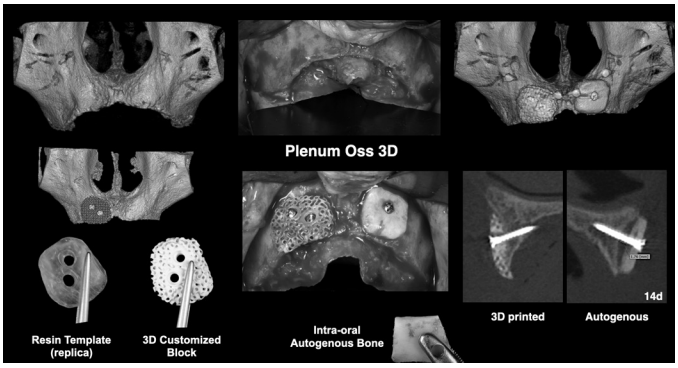
J.A. Shibli*, c. Malzoni, V. Gonçalves, P. Frigerio, R. Okamoto, E. Marcantonio Jr.

Introduction: Due to its unique biological properties, autogenous bone grafts remain outstanding for bone regeneration. However, they also have disadvantages such as postoperative morbidity and a limited amount of graft. Bone substitutes have been personalized by 3D printing, building complex 3D structures tailored to the bone defect. This split-mouth randomized clinical trial evaluated the volumetric stability of the 3D-printed patient-specific graft compared with the autogenous bone graft (ABG).

Method: Twenty patients with maxillary anterior horizontal defects were randomly divided into a 3D-printed bone graft (test group) and ABG. All patients underwent cone beam computed tomography evaluation before bone grafting (T1), 1 week after grafting (T2) and 8 months (T3). The surgical procedure was timed in both groups. After 8 months, biopsies were obtained and dental implants were placed. Resonance frequency analysis was performed to measure implants' primary and secondary stability. Immunohistochemical analysis were performed using osteocalcin (OCN), alkaline phosphatase (ALP), vascular endothelial growth factor (VEGF) and morphogenetic protein (BMP-2).

Results: After 8 months of healing, it was found that 3D printed bone graft showed 3 times less volumetric resorption of the graft (T2-T3) (4.12% ± 2.71) compared with ABG (12.93% ± 2.2). Furthermore, it reduced the surgery time (9.40 minutes ± 4.06 in 3D printed versus 34.65 minutes ± 14.5 in ABG Groups) and showed no differences relative to the primary and secondary stability values of the implants placed. 3D-printed bone graft showed no inflammatory infiltrate, favorable bone neoformation, and an advanced stage of mineralization. Immunohistochemistry indicated that after 8 months, the ABG appeared to be more mature and showed significant immunostaining for VEGF. BMP-2 was barely noticeable in both groups, and the presence of ALP and OCN in the test group indicated more significant osteoblastic activity.

Conclusion: The 3D-printed bone graft was similar to ABG, showing benefits for the professional and the patient, reducing postoperative morbidity, facilitating the technique, and promoting greater volumetric stability of the graft after 8 months of healing



clinical and radiographic view of the workflow of the bone graft: autogenous and 3D printing

CI-3

Artificial Intelligence Model for Automated Diagnosis of Peri-Implant Diseases Using Shear Wave Elastography and Doppler Ultrasound: A Randomized, Triple-Blinded Discordant-Pair Study

H. Sabri*, L. Tavelli, J.M. Zimmer, P. Kumar, H.L. Wang, S. Barootchi

Introduction: Diagnosing peri-implant diseases, including peri-implant mucositis and peri-implantitis, is challenging. Conventional methods like probing depth and radiography have limitations due to factors like crown emergence and probing angulation, and lack dynamic inflammatory markers. Ultrasonography with color Doppler and shear wave elastography (SWE) offers non-invasive, real-time insights into tissue perfusion and stiffness. This study aimes to train an artificial intelligence model to automatically diagnose peri-implant diseases based on SWE and doppler ultrasonography.

Method: The study included 612 implants, with patients contributing two or three non-adjacent implants with varied diagnoses (healthy, peri-implant mucositis, or peri-implantitis); 306 were clinically healthy, 153 had mucositis, and 153 peri-implantitis. Ultrasound data were collected using color Doppler for vascularity and SWE for tissue elasticity across mesial, distal, and mid-buccal regions. The dataset was randomly split into training (75%) and testing (25%) subsets, and a CNN model was trained separately on Doppler and SWE data. Performance was benchmarked against expert diagnoses using sensitivity, specificity, and AUC metrics. Clinicians, the AI model, and evaluators were blinded to implant health status to ensure unbiased analysis.

Results: The CNN model showed strong diagnostic performance, with an AUC of 0.94 for peri-implant mucositis and 0.90 for peri-implantitis. Sensitivity was 92% for mucositis and 89% for peri-implantitis, with specificity at 87% and 85%. Cross-validation and data augmentation ensured consistent performance, reducing overfitting and enhancing accuracy across varied datasets.

Conclusion: This study demonstrates the effectiveness of a dual-modality ultrasound approach with AI in diagnosing peri-implant diseases. The CNN model achieved high accuracy for both peri-implant mucositis and peri-implantitis, providing a reliable, non-invasive alternative to traditional diagnostics. By automating the analysis of

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vascularity and tissue elasticity, the AI model offers real-time support, reducing reliance on invasive probing and radiography. This approach has strong potential to improve early detection and management of peri-implant diseases, paving the way for a more precise, patient-friendly diagnostic solution in implants.

CI-4

Canceled

CI-5

Artificial Intelligence-based Model for Precisely Quantitative Analysis of Multiple Anatomical Structure-to-implant Contact (AIC) Areas in Zygomatic Implant Surgery

B. Tao*, B. Sun, Y. Li, Y. Gao, F. Wang, Y. Wu

Introduction: Zygomatic implant (ZI) surgery is an effective and promising solution for patients with severely atrophic maxilla or maxillary bone defects, and it is associated with vital anatomical structures, including maxilla, zygoma, and maxillary sinus, which are closely related to the primary stability, complications and long-term successful rate of ZIs. The study aims to propose an artificial intelligence (AI)-based model to precisely and quantitatively analyze the multiple anatomical structure-to-implant contact (AIC) areas of ZIs for surgical planning and clinical outcome prediction.

Method: 1335 cone-beam CT (CBCT) of patients were used to train an AI model to segment maxilla, zygoma, and maxillary sinus. Patients who received ZIs surgery were enrolled and the trained AI model was used to segment those structures. Virtual cylinders were aligned with ZIs in the postoperative CBCT and ZI models were aligned with the cylinders to copy the position of ZIs. Then, the postoperative CBCT was registered with corresponding preoperative one. Then, ZI models were registered to the segmented structures, and contact areas of ZIs to maxilla, zygoma, and maxillary sinus were calculated automatically. And the mean contact length of ZI to zygoma bone was calculated.

Results: A total of 113 patients (102 severely atrophic maxilla and 11 maxillary defect) with 357 ZIs were included. Seven ZIs were failed and the total survival rate of ZIs was 98.04 % with a mean follow-up time of 24.11 months, and finally 350 ZIs were included. The contact areas of ZIs to maxilla, zygoma, and maxillary sinus were 256.37 ± 112.28 mm^2, 178.39 ± 75.47 mm^2, and 281.64 ± 216.85 mm^2, respectively. According to zygoma-anatomy guided approach (ZAGA) classification, there were significant differences among ZAGA groups in contact areas (p=0.00, 0.00, 0.00, respectively). The mean contact length of ZI to zygoma was 10.68 ± 4.03 mm. And there is a significant correlation of contact area to zygoma between virtual ZI and cylinder (R^2=0.91, p=0.00).

Conclusion: Within the limitations of the study, the proposed AI-based model could precisely and quantitatively analyze multiple AIC areas of ZIs, which could be further used to predict primary stability, complications and long-term successful rate of ZIs, leading to a more precise and predictable ZI planning and surgery execution.

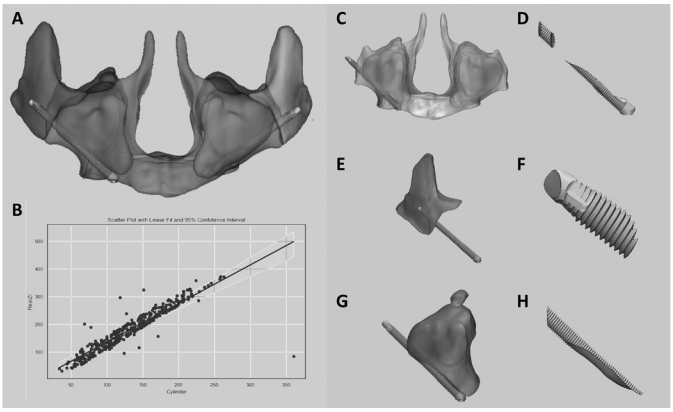

Fig.1 (A) The maxilla, zygoma, and maxillary sinus are segmented by a deep learning model and zygomatic implant (ZI) models are registered to the segmentations. (B) A significant correlation of the contact area to zygoma between virtual ZI and cylinder. (C) and (D) The contact area of ZI to maxilla and corresponding intersection result. (E) and (F) The contact area of ZI to zygoma and corresponding intersection result. (G) and (H) The contact area of ZI to maxillary sinus and corresponding intersection result.

CI-6

Exosome Mediated Peri-Implant Repair: A Case Series

S. Froum*, N. Estrin, H. Cho, R. Miron

Introduction: Exosomes are generally accepted to be essential mediators of tissue repair via well-established mechanisms of action that include stimulatory effects on angiogenesis and cellular proliferation, ingrowth, differentiation, and matrix biosynthesis in animal models. The aim of the present study was to evaluate exosomes (Periosomes) mixed with 90% anorganic bovine bone & 10% collagen (ABBMC) for the treatment of advanced per-implant lesions at 6 months of healing.

Method: 10 patients with severe peri-implantitis each of whom displayed at least 1 intraosseous lesion defect exhibiting 50% or more bone loss were selected to receive regenerative therapy. Flap surgery and defect debridement with a 9.3 micron Co2 laser (1.0 spot size 60% cutting speed) plus regenerative therapy consisting of exosomes/ABBMC. The following clinical and radiographic parameters were recorded at baseline and at 6 months: plaque index, gingival index, bleeding on probing (BOP), probing depth (PD), gingival recession, clinical attachment level (CAL) and percent defect bone fill (% BF).

Results: Healing was uneventful in all patients. At 6 months after therapy, the sites treated with Exosomes/ABBMC had a mean PD from 9.6±1.2 mm to 4.6±0.8mm and a change in mean CAL from 10.7±1.3 mm to 5.5±1.4mm ($p<0.001$). Percent defect bone fill was 57% +/- 8.5%.

Conclusion: To our knowledge, this study is the first human clinical study to asses the use of exosomes in peri-implant regenerative therapy. The study demonstrated that the use of exosomes/ABBMC was safe and effective in the treatment of advanced implant osseous defect leisons.

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CI-7

Augmented Reality-based Novel Surgical Navigation System for Clinical Use

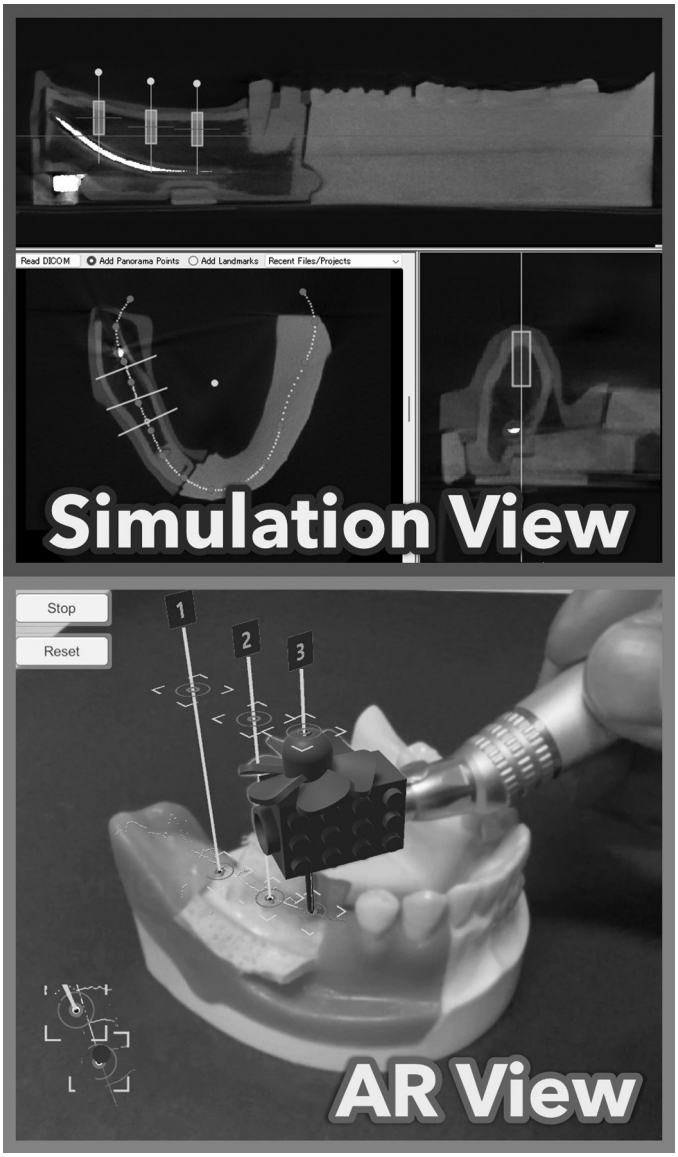
A. Takebayashi*, Y. Fukuda, R. Kawasaki, S. Kasugai, H. Yamamoto, T. Kano

Introduction: Placing an implant in an appropriate position is a key for successful treatment. Surgical (guide) plate and dynamic navigation systems are useful to place an implant at the planned position. However, the surgical plate system requires sufficient space for a surgical plate and drilling between the two jaws, which is difficult in the posterior region. In addition, since a surgical plate covers the whole surgical site, irrigation cooling water cannot reach the drill, and a surgeon cannot see the surgical site directly. Dynamic navigation systems address these problems; however, they use a large tracker fixed on a patient's jaw which obstructs the surgical workflow. Furthermore, although the surgeon can see the surgical site directly, they must focus primarily on the monitor screen. To solve these problems, we developed the following surgical navigation system based on augmented reality (AR) technology, displaying the surgical site overlaid with the virtual axes of the simulated implants on a screen.

Method: Our system consists of a camera, a computer, a monitor, original simulation software, and customized AR software, with a custom attachment for the contra-angle head which we designed to enhance trackability. Procedure Outline: 1. To create a treatment plan, perform a CT scan and determine the positions of implants with our simulation software. 2. Generate a 3D model of the patient's dentition from CT or optical scan data. 3. Mount the custom attachment on the contra-angle head. 4. Track the dentition shape and display the virtual implant axes using AR software. 5. Track the attachment shape and display the virtual drill axis on the actual drill. 6. Mark the point on the bone surface with a round bur where the virtual drill and implant axes overlap. 7. Place the apex of the pilot drill at the marked point and drill into the bone while aligning the drill axis with the implant axis. This procedure ensures preparation of the bony holes for implant placement according to the treatment plan.

Results: We first tested the system on a training typodont. The virtual drill and implant axes worked well on the typodont. We then performed implant placement surgeries on patients using our system. In clinical operations, our system functioned effectively as a surgical navigation, providing stability and accuracy.

Conclusion: Our system can solve the problems of the surgical plate and dynamic navigation systems outlined in the introduction.



Demonstration of our system in use: Simulation View (top) and AR View (bottom) navigating implant treatment.

CI-8

A Novel Approach to Guided Bone Regeneration With Simultaneous Dental Implant Placement: A Comparative Study and 1-Year Follow-up

H. Matsuda*

Introduction: In GBR, grafted bone volume around the implant platform often falls short of expectations. This retrospective study introduces an innovative GBR technique and evaluates its efficacy against conventional methods.

Method: Patients who received simultaneous GBR with implant placement (April 2020 - July 2022) were grouped as follows: Test: GBR with SUBMERGED healing abutment (healing abutment + cross-linked membrane[CM]) Control 1: Conventional GBR (cover screw + CM) Control 2: GBR with titanium pins (cover screw + stretchy membrane + titanium pins) Buccal bone width was measured at 0 mm, 2 mm, and 4 mm from the implant platform (BL0, BL2, BL4) using CT imaging at pre-op, post-op and one year after loading. Surgical times were also recorded.

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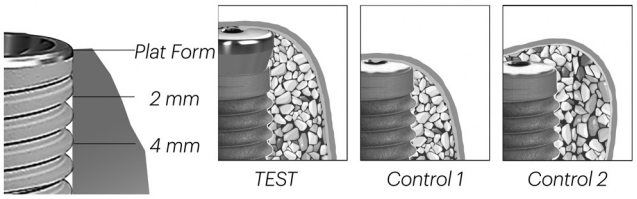
Results: This analysis included 45 patients who received a total of 88 dental implants. The mean buccal bone thickness (95% CI) measured postoperatively at BL0, BL2, and BL4 was as follows: **Test group**: 4.3 mm (3.8–4.9), 5.4 mm (4.8–5.9), and 5.6 mm (5.1–6.1). **Control group 1**: 3.0 mm (2.8–3.8), 4.2 mm (4.1–5.1), and 5.1 mm (4.9–6.0). **Control group 2**: 4.6 mm (3.8–5.4), 5.4 mm (4.6–6.2), and 5.9 mm (5.1–6.7). The mean surgical times (95% CI) for each group were as follows: **Test group**: 80 min (71–89) **Control group 1**: 87 min (74–100) **Control group 2**: 107 min (94–120) Although there was no significant difference in preoperative bone thickness between the groups, the Test group and Control group 2 showed significantly greater grafted bone thickness at BL0 and BL2 compared to Control group 1 postoperatively ($p < 0.05$). The surgical time for Control group 2 was also significantly longer than that of the Test group and Control group 1 ($p < 0.05$). One year after loading, the remaining grafted bone thickness in the Test group was 2.2 mm (1.6–2.9) at BL0, 3.0 mm (2.3–4.2) at BL2, and 3.7 mm (2.7–5.2) at BL4.

Conclusion: Keys of achieving sufficient bone volume around the implant platform include "packing", "tenting", and "isolation". This study shows that using a submerged healing abutment in GBR with a minimally flap design and CM, which packs bone particulates and maintains space through the abutment's tenting effect. The CM also provides extended isolation for better bone regeneration. While some clinicians may use similar ideas, no published data compares this technique with conventional methods or provides long-term follow-up results.



*GBR with **SUBMERGED** Healing abutment*

Pre-OP & Diagnosis *Surgery* *Pre-OP* *1Y after loading*

CI-9

Prediction of Alveolar Ridge Topography Change After Alveolar Ridge Preservation Using Deep Learning

X. Yu*, H. Li, F. Wang, X. Chen, Y. Wu

Introduction: Recent literature has highlighted that the ability to predict post- extraction ridge topography change could facilitate appropriate decision-making prior to tooth extraction. Therefore, the aim of the present study was to develop a deep learning (DL) model and evaluate its performance in predicting ridge topography after ARP before surgery.

Method: Patients who underwent single tooth extraction and subsequent ARP were screened for eligibility. As a proof of concept, a total of 427 samples, each consisting of one pre-operative and one post-operative cone-beam computed tomography (CBCT) scan (854 CBCT scans) were collected. Segmentation and cropping were conducted by one calibrated dentist and checked by an implant dentistry specialist. To address cross-case scale imbalance in predicting post-extraction ridge topography, we proposed a multi-scale dense attention network (MsDANet) using multi-stream dense blocks and Mamba blocks to capture high-dimensional features of preoperative CBCT scans at multiple scales.

Results: The dataset was divided in an 80-20 ratio, yielding 342 samples for the training set and 85 samples for the test set. After training the network under conditions consistent with various state-of-the-art (SOTA) methods, validation was performed on the test set of 85 samples. The results indicated that the MsDANet achieved a Precision of 98.82 ± 1.16, demonstrating superior performance compared to other SOTA networks. These findings underscore the effectiveness of the proposed multi-stream dense blocks and Mamba blocks in extracting multi-scale high-dimensional features, thereby enhancing the model's ability to predict post-extraction ridge topography.

Conclusion: The DL model demonstrated superior preoperative prediction of ridge topography after ARP compared to SOTA networks. With additional samples, not only could DL assist dentists in predicting post-ARP ridge topography, but it could also elucidate a trend after different healing durations.

TABLE 1. Network performance comparison with the current state-of-the-art

	MSE(10^{-4}) ↓	DICE (%) ↑	mIoU (%) ↑	Precision (%) ↑	Recall (%) ↑
ConvNeXtV2[1]	56.15±1.75	69.90±1.70	54.99±1.65	**98.82±1.16**	68.02±2.37
ViT [2]	34.21±4.96	77.15±3.12	65.22±2.94	97.65±2.30	73.74±3.62
TransUnet [3]	41.13±7.76	74.17±2.96	61.11±2.60	96.47±3.40	69.73±3.11
UNet3+ [4]	34.01±5.29	78.31±3.11	66.77±2.88	97.64±2.29	76.44±3.39
MsDANet (Proposed)	**31.5±4.25**	**80.25±2.29**	**68.93±2.40**	**98.82±1.16**	**80.21±2.69**

[1] Woo S, Debnath S, Hu R, et al. Convnext v2: Co-designing and scaling convnets with masked autoencoders[C]//Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. 2023: 16133-16142.

[2] Dosovitskiy A. An image is worth 16x16 words: Transformers for image recognition at scale[J]. arXiv preprint arXiv:2010.11929, 2020.

[3] Chen J, Lu Y, Yu Q, et al. Transunet: Transformers make strong encoders for medical image segmentation[J]. arXiv preprint arXiv:2102.04306, 2021.

[4] Huang H, Lin L, Tong R, et al. Unet 3+: A full-scale connected unet for medical image segmentation[C]//ICASSP 2020-2020 IEEE international conference on acoustics, speech and signal processing (ICASSP). IEEE, 2020: 1055-1059.

CI-10

Generation of Alveolar Ridge Contour Following Regeneration Procedures Using a Deep Learning Algorithm

P.C. Chang*

Introduction: Titanium meshes (Ti-meshes) are nowadays utilized for guiding alveolar ridge augmentation, and precontouring Ti-meshes according to the expected ridge contour (ERC) are frequently required. This study aims at generating ERC following regeneration procedures by using a deep learning (DL) algorithm.

Method: This study was approved by the Institutional Review Board of National Taiwan University Hospital (NTUH; protocol no: 202307069RINA and 202402020RINC). Pre-surgical CBCT images from 94 independent implant sites with ridge deficiency were collected, and 54 of them exhibited major combined vertical and horizontal deficiency. In each site, virtual implants were placed, and ERC was labelled by experienced clinicians. Sites were divided to the ratio of 8:1:1 for the training, testing, and validation datasets, and a 2.5D U-Net model was utilized to train the prediction model. The outcome was assessed by the Dice score of 1 cm cylinder area surrounding the virtual implant. A patient with a combined ridge defect on the mandibular posterior region was recruited to validate the clinical feasibility of this model.

Results: The ridge contour was re-established in all implant sites to the equivalent level of adjacent area, The overall Dice score was 0.924, and in sites with major combined defects, the Dice score was 0.932. A Ti-mesh was precontoured on the output model successfully, was well adapted on the native bone contour of the patient for clinical validation, and the site healed uneventfully following the regeneration procedure.

Conclusion: ERC could be successfully established by using an U-Net-based DL algorithm and was satisfactory for clinical use. The

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study was supported by NTUH and National Science and Technology Council of Taiwan (113-2622-B-002-015).

CI-11

Ingenious Sinus Floor Elevation With Endoscope, Irrigation System and Suction Elevator

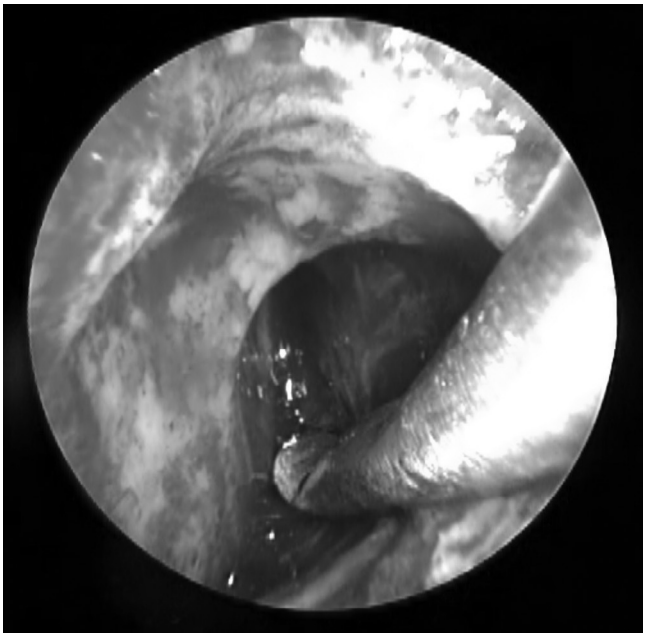
A. Ishikawa*

Introduction: In the maxillary molar region, it is often necessary to elevate the maxillary sinus floor when implant treatment is performed, which involves detaching the periosteum from the bone. Surgery is best performed with a clear view of the operation site, but it is difficult to see due to bleeding. Therefore, it tends to be a blind operation that relies on the sense of touch. Moreover, it essentially requires three hands to use the endoscope, the elevator and the suction. The objective of this study was to make it possible to detach the maxillary sinus mucosa with two hands using an endoscope, irrigation system, and suction elevator under clear visibility.

Method: In cases where sinus floor elevation of the maxillary sinus is required, a window is opened using an ultrasonic device. After that, a video camera is mounted on an endoscope (2.7mm in diameter and 11mm in length) so that the inside of the maxillary sinus is clearly projected on a monitor. In addition, the endoscope is equipped with an irrigation system. When a foot pedal is depressed for 1 second, saline solution spouts from the tip of the endoscope by a pump, and then blood is removed from the end of the scope. If the foot pedal is depressed for more than 1 second, saline solution will continue to be sprayed to wash out bleeding in the operative field, and a temporary hemostatic effect can be obtained. Furthermore, a suction elevator capable of sucking blood through its tip is used for detaching the maxillary sinus mucosa. While saline solution is sprayed to control bleeding, the sinus mucosa is detached with the suction elevator in a bright field clearly shown on the monitor. Thereafter, bone filling material is used to fill the open space in the sinus.

Results: With this method, the sinus mucosa can be detached with a clear view during sinus floor elevation. It is possible to carry out the procedure and notice fine irregularities and small septa that could not be seen with the conventional method. As a result, there is almost no sinus mucosa perforation, which usually occurs at a rate of about 20%.

Conclusion: By using an endoscope, an irrigation system, and a suction elevator, blind operations that depend on the sense of touch can be performed with a clear view using two hands. This makes it possible to prevent perforation of the sinus mucosa and reduce the incidence of maxillary sinusitis after sinus floor elevation.



CI-12

Expanding Intraoral Scanning Capabilities: The Role of Nasal Capture in Longitudinal Dental Superimposition

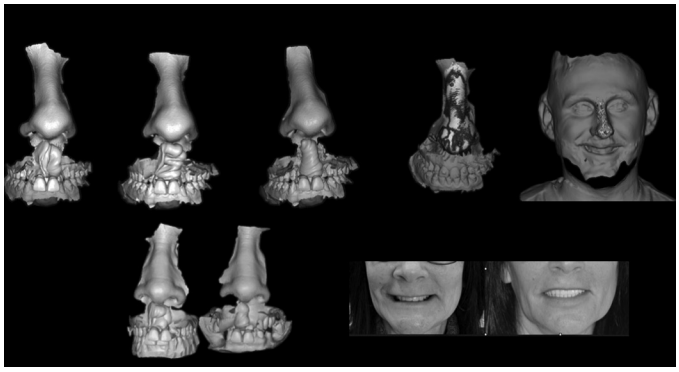
R. Salloum*

Introduction:Introduction: Innovations in dental diagnostics are transforming personalized treatment planning, with facial scans playing an essential role. However, nasal data is often excluded in intraoral scans, which can limit superimposition accuracy over time. This study evaluates the benefits of adding nasal landmarks to intraoral scans, creating a stable reference for longitudinal superimposition that enables clinicians to "restore the past." By incorporating nasal data, clinicians can reintroduce patients' original dental features when tooth loss or other changes occur.

Method: In the first phase, three intraoral scans, including nasal data, were taken of a single patient at different times, along with facial scans. Using Exocad software, the scans were superimposed, using the nose as a consistent reference, with minimal discrepancies. In a second case, a patient planned for full-arch extraction and denture placement received an initial scan of both arches at the new vertical dimension of occlusion (VDO), including nasal and facial data. Digital transitional dentures were designed and delivered. Three months later, the patient desired a return to her original tooth shape. An impression using the transitional dentures was scanned in 360 degrees and aligned with the pre-extraction scan using nasal landmarks. This alignment provided detailed guidance to recreate the original tooth positioning for a redesigned transitional denture.

Results: Findings indicate that scans with nasal landmarks improve alignment consistency over time, enhancing the accuracy of superimposing changes and restoring previous contours. Patients with nasal-integrated scans demonstrated significant improvements in match fidelity, confirming nasal data as a stable reference across life stages.

Conclusion: Integrating nasal data into intraoral scanning adds a critical enhancement for digital archiving and restorative precision. This methodology supports clinicians in accurately restoring original aesthetics for patients facing tooth loss, aligning closely with evolving needs in personalized and reconstructive care.



CI-13

Digital Sinus Planning: the Use of Digital Tool to Assess the Proper Reconstruction Therapy in the Posterior Maxilla

R. Scaini*, N. Vercellini, F. Giachi Carù, M. Deflorian, T. Testori

Introduction: The lateral approach to maxillary sinus elevation is a well-established surgical technique with extensive documentation in scientific literature. In recent years, digital tools and protocols like the Digital Sinus Planning (DSP) protocol have optimized outcomes by help clinicians to choose the most suitable treatment plan for the patient. The DSP protocol integrates CBCT and intraoral scanning, allowing precise, comprehensive preoperative planning that enhances predictability and minimizes invasive intervention in posterior maxillary rehabilitation. This study aims to define a fully digital protocol for assessing and determining the need for vertical and horizontal bone reconstruction in patients undergoing lateral sinus lift.

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Method: DSP protocol planning begins with CBCT scanning of the dental arch extended to the maxillary sinus to define surgical complexity. Key steps include the overlay of intraoral scans onto CBCT data for precise mapping of soft and hard tissues, creation of virtual diagnostic wax-ups, and prosthetically guided implant positioning. Vertical and horizontal bone deficits are evaluated based on parameters such as emergence angle, bone thickness, and sinus anatomy. This digital planning enables clinicians to pre-visualize the final prosthesis, ensuring optimized bone reconstruction strategies tailored to each patient.

Results: The DSP protocol facilitates effective, prosthetically oriented planning for lateral sinus lifts, minimizing surgical complexity by enabling detailed preoperative visualization. By superimposing intraoral and CBCT data with virtual planning software, clinicians achieve precise implant placement, proper bone reconstruction, and reduced intraoperative time, leading to improved implant maintainability and reduced complication rates.

Conclusion: Digital technologies such as the DSP protocol offer advancements in maxillary sinus elevation planning. Integrating 3D imaging with virtual wax-ups and prosthetically driven implant positioning enables clinicians to achieve superior procedural accuracy and patient outcomes. This approach establishes a new standard in digitally driven, minimally invasive reconstruction therapy for the posterior maxilla.

CI-14

Comparison of Artificial Intelligence Models for Automatic Segmentation of the Mandibular Canals and Branches

J. Shao*, H. Man

Introduction: In mandible, mandibular canals and their branches, i.e., the mandibular incisive canal and the mental canals, are major concerns in the implant-related surgeries. Manual labeling of the mandibular canal is time- consuming and laborious. The advent of artificial intelligence (AI) provides possibilities to improve the efficacy of segmentations through deep learning. UnetR, Swin UNETR, and 3DUXNet are among the most popular models in medical image segmentations. However, limited information can be found regarding their efficacies of segmentation of dental structures such as mandibular canals and their branches, let alone the customization of these models to improve their performance. Therefore, this study aimed to compare and improve the performances of UnetR, Swin UNETR, and 3DUXNet models in the mandibular canal segmentation task.

Method: 198 CBCT scans were selected for training, validation, and testing the UnetR, Swin UNETR, and 3DUXNet models. The mandibular canals and branches were manually segmented in multiplanar reconstructions. The models were used for automatic segmentations under AI-based learning. Post-processing of morphological operations was conducted to improve the performances. By comparing AI-based and refined-AI segmentation to manual segmentation, the evaluation metrics such as dice similarity coefficient (DSC), intersection over union (IoU), average symmetric surface distance (ASSD), precision, recall, accuracy, and consistency were evaluated.

Results: The 3DUXnet model showed superior performances compared to UnetR and Swin UNETR in terms of DSC (0.74 vs. 0.59 vs. 0.68), IoU (0.59 vs. 0.42 vs. 0.52), ASSD (0.94 mm vs. 1.37 mm vs. 1.02 mm), and recall (75% vs. 55% vs. 63%). Regarding precision, the Swin UNETR and 3DUXnet models are comparable (74% vs. 76%), and both are better than UnetR (65%). Further post-processes improved all three models, and the 3DUXnet with post-processing module showed the best performances in DSC (0.79), IoU (0.65), ASSD (0.85 mm), and Recall (87%). The precision and accuracy of 3DUXnet with the post-processing module were 73% and 99.9%.

Conclusion: The 3DUXnet model seems to be an optimal model for the automatic segmentations of dental structures such as mandibular canals and their branches. The post-processing module of morphological operations could further improve the performance of these AI-based automatic segmentations.

Networks	DSC (Mean, 95% CI)	IoU	ASSD (mm)	Precision	Recall	Accuracy
UnetR	0.5894 (0.5580~0.6208)	0.422 0.3912~0.4529)	1.3688 (1.0078~1.7300)	0.6462 (0.6183~0.6741)	0.5583 (0.5123~0.6043)	99.9899%
Swin UNETR	0.6831 (0.6545~0.7116)	0.5228 (0.4915~0.5542)	1.0207 (0.7736~1.2680)	0.7591 (0.7373~0.7809)	0.6345 (0.5897~0.6793)	99.9898%
3DUXNet	0.7422 (0.7281~0.7563)	0.5914 (0.5735~0.6092)	0.9404 (0.6792~1.200)	0.7427 (0.7220~0.7633)	0.7482 (0.7219~0.7746)	99.9906%
PP-Unetr	0.6904 (0.6557~0.7251)	0.5334 (0.4947~0.5721)	1.0450 (0.7681~1.3230)	0.7379 (0.7101~0.7656)	0.6719 (0.6152~0.7286)	99.9895%
PP-Swin UNETR	0.7371 (0.7103~0.7639)	0.5878 (0.5553~0.6203)	0.9084 (0.6987~1.1180)	0.7464 (0.7235~0.7693)	0.7446 (0.6944~0.7947)	99.9909%
PP-3DUXNet	0.7884 (0.7756~0.8012)	0.6519 (0.6341~0.6696)	0.8275 (0.6224~1.0332)	0.7266 (0.7034~0.7498)	0.8703 (0.8446~0.8959)	99.9917%

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P1

Papilla Preservation and Minimally Invasive Surgery for Treating Peri- implant Bone Defect Following Nasopalatine Cyst Enucleation: Clinical and Radiographic Outcomes

A. Alrmali*

Introduction: This case report aims to assess the clinical feasibility of a regenerative approach to address peri-implant cystic lesions using the papilla preservation flap (PPF) technique.

Method: A 29-year-old female patient exhibited a palatal swelling three years after undergoing horizontal block graft augmentation and implant placement. The papilla preservation approach was employed for cyst enucleation and decontamination of the implant surface. Clinical and radiographic data were gathered at baseline, post-surgery, and after one year.

Results: Primary wound closure was achieved in 100% of the treated site without comprising the esthetic. The reduction in pocket depth after one year was 3.8 mm, with residual probing depths measuring 4.1 mm, which remained stable for up to one year. Radiographic bone gain after one year measured 2.2 mm mesially and 2.4 mm distally after one year. The radiographic defect resolution was 71.4% mesially and 72.2% distally at one year. Disease resolution showed consistent clinical improvement across all treated sites by the end of the first year, with significant stability thereafter.

Conclusion: The papilla preservation flap technique can be effectively used for regenerative treatment of peri-implant defects.

P2

Evaluating the Effectiveness of Horizontal Bone Augmentation: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

A. Alrmali*, H.L. Wang

Introduction: This systematic review and meta-analysis aimed to evaluate the effectiveness of various techniques used for horizontal bone augmentation in terms of clinical and histopathological gains in horizontal bone width, whether performed using a staged or simultaneous approach.

Method: A systematic search was performed in PubMed, EMBASE and Scopus databases for articles published until December 2022. Randomized controlled clinical trials were included. A random-effects meta-analytic model was built to assess the primary outcome of horizontal bone gain measured in millimeters, based on the type of procedure and secondary outcome variables as histological outcomes including new bone formation, remaining bone particles, and connective tissue in percentage. Risk of bias assessment and grading the certainty of evidence were also performed.

Results: Overall, the summary estimate of means of horizontal bone gains (HBG) was 3.65 mm among 36 studies including bone block, particulate grafts and with ridge-split technique with extremely high heterogeneity (I^2= 98.4%). The summary measure of HBG means was 3.5mm (I^2= 98.3%) among 20 randomized clinical trials (RCTs) if the prospective or retrospective clinical trials were excluded. The result of meta-regression showed significantly negative correlation between the smoking habits and horizontal bone gain (coefficient=- 1.6, p= 0.04). The overall summary of HBG mean was significantly higher in non-smokers (4.66mm) compared to the smokers (3.04mm). Other variables such as age, or the use of xenografts did not show any significant correlation with the HBG.

Conclusion: Horizontal ridge augmentation procedures effectively increase alveolar ridge width. Non-smokers achieved significantly higher bone gains compared to smokers. Other factors such as age, and the use of xenografts did not significantly affect outcomes.

P3

Synergy in Implantology: Soft Tissue Augmentation and Prefabricated Crown for Enhanced Aesthetic Outcome in a Healed Maxillary Canine Site

A. Alanezi*

Introduction: Restoring a single missing tooth in the aesthetic zone is a complex challenge, especially in a healed site where optimal soft tissue contour and emergence profile are critical for success. This case report demonstrates the application of the Synergy concept, integrating digital planning and advanced surgical techniques to achieve a predictable aesthetic and functional outcome. The workflow included implant placement with a prefabricated crown, soft tissue augmentation, and guided tissue healing using the (EBC) concept.

Method: A 25-year-old patient presented with a healed site at tooth #10 (maxillary left canine). A comprehensive digital workflow was implemented using CARES and coDiagnostiX software for case planning. The protocol involved: Designing and prefabricating the final implant-supported crown pre-surgically. Creating a surgical guide for precise implant placement. Performing simultaneous soft tissue augmentation to enhance peri-implant mucosal thickness. The implant was placed using a fully guided approach to achieve ideal 3D positioning. After three months of healing, the definitive crown was customized following the EBC concept by Gómez-Meda to optimize soft tissue adaptation and contour the emergence profile.

Results: The synergistic approach facilitated precise implant placement and soft tissue management, resulting in an aesthetically pleasing outcome. Prefabricating the implant crown minimized chairside adjustments and enhanced patient comfort. The EBC concept allowed controlled soft tissue shaping, leading to natural emergence and harmonious integration with adjacent teeth. Radiographic and clinical evaluations confirmed stable peri-implant bone levels and healthy soft tissue architecture at the three-month follow-up.

Conclusion: The integration of digital workflows, prefabricated restorations, and guided surgery, combined with soft tissue augmentation and the EBC concept, represents a highly effective protocol for aesthetic implant rehabilitation. This case highlights the potential of the Synergy concept in delivering predictable, efficient, and aesthetically superior outcomes in the aesthetic zone.

P4

A Novel Digital Radiation-free Technique for Assessing the Accuracy of Guided Implant Placement: Case Report

A. Elsayyad*, L. Gholami, A. Doshi

Introduction: Several techniques have been introduced to assess the accuracy of guided implant placement. However, most of them require a post-operative CBCT scan to compare with the pre-operative implant plan. This case report describes a novel digital technique that can assess guided implant placement accuracy, using prosthetic components, without the need for additional radiation exposure after implants placement.

Method: During digital planning of implants at sites #13, and #14, the implant scan bodies were exported along with the preoperative intraoral scan (IOS) of the maxillary arch using an implant planning software. A surgical guide was 3D-printed for fully guided implant placement in the stone cast (duplicated from the IOS). Implant analogs were placed and then scan bodies were hand tightened to them. The cast along with the scan bodies were scanned using IOS, and the STL file was exported into digital design software to measure the 3D-deviation between these scan bodies (representing the final implant position) and the reference scan bodies exported from the implant planning software. The scan bodies were aligned using 3-widely distributed area-based alignment and were segmented from the partially edentulous arches. Their flat surfaces (with possibly different orientation) were removed leaving only uniform surfaces and geometry for precise superimposition.

Results: The 3D deviation between the implants, represented by the scan bodies, showed an absolute mean of 0.194 ± 0.271 mm compared to the reference scan bodies (Figure 1). When segmented separately, implant #13 had a deviation of 0.125 ± 0.177 mm, while #14 had a

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deviation of 0.286 ± 0.354 mm. Additionally, the vertical discrepancy between planning and execution of the implants, measured as linear deviation on the Y-axis, was 0.119 mm for #13 and 0.347 mm for #14. Validation of the suggested workflow through comparison to postoperative CBCT can be a subject of interest for future research.

Conclusion: The suggested digital workflow can be applied on a model before implants placement or intraorally after osseointegration to assess the accuracy of guided implant placement without the need for exposing the patient to post operative CBCT. Furthermore, comparing scan bodies rather than implants for superimposition can facilitate conducting clinical trials without the need to scan the implant-scan body complex.

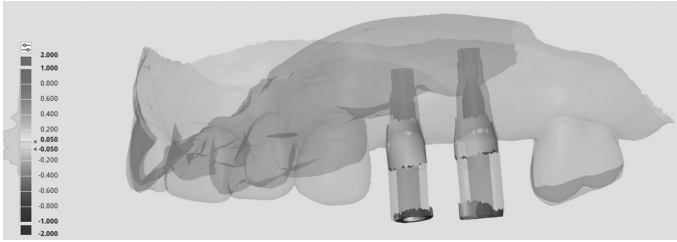


Figure 1: 3D-deviation between the segmented scan bodies from the scanned stone model and those exported from the implant planning software. Their flat surfaces were removed for accurate superimposition.

P5

Butterfly Graft: Optimizing Soft Tissue Outcomes in Adjacent Maxillary Implants Using a Digital Approach

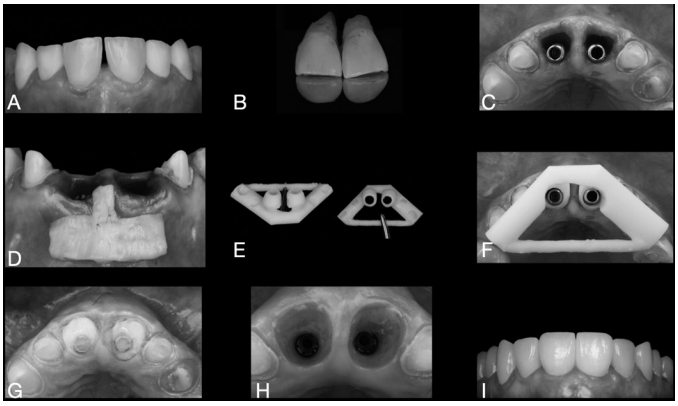
A. Rubinov*, N. Ehmann, S. Ganesan

Introduction: Implant treatment for cases with two adjacent missing teeth in the maxillary esthetic region is often unpredictable in terms of achieving a satisfactory esthetic result, due to the lack of connective tissue attachment to support the papilla between the implants. This novel approach utilized a "butterfly" soft tissue graft as well as segmentation of teeth and roots to make individualized 3D printed healing abutments.

Method: This case included a patient undergoing full-mouth reconstruction with failing maxillary central incisors. Immediate implant placement with butterfly connective tissue graft, harvested from posterior palate, was used to optimize soft tissue. Healing abutments were designed and printed by segmenting the teeth and roots digitally to reproduce the exact dimensions of the extracted teeth.

Results: At 12 months post-op, the soft tissue dimensions around both implants remained stable, with adequate papillary height and soft tissue contour achieved, reflecting natural gingival architecture. The customized digital healing abutments allowed for precise adaptation. There was no significant recession or loss of tissue volume, and the emergence profiles of the implants closely matched the original tooth anatomy. Patient reported satisfaction was high with favorable esthetic outcomes.

Conclusion: The combination of butterfly connective tissue graft and digitally prepared healing abutments provide a unique solution to one of the most demanding and unpredictable scenarios in the esthetic zone.



A - Frontal View - Before Extraction
B - Extracted #8,9
C - Immediate Implant Placement
D - Butterfly Graft
E - 3D Printed Provisionals with Seating Framework
F - Provisonal Framework Placed Intraorally
G - 3D Printed Provisionals Seated
H - Removal of Provisionals at 6-months
I - Final Restorations at 12-months

P6

Laser-patterned Microcoagulation Technology for Soft Tissues in the Implantation Zone

A. Eremina*, E. Zernitckaia, S. Vyzhu

Introduction: Lasers have become an integral tool in modern medicine, offering alternatives and enhancements to traditional techniques. Recent years have seen growing interest in using laser radiation to stimulate tissue and organ regeneration, with fractional laser technologies gaining popularity. These technologies rely on creating microchannels in tissues through laser radiation, stimulating regeneration. Oral tissues, with their higher vascularization and metabolism compared to skin, possess exceptional regenerative potential. We hypothesized that gingival tissue could demonstrate rapid, scar-free regeneration and possible volume enhancement when treated with thermal microwounds, similar to the regeneration observed in skin. This study employed laser-patterned microcoagulation (LPM) to initiate gingival and oral mucosal regeneration. The present study aimed to evaluate the effectiveness of non-ablative fractional laser treatment in the dental implantation zone, combined with gingival grafting.

Method: This study included 30 patients undergoing dental implantation combined with gingival grafting procedures. A diode laser with a wavelength of 1550 nm, power of 25 W, and a pulse width ranging from 60 to 250 ms was applied around the dental implant and gingival graft zones. The laser treatment aimed to create a precise pattern of microcoagulation sites to stimulate tissue regeneration and enhance healing.

Results: According to the results, an increase in attached keratinized gingiva around the implant was observed in 89% of cases in the laser treatment area compared to the control zone. Additionally, Doppler ultrasound analysis revealed an increase in hemodynamic parameters, as indicated by the Gosling and Purselo indices, suggesting improved blood flow in the treated tissues.

Conclusion: Fractional laser treatment is a safe and effective method for stimulating oral mucosa regeneration. This study demonstrated that fractional lasers can promote gingival and bone regeneration, reduce rehabilitation time, enhance the integration of gingival grafts with surrounding tissues, and increase angiogenesis in the treated area.

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P7

Guided Bone Regeneration (GBR) for Augmentation of the Anterior Mandibular Ridge in a Periodontitis Patient

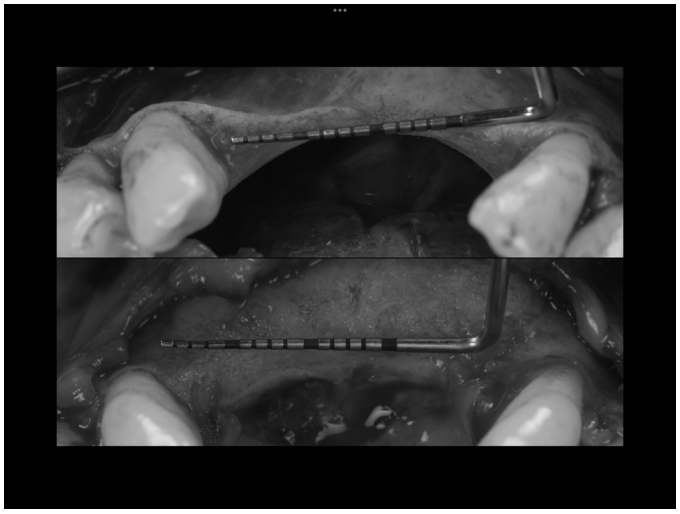
A. Zad*, N. Malek Mohammad, M. Ben Hassan

Introduction: The rehabilitation of patients with insufficient anterior mandibular ridges presents significant challenges, particularly when compounded by a history of periodontitis. Alveolar bone loss associated with periodontal disease often leads to a deficient ridge, complicating dental implant placement. This case report presents the clinical management of a patient with severe ridge deficiency in the mandibular anterior region (missing teeth #23, #24, #25, and #26), which required GBR for augmentation. The successful ridge augmentation allowed for implant placement in the anterior mandible, demonstrating the efficacy of GBR in complex clinical scenarios.

Method:Surgical Procedure: A full-thickness mucoperiosteal flap was elevated to expose the deficient ridge. The GBR was performed using a mixture of PRF and allograft bone particles to form a sticky bone scaffold. The flap was repositioned and sutured to achieve tension-free primary closure over the grafted site. A six-month healing period was allowed for bone regeneration. Afterward, the site was re-entered to evaluate the augmented ridge. Adequate bone volume was observed, enabling the placement of dental implants in positions #23 and #26.

Results: After six months of healing, the re-entry procedure revealed substantial bone regeneration in the mandibular anterior region, with a well-formed ridge that was adequate for implant placement. Dental implants were successfully placed at sites #23 and #26 without the need for additional grafting. Radiographic and clinical assessments confirmed the stability and integration of the implants within the augmented bone. The patient reported no complications during the healing phase, and follow-up visits demonstrated optimal tissue response.

Conclusion: This case highlights the successful use of guided bone regeneration (GBR) in the augmentation of a severely deficient ridge, enabling dental implant placement in a periodontitis-affected patient. The combination of PRF and allograft bone particles to form a sticky bone scaffold proved to be an effective approach for promoting bone regeneration in challenging cases. GBR remains a valuable technique in implant dentistry, particularly in situations where periodontal disease has compromised the alveolar ridge. Long-term follow-up is necessary to assess the longevity of the implants and overall periodontal stability.



P8

Full Arch Prosthetic Rehabilitation Utilizing Digital Full Arch Workflow Scanning as an Alternative to Analog Workflow: A Case Report

A. Akhras*, M. Omran-Alfaituori, R. Blackwell

Introduction: Traditional analog workflows have long been the standard workflow to obtain and record implant positions. However, cross arch implant position capturing garners difficulties and with limited accuracy of wax and cast errors could attribute to improper prosthesis seating. Digital dentistry has made strides with capturing implant positions using an intraoral scanner with precision and accuracy that is favorable over traditional workflows. The following case report serves to showcase both traditional and digital workflows of an FP1 prosthesis.

Method: Two pathways of obtaining implant positions were utilized in this case. The initial treatment plan consisted of the analog workflow with direct to implant prosthesis. Second treatment plan was to place multi-unit abutments and utilize full arch digital workflow scanning with an intra-oral scanner. The two workflows were compared and assessed for their level of accuracy in obtain implant positions, passivity of prosthesis, time to fabricate try-ins, and patient satisfaction.

Results: The analog workflow had issues with obtaining proper implant positions with the large A-P spread. It required several sectioning of the framework that also incorporated 2 custom abutments in the anterior implants that prevents a passive and complete seating. The switch to digital workflow operated at a much shorter treatment time from records capturing that recording the implant positions under 10 microns. A printed try-in prototype also confirmed full seated and passivity of the prosthesis on all 8 multi-units on implants. The length of treatment steps were considerably shorter and faster with digital workflow. In addition, it provided a more accurate and precise fit of the prosthesis thus translating to a more ideal method of capturing implant positions.

Conclusion: The importance of this case report aims to highlight the level of accuracy and precision that can be achieved with digital workflows with favorable outcomes. Our analog workflow proved to be too challenging to limit the discrepancies to precisely capture our implant positions for a complete passive fit. The digital workflow not only enhances patient satisfaction with digital scanning rather than PVS impressions, it also fast tracks the time to obtain a try-in to assess fit and function; and a more accurate final prosthesis.

P9

Calcium and Magnesium Releasing Carbonated Apatite Coatings on Titanium Dental Implants to Improve Osseointegration

A. Parekh*, A.V. Janorkar, M.D. Roach

Introduction: With the rising demand for dental implants, there is an increasing need to improve implant longevity. Titanium implants have a long history of successful use but lack an ideal for good osseointegration. Conventional plasma-sprayed hydroxyapatite coatings have been shown to improve osseointegration but are prone to delamination and implant failure. Anodized hydroxyapatite coatings, in contrast, have shown improved adhesion strengths. Calcium (Ca) and Magnesium (Mg) ions are critical bone tissue minerals and have been shown to promote osteoblast differentiation. The aim of this research study was to create Ca and Mg ions releasing anodized hydroxyapatite coatings for improving osseointegration of dental implants.

Method: In the present study, commercially pure titanium discs were anodized in a novel electrolyte to form oxides consisting of hydroxyapatite. Optical and Scanning electron Microscopy (SEM), thin film x-ray diffraction (XRD), electron dispersive spectroscopy (EDS), Fourier transform infrared spectroscopy (FTIR), Inductively Coupled Plasma Optical Emission Spectroscopy (ICP – OES) and VDI 3198 standard test were utilized to characterize the surface morphology, crystallinity, chemistry, molecular structure ion release profiles and oxide layer adhesion quality of the oxide coatings.

Results: SEM analyses revealed petal-like surface nanostructures, while XRD analyses revealed a combination of alpha-tricalcium phosphate and hydroxyapatite formation in the oxides. EDS results showed Ca, P, and Mg uptake into the oxides with a surface Ca/P ratio of approximately 2. FTIR analyses revealed the characteristic OH^- hydroxyapatite peak at 3570cm^{-1} to be poorly defined but substituted with carbonate peaks at 875,1570 and 1450cm^{-1}, indicative of carbonated or bone-like apatite formation. Furthermore, ICP-OES revealed the anodized coatings to show a substantial release of Ca^{2+} and Mg^{2+} ions over a 30-day period in a phosphate buffered saline

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solution. SEM and VDI adhesion quality analysis of the oxide coating showed the presence of bi-layered oxide with good oxide layer adhesion quality.

Conclusion: The present study successfully formed Ca and Mg, releasing carbonated apatite and tri-calcium phosphate coatings on titanium with acceptable adhesion strengths. Thus, these novel implant coatings show much promise to improve osseointegration and future patient outcomes.

P10

BERT Based Sentiment Analysis Classification Based on Patient Feedback Systems After Implant Surgery

A.R. Pawar*, P.K. Yadalam

Introduction: Post-surgery treatment response for implant surgeries depends on patient health, implant type, and technique. Key indicators include pain management, infection control, and improved function. Positive response includes reduced discomfort, restored mobility, and increased quality of life. Sentiment analysis after implant surgeries involves assessing patients' feelings and attitudes toward their experience, recovery, and satisfaction. This approach involves data collection, categorizing sentiments using Natural Language Processing (NLP), and analyzing emotions. Healthcare professionals use AI methods like natural language processing (NLP) to analyze patient feedback is useful for better understanding. BERT, a pre-trained model, has revolutionized sentiment analysis. This study demonstrates the effectiveness of BERT-based sentiment analysis in classifying patient feedback from post-implant surgeries, enabling informed decisions to improve patient care and service quality.

Method: A total of 79 patient feedbacks were collected with both positive and negative responses. The text was preprocessed, split into 80 percent training and 20 percent testing feedback datasets, and tokenized using a BERT tokenizer. Sentiment labeling was used for binary classification. The model was trained using a set to enhance its performance evaluated through metrics like accuracy, precision, recall, and F1-score, comparing predicted labels with actual ones. The BERT architecture is a machine-learning model that converts tokens into numerical representations called embeddings, which are used for Natural Language Processing tasks. It uses a self-attention mechanism and a position-wise feed-forward neural network during training, achieving high performance on various tasks.

Results: The sentiment analysis model using BERT has an overall accuracy of 75%, but its performance varies across different sentiment categories. The macro average performs poorly with a precision of 0.37, recall of 0.50, and F1-score of 0.43, while the weighted average performs better with a precision of 0.56, recall of 0.75, and F1-score of 0.64.

Conclusion: The sentiment analysis model, while predicting positive and negative sentiments in post implant treatment data, struggles to accurately predict neutral sentiments, requiring further research and improvement, including fine-tuning for balanced datasets.

BERT ACCURACY

SENTIMENT	PRECISION	RECALL	F1	SUPPORT
NEGATIVE	0.0	0.0	0.0	20
POSITIVE	0.75	1.00	0.86	59

P11

The Combination of Striate+ Membrane in Conjunction With MinerOss X Plug for Providing Hard Tissue Regeneration in Socket Preservation Procedure

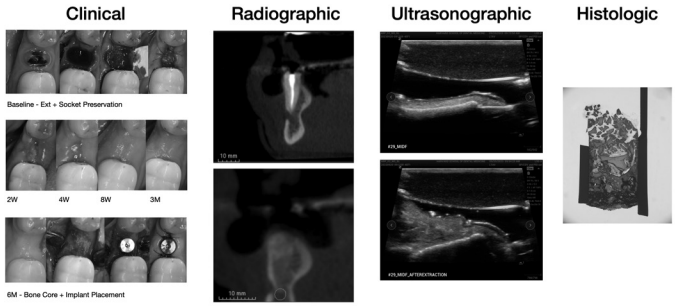
A. Khehra*, L. Tavelli, C.Y. Chen, D. Kim

Introduction: Conventional bone augmentation for dental implants typically uses grafting materials, with or without barrier membranes, to promote tissue repopulation. This study aims to compare new bone formation in patients undergoing socket preservation using a xenograft plug, with and without a non-crosslinked collagen membrane.

Method: The study design was a prospective randomized clinical trial involving 20 participants requiring socket preservation after tooth extraction. Participants were randomly assigned to two groups: Group I, which received socket preservation with a xenograft plug alone, and Group II, which received a xenograft plug with a non-crosslinked collagen membrane. Both groups healed by secondary intention. Patients were followed for 6 months, with bone core biopsies taken at the time of implant placement. The outcomes of interest included hard and soft tissue changes, blood flow, and evidence of new bone formation. A detailed assessment of outcomes was conducted through clinical, radiographic, ultrasonographic, and histologic evaluations.

Results: The preliminary results indicate promising clinical outcomes, showing maintenance in ridge width, soft tissue height, and thickness at both baseline and six months. Radiographic assessments reveal notable preservation of ridge height, width, and volume from baseline to six months, underscoring the effectiveness of the bone augmentation process. Ultrasound evaluations conducted at baseline demonstrate an intact buccal wall following extraction. At the two-week, three-month, and six-month follow-ups, ultrasound imaging indicates healthy soft tissue healing, along with increased blood flow and velocity, suggesting robust vascularization in the area. Histological analysis supports these findings, showcasing new bone formation and a reduction in soft tissue capture with the use of a membrane. An image illustrating these results is attached for further reference, providing a visual representation of the positive outcomes observed in this study.

Conclusion: This study shows that both socket preservation techniques promote bone regeneration after tooth extraction, with the combination of a non-crosslinked collagen membrane and xenograft plug leading to better new bone formation. These findings highlight the advantages of using membrane barriers in socket preservation protocols.



P12

A Novel Technique to Retrieve Stripped Healing Abutment With Limited Interarch Space: A Case Report

A. Gullard*

Introduction: The retrieval of stripped implant components may be more difficult when the working field exhibits limited interarch space.

Method: A patient presented with a stripped healing abutment in occlusion with the opposing arch. The working surface of the abutment was modified to accommodate a short overdenture abutment driver and torque wrench.

Results: Successful removal of the stripped healing abutment was accomplished. A shorter healing abutment was placed to ensure absence of occlusal loading and provide additional vertical space in the working field.

Conclusion: Stripped implant components located in sites with limited restorative space may need to be modified to facilitate the use of short implant drivers.

P13

Modified Custom Alveolar Ridge Splitting Technique to Improve Implant Angulation in the Posterior Mandible Area

A. Hakimi*, N. Sari, S. Froum, S. Cho, L. Palomo

Introduction: Dental implant restorations have become a standard solution for missing teeth, with screw-retained options preferred for their ease of maintenance and adjustability. In the maxillary anterior

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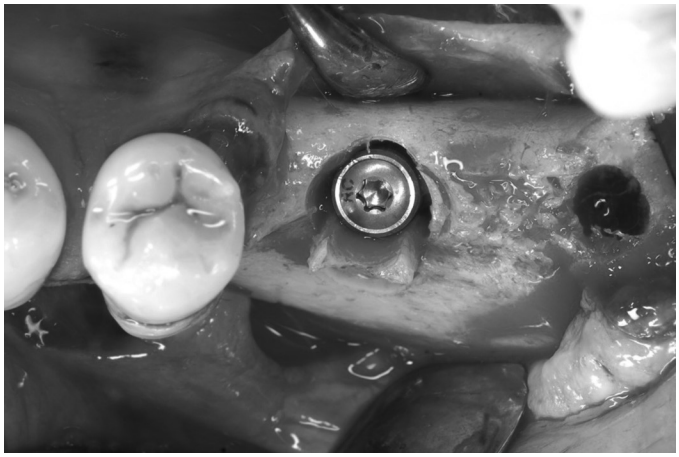
esthetic zone, particularly on atrophic ridges, implant placement presents challenges due to complex anatomy and high aesthetic demands. Traditional ridge augmentation techniques often fall short in achieving desired outcomes. This report presents a modified alveolar ridge splitting technique to improve predictability and aesthetics in the maxillary anterior area, specifically for screw-retained restorations.

Method: This case employed a modified custom alveolar ridge splitting approach for implant placement in an atrophic maxillary anterior ridge. The procedure was designed to allow for adjustments in implant angulation while maintaining the ridge's contour and shape, optimizing both aesthetic and functional outcomes.

Results: The modified ridge splitting technique successfully facilitated screw-retained implant placement with controlled angulation, preserving ridge shape and enhancing aesthetic integration. The approach provided stable support for the implant, ensuring both predictability and soft tissue stability in the esthetic zone.

Conclusion: This case demonstrates that the customized alveolar ridge splitting technique can address the limitations of traditional methods, particularly in anatomically challenging esthetic areas. By enabling precise angulation and contour preservation, this approach shows promise for enhancing the predictability and aesthetics of screw-retained restorations in complex cases.



P14

Achieving Successful Outcomes With Immediate Implant Placement and Provisionalization In the Anterior Esthetic Zone Using A Fully Guided Digital Workflow: A Detailed Case Report

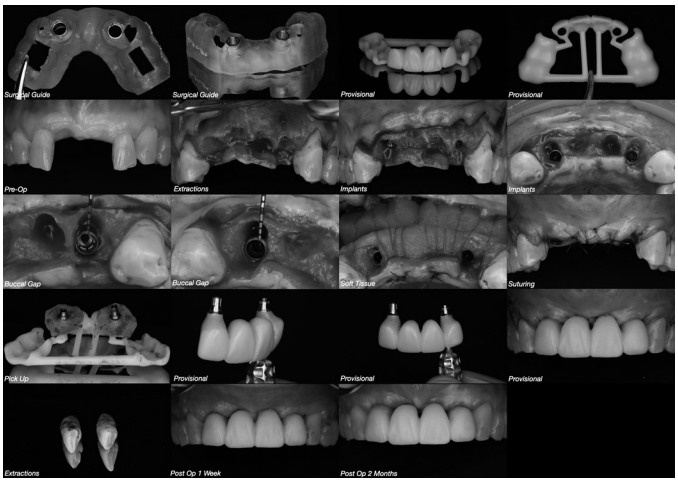
A. Danesh*, M. Lopez, D. Escalante, C. Molina, M. Garcia

Introduction: 3D position of the implant plays an important role in the emergence profile of the crown and in soft tissue management. Soft tissue contours can be maintained by immediate provisionalization to sustain the gingival architecture. The aim of this present case report is to exhibit a case where a digital workflow was utilized for immediate implant placement combined with immediate provisionalization for ideal aesthetics in a long span edentulous zone.

Method: 62 year-old male patient presented to PG Periodontics clinic with a previous unsuccessful history of extraction of #8 and #9, leading to remaining residual roots. Inadequate bone levels remaining in the #8 and #9 site did not allow for ideal 3D positioning of the implants, and a clinical decision to extract #7 and #10 was made, due to unfavorable aesthetics, crown-to-root ratio, and mobility of above teeth. After a thorough esthetic analysis, a digital workflow was utilized for immediate implant placement with immediate provisionalization. After extractions of #7 and #10, two implants were placed using a fully guided protocol. A porcine collagen matrix was utilized for soft tissue augmentation of the site. Xenograft combined with collagen was used to graft the buccal gap and pontic sites #8 and #9. Laboratory fabricated CR provisional shell was modified intraorally to achieve optimal EBC (esthetic, biologic, crestal) contours.

Results: Immediate implant placement with immediate provisionalization with correct emergence profile allowed for a stable gingival architecture over a short follow-up period. This procedure also favored the patient with shorter treatment time and minimized the amount of surgical intervention required. Vestibuloplasty to relieve the buccal frenum will be done at a secondary stage to allow for re-establishment of the vestibule.

Conclusion: Several factors should be considered when facing challenging cases in the esthetic area including patient selection, accurate preoperative planning, and restorative skills. When planned carefully, immediate implant placement and provisionalization offer several advantages, including shorter treatment time, improved esthetics, and enhanced patient satisfaction. The use of a digital workflow enables for accurate and predictable results.



P15

Successful Implant Therapy in Patients With Altered Passive Eruption Utilizing a Digitally Guided Workflow

A. Danesh*, T. Koutouzis, S. Vardar, M. Garcia, N. Surathu, P. Jarvis

Introduction: A clinical scenario in the aesthetic zone is the presence of short clinical crowns, which in the absence of occlusal wear and other injuries, can be referred to as altered passive eruption (APE). Presence of APE can lead to functional and esthetic issues, which can impact the patient's smile harmony. In aesthetically demanding cases, APE must be addressed prior to or in conjunction with implant therapy, and failure to do so can lead to aesthetic complications. This case report exemplifies a digital workflow in treating such patients to achieve optimal outcomes.

Method: Case 1: 67-year-old female presented to the Post-Graduate Periodontics Clinic at NSU with a concern of missing tooth #7, extracted previously without any grafting procedures. Examination revealed staining, extra-coronal restorations, excessive gingival display, square shaped teeth, and deficiency in the edentulous site #7. Patient was treatment planned for esthetic crown lengthening (ECL) of #6-11, bone augmentation #7, followed by implant placement and extra-coronal coverage of #6-11. A digital mock-up was created, and an ECL guide was fabricated. Initially, osseous reduction and GBR of #7 site took place. At 5.5 months, gingivectomy #6-11, implant #7, and a CTG was performed. Teeth and implants were provisionalized using lab-milled crowns to allow for soft tissue maturation. Case 2: 39-year-old male patient, presented to the Post-Graduate Periodontics Clinic with a concern of pain on #8 site, due to presence of external cervical root resorption. Examination revealed resin veneers on #8 and #9, square shaped teeth, asymmetric smile, lip hypermobility, and excessive gingival display. Patient was planned for ECL of #4-12, extraction, immediate implant placement and provisionalization on #8, restorations on #8i and #9, and botox treatment to address lip hypermobility. A surgical crown lengthening and implant guide was fabricated to allow for ECL, and implant placement of #8.

Results: Over a short follow up period, the treatments rendered resulted in a favorable dental-periodontal harmony, as well as an increase in function, esthetics, and patient satisfaction.

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Conclusion: Pre-operative analysis of patients' esthetics is important when implants are considered in the anterior segment. Recognition and treatment of APE can have significant effects on the 3D positioning of dental implants and the desired esthetic outcome.

P16

Assessment of Dimensional Changes in Free Gingival Graft Around Tooth and Dental Implant Sites: A Systematic Review and Proportional Meta-analysis

A. Almeshrafi*, A. Alblaihess, T. Alodhaib, R. Neiva

Introduction: The presence of adequate attached gingiva is crucial for maintaining periodontal health around both natural teeth and dental implants. Free gingival grafting (FGG) is a common technique used to augment the gingival tissue in these areas. However, graft shrinkage is a well-documented phenomenon that occurs during the healing process. Limited research exists comparing the extent of shrinkage in FGG around natural teeth and dental implants. This systematic review and meta-analysis aim to systematically evaluate the dimensional changes associated with FGG procedures in these two settings.

Method: This review and followed the PRISMA guidelines and was registered in the Prospero database (CRD42023437391). We included human studies that met the following criteria: 1) randomized clinical trials (RCTs), prospective clinical studies, or case series; 2) preoperative and postoperative assessments of keratinized tissue; and 3) a minimum follow-up period of 6 months. Exclusion criteria comprised studies that did not specify the surgical protocol for FGG, in vitro or animal studies, studies lacking clear assessments of keratinized tissue, and those with follow-up periods shorter than 6 months. An extensive electronic search was conducted across MEDLINE (PubMed), EMBASE, Web of Science, and SCOPUS, independently performed by two reviewers (AM and TO).

Results: Fifteen articles (N=306) met our inclusion criteria. Eight studies focused on FGG around natural teeth (N=156), while seven examined FGG around dental implants (N=150). The analysis revealed that FGG shrinkage around natural teeth was 25.528% by 6 months. In contrast, for dental implants, shrinkage was 28.066% by 6 months.

Conclusion: Our findings indicate a substantial incidence of graft shrinkage following FGG procedures, with significant changes observed within the first 6 months around natural teeth and peaking at 6 months for dental implants. While variability in shrinkage estimates for natural teeth was noted, a consistent trend emerged. Conversely, the studies related to dental implants exhibited considerable heterogeneity, suggesting that variations in study design and methodology may account for differing outcomes. Further research is essential to address this heterogeneity and potential publication bias, aiming to refine our understanding of gingival shrinkage following FGG procedures.

Variable for studies	Implant_studies				
Variable for total number of cases	n				
Variable for number of positive cases	Pre_overall				
Study	Sample size	Proportion	95% CI	Weight (%)	
				Fixed	Random
Amir Shammas et al (2020)	10	30	6.674 to 65.245	6.75	12.62
Jimmy Velis et al (2019)	30	13.333	3.755 to 30.722	19.02	15.81
Xiaojiao Fu et al (2022)	21	38.095	18.107 to 61.565	13.5	14.96
Xiaojiao Fu et al (2021)	21	14.286	3.049 to 36.342	13.5	14.96
Christian M Schmitt et al (2015)	21	23.81	8.218 to 47.166	13.5	14.96
Ali Hassani et al / 2010	5	100	47.818 to 100.000	3.68	10.01
Alberto Monje et al / 2021	48	6.25	1.308 to 17.196	30.06	16.66
Total (fixed effects)	156	19.886	14.052 to 26.847	100	100
Total (random effects)	156	28.066	13.119 to 46.069	100	100
Test for heterogeneity					
Q	32.4687				
DF	6				
Significance level	P < 0.0001				
I2 (inconsistency)	81.52%				
95% CI for I2	62.86 to 90.80				
Publication bias					
Egger's test					
Intercept	6.8899				
95% CI	3.1213 to 10.6585				
Significance level	P = 0.0053				
Begg's test					
Kendall's Tau	0.823				
Significance level	P = 0.0094				

P17

Innovative Technique for Maxillary Sinus Augmentation Education: A Step-by-step Approach Using 3D-printed Models

B. Grassi*, G. Wang, F. Aja, Y.C. Yu, S. Froum, S. Cho, L. Palomo

Introduction: The lateral window maxillary sinus augmentation is a well-established method in implant dentistry for ridge augmentation, but it is usually not included in undergraduate training and is reserved for specialized postgraduate programs. With 3D-printed models from CBCT scans, dental education has advanced, allowing clinicians to practice complex surgical techniques on realistic anatomical models before performing them on patients.

Method: This report outlines a step-by-step approach to the lateral window maxillary sinus augmentation technique, utilizing both patient-specific 3D-printed models and live patient surgeries. The 3D models provide a hands-on simulation, enabling clinicians to gain familiarity with the procedure before clinical application.

Results: Using 3D-printed models for training allowed clinicians to practice the sinus augmentation technique with greater confidence and precision. The combination of model-based simulation and live surgery facilitated a deeper understanding of the procedure, enhancing surgical skill and preparedness.

Conclusion: Incorporating patient-specific 3D-printed models in training for lateral window maxillary sinus augmentation offers a valuable educational tool, bridging the gap between theoretical knowledge and practical application. This approach enhances clinician readiness and could improve patient outcomes in complex implant procedures.

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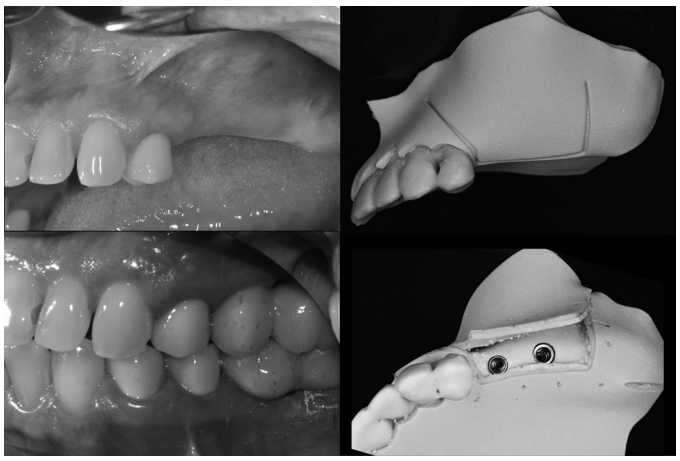


P18

Fit Accuracy of Conical Connection Implant System Components – 2D Tolerance Displacement

B.K. Tan*, M.Y. Tan, Y.L. See Toh, J.Z. Tan, B.C. Tan

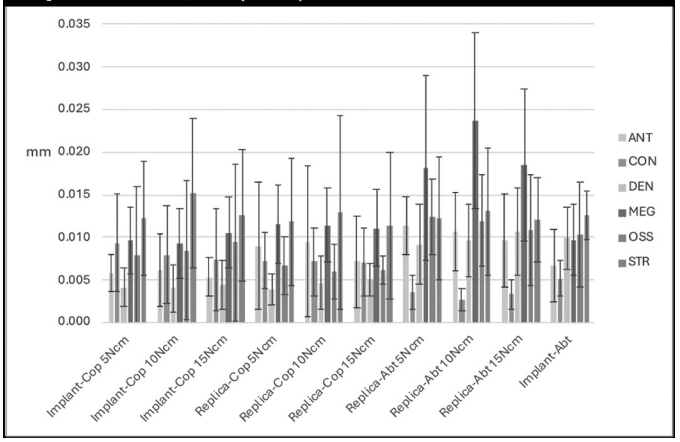
Introduction: Existing studies on accuracy of fit mainly evaluate external hexagonal implant system components. It is unknown whether differences in fit accuracy exist between conical connection implant systems and within system components. The effect of torque on fit accuracy is also unknown. This study evaluated the effect of torque on two-dimensional (2D) tolerance displacements of impression copings or abutments when connected to implants or replicas in conical connection implant systems.

Method: Ten each of impression copings (C), abutments (A), implants (I) and replicas (R) of six conical connection implant systems (Anthogyr AXIOM Reg (ANT), Biohorizons-Camlog CONELOG® (CON), Dentium Superline (DEN), MegaGen Anyridge (MEG), Osstem TSIII (OSS) and Straumann Bone Level RC (STR)) were measured for 2D tolerance displacement (d_r) in X- and Y- dimensions using a Coordinate Measuring Machine. Measurements were done at 5, 10, 15Ncm torque magnitude at implant-impression coping (I-C), replica-impression coping (R-C) and replica-abutment (R-A) connections and the respective manufacturer recommended torque magnitude at the final implant-abutment (I-A) connection.

Results: Overall, mean d_r ranged from 3±1µm (CON, R-A, 10Ncm) to 24±10µm (MEG, R-A, 10Ncm). Mean d_r of I-C connections ranged from 4±3µm (DEN, 10Ncm) to 15±9µm (STR, 10Ncm), R-C connections ranged from 4±2µm (DEN, 5Ncm) to 13±11µm (STR, 10Ncm), R-A connections ranged from 3±2µm (CON, 15Ncm) to 24±10µm (MEG, 10Ncm). Two-way ANOVA found that variations in torque magnitude had no significant effect on d_r but implant system had a significant effect on d_r at I-C, R-C, R-A connections. Mean d_r of I-A connections ranged from 5±2µm (CON, 20Ncm) to 13±3µm (STR, 35Ncm) and one-way ANOVA found that system had a significant effect on d_r.

Conclusion: At I-C, R-C, R-A and I-A connections, significant differences in d_r were found between implant systems and connections. No significant differences in d_r were found at I-C, R-C and R-A connections between torque magnitudes. The statistically significant differences in d_r are likely clinically insignificant for single implant restorations. However, these inaccuracies may be cumulative and significant in multi-implant prostheses. Consistent controlled torque application should be applied at each connection.

Figure 5.1 – Mean two-dimensional tolerance displacement, dr (mm)



P19

Implant Placement for Fixed Full Arch Prosthesis Using a Magnetic Stackable Guide: A Case Report

B. Moleta*, S. Arboleda

Introduction: Alveolar ridge deficiency can significantly affect the quality of life of individuals using complete dentures. Resorption and loss of bone volume results in an unstable foundation for complete dentures. This case report describes a digital and surgical workflow using magnetic stackable surgical guides to ensure increased stability and precision during guided bone reduction and implant placement for a fixed full-arch prosthesis.

Method: A 45 year-old male presented with the chief complaint of "I am unhappy with my dentures and would like implants placed." A dual CBCT scan revealed inadequate restorative space on the mandible requiring alveolar bone reduction prior to implant placement. The case was approached with a 3D-printed stackable guide for improved stability during the placement of 5 mandibular implants and a more streamlined workflow for prosthesis conversion using a stackable prosthesis. The guide was designed using a combination of digital designing softwares.

Results: The base of the guide serves as the bone reduction template and remains in place for the entire surgery. After flap reflection the base is seated and the bone is reduced to allow proper seating of the implant guide. The guide for implant placement can then be easily placed and removed for visibility of the osteotomies and the surgical field. The stackable conversion prosthesis with pre-printed holes for temporary cylinders affords the restorative dentist the ability to pick up the implant positions at the exact VDO the patient presented with. The advantages of this approach include ease of mind to the surgeon that the guide remains in place throughout the procedure via the magnetic wells, versatility of the guide, decreased use of materials by the restorative dentist, a more accurate occlusal relationship of the conversion prosthesis, and increased patient comfort during conversion. What might be considered a disadvantage to this approach is the structural stability of the guide due to flexure from the 3D-printed resin during implant placement. To combat this flexure one could consider fabricating a metal alloy stackable surgical guide for more precision.

Conclusion: This case report highlights how the use of a magnetic stackable guide facilitated a step-by-step approach simplifying various aspects of the surgery while ensuring both efficiency and precision.

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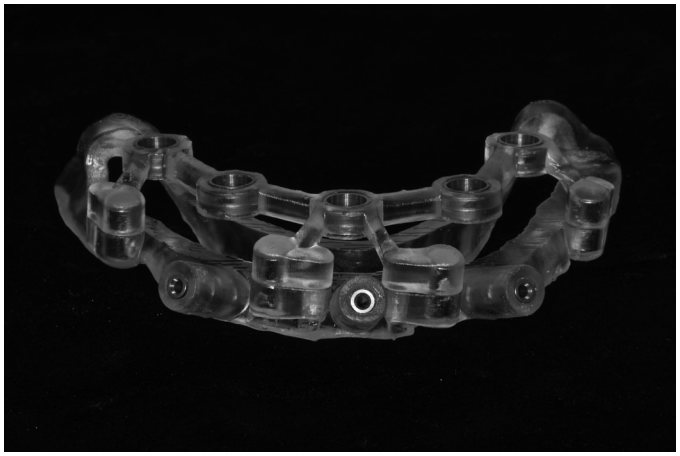


Guide base with magnetic stackable implant placement guide

P20

The Effect of Interproximal Area between Implants and Adjacent Teeth on Crestal Bone Loss

C.C. Chen*, V.M. Li, Y. Yeh

Introduction: Previous studies have reported an ideal distance between implants and adjacent teeth to prevent crestal bone loss. However, limited research has explored how the interproximal area between implant restorations and adjacent teeth affects bone levels around both the implants and adjacent teeth. This retrospective study aimed to investigate the effect of the interproximal area between implants and adjacent teeth on crestal bone loss.

Method: The dental records of patients at the University of California, San Francisco Dental Center who had received at least one implant were reviewed. To be included in the analysis, implants had to be functionally loaded for at least one year after crown insertion, with clear, undistorted periapical radiographs. Radiographic analysis was performed to assess the interproximal space between implant restorations and adjacent teeth at the time of placement and during follow-up visits. Crestal bone loss around the implants and adjacent teeth was calculated in relation to the interproximal space area.

Results: A total of 96 patients with 117 implants were included with an average follow-up period of 41.73 months. The study found significantly greater crestal bone loss on implants when the interproximal space area between implant restorations and adjacent teeth was < 6 mm^2 compared to those with ≥ 6 mm^2 (0.49 ± 0.76 mm vs. 0.25 ± 0.54 mm, $P < 0.05$). However, there was no significant difference in crestal bone loss on adjacent teeth, regardless of whether the interproximal space area was < 6 mm^2 or ≥ 6 mm^2 (0.27 ± 0.39 mm vs. 0.29 ± 0.60 mm, $P = 0.89$). Additionally, among all implants, significantly more crestal bone loss was observed on mesial sites compared to distal sites (0.45 ± 0.76 mm vs. 0.24 ± 0.50 mm, $P < 0.05$). However, when comparing interproximal space areas of < 6 mm^2 to ≥ 6 mm^2, neither mesial nor distal sites showed a significant difference in crestal bone loss on implants (mesial sites: 0.47 ± 0.77 mm vs. 0.20 ± 0.40 mm, $P = 0.18$; distal sites: 0.60 ± 0.75 mm vs. 0.35 ± 0.76 mm, $P = 0.21$).

Conclusion: The present study demonstrated that an interproximal space area of less than 6 mm^2 between implant restorations and adjacent teeth was associated with significantly greater crestal bone loss around the implants. Insufficient interproximal space may limit patients' ability to effectively clean the area with oral hygiene tools, leading to inadequate plaque removal.

P21

Utilizing Cone Beam Computed Tomography Segmentation With Digital Records in Full Arch Implant Digital Conversions

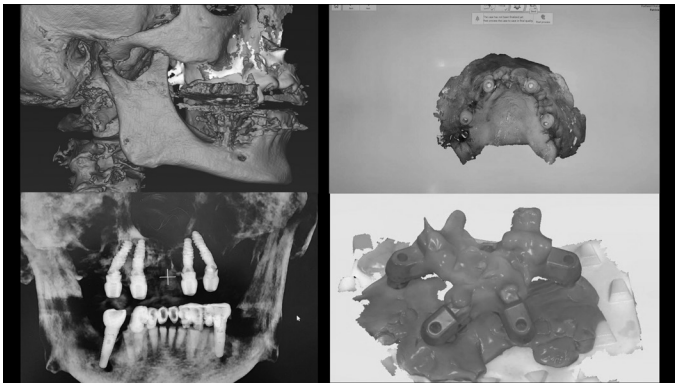
C. Banh*

Introduction: The transition from chairside analog denture conversions for the production of a full arch temporary to digital conversions utilizing 3D printing and milling has been on of the most discussed topics of the last several years. This has been in part due to the innovation in digital recording taking devices including both grammetry and photogrammetry. The missing link in the process has been the ability to accurately and predictably relate the post surgical scan and implant positions to the pre-operative intraoral scan and the digital wax up. Utilizing radiopaque healing caps allows the registration of a post operative CT to the pre operative CT scan using an unlimited number of registration points.

Method: Digital conversion for a milled temporary was conducted on 32 arches which were a mixture of single and dual arch cases. For each case radiopaque healing caps were printed from a radiopaque resin derived from barium sulfate. These healing caps were used in both grammetry and photogrammetry cases. A pre operative CBCT was conducted for each patient in a closed bite posture with a large field of view in order to visualize the condyle seated in the fossa. The visualization of the TMJ is critical to evaluate centric relation and also serves as a measurement of comparison. Full arch temporaries were fabricated and delivered the next day in each case. After delivery a CBCT was taken with a large field of view to compare condyle position and also VDO measurements to the pre operative condition.

Results: Pre operative and post operative CBCTs revealed the VDO deviation was 1.3 mm with a deviation tolerance of 0.2 mm. The condyle position in the fossa revealed an anterior posterior deviation of 0.9 mm with a deviation tolerance of 0.42 mm. Anecdotally 100% of patients in the study found the new vertical position to be satisfactory with little to no changes in their ability to speak or function.

Conclusion: Utilizing CBCT segmentation of pre operative and post operative conditions may be a more predictable way to digitally articulate these full arch cases and also allow more registration points during the merging process. A more accurate registration manifests in a more idealized centric bite position in comparison to the pre operative condition.



Summary of pre operative and post operative records: pre operative CBCT, post operative CBCT with radiopaque healing caps, soft tissue intraoral scan with radiopaque healing caps, and implant grammetry data.

P22

Vestibuloplasty and Free Gingival Graft (FGG) to Enhance Keratinized Tissue in a Fully Edentulous Mandible

C. Shyu*, G. Wang, S. Froum, S. Cho, L. Palomo

Introduction: Mandibular overdentures supported by 2 to 4 implants offer improved retention, stability, and patient satisfaction compared to traditional dentures. This approach is cost-effective and minimally invasive, making it suitable for patients who may not qualify for complex procedures. While two implants in the anterior mandible provide basic support, four implants offer enhanced stability, better load distribution, and reduced prosthetic movement, thus improving chewing efficiency and comfort. Maintaining a healthy zone of keratinized tissue around implants is essential for long-term success.

Method: This poster presentation details a technique to increase the keratinized tissue zone in the edentulous mandible, using vestibuloplasty and free gingival grafting. The step-by-step approach

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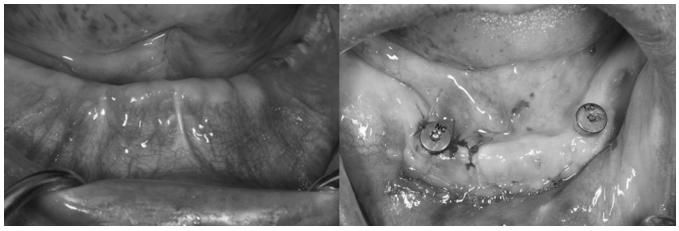
is designed to optimize gingival health around implants, contributing to both functional stability and aesthetic outcomes.

Results: The technique successfully expanded the keratinized tissue zone, supporting improved implant retention and gingival health. The enhanced stability and tissue support allowed for better denture functionality and comfort for the patient.

Conclusion: Increasing the keratinized tissue around mandibular implants using vestibuloplasty and gingival grafting provides a solid foundation for successful overdenture performance. This approach ensures stability and longevity of the overdenture while enhancing patient comfort and satisfaction.



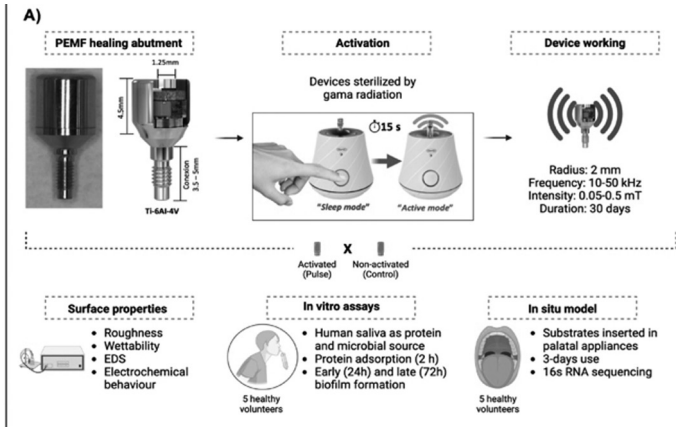


Figure 1 – PEMF evaluation. PEMF devices as implant healing abutment was used. Devices were activated to start pulse emission. Device were evaluated in terms of surface properties, in vitro biofilm model and protein adsorption, and in situ models, where the devices were inserted in the oral cavity.

P23

Does a Miniaturized Pulsed Electromagnetic Field Device Impact the Modulation of Pathogenic Microbiome Dynamics of Implant-associated Infections?

C.M. Greco*, J.G. Souza, R.C. Costa, T. Shiba, M.F. Figueiredo, V. Barão, S. Barak, Y. Meyer, J.A. Shibli

Introduction: Implantable devices are susceptible to adhesion and accumulation of polymicrobial biofilm, which often leads to an inflammatory response and tissue damage. In the oral environment, dental implant-related infections, which still lack effective therapeutic strategies, have been considered the main reason for treatment failure. Pulsed electromagnetic field (PEMF) technology has been introduced as a safe and effective modality for enhancing biological responses, including control of microbial growth. The effect of PEMF for controlling and modulating microbial diversity using human microbiome models has, however, not been tested experimentally. Thus, we tested a PEMF device as a healing component for dental implants.

Method: A PEMF device as healing abutment for implant was used to evaluate the effect on microbial accumulation, and physical, chemical and electrochemical properties of the material. Activated PEMF was used as experimental group (pulse). Non-activated PEMF was used as control. Surface roughness, wettability and surface chemical composition were evaluated before and after activation phase. For early and late in vitro biofilm accumulation (24 and 72h), stimulated human saliva was used as microbial inoculum for biofilm assay. In our in situ model, the same volunteers used a palatal appliance for 3 days containing the PEMF devices (control and pulse) to allow biofilm accumulation in the oral environment. Biofilms were evaluated in terms of live cell amount structure and microbial composition determined by DNA-DNA checkerboard hybridization and 16S RNA sequencing for the entire bacterial microbiome composition.

Results: PEMF activation did not change any of the chemical and physical characteristics of the implant. Positively, PEMF promoted salivary protein adsorption and controlled *in vitro* polymicrobial microbial accumulation by reducing the levels of 25 bacterial species. Our *in situ* model, in which the devices were inserted in the patients' oral cavity (3 days), PEMF showed a potent effect on reducing levels (by at least 5x) of 35 bacterial species, including pathogens associated with peri-implantitis. PEMF also changed bacterial interactions and promoted specific bacterial pathways.

Conclusion: PEMF has emerged as an effective strategy for controlling implant-related infections. Support: Magdent, Israel; CNPq Grant# 314479/2023-6

P24

Immediate Single-implant Restorations Supported by an Immediate Provisional Restoration Using New Digital Technology

C. Peron*, G. Romanos

Introduction: Digital technology as a tool for multiple integration of 3D radiographic data and intra-oral scan data, via virtual planning software, allows complete three-dimensional visualization of hard and soft tissues and the position of the future restoration, resulting in greater diagnostic accuracy. The purpose of this retrospective study is to evaluate clinical and radiographic outcomes 1 year after loading were evaluated.

Method: These retrospective study was performed by the same surgeon (C.P.) in a single private-office, prior to the implant treatment, intraoral scans of the upper jaw, lower jaw, and occlusion were made, as well as intraoral photographs and a CBCT scan. The IOS files and CBCT files were overlaid with the implant planning software to create a surgical guide that allows for planned implant placement. Single, non-restorable teeth with were atraumatically extracted and the implants were inserted in the exact position previously planned and gaps around the implants were grafted. An immediate provisional acrylic crown was delivered and placed in occlusion. After 3 months implants were definitively restored with zirconia screw-retained crowns. Thrity patients were treated with total 30 implants. In all cases the implant stability was checked with insertion torque and resonance frequency analysis. Bone levels were measured to an independent evaluator (G.R) at the time of definitive crown point and after 1 year and the Pink Esthetic Score was used to subjectively evaluate the esthetic outcome of soft tissue around each implant-supported single crown.

Results: All implant insertion torque levels were >40 Ncm. ISQ-values were greater than 65 immediately after placement. Peri-implant bone loss is stable over time with average values in the 1 year of 0,22 +- 0,21 mm. Evaluation of peri-implant soft tissues using pink esthetic score shows values of 13.5 PES in the first year. The implant survival and success rate were 100%.

Conclusion: Within the limitations of this clinical study, immediate implant placement with digital planning resulted in predictable and esthetic single-tooth restorations. This procedure is associated with an improvement in the predictability of the final result and the speed of execution of the surgical phases without compromising the final aesthetic result, helping to maintain the alveolar and interdental papilla architecture around the implant.

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P25

Enlarged Surface Design of Bioceramic Bone Grafts Enhances Proliferation and Promotes Bone Regeneration

D. Oh*, S.Y. Hann, o. finnaoui, M.F. Zahra, B. Park, S. Song

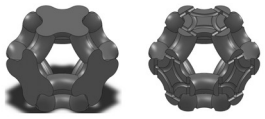
Introduction: This study addresses the ongoing challenge of bone regeneration in orthopedic, dental, and maxillofacial applications by exploring the impact of an enlarged surface design on bioceramic bone grafts, focusing on enhanced cellular proliferation rates and bone regeneration outcomes, aiming to improve the efficacy of biocompatible, osteoconductive alternatives to autologous grafts through optimized surface characteristics.

Method: Two types of granulated bone grafts were fabricated: one with a single-pore structure and another with a pore-and-microchannel structure. The single-pore structure consists of interconnected primary pores with diameters ranging from 200 μm to 350 μm. The double-structure graft features primary pores of 200 μm to 350 μm in diameter and secondary channels of 25 μm to 75 μm in diameter within each strut. These channels and pores are interconnected. Theoretical porosity and surface area were calculated using computer simulation to compare the two structures. Each type of granule was filled to a height of 5 mm in 96-well-like sockets and cultured with MC3T3-E1 cells. After three days of culture, cell proliferation on the graft surface was examined, and the proliferation rate was calculated following H&E staining. Extracellular matrix formation was also observed using fluorescence microscopy.

Results: The overall outer structure and shape do not differ significantly between the single-pore and micro-channel pore structures. The porosity difference is only 3.04%, with the single-pore structure at 75.6% and the micro-channel structure at 77.9%. The surface area was calculated to be 28.697 mm2 for the single-pore structure and 36.743 mm2 for the micro-channel structure, indicating that the micro-channel design increased the surface area by approximately 130%. Additionally, the proliferation rate for the micro-channel pore structure was three times faster than that of the single-pore structure.

Conclusion: Even a simple design change, such as adding a micro-channel in the strut, dramatically enhances the surface area, which is crucial for bone cell attachment and subsequently promotes greater proliferation. This design holds promise for improved and more effective bone regeneration.

Structure	Porosity	Pore diameter	Channel diameter	Surface area
Single pore	75.6%	250 μm	None	28.697 mm²
With channel	77.9%	250 μm	47.77 μm	36.743 mm²
	+ 3.04%			+ 28.04%



Single pore Pore with micro-channel

Comparison of Parameters and computerized model: Single Pore Structure vs. Pore with Micro-Channel Structure.

P26

Conventional and Digital Workflow for Fully Guided Implant Placement with Connective Tissue Grafting in the Esthetic Zone

G. Pipis*

Introduction: A patient presented with a missing tooth #10 and a buccal concavity, expressing a desire for improved function and esthetics. A combined conventional and digital workflow was utilized for the design and execution of a fully guided implant placement. The implant placement was performed simultaneously with a connective tissue grafting harvested from the palate and placed buccally in order to enhance and thicken the soft tissue.

Method: Conventional and Digital Workflow: A CBCT of the maxilla and mandible was taken and imported to the RealGUIDE platform. An Intra-oral scan was performed & imported, 3D-printed models were obtained. A conventional wax-up of #10 was completed, scanned and imported. Using the CBCT and STL files, a tooth-supported surgical guide was designed to enable optimal fully guided implant placement.

Surgical Therapy:

Implant placement: A sulcular incision (buccal and palatal) was made from the distal of #8 to the distal of #12 with a mid-crestal incision in the edentulous #10 site. A full thickness flap was reflected, and the tooth-supported guide was positioned. Astra Prime Taper EV surgical guide kit was used for osteotomy preparation: Drills used: EV-GS 3.6, EV-GS 1.9 ND, Prime Taper drill 2.95 GS and implant 3.6 X 11 mm Astra Prime Taper EV was placed. A cover screw was placed and radiographically verified as seated.

Connective Tissue Graft: Periosteal incisions were made buccal to soothe #10 using a 15c BP blade in order to achieve tension free primary closure. A free gingival graft was harvested from the palatal region #14-#15 and Surgicel was used for hemostasis. The graft was de-epithelialized and sutured to the buccal flap using 5-0 chromic gut sutures. Tension free primary closure was achieved with 5-0 glycolon sutures.

Post-Operative Care & Follow-up: The patient was prescribed Amoxicillin 500 mg, three times per day for 7 days. At 14-days post-op visit, sutures were removed, and buccal concavity was resolved.

Future Restoration: A temporary crown will be placed 3-months post-surgery, followed by the final restoration.

Results: Optimal implant positioning, buccal concavity resolution, increased keratinized tissue width.

Conclusion: A combined conventional and digital workflow provided precise implant placement, while autologous CTG effectively corrected the buccal concavity and enhanced keratinized tissue width contributing to optimal esthetics.

P27

3D-Printed Allograft/Alginate/Gelatin Scaffolds Coated With Platelet-Rich Fibrin or Adipose Stromal Vascular Fraction for In Vitro Osteogenesis

S. Baniameri*

Introduction: Addressing bone defects is essential for restoring functionality and improving quality of life. Bone tissue engineering integrates scaffolds, cells, and signaling molecules to enhance regeneration, offering an alternative to autologous bone grafts. Patient-derived products like platelet-rich fibrin (PRF) and stromal vascular fraction (SVF) are increasingly favored due to their abundance of growth factors, stem cells, and clinical feasibility. PRF and SVF activate key osteogenic pathways, promoting osteoblast differentiation and bone formation. Combining these biological components with 3D-printed hydrogel-based scaffolds, augmented with ceramics or alginate-gelatin composites, allows for the creation of patient-specific, biocompatible, and ECM-mimicking constructs, advancing the prospects of bone tissue regeneration.

Method: Buccal fat pad-derived stem cells (BFPdSCs), confirmed via flow cytometry and differentiation assays, were seeded onto scaffolds with a pore size of 481μm, suitable for cell adhesion and infiltration. Data were presented as mean ± SD, and statistical analysis was done using one-way or two-way ANOVA with Tukey's post hoc test. A p-value < 0.05 was considered significant.

Results: Cell adhesion was assessed via SEM and DAPI staining after 3 days, showing enhanced adhesion in coated groups, with the PRF group performing better. Osteogenic differentiation over 14 days revealed increased ALP activity in both coated groups compared to the control, with the PRF group exhibiting the highest activity at day 14. RT-PCR showed upregulation of osteogenic markers (BMP-2, OPN, RUNX2) and the angiogenic marker VEGF in coated groups. BMP-2 and VEGF peaked at day 7, while OPN increased from day 3 to day 7, and RUNX2 was notably higher in the PRF group at day 3 and day 7. Immunocytochemistry confirmed higher OCN and OPN expression in coated groups, with the PRF group showing the highest levels. Giemsa staining revealed granular purple aggregates, indicating bone matrix formation, predominantly in PRF-coated scaffolds.

Conclusion: Both components significantly enhanced osteoblastic differentiation in a time-dependent manner, with the PRF group outperforming in adhesion, gene expression, and protein expression. These findings highlight the promising role of PRFcoated scaffolds in promoting osteogenesis and facilitating bone tissue regeneration.

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P28

Photogrammetry and Intraoral Scanning for Full-arch Implant Restoration. Clinical Results and Evaluation of Existing Misfit

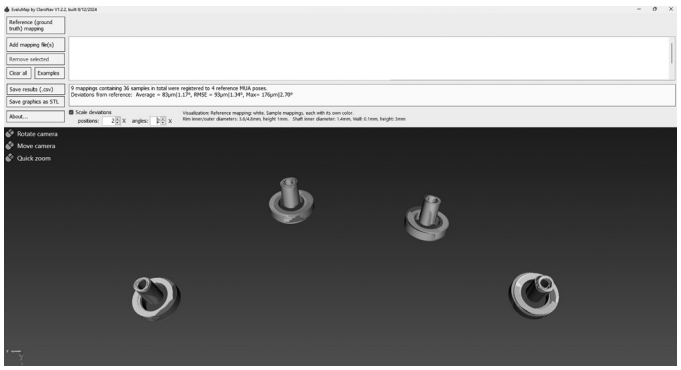
R.S. Pessoa*, B.V. Santos, C. Morabito, P. Mendes, T.S. Mendonca, L. Brito, U. Cadore, G. Khalil, P.S. Borella, G. Oliveira, G. Mendonca

Introduction: Photogrammetry has emerged as a transformative technology in implant dentistry, enhancing accuracy and efficiency in capturing implant positions, particularly for full-arch screw-retained restorations. Photogrammetry enables precise implant positioning by capturing simultaneous images of scanbodies, which can be seamlessly integrated with CAD/CAM systems for rapid prosthesis fabrication. This study evaluates the accuracy of photogrammetry in full-arch implant-supported restorations. Despite notable advantages, challenges remain in achieving standardized protocols, operator proficiency, and accurate data integration with intraoral scans.

Method: This study included 30 patients that previously received implants for full arch restoration in the maxilla and/or mandible. All restorations were fabricated over multiunit abutments (S.I.N. Implant systems). After implant sites healed patients returned to follow-up. Temporary prosthesis were removed and the patients were scanned with Micronmapper (MM) and medit i600 intraoral scanner. The prosthesis was also scanned to compare fit with implant position. A verification jig was also obtained at time of scanning.

Results: All implants were osseointegrated. After prosthesis removal the scanbodies for MM were placed and patient was scanned. IO scanbodies were also used. Comparison between casts and MM showed a difference of 70.86µm (±75.19) with a maximum variation of 100.76µm. When comparing MM and the index the difference was 66.42µm (±70.54) with a maximum variation of 97.17µm. Two different types of scanbodies also presented different results. Design #1 difference was 107.75µm (±115.06) with a maximum variation of 156.50µm and Design #2 difference was 74.57µm (±78.96) with a maximum variation of 107.04µm. Scanning the prosthesis showed higher values compared to MM (97.69µm (±103.84µm - max 142.19µm). Clinically the situations were the values were above 120µm the fit of the temporary was considered not ideal and clinically noticeable.

Conclusion: These results demonstrated accuracy of the photogrammetry system compared to a conventional cast. For the intraoral scanner, it was dependent on the shape of the scanbody used. This study also demonstrated some correlation between the values obtained in MM with clinically noticeable misfit of temporary prosthesis.



Software used to align and evaluate implant positions captured with all diferent methods for the same cases

P29

From an Impedement for Prosthodontics, to a Benefit for a Full Mouth Implant Rehabilitation. How Digital Workflow Can Transform the Role of Specific Anatomical Structures to Crucial Allies

D. Charoulis*

Introduction: A 71yo partially edentulous female patient, with excessive osseous atrophy in bothh upper and lower jaw was treated with RPDs. The poor adaptation of the dentures due to the presence of torus mandibularis had led to GI symptoms, loss of VDO, social psycholoogal concequences such as isolation and signs of primary depression as well as speech difficulties. The patient was fully rehabilitated with 6 implants on the upper and 5 on the lower placed fully guided, with screw retained ZrO2 bridge supported by Ti frame bars. The whole treatement was performed fully digital and no analog protocol was followed.

Method: CBCT and intra oral scan to analyse the osseous quantity and quality. Digital Design of the final prosthetic restoration. Digital 3D placement of the implants and selection of abutents Design of the bone supported surgical guide. Extractions of the remaing teeth and immediate placement & loading of Implants. Milling of the Ti frame bar. Printed PMMA of the final restoration was applied to corect the occlusion, the forms, phonetics and aesthetics of the patient prior to the final ZrO2 milling. Two arches -upper & lower- with hfull contour ZrO2 on the posterior and cut back on the anterior aesthetic zone were applied.

Results: The 6 upper implants were inserted with torque > 45 Nt/cm and were all loaded whereas out of the 5 lower only 4 were placed with highh torque while 1 was placed with 28Nt/cm. Hence only 4 were immediately loaded. The whole procedure did not exceed the timeframe of 3hours.

Conclusion: The patient was succesfully rehabilited and her quality of life changed within a day. She compared the digital data collection, as well as the digital impressions with the analog ones which she had undergone in the past and noticed the remarkable difference of contemporary dentistry. The digital workflow proved to be extremely acurate as everything fitted 1:1.

P30

Narrow Implant for Molar Area to Overcome Severely Reduced Bone: 10 Years Follow-up Cases

D. Choi*

Introduction: To overcome the narrow ridge on posterior area is somewhat challenging matter. Usually block bone graft or GBR is done to increase the width of the ridge. But these procedure is technique sensitive and sometimes makes various complications; pain, swelling, surgical site dehiscent, infection, numbness, etc.

Method: We do implantation with 3,5mm diameter implant without extra surgery in molar area safely, it makes implant easier and makes the patients more comfortable and satisfied by the results. The problem of narrow implant on posterior area is tearing of implant by continuous loading. And because of it narrow implant has been used only limited cases.

Results: To solve this problem we used wing structured implant. During 10 years (from june 2014 to june 2024) no tearing of implant on connecting point with abutment has been occurred. Only one implant on #24 area was fractured on middle portion of implant due to severe bone loss and mis-adjusted occlusion

Conclusion: Using the wing structured implant, narrower implant can be used safely on posterior area

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P31

Sinus Elevation by Lateral Approach Using 3D Reconstruction and Surgical Guides: A Clinical Case Report

F. Giachi Carù*, R. Scaini, M. Deflorian, T. Testori

Introduction: Sinus lift procedures are among the most effective regenerative techniques, boasting a high success rate. However, the anatomical variability of the maxillary sinus can complicate membrane elevation, raising the risk of sinus membrane perforation. Advanced 3D reconstruction software can help clinicians better understand sinus anatomy. In patients with thick sinus cortical bone, transferring CBCT data to a clinical setting can be challenging. This study presents the use of a surgical guide to outline the antrostomy for a lateral sinus lift approach, enhancing precision in accessing the sinus.

Method: The patient is a 59-year-old female, M.C., ASA 1, non-smoker, presenting with non-maintainable elements 25 and 27. Treatment planning included teeth extractions, lateral sinus lift, and implant-prosthetic rehabilitation of the quadrant two. A stereolithographic model of the maxilla was created to visualize the maxillary sinus anatomy more clearly. A surgical guide was employed to achieve precise localization of the antrostomy area. The sinus membrane was elevated with adherence detachment near the septum, which was removed using piezoelectric inserts. Sinus grafting was performed with xenograft biomaterial, and implants were placed in a follow-up surgery with prosthetic rehabilitation completed 9 months after the sinus lift.

Results: The digital technologies enabled precise maxillary sinus localization despite the thick cortical bone. The integration of 3D rendering software and CBCT-based models provided a comprehensive view of sinus anatomy, facilitating accurate antrostomy placement and lowering the membrane perforation rate

Conclusion: Digital technologies, including 3D rendering and stereolithographic models, significantly enhance the precision of sinus lift procedures. They allow clinicians to accurately interpret and navigate maxillary sinus anatomy, the use of surgical guide could help clinicians to locate the maxillary sinus even in cases with thick cortical bone, thereby improving procedural outcomes and reducing complications.

P32

Evaluating Osteogenic Cell Differentiation Efficacy in the Presence of Polylactide (PLA) Plates With Varied Compositions for Jaw Bone Grafting: An In Vitro Study

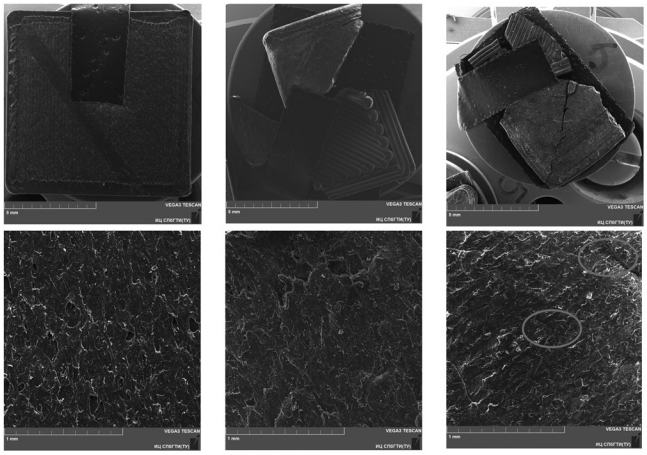
E. Zernitckaia*, J. Lozada, A. Reutova

Introduction: There are many world-known methods of bone augmentation, such as guided bone regeneration (GBR), augmentation with collagen bioresorbable membranes, titanium meshes and others. To improve the quality of maxillofacial surgery, materials with good mechanical properties and non-toxic and favorable biological and chemical characteristics are required to manufacture membranes for bone repair. Using bioabsorbable materials may be a new step in jawbone augmentation. Aim: To investigate the influence of different polymer compounds of individual scaffolds for bone repair on the processes of proliferation and osteogenic differentiation in vitro.

Method: Plates 10 x 10 x 0.5 mm were prepared from polylactide (PLA), polylactide with the addition of 15 wt%. hydroxyapatite nanoparticles (PLA/HA), copolymers of polylactide with glycolic acid 60:40 and 85:15. We use gingival fibroblasts to assess the influence of experimental samples on the processes of proliferation and osteogenic differentiation of cells, they were cultured in a low- glucose nutrient medium. Cell cultures were stained with alizarin red and the intensity of extracellular matrix calcification was measured using a spectrophotometer.

Results: We found that the intensity of alizarin red staining in sample PLA/HA was higher than in sample PLA, indicating greater calcification of the extracellular matrix. It was found that matrices supplemented with hydroxyapatite particles increase calcified extracellular matrix formation in gingival fibroblasts. However, when comparing samples PLGA 60:40 and PLGA 85:15 relative to each other, we found that the intensity of alizarin red staining in sample PLGA 85:15 was significantly higher, indicating greater calcification of the extracellular matrix.

Conclusion: The prototypes of membranes from the presented compositions are non-toxic and do not promote cell death. Plates with added hydroxyapatite facilitate the osteogenic differentiation of cells compared to other samples; however, they do not achieve the same level of proliferation and extracellular matrix synthesis as the control cells. The results of comparing PLGA copolymer samples with different concentrations of acids suggest that altering the ratio of glycolic acid to lactic acid in the matrix composition may influence the degree of calcified extracellular matrix formation.



PLGA 85:15 | PLGA 85:15 0 KGy after degradation | PLGA 85:15 25 KGy after degradation

P33

Hybrid Intra-oral and Extra-oral Scanning Techniques: Revolutionizing Articulation in Full-arch Implant-Supported Restorations

R. Salloum*

Introduction: Accurate occlusal records are crucial for successful full-arch implant restorations. Traditional techniques relying on impression materials and multiple visits can be time-intensive and prone to inaccuracies from material distortions. Hybrid intraoral and extraoral scanning introduces a fully digital workflow, enhancing precision, reducing treatment time, and improving patient comfort. By integrating both scanning techniques, clinicians can achieve superior accuracy in capturing the occlusal relationship, minimizing vertical discrepancies and optimizing articulation. This study explores the impact of hybrid scanning on full-arch restorations, offering a streamlined, efficient solution that enhances outcomes for both clinicians and patients.

Method: This hybrid technique requires a verified model of the arch planned for full-arch restoration. A custom device is attached to two anterior implants, enabling precise capture of the occlusal relationship with the opposing arch. Once the intraoral scan is complete, the device is moved to the verified model for additional scanning, facilitating virtual articulation. This hybrid approach merges intraoral and extraoral data to create a digital solution that surpasses traditional analog methods. By using the patient's anatomy as the primary reference, this method eliminates the need for a physical articulator, guiding alignment with hybrid scanning accuracy.

Results: Data indicate that using hybrid intraoral and extraoral scanning enhances alignment accuracy and provides consistent, reproducible results. Patients who underwent this hybrid scanning technique showed substantial improvements in capturing occlusal records accurately, confirming the efficacy of this approach in providing reliable outcomes for full-arch restorations.

Conclusion: The integration of hybrid intraoral and extraoral scanning into the digital workflow offers a significant enhancement for precision in digital archiving and restorative accuracy. This method enables clinicians to restore original dental aesthetics and functional alignment efficiently, supporting patient-centered care. By simplifying traditionally complex workflows, hybrid scanning represents a notable

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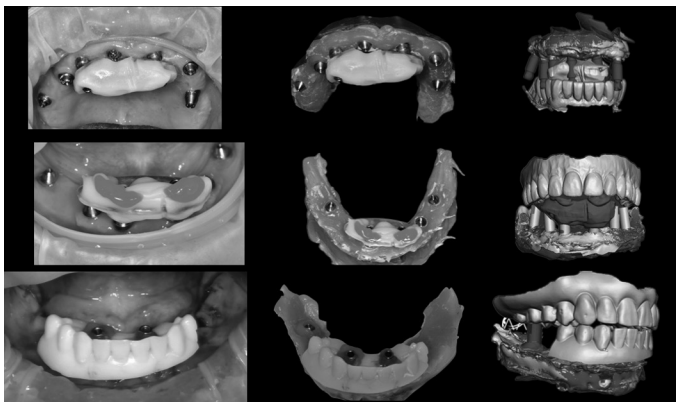
advancement in full-arch implant restorations, setting a new standard in accuracy, efficiency, and patient satisfaction in restorative dentistry.



P34

Fracture Strength of Cantilever Zirconia Implant Prostheses With Differing Prosthetic-Abutment Connections

E. Stewart*, M. Kesterke, J.H. Chen, E. Kontogiorgos

Introduction: Implant supported fixed complete dentures (ISFCDs) are a solution for patients with edentulism or failing dentition desiring fixed rehabilitation. Monolithic zirconia has emerged as a material option that takes advantage of the esthetics and strength while allowing for efficient CAD-CAM fabrication. The zirconia prosthesis can interface with multi-unit abutments (MUA) with several different prosthetic-abutment connections (PACs), including cementation on a bar substructure or with titanium bases (Ti-bases). Newer options, such as prosthetic screws that allow direct connection to the MUA, eliminate the need for Ti-bases and associated complications that can arise, including debonding. However, few in-vitro or in-vivo investigations exist to date. The purpose of this study is to evaluate the fracture strength of monolithic zirconia cantilever prostheses interfacing to MUAs with Ti-bases and two types of direct-to-MUA prosthetic screws.

Method: Two parallel MUA analogs were embedded 15mm apart from the center of the analog in acrylic to generate three master models, one for each test group (Group 1 = Ti-bases, Group 2,3 = direct-to-MUA prosthetic screws). Master models were digitized with a laboratory scanner and specimens were designed for each PAC in a design software. Six monolithic zirconia cantilever specimens were milled for each PAC for a total of N=18. Specimens underwent final sintering but no additional finishing or polishing was performed. Ti-bases were cemented to the specimens in Group 1 with a dual-cure resin cement. Specimens were seated onto the respective master models and the prosthetic screws were torqued to manufacturer's recommendations. Specimens underwent fracture strength testing in a universal testing machine loaded at the cantilever. Fracture strengths and photographs of specimen failures were collected and analyzed.

Results: Results pending.

Conclusion: Conclusions pending.

P35

Horizontal and Vertical Ridge Augmentation Utilize Allogeneic Bone Block Graft in Anterior and Permolar Area Prior to Implant Placement Follow up 2 years

E. Elganna*

Introduction: The anterior maxilla and mandible are critical regions in dental rehabilitation due to their impact on both functional and esthetic outcomes. However, atrophic conditions in these areas–whether due to tooth loss, trauma, or periodontal disease–can result in significant vertical and horizontal bone defects, making dental implant placement challenging

Method: Cases of vertical 10mm, horizontal crestal 7 mm and mesiodistal 10 mm, bone defect and tissue inflammation around the infected tooth 11 decision for extraction and curettage of infected socket remove all infected tissue and granulation accumulation and utilize allograft bone block using one screw for fixation of the plate and filled the gap with mixed allograft particles and autogenous bone chips harvested from external oblique ridge then covered the filled gap by collagen resorbable membrane stabilization by resorbable suture hanging it with the screw thats fixing the plate, tissue flap closer done by doing apical releasing incision for detached the apical muscles and tissue to get passive and stable wound closer done by using polypropylene suture 0.4 flap design for both case was trapezoidal in first case gum around the 21 keep it without reflection to avoid gum recession. secod case horizontally defect with 3 mm ridge

Results: after 4 months reveal completely bone integration of the plate with particles and with host bone give full length regain of vertical and horizontal bone defect angiogenesis formation on the plate and on the CBCT show perfect bone formation and stable graft on time of following up, implant placement of both cases show successful integration in the site of the gap was filled by autogenous bone and allograft particles even after 2 years of recall situation is free of inflammation on soft tissue even getting more thickness over time and creeping on the zirconia crown

Conclusion: allograft bone reconstruction is a safe and effective option for vertical and horizontal maxillary defects, especially when combined with strong means of fixation.

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P36

Socket-Shield Technique in Esthetic Zone With Immediate Implant: Three Year Follow-up

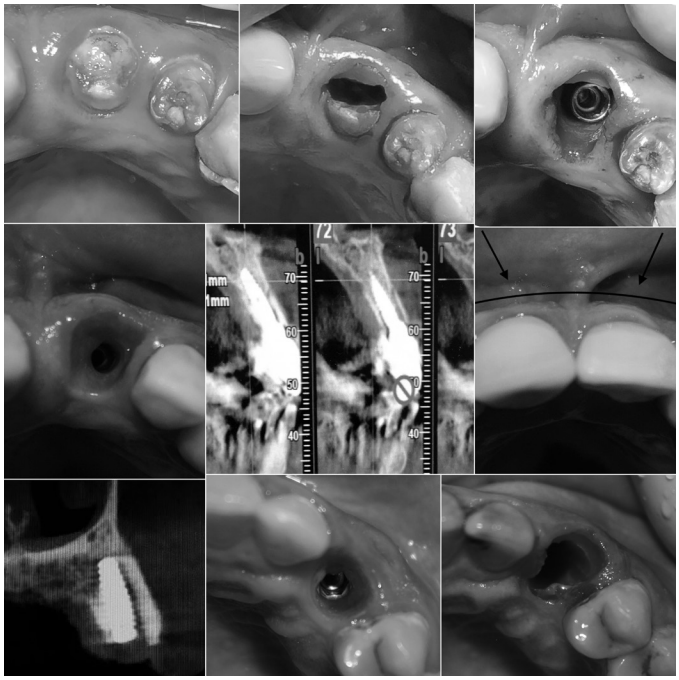
E. Elganna*

Introduction: The aim of this study to show there's no exposure for the shield and labial contour still the same and even better for long period of time in esthetic zone. Preservation of buucolingual dimension by immediate implant decrease buccal bone resorption. Presenting socket-shield technique by keeping a buccal fragment of the tooth to save labial bone in place mostly important in esthetic zone.

Method: horizontal splitting and remove palatal part of the root and leave 2mm thickness of labial fragment. Crestal part of labial part decreased 3mm under gingival margin. implant (3.4x10.5mm) tooth 21 and (4.2x10.5) tooth 23, no bone graft was used just collagen sponge. Screw retained zirconia crown used.

Results: follow up one years everything perfect, then after 3y follow up CBCT obtained labial fragment stable there's no vertical resorption, new bone maturated around the implant and at the gap of shield and there's no sign of inflammation or symptom no exposure and gingival margin keep without recession or change in level.

Conclusion: Socket shield technique with immediate implant in esthetic zone obtained great esthetic result and keep labial contour with natural shape without complication with highly satisfied patient



P37

Peri-Implantitis Management: Implantoplasty

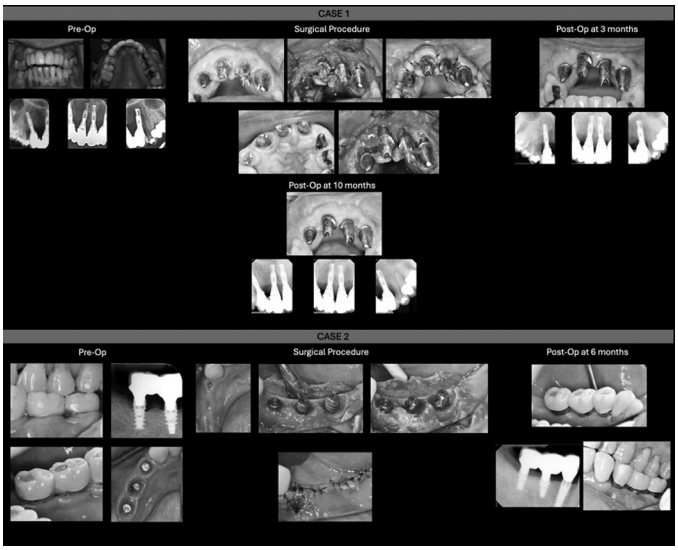
E. Ndreu*, F. Banday, P. Rosen, I. Tsolaki

Introduction: Implantoplasty is traditionally used alongside resective treatment of peri-implantitis. This method has been used to decontaminate the exposed implant surface aiming to reosseointegrate failing implants. Additionally, it facilitates optimal oral hygiene on the exposed implant surface.

Method: We are presenting two peri-implantitis cases where implantoplasty was performed both supracrestally and subcrestally to halt disease progression and potentially promote bone regeneration. In both cases, no bone grafts were used. Both patients exhibited bleeding on probing and deep probing depths of up to 7mm. Case 1 also presented with significant suppuration and had undergone two rounds of antibiotic (Z-Pak) treatment at an external facility before our intervention.

Results: In both cases, stable outcomes were observed for up to 10 months. Although no bone graft was placed, the implantoplasty procedures effectively halted disease progression, with evidence of stable implant surfaces observed radiographically and clinically.

Conclusion: Implantoplasty, performed both supracrestally and subcrestally, can effectively halt disease progression in peri-implantitis cases, even without the use of bone grafts. The stable outcomes observed in both cases suggest that this technique may help maintain implant integrity. Further research with extended follow-up is necessary to evaluate the long-term effectiveness of this approach.



P38

A Treatment Strategy to Achieve the Complete Healing From Severe Peri-Implantitis

E. Daikoku*, K. Takafuji, K. Kon, H. Kondo

Introduction: Peri-implantitis is a biological complication of the dental implant, and the absolute number of peri-implantitis is supposed to be increasing due to the recent spread of implant therapy. Currently, various studies have been conducted on the pathology and clinical diagnosis of peri-implantitis. However, the effective method has not yet been established, and this issue remains a major challenge in achieving long-term implant success. Here, we report that the clinically favorable result for peri-implantitis was obtained by the combination of mechanical cleaning with a titanium wire brush and autogenous bone grafting.

Method: The subject was a patient whose main complaint was discomfort around the implant. The dental implant of molar region had been placed at another hospital more than five years ago, and pus was found to be draining from the pocket, and X-ray photos revealed vertical bone resorption of 4 mm or deeper. The patient was diagnosed with peri-implantitis. Under the local anesthesia, a full-thickness flap was elevated to remove the contaminated soft tissue around the implant, and a titanium wire brush was used to mechanically remove the granulation tissue around the implant body. Simultaneously, autologous bone was harvested using a trephine burr from the buccal side of molar region, and the harvested bone was used to pack the peri-implant bone defect.

Results: The postoperative soft tissue was kept in good shape, and the grafted bone around the implant was also restored. Although about 10 years have passed since the final superstructure was placed on, no abnormal symptom was observed in X-ray examinations at the regular checkup. Also, the patient is fully satisfied with the function and aesthetics.

Conclusion: Consequently, complete healing from peri-implantitis was accomplished without problematic symptoms during about 10 years maintenance period, suggesting that this method is effective to recover peri-implantitis. (This procedure was performed with the patient's consent.)

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P39

Paroxysmal Positional Vertigo as a Complication of Oral and Maxillofacial Surgery Procedures

E.Y. Gal*, J. De Leon, G. Romanos

Introduction: Benign paroxysmal positional vertigo (BPPV) is a common inner ear disorder characterized by episodes of intense dizziness that is often triggered by sudden head movements. Certain dental and maxillofacial surgeries, particularly sinus lifts and dental implants, may induce BPPV due to vibrational trauma from osteotomes, extended hyperflexion of the head, and existing vestibular conditions. The objective of this study was to analyze certain oral and maxillofacial surgical procedures associated with BPPV and evaluate prevention and treatment strategies.

Method: A review of relevant literature was conducted through Google Scholar and the Journal of Oral and Maxillofacial Surgery (2005–2020), in addition to an extensive search on PubMed using the keyword "BPPV." Articles were screened up to the 2,564th listing focusing on cases of post-surgical BPPV.

Results: Eight studies were analyzed, including case reports, retrospective analyses, and literature reviews. The procedures that led to BPPV in these studies include sinus floor elevation, maxillary implant placement, third molar extractions, and orthognathic surgery. Factors that contributed to the development of BPPV include surgical trauma, use of osteotomes, abnormal head positioning, and pre-existing vestibular conditions. Although post-operative BPPV is typically self-limiting, treatment may involve physical rehabilitation (Epley maneuver) or pharmacotherapy (benzodiazepines, antihistamines). Analysis of the studies revealed that considerations for treatment may include referral to ENT for management, careful review of the patient's medical history, proper patient positioning, and cautious use of osteotomes.

Conclusion: Although BPPV is a rare complication, surgeons should be aware of its potential implications to mitigate unnecessary development of BPPV and management of the condition. Further research is needed on the optimal prevention, treatment, and patient management strategies.

P40

Implant Site Development Using Autogenous Cortical Plate Harvested From the External Oblique Ridge: A Case Report

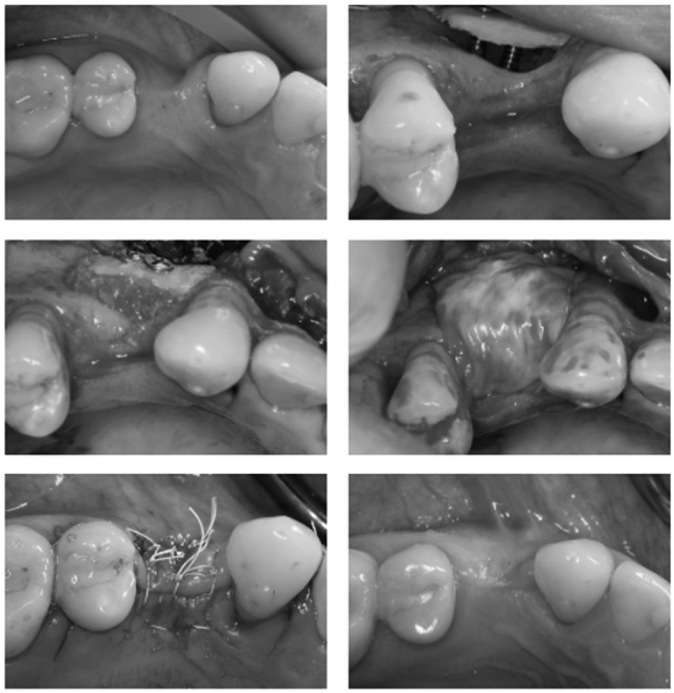
E.B. Barkin*

Introduction: Dimensional changes of the alveolar ridge post-extraction are well described in the literature. In the first year of healing, there is approximately 50% of alveolar ridge resorption in the horizontal dimension. This poses a challenge for the placement of dental implants in a desirable, prosthetically driven position. Several techniques have been proposed for the augmentation of the alveolar ridge including: guided bone regeneration, ridge split technique, and onlay grafts of autogenous or allogenic origin. The full and split block techniques have been proposed by Khoury, as an alternative to increasing ridge dimensions.

Method: A 38-year-old Male presented to the periodontal clinic for the replacement of the missing maxillary right first premolar. Upon cone beam computed tomography (CBCT) evaluation, it was determined that a staged approach to horizontal ridge augmentation would be required whereby an initial site preparation would be completed prior to implant placement. Residual ridge width prior to site preparation was 4.2mm in the area 3mm apical to the crestal bone. An autogenous bone block was harvested from the posterior mandible, fixated to the recipient site, supplemented with freeze-dried bone allograft, and covered by a native collagen membrane.

Results: After five months of healing, an updated CBCT was obtained for implant treatment planning purposes. The width of the grafted ridge increased up to 9.3 mm after the ridge augmentation procedure, meaning an increase of 5.1mm was obtained. The bone quantity at re-entry allowed for implant placement in a prosthetically driven position, with excellent primary stability (35ncm). A custom healing abutment was fabricated and delivered at the time of implant placement.

Conclusion: Early publications showed a major drawback of the onlay block graft being the amount of resorption that could occur, some reviews stating up to 60% of original block volume. The cause of this resorption is due, in part, to the poor rate of revascularization of intact bone blocks. The proposed methodology of "biologic grafting" by Khoury allows for an increased rate of revascularization and a decreased amount of resorption. The bone block technique is a predictable method to increase the dimension of the alveolar ridge prior to implant placement.



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P41

Reducing Complications in Maxillary Sinus Augmentation: A New Re-entry Technique for Effective Bleeding Control

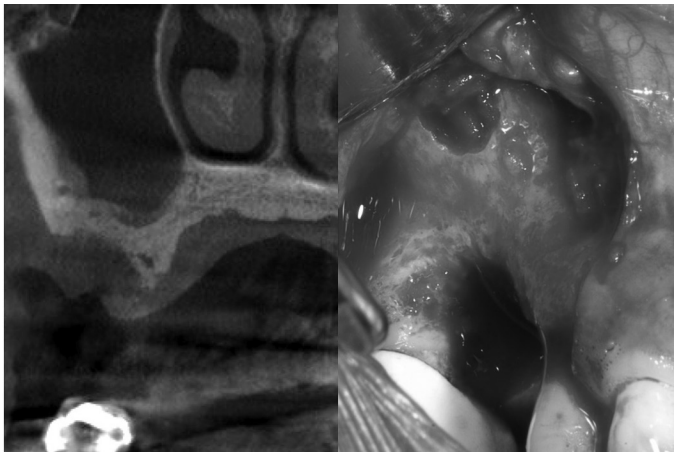
F. Gilli*, S. Bedoya, S. Froum, S. Cho, L. Palomo

Introduction: The lateral window technique for maxillary sinus augmentation is a reliable method for ridge augmentation, facilitating implant placement in the atrophic posterior maxilla. However, bleeding often complicates this procedure, and traditional hemostatic methods may not fully address bleeding from multiple small arteries during membrane elevation and osteotomy extension.

Method: This case report presents an innovative technique for managing persistent bleeding during lateral window sinus augmentation. After initial attempts to control bleeding with standard methods, the surgical site was temporarily closed and re-entered after 3–5 weeks, allowing for reduced bleeding and easier membrane elevation.

Results: The delayed re-entry approach significantly minimized bleeding, enabling smoother progression of the sinus augmentation procedure. This technique allowed for successful lateral window osteotomy and implant site preparation reducing significantly the bleeding at the time of the re-entry.

Conclusion: The novel technique of temporary closure and delayed re-entry offers an effective solution for managing persistent bleeding in maxillary sinus augmentation. This approach enhances surgical control, potentially improving outcomes in cases where traditional hemostatic measures are insufficient.



P42

Effect of Soft Tissue Conditioning on Implant Health – A Retrospective Study

F. SamavatiJame*, M. Saleh, A.T. Sheikh, H.L. Wang

Introduction: Peri-implant tissue health is vital for long-term implant success, with various surgical and non-surgical methods available to prevent complications. Achieving predictable outcomes with minimal issues is a key goal in implantology. This study aims to compare peri-implant tissue health in patients who have undergone autologous grafting procedures—free gingival grafts (FGG) and connective tissue grafts (CTG) at stage II surgery—with those who have not. By evaluating the impact of these grafts, we hope to determine how soft tissue augmentation influences peri-implant health and contributes to better clinical outcomes.

Method: Data was collected from 2 groups, the intervention group that underwent soft tissue grafting and a control group that did not, examining patient demographics, diabetic status, smoking habits, periodontal condition implant-related factors such as site and date of implant placement, implant brand, implant diameter, type of soft tissue graft, and assessments at multiple time points. The analysis included parameters such as bleeding on probing, marginal bone loss, peri-implantitis presence based on the 2017 World Workshop Classification, and implant loss. Statistical analysis included logistical regression with generalized estimation equations (GEE).

Results: A total of 113 patients were included, with a mean age of 61 years, a mean follow-up of 6.7 years ±7.3 years, and an almost equal distribution of genders (51% female, 49% male). Radiographic bone loss (RBL) showed no clinically significant differences between implants with and without tissue graft (0.4 mm vs 0.79 mm, respectively. Additionally, regression analysis suggested no significant differences between the groups' incidence of peri-implantitis or implant loss. For the secondary outcomes, diabetic patients were more prone to higher RBL ($p < 0.4$).

Conclusion: The study indicates that tissue grafting during implant uncovery had minimal effect on RBL (< 0.5 mm), and with no difference in the incidence of peri-implantitis, or implant loss. However, these conclusions should be interpreted cautiously due to the small sample size and the design, and the relatively short follow-up.

P43

Survival Rate of Implants Supporting Complete Fixed Rehabilitations in the Maxillary Arch – A Retrospective Study

F. SamavatiJame*, M.C. Sepúlveda-Figueroa, T. Koutouzis

Introduction: Complete edentulism significantly affects the elderly, with over 10% of those aged 50+ experiencing total tooth loss, predominantly in high-income countries. This condition impacts daily functions like chewing and speech, as well as self-esteem and quality of life. Treating an edentulous maxilla is common yet challenging in terms of rehabilitation.

Method: This retrospective study analyzed adult patients treated with complete fixed implant-supported maxillary prostheses at Nova Southeastern University from 2012 to 2022. Implant survival was based on ICOI's Pisa consensus, with success defined by intact function and structure, and failure by implant removal. Radiographic bone loss (RBL) was measured in 1.0 mm increments, assessing biological complications like peri-implantitis and technical issues, including screw fractures.

Results: Among 78 patients (mean age 72.2 ± 11) receiving 372 implants, most had 4-5 implants, with 50.7% showing no bone loss >3 mm. No implant failures were found in 74.4% of patients, and 39.7% had no biological complications. Most patients (54.7%) received metal-acrylic prostheses, with 92.8% showing no final restoration fractures. Implant survival was 90.9%, and 73.4% met the success criteria. No significant associations were found between implant success and patient characteristics like gender, ASA class, or history of periodontitis.

Conclusion: This study shows promising outcomes for implant-supported maxillary rehabilitations in an academic-clinical setting, with high survival rates and few complications. Continued follow-up and maintenance are essential for long-term success, and further research may uncover additional factors influencing implant outcomes.

P44

Managing a Failed Blade Implant and Implantation With Root Form Implants: A Case Report

F. Aja*, P. Patel, S. Froum, S. Cho, L. Palomo

Introduction: Blade implants were once popular but have fallen out of favor due to issues with osseointegration and complications related to their design, leading to a preference for conventional root-form implants. Rehabilitating sites with failed blade implants requires careful surgical planning, often involving bone augmentation or advanced techniques to ensure stability and success.

Method: This case report describes the surgical removal of a failed blade implant using piezo burs, followed by reimplantation with a conventional implant. The implant was placed lingual/medial to the inferior alveolar nerve, utilizing this positioning to optimize stability and minimize risks.

Results: The removal and reimplantation procedure resulted in successful osseointegration of the conventional implant, with stable outcomes and no complications reported. This approach demonstrated effective management of the failed implant site with improved functionality and patient comfort.

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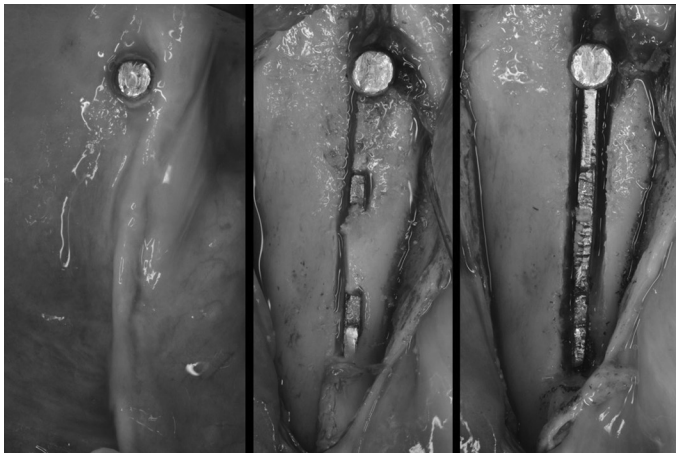
Conclusion: The case highlights that transitioning from failed blade implants to conventional implants can be achieved with precise techniques, such as piezo- assisted removal and strategic implant positioning. This approach offers a viable pathway for managing similar cases, potentially enhancing patient outcomes and implant stability.



P45

Guide for Lateral Sinus Lift With Simultaneous Implant Placement: A Case Series

F.D. Ouriques*, P.C. Meneghetti, M. Kaur, H. Basma, M. Geisinger, O.A. Mohamed

Introduction: Maxillary sinus augmentation is a widely employed procedure to increase bone height in the posterior maxilla, allowing for successful implant placement. Digital workflows have revolutionized the planning process, enabling the accurate design of a lateral window for sinus access. The utilization of a digitally designed surgical guide improves the precision and predictability of the procedure, reduces the risk of sinus membrane perforation, and enhances both the safety and clinical outcomes of sinus augmentation.

Method: The three-case series of sinus floor elevation using the lateral window approach (LSFE) was conducted with a surgical guide for the lateral window osteotomy along simultaneous implant placement. CBCT scans and digital impressions were obtained for all patients. The files were imported into the design program to conduct a virtual wax-up at the edentulous site, plan the implant placement, and determine the best position for the osteotomy window. The planning process ensured the avoidance of critical anatomical structures such as the alveoloantral artery, sinus septa, and any cysts or sinus pathology. The dental-supported surgical guides were positioned intraorally to facilitate the preparation of the sinus window opening. The sinus membrane was elevated using sinus curettes instruments to accomplish full detachment. After that, the implant osteotomy was performed using the implant position guide, and the sinus was augmented with xenograft bone. Implants were then inserted fully-guided, and primary stability was achieved. Finally, cover screw or healing abutment was hand-torqued into position, and the flaps were re-approximated with sutures.

Results: Digital surgical guides precisely locate and prepare the lateral window and expedite sinus cavity access. Additionally, the guide provided a retracting effect on the flap, facilitating improved visualization and access during the procedure. However, a notable drawback was the necessity for a more extensive flap elevation to ensure proper positioning of the guide.

Conclusion: This innovative digital surgical guide for lateral sinus lift allows for precise planning and execution of the osteotomy window, enhancing accuracy and reducing the risk of intraoperative complications, even in complex clinical scenarios. By improving predictability and control, this approach contributes to safer, more efficient outcomes in sinus augmentation procedures.

P46

Long-Term Eruption of Teeth Adjacent to Dental Implants in the Esthetic Zone: A 14- to 20-Year Clinical Study on Adult Population

E. Shlomi*, Z. Ormianer

Introduction: Dental implants do not adapt to alveolar bone changes, potentially leading to infra-occlusion phenomena with the adjacent natural tooth. The factors influencing infra-occlusion in adults remain unclear. The aim of this retrospective study is to evaluate continued tooth eruption and dental implant infra-occlusion in the anterior maxilla in adults.

Method: The study protocol was approved by the ethics committee of the university. Data were collected from patients records who received a single dental implant in the anterior maxilla. Inclusion criteria included healthy adults over 30 who lost teeth due to accidents, caries, or congenital reasons. Exclusion criteria included incomplete records or tooth loss due to periodontal disease. Bone loss was measured with periapical radiographs and vertical differences between implant-supported crowns and adjacent teeth were assessed using digital images.

Results: The study included 30 patients, 15 males and 15 females, who received 32 anterior maxillary implants. The mean age was 47.07 years (SD = 7.99), with a median age of 45. The average implant length was 12.55 mm (SD = 0.7 mm). The average follow-up period was 14 years (range 10-26 years), with no recorded implant failures over the follow-up period. A Chi-square test revealed a significant correlation between Angle occlusion classification and tooth eruption above the occlusal plane (X^2 = 15, P = 0.0005). All Class II occlusion cases demonstrated more than 1 mm of eruption above the occlusal plane. Mean bone loss was 1.76 mm (SD = 1.01mm, median 1.75 mm). A significant correlation was observed between bone loss and tooth eruption above the occlusal plane (P = 0.003), with higher bone loss measured in cases where the eruption exceeded 1 mm. Linear regression analysis revealed a correlation between bone loss and tooth eruption (R^2 = 0.349).

Conclusion: This study demonstrates the significant impact of Class II occlusion and bone loss on tooth eruption above the occlusal plane in adults. It is recommended that patients with these conditions be informed about the increased risk of experiencing these phenomena.

Chi-square analysis

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-square	15.000	1.000	0.000	-	-
Continuity Correction	11.484	1.000	0.001	-	-
Likelihood Ratio	16.563	1.000	0.000	-	-
Fisher's Exact test	-	-	-	0.000	0.000
Linear-by-Linear Association	14.500	1.000	0.000	-	-
N of Valid Cases	30.000	-	-	-	-

Chi-square analysis shows a significant correlation between Angle occlusion classification and tooth eruption levels.

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P47

Autogenous Third Molar Transplantation: A Viable, Conservative and Public Health Alternative: Clinical Case Report

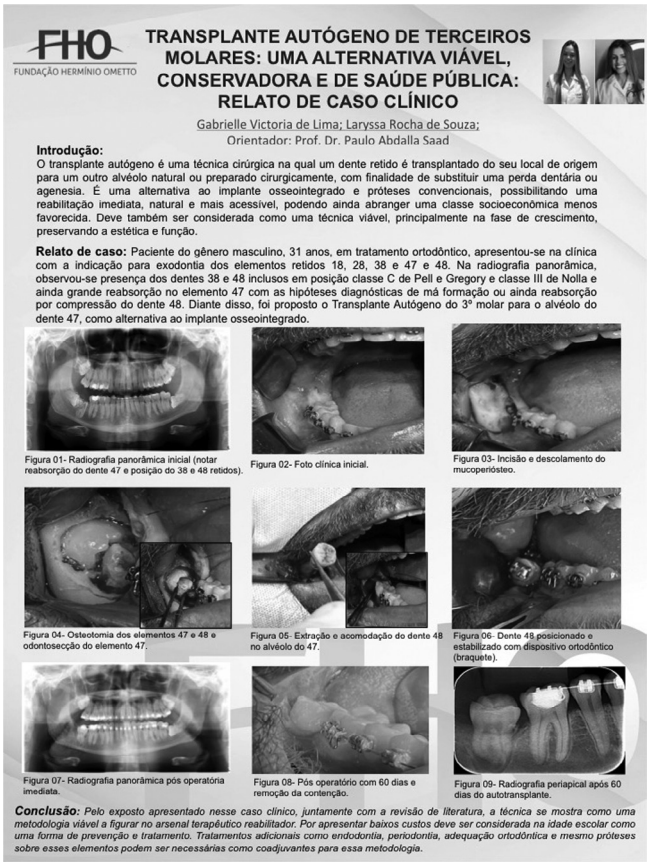
G.R. Saad*, G. Victoria de Lima, L. Rocha de Souza, P.A. Saad

Introduction: Autogenous transplantation is a surgical technique in which a retained tooth is transplanted from its place of origin to another natural or surgically prepared socket, with the aim of replacing tooth loss or agenesis. It is an alternative to osseointegrated implants and conventional prostheses, enabling immediate, natural and more accessible rehabilitation, and can also cover a less favored socioeconomic class. It should also be considered as a viable technique, especially in the growth phase, preserving aesthetics and function.

Method: Incision and detachment of the mucoperiosteum. Osteotomy of elements 47 and 48 and odontosection of element 47. Extraction and accommodation of tooth 48 in the socket of 47 Tooth 48 positioned and stabilized with an orthodontic device (bracket).

Results: Succesfull transplantation on a 60 day follow-up.

Conclusion: Based on the above presented in this clinical case, together with the literature review, the technique appears to be a viable methodology to be included in the rehabilitative therapeutic arsenal. As it presents low costs, it should be considered at school age as a form of prevention and treatment. Additional treatments such as endodontics, periodontics, orthodontic adaptation and even prosthetics on these elements may be necessary as adjuncts to this methodology



P48

Immediate Provisionalization in Total Arches: Benefite and Methodology: Clinical Case Report

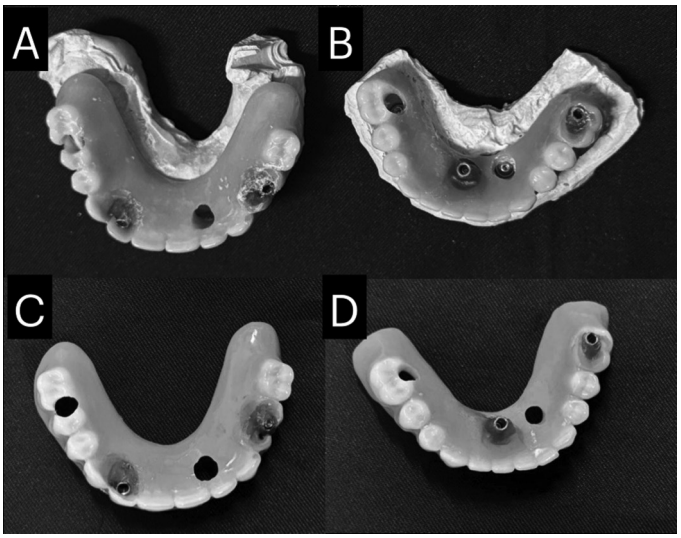
G.R. Saad*, P.A. Saad

Introduction: We present, through a clinical case report, the benefits of using an implant-supported temporary prosthesis with immediate loading in the All-on-four technique. The suggestion of a hybrid methodology, with stabilization carried out intra-operatively associated with a brief laboratory stage, provides greater comfort for the patient and even greater fidelity in the preparation of the prosthetic part. This methodology was used for this case of double protocol carried out in the Specialization Course in Implantology at APCD-FAOA/ARARAQUARA, in which we were able to observe its benefits, such as reducing total treatment time, reducing postoperative discomfort and satisfaction of the patient with immediate results. The practical experience gained through this treatment not only suggests the effectiveness of the approach, but also highlights its potential to enhance clinical practices in contemporary implant dentistry.

Method: We obtained 2 plaster models through initial study impressions, on which surgical simulation and complete dentures were made. We subsequently obtained 2 new plaster models with the implants and components in position. The capture was carried out intraoperatively and in the laboratory.

Results: The present clinical case demonstrates the effectiveness and benefits of the immediate loading approach using a fixed provisional prosthesis obtained in a hybrid manner in an "All-on-4" protocol. This technique, which combines complete denture conversion with intraoral partial capture and extraoral completion, offers significant advantages for both the patient and the professional [11,12,13].

Conclusion: After reporting this clinical case, we can conclude that the immediate hybrid provisionalization methodology with immediate loading is really efficient.



P49

Connective Tissue Graft for Esthetic Implant Restoration: A Three-case Report in Anterior Mandible

G. Wang*, F. Gilli, G. Grasso, Y.C. Yu, S. Froum, S. Cho, L. Palomo

Introduction: Achieving an ideal gingival contour is crucial in dental implants, especially in the esthetic zone. Autogenous connective tissue grafting (CTG) is the gold standard for soft tissue enhancement around implants, yet outcomes can vary. This report identifies key surgical factors that contribute to successful CTG, including scar-free flapless surgery, immediate implant placement, precise site preparation, and donor tissue stabilization, aiming to optimize aesthetics and address common challenges in implant dentistry.

Method: These cases involved implant placement with CTG in the esthetic zone, using techniques focused on minimally invasive surgery to reduce scarring. Immediate implant placement. Careful undermining of the recipient site and donor tissue stabilization. Each technique was documented for its effectiveness in this poster presentation.

Results: The approach resulted in stable, aesthetically pleasing soft tissue around the documented implants at one year follow up.

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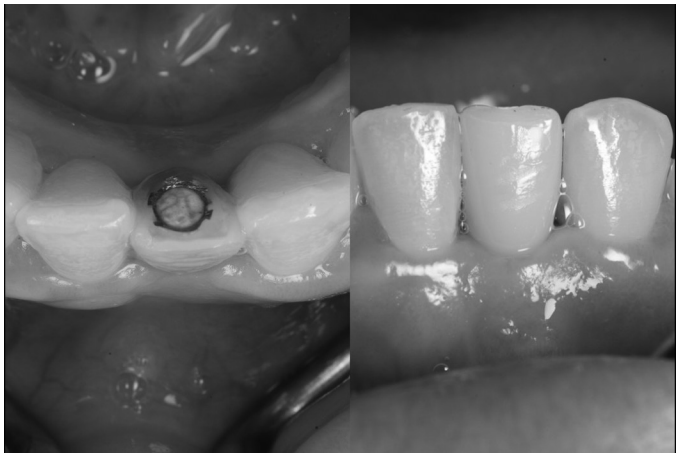
Conclusion: This report emphasizes the importance of specific techniques–flapless surgery, immediate placement, site preparation, and tissue stabilization–in achieving predictable soft tissue aesthetics around implants. These methods can improve CTG outcomes in the esthetic zone, with further research needed to confirm reproducibility in broader practice.



P50

Subperiosteal Implants Replaced With Endosseous Implants Utilizing A Novel Two-stage Guided Approach: An Interdisciplinary Case Report

G.D. Pylant*, A. Sones, M. Ellis, R. Venter

Introduction: This case report demonstrates an interdisciplinary approach to transitioning a severely atrophic edentulous patient with failing subperiosteal implants to endosseous screw form dental implants utilizing a novel two stage fully guided approach.

Method: A 72-year-old healthy Caucasian female presented in 2019 with failing maxillary and mandibular subperiosteal implants complained of pain, inability to clean, and paresthesia of the left mandibular lip. The patient reported becoming edentulous in the 1960s at age 15 and was restored with complete dentures. In the 1980s maxillary / mandibular subperiosteal implants were placed with bilateral sinus augmentations with hydroxyapatite graft. In 2019 surgical removal of the subperiosteal implants and infected graft material was performed with immediate complete dentures delivered. The patient was maintained from 2019 – 2022 with interim dentures and soft relines. In 2022 the patient opted for screw form endosseous implants for rehabilitation and refused other forms of dental implants.

Results: A novel two-stage guided approach was developed to allow for accurate placement of small screw-form endosseous implants using an implant supported and retained surgical guide. Stage 1 surgery involved placement of two maxillary and one mandibular implant with soft tissue supported surgical guides. These implants were to be used as implants for the screw retained surgical guide and final prosthesis. A CBCT was acquired with custom imaging dentures connected to the implants, removed, and closure screws placed. Master casts were made from the imaging dentures and digitized. Implant planning software was used to plan the placement of six maxillary implants and four mandibular implants and generate combination bone and implant supported surgical guides. Stage 2 surgery was performed within 48 hours of stage 1. Implant uncovery and multiunit abutments were placed seven months after implant placement. After healing the patient was restored with a primary bar with locators and implant overdentures.

Conclusion: This multi-specialty 5-year case study demonstrates the interdisciplinary process of transitioning a long-term edentulous patient from failing periosteal implants to screw form endosseous implants using a novel technique for accurate guided implant placement in severely atrophic jaws.

P51

Impact of Anodized Surfaces on Soft Tissue Response and Osseointegration: 1000 Patient Study

G. Carmichael, M. Roig Cayón, G. Fabbri, T. Staas, V. Mannisto, T. Crosby, H. Antoun, D. de Santis, W. Prinz, M. de Araujo Nobre, A. Ferro, F. Brunner, R. Sleiter, S. Scherg, T. Eshraghi, J. Kowar, E. Crooke, R. Noharet, L. Kold, S. Kold, R. Haas, M. Guazzato, M. Ghibaudo, P. Avontroodt, G. Raghoebar, J. Mesquida, R. Stillmann, G. Liddelow

Introduction: Implant surface characterized by gradual anoddization from a moderately rough apex to a minimally rough collar was designed to reduce bacterial adhesion and limit peri-implantitis without compromising osseointegration. This interim analysis of a prospective real-world study including patients without strict exclusion criteria provides an assessment of early clinical outcomes.

Method: Enrollment comprised consecutive patients under 71 years of age with varying co-morbidities such as nicotine use, periodontitis, diabetes, osteoporosis, parafunctional tendencies, history of mucositis and peri-implantitis on pre-existing implants, cancer (non-oral), and bisphosphonates treatment. All indications were treated in every-day practice with 4 implant designs: variable-thread tapered; parallel conical connection (CC); slightly tapered CC; or trioval tapered low-speed drill system. Patients will be followed for 5 years from final prosthetic delivery (FPD). This interim analysis is based on data extraction from August 21, 2024.

Results: Of the 1027 enrolled patients, 999 received 1548 implants, of which 1136 were restored, and 442 subjects (617 implants) completed the 1-year follow-up. Majority of implants (58.7%) were positioned subcrestally, 37.7% equicrestally, with the remainder placed supracrestally. The distribution of crestal position differed for single implants, of which 71.8% were placed subcrestally compared to 48.3% for multi-unit restorations (the corresponding soft-tissue outcomes will be reported in the poster). About a third of implants (n=504) were placed in fresh post-extractive sites, whereas 297 (19.2%) were immediately provisionalized. Twenty-eight implants failed, at the average time of 7.5 ± 5.47 months after implant insertion, yielding a survival rate of 98.2% with the mean follow-up of 10.8 (0-34.5) months. Nearly all implant sites displayed absence or low level of plaque (Fig 1A) and healthy soft tissue response (Fig 1B) at FPD and 1 year.

Conclusion: Within the limitations of short-term follow-up, gradually anodized surface exhibited broad applicability across all indications. Successful early osseointegration was evidenced by high implant survival while soft tissue response was characterized by low plaque accumulation and minimal inflammation. These outcomes suggest that the multi-zoned surface topography promotes excellent response at both hard and soft tissue levels.

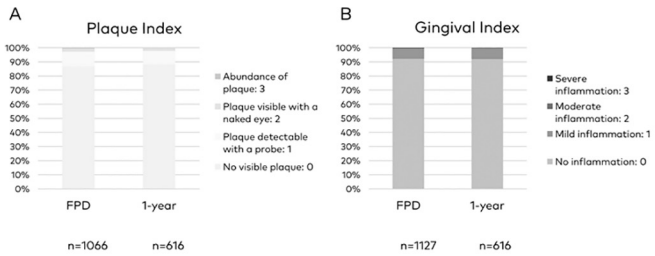


Figure 1. The relative contribution of plaque and gingival indices scores at implant level. Note that plaque was absent or only detected upon running a probe across the margin in 97.6% at final prosthesis delivery (FPD) and 97.9% at 1-year follow-up. Gingival scores reflecting absence or only mild inflammation were recorded at 99.6% and 99.5% of implant sites at FPD and 1-year visit, respectively. There was a moderate correlation between plaque and gingival indices.

Plaque and Gingival Indices

P52

Influence of Scanbodies Material and the Presence of Errors in Their Scanning on the Accuracy of Digital Models

G. Faria Moura*, R. Silva Moreira, G. Mendonca, F.A. Rizzante, C.J. Soares, F.D. das Neves

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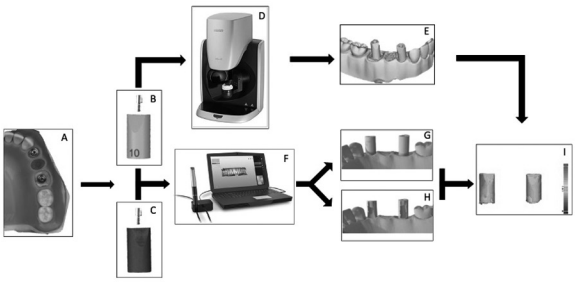
Introduction: Certain clinical situations may present difficulties in capturing the entire scanbody surface. Additionally, different materials may offer distinct optical features for image capture by intraoral scanners. However, the influence of several factors remains unclear. The purpose of this in vitro study was to evaluate the influence of scanbody material and the presence of scanning errors on digital file accuracy.

Method: Two different scanbody materials (PEEK and Titanium) were used to generate models with and without scan errors on the lingual surface of the devices. Each group was scanned 12 times using the Virtuo Vivo intraoral scanner. The files were than analyzed for trueness and precision analyses. For trueness evaluation, the files were compared to a reference file obtained by scanning the tipodont with the InEos X5 lab scanner. These analyzes were conducted using Geomagic Control software to perform 3D comparison of the files. Precision data were subjected to the Kruskal-Wallis test, and a multiple comparison was performed using the Dwas-Steel-Critchlow-Fligner test. Trueness data were analyzed to the ANOVA test followed by the Tukey test.

Results: Regarding precision, a significant difference was observed, with the PEEK group with error presenting the lowest degree of discrepancy to the other groups (P= 0.003). For trueness evaluation, there was a significant difference in the presence of errors (groups with errors presented less discrepancy). As for the material variable, no significant difference was detected. The groups Titanium with error (5.40) and PEEK with error (4.81) showed a significant difference when compared to the other groups (P< 0.001).

Conclusion: The accuracy of scanned files was significantly influenced by the presence of errors during the acquisition of scanbody images, files without errors had lower accuracy. There was no significant influence on the accuracy parameters when using PEEK or titanium.



P53

Can the Strength of 3D-Printed or Milled Implant-supported Cantilevered Prostheses in New-generation Resins be Comparable to Zirconia Depending on Their Height?

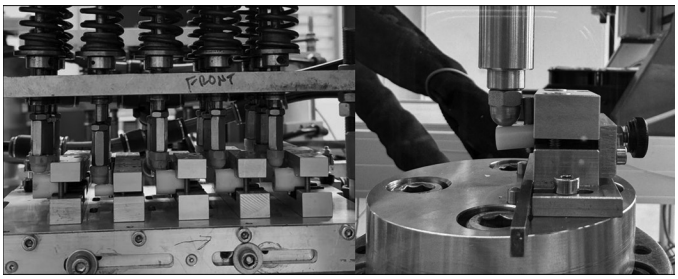
G. Cakmak*, M.B. Donmez, P. Maldonado, Ç. Kahveci, M. Schimmel, B. Yilmaz

Introduction: Monolithic implant-supported cantilevered complete-arch fixed prostheses (MISCAFPs) in new-generation resins intended for definitive use offer elasticity and reduced cost. However, how these new resins perform when interocclusal space, and accordingly, their height varies is not well-known. This study aimed to evaluate how framework height and cyclic loading affect the fracture strength of MISCAFPs 3D-printed (3DP) from resins for definitive use and milled (M) in high-impact polymer composite and zirconia, which was the control group.

Method: Master standard tessellation language files (7, 11, 15×11×20-mm) including a titanium base (Ti-base) space that represented MISCAFPs were designed to fabricate specimens in 3DP resins for definitive use (a hybrid resin (3DP-FP) and a glass filler-reinforced resin composite (3DP-CT)), milled high-impact polymer composite (M-CR), and a strength gradient zirconia (M-ZR) (n=12). After fabrication, Ti-base abutments were cemented by using a dual polymerized resin cement and the specimens were divided into two groups: cyclic loading and control. The cyclic loading group was subjected to 1.2 million cycles of 50 N loading at 1.5 Hz. The load was applied to the distal extension of the specimens to simulate a cantilevered prosthesis. After cyclic loading, static load was applied in vertical direction at a crosshead speed of 1mm/min until failure occurred. Maximum load-to-failure values were recorded in Newtons.

Results: The interaction between material type and aging condition, material type, and framework height affected the fracture strength values ($P \leq .020$). One 3DP-CT and two 3DP-FP 7 mm-height specimens failed during cyclic loading. 3DP-CT led to the lowest and M-ZR led to the highest fracture strength, regardless of the aging condition and height ($P < .001$). The difference between 3DP-FP and M-CR specimens was nonsignificant ($P \geq .072$). The fracture strength values increased with framework height for all materials ($P \leq .001$).

Conclusion: Considering previously reported clinical occlusal force values and measured raw data in the present study, 3DP-FP and M-CR may be alternatives to M-ZR when the interocclusal space is 11 mm or higher, while 3DP-CT may be suitable for patients without parafunctional habits when the interocclusal space is 15 mm or higher.



P54

Evaluation of Implants Placed With Crestal Versus Lateral Sinus Floor Augmentation Techniques and Allogenic Bone Grafting

H.A. Mattar*, T.A. Nasr, M.A. ElSholkamy

Introduction: Maxillary sinus elevation is frequently necessary for implant placement in cases where the maxillary sinus has pneumatized. The preferred method of sinus elevation and or augmentation is questionable, particularly in regions where the remaining bone height varies between 4 and 7 mm. So, the aim of our Randomized prospective control clinical trial was to use two distinct sinus floor elevation and augmentation procedures and to clinically and radiographically evaluate implants simultaneously inserted with them.

Method: Thirty implants were iplaced with sinus membrane elevation using crestal or lateral sinus augmentation by allograft material in fourteen patients with maxillary sinus pneumatization and residual bone heights of 4–7 mm. Patients were randomized to either the control group (lateral window sinus technique) or the test group (crestal sinus technique). Resonance Frequency Analysis (RFA) was used to evaluate implant stability throughout a 12-month follow-up, which also tracked plaque, bleeding indices, and probing depths. Low-dose Cone Beam Computed Tomography (CBCT) with a fusion module was used to assess changes in the buccal, crestal, and vertical bone around the implants both at the 12-month mark and following surgery. Furthermore, radiographic bone density was assessed using a specialized software.

Results: After12 months follow up and after restoration of the dental implants, there were no discernible variations in radiographic characteristics between the groups. The ISQ scores and implant success/failure rates did not differ statistically significantly ($p>0.05$). Clinically, the bleeding index (BI) ratings of the crestal group were lower than those of the control group ($p=0.027$).

Conclusion: When used in conjunction with implant insertion and allogenic bone grafting, the crestal sinus lifting approach yields clinical and radiographic results t similar to those of the lateral window technique, especially when bone heights fall between 4 and 7 mm. yet, over time, the closed method demonstrated less buccal bone loss and a lower bleeding index score. Hence, our study findings suggest the use of closed sinus elevation in cases of residual bone heights of 4 mm to 7 mm since it has been shown to be an effective procedure and is concidered less invasive than the lateral antrostomy open technique.

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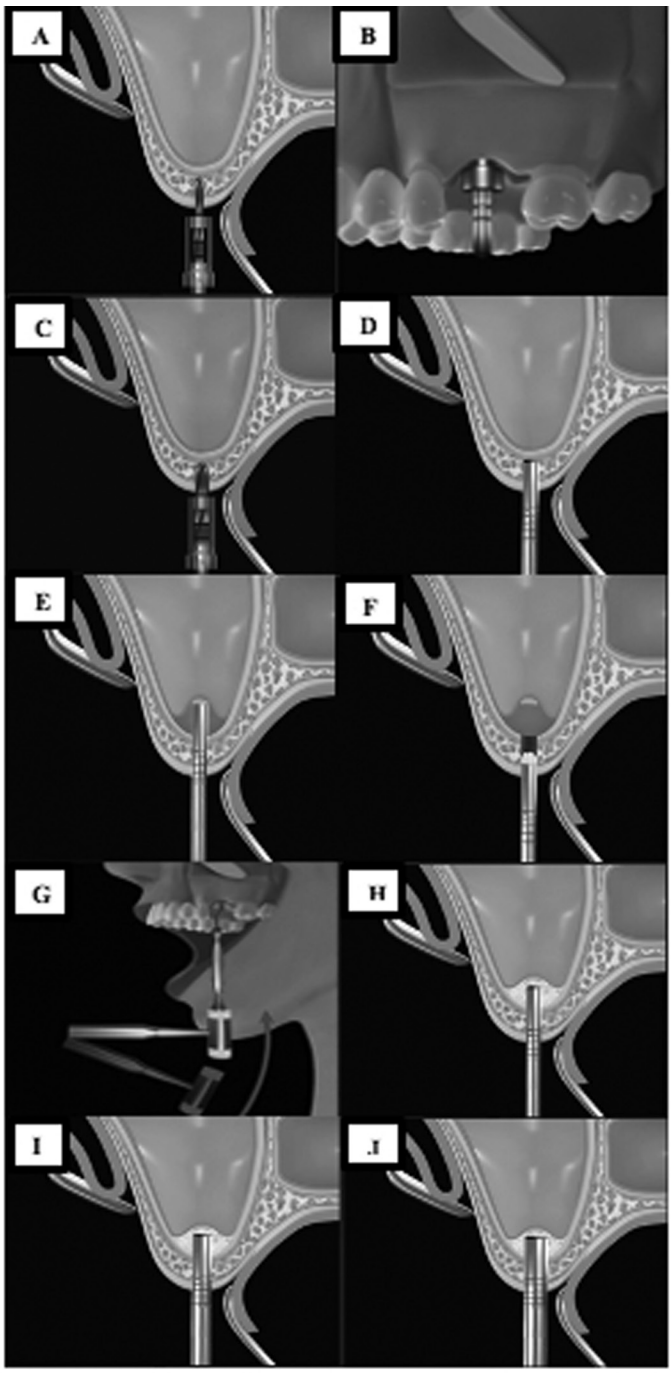


P55

Comparative Microbial Profiling in Natural Teeth, Gold Crown, Zirconia Crown and Implants: An NGS-Based Study

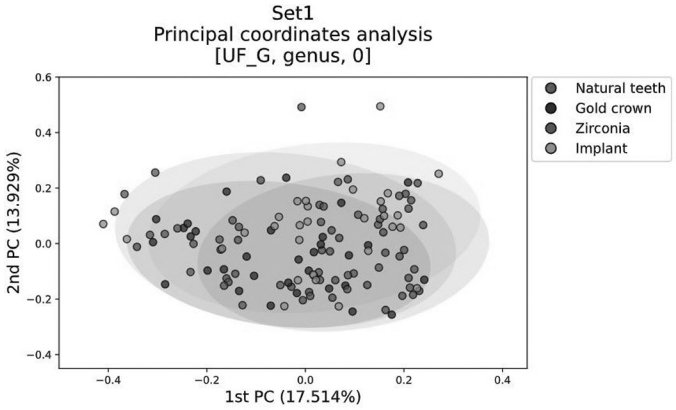
H.S. Choi*, Eun-Kyoung Pang, Eun-Jin Park

Introduction: This study aimed to investigate the differences in microbial profiles across dental prostheses, natural teeth, and dental implants. Microbial communities in the oral cavity are essential for maintaining oral health; however, imbalances or dysbiosis can lead to conditions such as periodontitis. The surface characteristics of different restorative materials may influence microbial composition, making it crucial to understand how each material affects microbial communities.

Method: We included 32 subjects, each with four types of restorations: natural teeth, gold crowns, zirconia crowns, and implants. A total of 128 samples were collected from the supracrestal tissue around these restorations and processed using Next-Generation Sequencing (NGS) targeting the V3–V4 regions of the 16S rRNA gene. Sequencing data were analyzed through bioinformatics and uploaded to EzBioCloud for secondary analysis. Comparative analysis was conducted to evaluate microbial diversity and composition across the different restorative surfaces, using Shannon and Simpson indices for alpha diversity and Principal Coordinates Analysis (PCoA) for beta diversity.

Results: Our results showed significant differences in microbial composition between the prosthetic materials. At the phylum level, the most abundant taxa were Firmicutes, Proteobacteria, Actinobacteria, and Bacteroidetes, each showing distinct distribution patterns across natural teeth, gold crowns, zirconia, and implants. Alpha diversity analysis revealed higher microbial diversity in gold crowns and zirconia, while natural teeth maintained more balanced microbial communities. Beta diversity analysis further showed clear clustering differences between natural teeth and the other restorations, with the Generalized UniFrac method indicating significant microbial variations between groups.

Conclusion: This study demonstrates that microbial profiles vary significantly based on the type of dental restoration. The material-specific differences in microbial diversity and composition provide valuable insights into the impact of dental materials on oral health. These findings could inform future restorative choices, particularly for aging populations, where prosthetic use is prevalent.



This PCoA plot, using the Generalized UniFrac method, shows how microbial communities differ by restorative material.

P56

Senescence-associated Gene Expression in Human Gingival Tissue Affected by Periodontitis

S.J. Kim*, C. Batra, Y. Hamada, Y. Ueki, V. John, M. Kittka

Introduction: Accumulation of senescent cells are increasingly recognized as a fundamental mechanism of aging and are regarded as an attractive therapeutic target for various age-associated pathological conditions. Although the prevalence and severity of periodontitis are highly associated with age, and preclinical studies have demonstrated that senescent cells could be a potential therapeutic target of age-associated alveolar bone loss, clinical data that indicates the association between cellular senescence and periodontitis is limited. This study evaluated the accumulation of the senescent cells in periodontal tissues and its association with the disease state by comparing level of senescence markers in healthy and diseased human gingival tissue.

Method: The protocol was reviewed and approved by the Institutional Review Board (#17678). Gingival tissues were collected from patients with or without a diagnosis of periodontitis, followed by RNA isolation from tissue samples and cDNA synthesis. Then, qPCR assays were performed to analyze gene expression of senescence-associated genes, including cell cycle inhibitors, anti-apoptotic genes,

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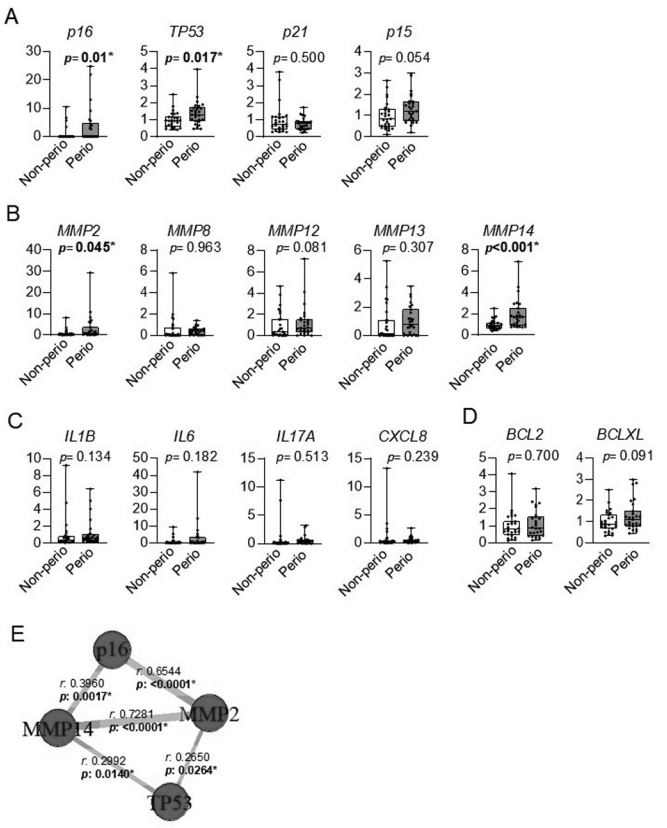
and senescence-associated secretory phenotype (SASP) genes. The associations of the gene expression levels with periodontal diagnosis, presence or absence of attachment loss, presence or absence of bleeding, and age were analyzed.

Results: Total of 54 gingival tissue samples were included in the study. Among the genes analyzed, *p16*, *TP53*, *MMP2*, and *MMP14* showed significantly higher expression in the group diagnosed with periodontitis than control group (p = 0.010, 0.017, 0.045, and <0.001). Additionally, these genes were associated with the clinical signs of periodontitis, such as bleeding on probing and presence of attachment loss. There were no statistically significant positive correlations between the gene expression levels and age.

Conclusion: Gene expression analysis indicates an association between periodontitis and senescent cell accumulation in periodontal tissue. Upregulation of *p16*, *TP53*, *MMP2* and *MMP14* would be a characteristic of periodontitis-associated senescence. Further research is needed to help understand the causal relationship of senescence and periodontitis, as well as the impact of cellular senescence on the pathogenesis of periodontitis. This can possibly aid in novel therapeutic for periodontitis targeting cellular senescence.

Figure 1. Senescence-associated gene expression in gingival tissue



P57

Evaluating the Impact of Rotary Instrument Lubricants on Dental Implant Osseointegration: An Experimental Rabbit Tibia Study

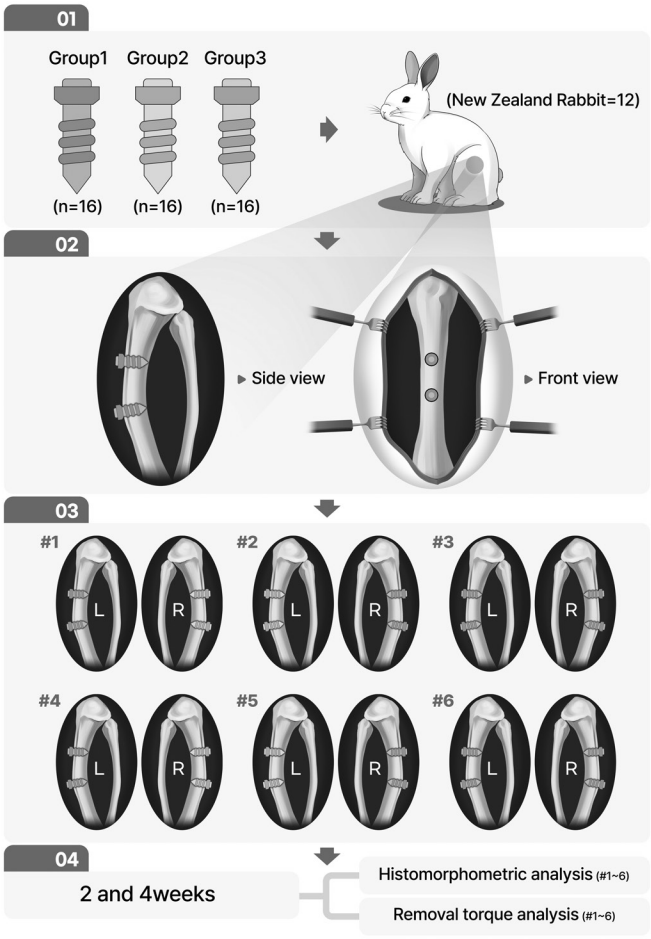
H.Y. Kim*, D.M. Yoon, S.J. Kim, J.W. Kim

Introduction: The osseointegration in dental implants is greatly affected by various surface properties, such as chemistry, texture, and overall cleanliness. This study aimed to investigate the impact of mineral oil lubricants used in rotary instruments on osseointegration within rabbit tibiae, with a specific focus on potential contamination from dental handpices.

Method: Twelve New Zealand rabbits were included in this study, each receiving two implants in each tibia, resulting in a total of 48 implants across the study. Groups were organized based on the time until euthanasia and the degree of implant contamination. Three contamination levels were defined: the first group received implants without any lubricant in the handpiece (control group); the second group received implants with handpices managed as recommended; the third group had implants placed using fixtures pre-soaked in lubricant. These groups were further subdivided based on euthanization periods of two and four weeks. We measured and analyzed both the removal torque and the bone-implant contact.

Results: We observed a non-significant inverse correlation between the severity of fixture contamination and removal torque. However, there was a significant reduction in bone-implant contact associated with higher contamination levels, particularly after four weeks.

Conclusion: Even brief exposure to lubricants from handpieces can jeopardize the osseointegration of implants in bone. Therefore, it is imperative to implement thorough procedures for lubricant removal post-application and to employ precise cleaning and suction during implant drilling and placement to minimize residual oil on the implant surface.



P58

Potential Aetiological Factor of Peri-implant Gingivitis and Improvement of Epithelial Adhesion

H. Harada*, S. Ikezaki, K. Otsu, Y. Shindo, Y. Kido, K. Kakura, H. Kido

Introduction: The area around the tooth is closed by the junctional epithelium derived from the dental epithelium. In the case of implants,

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the gingival epithelium is responsible for adhesion and closure due to the loss of the junctional epithelium. We hypothesized that the difference in adhesion of the gingival epithelium and the junctional epithelium to apatite and titanium is the basic reason for the etiology of peri-implant gingivitis.

Method: We established a mouse junctional epithelial cell line, mHAT-JE01, and a gingival epithelial cell line, mOE-T2, and compared their adhesion to apatite and titanium. In addition, we examined whether the enamel protein secreted by mHAT-JE01 enhances the adhesion and proliferation of mOE-T2 cells to apatite and titanium.

Results: mHAT-JE01 and mOE-T2 showed similar adhesion and proliferation on normal culture dishes. However, on apatite coatings and titanium, mHAT-JE01 showed high adhesion and proliferation, while mOE-T2showed little adhesion. mOE-T2 showed high adhesion and cell proliferation capacity when coated with basement membrane proteins expressed by mHAT-JE01.

Conclusion: Gingival epithelial cells do not adhere to apatite or titanium, which makes the epithelial attachment of implants fragile. This was thought to be a factor in the development of peri-implant gingivitis. The basement membrane component secreted by the junctional epithelium could improve the adhesion of the gingival epithelium and could be applied to the prevention and treatment of peri-implant gingivitis.

P59

Metal Ceramic Implant Supported Completed Fixed Prostheses With Metal Occlusal Surfaces Manufactured With CAD-CAM

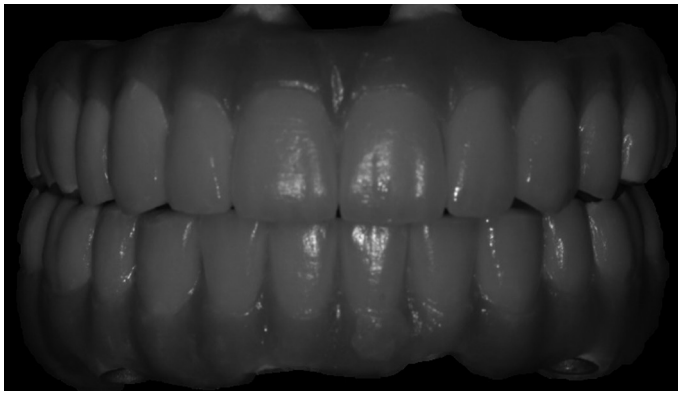
H.G. Maciel Legorreta*

Introduction: A number of fixed prostheses each with distinct advantages and disadvantages are available for implants of different materials and designs. The most frequent of these complications have been fracture and wear of material.

Method: We planned two full-arch implant-supported fixed prostheses for the treatment of an 80-year-old patient with periodontitis and cavities. We fabricated the structure using CAD-CAM technology with a milling technique. Protheses with milled metal occlusal surfaces are more efficient than others given advantajes of CAD-CAM milling technology, a technique preferable to casting. Selective Laser Melting has also shown significant advantages and merits comparative study.

Results: After placing the polished prostheses in the patients mouth, we observed that the milled metal occlusal surfaces were imperceptible when she smiled, besides to reducing the risk of delamination and better pasive fit.

Conclusion: CAD-CAM technology achieves milled metal occlusal surfaces without mechanical complications and with a better passive fit at a competitive cost.



Metal-ceramic implant- supported complet fixed prostheses with metal occlusal surfaces manufactured with CAD-CAM

P60

Novel All-in-one Multifunctional Surgical Template Design for Edentulous Guided Implant Surgery

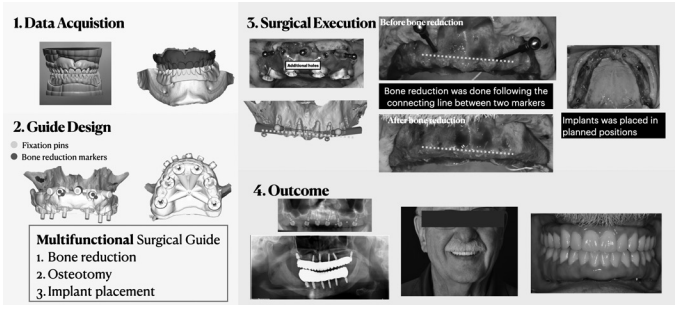
H.C. Lee*, B. Freeman, H. AlQallaf

Introduction: Malpositioned implants result in adverse outcomes. Guided surgery was introduced to increase the accuracy of implant surgery. However, guided surgery for edentulous arch remains challenging due to the lack of teeth to support the template and the frequent need for bone reduction. Sequential guide and stackable guide designs were proposed. However, both designs require complex planning and can increase surgical time. Therefore, this abstract presents a novel multifunction guide design, simplifying the planning process and reducing surgical time by using one surgical template for bone reduction and guided implant placement.

Method: The dual-scan protocol was used. Following superimposition, implants were placed in the ideal position for adequate restorative space and a favorable distribution. The prospective horizontal ridge plane was created virtually. A multifunctional surgical template was designed to aid as a guide in bone reduction and implant placement. Three lateral holes are made to fixate the guide on the bone, and two additional holes were designed on the surgical template at previously created horizontal plane to mark the reference points for bone reduction. The sleeves for implant placements were added to the same template. Multifunctional surgical template was seated on the edentulous ridge. 3 pin holes were drilled through the sleeves, and fixation pins were inserted. Two additional holes were then drilled through the template to mark the bone reduction plane. The template was removed. Three pin holes and two bone reduction marker holes were visible after flap reflection. The bone reduction was performed, following the plane defined by the two marker holes. The surgical template was replaced, supported by fixation pins, and osteotomy and implant placements were performed following the fully guided implant placement protocol.

Results: Implants were placed in the planned position and bone reduction was done using the multifunctional template, which provided adequate restorative space and ideal prosthesis design. Full-arch implant-supported prosthesis was restored without complications.

Conclusion: Multifunctional surgical template can be used for bone reduction, osteotomy, and implant placement in edentulous guided implant surgery. This approach eliminates the need for multiple guides and offers favorable surgical outcomes with a simplified planning process and surgical steps.



P61

Repair of Maxillary Sinus Lateral Wall Defect After Caldwell-Luc Operation: Two Cases Report With Literature Review

H.S. Kim*, H. Lee, M.J. Kang, J.Y. Kim, J.K. Huh

Introduction: These cases are about the advanced chronic sinusitis with Caldwell-lup operation history decades ago. In these cases, during surgery, after the inflammation removed, the defect is often covered only by mucosal tissue without the restoration of the bony wall. To address such bone defects, we present two cases of sinus wall reconstruction performed simultaneously with inflammation curettage, accompanied by a review of the literature.

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Method: A 74-year-old female patient with a history of Caldwell-Luc surgery 30 years prior presented with persistent inflammation in the region of #16 and the right maxillary sinus. A CT scan revealed maxillary sinusitis with absorption of the anterior and lateral walls of the sinus. During surgery, after debridement of the inflamed tissue, the sinus wall was reconstructed using a three-layer technique: titanium mesh + bone (xenograft, allograft) + resorbable membrane onlay. Additionally, a sinus lift and implant placement were performed at site #16. An 81-year-old female patient, also with a history of Caldwell-Luc surgery 30 years earlier, presented with a fistula between the sinus and oral cavity at sites #15 and #16, accompanied by yellow pus discharge. Although fungal infections were identified, surgery was initially postponed due to the patient's age, and antifungal and antibiotic treatments were administered. Six months later, surgery was performed. After debridement and curettage, the sinus wall was reconstructed using a three-layer technique: titanium mesh + (allograft, alloplastic bone graft) + resorbable membrane onlay. The infected implants at sites #15 and #16 were also removed.

Results: In both cases, the preoperative sinus volume was small, and the sinusitis resolved after surgery. Follow-up X-rays at 18 months for the first patient and 14 months for the second patient showed partial resorption in the anterior wall of the grafted bone. However, the lateral walls demonstrated relatively good bone healing.

Conclusion: The question of whether to regenerate defects with epithelial or bony tissue remains a challenge for clinicians. From these cases, we have experienced partial bony regeneration with a layer-by-layer sinus wall reconstruction technique and would like to share our surgical experience with other clinicians.

P62

Enlarge Marrow Space of the Mandible: Report of a Rare Case

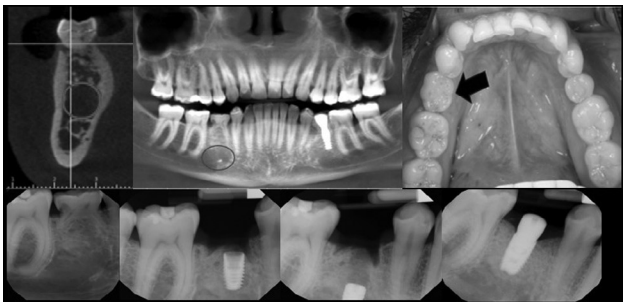
I.R. Chikelu*, D. Gogarnoiu

Introduction: Previous literature has shown frequent occurrences of incidental findings with CBCT. The case report reveals a relevant incidental finding of an enlarged marrow space in the right mandible during implant planning and placement.

Method: Case Presentation: 28-year-old male patient with no significant past medical history was referred for extraction of mobile lower right deciduous molar "L" and possible immediate implant. Past dental history revealed previous dental visits for extraction of lower left deciduous molar 'S' and implant placement. Intraoral oral examination revealed oral hygiene with clinically normal hard and soft intraoral tissues. An incidental finding of an enlarged marrow space in the right mandible during implant planning and implant placement was revealed on the CBCT.

Results: An incidental finding of an enlarged marrow space in the right mandible during implant planning and implant placement was revealed on the CBCT. Periapical radiograph showed the enlarged marrow space engulfed the implant during implant placement procedure which required immediate removal of the implant and ridge preservation with bone graft. Final Implant placement was performed after 4 months.

Conclusion: The review emphasizes the importance of a thorough review of the entire tomographic image volume of CBCT. Using advanced technology for treatment planning creates new responsibilities and places more liability on providers not to overlook findings that may be significant to the patient's health.



P63

The Use of Shell Technique Provisional Crown Fabrication for Soft Tissue Recontouring

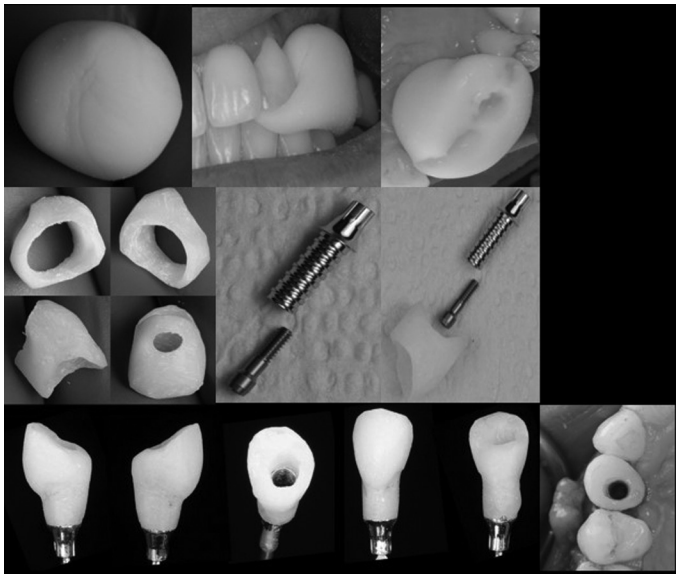
I.R. Chikelu*, D. Gogarnoiu

Introduction: An important factor for the esthetics and health of peri-implant tissue is the idea of emergence profile of an implant restoration. This case shows soft tissue recontouring by the fabrication of a provisional implant restoration using the shell technique to produce an ideal emergence profile for implant restoration.

Method: A custom pliable mold created with a self-cure resin material is molded around the teeth in the doughy stage to capture the impression of the site. A crown shell was fabricated with a round access on the facial surface and tried on the implant fixture. A provisional crown was then fabricated with the implant fixture in place. Resin material was added through the access to fill the space between the provisional crown base and gingiva.

Results: This technique allows the gingiva reformation with harmony between the peri-implant gingiva and adjacent dentition.

Conclusion: The shell technique provisional implant restoration can be utilized for gingival recontouring to obtain an ideal emergence profile to provide good esthetic and functional results.



P64

Application of Dynamic Navigation System in Implant Placement in the Esthetic Zone and Palatally Impacted Supernumerary Tooth Removal in a Close Proximity Simultaneously: A Case Report

I.O. Chan*, C. Tu

Introduction: Implant placement in the esthetic zone has been a challenging task for surgeons. Experiences and knowledge are highly required for the optimal implant position/angulation. Removal of impacted supernumerary teeth is also a huge challenge. Dynamic navigation system has become a reliable method for its high level of surgical accuracy during the execution of implant procedures. The present case report aimed to evaluate whether dynamic navigation system is a reliable method for optimal implant position/angulation and minimized surgical complications in the esthetic zone.

Method: A 42 y/o male came to OPD in VGHTC for tooth 12 implant consultation. CBCT revealed a 19 palatally impacted supernumerary tooth was in a close proximity near 12 missing site. Dynamic navigation system was planned and used for the location of the 19 impacted tooth removal and 12 implant placement combined with GBR simultaneously. -Surgical procedure X-guide was used for the location of 19 impacted tooth and osteotomy was performed using high speed. A 3.5 x 11.5mm

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implant was placed in the 12 osteotomy site and primary stability was achieved. FDBA was filled in the 19 post-ext site and a collagen membrane was used to cover the bone graft. Flap was tension released, primary closure was done and sutured with 5-0 Nylon. Implant Stage II surgery was performed 4 months later. A 12 temporary crown was delivered 1 month post-op. -Data analysis The pre-op implant position design data and post implantation image from CBCT were manually super-imposed and compared. After superimposition, the platform, apex point, depth, angular deviations were measured at two locations.

Results: CBCT was used for the examination and evaluation of the position/angulation of implant placement at platform and apical levels. The angular deviation if 1.42 degree. Platform depth deviation is -0.26mm, apical depth deviation is -0.26mm. No additional surgical or biological complications were noted. The patient was satisfied with the surgery and the current provisional crown.

Conclusion: The application of dynamic navigation system is an accurate, reliable and reproducible clinical protocol for optimal implant position/angulation even with complicated clinical circumstances such as impacted tooth in a close proximity which needs to be removed simultaneously.

Pre & post operative superimposed CBCT image implant position and angulation comparison

Angular Deviation (deg)	Platform depth deviation (mm)	Apical depth deviation (mm)
1.42	-0.26	-0.26

P65

Evaluation of Fully Sintered Yttrium-Niobium-Tetragonal Zirconia Polycrystal ((Y, Nb)-TZP) for Prosthodontic Restorations and Dental Implants

I.S. Yeo*, J.W. Kim, M.K. Thu, K. Jeong

Introduction: Fully sintered zirconia ceramics are necessary to realize single-visit restoration. However, achieving adequate machinability in fully sintered zirconia remains a challenge. The addition of yttria (Y_2O_3) and niobia (Nb_2O_5) to tetragonal zirconia polycrystal (TZP) improves both machinability and fracture toughness, despite reducing the strength and hardness of TZP. Enhanced fracture toughness helps decrease the fracture rates of zirconia crowns during function and zirconia implants during installation. This study aimed to evaluate the clinical survival rates of single zirconia crowns and the in vivo histomorphometry of zirconia implants made of (Y, Nb)-TZP.

Method: Fifteen participants received a total of 15 monolithic single restorations made from fully sintered (Y, Nb)-TZP blocks. The restorations were clinically evaluated for survival rate 2.5 years after crown delivery. (Y, Nb)-TZP dental implants, measuring 3.4 mm in diameter and 7 mm in length, were inserted into rabbit tibiae and compared to sandblasted, large-grit, acid-etched (SLA) titanium implants made from grade 4 commercially pure titanium. Four weeks after implant surgery, the experimental animals were sacrificed, and undecalcified specimens were prepared for light microscopy. The primary outcome measure was bone-to-implant contact (BIC). Wilcoxon's signed-rank test was used to compare means at a significance level of 0.05.

Results: The survival rate of the (Y, Nb)-TZP single crowns was 100% after 2.5 years of clinical service. The median values (interquartile range) of bone-to-implant contact (BIC) were 44.4% (10.8%) for the (Y, Nb)-TZP implants and 67.7% (6.9%) for the SLA titanium implants. However, no significant difference was found in BIC between the two implant types ($P = 0.25$).

Conclusion: The fully sintered (Y, Nb)-TZP single-unit restorations demonstrated successful clinical performance over 2.5 years. Dental implants made of (Y, Nb)-TZP showed biocompatibility in bone response, based on the results of this in vivo experiment. However, considering the median BIC values and interquartile ranges of these zirconia and SLA titanium implants, topographical modification of the zirconia surface may be necessary.

P66

Clinical Guidelines for Minimizing Complications in Subcrestal Implant Placement

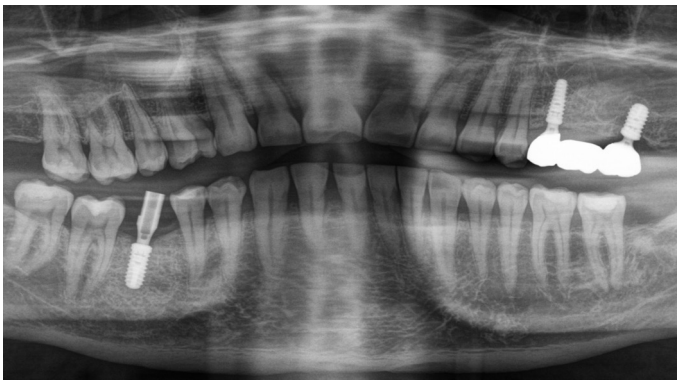
F. Kistler*, I.K. Frank, S. Kistler, J. Neugebauer

Introduction: A new concept in implant design incorporates a back-tapered neck with a microstructured surface to promote bone growth at the implant shoulder. This design necessitates subcrestal implant placement. While statistical analyses indicate favorable outcomes for marginal bone level development, challenges remain during the second-stage and prosthetic treatment phase.

Method: Since 2018, back-tapered neck implants with a uniform prosthetic platform and diameters ranging from 3.5 mm to 6 mm have been utilized. Implants were predominantly placed subcrestally, with some positioned epicrestally. The maximum subcrestal placement depth across all dimensions was 3 mm, with single-wall depths reaching up to 5 mm in select cases to avoid the need for additional grafting.

Results: Implants placed epicrestally showed no increase in vertical bone dimensions at the level of the implant shoulder. In contrast, subcrestally placed implants demonstrated new bone formation on the shoulder at the time of the second-stage surgery, depending on the placement depth and implant diameter. The most common challenge during second-stage surgery was the need for bone removal, even over the cover screw. Larger incisions provided better visualization for bone removal and improved wound healing compared to point-like incisions, which risked harming the soft tissue. A frequent complication was the difficulty in seating the iscan body due to direct contact between the secondary component and surrounding bone. Furthermore, depending on the design of the individual abutment, insufficient space for soft tissue nutrition sometimes resulted in tissue necrosis or abscess formation. When the distance between the abutment contour and the bone was less than 3 mm, bone resorption was observed.

Conclusion: Post-surgical radiographs should be reviewed prior to second-stage surgery to determine the most suitable incision type. For deeply seated implants, an actual radiograph is recommended. Strict radiological monitoring is crucial during impression-taking to ensure precise transfer of the vertical implant position. Radiological data should also be provided to the lab technician at the time of impression to guide the design and ensure adequate space for soft tissue. Following these principles minimizes lab-related misfits, pain, and infections. Over the long term, these practices contribute to stable marginal bone levels and, in most cases, even bone growth.



P67

Alveolar Reconstruction for Implant Placement in a Patient With a History of Bisphosphonate Treatment

I.A. Rosas García*, P. Marisol

Introduction: Bisphosphonates inhibit bone resorption and bone metabolism, which are important processes for the integration of implants. The waiting time for implant placement in patients with history of bisphosphonates use depends on several factors, such as the duration, type of medication and dose, as well as the general health of the patient. Although implant treatment is possible in patients with

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history of antiresorptive medication, there are laboratory test such as C- terminal telopeptide which can help the clinician in the decision making of the implant therapy it is not possible to determine whether the area where a regeneration procedure is intended to be performed has adequate bone metabolism.

Method: Anterior alveolar reconstruction in a patient with a history of Zolendronic acid application by means of a curved cortical plate of porcine bone in conjunction with particulate allograft and xenograft and by means of a new tomography the bone volume was re-evaluated for the subsequent placement of implants. In the tomography, bone volume is measured taking as a reference the implant placement area, measuring from the vestibular cortex to the palatal cortex and bone density by Hounsfield units in the area.

Results: In 4 weeks of evolution, the patient present adequate healing, with the presence of some areas with wound dehiscence that required a new wound closure, but at the moment no infectious processes or graft exposure have been observed.

Conclusion: The management of patients that use antiresorptive drugs is complicated. Currently are available materials that help us to perform bone regeneration with a high success rate, but in patient who present bone metabolism alterations, the result is still uncertain.

P68

Clinical Benefits of Custom Healing Abutments in Immediate Implant Placement for Peri-implant Soft-tissue Management: A Case Series

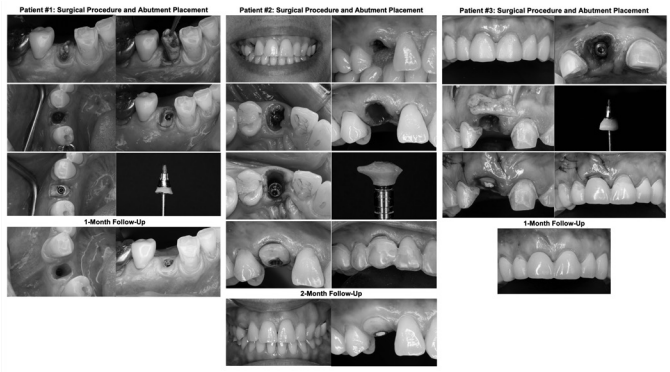
J.C. Jaar*, A. Rivera, Y. Desai, T. Koutouzis

Introduction: Immediate loading of implants provides a fixed temporary tooth replacement throughout osseointegration. While they allow for improved patient esthetics and the maintenance of soft tissue dimensions, some factors such as primary stability, occlusion, and implant design may prevent the clinician from immediately loading an implant. Considering such unfavorable conditions, this case series will demonstrate how custom healing abutments can be similarly effective in peri-implant soft tissue management when it is not possible to immediately load.

Method: Three otherwise healthy patients requiring hopeless tooth extraction and immediate implant placement were selected to take part of this case series at the postgraduate periodontology clinic at Nova Southeastern University. Patient #1: 81M presented with a coronal fracture of endodontically treated #28. The tooth was extracted and an implant was placed at 35 Ncm. The buccal gap was grafted with xenograft bone particulate. A custom healing abutment was fabricated with acrylic resin, due to the high occlusal forces associated with a posterior tooth. Patient #2: 57M presented with a root fracture on endodontically treated #6 The tooth was extracted and an implant was placed at >40 Ncm. The buccal gap was grafted with allograft and xenograft bone particulate. A custom healing abutment was fabricated with flowable composite due to the high occlusal forces associated with a canine and the patient's deep bite. An essix retainer was provided for esthetics. Patient #3: 45F presented with a defective restoration on endodontically treated #8 The tooth was extracted and an implant was placed at 15 Ncm. The buccal gap was grafted with allograft bone particulate and a CTG was tunneled on the buccal. A custom healing abutment was fabricated with flowable composite due to poor stability and the presence of temporary bridge pontic over the site.

Results: At follow-up, the peri-implant soft tissue dimensions, both bucco- lingually and mesio-distally, were similar in appearance to the original tooth's, when comparing the pre-operative and post-operative pictures.

Conclusion: In cases where immediate loading is not possible due to certain factors such as occlusion and implant primary stability being unfavorable, the use of custom healing abutments appears to be beneficial in maintaining peri-implant soft tissue dimensions.



P69

Vertical Ridge Augmentation Using Ceramic 3D-printed Customized Bone Block-associated rhBMP-2: a Report After Four Years Implant-supported Restoration Loading

J.A. Shibli*, M. Nagasawa, O. Baptista, S. Saska, s. Tunchel, A. Blay

Introduction: Vertical bone augmentation in the posterior mandible is a challenge due to its unique anatomy. Previous studies have shown several surgical techniques that could be used. Recently, many 3D printed techniques have been developed to produce customized bone grafts, aiming to reduce morbidities and increase the previsibility of the surgical procedure. This patient report shows the use of a customized 3D-printed bone graft to increase the bone height in the posterior mandible after 4 years of follow-up of the implant-supported restoration.

Method: A 56-year-old female patient with Kennedy class I was referred to the treatment of the vertical atrophy of the posterior mandible. The DICOM and STL files were acquired and sent to produce the patient-specific block, manufactured by additive manufacturing in a 3D ceramic printer. The patient-specific graft was produced using Lithography-based Ceramic Manufacturing technology. Next, local anesthesia was applied, followed by a linear incision over the alveolar crest to expose all receptor areas on both sides of the mandible. Grooves were performed in the receptor site to stimulate vascularization, and the 3D-printed block was fixed by fixing screws. Then, the rhBMP-2 was injected into the blocks. The flaps were sutured with Teflon sutures.

Results: After a 10-month healing period, 6 dental implants were placed in the grafted area, with 4 implants placed totally in the regenerated area with 3D-printed blocks. Bone biopsies were taken to provide a ground section and MIcroCT images of the regenerated area. The ground section depicted a bone ingrowth into the customized 3D printed blocks, showing linear areas with osteoblasts next to the graft material as well as a mature and well-formed newly formed bone showing a complete regeneration of the area. The implants were restored after a 3-month healing period with an interim resin restoration, and at 5 months, the implants were restored with metal-ceramic restorations. At 58 months after surgery (48 months after implant loading), the peri-implant bone margin showed a 0.2mm remodelation around the implants and a 3D customized bone resorption lower than 4%.

Conclusion: The use of a 3D customized bone block associated with rhBMP-2 resulted in stable bone formation over 58 months (48 months post-implant loading).

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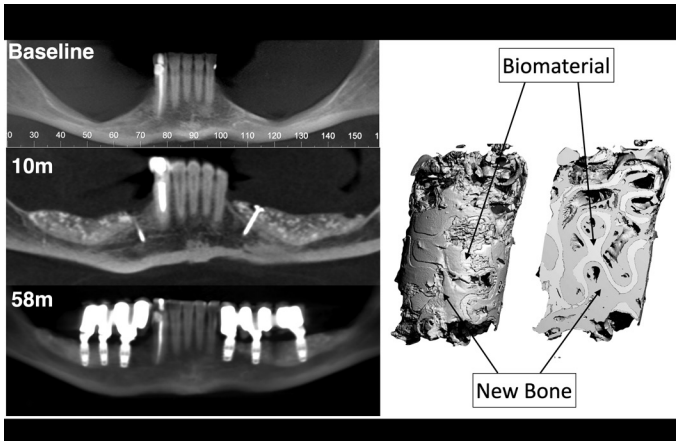

P70

Enhancing Bone Healing in Rabbit Premaxillary Defects With 3D-Printed Grafts Stimulating Proteoglycan Activity

J.A. Shibli*, E. Dallazen, G. Dias, G. Ferreira, A.R. Naqvi, L. Faverani

Introduction: Critical bone defects pose a challenge in oral and maxillofacial surgery. Advancing additive manufacturing is crucial for personalized grafts and fixation materials, customizing treatments to individual needs, and enhancing bone healing. This study investigated the effectiveness of additive manufacturing (AM) for fixation plates and bone grafts in a rabbit model.

Method: Male rabbits underwent premaxillary osteotomies, then were divided into four groups: conventional plates and screws (PLATES), 3D-printed plates (3D-PRINTED PLATES), custom AM-fabricated bone grafts (GRAFTS), and a combination of both (PLATES+GRAFTS). Pain behavior assessment, mass spectrometry, western blotting, and micro computed tomography (MicroCT) were performed.

Results: Pain scores decreased over time with no inter-group differences ($P>0.05$). Mass spectrometry identified 120 proteins and 63 of them were higher expressed in test groups($P<0.05$). Bone-related proteins were higher in test groups, validated by western blotting ($P<0.05$). Proteoglycans such as decorin and biglycan showed significant expression variations, indicating their role in bone repair and extracellular matrix restructuring. Micro-CT analysis revealed higher bone volume (BV/TV) and improved trabecular bone (Tb) parameters (number and thickness) in groups with AM-produced materials (3D-PRINTED PLATES and PLATES+GRAFTS) compared to the control group ($P<0.05$).

Conclusion: Overall, this study demonstrates the potential of additive manufacturing techniques in enhancing bone healing outcomes and elucidates the functions of proteoglycans in bone repair. These findings provide valuable insights for developing innovative strategies in regenerative medicine for bone defects.

P71

Management of Early Implant Loss With Guided Bone Regeneration and Simultaneous Implant Placement: A Case Report

J. Poon*, J. Korostoff, J. Fiorellini

Introduction: Lack of osseointegration and early implant loss, loss within 3 weeks in this case, may be due to surgical trauma, resulting in pressure necrosis or overheating[1], occlusal load, infection, or other risk factors. Identifying these factors and a solution allows for treatment adjustments. A systematic review by Dr. Thoma[2] supports lateral bone augmentation with simultaneous implant placement; clinical scenarios reviewed showed fenestration defects, implant placement, and resolution of the defects through GBR, noting greater defect resolution with the resorbable membranes. Stabilizing options include the Lasso technique with internal sutures proposed by Dr. Neiva[3] or titanium tacks as mentioned by Dr. Benic[4]. GBR with simultaneous implant placement may be considered for failed sites with consideration for primary wound closure, angiogenesis, space maintenance, and stability[5] to restore the patient's function.

Method: A 53-year-old patient presented with a chief complaint of wanting to restore site #13. The initial implant, placed three months prior, was lost within three weeks post-surgery, resulting in a bony architectural defect. CBCT revealed poor alveolar remodeling and GBR would be required. This case explores the use of GBR with simultaneous implant placement as a method to restore the alveolar ridge for a previously affected, lack of osseointegration, implant site. Alongside the bone particulate, long-lasting resorbable membrane, and stabilizing tacks, a 3.6mm x 11mm implant was placed and allowed to heal for 6 months.

Results: 6 month follow-up showed clinical and radiographic findings consistent with implant integration. No exposure of the membrane or infection occurred. Stable occlusal tacks were removed at stage II. Final impressions were later taken, followed by the delivery of the permanent screw-retained implant crown. Patient-centered care was optimized and the treatment time was significantly reduced in comparison to alternative approaches of guided bone regeneration followed by staged implant placement.

Conclusion: The results presented from this case may offer a reliable solution for patients with prior implant failures. Simultaneous implant placement with guided bone regeneration in failed implant sites may be a treatment modality for consideration in reducing the amount of surgical intervention to augment hard tissue for implant support.

P72

A Case Report of Immediate Implant Placement in Two Class IV Root Configurations in the Maxillary Anterior Region

J. Bobera*, A. Green, C. Garaicoa-Pazmino, S. Ganesan

Introduction: Immediate implant placement in the maxillary anterior region remains a topic of debate, particularly in cases where contraindications are present. Root configuration is a critical determinant for successful immediate placement, with classifications ranging from Class I to Class IV. Class IV root configurations, characterized by pronounced apical divergence, are generally considered unfavorable due to challenges in achieving primary stability. This case report discusses the successful placement of two immediate implants in Class IV root configurations of maxillary central incisors.

Method: A 28 yr old female patient presented with non-restorable maxillary left and right central incisors. Cone-beam computed tomography (CBCT) revealed rarefying osteitis in the apical areas and Class IV root configurations for both teeth. Minimally invasive extraction techniques were employed to preserve the surrounding alveolar bone. Immediate implant placement was performed freehand, followed by grafting the extraction sockets with bone allograft. Custom healing abutments were fabricated to contour and shape the interproximal soft tissues.

Results: At the two-week postoperative visit, the patient reported minimal pain and discomfort. Clinical examination revealed healthy peri-implant tissues with no signs of inflammation or interproximal tissue

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recession. Ongoing follow-up is planned to monitor osseointegration and evaluate volumetric bone stability around the implants using CBCT.

Conclusion: Although Class IV root configurations are typically contraindicated for immediate implant placement due to the difficulty in achieving primary stability, this case demonstrates that with meticulous planning and technique, immediate implant placement can be successfully executed. Primary stability was achieved, and the use of custom healing abutments supported soft tissue management. Long-term follow-up will be essential to confirm implant success and stability.

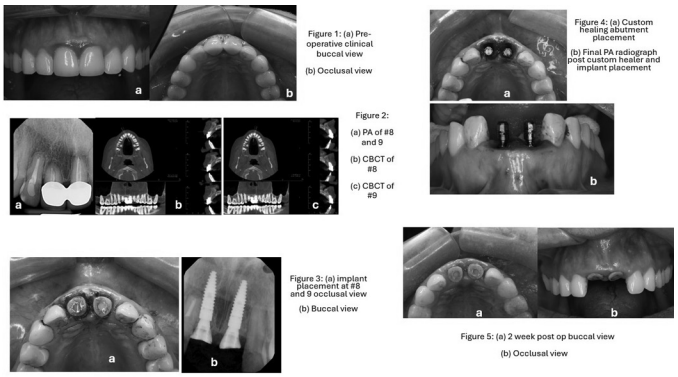


Figure 1: (a) Pre-operative clinical buccal view (b) Occlusal view

Figure 2: (a) PA of #8 and 9 (b) CBCT of #8 (c) CBCT of #9

Figure 3: (a) implant placement at #8 and 9 occlusal view (b) Buccal view

Figure 4: (a) Custom healing abutment placement (b) Final PA radiograph post custom healer and implant placement

Figure 5: (a) 2 week post op buccal view (b) Occlusal view

P73

From Fixed Implant-Supported Prosthesis to a Removable One With Parallel Bars

J. Castro*

Introduction: In oral implantology, edentulous patients have several rehabilitation options according to their oral and facial characteristics. The clinician can indicate a fixed or removable prosthesis, or a convertible infrastructure prosthesis whose design allows for a fixed or removale prosthetis, partially or totally, using the same structure without the need for numerous modifications by screwing or unscrewing either axial abutments or trans occlusal screws.

Method: This report describes a prosthetic treatment for a 76-year-old partially edentulous in the upper jaw female patient (Implantology clinic, UNAM) based on the fabrication of an implant-supported fixed prosthesis with the possibility of becoming a removable prosthesis. The treatment plan consisted of placing 5 monolithic zirconia crowns, a 3-unit zirconia bridge, incisal resins for VD augmentation, and adopting the protocol to design a FP3 metal-porcelain prosthesis and a RP4 metal-acrylic prosthesis according to the Misch (2015) classification. The infrastructures were created for the FP3 and RP4, which consisted of 2 upper bilateral bars with a 6mm high Cr-Co alloy and an angulation of 6° to obtain mechanical retention since through this structure it was possible to screw the FP3 and ensure the possibility of converting it to RP4 by means of axial attachments without unscrewing the infrastructure. The preservation of teeth 17 and 27 with monolithic crowns allowed for an adequate distribution of the masticatory loads of the prosthesis towards the implants to ensure the durability and biomechanical success of the implants.

Results: The possibility to convert the FP3 to a RP4 prosthesis during maintenance checks when the patient cannot perform adequate hygiene with the FP3 or their motor ability to clean decreases, a change to RP4 is indicated; this feature reduces the treatment cost. Besides, the parallelization of the implants was also achieved, obtaining a more predictable passivity, optimizing aesthetics, avoiding access to the screw through the vestibular, recoverability and effective repair.

Conclusion: The treatment achieved function, aesthetics and balance of masticatory forces, meeting the patient's expectations and, despite having a degree of complexity and a high budget, it will continue to be a recommended alternative to replace lost teeth.

P74

Nature-inspired "Waterwheel" Strategy Engineered Bio-Heterojunction for Peri-implantitis Treatment via ROS Self-circulating Platform

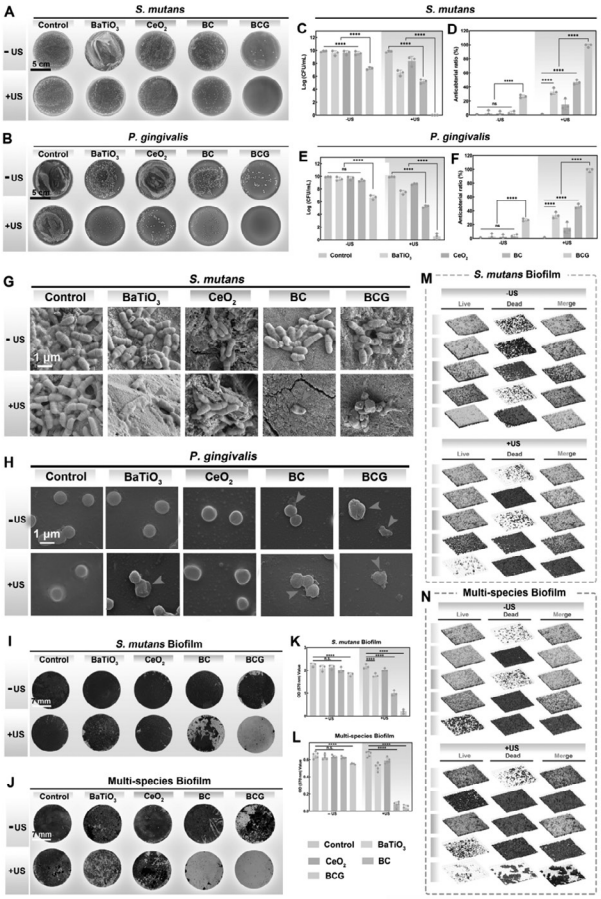
J.H. Li*

Introduction: Peri-implantitis, characterized by inflammatory destruction of implant-supporting tissues, poses a significant challenge in dental implantology due to its high prevalence and complex pathological environment. While peroxide-based treatments show promise in managing peri-implantitis, the intricate anatomical structures around dental implants often impede the timely removal of residual reactive oxygen species (ROS), leading to potential damage to periimplant tissues.

Method: To address this challenge, we designed a novel "Waterwheel" strategy-based Bio-heterojunction (BCG) incorporating $BaTiO_3$@CeO_2 (BC-BioHJs) functionalized with glucose oxidase (GOx), enabling dynamic ROS-microfluidics regulation for peri-implantitis treatment. The "Waterwheel" mechanism facilitates controlled ROS generation and elimination through a self-circulating microfluidic platform, where ultrasound stimulation triggers ROS production while inherent SOD-like and CAT-like activities ensure rapid residual ROS clearance post-treatment. Molecular simulations reveal the mechanism of BCG's self-circulating ROS generation and elimination.

Results: *In vitro* experiments demonstrate BCG's effectiveness in eliminating peri-implantitis-associated pathogens and regulating inflammation, while *in vivo* studies confirm its therapeutic efficacy in treating experimental peri-implantitis with significantly reduced post-treatment complications.

Conclusion: Collectively, this "Waterwheel" strategy achieves controlled ROS generation and elimination, thereby ensuring treatment efficacy while safeguarding periimplant tissue integrity, showing promise for clinical management of peri- implantitis.



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P75

Maxillary Sinus Augmentation Via Palatal Wall Approach in a Previously Poorly Grafted Case

J. Kim*, D. Lao Rodriguez, S. Froum, S. Cho, L. Palomo

Introduction: Maxillary sinus augmentation is an effective technique to increase bone height in the posterior maxilla for implant placement where bone volume is insufficient. The lateral window approach is widely used, requiring careful sinus membrane elevation to allow sufficient graft material placement and bone regeneration. When inadequate elevation occurs, reentering through the thickened buccal wall can be challenging, and an alternative approach, such as the palatal window technique, may be necessary.

Method: This report describes two cases where the palatal window technique was used for sinus augmentation due to insufficient bone height and thickened buccal wall from a previous graft. This approach provided improved access to the sinus cavity and allowed for optimal graft placement without disturbing the buccal regenerated bone.

Results: In both cases, the palatal window technique facilitated successful sinus grafting and implant placement in prosthetically desirable positions. The procedure maintained the integrity of the initial graft while providing adequate bone regeneration for implant stability.

Conclusion: The palatal window technique offers a viable alternative for sinus re-entry in cases where a thickened buccal wall complicates access. This approach enables effective grafting and implant placement, supporting long-term stability in challenging maxillary cases.

P76

Management of Full-arch Prostheses With Immediate Loading in Patients With Terminal Dentition

J. García*, M.H. Tizcareño, V. Garcia Lee

Introduction: Digital workflow optimizes the planning and fabrication of prostheses in cases of terminal dentition. Primary stability is essential for the success of the treatment and is achieved through the appropriate selection of implants and surgical techniques. Additionally, the question arises regarding the use of torque versus the Implant Stability Quotient (ISQ) to evaluate implant stability; while the torque wrench provides immediate measurements, the ISQ allows for quantitative and less invasive monitoring. This study aims to describe the clinical and technical decisions that should be considered for the implementation of immediate loading in patients with terminal dentition.

Method: We present the case of a 63-year-old female patient, with controlled hypertension, who was wearing removable partial dentures and diagnosed with generalized stage IV periodontitis, grade B. The clinical evaluation of the type of smile and the remaining tissues allowed for the development of a virtual design for the choice of prosthesis. Tomography complemented this evaluation, facilitating more precise planning. Decisions included the complete extraction of the remaining teeth and the placement of six conical titanium implants in the upper jaw, as well as the placement of a screw-retained transitional prosthesis with immediate loading.

Results: Due to the severe loss of attachment of the remaining teeth, their extraction was determined. The choice of prosthesis type, without a gingival component, as well as the design and distribution of the implants, was based on the midline smile and the support of the upper lip. The use of digital workflow facilitated the planning and optimization of the design, allowing for greater precision in the placement of the implants. Immediate loading was possible due to the primary stability achieved, evaluated through the implant stability index (ISQ) and the insertion torque at the time of placement, which enabled the loading of the transitional prosthesis.

Conclusion: The management of full arch prostheses with immediate loading benefits from the use of digital workflow for precise planning and the appropriate selection of implants to enhance primary stability. Evaluation through torque and ISQ facilitates quantitative clinical decisions, resulting in satisfactory outcomes in terms of functionality and patient comfort.

P77

The Use of Membrane Pins for the Management and Fixation of Free Gingival Grafts and Apically Repositioned Flaps During Stage Two Surgery

J. Li*

Introduction: The presence of adequate keratinized mucosa around dental implants is essential for the long term success of dental restorations. This study introduces a novel technique using membrane pins for the fixation of apically repositioning flap and free gingival grafts(FGG) during the stage two surgery. Four patients with insufficient KM width underwent soft tissue augmentation. Membrane pins provided a reliable fixation in challenging surgical sites.

Method: Four patients with inadequate KM underwent surgery using titanium pins for the fixation of free gingival grafts and apically repositioned flaps. After local anaesthesis, a split-thickness flap was prepared. Followed by the placement of membrane pins to fix FGG to the periosteum. Postoperative care included monitoring for shrinkage. Revascularization, and integration. Titanium pins were removed after 10 days

Results: postoperative follow-up showed successful integration of the grafts in all cases, with minimal shrinkage and satisfactory keratinized mucosa. The use of titanium pins allowed for a stable and predictable outcome. Especially in areas with extensive muscle pull and fragile tissue.

Conclusion: The use of titanium membrane pins in soft tissue surgery for FGG and APF during keratinized tissue widening procedure. Providing mechanical stability and reducing patient morbidity. This technique presents a viable alternative to traditional suturing methods. Especially in challenging anatomical condition.

P78

Horizontal Ridge Augmentation Using Collagen Membrane and Bendable Tenting Screws in the Posterior Area

J. Li*

Introduction: The healing process of the alveolar ridge after tooth loss is followed by dimensional changes in both soft and hard tissue that may jeopardize a prosthetically ideal implant positioning. The use of tenting screws has been proposed as an adjunct device for GBR in many publications. However, the angle and positioning of the tent pins require good clinical experience. Otherwise, they may cause mucosal perforation and insufficient bone augmentation width at the alveolar ridge's crest. This study utilizes innovative bendable tenting screws, which can reduce the side effects of tenting screws on the mucosa at the spine, thereby reducing the likelihood of mucosal perforation.

Method: Seven patients with severe horizontal bone defects in the posterior region were included in this study. This group comprised individuals who underwent both staged and simultaneous implant placement. The study involved monitoring the perforation of the gingival mucosa during the healing process and assessing the widening of the

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alveolar bone through cone beam computed tomography (CBCT) and a second re-entry measurement.

Results: A Student t-test was conducted to compare bone gains and the perforation rate of the mucous membrane, with significance set at $P < 0.05$. Initially, 7 subjects and 13 surgical sites demonstrated a mean bone width of 2.95 ± 0.75 mm. Six months after the augmentation, the mean bone width increased to 7.15 ± 1.87 mm, indicating a significant bone gain of 4.2 ± 1.26 mm. Throughout the healing period, no perforations of the gingival mucosa were observed.

Conclusion: This study highlights the effectiveness of bendable tenting screws in rehabilitating posterior alveolar ridges and achieving optimal dental implant outcomes while reducing the complications associated with mucosal perforation. Further research is necessary to validate these findings and evaluate this technique's long-term stability and success.

P79

Individualized 3D Titanium Printing for Alveolar and Jaw Rehabilitation: Case Report

J.W. Kim*, S.J. Kim

Introduction: In the rehabilitation of alveolar and jaw bones, the use of traditional titanium and metal mesh has been limited due to issues such as infection, dehiscence, and fit limitation. In contrast, the medical field has seen revolutionary advancements in 3D printing technology in recent years. By providing customized treatment that considers the individual's anatomical characteristics, this technology has led to improved surgical outcomes and reduced complications. This study investigates several cases of rehabilitation in the alveolar and jaw bones using 3D-printed titanium, demonstrating the potential benefits of this approach.

Method: This study involved patients who underwent alveolar and jaw bones rehabilitation surgery at the department of oral and maxillofacial surgery of Ewha Womans University Mokdong Hospital and Seoul Hospital. Each patient underwent a preoperative CT scan, and custom-made 3D titanium prints were produced using Ondemand® CAD/CAM software (Cybermed Co., Seoul, Korea) and Doctor Check software® (Cusmedi Co., Seoul, Korea). The fabricated 3D titanium prints were fitted onto a Rapid Prototype (RP) model before surgery to check for compatibility, and rehabilitation was performed with bone grafting materials during surgery.

Results: In the case of 53-year-old female patient who underwent alveolar rehabilitation with a 3D-printed titanium after mandibular resection due to osteonecrosis, the results were so successful that, one year later, the rehabilitation bone had fully integrated with the 3D titanium print, making it difficult to remove. In the case of a 45-year-old male patient who had mandibular rehabilitation surgery using a 3D-printed titanium after a mandibular fracture reduction, the surgery demonstrated a stable fit even tin the irregularly shaped fracture area, showing that the titanium printing adapted well to the contours of the non-standard bone surface.

Conclusion: Individualized 3D printed titanium, designed to address the shortcomings of both 3D printed PCL (polycaprolactone) and conventional titanium meshes, have demonstrated smooth, personalized fabrication and high precision. They minimized the possibilities of infection and dehiscence, offering differentiated bone formation outcomes from traditional methods. This approach also confirmed the possibility of successfully proceeding to subsequent implant placements.

P80

Effect of Abutment Color, Cement Opacity, and Zirconia Restoration Thickness on Final Restoration Shade

J.W. Cortina*, J. Chow, M. Kesterke, J.H. Chen, E. Kontogiorgos

Introduction: Anterior implant restorations inherently face an esthetic challenge to clinicians due to the combination of prosthetic materials with varying colors and opacites. Restorations commonly consist of a metal abutment, a ceramic restoration, and cement to lute the two together. Ceramic materials obtain a translucent property which makes them more natural in appearance but create an undesirable effect of abutment and cement show-through. Titanium abutments can be anodized to achieve improved esthetics by matching dentin shades. Dental cements are produced in varying shades and opacities to prevent color change or help mask underlying structures, respectively. Previous studies have examined the effect of anodization on lithium disilicate restorations or different cements opacities on final restoration shade. However, studies are sparse combining the effect that an opaque cement, anodized abutment, and thickness of a monolithic zirconia restoration can have on the appearance of a final restoration. The purpose of this in vitro study is to evaluate the effect of cement color, zirconia thickness, and abutment color on final restoration shade for milled zirconia restorations cemented on abutments that have undergone anodic oxidation.

Method: Stock titanium abutments (n=120) were divided into 2 groups: Non-anodized (N) (n=60) and yellow anodized (Y) (n=60). Specimens were designed and milled in Shade A2 high translucent 5-8Y monolithic zirconia (n=120) to fit onto the abutments with a set parameter of 0.08mm cement layer thickness. Three thicknesses of 0.5mm (n=40), 1mm (n=40), and 1.5mm (n=40) were fabricated. Specimens were cemented to the abutments with either clear (n=60) or white cement (n=60) according to manufacturer instructions for each abutment type. L*a*b* values were acquired with a spectrophotometer before and after cementation for each thickness to determine change in shade (ΔE). Statistical analysis completed using a statistical software program for comparison of ΔE between abutment color, cement opacity and zirconia thickness (α=.05).

Results: Results, Tables, and Images are pending.

Conclusion: Conclusions are pending.

P81

Plasma Treatment Removes Surface Contaminants and Improves Implant Biocompatibility

K. Ho*, C.Y. Chen, T. Shiba, D. Kim

Introduction: Plasma technology is one of the emerging treatments that has shown potential for implant surface modification. Our *in vitro* study investigates the effects of plasma treatment on cellular adhesion, proliferation, and differentiation of fibroblasts and osteoblasts on titanium surfaces.

Method: Plasma treatment was performed on machined and rough-surface titanium discs. Surface characterization of titanium surfaces pre-plasma (control group) and post-plasma (test group) treatment is performed using scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), and hydrophilicity tests. Cell adhesion and proliferation on control and test groups are qualitatively and quantitatively evaluated using SEM imaging for cell morphology, viable cell assays, and immunohistologic staining. Mean values of test and control groups were compared using an independent two-sample t-test with a significance level set at 0.05.

Results: While there were no notable surface changes on machined and rough surface discs using SEM imaging, there were significant changes on machined discs when analyzed with XPS. After plasma treatment, there was a significant reduction ($p<0.001$) in the amount of carbon molecules, suggesting that plasma treatment reduces hydrocarbon buildup on titanium surfaces. We also found notable differences in surface hydrophilicity after plasma treatment for both machined ($p<0.0001$) and rough ($p<0.0001$) surfaces, which suggests possible benefit with implant osseointegration. On titanium discs seeded with fibroblasts, SEM imaging showed differences in cell morphology and behavior. The control group showed higher numbers of inactive fibroblasts, while the test group had higher numbers of active fibroblasts. Cell viability assays showed significant differences favoring plasma-treated groups for both osteoblasts and fibroblasts at 1-hour and 2-hour time points at p-value less than 0.05. Differences in cell viability was not apparent after 12 hours for both groups.

Conclusion: This study demonstrated that when titanium surfaces are treated with plasma, **1)** there was an appreciable decrease in the amount of hydrocarbon buildup, **2)** the surface becomes significantly more hydrophilic, and **3)** fibroblasts and osteoblasts have increased cell viability 1-2 hours after treatment. Further investigation on the

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effect on cellular morphology and bioactivation is required through immunohistology staining and cell sequencing.

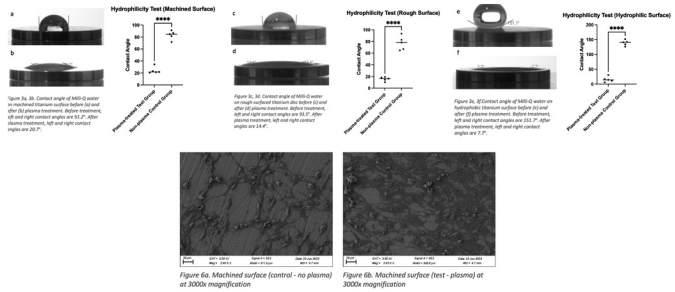

Figure 6a. Machined surface (control - no plasma) at 3000x magnification

Figure 6b. Machined surface (test - plasma) at 3000x magnification

P82

Implant Rehabilitation in the Aesthetic Zone With Digital Workflow: A Clinical Case Report

K. González Izalde*, R. Neria Maguey

Introduction: Digital workflows have transformed dental implant rehabilitation, with more precision, reducing treatment time, and enhancing patient outcomes. The integration of digital tools like CAD/CAM systems and oral scanning allows for more predictable results. These technologies help clinicians achieve superior functional and aesthetic outcomes with greater efficiency and improved patient satisfaction. Purpose: To present a case of anterior dental implant rehabilitation using a fully digital workflow, focusing on its benefits in terms of efficiency, precision, aesthetic results, and reduced treatment time.

Method: A 44-year-old female with no comorbidities presented with stage III periodontitis, generalized grade C, leading to the loss of the upper central incisors (teeth 8 and 9). Following successful periodontal treatment, a digital workflow was used for diagnosis, planning, and implant rehabilitation. Upper and lower impressions were taken and digitized through oral scanning. The resulting STL files, combined with DICOM files from a full-mouth CBCT, were used for virtual planning. A surgical guide was fabricated, followed by the placement of implants. Digital technology was also employed to design and fabricate provisional restorations. Six months later, final digital impressions were taken for the definitive prostheses, which were fabricated using advanced CAD/CAM systems for optimal fit and aesthetics. The final crowns were placed, achieving excellent functional and aesthetic outcomes within a shortened treatment period.

Results: The use of a digital workflow in this case improved the precision of restoration design and fabrication, minimizing errors and ensuring high accuracy. The digital process not only enhanced aesthetic outcomes but also increased efficiency, reducing chair time and improving patient satisfaction. This streamlined workflow significantly shortened the overall treatment duration.

Conclusion: A fully digital workflow enabled the precise fabrication and placement of implant restorations, achieving excellent functional and aesthetic outcomes in a shorter time. Digital workflows offer a highly efficient, predictable, and patient-friendly approach to implant cases, minimizing errors and treatment time while enhancing clinical outcomes.

P83

Strontium-incorporated Biphasic Calcium Phosphate on Modified 3D Titanium Surface Using Sol-gel Technology to Promote the Biological Response

K.K. Ye Mon*, Y. Sun, W.J. Chang

Introduction: The success of implants depends on effective osseointegration. To enhance osteogenic activity and prevent infections, implant surfaces are modified. Strontium (Sr), a bioactive material similar to calcium, improves osseointegration when added to biomedical materials. Nanoscale Sr coatings on rough titanium surfaces show promising results for bone healing and implant stability. Biphasic calcium phosphate (BCP), commonly used in bone and dental applications, is incorporated via the sol-gel method to further boost osteogenic activity and osseointegration.

Method: The surfaces of titanium discs were modified by grinding, sandblasting, acid-etched in a mixture (H2SO4+HCl), and underwent a NaOH treatment. The discs were then coated with strontium-incorporated biphasic calcium phosphate (Sr-BCP) by the sol-gel method in 3 Sr molarities (0.005M, 0.01M, and 0.02M), in 2 alginate % (1% and 3%). The coated discs were oven-dried and examined the characteristics and cellular activities.

Results: Modified 3D Ti surface showed pits and fissures and a spider web structure after alkali treatment. Sol-gel coating displayed a nodules-like appearance. The super hydrophilic surface showed in low Alg% coating. Standard HA, and β-TCP appeared after coating with Sr-CaP compound. The chemical composition and the elements become higher showing that the sol-gel coating affects the surface chemical structure. The surface roughness becomes lower because of the 3D surface production at the nanoscale level. The cell shape flattened and adapted to the sol-gel layer and it is found that the elongation and the arm of cells can grow into the sol-gel layer. The cell proliferation rate shows an improvement in the cellular activity of osteoblast-like cells in the modified 3D Ti sample on the Sr-CaP coating in low alginate concentration. The cell differentiation rate significantly increased in low Sr molarity and low Alg% groups till day 14 of the culture time. In cell mineralization analysis, The low Alg% groups showed higher calcium deposition and better in lower Sr concentration.

Conclusion: The synergistic effect of the combination of strontium (Sr) and biphasic calcium phosphate(BCP) can promote osteogenic cell activity by coating Sr-Ca/P on the 3D surface of titanium metal through sol-gel technology at the low molarity percentage of Sr with the lower alginate percentage.

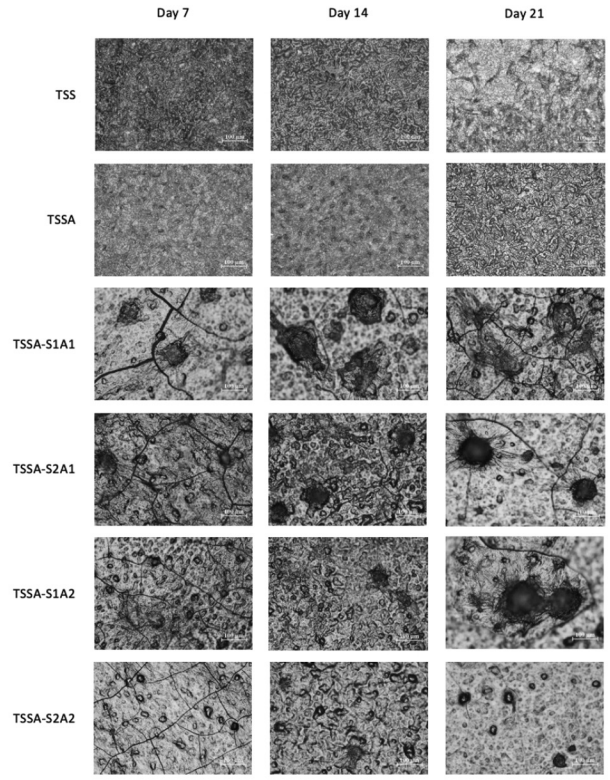

Figure 17. Analysis of cell mineralization by using Alizarin Red S Staining (ARS Assay) assay – Microscopic images (20X magnification)

Analysis of cell mineralization by using Alizarin Red S Staining (ARS) assay

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P84

Innovations in the Double Scan Technique for Optimizing Digital Workflow

K. Egashira*, A. Matsumoto, M. Arakawa, M. Fujigaki, Y. Kido, Y. Shindo, Y. Taniguchi, T. Matsunaga, K. Kakura, H. Kido

Introduction: The double scan technique involves creating a diagnostic stent and aligning DICOM data from the patient's jawbone with the stent after CT imaging. This enables implant simulations without interference from metal artifacts or missing teeth. However, challenges remain: 1) Generating CAD/CAM provisional restoration data that accurately reflects the implant simulation is difficult. 2) Without intraoral scan or STL data, the surgical guide relies on the stent's DICOM data, leading to poor fit. 3) Wax-up morphology is often unclear, and subgingival contours are limited in detail. 4) Modifying the wax-up to accommodate changes in the treatment plan is also difficult. The superimposition technique, aligning DICOM and STL data, addresses the limitations of the double scan technique. This study aimed to combine both methods to improve implant simulation accuracy.

Method: An intraoral impression was taken, and a radiographic guide was fabricated. STL datasets were collected, including 1) the current model with the guide, 2) the current model STL, and 3) the wax-up STL. These datasets were pre-aligned using CAD software. The radiographic guide and reference points were attached, and CBCT imaging was performed. DICOM and STL data were aligned using guide markers. Matching points were verified, and dental scan data were replaced, integrating steps 1 and 2. The wax-up data were aligned following the established protocol.

Results: A CAD/CAM-milled provisional restoration reflecting implant placement was fabricated. Superimposition accuracy improved, providing clearer wax-up and mucosal contours. The surgical guide fit well, and similar outcomes were observed in other cases. The implant was placed according to the simulation, and immediate loading was performed with the provisional restoration. The aligned axes allowed the STL data to be accurately replaced by the stent model.

Conclusion: Fabricating a radiographic guide and aligning it with STL data enabled the creation of CAD/CAM-milled provisional restorations. The surgical guide fit well, and superimposition accuracy improved. If the guide is not properly fitted during CT, discrepancies between simulation and actual implant placement may occur. A well-fitting guide and bite index stabilization are essential. Combining the double scan technique with superimposition enhances implant placement precision, particularly in cases with metal artifacts or missing teeth.

Simulation, Provisional Restorations, and Intraoral Operation

P85

The Planning, Placement, Restoration, and Management of Adjacent Dental Implants: A Case Series

K.A. Cusack*

Introduction: Adjacent dental implants create surgical and prosthetic challenges that require critical attention to detail, pre-surgical planning, and flawless execution to achieve results to satisfy provider and patient expectations

Method: Four patients presented for placement and restoration of adjacent dental implants. All surgical planning was completed digitally, and casts were analyzed. In these cases, either extraction and immediate implant placement or delayed implant placement was completed. In all cases, a full thickness flap was reflected, all implants were placed following respective manufacturer's protocols, initial stability of minimum 32ncm was achieved, all were temporized following completion of osseointegration and porcelain fused to metal crowns were delivered.

Results: In all four cases, adjacent dental implants created many challenges that can be complicated by personal oral hygiene, gingival architecture, embrasure spaces, and a high standard for esthetic outcome that complements the patient's existing dentition. In these cases, temporary restorations were critical for shaping gingival architecture and perfecting the patients' personal oral hygiene and occlusion prior to the final restorations. As clinicians, it is critical to be able to recognize and address these challenges and customize treatment to your patient's specific needs to provide them with a predictable, esthetic, and functional solution.

Conclusion: Adjacent dental implants create unique surgical and prosthetic challenges that require critical attention to detail, pre-surgical planning, flawless execution, and patient education to achieve a long-term and predictable result.

P86

Characterization of the Healthy Peri-implant Mucosa

K. Kalani*, T. Heck, A.T. Sheikh, J. Li, S. Barootchi, H.L. Wang

Introduction: Gingival characteristics have been described for natural tooth periodontal tissues. However, only a few studies have examined these in peri- implant mucosa. This cross-sectional study aimed to characterize the soft tissue around healthy implants and compare it with healthy natural teeth.

Method: The study involved 33 participants (20 males, 13 females) with dental implants and corresponding contralateral natural teeth recruited from the University of Michigan School of Dentistry. Ultrasonography was employed to measure buccal bone thickness (BBT), soft tissue thickness (ST), and papilla heights at various locations using a ZS3 ultrasound device, with image analysis conducted through Horos and Pixel Flux software. Clinical photography was performed using a Canon EOS 77D camera with a macro lens and cross-polarized filters for accurate color calibration. Data analysis included descriptive statistics, paired T-square tests, multi-ANOVA, and linear regression

Results: Implants and natural teeth showed significant differences in soft tissue and bone characteristics. Papilla heights were significantly lower in implants than in natural teeth. Specifically, the mesial papilla height in implants was 3.0 ± 1.3 mm, while in natural teeth, it was 3.7 ± 1.0 mm ($p = 0.00125$). The distal papilla height in implants averaged 2.2 ± 1.0 mm, compared to 2.9 ± 1.3 mm in natural teeth ($p = 0.0022$). Ultrasonography revealed thicker buccal soft tissues in implants and a greater distance between the buccal bone crest and free gingival margin. The average buccal soft tissue thickness in implants was 2.3 ± 0.7 mm, compared to 1.3 ± 0.5 mm in natural teeth ($p = 0.048$). Additionally, the distance from the buccal bone crest to the free gingival margin was 4.13 mm ± 1.5 in implants, while 2.9 mm ± 1.0 in natural teeth ($p = 1.9 \times 10^{-4}$). Soft tissue thickness correlated positively with L* (lightness) values, indicating thicker tissues in implants resulted in lighter colors ($p = 0.032$), while natural teeth showed the opposite trend. Qualitative assessments revealed similar tissue texture and form characteristics, including stippling, resilience, and scalloping of the gingival margins for both implants and natural teeth.

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Conclusion: The results showed significant differences between implants and natural teeth. Soft tissue color is influenced linearly by increasing tissue thickness at an implant or tooth site.

P87

SFOT to Treat Class 3 Malocclusion Recurrence

K. Changa*, F. Celenza, A. Tran, T. Rogoszinski

Introduction: Class III malocclusion is a complex orthodontic condition involving misalignment of the dental arches, often requiring comprehensive treatment. Patients may sometimes relapse after initial treatment, necessitating retreatment. This case report presents the use of Surgically Facilitated Orthodontic Therapy (SFOT) for a Class III malocclusion relapse after orthodontics completed in 2017. The patient presented to the Orthodontics clinic in 2023 with concerns of edge-to-edge occlusion, progressing toward Class III. SFOT was recommended to accelerate orthodontic treatment and manage occlusal discrepancies while minimizing further apical root blunting.

Method: The patient underwent a maxillary and mandibular SFOT, 3 months after orthodontic initiation. Elevation of the full-thickness flap from the second molar to the second molar was achieved. Corticotomies and vertical piezo incisions were made on the cortical housing until the trabecular bone was reached, and then graft material and membrane was used. The flaps were positioned back to the cementoenamel junction (CEJ) of all teeth.

Results: In the maxilla, a xenograft was used buccally from canine to canine, covered with a resorbable membrane. In the mandible, DFDBA allograft was applied in the same region, with an acellular dermal matrix managing a mucogingival defect on teeth #25 and #26. Temporary Anchorage Devices (TADs) were placed posterior to the mandibular second molars to aid in distalization one month after SFOT. This strategic placement of TADs provided additional anchorage support, ensuring more efficient orthodontic movement. The patient achieved malocclusion correction within 6 months, shorter than the 10 month quotation. Slight adjustments were required after, with retention wiring still necessary. The combination of corticotomies, bone grafting, and precise orthodontic planning ensured rapid, stable outcomes, minimizing further apical root blunting, enhancing the long-term stability of the corrected Class III malocclusion, and significantly reducing overall treatment time.

Conclusion: SFOT proved to be a valuable adjunct in the retreatment of a Class III relapse, reducing orthodontic treatment time while minimizing risks such as further apical root blunting. The patient's treatment outcome highlights the potential of SFOT in addressing malocclusion relapses and optimizing orthodontic care.

P88

Flapless and Fully Guided Palatal Sinus Lift Approach and Simultaneous Implant Placement

K. Richey*, T.J. Wang, J. Korostoff

Introduction: Irregular sinus shapes at proposed implant sites pose challenges in implant dentistry. For example, an irregular shaped sinus could result in unnecessary bone removal if approaching in the conventional method. In order to achieve ideal prosthetic-driven implant placement, approaching from the thin lingual wall will allow for the minimum amount of bone to be removed. While guided surgery is widely utilized for implant placement, its applications extend to sinus augmentation, allowing precise osteotomy positioning. Furthermore, when only a small sinus elevation is needed, a singular guide can be used to place the implant and make the sinus lift osteotomy.

Method: A 59-year-old female patient presented at the University of Pennsylvania School of Dental Medicine for implant placement at site #15. CBCT analysis revealed that the proposed implant location encroached upon the palatal aspect of the sinus, necessitating a sinus lift. Given the sinus' unique morphology, a flapless, guided palatal approach was developed. An intraoral scan was conducted, and the CBCT data was merged with the scan to create a customized surgical guide. A tapered implant was placed in a fully guided method. On the palate, an amnion chorion membrane was placed at the exposed palatal site to promote soft tissue healing.

Results: This innovative approach resulted in a successful sinus lift and simultaneous implant placement, minimizing trauma to the patient and achieving an excellent clinical outcome.

Conclusion: The flapless and fully guided palatal sinus lift technique demonstrates a valuable strategy in managing complex sinus anatomies during implant procedures, promoting patient safety and enhancing healing.

P89

Successful Implant Treatment After Vertical Bone Augmentation Using Ti-reinforced PTFE Membrane With Enucleation Of Nasopalatine Nerve

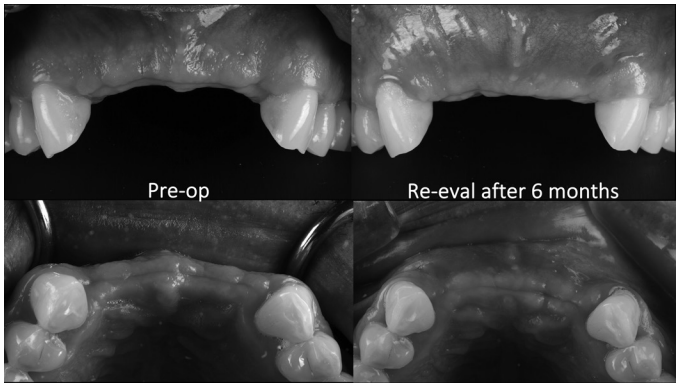
K. Oh*, S. Ayilavarapu

Introduction: A 57 year-old-male presented for the treatment of periodontal disease prior to implant therapy. He is classified as ASA II due to history of hypertension. There is no other significant medical or social history. Patient received extractions of #7,8,9,10 without ridge preservation, followed by interim maxillary partial denture. Periodontal diagnosis was generalized periodontitis Stage IV, Grade C.

Method: Periodontal surgeries, including osseous surgery and periodontal regeneration using cortical/cancellous DFDBA plus resorbable collagen membrane, were performed for all four quadrants. Surgical re-evaluation six months after the regenerative surgery revealed periodontal stability achieved successfully with significant improvement of oral hygiene. Virtual implant planning suggested that the patient required vertical and horizontal augmentation in maxillary anterior area for ideal implant placements.

Results: Guided bone regeneration (GBR) was performed, consisting of flap reflection, buccal periosteal release, decortication, enucleation of nasopalatine nerve, bone graft placement with Ti-reinforced PTFE membrane and resorbable collagen membrane overlaying it. Cortical/cancellous DFDBA was packed into nasopalatine canal and onto labial side of the ridge. The PTFE membrane was tacked with fixation screws bucco-lingually. The collagen membrane was secured by periosteal anchoring sutures using 4-0 resorbable monofilament. Horizontal mattress followed by single interrupted sutures by 4-0 PTFE sutures achieved primary closure. 6 months after the GBR, CBCT was rescanned. GBR was successful clinically with complete closure and no sign of infection at the time of re-evaluation. The updated CBCT revealed that adequate vertical/horizontal bone augmentation was achieved radiographically. Due to esthetic demand for implant treatment, surgical guide was carefully planned and used. Implants were successfully placed in an ideal prosthetically driven positions. Final restoration of fixed partial denture will be delivered after sufficient healing period.

Conclusion: Atrophied alveolar ridge in esthetic anterior area for implant placement is a challenge, entailing special care based on PASS principles. This patient was complicated case requiring meticulous process with periodontal management and hard tissue augmentation, but overall it concluded satisfying outcomes.



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P90

A Novel Technique of Placing Immediate Implants in Poor Bone Sockets: The Hanged Implant Concept

L. Glissa*, L. Berrezouga

Introduction: The primary stability of immediate implants is essential for successful osseointegration. However, sockets with minimal or no existing bone for anchoring the implant pose a significant challenge and may even contraindicate fixture placement. The technique presented here offers a novel approach to achieve primary stability in such cases.

Method: The study involved three patients with insufficient alveolar bone in the sockets to anchor implants properly. Implants were suspended in the sockets without bone contact and stabilized using zirconia membranes, which were secured to the buccal and lingual walls with screws (as shown in the image below). Two implants were placed in the posterior maxilla, and one in the posterior mandible. Bovine bone was added to one maxillary case (Case 1), while no grafts were used in the other maxillary (Case 2) or mandibular case (Case 3).

Results:Case 1: We removed the membrane after 8 months, with no signs of inflammation. A CT scan confirmed that bone covered the entire implant. Upon loading, the patient experienced no pain, and after 1 year, the implant remained healthy and fully functional.**Case 2:** After 4 months, we removed the zirconia membrane. The implant showed movement, so we allowed an additional 4 months for healing without the membrane. At 8 months, the fixture was mechanically stable. The CT scan indicated that the bone had reached the apex, though with a loss of 3-4 mm from the crest. On loading, the patient experienced no pain during mastication, and after one year, the implant was fully functional with healthy gingiva.**Case 3:** We removed the zirconia membrane after 4 months, but the implant was mechanically unstable, so we allowed another 4 months for healing. At 8 months, the fixture was stable but deviated buccally. The CT scan showed bone coverage with a 1 mm loss from the crestal bone. On loading, the patient reported no pain, and after 1 year, the implant remained fully functional and healthy.

Conclusion: These results suggest that this technique is promising, potentially reducing mechanical contraindications for immediate implants. It provides clinicians with greater control over implant axis in sockets with minimal bone, offering time savings for patients compared to other methods. Further studies are needed to better assess clinical outcomes.

Case 1: Explanatory image of the hanged implant technique

P91

Post-graft Pain Management: Evaluating Collagen Sponge and Composite in Free Gingival Graft Donor Sites

L. Bou Semaan*, P. Sosa, F.D. Ouriques, M. Kaur, H. Basma

Introduction: Soft tissue grafting is commonly employed to treat gingival recession and mucogingival deformities. Patients often face significant postoperative issues such as pain, discomfort, and bleeding. Studies indicate that healing by secondary intention after harvesting leads to increased pain and morbidity. To help reduce prolonged bleeding and pain, various agents like acrylic stents, cellulose, absorbable gelatin sponges, platelet-rich fibrin, cyanoacrylate, and propylene mesh have been suggested to protect the wound and minimize complications. Collagen sponges are the most widely used due to their biocompatibility, safety, and affordability. Studies have indicated that when in contact with gingival tissue, flowable resin composite allows complete tissue epithelization without inflammation.

Method: After free gingival graft harvesting, the palatal wound is protected by placing a hemostatic collagen sponge secured with sling-crossed sutures around the teeth to hold it in place. Then, a drop of 35% phosphoric acid gel is applied for 30 seconds on the palatal surfaces of the teeth, rinsed for 10 seconds, and excess moisture is blotted. An adhesive is applied for 15 seconds, followed by the application of flowable resin composite. The resin composite is placed along the edges of the collagen sponge, adhering to the palatal surface of the teeth, creating a double-layered protective barrier.

Results: Collagen sponges are popular in wound healing due to their biocompatibility, safety, and cost-effectiveness. They offer mechanical protection and a supportive matrix for clot formation, helping reduce postoperative pain after soft tissue harvesting. To further alleviate discomfort and bleeding, applying a flowable resin composite over the collagen sponge has been suggested. Results indicate that the additional resin layer may enhance the sponge's sealing properties, reducing palatal pain more effectively. In these cases, most resin applications remained intact for two weeks post-surgery, with only minor detachment reported, aligning with typical pain reduction timelines in similar treatments.

Conclusion: In conclusion, applying a flowable resin composite coating over a hemostatic collagen sponge placed after palatal harvesting appears to offer additional benefits, including pain relief at a low cost compared to using only a suture-stabilized collagen sponge.

P92

A Full Guided Implant Surgery Using Complete Digital Workflow With Cobalt Chrome Guide: A Case Report

M. El Najjar*, A. Rubinov

Introduction: Many patients require solutions to shift from a failing dentition to a full arch rehabilitation using dental implants. The placement of four to five implants through guided surgery combined with an interim, immediately loaded prosthesis constitutes a predictable treatment for full arch rehabilitation. This report aims to present the digital workflow and clinical use of a chrome cobalt bone reduction and surgical guide, which can simplify implant rehabilitation in terminal dentitions and increase the precision and predictability of treatment outcomes.

Method: The patient was treated with an entire arch implant-based fixed Maxillary and mandibular prosthesis with immediate function. A virtual patient was created, and implant planning software was used to develop three guides: a tooth-supported guide, stabilized by three stabilizing pins, a bone reduction guide fabricated from chrome cobalt, and an implant guide from chrome cobalt that fit onto the bone reduction guide.

Results: In this case of full-arch prosthetic implant-based rehabilitation in the maxilla and mandible, using a chrome cobalt bone reduction guide and implant guide succeeded in increasing stability, resistance to fracture and predictability of the alveoloplasty procedure.

Conclusion: A chrome cobalt bone reduction guide and implant guide can be beneficial when working in areas with reduced bone density.

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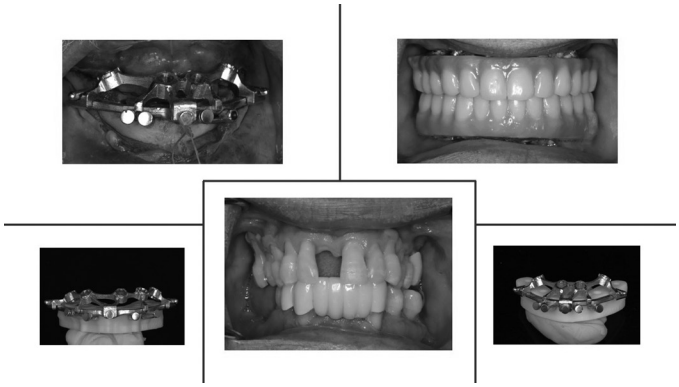


Before and after with the Chrome cobalt guide

P93

Evaluation of the Microbial Profile on the Polydioxanone Membrane and the Collagen Membrane Exposed to Multi-Species Subgingival Biofilm: An In Vitro Study

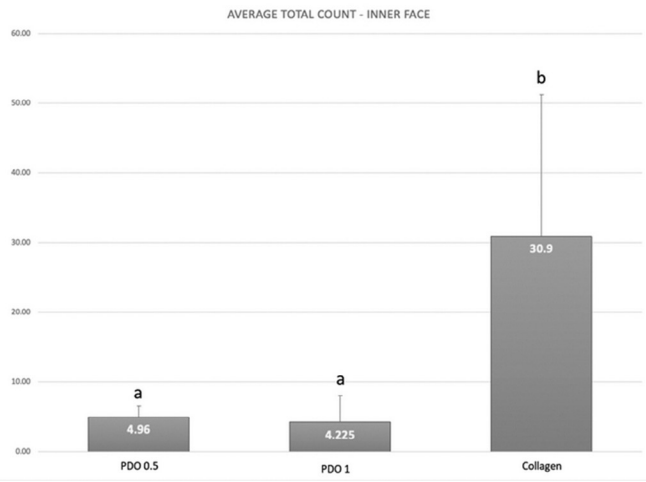
M.A. Melo*, M. Cintra Moreira, L.C. Figueiredo, F.H. Uyeda, L.D. Silva, T.T. Macedo, R. Sacco, C.F. Mourão, B. Bueno-Silva, J.A. Shibli

Introduction: Dehiscence in surgeries involving membranes often leads to bacterial contamination, hindering the healing process. This study assessed bacterial colonization on various membrane materials.

Method: Polydioxanone (PDO) membranes, with thicknesses of 0.5 mm and 1 mm, and a collagen membrane were examined. Packages containing polystyrene pins were crafted using these membranes, attached to 24-well plates, and exposed to oral bacteria from supra and subgingival biofilm. After a week's anaerobic incubation, biofilm formation was evaluated using the DNA–DNA hybridization test. Statistical analysis employed the Kruskal–Wallis test with Dunn's post hoc test.

Results: The biofilm on the polystyrene pins covered by the 0.5 mm PDO membrane showed a higher count of certain pathogens. The collagen membrane had a greater total biofilm count on its inner surface compared to both PDO membranes. The external collagen membrane face had a higher total biofilm count than the 0.5 mm PDO membrane. Furthermore, the 1 mm PDO membrane exhibited a greater count of specific pathogens than its 0.5 mm counterpart.

Conclusion: In conclusion, the collagen membrane presented more biofilm and pathogens both internally and on its inner surface.



The mean and SD of the total count means of the biofilm formed in the inner part of the polystyrene pins covered by the evaluated membranes. Kruskall–Wallis test ($p \leq 0.05$) Letters show the difference between the membranes: PDO 0.5 = PDO 1.0 < Collagen.

P94

Pulsed Electromagnetic Field Increases Bone-Implant Contact in the Cervical Region of the Implant: A Pilot, Double-blind, Split-mouth Clinical Study

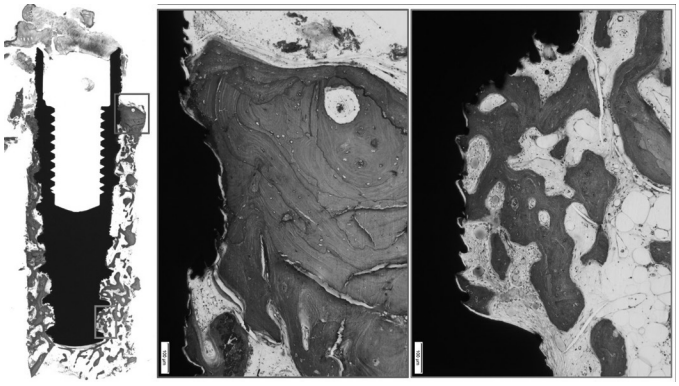
M.A. Melo*, K. Grandfield, R. Okamoto, S. Barak, J.A. Shibli

Introduction: Pulsed electromagnetic field (PEMF) is a non-invasive technique that increases osteoblastic activity and healing of peri-implant tissues. The objective of this study is to evaluate how much PEMF can increase bone-implant contact (BIC) in the cervical region of the implant, the region with the highest incidence of forces.

Method: Six edentulous patients (12 implants in total) were selected for the clinical study, and received temporary implants with the installation of healing devices containing a miniature electromagnetic device (MED) classified as A or B. All patients received the MED type A (control) on one side of the mouth and type B (test) on the other side. To evaluate the BIC, after 8 weeks the temporary implants were removed with a trephine and slides were prepared for histometry performed using ImageJ software. The bone-titanium implant interface was analyzed at micro and nano scales using scanning electron microscopy (SEM) and high-angle annular dark-field scanning transmission electron microscopy (HAADF-STEM) techniques respectively.

Results: The test group showed an average BIC of 55.92% while the control group had an average BIC of 45.64%.the SEM and HAADF-STEM techniues shoed that While no significant difference in bone-implant contact was found, indications of new bone growth and remodeling at the implant interface were shown arouf PEMF samples.

Conclusion: The pulsed Electromagnetic Field generated by the MED can be used to accelerate the increase in bone-implant contact in the initial weeks of healing. These results may contribute to rehabilitated patients with early loading and low bone density areas.



Histological ground section of experimental dental implant retrieved after 60 days of human maxilla with the use of MED applying PEMF

P95

Innovative Closed Tray Dragging Impression Technique for Implants in the Aesthetic Zone: A Clinical Approach Based on an Established Method

M. Plascencia Medina*, J.H. Gil Valdez

Introduction: This study describes an innovative technique used to capture the emergence profile in dental implants in the aesthetic zone, evaluating the precision and influence on aesthetic results, but also in capturing the best restorative position. Impression techniques have been developed to accurately capture the emergence profile, ensuring both aesthetic results and implant stability by preserving a soft tissue seal around the peri-implant area.

Method: Impressions in this study are taken using this new technique, based on the conventional closed tray impression method but with specific adjustments. The dragging motion incorporated into the closed tray system is designed to optimize soft tissue contouring and emergence profile capture. To assess the effectiveness of the new

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technique time of procedure, accuracy of the emergence profile and soft tissue contour are considered.

Results: The modified approach is expected to allow a more precise fit of the tray against the soft tissues, reducing distortion during the impression process. The total time required to complete the impression is recorded and compared to standard procedural times. Accuracy of the emergence profile is evaluated at 2 weeks and 3 months post-operatively using a dental probe, clinical photographs, and periapical X-rays. Soft tissue management is assessed through clinical examination, focusing on tissue health indicators such as absence of inflammation, lack of recession, and integration with the restoration. By implementing these strategic adjustments to the original technique, the process is anticipated to improve tissue handling and simplify procedures without adding complex steps.

Conclusion: This technique, derived from a proven closed tray method, is a refined approach to capture the emergence profile in the aesthetic zone. This clinical adaptation demonstrates potential for a broader application in aesthetic implant cases.

P96

A Fully Digital Workflow for Immediate Placement and Immediate Loading of Dental Implants With Angled Screw Channel Abutments

M. Udomsinroj*, T. Nagai, C.C. Yang

Introduction: This clinical report presents techniques in implant dentistry, focusing on immediate placement of dental implants and immediate loading of interim implant-supported fixed dental prostheses (ISFDP) with angled screw channels (ASC), as well as definitive restorations with ASC abutments.

Method: A 66-year-old male patient exhibited third-degree mobility and severe bone loss around teeth numbers 7, 8, 9, and 10. The prognosis was hopeless, prompting the patient to opt for extractions followed by ISFDP restoration. A fully digital workflow facilitated the planning of the implants and the design of both provisional and definitive ISFDP. An intraoral scanner (TRIOS 4; 3 Shape, Denmark) captured the existing dentition, while a cone-beam CT scan provided a three-dimensional view of the implant sites. A digital wax-up was created using CAD software (Exocad 2.4 Plovdiv) and superimposed onto the cone-beam CT scan for precise implant positioning. Digital software (CoDiagnostiX) was used to plan the fully guided implant surgery. Provisional fixed dental prostheses were designed in Exocad 2.4 and printed using a 3D printer (Straumann P30+). Extractions for teeth 7-10 were performed, and bone-level dental implants were placed immediately in the areas of teeth 8 and 9. The implants were loaded with the provisional ISFDP using ASC abutments on the same day.

Results: After osteointegration, definitive screw-retained monolithic zirconia ISFDP with ASC abutments for teeth 8 and 9, along with cantilever pontics for teeth 7 and 10, were fabricated. The patient was periodically recalled for postoperative evaluations and oral health checkups.

Conclusion: The fully digital workflow enabled predictable outcomes for implant surgery and restoration, saving time and materials. ASC provides optimal screw access, enhances aesthetics, and reduces cement-related peri-implant disease risks. Immediate placement and loading minimize the need for further surgical interventions, allowing provisionals within 24 hours. Additionally, soft tissue begins healing around the provisional prosthesis immediately after loading, reducing the time for tissue conditioning around the implant. The patient was highly satisfied with the treatment outcomes and the reduced number of appointments.

P97

Management of Persistent Tissue Inflammation Through Free Gingival Graft for a Hopeless Mandibular Central Incisor: A 4-Year Follow-Up Case Report

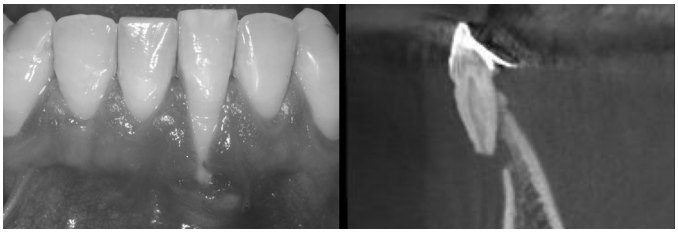
M. Katafuchi*, T. Olsson, M. Karbakhsch

Introduction: Gingival recession is a common issue in the mandibular anterior region, often accompanied by a lack of keratinized gingiva, which can lead to persistent tissue inflammation. The root position relative to the bone contributes to the risk of gingiva recession and influences treatment outcomes. Following the loss of a mandibular incisor, dental implant treatment faces unique challenges due to the thin facial bony wall and limited mesiodistal space. This study represents a 4-year follow-up on the combined use of root canal treatment (RCT) and free gingival grafting (FGG) to maintain a hopeless mandibular central incisor and to avoid implant treatment.

Method: The case involved a patient with a mandibular left incisor with a hopeless prognosis. The tooth presented with severe tissue inflammation on the facial aspect and bleeding. There was an 8 mm facial gingival recession with a deep probing depth of 7 mm and no keratinized gingiva. A pre-operative CBCT scan revealed the root apex entirely outside the bone housing, a periapical radiolucency, and an absence of facial bone. After a discussion of treatment options, the patient elected to attempt treatment with RCT and FGG. First, RCT was performed. The canal was obturated using Bioceramic putty at the apical area to allow surgical modification of the root apex. Subsequently, a recipient bed was prepared for FGG, and the root, including the apex, was shaped to the level that the remaining root was within bone housing. The gingival graft was harvested from the maxillary left palate and sutured onto the recipient bed. Occlusal adjustment was also performed during the procedure.

Results: The treated incisor was monitored over a 4-year period, during which no signs of tissue inflammation were observed, and probing depths remained shallow. Approximately 6 mm wide keratinized tissue was established on the facial aspect of the tooth. A radiographic analysis showed a shortened root length and confirmed the absence of periapical radiolucency.

Conclusion: This case demonstrates that inflammation control through FGG can successfully maintain a mandibular central incisor with a hopeless prognosis, avoiding implant treatment over a 4-year period. Odontoplasty may influence the stability of FGG.



P98

A Clinical Case of Modifying the Scanbody for a Patient With Limited Mouth Opening

M. Arakawa*, K. Egashira, K. Isshi, A. Matsumoto, M. Fujigaki, Y. Shindo, R. Ito, Y. Kido, Y. Taniguchi, T. Matsunaga, K. Kakura, H. Kido

Introduction: In implant treatment, digital impression is considered more suitable for patients with limited mouth opening compared to analog impression. However, in clinical practice, attaching the scanbody in the molar region can be difficult when taking digital impressions of patients with such conditions. In this case, the scanbody was modified for the patient in order to attach the scanbody. Furthermore, after modification, the scanbody was examined both occlusally and coronally to determine if the design of the modification affects the matching process.

Method: The case involved a patient with missing teeth #5, #4, #19, #18, #30, and #31, with a maximum mouth opening of 33.0 mm. Implants (ϕ4.3×10mm, tapered) were placed in positions #19 and #30, and a second surgery was performed. Digital impression was taken using an intraoral scanner. However, during the attachment and detachment of the scanbody, the patient complained of temporomandibular joint pain, making it difficult to insert the implant driver. To solve this, a groove was created in the PEEK scanbody with a diamond bur to allow the driver insertion. Based on the intraoral scan data, a 3D-printed model and provisional restoration were fabricated, and the final restoration was completed. The occlusal surface of the scanbody was divided into six

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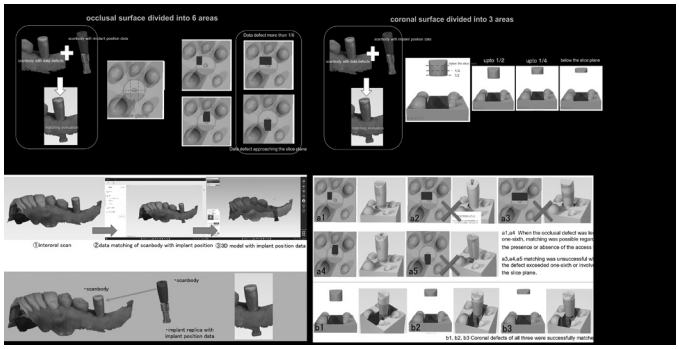
areas, and the coronal surface of the scanbody was divided into three areas: coronal half, coronal one-quarter, and defects below the slice plane. Data loss was artificially created for evaluation.

Results: When the occlusal defect was less than one-sixth, matching was successful regardless of the presence or absence of the access hole. However, matching was unsuccessful when the defect exceeded one-sixth or involved the slice plane. Coronal defects of all three were successfully matched. From this, it was concluded that as long as the slice plane is preserved and the defect is within one-sixth of the scanbody, the matching process is not affected.

Conclusion: To achieve successful matching between optical scan data and the scanbody which records implant position information, it is essential to preserve the slice plane and limit defects to within one-sixth of the scanbody. This suggests that even for patients with restricted mouth opening, modifying the scanbody allows for successful digital impressions. Further studies should explore whether similar modifications can be applied to other types of scanbodies.



Evaluation of the Modificated Scanbody

P99

Efficacy of Laser Therapy on Treatment of Peri-implantitis

M. Hanson*

Introduction: Dental implants are the standard of care for partial and complete edentulism with more than 90% success rates in most patients. However, dental implants are susceptible to bone loss and failure due to peri-implantitis. Peri- implantitis is a chronic inflammatory process that leads to bone loss around dental implants similar in nature to the pathogenesis of bone loss around teeth in periodontal disease. When peri-implantitis is diagnosed at an early stage then treatment and subsequent implant retention may be possible through resective or regenerative surgery. A major factor that influences treatment success is the ability to effectively decontaminate the implant surfaces to reduce or eliminate the plaque biofilm. Many decontamination protocols for treatment of periimplantitis have been suggested including airflow debridement, implantoplasty, titanium brushes, local antimicrobials, scalers and lasers. However, limited evidence exists to support a gold standard treatment for peri-implantitis. Laser therapies are promising due to their ability to selectively target microbes while potentially limiting damage to exposed implant structures.

Method: A systemic search using PubMEd, Ovid, Cochrane library used to look for different method of treating peri-implantitis using different laser for purpose of regeneration. Studies reviewed included use of different laser to treat peri-implantitis July 2014 to 2024. All human and animal studies were included.

Results: Twenty-one studies met the proposed inclusion criteria four systemic review, twelve case studies and five human and animal studies. Primary outcome result was radiographic bone level changes with peri-implantitis. Secondary outcome was changes of probing depth and bleeding. Most studies didn't show changes in radiographic bone level, but bleeding was significantly reducing (p=0.05) Those studies looked at a different type of laser. Statistical results were not consistently reported.

Conclusion: Some studies showed CO2 laser with low power setting has better result for treating peri-implantitis. Current evidence suggests that laser treatment significantly reduces bleeding, but the change of the radiographic bone level was not significant. (p=0.05). Within the scope of this review, it appears that one session of laser treatment is insufficient to effectively treat peri-implantitis and more evidence is needed to determine which laser treatments protocols are most effective.

P100

Assessment of Nasopalatine Canal Bone Grafting and Dental Implant Treatment: Two Case Reports

M. Omran-Alfaituori*

Introduction: The nasopalatine canal is an important anatomical structure located in the maxillary anterior region. It contains the nasopalatine nerve and artery and is a potential limitation in implant placement. Two approaches to this technique have been described in the literature. The first involves removing the contents of the nasopalatine canal and packing the canal with an osseous graft material to provide a stable base for the implant. The second approach involves dislocating the nasopalatine nerve and packing the canal with an osseous graft material to provide support for the implant.is region.

Method: Local anesthesia was administered. The nasopalatine canal was exposed, and all soft tissue was removed. Case 1: The implant placement process started with a surgical guide creating the initial osteotomy. A verification pin was placed with floss to confirm placement position and direction. A CBCT was taken to verify the anticipated implant length. The CBCT also confirmed a perforation in the nasopalatine canal. Implant site preparation was completed for the implant. The canal was irrigated with sterile saline, and a small Colla-plug was placed at the base of the canal. A bone graft was placed in the nasopalatine canal. The implant was then placed, and primary stability was achieved above 35 n/cm Case 2: After flap elevation, the nasopalatine canal was close to the planned implant position. A surgical curette was used to remove all soft tissue contents from the nasopalatine canal. An osteotomy was then made for the bone-ring graft using the bone-ring graft kit, and the canal was irrigated. Freeze-dried bone allograft was placed in the nasopalatine canal. The bone ring was then fixed in implant site number 8, and the implant was placed through the bone ring, and the implant cover screw was placed.

Results: Throughout the entire post-surgery period, which included the implant healing phase and the second surgery to uncover the implant, the patient did not experience any clinical complications. The implant remained stable, and the patient is now awaiting the final impression, which will be used to create the final crown.

Conclusion: Implant placement in the nasopalatine canal region can be a valuable option for patients who require implant-supported rehabilitation. Further research and clinical experience may help to refine the technique and improve its predictability and safety.

P101

Effective Decontamination of Fixture-abutment Interface Using Manganese Oxice Nanozyme-doped Diatom Microbubbler

M.J. Kim*

Introduction: When a prosthetic abutment is connected to an implant fixture, a microgap is created. The fixture-abutment interface (FAI), where microorganisms grow, has the potential to become a bacterial reservoir, leading to both biological and mechanical issues. Therefore, there is a need for an effective method to decontaminate the FAI. MnO_2 nanozyme-doped diatom microbubbler (DM) generates oxygen and moves in the H_2O_2 solution, resulting in the mechanical removal of biofilms. The objective of this study is to evaluate whether DM can effectively remove biofilms in the FAI.

Method: *Porphyromonas gingivalis* biofilms formed in the FAI, and were treated for 2 min with phosphate buffered saline (PBS group), 0.12% chlorhexidine (CHX group), 3% H_2O_2 (H_2O_2 group), and co-treatment of 3 mg/mL of DM and 3% H_2O_2 (DM group). The viability of the remaining biofilms was analyzed using cell counting kit-8. The biofilms were stained with FITC-conjugated Concanavalin A, visually analyzed using a fluorescence imaging system, and quantitatively measured. The biofilms on the surface of decontaminated cross-sectioned implants were visualized using scanning electron microscope.

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The remaining biofilms were stained and examined using confocal laser scanning microscopy (CLSM). Cement-retained abutments were connected to decontaminated implants with a torque of 30 Ncm, and the reverse torque value (RTV) was measured. After each treatment, the physicochemical surface properties of titanium disks were analyzed by X-ray photoelectron spectroscopy and CLSM.

Results: According to electron microscopy and energy dispersive spectroscopy analysis, MnO_2-nanozymes were well-doped on DM surfaces. The biofilms in the FAI were effectively removed in the DM group compared to the other groups. With the exception of the DM group, the RTV significantly decreased compared to the control group. The physicochemical properties of the titanium surfaces were not altered by the co-treatment of H_2O_2 and DM.

Conclusion: The novel therapeutic approach using H_2O_2 and DM effectively removed biofilms in the FAI compared to conventional antiseptic approaches. This can reduce the risk of biological and mechanical complications that may occur due to biofilms in the FAI of implants.

P102

Education-based Oral Health Promotion Interventions During Pregnancy: A Systematic Review

N. Binte Islam*

Introduction: Oral health problems in expectant mothers continue to be a major worldwide health concern, with consequences for fetal development, maternal health, and long-term health outcomes for both mother and child. The aim is to assess the effectiveness of education-based oral health interventions during pregnancy.

Method: Five databases (MEDLINE, Cochrane, Embase, Scopus, CINAHL) were searched from 2014 to January 14, 2024. Results were screened based on eligibility criteria in a two-stage process: title, abstract, and full-text review. Additionally, a forward search of the included papers' citations and a backward search of reference lists were carried out. The included papers' quality was assessed using the Cochrane Risk of Bias 2.0 instrument for randomized controlled trials, and the Mc Master tool for other studies. Important study data was retrieved, and the results were narratively synthesized.

Results: A total of 14 studies were included with RCTs, quasi-experimental, observational, and longitudinal designs, examined oral health issues in pregnant women globally, focusing on gingivitis, periodontitis, dental plaque, sensitivity, and DMFT scores, starting from age 15. Geographically, the studies spanned multiple regions globally with the age of participants beginning in 15 years. The risk of bias was thoroughly assessed using the Cochrane Risk of Bias (RoB 2.0) tool for the RCTs and the McMaster tool for non-RCT studies. The overall risk of bias was deemed low in 75% of the studies, while 25% were categorized as having "some concerns." Specifically, the randomization process presented a 50% risk of bias, as some studies lacked appropriate sequence generation and allocation concealment. Additionally, non-RCT studies exhibited concerns regarding sample size justification, contamination, and inadequate reporting of statistical significance.

Conclusion: This study highlights the effectiveness of oral health interventions during pregnancy, though some studies faced limitations, particularly in randomization and reporting. Overall, the majority of studies demonstrated a low risk of bias, supporting reliable intervention outcomes for pregnant women.

P103

Digital Occlusal Analysis Using a Prosthetic Software and a Digital Pressure Sensor Equipment, a New Methodology of Identifying Occlusal Trauma in Dynamic Movements

N. Zambrana*, M. Saleh, N. Sesma, H.L. Wang

Introduction: The absence of periodontal ligament in dental implants makes their occlusal analysis clinically challenging as implants lack the ability to adapt to occlusal forces through movement. This case series aims to propose a new methodology of analyzing occlusal contacts of dental implants and teeth in static and dynamic movements using a real-time pressure sensor equipment and dynamic virtual occlusion using a prosthetic design software.

Method: Occlusal data were collected using OccluSense (Bausch) in static and dynamic movements and an intraoral scan. The electronic pressure sensor (60microns) with a printed circuit containing 1018 pressure pixels was able to capture 256 levels of pressure. It allows real-time digital pressure mapping by showing static and dynamic occlusal contacts in colored bars of different heights depending on the pressure delta and quadrant pressure percentage distribution. Intraoral scans were virtually mounted using Exocad software with average sagittal inclination and Bennet angles of 30 and 15 degrees, respectively. This allows for mathematical analysis of virtual dynamic articulator movements, visualizing occlusal contacts through a color scale. Four clinical cases demonstrate how this methodology identifies static occlusal contacts, excursive contacts, and interferences during dynamic occlusion, correlating with clinical signs such as crown chipping, tooth wear, mobility, and occlusal discrepancies.

Results: While Exocad provides a digital simulation of occlusal dynamics, facilitating the identification of high-contact areas, it lacks patient-specific jaw relationship data. This omission can lead to the exclusion of important occlusal nuances, limiting the accuracy of individualized treatments. In contrast, OccluSense offers real-time occlusal contact data by combining physical contact marks on teeth with digital pressure mapping. It visualizes pressure intensity, quadrant distribution, and recorded movements, providing a more precise and dynamic understanding of a patient's occlusal forces during excursive movements.

Conclusion: Combining digital tools like Exocad with real-time systems such as OccluSense enhances the precision and personalization of occlusal analysis. Together, they offer a comprehensive approach to diagnosing and managing occlusal dynamics, leading to improved clinical outcomes.

P104

Addressing the Lack of Vestibule and Keratinized Tissue in a Patient Diagnosed With Granulomatosis With Polyangiitis: Vestibuloplasty and Strip Free Gingival Graft in Combination With Xenogeneic Collagen Matrix

N. Mithia*, E. Kotsailidi, S. Benzaquen

Introduction: Granulomatosis with Polyangiitis (GPA) is a necrotizing granulomatous inflammatory disease usually involving the upper and lower respiratory tract with necrotizing vasculitis affecting predominantly small to medium vessels. The head and neck are involved in nearly 90% of cases, with the nose, eyes, ears, and mouth being the most often affected. Oral manifestations of this condition include oral mucosal ulceration, gingival enlargement, abnormal tooth mobility, exfoiliation of teeth and a delayed healing response. GPA is a rare condition that can have dehibilitating consequences for patients that suffer from oral manifestation of this condition.

Method: This case report discusses the treatment of a 52 year old Caucasian female who's medical history is positive for Chron's Disease, anal cancer, anxiety, depression, and most recently granulomatosis polyangiitis. In 2021, the patient had a chief complaint of painful, swollen

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gingiva and mobile teeth. The gingiva appeared to have a strawberry-like appearance and were enlarged, erythematous, contained red to purple petechiae and had a granular appearance. After pathology results confirmed a probable diagnosis of Granulomatosis polyangiitis, the patient was edentulated by the OMFS department in March 2022. The patient was seen in the Periodontics Department in 2023, she presented with severely resorbed ridges, no vestibule and little to no keratinized tissue. A treatment plan was made to first address the soft tissue deficiencies by performing a vestibuloplasty and strip free gingival grafts in combination with xenogeneic collagen matrix. This was in prepartion for her to receive implants and an implant supported prostheses.

Results: At a 10 months post-operative follow-up for the maxilla, and a 4-month post-operative follow-up for the mandibular procedures, the patient demonstrated an increase in keratnized tissue and thickening of the soft tissues. The patient also demonstrated a slight increase in vestibule. With improvment of the quality of tissue, the patient is ready for implant therapy.

Conclusion: A suitable option for the treatment of a lack of vestibule and keratinized tissue in a patient suffering from Granulomatosis with Polyangiitis is the use of strip free gingival grafts in combination with xenogeneic collagen matrix.

P105

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Outcomes of Implants Placed in Grafted Maxillary Sinuses

N. Manouchehri*, A. Baez-Gutierrez, S. Vardar, A. Shafagh, T. Koutouzis

Introduction: This retrospective study evaluates and compares the clinical outcomes of implants placed after sinus augmentation procedures performed using two techniques—lateral wall and crestal approaches—at Nova Southeastern University's Post-Graduate Periodontology Clinic. The study specifically focuses on surgical complications, implant success rates, and the factors influencing the long-term implant success.

Method: A review of patient records from 2012 to 2022 was conducted. Inclusion criteria required patients to be at least 21 years old and to have undergone sinus augmentation surgery with a minimum follow-up of one year. All procedures were performed by residents at the Periodontics Program. Data collected included age, gender, smoking status, ASA classification, and the incidence of surgical complications. The study utilized both parametric and non-parametric statistical analyses to evaluate the data, including Fisher's exact test and multiple regression analysis, to compare complication rates and implant outcomes between the two surgical techniques. Biological complications and implant survival rates were and compared between the two techniques.

Results: A total of 131 patient records were reviewed, resulting in the placement of 194 implants. While no significant differences were observed in demographic variables such as age, gender, and smoking status ($p<0.05$); the lateral wall approach demonstrated a significantly higher rate of complications (36.4%) compared to the crestal approach (8.2%) ($p < 0.001$). Schneiderian membrane perforation was the most common complication, occurring in 29.1% of the lateral wall cases and 14.5% of crestal cases ($p < 0.001$). However, implant survival rates remained similar between the groups, with success rates of 83.88% for the lateral wall approach and 86.37% for the crestal approach ($p = 0.645$).

Conclusion: Despite the higher incidence of surgical complications associated with the lateral wall sinus lift technique, long-term implant survival was not significantly affected when compared to the crestal approach. These findings suggest that both sinus augmentation techniques are viable options for implant placement in grafted sinuses, and the choice of technique should be based on individual clinical and anatomical considerations. The lateral wall approach, while more prone to immediate surgical complications, does not compromise implant survival in the long term.

OVERAL SINUS COMPLICATION FREQUENCIES

			SINUS COMPLICATIONS		
			No	Yes	Total
SINUS GROUP	Lateral	Count	35	20	55
		% within Lateral	63.6%	36.4%*	100.0%
	Crestal	Count	101	9	110
		% within Crestal	91.8%	8.2%*	100.0%
Total		Count	136	29	165
		% of Total	82.4%	17.6%	100.0%

Implant Survival

		Survive	Explant	Total
SINUS	Lateral	52	10	62
	Crestal	114	18	132
Total		166	28	194

IMPLANT BIOLOGICAL COMPLICATION FREQUENCIES

			COMPLICATION TYPE						
			No	Peri-implantitis	Mucositis	Mucogingival	Implant Loss	Loss due to Peri-implantitis	Total
SINUS GROUP	Lateral	Count	33	5	3	4	9	1	55
		% within LATERAL GROUP	60.0%	9.1%	5.5%	7.3%	16.4%	1.8%	100.0 %
	Crestal	Count	69	11	3	9	12	6	110
		% within CRESTAL GROUP	62.7%	10.0%	2.7%	8.2%	10.9%	5.5%	100.0 %
Total		Count	102	16	6	13	21	7	165
		% Total	61.8%	9.7%	3.6%	7.9%	12.7%	4.2%	100.0 %

P107

Immediate Implantation After Extraction With Non-submerged Guided Bone Regeneration in the Aesthetic Zone

o. finnaoui*, S. Song, M.F. Zahra, S.Y. Hann, D. Oh

Introduction: Implant dentistry has reduced treatment time, improved aesthetic outcomes, and enhanced patient satisfaction. Immediate implantation and provisionalization offer fewer surgical interventions and lead to faster aesthetic improvements while preserving bone and gingival architecture in the anterior zone. The 5th ITI Consensus (2013) emphasizes that successful aesthetic outcomes depend on careful case selection. Key criteria include an intact labial bone wall (>1 mm), a thick soft tissue biotype, no acute infection, and sufficient bone apically and palatally for primary stability. However, a thick bone wall in the anterior maxilla is rare, with only 4.6% of patients exhibiting a wall >1 mm in the central incisor region. Research shows that nearly 50% of sites have a bone wall thickness of 0.5 mm, and 52% of maxillary central incisors present facial bone defects.

Method: A 27-year-old male with provisional restorations by a charlatan reported past dental trauma. Radiographs revealed periapical radiolucency in teeth #9-11. Teeth #9-11 were extracted atraumatically to preserve the labial bone plate. Vertical releasing incisions were made at the mesial line angles of #8 and #12, and a full-thickness flap was elevated to expose fenestrations. Osteotomies were performed, and implants (diameter = 3.4 mm, length = 12 mm) were inserted 3 mm apical to the future gingival margin with 35 N/cm torque. Bioceramic bone graft (InRoad®, Osteogene Tech Corp., USA) was placed in the gaps between the socket walls and implants, and the horizontal bone defect. A collagen membrane (Genoss®, Korea) covered the graft, secured with healing abutments and vertical mattress PTFE sutures (4-0). The flap was secured with non-resorbable interrupted sutures (4-0 nylon). Releasing incisions were sutured with 6-0 nylon. Healing abutments were later replaced with metal temporary abutments, and provisional restorations were fabricated.

Results: At the one-year follow-up, immediate implant placement with GBR and non-submerged healing showed promising outcomes for maxillary anterior teeth with buccal bone defects. Further monitoring is necessary to assess long-term tissue changes.

Conclusion: Immediate implantation and provisionalization are effective strategies for the anterior maxilla, meeting aesthetic expectations and streamlining treatment. This protocol can be completed efficiently in a single session.

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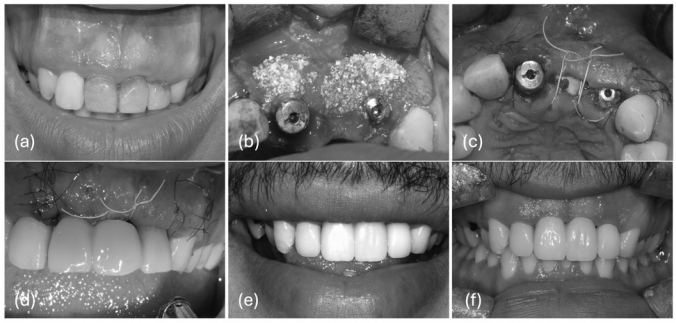

Figure. Step-by-step procedure: (a) before, (b) implant placement and bone graft, (c) non-submerged GBR, (d) completion of surgery, (e), (f) one-year follow-up.

P108

Caspase Mediated-Interleukin-1β Promoted Inflammation in Peri-implant and Periodontal Diseases. A Cross-Sectional Study in Humans

P. Galindo-Fernandez*, D. Herrera-Garcia, N. Martin-Morales, F. O Valle, H.L. Wang

Introduction: The NLRP-3 and AIM-2 inflammasomes, inflammatory systems linked to the innate immune system, trigger cascades of proinflammatory mediators (IL-1β) mediated by caspase-1 and pyroptosis. Although their role in periodontitis has been described, they have hardly been analyzed in peri-implantitis. Given their linkage to dual metabolic activation, where not only pathogens but also other elements such as ATP or metals are involved, we might wonder if their activation is similar in both conditions. Therefore, the aim is to evaluate differences in the expression of inflammasome components in inflammation in both pathologies and their comparison to healthy tissue.

Method: Forty-eight samples of gingival biopsies from periodontitis, peri-implantitis, and other disease-free samples as control were evaluated. Clinical, histomorphometric, immunohistochemical, and transcriptomic parameters were analyzed.

Results: A significant decrease in collagen areas was observed in both pathological conditions, although there were no statistically significant differences between them. Inflammatory infiltration was more intense in samples with peri-implantitis. The expression of genes associated with the inflammasome was significantly higher in both diseases compared to controls. This clinical study compares both pathological processes for the first time, observing an overexpression of Il-1β, AIM-2, and NLRP-3 in affected samples. Inflammasome activation requires at least two stimuli, which may include microbial factors and metals such as titanium. Additionally, this activation correlated positively with analyzed clinical parameters.

Conclusion: The activation of NLRP-3 and AIM-2 inflammasomes and their mediators, interleukin-1β and caspase-1, is evident in peri-implantitis and periodontitis. Despite a greater inflammatory infiltrate in peri-implantitis biopsies, no significant differences were found between pathologies regarding inflammasome expression. These findings suggest that a common mechanism underlies inflammatory activation and alveolar bone loss.

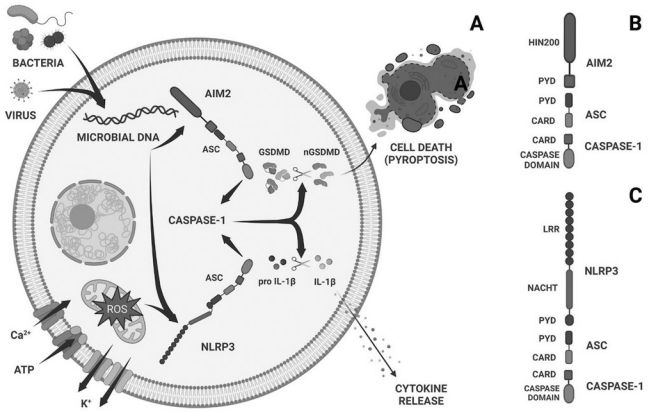

FIGURE 1. A) Mechanism of activation of AIM-2 and NLRP3. **B)** AIM2 inflammasome diagram. **C)** NLRP3 inflamassome diagram. The activation occurs upon receiving a specific stimulus depending on the type of inflammasome. When the sensors receive a signal, they oligomerize and bind ASC, subsequently pro-caspase-1. When this happens, caspase-1 is cleaved, which will induce pyroptosis by forming the N-terminal of gasdermin D and lead to the maturation of IL-1β. *Created with BioRender.com*

P109

Comparison of Ultrasonography, CBCT, Transgingival Probing, and Probe Transparency With Histological Gingival Thickness: A Diagnostic Accuracy Study Revisiting Thick Versus Thin Gingiva

P. Hazrati*, H. Sabri, H.L. Wang

Introduction: This study evaluated the accuracy of Ultrasonography (US), Cone Beam Computed Tomography (CBCT), Probe Transparency, and Transgingival Probing (TGP) for assessing gingival thickness (GT), with histology as the reference standard. Secondary aims included assessing agreement between methods and establishing an optimal cutoff to differentiate thick vs. thin gingiva.

Method: Sixteen fresh, non-embalmed cadaver heads with intact gingivae were examined. The data collection sequence included CBCT, US, probe transparency, TGP, and histology for GT measurement. Both stainless steel and color-coded probes were used for transparency assessments, while TGP was performed using a calibrated endodontic spreader. Histologic sections were used for the reference GT. Primary outcomes evaluated the accuracy of US, CBCT, and TGP compared to histology, and secondary outcomes assessed the inter-method agreement and a new clinical cutoff to define thick vs. thin gingiva.

Results: A total of 115 teeth were assessed. The mean GT from histology was 1.34 mm, with US and CBCT slightly underestimating GT (1.25 mm and 1.13 mm, respectively) and TGP overestimating it at 1.51 mm. Correlations ranged from r = 0.88 to 0.98, with ICC values from 0.73 to 0.95, indicating strong inter-method agreement. Regression models confirmed significant associations between histological GT and measurements from US, CBCT, and TGP. Using a 1 mm cutoff, both CCP and PPB showed acceptable diagnostic accuracy; however, a revised cutoff of 1.18 mm provided improved accuracy in distinguishing thin from thick gingiva.

Conclusion: Histology remains the gold standard for GT measurement; however, US, CBCT, and TGP demonstrated strong clinical reliability, with US showing the closest agreement with histology, followed by TGP and CBCT. The study established a new clinical threshold of 1.18 mm for differentiating thin vs. thick gingiva, improving diagnostic accuracy compared to the traditional 1 mm cutoff. Despite method-specific limitations, US emerges as the most accurate and practical non-invasive tool for GT measurement. CBCT and TGP remain viable alternatives depending on clinical context. Further validation studies are recommended to verify these findings in live clinical settings.

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P110

From Complication to Reconstruction: Rehabilitation in Atrophic Maxilla. Clinical Case

P.D. Guallpa Guamán*, A. H. Diaz, L. Barajas, V. Garcia Lee

Introduction: Dental implant failure is a significant complication that often leads to bone loss and increased maxillary atrophy, complicating future treatments. This not only affects the mechanical function of dental prostheses but also has a negative impact on patient aesthetics and overall quality of life. Guided bone regeneration (GBR) and digitally assisted surgical techniques are widely used to restore bone volume and enable effective rehabilitation in complex cases.

Method: A patient with a failed full-arch maxillary fixed prosthesis experienced severe maxillary atrophy following implant loss. The prior prosthesis exhibited frequent mobility and dislodgement due to screw loosening and peri-implant bone loss, which compromised function and quality of life. The new prosthesis aimed to achieve similar or enhanced aesthetic results. The intervention included the removal of six failing implants, GBR techniques, and the placement of five new implants using guided surgery, with immediate loading of a fixed maxillary prosthesis. Patient satisfaction and function were assessed using the Oral Health Impact Profile (OHIP-5) at 1, 3, and 5 months post-intervention, focusing on oral well-being, masticatory efficiency, and overall quality of life.

Results: Three weeks postoperatively, the patient showed no surgical or prosthetic complications. Occlusion was confirmed intraoperatively with articulating paper, showing strong posterior and slight anterior contacts in centric occlusion, with no premature or excursive interferences. The patient reported significant improvements in comfort, functionality, and the ability to perform daily activities. Aesthetic outcomes were consistent with prior results, with no differences in the perception between the previous and new prostheses. Patient satisfaction, measured by the OHIP-5 questionnaire, improved from 9/20 pre-treatment to 2/20 post-intervention, with the most notable improvements seen in oral function and psychosocial impact.

Conclusion: Dental implant failure can severely affect oral health and quality of life. However, through careful planning and execution, positive outcomes in functionality and aesthetics can be achieved, leading to improved patient satisfaction and quality of life. While the initial results are promising, long-term follow-up is necessary to assess the durability of the intervention.

P111

Accuracy of Eight Intraoral Scanners in Determining Implant Positions for Full-arch Implant-supported Maxillary Provisional Restorations Using Analogs as Scan Bodies

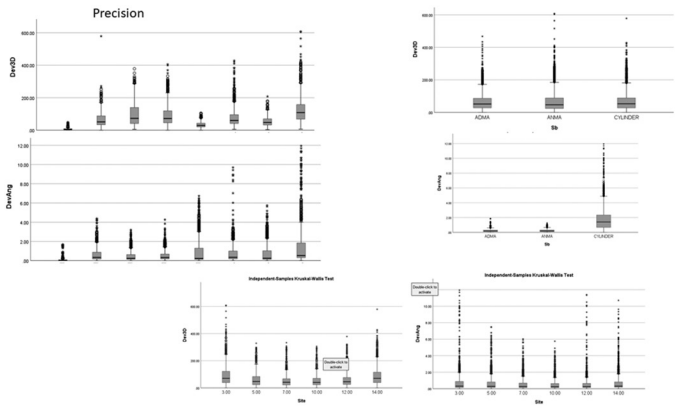
P.S. Borella*, J. Li, M. Lozada, F.d. Costa Santos, C. Adams, G. Mendonca

Introduction: Accuracy in full-arch implant-supported restorations is influenced by the fit of the restoration within the mouth. Using an adjusted provisional restoration or verification jig as a reference can help refine implant positioning in digital impressions, enhancing restoration fit. Using a reverse scan body on adjusted temporary offers promising solutions for implant position verification and fit improvement.

Method: A master model with 6 implants was created, scanned with a bench scanner, and a restoration was designed and printed. Prefabricated titanium abutments were cemented, and three groups (n=10) were scanned using 7 intraoral scanners. Spheres were strategically added at coronal, apical, and platform points for alignment with each implant. Trueness and precision (Global and Angular deviation) were assessed by comparing the spheres to the reference scan, with a Kruskal-Wallis test applied to evaluate Scanner, Scanbody, and Implant Site differences (α=.05).

Results: The scanners, SBs, and implant site showed influence for trueness and precision in both 3D global deviation and angular deviation (p<.001). Scanners 5 and 6 had the lowest Global and Angular deviations compared to the other scanners (p<.001). The SBs showed differences in precision for global (p=.005) and angular (p=.001) deviations, but they did not differ in trueness for global deviation (p=0.39), only for angular (p<0.001). The implant site showed differences in global and angular deviation for trueness and precision (p<0.001). The implants on the extremity showed more deviations than those closer to the midline.

Conclusion: Regarding the limitations of this in vitro study, it can be concluded that the Scanner, SB, and site of the implant had an influence on the accuracy of digital impressions of full-arch implant-supported restorations. The use of analogs as SB presented to be valid for most scanners to verify or utilize the implant position from a provisional captured restoration. The median values for deviation were below the clinically acceptable of 100μm.



P112

Impact of Progressive and Conventional Thread Designs on Primary Implant Stability: An In-vitro Comparison

P.U. Gehrke*, C. Stein

Introduction: To reduce implant failure in poor bone quality and support shorter treatment protocols, efforts have focused on enhancing initial stability through modifications in implant body and thread design. However, evidence comparing conventional and progressive thread designs is limited. This in-vitro study aims to evaluate the primary stability of screw implants with different macro geometries and thread designs (conventional vs. progressive) across various bone densities using resonance frequency analysis (RFA) and insertion torque (Ncm).

Method: 240 implants were placed in polyurethane blocks (SawBones, Pacific Research Laboratories, WA, USA) simulating bone densities D1-D4. The blocks had densities of 10, 15, and 20 PCF (0.16, 0.24, and 0.32 g/cc), corresponding to bone types D4, D3, and D2, respectively. Insertion torque and ISQ values from resonance frequency analysis were recorded. Implants were divided into two main groups: implants with standard thread design (SI, n=120) and implants with progressive thread design (PI, n=120). The SI group consisted of 30 Camlog Screw Line (CS), 30 Astra Tech (EVS), 30 Xive (XS), and 30 Blue Diamont (BD) implants, while the PI group consisted of 30 Camlog Progressive Line (CP), 30 Prime Taper (EVP), 30 Omni Taper (OT), and 30 Anyridge (AR) implants. Subgroups (A, B, C, D) were created for comparative analysis between corresponding standard and progressive implants from the same manufacturer. Mann-Whitney U and Kruskal-Wallis H tests were used for comparisons, with Tukey-Kramer for post-hoc analysis, at p = .05.

Results: In all PCF classes, the PI group exhibited higher primary stability and insertion torque values compared to the SI group. SI had a mean primary stability of 54.8 ± 10.9 ISQ, which was significantly lower than the 58.6 ± 9.2 ISQ observed for PI (p = 0.03). The SI group also demonstrated significantly lower insertion torque (22.7 ± 13.1 Ncm) compared to the PI group (27.3 ± 14.2 Ncm) (p = 0.01). A correlation coefficient of 0.66 between ISQ and Ncm values indicates a positive relationship, where increases in ISQ values are associated with increases in Ncm values.

Conclusion: The results of the present in-vitro study indicate that implants with a progressive thread design exhibit higher primary stability and insertion torque in different artificial bone densities compared to implants with a conventional thread design.

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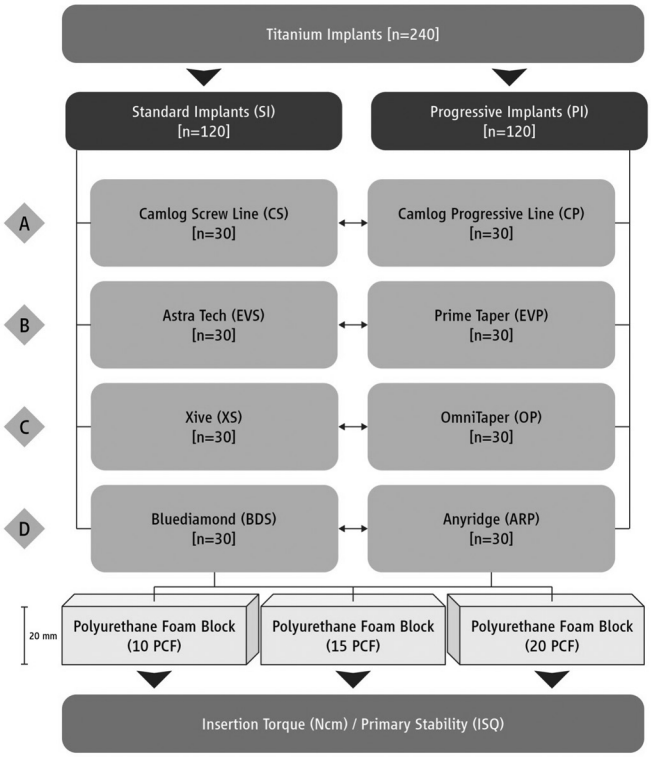

Fig 1: Study design

P113

Prosthetically Driven Bone Scalloping Guide for Implant Placement in a Patient With Limited Inter-arch Space

P. Ceolin Meneghetti*, F. Damerau Ouriques, M. Geisinger, C.C. Fu, R. Sadid-Zadeh

Introduction: Prosthetically driven and biologically executed implant placement is essential for achieving optimal esthetics and function while minimizing complications. This case report presents a novel approach to bone scalloping using a guide designed from the planned final prosthesis. The pre-prosthetic surgery aimed to increase crown height and improve esthetic outcomes in patients with limited inter-arch space, creating ideal conditions for implant placement and final crown restoration.

Method: A 28-year-old female patient presented for oral rehabilitation requiring tooth- and implant-supported restorations. Diagnostic assessment revealed passive eruption, loss of vertical dimension, and limited inter-arch space to restore the edentulous site at the maxillary left quadrant. An implant-supported fixed partial for #12-14 was planned for the site with limited prosthetic space. Design software was used to create a virtual wax-up for the definitive crowns and a position guide to allow a vertical stop. An implant planning software was then used to plan a prosthetically driven implant position. Bone scalloping and implant surgical guides were then manufactured using a 3D-printing machine. The bone scalloping guide, determined by the crown margin position, enabled the surgeon to perform precise osteoplasty strategically before implant placement.

Results: The implant surgical guide facilitated the prosthetically driven implant positioning, while the bone scalloping guide allowed the prosthetically driven osteoplasty, resulting in an esthetic and functional prosthesis. In the patient's case, post-surgical outcomes demonstrated significantly improved crown height and enhanced esthetic and functional results. This method highlights the value of a digital, prosthetically driven approach, offering an innovative and precise solution for implant placement and osseous contouring.

Conclusion: Integrating a digitally designed guide based on the final prosthesis offers a streamlined approach for pre-surgical bone modification, ensuring precise implant placement. This technique helps optimize esthetics and function by enhancing crown height and improving outcomes in challenging cases with limited inter-arch space.

Prosthetically driven bone scalloping guide in position, precisely defining the osseous contour for optimal implant placement.

P114

Effect of Different Intra-oral Scanners and Photogrammetry Systems in the Accuracy of Full-arch Scan for Fixed Implant Retained Restorations

P.C. Meneghetti*, P.S. Borella, A.S. Guimaraes, T.S. Mendonca, J. Li, L.G. Lopes, G. Mendonca

Introduction: New intraoral scanners become available almost every year. They use newer technologies that can improve accuracy for several applications. These systems now are also broadly used for restoration of dental implants including full arch fixed screw retained restorations. The purpose of this study was to compare the accuracy of full-arch digital implant impressions using 8 different digital impression systems currently available.

Method: A reference maxillary model with six implants and multi-unit abutments was used for this study. Medit i700, Medit i900, iTero Lumina, Dentsply Sirona Primescan, 3Shape Trios4, 3Shape Trios5, and Micronmapper were assessed. Each combination groupwas scanned ten times and a dental lab scanner (E4, 3Shape) was used as a reference. All scans were exported as STL files, and an implant bar was designed in 3Shape Dental System software. 3d position for each implant was extracted from digital design of the bars and saved in a .CSV format that contained implant position and rotation using a Python script in Blender software. These data were analyzed using the Evalumap software (Claronav Dental). The 3D deviation and angular deviation was obtained for each group. Accuracy was measured in terms of "trueness" (comparing test and reference). The Shapiro-Wilk test showed that the data were not normally distributed. Kruskal-Wallis followed by Mann-Whitney test was used to analyze the data (p=.05).

Results: The study found differences in impression accuracy among the scanners and photogrammetry systems ($p<0.001$). Considering all scanners, iTero showed the lowest results for 3D deviation for precision and trueness. The lowest results for angular deviations were obtained by i900 and iTero. These new systems have more cameras or larger field of view that can reduce time of scanning and area captured. Photogrammetry system presented accurate results as well compared to the desktop scanner.

Conclusion: Different intraoral scanner influenced the accuracy of digital impressions on completely edentulous arch. Additional research will be discussed to evaluate the effect of different accuracies in the precision of these intra-oral scanners for full arch implant restorations

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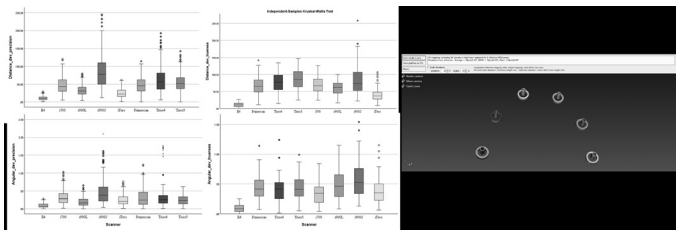


Precision and trueness of the different intraoral used. 3d deviation and angular deviation.

P115

Long-term Effects of Focused Pulsed Electromagnetic Field Non-surgical Therapy on Peri-implantitis

R.S. Siroma*, J.A. Shibli, S. Barak, Y. Meyer, A. Younis, I. Georgy, E. Gabay, Y. Friedlander, O. Ginesin, H. Zigdon

Introduction: Pulsed electromagnetic field (PEMF) therapy, renowned for its immunomodulatory effects and established efficacy in orthopedics, shows promise for managing peri-implantitis by reducing soft tissue inflammation and marginal bone loss. This study aimed to compare the long-term clinical and radiographic outcomes of non-surgical peri-implantitis treatment with and without PEMF therapy.

Method: Thirty-one patients, with a total of 45 implants displaying peri-implantitis diagnosed with pocket probing depths (PPD) of 6-8mm with bleeding on probing (BoP%) and crestal bone loss ranging from 3-5 mm, was completed this multicenter study. A novel healing abutment integrating active (15 test) or inactive (19 control) PEMF was employed, delivering PEMF at an exposure ratio of 1/500 – 1/5000, intensity: 0.05-0.5 mT, and frequency: 10-50 kHz for 30 days. Non-surgical mechanical debridement of implant surfaces was conducted before abutment placement. Patients were evaluated at baseline (T0), 3 months (T1), and 12-24 months (T2), assessing plaque index (PI), bleeding on probing (BoP), pocket depth (PD), recession (REC), suppuration (SUP), and radiographically measured vertical bone loss (VBL).

Results: Follow-up assessments revealed significantly lower mean BoP, and SUP in the test group after 12-24 months compared to the control (17.1% vs. 97%, and 0 vs. 10%, respectively; $p < 0.05$). Furthermore, the test group, PD at the deepest site and mean PD decreased significantly between T0 and T2 (7.1mm ± 0.90 to 4.4mm, 5.3mm to 3.7mm, respectively; $p < 0.05$). Also, a decrease was observed in the control group for the T2 (6mm to 4.5mm; $p < 0.05$). Additionally, although not significant, a positive trend was observed for VBL after one year in the test group compared to the control (0.2mm vs. -0.3mm).

Conclusion: These findings suggest that focused PEMF therapy could offer a nonsurgical solution for peri-implantitis, capable of achieving clinical goals. Nevertheless, larger samples and longer follow-ups are needed to understand its long-term benefits and limitations.

P116

Non-abrasive Peri-implantitis Treatment to Maximize Titanium Surface Cytocompatibility

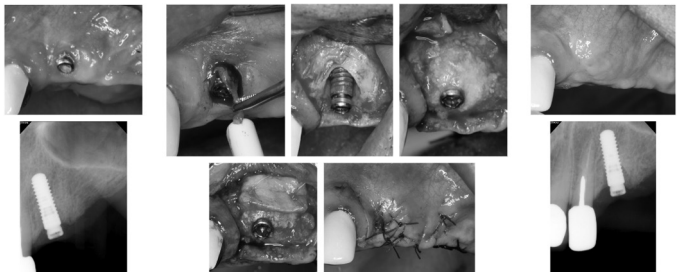
R. Vaeth*, I. Tsolaki, G. Kotsakis

Introduction: It has been suggested that instrumentation of the implant surface results in release of titanium particles which may induce an inflammatory response. Decontamination of the implant surface using chemotherapeutic agents during treatment of peri-implantitis defects may minimize the release of these titanium particles and preserve the implant's surface properties. Additionally, the use of adjunctive biological materials such as enamel matrix derivative (EMD) has been positively associated with implant survival.

Method: I am presenting a case where a peri-implantitis defect was treated using a non-abrasive approach which included removal of the surrounding granulation tissue, burnishing of the exposed titanium surface with a NaOCl solution, placement of allograft combined with EMD, and a connective tissue graft.

Results: At a 5 month follow up, radiographic presentation of the peri-implant defect appears to have bone fill.

Conclusion: A peri-implantitis treatment method in which the implant surface is burnished with NaOCl and the defect was grafted with allograft mixed with EMD can halt the progression of peri-implantitis while re-establishing healthy bone levels. Further research with extended follow-up would be necessary to determine reproducibility and long-term effectiveness of this technique.



P117

Flat Versus Sloped Implant Shoulder Configuration for Immediate Implant Placement and Provisionalization: 12-year Results of a Prospective Study

R. Noelken*, M.B. Henle, B. Al-Nawas

Introduction: The architecture of extraction sockets often presents with different vertical bone heights. To improve the support and the long-term preservation of the varying bone levels an implant system with a sloped shoulder (OsseoSpeed Profile) was developed in addition to the traditionally flat shoulder implant (OsseoSpeed). This prospective study compares the clinical performance of OsseoSpeed and OsseoSpeed Profile implants in a one-stage procedure with immediate insertion and immediate provisionalization in the esthetic zone within a follow-up period of 10 to 15 years.

Method: 37 OsseoSpeed implants (20 patients) and 21 OsseoSpeed Profile implants (16 patients) were included. All implants were placed immediately into extraction sockets. Flapless reconstruction of facial bony deficiencies was performed with autogenous bone chips. All patients received immediate provisional restorations. Implant survival, success rates, marginal bone levels and Pink Esthetic Score (PES) were assessed per implant.

Results: Mean follow-up period was 12.5 years (range 10 to 15 years). Four implants were classified as drop-outs in the OsseoSpeed implant group, and two in the OsseoSpeed Profile group. One Profile implant was lost early at 2.5 months. Cumulative survival rate according to Kaplan-Meier was 98.1%; 100% for OsseoSpeed, and 95% for OsseoSpeed Profile. Marginal bone levels remained close to the level of the implant shoulder (-0.11 ± 0.66, range, -1.86 to 1.67 mm) at final follow-up. At OsseoSpeed Profile implants the marginal bone level was maintained at a more coronal level (OsseoSpeed -0.21 mm, OsseoSpeed Profile 0.07 mm), not statistically significant (p=0.74). Implant success, defined as implant survival, marginal bone loss ≤1mm and pocket probing depths ≤5mm was 60.6% in the OsseoSpeed group and 84.2% in the OsseoSpeed Profile group (p=0.107). The gingival esthetics measured by the PES improved from 10.6 to 11.5. Even the PES improvement from pre-op to final follow-up was higher in the Profile group, however not reaching the level of statistical significance (OsseoSpeed 0.67, OsseoSpeed Profile 1.28, p=0.189).

Conclusion: The results from this prospective study after a mean follow-up period of 12.5 years show favorable survival rates, stable marginal bone levels and a long-term improvement of periimplant esthetics for OsseoSpeed and OsseoSpeed Profile implants.

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P118

A Prospective Clinical Study on the Performance of a Platform Switched, Multi-level Surface Implant System – 2 Year Follow Up

R.A. Leyton*, K.V. Carmona, J. St Germain, D. Simmons, E. Kandaswamy

Introduction: In recent times, newer implant systems with increased thread depth that allow higher bone to implant contact and insertion torque (IT) have been developed to increase the success in immediate and early loading protocols. However, in the long term, exposure of these threads due to marginal bone loss creates a clinical challenge. Thus, an implant system was developed by increasing the thread depth at the apical portion while maintaining shallow thread depth at the coronal portion of the implant. The aim of this prospective observational clinical study is to evaluate the performance of this implant design for up to two years follow-up.

Method: This clinical study (IRB# 4572) included patients with edentulous areas who required dental implants. The implant was placed using standardized protocols and IT and Implant Stability Quotient (ISQ) values were recorded. Demographic details, clinical measurements such as probing depth (PD), bleeding on probing (BOP), as well as patient satisfaction were collected at the time of prosthesis delivery, 1 and 2years. Additionally, standardized radiographs taken at implant placement, prosthesis delivery, and 1 and 2years were used to measure crestal bone levels, with the data analyzed using descriptive statistics and paired t-test for all parameters.

Results: A total of 30 patients (14 male; average age: 61.5) were treated with 31 implants having an average torque of 40 Ncm. The ISQ values were found to significantly increase from implant placement (mean:71.53±14.71) to the time of restoration (80.96±4.18) ($p<0.001$). Data from 28 patients revealed that there was a small increase in marginal bone loss from the time of restoration (0.50±0.32mm) to 1-year follow up (0.66±0.43) ($p<0.05$). PD remained stable from time of restoration (2.95±1.39) to 1-year follow up (2.90±0.91) ($p>0.05$). Patients reported high satisfaction with prosthesis at 1 year follow up. The 2-year patient follow up is ongoing.

Conclusion: This study demonstrated that the platform-switched progressively deep threaded implant system managed to achieve both high IT and ISQ values along with acceptable clinical performance.

P119

Development and Validation of an Artificial Neural Network Model for Robot-assisted Implant Osteotomy Drilling

R. Wang*, X.Y. Zhou, T.S. Kan, Y.F. Liu, K.J. Cheng

Introduction: Bone density is one of the important factors which affects osteocyte survival from frictional heat generated by implant osteotomy drilling. More dense bone usually creates higher heat during osteotomy. Forces required to apply to an osteotomy site drilling are also related to the quality of the bone. There is no implant robot in the orthopedic or dental field which has the capability to perceive bone density in real-time. It is significantly beneficial to apply artificial intelligent technology to a robotic drilling device to detect bone density and feed-back to the system to adjust proper forces used at the osteotomy drilling site in a real-time.

Method: During osteotomy preparation, a contact force and torque at the tip of a drill was collected in real time, and a tracking differentiator was used to filter and differentiate the force signal. A data-driven artificial neural network model for bone density identification was developed. The bone density at the cutting position was evaluated by the model based on cutting parameters and forces. Total 18 groups of samples were tested and analyzed. The feasibility of the method was verified by an in-vitro experiment using artificial bone blocks.

Results: The bone density identification model showed 94.42% accuracy for the training and the validation sets. The theoretical modeling had 92.94% accuracy of three selected bone densities used in the study. Our designed models to differentiate cortical and cancellous bone had 98.33% accurate rates.

Conclusion: Our bone density identification model can recognize bone density at an osteotomy site with great accuracy. The online test results demonstrated that the method exhibited a good real-time performance and stability. The method allows the robot to receive bone density information based on real-time data, thereby providing a basis for the robot's adaptive control. Further expansion of data collections from various bone densities and experiments on fresh bone segments will be conducted to augment experiment observations and theoretic analysis. Based on our computation and system design, we envision a machine learning model with haptic feedback function will be developed to further optimize the osteotomy preparation for the improvement of robotic assist implant surgery.

P120

Management of Post-implant Fibrous Dysplasia in the Maxilla: A Case Report

S. Zafar*, Y.T. Amrou, A. Alrmali, H.L. Wang, F. Nor, A.M. Koleilat

Introduction: Fibrous dysplasia (FD) is a rare, benign lesion in the maxillofacial region that can lead to bone pain, deformities, and fractures. It accounts for approximately 7% of benign bone tumors. While dental implants often have high survival rates in FD patients, diagnosing the condition can be challenging, especially with atypical presentations and older age. In this case, a systemic evaluation ruled out other diseases, complicating the diagnosis. However, through clinical, radiographic, and histopathological assessments, a definitive diagnosis of fibrous dysplasia was made. Tissue sampling and bone reshaping were performed to ensure optimal outcomes. The patient healed well and was pleased with the aesthetic results.

Method: A 63-year-old African American female presented in December 2023 with a gum bump on the right side. Her medical history was unremarkable. Imaging, including periapical radiographs and CBCT scans, showed a radio-opaque area in the right upper alveolar process, suggesting monostotic fibrous dysplasia. An incisional biopsy was performed under local anesthesia, involving both bone and soft tissue samples. Microscopic analysis revealed mature bone and fibrous tissue, confirming fibrous dysplasia without atypia. Following the biopsy, the patient underwent osseous recontouring surgery to reshape the bone, preserving critical neurovascular structures. Post-surgery, she received antibiotics and was advised on recovery and periodontal maintenance. A second biopsy was sent for further confirmation.

Results: Six months post-surgery, both clinical photos and 3D scans showed stable, well-shaped bone, with intact dental implants and no signs of complications or fibrous dysplasia regrowth. The patient reported no discomfort and was pleased with the improved appearance of her jaw. This successful outcome demonstrates that careful surgical intervention can effectively manage fibrous dysplasia while preserving dental implant function.

Conclusion: This case demonstrates that fibrous dysplasia in the upper jaw can be successfully treated while preserving dental implants. Careful bone reshaping maintained implant stability, and the patient showed no complications. The results highlight that with the right approach, challenging conditions like fibrous dysplasia can be effectively managed, ensuring successful oral rehabilitation.

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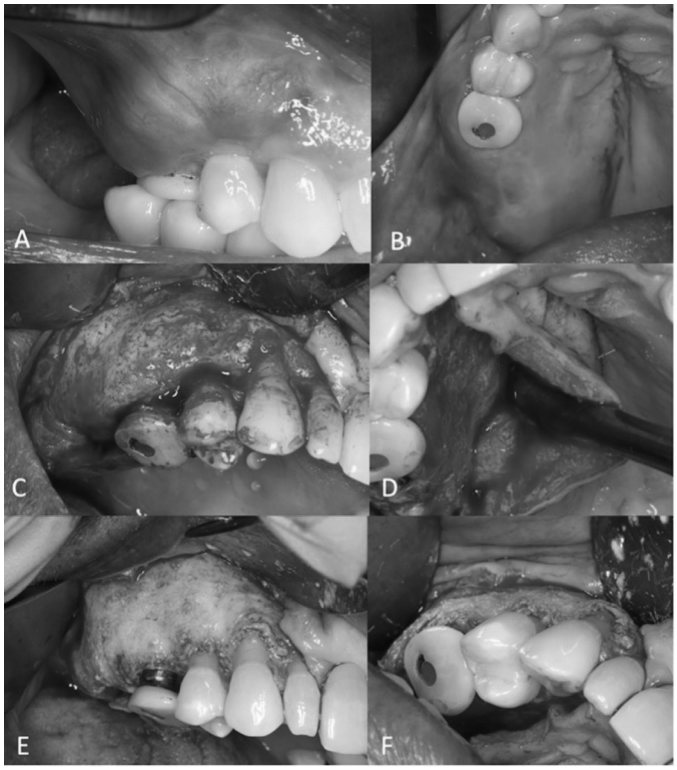


P121

Preliminary Observations Concerning the Stability of a Bone-engaging Dental Implant

S. Phillips*, P. Rosen

Introduction: Dental implants have been immensely successful in achieving osseointegration. Over time, they have undergone modifications in their macro- and micro-geometries to achieve faster and more predictable osseointegration to better handle a wide variety of circumstances. This retrospective analysis was performed to provide initial observations related to stability using an implant made from commercially pure titanium with an active designed macrostructure.

Method: This retrospective study comes from a clinical private practice limited to periodontics, dental implants, and regenerative therapy. All implants were consecutively placed. The information collected at the time of surgery included, the age of the patient, gender, bone type, whether the site was healed or an immediate extraction, width and length of the implant, insertion torque, resonance frequency values expressed as implant stability quotient (ISQ) using Osstell. The ISQ values were repeated prior to restoration at this second stage.

Results: 76 patients (45 male, 31 females) received dental implants. Age ranged wasfrom 30 to 85 years (average of 66.2±12.4 years). 146 implants were placed of which 102 could be considered for inclusion. Of those 102, there were 2 that didn't integrate for a success rate of 98%. 47 of the implants were placed as a single stage and 55 submerged. Average insertion torque was 35.1±11.7 N-cm (range of 10 to 60) (single stage 39.1±10.6 N-cm and submerged 31.6±11.7 N-cm). Baseline ISQ value overall was 73.3± 5.7 buccal-lingual and 73.7±5.9 mesial-distal (single stage 74.8±5.3 buccal-lingual and 75.2±4.7 mesial-distal and submerged was 71.9±5.5 buccal-lingual and 72.5±4.7 mesial-distal). The average duration to the second RFA value was 15.5±4.1 weeks (8 to 25 weeks). The ISQ values at second visit were overall 77.7±4.8 in the buccal-lingual direction and 78.3±4.3 in the mesial-distal direction (single stage was 78.6±4.8 buccal-lingual and 78.7±4.8 mesial-distal and submerged were 77.1±4.6 buccal-lingual and 78.0±3.7mesial-distal. Using a threshold of ±2 units to calculate dips/bumps, overall there were 12 dips, 18 bumps, and 72 unchanged buccal-lingually and 7 dips, 14 bumps, and 81 unchanged mesial-distally.

Conclusion: The results of this study suggest that the Genesis Active implant achieves high success along with good stability at time of implant placement and second stage as measured by insertion torque and ISQ.

P122

Retrospective Radiological Analysis of Peri-implant Bone Level and Peri-implant Bone Quality of Dental Implants of Different Lengths

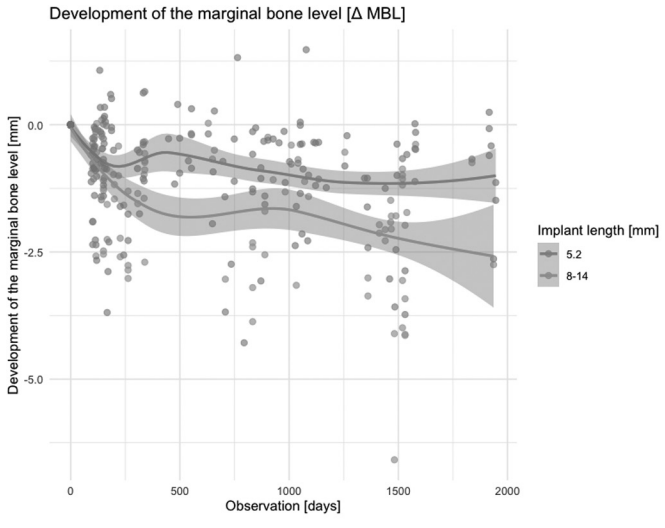
S.M. Peppmeier*, P. Henn, J. Neugebauer

Introduction: This retrospective case-control study aims to compare the vertical bone level changes and bone density development of short implants (5.2mm) versus standard-length implants (8.0–14.0 mm). The goal is to determine whether short implants are a viable alternative to extensive bone augmentation and standard implants in atrophic jaws, particularly regarding bone loss and bone density at reproducible measurement sites.

Method: This retrospective case-control study examines 53 patients who received a total of 123 dental implants, including both standard-length and short implants. All implantations were completed prior to the study, and routine radiographic imaging was performed to document the peri-implant bone level and its density.

Results: The mean peri-implant bone level (ΔMBL, marginal bone level) in the 5.2 mm implant group was **-0.606 mm ± 0.93**, while in the 8.0-14.0 mm group, it was **-1.110 mm ± 1.26**. Statistical analysis revealed a highly significant difference in the development of the ΔMBL between the two groups (**p < 0.01**), indicating that the shorter implants maintain a more favorable marginal bone level over time. Regarding bone density (ΔGSV, gray scale value), no statistically significant differences were observed in the mesial (**p = 0.566**), apical (**p = 0.426**), or distal (**p = 0.212**) aspects of the peri-implant bone. Nevertheless, there is a weak trend suggesting that implants with a length of 5.2 mm may exhibit a greater change in bone density compared to longer implants, as reflected by the positive estimate (**1.716/2.892/4.022**). However, this effect did not reach statistical significance (**p = 0.566/p = 0.426/p = 0.212**) and should therefore be interpreted with caution.

Conclusion: Short implants are a viable option in atrophic bone, demonstrating stable peri-implant bone levels. However, the tendency for higher surrounding bone density may elevate fracture risk, necessitating further investigation.



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P123

Clinical Study of SLA Surface Coated With a pH-buffering Agent After Vacuum UV Treatment Implant for Osteoporosis/ osteopenia Patient

S. Cho*, J.M. Cho, J.Y. Kim

Introduction: Osteoporosis and osteopenia, characterized by reduced bone density, can affect skeletal strength and healing, making dental implant success in these patients a key area of interest. This prospective study evaluates both implant-related factors (osseointegration and survival) and osteoporosis-related variables (T-score and bone turnover markers).

Method: This open-label prospective study involved postmenopausal women requiring dental implants. Bone mineral density (BMD) and systemic evaluations were performed. Based on inintial T-scores, participants were divided into two groups: Group A (T-score ≥ -2) and Group B (T-score < -2). SLA surface coated with a pH-buffering agent after vacuum UV treatment Implants were placed using a two-stage procedure, and patients were followed up nine times at regular intervals. At 6 months and 1 year after fixture insertion, clinical parameters and radiographs were evaluated. In addition, systemic evaluations—BMD (T-scores), serum bone turnover markers, and the occurrence of osteoporotic fractures—were measured at the start and end of the study to compare changes in bone health.

Results: 45 dental implants were placed in 36 subjects (mean age: 68 years; range: 54–86). Group A (T-score ≥ -2) included 17 patients with 21 implants, and Group B (T-score < -2) included 19 patients with 24 implants. The cumulative survival rate at both implant and patient levels was 100%. At 12 months, resonance frequency analysis showed a mean ISQ of 71.4 ± 5.52, indicating satisfactory osseointegration. Radiographic assessments revealed a mean peri-implant bone loss of 0.54 ± 0.35 mm. Clinical parameters, such as plaque scores, bleeding on probing, and probing depth, showed no complication. Secondary outcomes showed minimal decreases in T-scores and bone turnover markers during the study period, indicating stable systemic bone health throughout the study.

Conclusion: No significant differences were observed between the groups in any of the outcome measures. Despite the challenges posed by osteoporosis, this study demonstrated a high implant survival rate, even in patients with decreased bone metabolism. Secondary outcomes confirmed minimal changes in bone mineral density and serum markers over the first year, supporting the viability of dental implants in osteoporotic patients.

P124

Maximizing Implant Stability in the Edentulous Maxilla: Innovative Use of the Anterior Maxillary Sinus Border

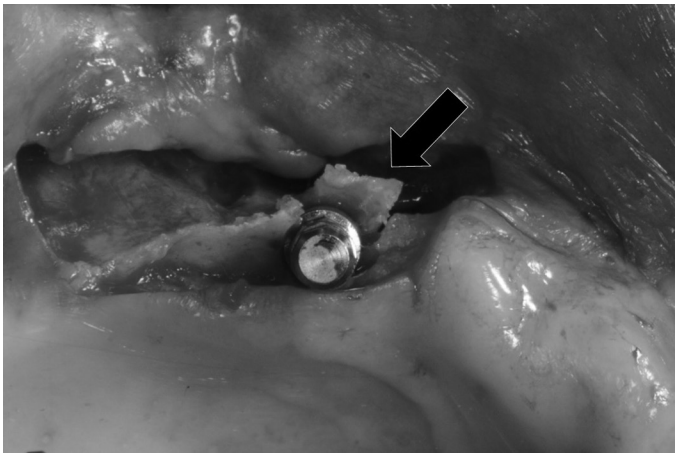
S. Bedoya*, D. Lao Rodriguez, F. Gilli, J. Kim, S. Cho, S. Froum, L. Palomo

Introduction: In fully edentulous maxillary arches, implant-supported fixed restorations are challenging due to severe bone resorption, particularly in elderly or medically compromised patients where invasive procedures like ridge or sinus augmentation may not be feasible. Optimal implant placement relies on precise planning, considering both clinical and radiographic data to ensure stability and effective load distribution. However, traditional implant positioning is often restricted by the anatomy of the maxillary sinus, particularly in posterior placements.

Method: This report introduces a novel technique that utilizes the thicker anterior wall of the maxillary sinus for implant placement. By leveraging this area, the technique aims to improve implant stability and accommodate patients who cannot undergo extensive augmentation procedures

Results: The technique demonstrated effective use of the anterior sinus wall to enhance implant stability in the maxilla, achieving favorable load distribution and minimizing leverage. This approach provided a viable alternative for patients with anatomical and medical limitations.

Conclusion: Utilizing the anterior wall of the maxillary sinus presents a promising solution for implant-supported restorations in fully edentulous maxillary arches, especially when traditional approaches are constrained by anatomical limitations. This technique offers enhanced stability and could benefit patients for whom invasive procedures are unsuitable.



P125

Effects of Maximal and Minimal Mouth Opening on Mandibular Flexure With Digital Scanning

K. Lim*, J. Kan, C. Goodacre, A.J. Al-Ardah, S. Limmeechokchai, B. Goodacre, J. Lozada

Introduction: Mandibular flexure during mouth opening can be a matter of considerable concern for prosthodontic, periodontal, and implant outcomes. Despite various methodologies employed to study mandibular flexure, there is a distinct shortage of research utilizing intraoral scanners for this purpose. The primary objective of this study is to address this gap by employing digital analysis to precisely determine the magnitude of mandibular flexure during mouth opening.

Method: A total of 70 dental students, including 35 males and 35 females meeting the inclusion criteria of a minimum mouth opening of 20 mm and maximum mouth opening equal to or greater than 50 mm, participated. Each subject underwent two impressions: one at maximum mouth opening (≧50 mm) and one at minimum mouth opening (20 mm). Scan data were exported as STL files and analyzed using a 3dimensional software. Linear and rotational deviations were calculated for specific tooth regions: mesial buccal, distal buccal, distal cusp tip, and halfway point of the mesial marginal ridge for first molars, and buccal cusp and halfway points of the distal and mesial marginal ridges for first premolars. These region deviations were averaged to establish mean values for first molars and first premolars. Dimensional differences between minimum and maximum mouth opening scans were assessed through repeated measures ANOVA, andGender-based deviation differences and deviation variances between first molars and premolars were assessed using an Independent Samples T-test. The significance level was set at $\alpha = 0.05$.

Results: First molars had significantly higher mean linear and rotational deviations than first premolars in both genders. Female subjects exhibited larger mean linear and rotational deviations in examined areas of first molars and first premolars, but these differences were not statistically significant. However, a statistically significant difference was observed in the datasets, with greater deviations occurring at maximum mouth opening.

Conclusion: First molars exhibited higher mean linear and rotational deviations than first premolars. There was a statistically significant difference between the datasets with greater deviations occurring at maximal opening. Larger mean linear and rotational deviations in all examined teeth were recorded for females subjects than males subjects. But the differences were not statistically significant.

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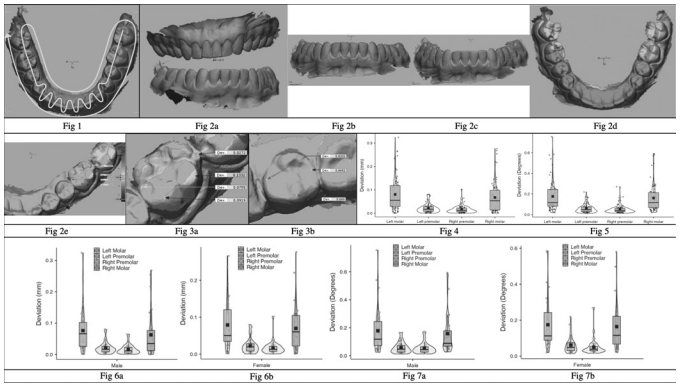


Fig 1 Schematic illustrations of the scan strategy
Fig 2a, 2b, 2c, 2d, 2e Evaluation flow chart of digitized models
Fig 3a, 3b Point Selection
Fig 4 Linear deviation for each tooth
Fig 5 Rotational deviation for each tooth
Fig 6a, 6b Linear deviation differences between male and female subjects
Fig 7a, 7b Rotational Deviation Differences between Male and Female subjects

P126

Patch Perfect: Innovative Epithelial Technique for Minimized Pain and Efficient Gingival Recession Treatment

S. Mojaver*, R. Neiva, H. Sarmiento, J. Fiorellini

Introduction: When it comes to gingival recession, connective tissue grafting (CTG) remains the gold standard for recession. This case report introduces a novel epithelial patch technique for harvesting a CTG from the palate aiming to enhance patient comfort. The subject was a 35-year-old male presenting with a Cairo RT1 recession defect extending beyond the mucogingival junction (MGJ) at mandibular canine (#22).

Method: Harvesting the patch involved dissection of the epithelial layer from the palatal mucosa prior to harvesting the underlying connective tissue. After the CTG was excised, the epithelial layer was repositioned over the donor site. This repositioning created an immovable barrier that facilitated healing, eliminating the need for conventional dressings or sutures. The graft was then positioned over the defect sites using the traditional tunneling technique and stabilized coronally using polyglycolon sutures. No medications were prescribed.

Results: At the 4-month postoperative evaluation, complete root coverage of the recession defect was achieved, accompanied by a significant increase in soft tissue thickness. The patient reported no postoperative pain and the recipient site showed notable improvement in gingival contour and tissue volume. The donor site healed without complications, as the epithelial patch effectively covered the area, eliminating the need for secondary intervention. No postoperative bleeding occurred, and at the two-week follow-up, the epithelial layer demonstrated granulation and integration with the underlying connective tissue.

Conclusion: The epithelial patch technique offers a promising, patient-centered approach for treating gingival recession. This method significantly reduces postoperative morbidity, ensures effective hemostasis, and yields excellent clinical outcomes in terms of root coverage.

P127

Stage Approach of Soft Tissue Management and Buccal Vestibular Deepening Around Dental Implants in a Patient With History of Iliac Graft and Amylogenesis Imperfecta

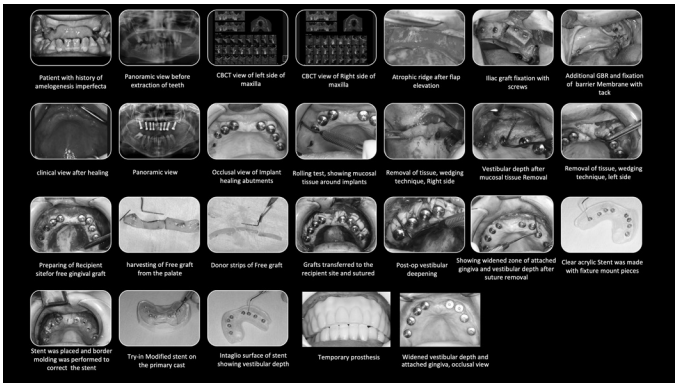
S. Mohseni Salehimonfared*, S. Farahani, R. Sharifi

Introduction: Effective management of soft tissue around dental implants is crucial for achieving satisfactory aesthetic and functional outcomes, particularly in patients with complex medical histories. This case presents the challenges of managing iliac grafting and amelogenesis imperfecta during dental rehabilitation, characterized by compromised tissue quality and volume, as well as difficulties in restoring adequate buccal vestibular depth to ensure implant stability and aesthetic results. A staged soft tissue approach is vital for long-term success in dental implant therapy.

Method: A 19-year-old female patient who had undergone iliac grafting presented to the Implantology Department for the second-stage surgery following the insertion of eight screw-shaped titanium fixtures in the maxilla. The clinical examination revealed a lack of keratinized tissue around the implants and a very shallow vestibule. During the second-stage surgery, a split-thickness labial flap was elevated, and three free gingival grafts were harvested and sutured into the recipient site. To establish vestibular depth and promote scar tissue formation, a custom-made acrylic stent was secured onto the implants using modified fixture mount pieces, which incorporated a metal disk and slots to facilitate proper tightening with a screwdriver.

Results: This approach successfully increased the area of attached gingiva, extended the vestibule, and avoided muscle reinsertion. Healing was satisfactory, with the implants demonstrating clinical stability and healthy surrounding soft tissues.

Conclusion: This technique not only enhanced the volume and contour of the soft tissues but also ensured adequate vestibular depth. The favorable results, which improved both aesthetics and function, highlight the importance of customized treatment strategies in challenging cases. This approach can serve as a valuable technique for clinicians managing similar patients, ultimately contributing to higher success rates in dental implant therapy.



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P128

Full-arch Reconstruction of Severely Atrophic Maxilla using One-piece Fixed Implant-supported Prosthesis: 10 Year Follow-up Outcome

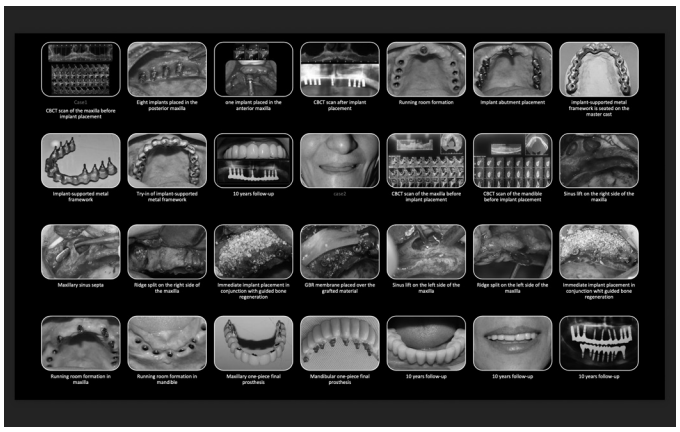
S. Mohseni Salehimonfared*, G. Soleymani

Introduction: The severely atrophic maxilla poses significant challenges in treatment planning for both dental professionals and patients. Full-arch implant- supported fixed prostheses represent a premier solution for edentulous patients, offering substantial improvements in facial aesthetics, masticatory function, and overall patient satisfaction. By placing implants into the remaining jawbone, a custom one-piece prosthesis can be created to mimic the function and appearance of natural teeth. However, the widespread use of this approach in clinical practice necessitates the demonstration of long-term success. This study presents long-term data on full-arch rehabilitation using one-piece fixed implant-supported prostheses in patients with severe maxillary atrophy, focusing on clinical efficacy and patient satisfaction over a ten-year follow-up period.

Method: Two patients with severely atrophic maxillae were evaluated for sinus lift procedures and implant placement through clinical and radiographic examinations. A lateral approach was employed in both cases to elevate the Schneiderian membrane and place bone graft material into the maxillary sinus. Primary stability was achieved by immediately placing dental implants following augmentation. In the patient with advanced resorption, a ridge splint was utilized, and guided bone regeneration (GBR) was performed using a resorbable membrane to create a one-piece prosthesis that restored both appearance and function. After satisfactory osseointegration (four months post-implantation), the prosthesis was seated, achieving optimal aesthetic and functional results.

Results: Both cases demonstrated successful osseointegration and resulted in satisfactory aesthetic outcomes. Soft tissue stability was maintained throughout the ten-year follow-up period, which is considered significant. Patients reported high levels of satisfaction with their prostheses.

Conclusion: This technique offers an appealing alternative for full-arch rehabilitation, characterized by a low complication rate and high patient satisfaction. One-piece fixed implant-supported prostheses exhibit excellent survival rates and long-term performance in patients with severely atrophic maxillae.



P129

Innovative Technique for Simultaneously Hard and Soft Tissue Augmentation With History of Implant Failure in the Esthetic Zone

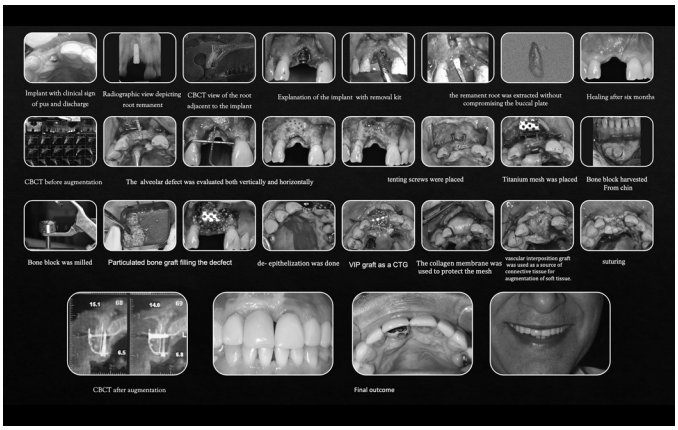
S. Mohseni Salehimonfared*, A. Mahdian

Introduction: In oral implantology, the quality and volume of alveolar bone in the implant area significantly influence implant positioning, primary stability, soft tissue contour, and overall restoration outcomes. Therefore, reconstructing the alveolar bone in the implant site is crucial for successful implant procedures.

Method: A patient presented with an implant exhibiting clinical signs of pus and discharge. Radiographic assessment revealed a remnant root as the underlying cause. After careful removal of both the implant and the root, titanium mesh was secured in place, and the defect was filled using a composite bone material (sausage technique). Following hard tissue augmentation, de-epithelization was performed using a wheel bur, and a vascular interposition graft was utilized to provide connective tissue for soft tissue augmentation. A collagen membrane was applied to protect the titanium mesh from exposure.

Results: The reconstruction of the alveolar defect was successful without any complications, resulting in a sufficient amount of keratinized gingiva in the buccal area. The patient expressed satisfaction with the final outcome.

Conclusion: Guided bone regeneration (GBR) technology proves to be a reliable and predictable approach for reconstructing alveolar ridge defects. Titanium mesh, due to its versatile application, suitable elasticity and plasticity, and excellent mechanical properties, effectively meets the bone augmentation needs in various clinical situations, distinguishing it from traditional GBR barrier membranes. The vascular interposition connective tissue graft (VIP-CTG) technique effectively enhanced soft tissue aesthetics in the anterior region.



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P130

The Combination of Block and Particulated Graft Harvesting by Trephine and Bone Collector for Lateral and Vertical Augmentation

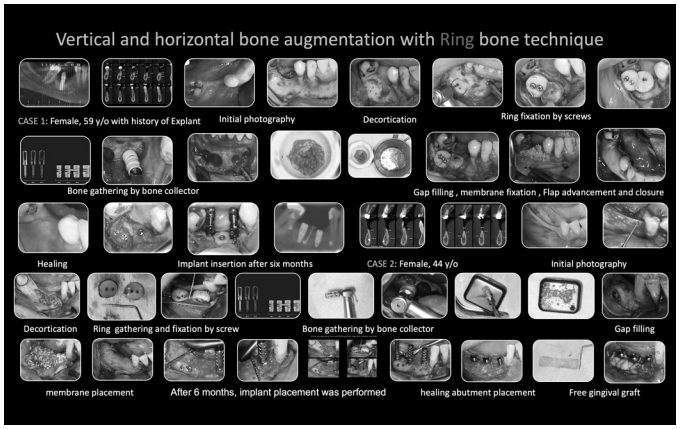
S. Mohseni Salehimonfared*, F. Pirzadeh

Introduction: After tooth extraction, the alveolar ridge undergoes significant changes in both quality and quantity, leading to alterations in its dimensions—both horizontally and vertically. These changes can compromise the predictability and feasibility of implant treatments. To address these challenges, it is essential to implement specific procedures prior to implant insertion to enhance success and survival rates, as well as improve functional, biological, and aesthetic outcomes. In this session, we present the use of autogenous ring augmentation as the gold standard bone substitute for alveolar reconstruction, in conjunction with particulate bone graft materials, to achieve adequate vertical and horizontal ridge dimensions before implant placement.

Method: Two patients with vertical, horizontal, or combined defects were treated in our department. Based on the defect's size and morphology, at least two ring block grafts were harvested using a trephine bur from the chin or ramus area. The harvested ring blocks were secured in place with screws. To reconstruct the alveolar defect both vertically and horizontally, additional particulate bone substitute was collected from the chin or ramus to fill the gaps between the blocks. An absorbable membrane was adapted at the reconstruction site, and the flap was closed. After approximately six months, implant placement was performed following a controlled drilling sequence and torque protocol.

Results: The use of autogenous ring grafts offers a multidimensional solution for addressing implant recipient area challenges. The ring block technique facilitates effective reconstruction of bony defects in both horizontal and vertical dimensions, often simultaneously. Accurate clinical examinations and radiographic assessments, particularly using precise cone-beam computed tomography (CBCT), are crucial for identifying the configuration and dimensions of bony defects, ultimately leading to an appropriate treatment plan for subsequent implant placement.

Conclusion: Alveolar ridge reconstruction prior to implant placement is a vital step for ensuring implant success. Innovative techniques, such as the ring block method, can yield multiple positive outcomes in implant treatment and enhance the long-term prognosis of dental implants.



P131

Immediate Implant-supported Interim Restoration: A Digital Workflow

S.W. Wang*

Introduction: An immediate interim restoration for an implant is essential for achieving optimal soft tissue contour, particularly in the esthetic zone. Traditional pick-up impression can be challenging in this context; however, by creating a digital pick-up guide, the process of fabricating an immediate implant-supported interim restoration becomes significantly more efficient and precise.

Method: A 48-year-old man presented to our clinic seeking an implant and fixed restoration for tooth #7. The patient expressed preference for an immediate implant-supported interim restoration. A CBCT and intraoral digital scan were obtained for treatment planning.

Results: A digital wax-up of the planned prothesis was created. Implant placement was performed using a 3D-printed tooth-supported surgical guide, following the manufacturer's protocol. The primary stability was achieved with an insertion torque of 45 Ncm. Prior to the surgery, a 3D-printed pick-up guide was fabricated to transfer the implant position onto a prefabricated digital cast, with #7 implant site hollowed out. A positioning stent was made to stabilize the interim restoration in place. The 3D-printed crown shell was placed within the stent and relined with the precisely positioned interim abutment, ensuring an accurate fit and optimal positioning of the restoration. The screw-retained interim restoration was trimmed, adjusted and thoroughly polished. It was tried intraorally. Adjustments were made as needed to ensure optimal fit and function. The surgical flap was carefully repositioned and sutured to achieve primary closure.

Conclusion: This technique provides an accurate and efficient method for fabricating immediate implant-supported interim restorations. It minimizes direct contact with surgically exposed hard and soft tissues, thereby reducing the risk of complications and shortening clinical chair time.

P132

Vertical Ridge Augmentation in Severely Atrophic Anterior Mandible

S. Koga*

Introduction: Achieving esthetic and functional success in implant dentistry is particularly challenging with vertical bone defects exceeding 5 mm. The primary methods to address vertical alveolar ridge deficiencies include guided bone regeneration (GBR), bone grafting, alveolar distraction, and interpositional osteotomy. Among these, GBR is widely used for vertical augmentations of 5 mm or more, often involving nonabsorbable membranes. When performed without complications like infection or wound dehiscence, GBR can yield substantial hard tissue regeneration. However, in severe defects greater than 7 mm or with dense scar tissue, non-vascularized options such as autogenous grafts and GBR may face limitations, including a higher likelihood of postoperative complications. In such cases, alveolar distraction and interpositional osteotomy present effective alternatives.

Method: We describe a clinical case involving a 57-year-old man with significant anterior mandibular atrophy due to periodontal disease, referred to our clinic for implant-supported dental rehabilitation. Bone augmentation was achieved using an interpositional osteotomy with focus on surgical technique and novel instrumentation. The transport segment was vertically and horizontally mobilized, yielding an 8-9 mm increase in ridge height. Graft material was inserted between the transport segment and the basal bone, secured with microplates to ensure stability. The augmentation was completed without complications, allowing for implant placement 9 months postoperatively.

Results: At the 2-year follow-up, the patient exhibited stable ridge height with no signs of bone resorption, and the implants remained functional and esthetically pleasing.

Conclusion: This case illustrates that interpositional osteotomy offers a reliable and effective approach for vertical ridge augmentation in the severely atrophic anterior mandible, particularly when traditional grafting methods are insufficient.

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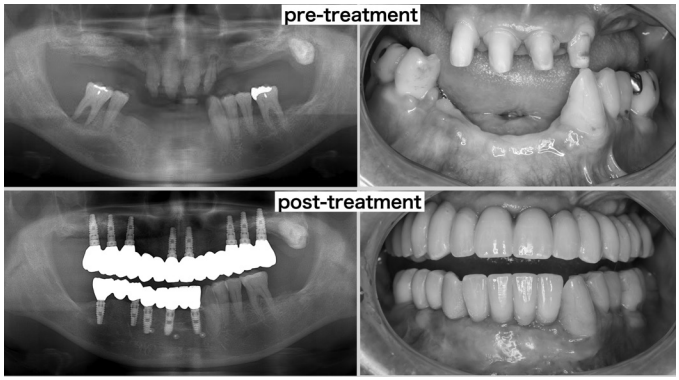

P133
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P134
Semilunar Lingualized Apically Positioned Flap (SLAP) for Peri-implant Soft Tissue Phenotype Modification Therapy at the Time of Implants Placement: A Case Report

S. Arboleda*, A. Saqr, S. Min

Introduction: Phenotype modification therapy aims to increase peri-implant mucosal thickness and the amount of keratinized mucosa, thereby promoting improved long-term clinical outcomes for dental implants.

Method: A 52-year-old Asian male with non-contributory medical history presented to the Graduate Periodontics Clinic with missing #24 and #25 and desires to restore his edentulous space with a fixed restoration. Upon clinical examination, horizontal and vertical ridge deficiencies in edentulous space #24 and #25 were observed. Teeth #23 and #26 were considered hopeless and indicated for extraction. However, a combination of hard and soft tissue grafting was required to properly develop the site for future implant placement.

Results: Teeth #32 and $42 were extracted without grafting to allow for increased keratinized tissue. Four weeks after extractions, guided bone regeneration (GBR) was performed. After 6 months, a new CBCT revealed improved vertical and horizontal dimensions for an implant supported FPD 26x24x. However, to obtain primary closure for the GBR, the lingual alveolar mucosal tissue was coronally advanced thus resulting in a high lingual frenum attachment, minimal keratinized tissue and thin mucosal in the desired implant positions. In order to address the mucogingival deformities and partial edentulism, the treatment plan included implants placement at #26 and 24 with simultaneous SLAP and buccal periosteal tunneled connective tissue graft (CTG). After 4 months, the patient received the final restoration and there was an increased in keratinized mucosa ~2 mm on buccal and lingual and increased peri-implant mucosal thickness around both implants. The prevention and management of soft tissue complications around dental implants is essential to prevent adverse outcomes in implant dentistry.

Conclusion: The SLAP technique, combined with a subperiosteal tunnel CTG, presents an effective solution for simultaneously increasing peri-implant keratinized mucosa and mucosal thickness circumferentially. This case report is the first to showcase the application of the minimally invasive SLAP technique, highlighting its predictability and efficacy in optimizing peri-implant mucosal phenotype during implant placement.

P135
Periosteoplasty Flap for Vertical Ridge Augmentation in Soft and Hard Tissue Complexities Within the Esthetic Zone: A One Year Case Report

H. Ting*

Introduction: Vertical ridge augmentation is a well-established protocol for addressing ridge deficiencies in the esthetic zone, yet challenges arise when periodontal compromise impacts neighboring teeth around the augmentation site. This study presents a one-year follow-up on the application of the Periosteoplasty Flap (Fig. 1a), a technique designed to address the challenges posed by both native periosteum and scarred periosteum (Fig. 1b-c) during vertical ridge augmentation and primary closure in the upper anterior esthetic zone.

Method: The case involved a patient with a compromised maxillary right central incisor. Preoperative periapical imaging revealed papilla bone loss around the tooth (Fig. 1a-b). Following extraction, a four-week healing period allowed soft tissue recovery (Fig. 1c-d). Vertical ridge augmentation began with a full-thickness flap extending one tooth beyond the surgical site. After degranulation and decontamination, the native periosteum was partially released from the buccal flap, inverted over the crest, and secured beneath the palatal flap using a suspended suture, enhancing primary closure and increasing supracrestal soft tissue thickness (Fig. 2a-c). FDBA and an absorbable collagen membrane were applied, achieving stable healing (Fig. 2d). After six months, a guided implant was placed. The scarred periosteum was again released, inverted, and secured to support closure and augment soft tissue (Fig. 3a-c). FDBA and a mini-sausage collagen membrane technique stabilized the GBR site with uneventful healing (Fig. 3d). Four months later, ridge height was assessed and confirmed. A connective tissue platform with a deepithelialized gingival graft enhanced keratinized mucosa (Fig. 5a-b). After four weeks, a modified apically positioned flap expressed keratinized mucosa, achieving optimal vestibuloplasty and papilla fullness for the final crown (Fig. 5c-d).

Results: The implant was followed for one year post-placement (Fig. 6a-b). No signs of inflammation were observed in the peri-implant tissue, with shallow probing depths, and an approximate 2-3 mm increase in papilla bone height.

Conclusion: The Periosteoplasty Flap technique appears to be a promising approach for managing papilla loss around implants in the esthetic zone, successfully maintaining peri-implant health and esthetic papilla height over a one-year period.

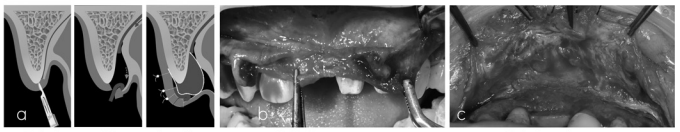

Fig.1a Concept of Periosteoplasty Flap Fig.1b Native periosteum Fig.1c Scarred periosteum

P136
Full-arch Implant Treatment for Maxilla With Insufficient Bone Volume for a Stable Long-Term Prognosis

T. Matsunaga*, M. Arakawa, K. Egashira, H. Kido

Introduction: In recent years, fixed implant treatment for full arch cases has become stable due to the development of digital implant treatment and the use of zirconia materials. However, clear guidelines regarding the number and position of implant bodies, the design of the superstructure, etc. have not been provided. We report an attempt to stable the long-term prognosis by performing implant inclination placement, GBR bone grafting, and precise guided surgery in a case with a significant minimum bone volume.

Method: The patient was a 62 years old Female with a completely edentulous upper jaw, natural teeth affected by periodontal disease in the mandible, and peri-implantitis was observed on the implants in the right side molars. The amount of bone in the anterior maxilla was minimal, and no bone amount was observed in the molars up to the maxillary sinus. Precise guided surgery was performed by the shortest implant placement in the anterior region and the tilting implant placement in the molar region.

Results: After osseointegration of the implant was achieved, the morphology and occlusion of the final superstructure were explored in provisional restoration(Fig. 1). The final superstructure was delivered with zirconia screw retaining to provide functionality and esthetics. Full-arch implant treatment for cases with insufficient bone volume is often limited in the number and position of implants that can be placed. Inappropriate implant placement may induce complications and pose a problem in long-term prognosis.

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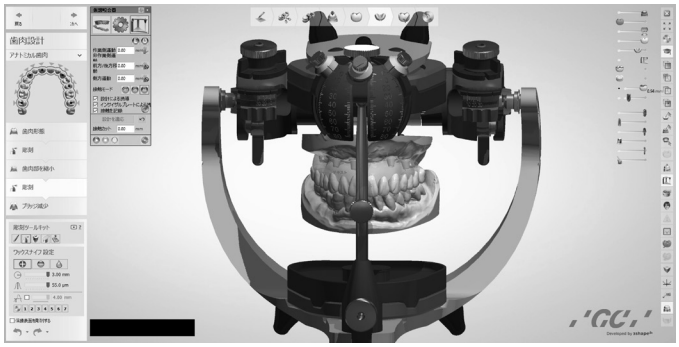
Conclusion: In this case, we were able to create a highly accurate superstructure using guided surgery based on accurate computer simulation and a zirconia superstructure. We report the details of the surgical techniques and prosthetic treatment used to stabilize the long-term prognosis.



P137

GBR: A Partially Decalcified Approach

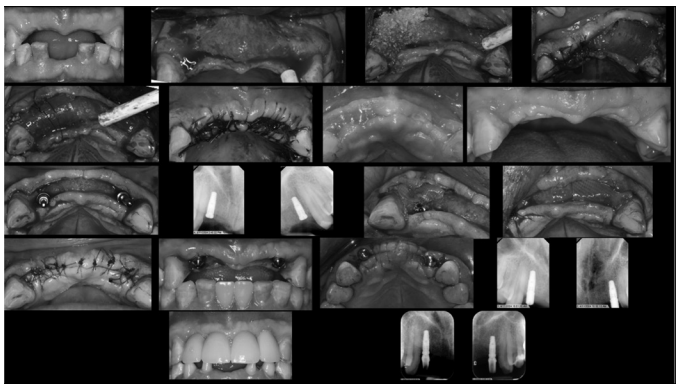
T. Rogoszinski*, K. Changa, L. Galiano

Introduction: Guided Bone Regeneration is essential in implant dentistry when bone loss hinders implant placement. This case report discusses a 55 year old male with a history of diabetes, hypertension, and hyperlipidemia seeking dental implants in the anterior maxilla. Radiographic evaluation revealed insufficient buccal bone at sites #7 and 10, requiring GBR before implant placement. A partially decalcified bony plate of 1mm thickness was used to stabilize the graft, facilitating bone regeneration and successful implant placement.

Method: The treatment plan aimed to restore buccal bone at sites #7 and #10 for anterior implants. A full-thickness flap was elevated, followed by decortication. 2 CC of mixed DFDBA/FDBA allograft were hydrated with rhPDGF-BB and placed. A 1mm partially decalcified bony plate was secured with 4-0 resorbable sutures, and the area closed with 5-0 resorbable sutures. The patient wore a provisional flipper during healing. Three months later, implants were placed at #7 (4/3 x 13mm) and #10 (4/3 x 11.5mm) with primary stability at 35 Ncm. An additional 1.0 cc of DFDBA allograft was applied to address a minor buccal deficiency and covered with a collagen membrane. Primary closure was achieved, and healing abutments were placed after three months of healing.

Results: GBR procedure successfully regenerated buccal bone at sites #7 and #10. Initial healing was uneventful, with no complications such as graft exposure or infection. After three months, sufficient bone volume supported implant placement, with both implants torqued to 35 Ncm, indicating excellent stability. The minor buccal deficiency was corrected during implant placement using additional graft material, improving bone contour and volume. The partially decalcified bony plate stabilized the graft effectively, promoting consistent bone regeneration. Soft tissue healing was ideal, and no signs of peri-implant complications were noted at uncovering. Healing abutments were placed without issues, and the final restoration with a fixed anterior bridge was successful. The patient reported satisfaction with both function and aesthetics, and stable occlusion was maintained.

Conclusion: This case demonstrates that GBR using a partially decalcified bony plate is an effective method for addressing buccal bone deficiencies before implant placement. The regenerative techniques provided stable outcomes, ensuring both functional and aesthetic success for long-term implant stability.



P138

Nanostructured Magnesium-coated Acid-etched Titanium Implant Surface for Enhancement of Both Osteoblast-like Cells and Fibroblast Cells Responses

T.Y. Linn*, E. Salamanca, Y. Sun, W.J. Chang

Introduction: Role of dental implant surface modification plays pivotal role in the enhancement of fixation between bone and implant surface. Magnesium (Mg) exhibits synergistic interactions with initial cellular processes of bone formation, thereby facilitating early osseointegration and promoting osteoblastic differentiation. Leveraging the simplicity, environmental friendliness, cost-effectiveness, and scalability of hydrothermal treatment, Mg precipitation onto nanostructured roughened titanium surfaces has been pursued to augment bioactivity. The purpose of this study is to enhance the bioactivity of the nanostructured magnesium-coated surface of acid-etched titanium implants including the osteoblastic cells like behavior and fibroblast responses.

Method: Mg ions were deposited onto microlevel roughened acid-etched titanium surfaces using four distinct concentrations of magnesium acetate solutions via the hydrothermal method, with treatment durations of 3 hours and 6 hours. Subsequently, the physical properties and biological responses of the magnesium-coated surface were examined to discern enhancements in its characteristics.

Results: Porous structured titanium surface exhibited a layer of magnesium coating characterized by a muddy pattern interspersed with rod-shaped nanostructures (0.1~0.3mm). The surface of 3 h treated Mg coated samples had more rutile TiO2 than 6 h samples. Both acid-etched and magnesium-coated samples displayed higher surface roughness values compared to the control group. Additionally, hydrophilicity properties were enhanced following magnesium coating. Cellular responses of osteoblast like cells to the modified surface demonstrated increased proliferation in the higher Mg concentration. Cells differentiation rate was significantly increased, and cells mineralization displayed high calcium deposition on the Mg coated surface than the acid etched sample. Furthermore, immunofluorescent analysis revealed relatively robust responses on focal adhesion of osteoblasts like cells and gingival fibroblast cells.

Conclusion: The modified nanostructured magnesium-coated titanium surface exhibited superior physical properties and enhanced bioactivities. Consequently, magnesium emerges as a promising candidate for use as a coating ion in dental implant materials.

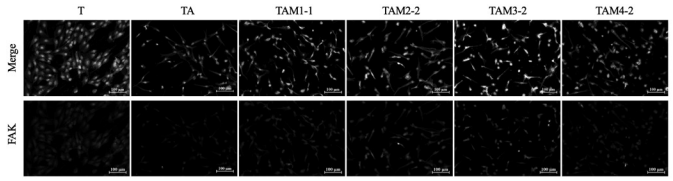


Figure. MG 63 Focal cell adhesion analysis by using the immunofluorescence staining (red: FAK, green: actin, blue: nuclei)

MG63 focal cell adhesion analysis by immunofluorescence staining method

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P139

Mucosal Cyst Aspiration With Maxillary Sinus Elevation: A Case Report

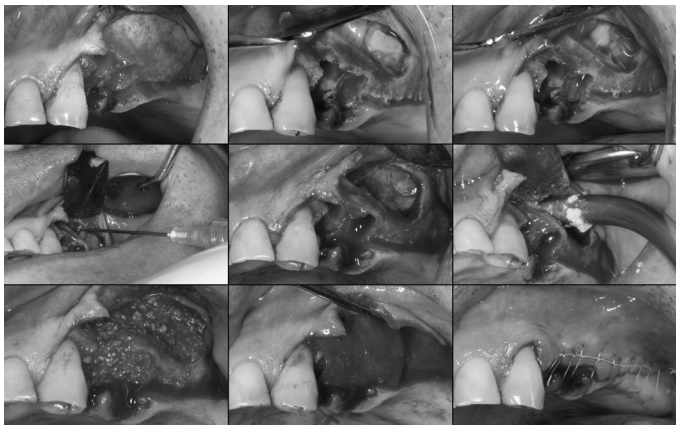
T. Chang*, H. Moroi

Introduction: Maxillary sinus elevation via a lateral approach is a reliable procedure for implant site development. However, the presence of sinus pathology, occurring in 45.1% of cases, introduces significant risks. Mucosal retention cysts are common sinus pathology that often complicate this procedure and may necessitate prior surgical removal if large. While cyst aspiration may be an approach to address mucosal retention cysts, studies on its effectiveness during concurrent sinus elevation are limited. The aim of this study is to present a complex sinus elevation surgery incorporating concurrent mucosal cyst aspiration to address the challenges posed by sinus pathology.

Method: A 63-year-old male with no contraindicating medical history was referred for the extraction of residual roots (#12 and #13) and subsequent implant placement at sites #12 and #13. Radiographic examination revealed a 20x30 mm mucosal retention cyst in the maxillary left sinus. The treatment plan included maxillary sinus elevation with cyst aspiration, extraction of residual roots, and ridge preservation. Pre-operative consultation with an otolaryngologist was conducted. Under local anesthesia, teeth #12 and #13 were extracted, and a full-thickness flap was raised. A lateral window was created using a piezo instrument, and the sinus membrane was carefully detached. The mucosal cyst was perforated for aspiration, and a collagen membrane was placed to protect the sinus membrane. The elevated sinus area and extraction sites were grafted with a 1:1 ratio of allograft and xenograft. Primary closure was achieved, and healing proceeded uneventfully. Implants were placed 8 months later.

Results: Follow-up CBCT at 8 months post-operation demonstrated a substantial decrease in the size of the mucosal cyst, with a thickened membrane lining observed. This did not impact implant planning or placement. A vertical bone gain of 10 mm was achieved. The implants were successfully placed with stability >35 N, and the implant bridge was delivered 4 months later. Follow-up radiographs indicated minimal bone remodeling.

Conclusion: Concurrent cyst aspiration with sinus elevation can effectively manage large mucosal retention cysts when supported by meticulous preoperative planning, comprehensive medical consultation, and detailed risk assessment.



P140

A Novel Approach for Implant Placement With Simultaneous Rolled Flap Technique

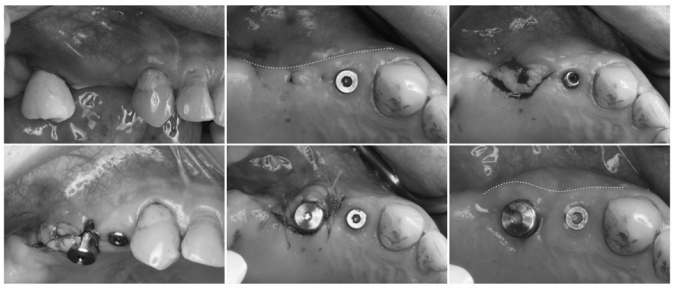
T. Chang*, H. Moroi

Introduction: The presence of sufficient keratinized mucosa around an implant is paramount for peri-implant health. When limited keratinized mucosa is present at a planned maxillary implant site, treatment options may include an apically positioned flap, pedicle flap, or free gingival graft. In this case report, we aim to present a novel approach for implant placement using a simultaneous rolled flap technique that is more minimally invasive compared to conventional methods.

Method: A 52-year-old male with no contraindicating medical history was referred for implant placement at site #4. Clinical examination revealed that #5 had a previously placed implant with a healing abutment, while site #4 exhibited minimal keratinized tissue. Under local anesthesia, a precision drill was used flapless to verify the accurate implant site. A semilunar incision was then performed, and a small flap was raised. The implant was placed using sequential drilling, and a healing abutment was inserted. The flap was subsequently de-epithelized and rolled beneath the buccal area. Primary closure was achieved through suturing.

Results: Healing proceeded uneventfully, and the patient reported minimal discomfort during the healing period. Follow-up clinical photographs demonstrated an increased band of keratinized tissue around the buccal aspect of the #4 implant.

Conclusion: This technique incorporates a flapless landmark drill, which enables an accurate incision and the creation of a precise rolled flap, resulting in increased keratinized tissue width and thickness with primary closure. This minimally invasive approach may serve as an optimal solution when keratinized tissue is limited preoperatively.



P141

Influence of Operator Expertise and Scan Body Design on the Accuracy and Efficiency of Intraoral Implant Scans

T. Roozbehi*, H. Kapoor

Introduction: The primary objective of this poster is to determine if operator experience and implant scan body design influence file size, time, and accuracy of an intraoral implant scan.

Method: This study examines how operator experience influences the speed and number of images in intraoral scans. Operators with different experience levels (novice <10 scans, intermediate <100 scans, expert >100 scans) will scan customized mandibular typodonts with multi-unit implant analogs, each fitted with distinct scan bodies (Atlantis, Dess, Nobel Biocare). Each operator will conduct three scans per scan body type, totaling nine scans. Scanning times and image counts will be recorded. Using Geomagic Control X, scan accuracy will be evaluated against a reference scan for trueness and precision. Statistical software will analyze data for significance.

Results: Pending

Conclusion: Pending

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P142

Implant Placement in Bone Defect With Ridge Split Technique and Guided Bone Regeneration

T.A. Villela*

Introduction: The ridge split technique aims to create a space by dividing the bone crest into two parts with a longitudinal greenstick fracture, allowing the immediate insertion and stabilization of the implants in the most apical unfractured portion of the bone ridge. This region of intact apical bone should allow for a preparation of at least 3 to 4 mm depth to obtain primary stability during implant insertion.

Method: A 47-year-old female patient in apparently good general condition went to the implantology clinic in the postgraduate department at the requiring the placement of two implants in the lower jaw. In the intraoral examination, the absence of dental organs (45,46) and a combined horizontal and vertical defect were observed. In the tomographic planning, the dental nerve was observed very close to the bone crest, so it was decided to use a short implant 7.4 mm (neobiotech) and to augment with the ridge split technique with the ESSET KIT from OSSTEN. the surgical procedure was performed under local anesthesia. [TV1] A crestal incision was made with a full thickness flap, with a diamond drill, a marking guide was placed to position the 2.0 mm Linderman marking drill. Once the position of the implants had been marked, a diamond drill was used to create a plateau, once the plateau was made, a marking guide was placed to have a reference of where the implants would be, with a 0.5 mm diamond disc it was used to create a crestal groove to cross the cortical bone and allowed access for the implants. Expanders Once the cortex has expanded, the implants are placed in the desired position, thus achieving a torque of 37 N, guided bone regeneration is performed with allograft and the pericardium membrane is fixed with tacks. simple stitches and a mattress were used.

Results: no postoperative complications were observed. the results obtained with the ridge split technique it will be measured with cone bean tomography marking the width gained in 1 month, 3 months and 6 months.

Conclusion: In conclusion, the appropriate selection of the case for the application of this technique is recommended, considering the morphology of the ridge and bone density. Adequate tissue management is also suggested.

P143

Zygomatic Implants for Nasal Prosthesis: A Case Report

U.K. Lee*, A. Agahi, J. Costandi

Introduction: Implants have significantly improved stability of maxillofacial prosthetics particularly in total rhinectomy cases. However, challenges persist regarding the placement and effectiveness of these fixtures due to differences in bone availability and viability. While the application of dental implants for securing nasal prostheses is well-established, the use of zygomatic implants in irradiated patients are less frequently documented in the literature. Oral maxillofacial surgeons (OMFS) and maxillofacial prosthodontists (MP) may work together to assist in nasal prosthetic rehabilitation. Zygomatic implants have demonstrated success in the nasofacial area for nasal prosthetics. Computed tomography guided navigation (CTGN) may aid in navigating important anatomical structures and accurate implant placements in the zygoma.

Method: A 52-year-old male with history of T2N0M0 Stage II nasal squamous cell carcinoma treated with total rhinectomy and chemoradiation therapy, which concluded in 2017 without recurrence, presented to OMFS and MP teams for nasal reconstruction. Prior prosthetic trials were unsuccessful due to poor stability. In 2017, his premaxilla/nasal floor received 60-40Gy and bilateral zygomas received 20Gy. His radiation exposure limited his options for reconstruction. Zygomatic implant placement with CTGN for nasal prosthesis retention was elected for treatment. Virtual surgical planning (VSP) with preoperative CBCT scan was employed to guide pilot holes; ensuring for adequate clearance and at least 7mm of inter-implant spacing. Files from the VSP were then utilized for CTGN. Once pilot holes were placed and guides removed, the surgical drill was calibrated to the CTGN system and implant sites were prepared in sequence with the elected implant system. A 4.0 x 45mm zygomatic implant torqued at 40 Ncm and a 4.0 x 40mm zygomatic implant torqued at 70 Ncm were placed on the right and left zygomas respectively. The MP then connected the 2 implants with the use of titanium cylinders and self-curing resin. Postoperative CBCT scan showed proper placement of implants.

Results: The implants were followed at 1- week and 1-month after placement. Patient is currently awaiting osseointegration prior to fabrication of the nasal prosthesis by the MP.

Conclusion: Zygomatic implant placement with CTGN in patients exposed to maxillary radiation after total rhinectomy for malignancy appear to be promising in delivering a stable nasal prosthesis.

CBCT 3D post-operative frontal view showing zygomatic implants in place.

P144

Immediate Provisionalization as a Form for Soft and Hard Tissues Stabilization in Single Implants in the Eesthetic Zone

V. Zamora Alpizar*, M. Rodriguez Tizcareño, G. Sifuentes, V. Garcia Lee

Introduction: Dental implants are considered the choice of treatment for single tooth loss, in such cases, there is bone remodeling leading to a decrease in height and width of the alveolar process. Consequently, the surrounding soft tissues collapse and reduce. However, using the technique of immediate provisionalization, which involves the connection of the interim restoration at the same moment of the implant insertion, there is a better stabilization of the hard and soft tissues, avoiding a greater collapse during the osseointegration period. In addition, with this technique, high patient satisfaction rates are reported.

Method: Three patients received a single tooth implant in the anterior maxilla with immediate provisionalization. Using CBCT and IOS, the vertical and horizontal dimensional changes of soft and hard tissues after the placement of the implant were evaluated; as well the aesthetic parameters using the PES/WES and patient satisfaction with the PIDAQ survey.

Results: Soft and hard tissue measurements will be analyzed three months after the implant insertion and after the definite restoration delivery. Crestal bone loss and vestibular plate are measured using CBCT. The soft tissue dimensions are estimated in two aspects: in the interproximal area evaluating the presence or absence of papilla and the level of the midfacial mucosa. With the interposition of IOS, measurements improved in accuracy because the location of the structures are identified easily in multiple scans. Assessment with the PES/WES showed the esthetic outcomes with positive scores.

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Conclusion: Immediate provisionalization is a functional technique that helps maintain and stabilize peri-implant soft and hard tissue during osteointegration period. CBCT and IOS facilitate the establishment of more exact measurements to compare the position of the peri implant tissues along the treatment.

P145

The Effect of Implant Vertical Position on Crestal Bone Loss of Adjacent Teeth

V.M. Li*, C.C. Chen, H.H. Chen, G.H. Lin, Y. Yeh

Introduction: Dental implants placed at a deep apico-coronal position relative to the cementoenamel junction of adjacent teeth have been associated with an increased risk of peri-implant bone loss. However, limited research has explored how implant vertical position affects the bone level of the adjacent teeth. This retrospective study aimed to investigate the effect of implant vertical position on crestal bone loss of adjacent teeth.

Method: The dental records of patients at the University of California, San Francisco Dental Center who had received at least one implant were reviewed. To be included in the analysis, implants had to be functionally loaded for at least one year after crown insertion with clear, non-distorted radiographs. Radiographic analysis was performed to assess the vertical position of the implant platform relative to the crestal bone level of implants and adjacent teeth at the time of placement and during follow-up visits, as well as the contours of the prosthesis. Crestal bone loss at different subcrestal implant positions, in relation to the mesial and distal sites of adjacent teeth and implants was calculated.

Results: A total of 96 patients with 117 implants were included, with an average follow-up period of 41.73 months. Results showed significant crestal bone loss on adjacent teeth when the implant platforms were placed at a subcrestal position of ≥ 2 mm compared to those placed at < 2 mm (0.50 ± 0.65 mm vs. 0.10 ± 0.34 mm, P < 0.05). There was no significant difference in crestal bone loss between the mesial and distal adjacent teeth (P=0.35). However, more crestal bone loss was observed on the mesial teeth (0.55 ± 0.68 mm vs. 0.07 ± 0.30 mm, P < 0.05) and the distal side of the implants (0.78 ± 1.06 mm vs. 0.27 ± 0.46 mm, P < 0.05) when comparing subcrestal positions of ≥ 2 mm to those < 2 mm. Linear regression analysis indicated that a greater subcrestal vertical depth of implant platforms was associated with greater crestal bone loss on adjacent teeth (P < 0.05). No significant influence of the platform vertical depth on the peri-implant bone level (P = 0.51).

Conclusion: The present study demonstrated that implant placement more than 2 mm subcrestally, relative to the crestal bone level of adjacent teeth, was associated with crestal bone loss on adjacent teeth. This suggests that clinicians should avoid placing implants too subcrestally to prevent adverse outcomes.

Sites		Subcrestal Position		
		<2 mm	≥2 mm	P value
Adjacent Teeth	Both	0.10 ± 0.34	0.50 ± 0.65	P < 0.05
	Mesial	0.07 ± 0.30	0.55 ± 0.68	P < 0.05
	Distal	0.15 ± 0.38	0.39 ± 0.58	P = 0.06
Implants	Both	0.28 ± 0.53	0.36 ± 0.72	P = 0.41
	Mesial	0.29 ± 0.58	0.18 ± 0.42	P = 0.34
	Distal	0.27 ± 0.46	0.78 ± 1.06	P < 0.05

Table: Bone loss at <2 or ≥2 mm subcrestal implant platform positions in relation to the mesial and distal sites of adjacent teeth and implants

P146

Assessment of Guided Lateral Maxillary Sinus Lift Procedure With Simultaneous Implant Placement Using Stereolithographic Surgical Guide. A Randomized Control Study

W.A. Hussein*, A.M. Elrawdy, A.A. Younis, M.A. ElSholkamy

Introduction: The goal of this study is to evaluate the efficacy of the stereolithographic surgical guide in reducing intraoperative and postoperative complication during lateral sinus lift operation. Mandelaris and Rosenfeld (2008) were the first to manufacture three-dimensional printed surgical guides for outlining the lateral windows. The technique was modified using various implant planning software to enhance its effectiveness.

Method: The study design was interventional prospective randomized clinical trials. The individual implant location serves as the analysis and randomization unit. The study was a double blinded study, both the outcome assessor and statistician were blinded. Using random.org, implant sites were assigned at random to each of the two groups. Group 1 (Study Group): Fifteen implants were placed in posterior edentulous maxillary areas through a lateral window utilizing a stereolithographic surgical guide. Group 2 (Control group): In posterior edentulous maxillary areas, 15 implants were placed through a lateral window using a traditional, freehand method.

Results: There was no statistically significant difference between either group regarding intraoperative or postoperative complications. Regarding pain scores, after one day, there was no statistically significant difference between the two groups (P-value = 0.114, Effect size = 0.576). While after two days, study group showed statistically significantly lower pain score than control group (P-value = 0.0121, Effect size = 1) Furthermore, the study group showed statistically significantly higher prevalence of moderate and severe edema than control group which showed higher prevalence of mild edema.

Conclusion: According to current study it has been concluded that there was no remarkable difference between the outcomes of both methods.

P147

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P148

Comparison of Accuracy in Robotic Computer-Assisted Implant Surgery Across Varying Bone Inclinations: A Retrospective Study

W. Song*

Introduction: Robotic computer-assisted implant surgery (r-CAIS) has become widely used in clinical practice. During these procedures, drilling instruments may deviate from the planned trajectory due to bone inclinations, resulting in misalignment of the dental implant position. This study evaluates the accuracy of implant placement in r-CAIS across different bone inclinations.

Method: A retrospective design was used for this study. Preoperative CBCT scans were imported into implant planning software to determine the optimal implant positions and measure the bone inclinations. Bone inclination, defined as the complement of the angle between the planned implant central axis and the plane of maximum bone surface slope along this axis, was categorized into three groups: 0-20°, 20-45°, and 45-90°. Maxillary bone matching was used to calculate coronal, apical, and angular deviations between the planned and placed implants. A generalized linear mixed model (GLMM) was employed for statistical analysis, with significance set at $p < 0.05$.

Results: This study included 59 patients and 107 implants, all placed by a single surgeon. The mean deviations were 0.65 ± 0.35 mm for coronal, 0.73 ± 0.38 mm for apical, and 1.66 ± 0.10 degrees for angular positions. Generalized linear mixed model (GLMM) analysis indicated that implant location, diameter, and bone inclination influenced coronal deviation ($p < 0.1$). Specifically, bone inclinations greater than 45° were identified as significant risk factors for coronal accuracy ($p < 0.05$). For apical deviation, bone inclination significantly affected accuracy, with improvements noted when inclination was less than 20° ($p > 0.05$). In terms of angular deviation, univariate screening revealed age, implant length, and bone inclination as influencing factors. The multivariate GLMM analysis showed that in patients over 60 years, angular deviation significantly increased ($p < 0.05$), and inclinations over 20° also resulted in notable increases in angular deviation ($p < 0.05$).

Conclusion: Bone inclination significantly affects the accuracy of dental implants in r-CAIS, particularly regarding apical and angular deviations. Specifically, a bone inclination of less than 20° acts as a protective factor for the accuracy of implant placement.

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P149

Use of a Flex Constant to Monitor Implant Stability in a Porcine Model

W. Xu*, Y.W. Chen, K.J. Nagatomo, G. Porter, I.S. Scher, S.I. Shen

Introduction: This research study aims to evaluate the feasibility of using flex constants (displacement over force) to monitor implant stability. The goal is to identify a physical quantity (e.g., flex constant) in lieu of an artificial index (e.g., implant stability quotient, aka ISQ) to indicate implant stability.

Method: The feasibility study was carried out via a porcine model in a frozen and a thawed state, wherein mechanical and stability properties were dramatically varied by the temperature. A dental implant was placed in the porcine model adjacent to the last molar. A flex constant, measured via a locator abutment, was compared with a measured ISQ to establish the feasibility.

Results: In general, the flex constant and the ISQ both were able to reflect the trend of the implant stability as the porcine mandible thawed. When the porcine mandible was frozen, the ISQ measurements were approximately 88-89 indicating extremely high implant stability. As the porcine mandible thawed, the ISQ dropped steadily for 20-30 minutes and eventually reached a stable value of 66. Obviously, properties of the bone near the implant had changed during the thawing process, thus reducing the stability of the implant. In contrast, the flex constant was around 0.4-0.5 when the porcine mandible was frozen. As the porcine mandible thawed, the flex constant steadily increased for 20-30 minutes, and reached a steady state of 1-1.4 when around 30-40 minutes. There are several observations worth mention. First, the increase of the flex constant means larger displacement per unit force applied, thus indicating a lower stability. This is consistent with the ISQ measurements. Second, both ISQ and flex constant reached its respective steady state around 30 minutes under the same thawing process. Lastly, a spike in the flex constant measurement was observed when transitioning from the steady increase to the steady state. The spike most likely resulted from a mismatch of the coefficient of thermal expansion (CTE) of various components comprising the sensor that measured the flex constant.

Conclusion: The measured results in this study suggest that both flex constant and ISQ are sensitive enough to detect changes of bone properties. The flex constant is a physical quantity, while ISQ is an artificial index.

P150

Suggested Mesiodistal Distance for Multiple Implant Placement Based on the Natural Tooth Crown Dimension

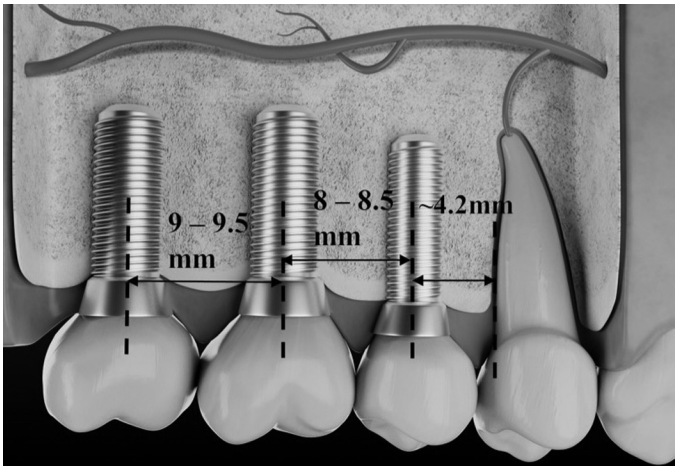
W. Liu*, L. Han, H.L. Wang

Introduction: The mesiodistal distance in implant placement is crucial for achieving optimal prosthetic outcomes and a healthy soft tissue profile. In posterior edentulous cases, factors influencing the appropriate size and spacing of dental implants can be multifactorial. This study aims to establish a mesiodistal algorithm for multiple posterior implant placements, providing a measurable criterion to predict implant prognosis based on mesiodistal spacing.

Method: A total of 101 cases with posterior edentulous arches were selected for digital crown fabrication, with measurements taken using cone beam computed tomography (CBCT) and digital software. The mesiodistal space between adjacent tooth roots and the center of potential implants was measured in both cross-sectional and coronal planes. An algorithm was derived using t-tests. Additionally, 102 retrospective cases were analyzed using periapical (PA) or bitewing X-rays to evaluate bone resorption. Implants were categorized into test and control groups based on whether their mesiodistal distances adhered to the proposed algorithm. Logistic multivariate regression analyses examined the relationship between inter-implant distance and marginal bone loss (MBL), while the impact of smoking was also assessed.

Results: For premolars, interdental and inter-implant distances averaged 4.2 mm, while for molars, it was approximately 5.4 mm. Inter-implant distance for second premolars ranged from 7 to 7.4 mm, and for first molars, from 8 to 8.5 mm. In the maxillary second molar region, inter-implant distance was 9.26 ± 0.29 mm, and for mandibular second molars, it measured 9.58 ± 0.19 mm—a statistically significant difference. Significant differences in peri-implant bone levels were observed between the test and control groups ($p < 0.01$), with greater bone preservation over time in the test group. No significant differences were found between smokers and non-smokers ($p > 0.05$).

Conclusion: The mesiodistal algorithm of 4–4.6 mm, 7–7.4 mm, 8–8.5 mm, and 9–9.5 mm effectively maintained peri-implant bone levels. Inter-implant distance had a greater impact on bone preservation than smoking status, providing clinicians with valuable guidelines for implant success and treatment planning. The findings provide clinicians with reliable prognostic guidelines for implant success and a reference for treatment planning.



P151

Immediate Implantation and Immediate Restoration of Maxillary Incisors: A Case Report

X. Huang*

Introduction: Due to the aesthetic considerations, a provisional restoration is important for cases of maxillary anterior teeth implantation. At present the provisional restoration could be made either chairside or in-advance, while the latter solution is proved to be more convenient and timesaving. To prepare the temporary restoration before surgery, the digital design is indispensable. Both the appearance of the crown and position of the implant can be designed and determined pre-operatively, and hence the surgical guide and restoration can be manufactured in advance. In this way, we can reduce the clinical time and surgical trauma, thereby ensuring a better clinical outcome.

Method: In this case report, a young female experienced severe external root resorption of her maxillary middle incisors, necessitating their removal. Due to her occupation, she sought immediate restoration. We replicated the crowns of her existing incisors to design the immediate restoration and planned the implants using digital software. A surgical guide and screw-retained provisional restorations were manufactured. After extracting the incisors, we inserted two *3.5 *13 mm bone level implants with an insertion torque of 35N*cm*, applying bone substitutes and a collagen membrane for the bone defect. The provisional restorations were fixed onto the implants, then adjusted to prevent occlusal contact. After 6 months of healing, the restorations were refined for better gingival contour, and 2 months later, an impression was taken for the definitive restorations, which were subsequently delivered to the patient.

Results: The drill guide did not guarantee 100 percent accuracy of implant insertion. As we assessed post operation, the angular deviation was 7.59 at #8 while 10.12° at #9. However, with some minor modifications, the pre-manufactured temporary restoration was successfully delivered. Furthermore, through the traditional adjustment of the provisional crown after healing stage, we managed to reshape the gingival line and eventually achieved good esthetic outcome.

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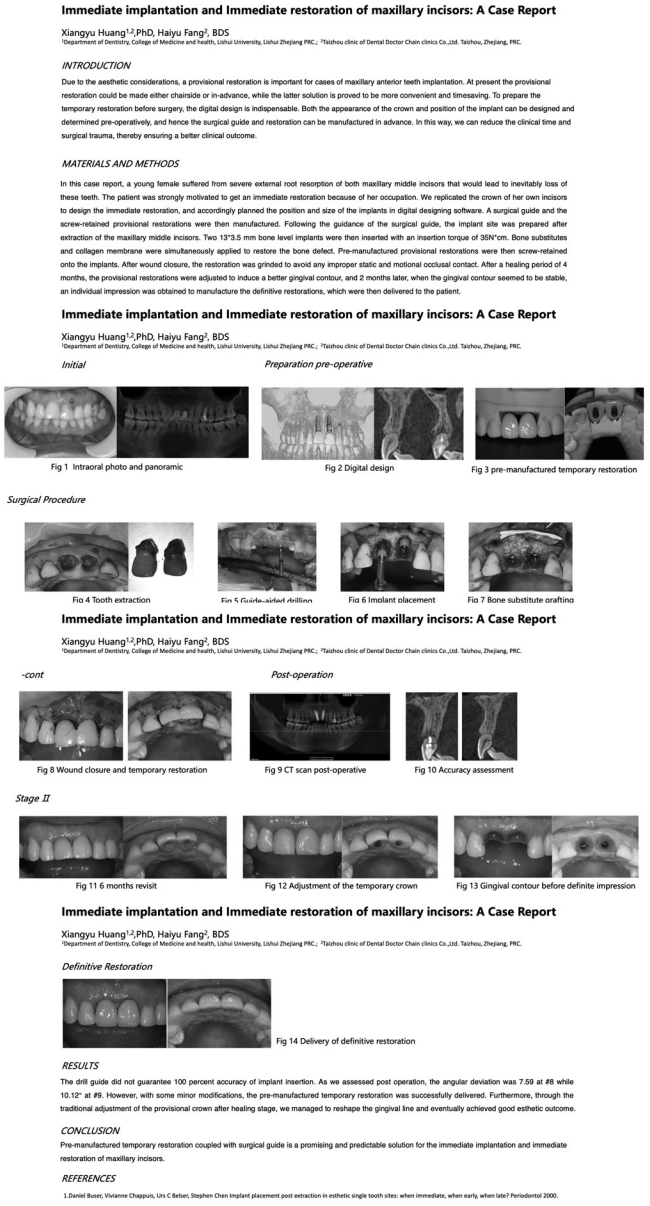
Conclusion: Pre-manufactured temporary restoration coupled with surgical guide is a promising and predictable solution for the immediate implantation and immediate restoration of maxillary incisors.



P152

Successful Keys to Immediate Implant Placement and Immediate Provisionalization and Soft Tissue Augmentation: Case Report

W.C. Kuo*

Introduction: Immediate implant placement (IIP) is one of the most technical sensitive and challenging treatment in maxillary esthetic zone. There are 7 important lucky number and successful keys to IIP. 1st, before IIP we should check facial soft tissue height is normal and no recession. The distance from free gingival margin to facial bone plate is less than 7 mm. 2nd, before IIP we also check CBCT to make sure saggital root position is favorable for IIP. Buccal to lingual and interradicular distances from mesial to distal are more than 7mm. 3rd, after extraction, there are at least 4mm remaining bone apical to the socket, totally height are more than 7mm. 4th, check the distance from papilla tip to interproximal bone is less than 7 mm. 5th, we place implant by a precision surgical guide at ideal position and correct angle.(7D position) 6th, check the distance from implant center to buccal mid-facial gingival margin is more than 7mm. 7th, we always might need a soft tissue graft to stabilized the soft tissue margin and prevent mid-facial recession. The graft size should be covered facial side, length is more than 7mm, width is more than 4mm and thickness is not less than 2mm. Following these rules, we can get the stable gingival margin and long-term successful result.

Method: The demonstrated case show the #22 lateral incisors root caries with fracture. After discussion, we decided to treat by IIP, immediate provisionalization if possible and soft tissue augmentation.

Results: Finally we have a satisfactory results and stable tissue margin profile.

Conclusion: IIP is a reliable and minimal invasive treatment option if the case is optimally selected. IIP not only saves time for patients but, more importantly, focuses on maintaining the stability of tissue morphology and aesthetic outcomes. By conducting a thorough diagnostic analysis beforehand, we can identify suitable indications, perform minimally invasive extractions without damaging the papillae, and use surgical guides to place the implants accurately in the ideal position, ensuring a strong foundation. We share the successful keys and critical numbers for IIP, immediate provisionalization and soft tissue augmentation at the same time even can prevent complications. Through scientific measurement and precise execution, we will significantly increase the success rate and create aesthetically pleasing and natural results.

P153

Dual-arch Immediate Implant Placement and Immediate Loading With an Autonomous Dental Implant Robot in Terminal Dentition Treatment: A Clinical Report

X. Yang*, H. Wang

Introduction: Computer-guided surgery, including static computer-assisted implant surgery (s-CAIS) and dynamic computer-assisted implant surgery (d-CAIS), have been applied to complete full-arch implant-supported restorations, enabling precise implant placement. Limitations of either s-CAIS or d-CAIS technology include inadequate water cooling, increased surgical time and reliance on the clinician's surgical experience. An autonomous robotic computer-assisted implant surgery (r-CAIS) was introduced as a prospective alternative for accurate implant placement. However, the application of autonomous r-CAIS in dual-arch immediate restoration has limited supporting evidence. This clinical report had two primary objectives. First, we evaluated the accuracy of the autonomous r-CAIS in dual-arch immediate implant surgery. Additionally, we assessed the feasibility of r-CAIS for immediate dual-arch restoration.

Method: A 53-year-old male patient with terminal maxillary and mandibular dentition underwent dual-arch r-CAIS using an autonomous robot. Alveoloplasty was performed in anterior maxilla using a CAD/CAM osteotomy guide. Implants were placed following extractions and prefabricated provisional prostheses were delivered immediately after surgery. A postoperative cone-beam computed tomography(CBCT)

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scan was performed to assess the deviation between the virtual planned implants and placed implants.

Results: A total of 12 implants were placed separately in the maxilla and mandible. No adverse surgical events were reported. Healing was uneventful and all implants integrated successfully. Alignment between the planned and placed implants proved a high degree of accuracy. Table 1 lists the accuracy parameters. The means of the global coronal deviation and global apical deviation were 0.30 ± 0.17 mm and 0.32 ± 0.16 mm, respectively. Additionally, the angular deviation was 0.75 ± 0.21 degrees. Both the maxilla and the mandibular successfully received immediately loaded full-arch prostheses.

Conclusion: This case demonstrated the feasibility of autonomous robotic implant surgery for dual-arch immediately loaded implants. r-CAIS may open up new horizons for dental implant surgery, enabling accurate and efficient patient-specific procedures. However, further clinical trials are required to provide hard clinical evidence.

Accuracy parameters at each implant site.

Evaluation Parameters	Global coronal deviation(mm)	Global apical deviation(mm)	Lateral coronal deviation(mm)	Lateral apical deviation(mm)	Vertical coronal deviation(mm)	Vertical apical deviation(mm)	Angular deviation(°)
Site 16	0.24	0.15	-0.17	-0.04	0.11	0.22	0.61
Site 14	0.18	0.18	-0.01	-0.11	0.17	0.41	0.62
Site 12	0.73	0.69	0.25	0.28	0.69	0.13	0.99
Site 22	0.24	0.41	0.11	0.31	0.03	0.09	0.89
SIte 24	0.30	0.25	0.25	0.17	0.23	0.54	0.54
Site 26	0.19	0.17	0.08	0.02	0.17	0.49	0.29
Site 36	0.22	0.33	0.10	0.27	0.16	0.19	0.81
Site 34	0.41	0.44	0.11	-0.07	0.27	0.30	0.79
Site 32	0.46	0.40	0.40	0.21	0.32	0.27	0.91
Site 42	0.36	0.41	-0.08	-0.24	0.24	0.34	0.69
Site 44	0.15	0.22	-0.11	-0.18	0.05	0.08	0.98
Site 46	0.15	0.15	-0.05	-0.14	0.06	0.11	0.89
Mean ± SD	0.30±0.17	0.32±0.16	0.07±0.17	0.04±0.20	0.21±0.18	0.26±0.16	0.75±0.21

P154

Incremental Cases of Free Gingival Transplantation Using a Root-oriented Reduction Flap Performed With Insufficient Keratinized Mucosa Following Implantation

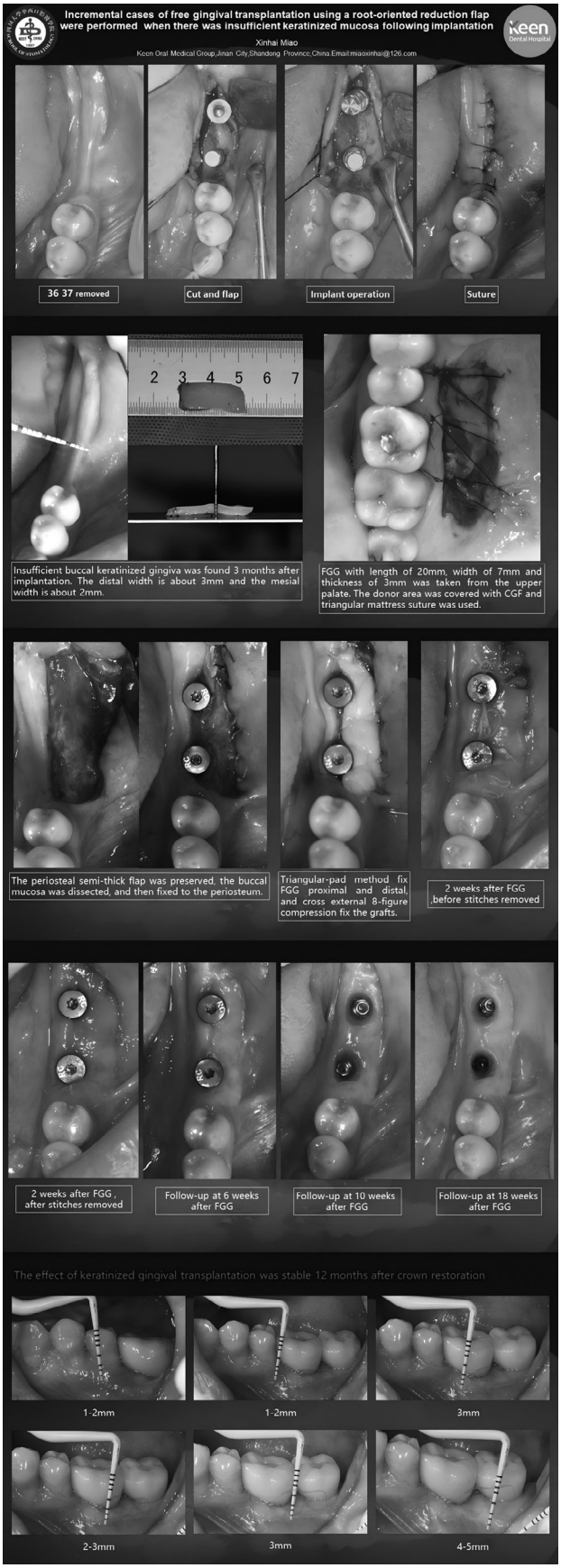
X. Miao*

Introduction: Soft tissue dehiscence and the loss of gingival are the main problems affecting the aesthetic outcomes of implant therapy. Various techniques have been proposed to reconstruction the lost or deficient gingival, which can generally be classified as non-surgical and surgical approaches. The free gingival graft (FGG) and CTG are most commonly used for soft tissue augmentation.

Method: 36, 37 Three months after tooth extraction, flap incision, implant surgery, and close suture. Insufficient buccal keratinized gingiva was found 3 months after implantation. The distal width is about 3mm and the mesial width is about 2mm. FGG with length of 20mm, width of 7mm and thickness of 3mm was taken from the upper palate. The donor area was covered with CGF and triangular mattress suture was used. The periosteal semi-thick flap was preserved, the buccal mucosa was dissected, and then fixed to the periosteum. Triangular-pad method fix FGG proximal and distal, and cross external 8-figure compression fix the grafts. 2 weeks after FGG, stitches removed.

Results: The effect of keratinized gingival transplantation was stable 12 months after crown restoration

Conclusion: Autogenous free gingival grafts(FGG) is considered the clinical standard for obtaining the width and thickness of the keratinized tissue (KT) around dental implants, showing good results over time. KM≥2mm is necessary to reduce peri-implant mucositis. Mucosal thickness (MT) plays an important role not only in aesthetic results, but also in the health surrounding the implant. Thicker MT can also provide greater mucosal margin stability than thinner MT. Thick mucosal tissue has a very good positive effect on maintaining bone stability.



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P155

Effect of Varying Processing Techniques of Amnion Chorion Membranes on the Osteogenic Cell Response in Vitro

X. Wang*, O. Sanchez, E. Ajami, H. Wen

Introduction: Amnion chorion membranes(ACM) are widely used in dental applications for their growth factor-rich extracellular matrix, which supports tissue regeneration.[1,2] However, diverse processing and preservation methods create structural, chemical, and biological variations among ACMs. The removal or preservation of the intermediate (IL) and trophoblast layers to retain critical signaling components for tissue regeneration remains debated.[3-5] This study investigates how different ACM processing techniques influence hBMSCs adhesion and proliferation in vitro.

Method: 3 differently processed ACMs(test groups) and 1 pericardium membrane(PCM, control) were compared(Tbl.1). Surface morphology of ACMs was observed with SEM(JEOL) and mapped with a Keyence microscope(VK-X1050). The Sa roughness values were analyzed with MultiFile Analyzer(n=4). Cell proliferation was assessed by culturing hBMSCs on the membranes at 37 °C for 1, 3, and 7 days, quantified with a cell counting kit(Dojindo)(n=3), and visualized by fluorescent microscopy following LIVE/DEAD staining. One-way ANOVA with Tukey's multiple comparison tests was performed to determine statistical differences(Prism 10), with $p<0.05$ considered significant.

Results: SEM showed intact collagen structure and surface complexity on PCM. Whereas ACM1 and 2 had relatively smooth surface morphologies(Fig.1), ACM3 retained substantial salt crystals. The Sa roughness value of PCM was significantly higher than ACM1 and 2, but no significant roughness Sa differences were observed between 3 ACMs(Fig.2A). ACM1 supported hBMSCs growth as effective as PCM without showing statistical difference over 7 days. However, ACM2 and 3 had significantly lower hBMSCs growth than ACM1 at 3 and 7 days and PCM at all times(Fig.2B). LIVE/DEAD showed more live cells (green) on PCM and ACM1. ACM3 had more dead cells (red) at all time points. Only PCM and ACM1 were fully confluent with hBMSCs at 7 days(Fig.4).

Conclusion: Significant differences in-vitro cell response to ACMs may be due to physicochemical variations caused by different tissue processing and preservation methods. Within the study's limitations, ACM1 showed a considerably favorable hBMSCs response compared to ACM2 and 3, suggesting its well-preserved growth factor component. Therefore, ACM1 could be a superior candidate to improve clinical performance in procedures like ridge preservation and bone augmentation.

Membranes	Processed tissue structure	Preservation method	Source
PCM	Intact pericardium	Tutoplast®	Pericardium
ACM1	Amnion + IL + Chorion	Excellion®	Placenta
ACM2	Amnion + Chorion	Purion®	Placenta
ACM3	Amnion + IL + Chorion + Trophoblast	Matracell®	Placenta

Table 1: List of membranes include in this study

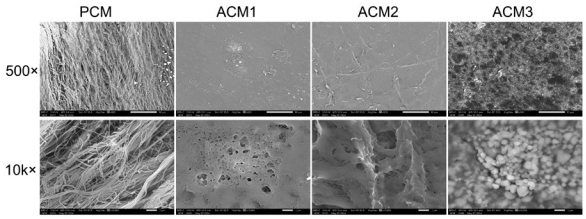

Figure 1: SEM images of the membrane surfaces taken at 500x (top row) and 10kx (bottom row).

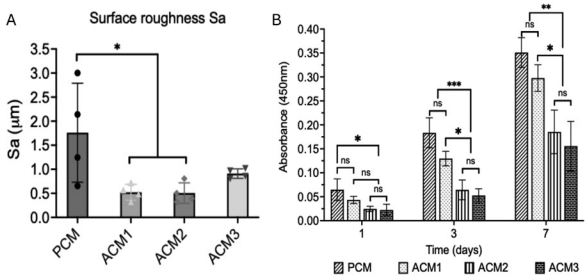

Figure 2: (A) Surface roughness (Sa values) of membranes as measured by Keyence microscope. (B) Quantitative analysis of hBMSCs growth on the membranes at 1,3, and 7 days.

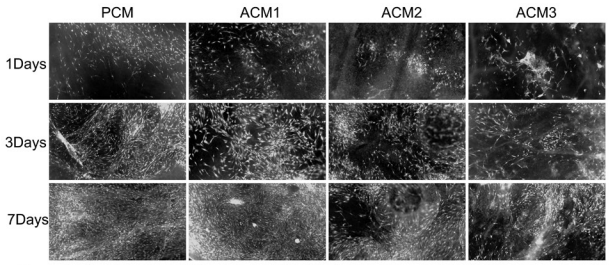

Figure 3: Fluorescence LIVE (green) / DEAD (red) images of hBMSCs growth on different membranes at 1,3 and 7 days.

References:

1. Agrawal, R.; Sinha, A.; Chauhan, S. S.; Sharma, S. Harnessing the Power of Amnion-Chorion Membrane in Periodontal Therapy: A Comprehensive Review. J. Oral Res. Rev. 2024, 16 (2), 157.
2. Gulameabasse, S.; Gindraux, F.; Catros, S.; Fricain, J.-C.; Fenelon, M. Chorion and Amnion/Chorion Membranes in Oral and Periodontal Surgery: A Systematic Review. J. Biomed. Mater. Res. B Appl. Biomater. 2021, 109 (8), 1216–1229.
3. Moreno S, Massee M, Campbell S, Bara H, Koob TJ, Harper JR. PURION® processed human amnion chorion membrane allografts retain material and biological properties supportive of soft tissue repair. Journal of Biomaterials Applications. 2024;39(1):24-39.
4. Roy A, Griffiths S. Intermediate layer contribution in placental membrane allografts. J Tissue Eng Regen Med. 2020; 14: 1126–1135.
5. Wetzell B, Ork B, Softic D, et al. Characterization of a full-thickness decellularized and lyophilized human placental membrane for clinical applications. Int Wound J. 2024; 21(5): e14888.

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P156

Achieving Predictable Maxillary Sinus Bone Augmentation: BASS Principles

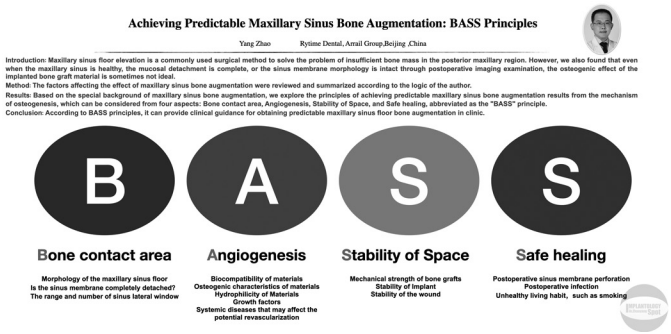
Y. Zhao*

Introduction: Maxillary sinus floor elevation is a commonly used surgical method to solve the problem of insufficient bone mass in the posterior maxillary region. However, we also found that even when the maxillary sinus is healthy, the intraoperative mucosal detachment is complete, or the sinus membrane morphology is intact through postoperative imaging examination, the osteogenic effect of the implanted bone graft material is sometimes not ideal.

Method: The factors affecting the effect of maxillary sinus bone augmentation were reviewed and summarized according to the logic of the author.

Results: Based on the special background of maxillary sinus bone augmentation, we explore the principles of achieving predictable maxillary sinus bone augmentation results from the mechanism of osteogenesis, which can be considered from four aspects: Bone contact area, Angiogenesis, Stability ofSpace, and Safe healing, abbreviated as the "BASS" principles.

Conclusion: According to BASS principles, it can provide clinical guidance for obtaining predictable maxillary sinus floor bone augmentation in clinic.



P157

Retrospective Analysis of Outcomes of Peri-implantitis Regenerative Procedures, With a Focus on Comparing the Effectiveness of Submerged and Non-submerged Healing Approaches

Y. Desai*, L. Guillen, M. Hernandez

Introduction: Biological complications of osseointegrated implants are a significant focus in implant dentistry. Surgical management of peri-implantitis may involve either resective or regenerative strategies, with the regenerative approach utilizing either a submerged or non-submerged healing process. The objective of this study is to evaluate the outcomes of peri-implantitis regenerative procedures via submerged and non-submerged healing approaches. The hypothesis is that there will be a significant difference in radiographic bone level gain and reduction of periodontal probing depths between the submerged and non-submerged approaches, favoring the submerged approach.

Method: A retrospective chart review will be performed for patients treated for regenerative treatment of peri-implantitis at NSU's PG Periodontics department from 2012 to 2022. Electronic health records will be screened and cases will be excluded if records are incomplete or if radiographs lack clear implant thread visibility needed to assess outcomes before and after treatment. Periodontal probing depths and radiographic bone levels will be measured both before treatment and at least six months afterward, with comparisons made between patients treated using the submerged versus non-submerged approach.

Results: This study is currently being conducted and expected to be finished by January 2025 so the results are pending.

Conclusion: The conclusion is pending as the study is still currently underway.

P158

Vestibular Incision Subperiosteal Tunnel Access for Treatment of a Fenestration Defect During Immediate Implant Placement in the Esthetic Zone: A Case Report

Y. Desai*, M. Garcia

Introduction: The presence of a fenestration defect and chronic apical pathology add complexity to the already challenging esthetic zone immediate implant surgery. Raising a traditional flap to address these complicating factors can lead to wound healing complications and unfavorable esthetic outcomes. The objective of this case report is to demonstrate the use of a VISTA incision to manage a buccal fenestration defect and complete removal of apical pathology during an immediate implant surgery.

Method: A healthy 45-year-old female patient with a high smile line presented with a non-restorable #8. The patient was undergoing FMR, so teeth #6 to #11 were prepared for full-coverage crowns and provisionalized as a FPD. A sulcular incision was made around tooth #8 with a microsurgical blade, and the tooth was extracted with minimal trauma. Efforts were made to remove all apical granulation tissue, but it had become incorporated into the buccal mucosa through the fenestration. A VISTA incision was used and a full-thickness tunnel was prepared to access the fenestration. Sharp dissection was used to separate the granulation tissue from the buccal mucosa. A hydrated, sugar-cross-linked collagen membrane was tunneled to cover the fenestration, extending beyond its borders in all directions. A surgical guide was used to prepare an osteotomy followed by the placement of 3.6x13 mm implant. A cortico-cancellous particulate allograft was packed into the buccal gap (>2 mm). A small buccal pouch was created at the marginal gingiva and a CTG was secured. A custom healing abutment was fabricated chairside. The provisional FPD's pontic at site 8 was adjusted and cemented with Temp-Bond.

Results: At five days post-op, soft tissue healing appeared excellent, and the patient reported minimal discomfort. A newly lab-fabricated provisional FPD spanning teeth 6 to 11 was cemented at that time. At the one-month and two-month post-op visits, healing continued to be excellent and the mid-buccal soft tissue was at a more coronal location as compared to the pre-op level.

Conclusion: By utilizing a VISTA incision, the fenestration defect and chronic apical pathology were adequately managed after the extraction to allow for an immediate implant placement and marginal soft tissue levels were also maintained.

P159

The Impact of Prosthetic Design on Bone Loss Around Dental Implants: A Systematic Review

Y. Hanine*

Introduction: Peri-implant bone loss is a critical factor influencing the long-term success of dental implants. Various prosthetic design factors, such as the type of attachment (screw-retained vs. cemented), abutment material, and height, have been hypothesized to affect bone preservation around implants. This systematic review and meta-analysis aim to synthesize current evidence regarding the influence of prosthetic design on peri-implant bone loss.

Method: A systematic search was performed using various databases, including PubMed, Scopus, and the Cochrane Library, to identify studies evaluating the impact of prosthetic design on bone loss around dental implants. The inclusion criteria were prospective and retrospective clinical studies with a follow-up period of at least one

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year, comparing bone loss in various prosthetic designs (e.g., screw-retained vs. cemented, material types). Meta-analysis was conducted on studies with comparable outcome measures and methodology, with additional subgroup analyses for specific design variations.

Results: The reviewed studies presented varying results regarding the impact of abutment width, implant-abutment connection, and abutment geometry on peri-implant bone loss. Several studies suggested that wider abutments and platform-switching connections were associated with reduced bone loss, likely due to their influence on stress distribution and soft tissue adaptation. Other studies, however, found no significant difference in bone loss based on abutment width or connection type. Similarly, while some research indicated that specific abutment geometries (such as conical versus flat designs) could enhance bone preservation, others reported negligible differences across geometry types. These inconsistencies may stem from differences in study protocols, sample sizes, and follow-up durations.

Conclusion: The impact of abutment width, implant-abutment connection, and abutment geometry on bone loss around implants remains partially unresolved. Although some evidence suggests these design factors may influence bone preservation, findings are inconsistent across studies. Further standardized, long-term research is needed to establish clearer guidelines for optimal prosthetic design that promotes bone stability around dental implants.

P160

Minimally Traumatic and Predictable Implant Removal Methods: Report of Two Cases

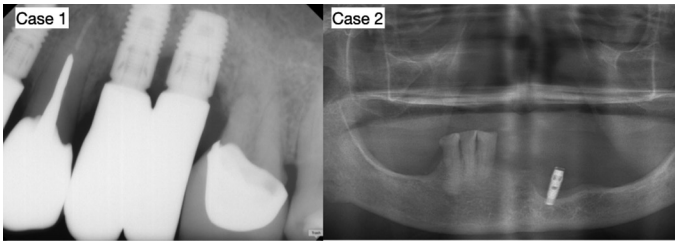
Y.P. Young*, Y. Hamada

Introduction: A higher prevalence of peri-implantitis has been reported, and many clinicians have faced decreased predictability of treatment of peri-implantitis. Additionally, mechanical complications have been observed, such as implant fixture fractures that require implant removal. Traditionally, implant removal has relied on trephine drills and high-speed rotary burs; however, these methods have raised concerns about the invasiveness and release of titanium particles. The addition piezoelectric devices has proven beneficial in the safety profile of these procedures, reducing the risk of damage to surrounding structures and minimizing metal particle dispersion during corticotomy. Although reverse torque implant removal kits have been utilized, the application of extremely high torque can raise concerns for clinicians. This report presents two cases that illustrate predictable and minimally invasive implant removal methods by combining traditional implant removal modalities with piezoelectric technology.

Method: Case 1: 70-year-old ASA II patient presented with severe peri-implantitis on #12-13 and hopeless prognosis for teeth #11 and 14. After the crowns and abutments were removed, extractions of #11 and 14 were completed. Following flap reflection, the corticotomy around #12 and 13 was completed using a piezoelectric device. A reverse torque technique was applied to remove the implants in a minimally traumatic approach. Ridge preservation was achieved using Allograft and a non-cross-linked collagen membrane. Case 2: 76-year-old ASA II patient presented with severe peri-implantitis affecting #22 implant. A plan was developed for the removal of #22 implant and the placement of #21 and 25 implants to support an implant-retained overdenture. Following flap reflection, a piezo-electric device was used for corticotomy around #22 implant, and an elevator was utilized to deliver the implant.

Results: Both cases exhibited no significant complications. However, implant removal sites exhibited reduced formation of granulation tissue and delayed epithelialization during the healing process compared to the sites of tooth removal.

Conclusion: Multiple modalities is used implant removal, and the incorporation of piezoelectric devices can reduce trauma associated with traditional instruments. Further investigation is needed to evaluate the differences in wound healing processes between tooth extraction and implant removal sites.



P161

Digital Workflow for an Implant-supported Full Arch Fixed Mandibular Prosthesis in a Patient Reconstructed With Fibula Free Flap Graft

Y. Lieu*, A. Hernandez, C.C. Yang, W. Polido

Introduction: To assess feasibility of incorporating a digital workflow into a fixed full arch mandibular prosthesis in a patient reconstructed with fibula free flap graft

Method: A patient with a history of a mandibular gunshot wound underwent fibula free flap surgery as part of his mandibular reconstruction in 2019. In 2020, the patient had a debulking procedure on the fibula flap before prosthetic rehabilitation to restore function and aesthetics. A provisional complete denture was fabricated to patient's satisfaction. A dual scan was performed and 4 mandibular implants with diameter of 3.75mm and 8mm in length were placed in the mandible. During implant placement, a simultaneous debulking of the fibula flap was done to accommodate the restoration space requirement The existing mandibular denture was converted to a fixed provisional prosthesis, and the implants were immediately loaded. 3 months after surgery, the implants were stable and osseointegrated. To address the inaccuracies associated with a conventional full-arch intraoral scan due to the nature of the soft tissue reconstruction, an intra-oral scan using a cross-arch fixation scan body was used to verify the implant positions.

Results: This digitally verified position was then used to fabricate a new prototype to ascertain the final aesthetics and to verify passivity of the prosthesis. The patient was happy with the aesthetics and improved ability to function.

Conclusion: Incorporation of digital workflow is feasible for patients with large fibula flap rehabilitations.

P162

Development of Medication-Related Osteonecrosis of the Jaw in Association With Dental Implant: Report of 3 Cases With Literature Review

Y. Cho*, M.J. Kang, H.S. Kim, J.K. Huh, J.Y. Kim

Introduction: There is still controversy regarding the occurrence of medication- related osteonecrosis of the jaw (MRONJ) in association with dental implants. Recently, several studies have reported that implant placement itself does not increase the incidence of MRONJ in patients with osteoporosis. However, some have reported the occurrence of MRONJ in implanted implants, which has been named implant-presence triggered MRONJ. In this study, we report three cases of MRONJ associated with dental implants in various clinical situations and provide precautions.

Method: Three patients, each diagnosed as MRONJ associated with dental implants, were retrospectively analyzed. The patients varied in their medical backgrounds, including osteoporosis and cancer treatments with antiresorptive medications. After undergoing radiographic and clinical examinations, Surgical procedures such as sequestrectomy and explantation were performed, and clinical outcomes were monitored postoperatively.

Results: A 68-year-old female patient who had been taking Alendronate for osteoporosis for 2 years had an implant placed in the lower left molar area while taking the medication. Due to pain and inflammation. The implant was removed 6 months later, and over the next 2 years, the surrounding implants and teeth were removed and a sequestrectomy was performed. A 56-year-old male visited our clinic complaining of pain around a dental implant that had been placed 7

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years ago. The patient had recently been receiving chemotherapy for recurrent liver cancer using bevacizumab and lenvatinib. Panoramic view showed sequestration around the implant, and he underwent sequestrectomy surgery twice. A 69-year-old woman underwent extraction and mandibular anterior implant surgery while receiving chemotherapy and denosumab for breast cancer. Six months after the procedure, she visited our clinic complaining of pain in the mandibular anterior teeth and around the implants that had been placed 10 years ago. Nuclear medicine examination showed uptake in the lower 2/3 of the mandible.

Conclusion: Antiresorptive agents or anticancer chemotherapy agents can cause MRONJ in association with implants. In addition, implant surgery should be carefully considered in cancer patients receiving high-dose antiresorptive agents, as it may carry risks, warranting further research to fully understand its implications.

P163

Evaluation of Low Crystalline Apatite-Resorbable (LCR) Bone Grafts in the Mandibular Socket Preservation: An Experimental Study in the Mongrel Dog

Y. Cho*, D.K. Kang, H.S. Kim, J.Y. Kim, J.K. Huh

Introduction: Recently, LCR (Low Crystalline Apatite) has been introduced as a novel non-heat-treated alloplastic bone graft material with not only osteoconductive properties but also significant osteoinductive potential. The unique nano-scale microstructure and macropores of LCR distinguish it from conventional synthetic bone graft materials (CSBs) like hydroxyapatite (HA), beta-tricalcium phosphate (β-TCP), and octa-calcium phosphate (OCP). This study aims to compare the physicochemical properties of LCR with CSBs and assess its in vivo performance in a mongrel dog mandibular socket preservation model.

Method: This study involved 7 mongrel dogs, each with bilateral mandibular premolars and molars designated as experimental sites. In each dog, four different graft materials were applied to individual sites, categorized into four groups: Group I (LCR), Group II (HA 20 % + OCP 80 %), Group III (HA 30% + β-TCP 70%), and Group IV (HA 60% + β-TCP 40%). After 12 weeks, dental implants were placed in the grafted areas, and drilling and insertion torque measurements and implant stability quotient (ISQ) were recorded. Six weeks after implant placement, the mogrel dog were euthanized, and removal torque and ISQ were subsequently measured. Additionally, micro-computed tomography (mCT) and histological analysis were conducted to assess new bone formation and graft material resorption.

Results: At 12 weeks post-socket preservation, Group I demonstrated significantly higher insertion and drilling torque values compared to Group III and IV, and comparable or slightly higher values than Group II. At the 6-week post-implantation, removal torque and ISQ results indicated that Group I had significantly higher stability compared to Group III and IV, while showing similar or marginally superior stability to Group II. The analysis mCT revealed that bone remodeling was most prominent in the Group I, followed by Group II, while the remaining groups showed no distinct signs of bone remodeling. Histologically, Group I showed significantly greater new bone formation compared to other groups, further supporting its osteoinductive properties.

Conclusion: LCR showed statistically better bone regeneration and implant stability compared to conventional synthetic bone grafts in mongrel dog model. LCR may serve as a alternative to CSBs in dental implants.

P164

The Socket Shield Technique in the Anterior Maxilla: A Case Series

Y. Ali*, S. Chu, T. Simmonds

Introduction: Maxillary anterior implant placement has always posed a challenge given the anatomy of the anterior maxilla and the resorptive pattern of the buccal bone after tooth extraction. The socket-shield (SS) technique can minimize buccal bone resorption as described by Hurzeler's proof-of-principle report in 2010. The SS functions by retaining the buccal portion of a root and an implant can be placed lingual to this fragment. In this case series, 15 patients were followed after SS therapy for a minimum of 3 months up to 3 years.

Method: 15 patients whom presented to the veterans hospital and a private clinic that received socket shield therapy with immediate implant placement were followed for a minimum of 3 months to 3 years. Each case was thoroughly documented with radiographic images, CT slices, and clinical photographs. Flap vs no flap, socket shield-implant contact, gap grafting and immediate loading were the parameters recorded. Implant success rate, exposures, radiographic evaluation of the buccal plate, and radiographic evaluation of the implant-socket shield gap were recorded.

Results: After a follow up period of a minimum 3 months up to 3 years, all implants were successful. Exposures were associated with the flapless approach compared to a minimal flap design which resulted in 0 exposures. Patients were most satisfied after immediate provisionalization and the buccal plates on all implants were fully intact.

Conclusion: The SS technique is a procedure that can prevent the resorption of the buccal plate but can have complications that need to be managed appropriately. Immediate provisionalization lead to higher patient satisfaction.

P165

Successful Implant Treatment at an Oroantral Communication Repair Site: A Case Report

Y.C. Wu*, D. Tatakis

Introduction: Tooth extraction in the maxillary posterior region can result in an oroantral communication (OAC), which requires careful management to prevent complications. This case report details the successful management of both soft and hard tissue deficiencies following advanced buccal flap repair of an OAC, enabling effective implant placement and function.

Method: A 63-year-old female with osteoporosis and a history of intravenous bisphosphonate therapy presented for implant consultation to replace missing tooth #3. After the extraction of tooth #3 in 2022, she developed an OAC and subsequent sinus infection. The OAC was initially repaired using an advanced buccal flap procedure at an oral surgery clinic. However, mucogingival deformities (keratinized tissue deficiency and thin gingival phenotype) persisted on the buccal aspect of the edentulous ridge. Additionally, radiographic evaluation revealed the absence of the sinus osseous floor, with a bony channel remaining from the OAC and covered only by buccal mucosa.

Results: To address the mucogingival deformities, a free gingival graft (FGG) was performed to augment keratinized tissue. Six months later, sinus augmentation was conducted through the OAC channel using an allograft-xenograft combination. Following six months of healing post-sinus augmentation, cone-beam CT confirmed sufficient bone volume for implant placement on the edentulous site. During implant placement, the OAC channel was observed to be fully closed by hard tissue, ensuring primary stability of the implant with an insertion torque exceeding 40 Ncm. The implant was restored and functional six months post-placement, with an uneventful healing period and without signs of radiographic bone loss or any clinical signs or symptoms.

Conclusion: This case report highlights the successful management of OAC- related soft and hard tissue deficiencies, remaining after advanced buccal flap repair, through a combination of FGG and sinus augmentation. Initial treatment with FGG improved soft tissue quality, while subsequent sinus augmentation restored bone structure and quantity, enabling successful dental implant placement with excellent primary stability. These staged procedures, executed with meticulous planning, provided adequate soft and hard tissue support and achieved successful implant restoration and function with no radiographic bone loss or clinical symptoms over a 6-month follow-up period.

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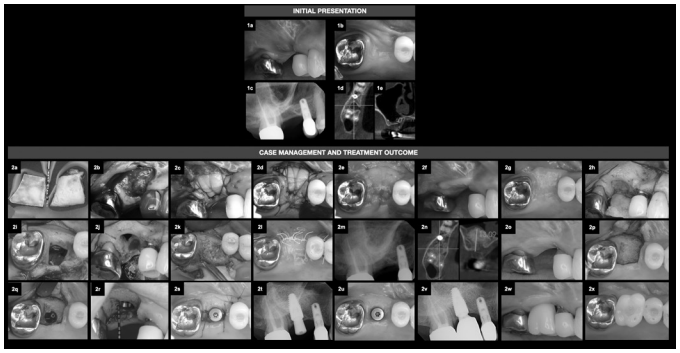

P166

A Case Report of Visual Transcrestal Sinus Elevation With Digital Dynamic Navigation System

Y. Tang*, Y. Man

Introduction: Transcrestal sinus elevation is a less invasive technique to achieve bone augmentation in the posterior maxilla to meet implantation conditions. Nonetheless, perforation of the Schneiderian membrane is a common complication bothering surgeons since it is hard to directly obeserve and detach the Schneiderderian membrane from limited field of view in the sinus lifting procedure. This study presents a novel method to visualize the membrane-detaching procedure on the application of digital dynamic navigation.

Method: The case involved a patient with missing teeth #13 and #14. And the maxillary left first premolar had severe mobility. The pre-operative CBCT scan revealed insufficient residual ridge height in #14. Tooth #12 was extracted, followed by transcrestal sinus lifting, bone grafting with deproteined bovine bone mineral (Bio-Oss, Geistlich Pharmaceutical) and implant placement in the teeth sites #12 and #14 (BLT 4.8*10, Straumann). Dynamic navigation system (Dcarer, China) was employed to guide transcrestal sinus lifting and implant placement. Initially, the surgeon designed membrane lifting scope and ideal implant location according to CBCT. Then, the virtual surgeon-related information was imported in the navigation system. After caliberation, the system could display onto the screen the real-time postion of instruments. A pilot drill was used to reach 0.5-1 mm below the sinus floor in the tooth site #14. A protective round diamond bur was used to grind the sinus floor bone and a delicate angle-necked elevator was used to elevate the Schneiderian membrane further. The surgeon could see the direction and depth of the elevator directly and be informed of its relation to the pre-designed elevation scope on the screen. After the detachment, membrane integrity was confirmed and the bone graft material was transported through the prepared site to fill the space below the Schneiderian membrane. Two dental implants were then placed under drill tracking of the navigation system.

Results: The postoperative CBCT showed ideal implant location in the teeth sites #12 and #14, intact Schneiderian membrane and accurate bone augmentation range after sinus elevation.

Conclusion: The application of dynamic navigation system seems to be a promising approach ensuring visuliaztion and accuracy of transcrestal sinus elevation, making the surgical procedure easier and safer.

P167

Utilizing a PMMA Shell Technique for Immediate Implant Placement: Preserving Root Contour and Enhancing Soft Tissue Architecture

Y.H. Chen*, D. Gogarnoiu

Introduction: Immediate implant placement requires specific anatomical conditions for stability, aesthetics, and long-term success. A minimum of 2 mm of keratinized tissue and a thick gingival phenotype around the socket are essential for soft tissue harmony, while at least 4 mm of apical bone and 1.5 mm of buccal bone thickness are critical for structural support and resilience. To enhance tissue architecture and achieve a coronal seal, a novel shell technique using PMMA was introduced in an immediate implant case.

Method: A 69-year-old male patient presented with a non-restorable upper left first premolar (#12) and underwent extraction with immediate implant placement. Due to low initial torque, a PMMA shell was fabricated to maintain soft tissue contour and create a stable coronal seal. After attaching a temporary cylinder to the implant and positioning the PMMA shell, PMMA material filled the space between them. The temporary cylinder was polished extraorally, the socket irrigated with saline, and allograft bone placed. To reduce occlusal load, the cylinder was trimmed to the gingival level before final attachment.

Results: Immediate loading was not performed due to the suboptimal implant torque. A customized healing abutment with a secure coronal seal was fabricated, and follow-up appointments revealed uneventful healing, with the implant well-protected from occlusal forces. Bone underwent remodeling around the implant site, ensuring stability and successful integration. Five months later, the customized healing abutment was removed, and the implant successfully withstood a counter-torque test exceeding 40 Ncm. Soft tissue healing was favorable, with an adequate amount of keratinized gingiva. The patient was then returned to the prosthodontics department for final restoration.

Conclusion: The PMMA shell technique effectively preserved the original root contour, maintaining the soft tissue architecture and achieving a secure coronal seal. This approach promoted bone remodeling and adequate keratinized tissue formation, with stable implant integration confirmed by counter-torque testing. The technique demonstrates potential as a valuable method for enhancing outcomes in cases with limited initial stability, aligning with goals for optimal soft and hard tissue preservation in immediate implant placement.

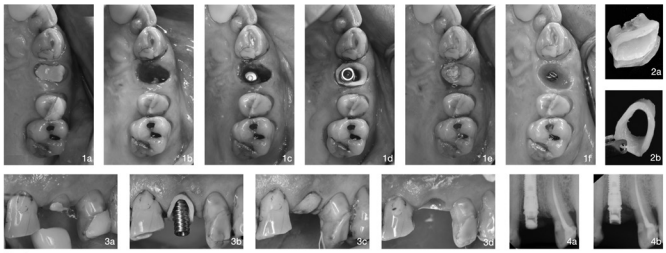

Figure 1
1a) Occlusal view of the upper left first premolar (#12) prior to extraction.
1b) Occlusal view of the socket immediately following extraction of tooth #12.
1c) Occlusal view of implant placement at the site of tooth #12.
1d) Customized healing abutment fabricated using the PMMA shell technique.
1e) Occlusal view of the customized healing abutment, trimmed to an equi-gingival level.
1f) Occlusal view of the healed implant site 6 months post-placement.
2a) Lateral view of the PMMA shell.
2b) Occlusal view of the PMMA shell.
3a) Lateral view of the upper left first premolar (#12) prior to extraction.
3b) Lateral view of implant #12 with the PMMA shell positioned in the extraction socket.
3c) Lateral view of the customized healing abutment, trimmed to the equi-gingival level.
3d) Lateral view of the implant site 6 months post-placement.
4a) Periapical radiograph taken on the day of implant placement.
4b) Periapical radiograph taken 6 months following implant placement.

P168

Application of Mixed Reality for Enhancing Student Understanding of Implant Internal Structures in Practical Training

Y. Sasaki*, Y. Oyamada, A. Nakanishi, A. Fukutoku, K. Kon

Introduction: Understanding the complex internal structures of implants is essential in dental education. Mixed Reality (MR) offers immersive 3D visualization and is widely used in industrial education to facilitate comprehension of complex structures. This pilot study evaluates the effectiveness of MR combined with a conventional cast in enhancing dental students' understanding of implant anatomy.

Method: Using general-purpose CAD software, three types of implants classified by connection type (external, internal, and internal with screw-retained abutments) and their associated components (cast and fixed prosthesis) were created and exported in FBX format. These models were integrated into MR content through a game engine and viewed on a head-mounted display (HMD). The MR content featured adjustable contras and interactive 3D models. A definitive cast and prosthesis were fabricated using a 3D printer with a model resembling the one used in MR. Implant replicas for 3D printing were inserted into the printed cast and cylinders were adhered to the printed restoration, creating an experimental cast and prosthesis. Twenty dental students were divided into two groups: a 3D printed cast group (Cast) (n=10) and a combined MR and a 3D printed cast group (MR) (n=10). The Cast

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group received instruction using only 3D printed models, while the MR group received instruction that combined 3D printed models with MR content presented through an HMD. Each participant used their smartphone to scan a QR code and completed an anonymous online questionnaire, providing responses item by item for the two methods. Descriptive (mean) and statistical analyses were used.

Results: Regarding comprehension, both the Cast and MR groups showed a significant increase compared to the pre-assessment ($P < 0.05$). Statistically significant differences were observed in the categories of helpfulness in understanding, level of interest, clarity, and element of surprise ($P < 0.05$). No significant differences were observed in ease of operation or discomfort.

Conclusion: MR effectively enhances comprehension of implant structures and shows promise as educational tool for dental training. Further studies could explore its potential across various areas of dental education.

P169

Survey of Students' Perceptions of Undergraduate Education in Oral Implantology

Y. Kido*, K. Kakura, Y. Taniguchi, R. Uchida, T. Yanagi, A. Matsumoto, K. Egashira, H. Kido

Introduction: Fukuoka Dental College began hands-on implant placement training for undergraduates in 2003, with ongoing improvements. In their fifth year, students participate in small group sessions (12 students per group) for hands-on training with models. The training includes incision, mucoperiosteal flap elevation, placement of two implants, and traditional impression taking, the exercise is conducted in one day, with one instructor for every two to three students. A questionnaire was administered before and after the training to assess students' attitudes toward implantology.

Method: In 2024, 84 students who completed the implant training were surveyed. The questionnaire assessed students' perceptions of the need for implant education and the role of implant therapy in clinical practice before and after the hands-on experience. Responses were compared to gauge shifts in attitudes toward implant treatment.

Results: The response rate was 100%. Before the training, 42 students believed implant treatment should be taught after mastering general dental procedures, while 12 students felt it should be introduced after passing the national exam. These views remained consistent after training. However, following the hands-on session, the number of students who said they would incorporate implant therapy into their future practice increased by 33%, while those who planned to "wait before incorporating implants" dropped by 24%. The perception of implant therapy as "technically difficult" decreased, while more students found it manageable. When asked how they would restore their own missing mandibular first molar, the preference for bridges dropped by 41%, and preference for implants increased by 31%

Conclusion: Although some reluctance remains regarding the timing of implant training in undergraduate education, this reflects the challenges of Japan's national dental exam, which has a pass rate of around 65%. After the hands-on training, negative perceptions decreased, and positive attitudes toward implant therapy increased. This suggests that practical training is key to improving students' understanding of implantology and their confidence in its application.

Clinical Practice Scenes

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Splinted Versus Nonsplinted Attachments for Mandibular Implant-supported Overdentures?

Y. Yi*, S.K. Kim

Introduction: Implant-supported overdentures offer better retention and stability for edentulous patients than conventional dentures. There are two main attachment options: splinted and nonsplinted. Splinted attachments use a rigid bar to connect the implants, while non-splinted attachments connect the overdenture directly to individual implants. The choice depends on patient needs, preferences, and other conditions. The aim of this study was to compare the clinical outcomes of mandibular implant-supported overdentures using splinted and nonsplinted attachments. The null hypothesis was: there is no difference in complications between overdentures retained by splinted or nonsplinted attachments.

Method: The data included 82 patients (43 splinted, SP; 39 nonsplinted, NS) with completely edentulous mandible treated with implant-supported overdentures using splinted attachment (Hader bar & clip, Preci-Horix, Alphadent NV, Belgium) or nonsplinted attachments (Locator, Zest Anchors, CA, USA) between 2006 and 2016. The prosthodontic complications, denture-related and attachment-related, were analyzed at the treated arch level, and surgical complications of implants were analyzed at the implant level. Kaplan-Meier curves and the multivariable Cox regressions model were used to analyze the success and survival of overdentures and supporting implants.

Results: The prosthodontic complication occurred in 67.4% of SP group and 66.7% of NS group with no significant differences between the groups (Fig. 1A). Peri-implant diseases showed significantly higher risk in the SP group, and all instances of osseointegration failure occurred in the SP group (Fig. 1B). The cumulative implant survival rate was 100% for the NS group and 96.8% for the SP group, with no significant difference. In the SP group, a significant increase in the risk of peri-implant disease was observed with a decrease in horizontal distance between implants.

Conclusion: The success of implants was associated with the attachment type: implants which support splinted attachments had higher risks of peri-implant disease than those of nonsplinted attachments. The risk increased the closer the horizontal distance between implants. For the patients with high risk of peri-implant disease, overdentures retained by non-splinted attachments would be recommended, however, the attachment type should be carefully determined considering factors such as implant angulations.

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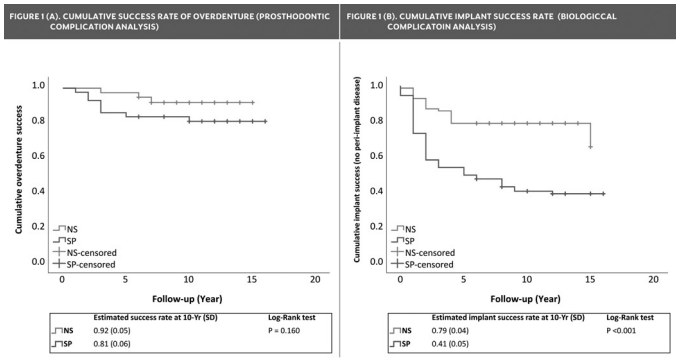


P172

Evaluation of Bone Regeneration Effect of Porous Carbonate Apatite in Dog 3-wall Dehiscence Bone Defects

Y. Shigemitsu*, N. Kitamura, Y. Sakaguchi, K. Yamanaka, T. Sato

Introduction: As bone mineral is composed of carbonate apatite (CO_3Ap), we developed a bone graft substitute made of CO_3Ap. The CO_3Ap bone graft, which was previously made of dense granules, has now been improved into porous granules. In this study, we aim to evaluate the efficacy of porous CO_3Ap compared to the dense CO_3Ap in dog model.

Method: The experimental protocol was approved by the Institutional Animal Care and Use Committee (IACUC) of Hamri Co., Ltd. (Ibaraki Japan); approved experiment number IACUC No. IB21044. Lower premolars (P4) were extracted from adult dogs. After a healing period of 8 weeks, a 3-wall bone defect (10×4×5 mm) was prepared at the proximal section of molars with buccal dehiscence. The defect was filled with 0.3 ml of porous CO_3Ap, and dense CO_3Ap (particle size: 1-2 mm), and closed the surgical incision without membrane. μCT evaluation was performed after healing for 12 weeks.

Results: There were no signs of inflammation, wound dehiscence, leakage of experimental samples, or infection in two groups. Results for the formation of new bone throughout the defect were observed in the porous CO_3Ap group, which were comparable to those in the dense CO_3Ap group. The percentage of granules remaining in the porous CO_3Ap group was significantly lower than in the dense CO_3Ap group. The volume of the new bone formed was 0.24 ml in porous CO_3Ap group and 0.23 ml in dense CO_3Ap group, with no significant difference.

Conclusion: Porous CO_3Ap showed no difference in bone formation and volume of new bone compared to dense CO_3Ap. On the other hand, less material remained in porous CO_3Ap, suggesting that porous CO_3Ap tended to promote bone replacement. These results suggest that porous CO_3Ap is a clinically useful bone graft substitute with excellent bone replacement.

P173

The Effect of Implant Adjacency on Fracture and Loss of Endodontically Treated Teeth

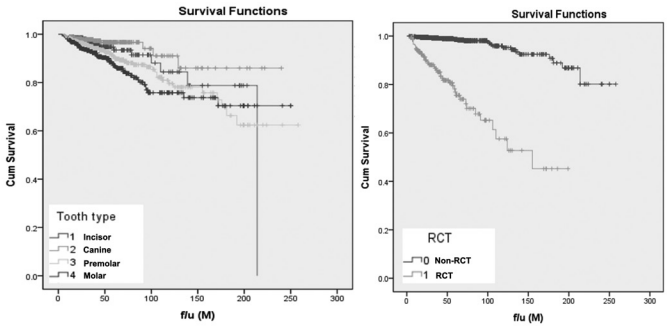
Y. Yeh*, A. Nazeri, H.H. Chen

Introduction: Previous studies have suggested a possible association between root fractures in endodontically treated teeth and their adjacency to dental implants. This retrospective study aimed to investigate the effect of implant adjacency on endodontically treated teeth.

Method: A total of 787 patients with an average follow-up of 57.1 months were examined to define the tooth loss, cumulative survival rate, and odds ratio (OR) for endodontically teeth adjacent versus nonadjacent to implants. Chi-square tests were employed to assess the tooth loss comparing endodontically treated teeth and implant adjacency. To investigate how different tooth types including incisors, canines, premolars, and molars affect the tooth loss, binary logistic regression analysis was employed.

Results: A total of 213 endodontically treated teeth adjacent to implants and 906 non-adjacent to implants were included. Teeth adjacent to implants with endodontic treatment had a significantly higher risk of tooth loss due to fracture compared to those adjacent to implants without endodontic treatment (Odds ratio, OR = 15.151, $p < 0.001$). Among endodontically treated teeth adjacent to implants, the risk of tooth loss due to fracture was similar across all tooth types. However, when considering all causes of tooth loss, including fracture, caries, periodontitis, and endodontic failure, incisors and canines presented a lower risk of tooth loss compared to molars, with OR of 0.468 ($p < 0.05$) and 0.280 ($p < 0.001$), respectively. However, premolars didn't show a significantly lower risk compared to molars (OR = 0.734, $p = 0.085$). Additionally, for endodontically treated teeth, the risk of tooth loss due to fracture was significantly higher for those adjacent to implants compared to non-adjacent endodontically treated teeth, with a risk rate of 26% (CI: 18.98% to 33.12%, $p < 0.0001$). The positions of endodontically treated teeth such as incisors, canines, premolars, and molar did not affect the risk of tooth loss due to fracture.

Conclusion: The present study demonstrated that after patients received dental implant treatment, teeth adjacent to implants with endodontic treatment showed a 15.2-fold higher risk of tooth loss due to fracture compared to those without endodontic treatment. There is a higher risk of tooth loss due to fracture for endodontically treated teeth adjacent to implants compared to those non-adjacent to implants.



Survival rates of endodontically treated teeth adjacent to implants are analyzed in relation to different tooth types (incisors, canines, premolars, and molars) and compared to non-endodontically treated teeth.

P174

Application of a 3D-Printed Assembled Custom Tray for the Fabrication of an Implant-assisted Removable Partial Denture in Mandibular Defects

Y. Oyamada*, A. Fukutoku, A. Nakanishi, Y. Sasaki, K. Kon

Introduction: Implant-supported removable prostheses are considered an effective treatment option for maxillofacial defects, particularly for restoring alveolar ridge mucosa and facial morphology. In the treatment of maxillofacial defect, which often involves complex reconstructive procedures, it is not uncommon to adjust the prosthesis form during the treatment process in accordance with the progress of surgical interventions. Here, we report a case involving the fabrication of an implant-assisted partial denture using a 3D-printed custom tray that incorporates the form of a provisional denture.

Method: The patient, a 60-year-old woman, underwent segmental mandibulectomy and subsequent mandibular reconstruction due to gingival carcinoma, followed by implant placement surgery and a second-stage procedure. The maxilla, mandible, and occlusion were scanned using an intraoral scanner. Two datasets were created for the treatment denture and the residual tissues. The custom trays were designed with computer-aided design software to be combined, with one tray for the residual tissue and another for the treatment. The custom trays were built using a digital light processing 3D printer. The custom trays were then used for occlusal registration and functional impression-making, followed by the fabrication of a definitive cast and denture.

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Results: The implant-assisted partial denture demonstrated satisfactory adaptation to the alveolar ridge mucosa and maintained proper occlusal relationships. Additionally, no significant differences in masticatory efficiency were observed between the provisional and final dentures.

Conclusion: In this patient, duplicating the adjusted provisional denture allowed the ideal molfology and occlusion to be transferred to the final prosthesis, simplifying the treatment process.

P175

Optimized Stackable Surgical Guide Design Using RealGuide Software

Z. Meykadeh*

Introduction: This case report demonstrates the successful design of a stackable surgical guide using RealGuide software, enabling bone reduction with minimal flap elevation and reduced trauma.

Method: A 49-year-old male presented to the Prosthodontics Department at UT Health School of Dentistry with a non-contributory medical history and complete edentulism on the mandibular arch. The extra-oral examination revealed a symmetrical face, a straight to convex profile and normal facial musculature. The intra-oral examination showed complete edentulism in the mandibular arch, with the opposing maxillary arch exhibiting natural dentition. The patient requested a fixed arch solution for the treatment of the lower jaw. Evaluation of the patient's CBCT scan indicated that minimal bone reduction in the anterior region would be sufficient for the planned prosthesis. The enhance stability and streamline the workflow for immediate loading surgery, a 3D-printed stackable surgical guide was designed. Both the surgical guide and FP3 prosthesis were designed using RealGuide software, while the mandibular interim prosthesis was fabricated utilizing Form Labs Hardware and Software.

Results: Using the complete RealGuide software suite, an interim FP3 prosthesis was designed following a full mouth evaluation and complete rehabilitation of the maxillary arch to re-establish the baseline for occlusal vertical dimension. After temporizing the crowns in the maxillary arch, a mandibular complete denture set-up was created as a prosthetic reference for restoring the patient with a fixed arch solution. The analog-to-digital conversion of this mock-up was imported into the software suite enabling precise implant placement and restoration. A stackable-surgical guide was designed and used for the efficient and accurate placement of the implants. Immediate temporization was successfully achieved with minimal deviation from planned workflow and the patient was treated within an optimal time frame.

Conclusion: The RealGuide software suite is a comprehensive all-in-one dental design platform that integrates restorative and surgical workflows. This case report highlights the successful application of RealGuide software in designing a full-arch, immediate load FP3 prosthesis combined with traditional prosthetic mock-up preparation.

P176

Marginal Bone Loss and Related Factors of 1,040 Dental Implants Placed in Fresh Extraction Sockets: An Observational Retrospective Clinical Study

D. Chele*, F. Rehberger-Bescós, Á.O. Salgado-Peralvo, C. Chamorro Petronacci, F. Camacho Alonso, D. Peñarrocha Oltra, Ó. Lado Baleato, M. Pérez-Sayáns

Introduction: Immediate dental implants (IDIs) have shown survival rates similar to those following other insertion protocols; however, higher rates of marginal bone loss (MBL) have been recorded. The aim of this study was to evaluate the MBL over a follow-up period of up to 36 months in IDIs, as well as the impact of various clinical variables on the MBL

Method: This retrospective observational study adhered to STROBE guidelines and included 1,040 immediate dental implants (IDIs) placed in fresh extraction sockets in a cohort of 344 patients treated between 2018 and 2023. Patients selected had baseline and follow-up radiographs, allowing for MBL analysis at intervals: baseline (post-surgery), 2, 6, 12, 24, and 36 months. IDIs were classified based on radiographic analysis of bone levels as bone loss (BL), bone remodeling (BR), or bone overlapping (BO). Data on factors such as implant placement depth, implant location (mandibular or maxillary), and abutment design were recorded. MBL was statistically analyzed using generalized additive mixed regression models to identify significant associations and trends over time, with particular emphasis on pre- and post-loading phases

Results: A total of 1,040 immediate DIs were inserted in 344 patients, on average 1.6 ± 1.1 mm subcrestally, with a successful osseointegration rate of 98.9%. The average MBL at 2, 6, 12, 24, and 36 months was -0.3 ± -1.0 mm, -1.1 ± -1.8 mm, -1.4 ± -1.8 mm, -1.7 ± -1.9 mm, and -1.3 ± -2.3 mm, respectively. In the B0-12-month period, 17.5% of the IDIs presented BL, 9% BR, and 73.5% BO. For the B1-12-month period, 19.8% presented BL, 10.7% BR, and 69.5% BO. Generalized additive mixed regression models showed significant marginal bone loss (MBL) over time pre-loading ($p < 0.0001$), stabilizing at 8.5 months from implantation. Immediate mandibular implants had lower MBL ($p = 0.0365$). Post-loading, MBL was lower in the mandible ($p = 0.0095$) and positively influenced by abutment height and rotational abutments.

Conclusion: The present study supports the clinical efficacy of the immediate DI placement protocol with high survival rates and acceptable MBL. It is recommended to place bone level DIs slightly below the crest to ensure the platform remains at an optimal depth during the initial bone remodeling phase post-implantation

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Influence of Implant Depth on the Accuracy and Precision of Intraoral Scanning in Anterior Immediate Implant Placement: An In Vitro Comparative Study of Varying Implant Depths

S. Kamimura*, H. Liao, J. Kan, C. Goodacre, J. Lozada

Introduction: Intraoral scanning has been widely applied in implant dentistry. Despite the satisfactory results, challenges remain on certain clinical procedures like immediate implant placement especially in the esthetic zones. Previous studies have shown controversial results on the influence of implant depth. Therefore, the purpose of this *in vitro* study was to compare the accuracy and precision of intraoral scanning at different implant depths. The null hypothesis is that there is no difference in terms of accuracy and precision when scanning implant in an immediate implant placement setting with varying depths.

Method: Three identical custom-made epoxy resin models were fabricated. In the models, teeth #6 and #11 represent extraction

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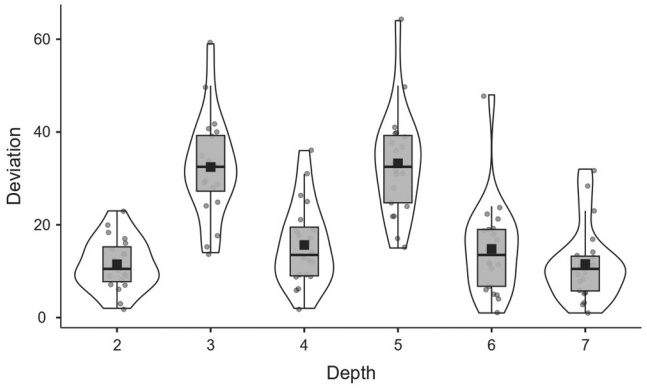
sockets with identical Class I Sergital Root positions. Six dental implants were placed at different depths (2, 3, 4, 5, 6, 7 mm) by using tooth supported stereolithographic surgical guides. The implant positions and angulations were planned by using a treatment planning software.

Results: Intraoral scanning images were obtained 20 times on each models (120 times total) and analyzed using desktop scanning images by a matching software. Desktop scanning images served as references. Accuracy and precision of implant placement was evaluated by superimposing images and quantifying deviations and angulation by mathematical algorithmA Kruskal-Wallis H test was conducted to compare the implant deviation at different depths (2, 3, 4, 5, 6, and 7 mm). There was a statistically significant difference in deviation across the six depth groups (p<.001). Therefore, the null hypothesis was rejected. Futhermore, Post-hoc pairwise comparisons using the Dwass-Steel-Critchlow-Fligner method revealed depth 2mm has no significant difference with depth 7 mm. (p>.05)

Conclusion: Significant deviations were found when scannong implant placement at different depths in extraction sites. However, clinically the difference is unlikely to be relevant since the mean defference were less than 40 micrometers. Therefore, scanning implant position can be recommended with immediate implant placement and provisionalization procedures.



P180

Comparison Between an Artificial Intelligence-driven Novel Tool and Resonance Frequency Analysis in the Evaluation of Immediate Loading Feasibility: Preliminary Results

G. Daprile, M. Degidi

Introduction: Resonance Frequency Analysis (RFA) is one of the most used systems for primary stability evaluation. Nevertheless, RFA presents some critical issues, such as a limited sensitivity. In order to overcome these limits, a novel tool based on artificial intelligence (AIT) to evaluate immediate loading feasibility was recently introduced. The aim is to compare AIT and RFA outputs in the evaluation of immediate loading feasibility.

Method: During the period between January 2022 and March 2024, for all the implants placed by the authors, AIT indication of immediate loading feasibility and Implant Stability Quotient (ISQ) values were recorded. ISQ values were then divided in 2 groups: suitable or not suitable for immediate loading following the scale provided by the manufacturer. Both systems were set in the evaluation of implant as presumed each of them to be immediately loaded by a single non splinted crown.

Results: Data from 1220 implants were collected. Following RFA indications 961 implants were suitable for immediate loading of a single non splinted crown, whereas 259 presented values <70 ISQ and thus were not suitable for immediate loading. On the other hand, when evaluated by AIT, the implants suitable for immediate loading were 796 and those not suitable were 424. RFA and AIT evaluation matched in 871 cases: 704 times when the implants were considered suitable for immediate loading, and in 167 times when considered not suitable. By consequence, the evaluation did not match in 349 cases: 257 times AIT evaluated implants not suitable for immediate loading while RFA evaluated them suitable. In 92 cases the evaluations were inverted.

Conclusion: The comparison between RFA and AIT evaluation suggests that ISQ values are sufficient for immediate loading in a larger number of cases and thus, following the RFA scale, there is a higher risk of loading implants that are not suitable according to AIT.

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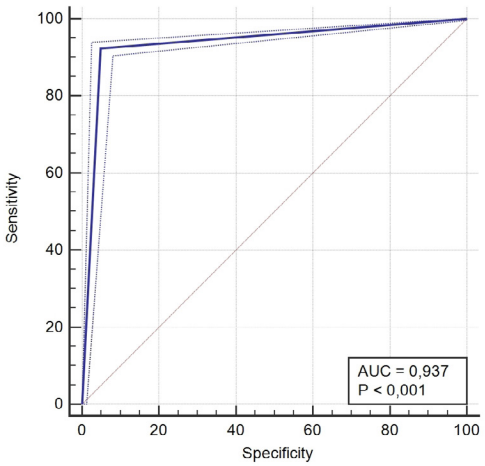
The Use of an Artificial Intelligence-driven Novel Tool for the Evaluationof Dental Implants Primary Stability and Immediate Loading Feasibility: A Multicentre Clinical Study

G. Daprile, M. Degidi

Introduction: A novel tool based on artificial intelligence (AIT) to evaluate immediate loading feasibility was recently introduced. The aim of this study is to evaluate the correspondence between the AIT prediction and the operator's evaluation in a large sample of implants.

Method: During the period between September 2022 and August 2023, 11 operators, after the placement of all their scheduled implants, were asked to classify the recorded insertion curves as suitable or non-suitable for immediate loading. Next, the same curves were analyzed by the AIT that classified them as belonging to YES (suitable for immediate loading) or NO (non-suitable for immediate loading) class.

Results: 1,924 dental implants were placed and a total of 21 different implant systems were used. According to the surgeons' evaluation 1,510 curves were suitable and 414 were non-suitable for immediate loading; when evaluated by the AIT, 1,414 curves belonged to class YES, while 510 belonged to class NO. The sensitivity resulted 92.32% (95% CI = 90.9% to 93.6), specificity 95.17%(95% CI = 92.6% to 97%), PPV 98.6% (95% CI = 97.8% to 99.1%), and NPV77.3% (95% CI = 73.4% to 80.8%).Conclusion: The AIT tested in the present clinical multicentre study, demonstrated a high level of accuracy in the prediction of immediate loading feasibility.



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