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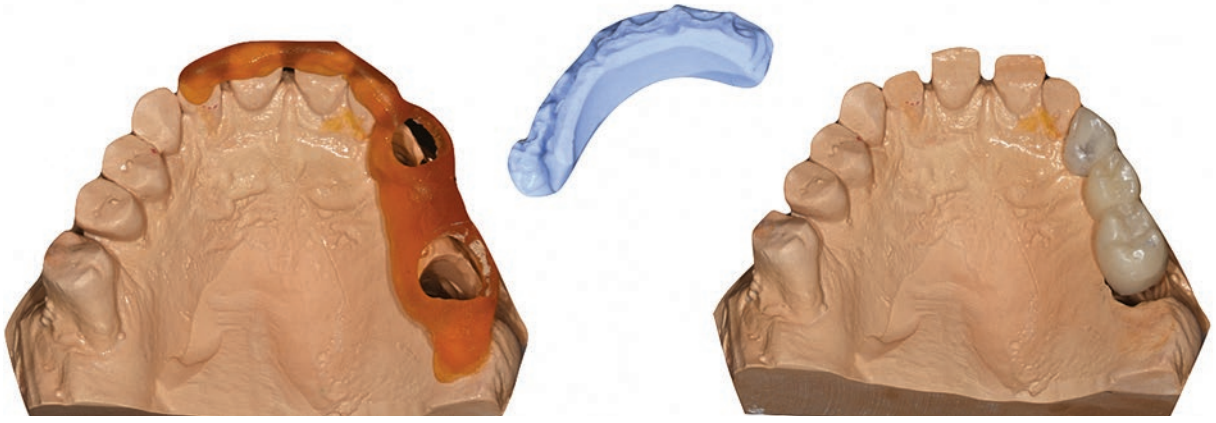

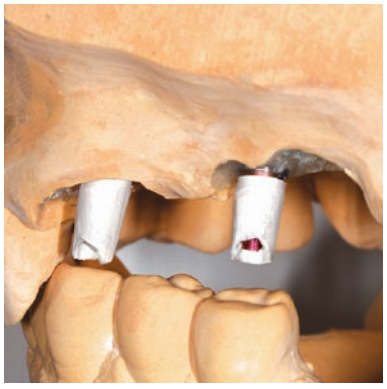

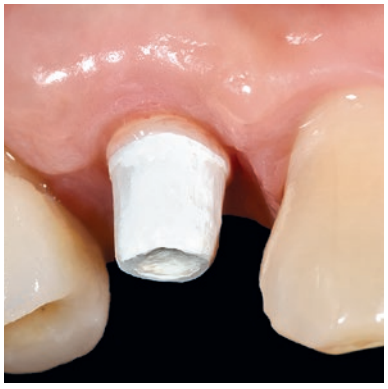

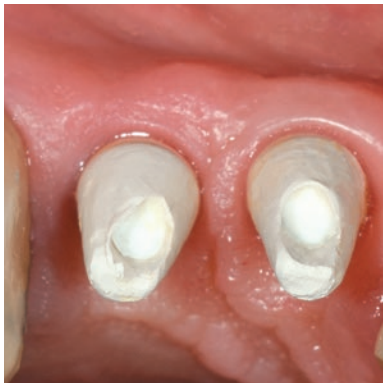

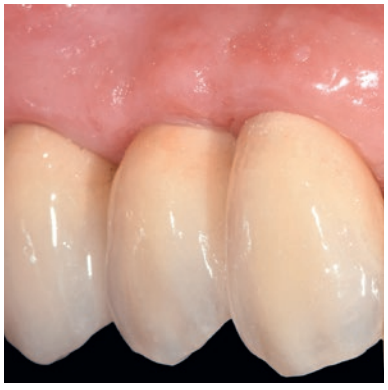

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Soft tissue integration with a hybrid abutment using the "one abutment–one time" therapeutic protocol: case series

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QUINTESSENCE PUBLISHING

TRANSLATED ARTICLE

Soft tissue integration with a hybrid abutment using the "one abutment–one time" therapeutic protocol: case series

Fabio De Pascalis, DMD

Objective: To describe a procedure that uses a definitive BioHPP hybrid abutment (polyether ether ketone [PEEK] reinforced with ceramic nanoparticles), to obtain a hermetic mucous seal with the peri-implant soft tissues. **Method and materials:** Between July 2017 and December 2019, seven patients aged between 40 and 60 years, who needed prosthetic rehabilitation in the esthetic zone, were treated. Among the various therapeutic solutions offered, patients chose an immediate or conventional implant rehabilitation using the "one abutment–one time" technique with the hybrid SKY elegance implant abutment (bredent medical). Ten implants were placed, five with immediate loading including two postextraction, and five in a conventional/classic loading protocol. The protocol required that the finishing margin of the provisional restoration was positioned approximately 1 to 2 mm from the implant platform, allowing the tissues to heal around the ceramic-reinforced PEEK abutment. After 6 months for the implants with immediate loading, and 3 months for those with conventional loading, the provisional restorations were replaced with definitive zirconia-ceramic prostheses. **Results:** The clinical evaluation on the 10 implants showed that the reinforced PEEK abutments integrated well with the peri-implant tissues, and were healthy, without plaque, and with no bleeding on probing. An average probing depth of 1.0 mm was observed for nine of the ten placed implants, and for the tenth the implant probing depth was 1.5 mm. **Conclusions:** The ceramic-reinforced PEEK abutments BioHPP SKY elegance associated with the one-time therapeutic protocol is a valid alternative to traditional implant loading procedures, leading to an effective peri-implant hermetic mucous seal. *(Quintessence Int 2022;53:590–596; doi: 10.3290/j.qi.b3082565; Originally published (in Italian) in* Quintenssenza Internationale 2021;35:48–57*)*

Key words: BioHPP, hybrid abutment, immediate implant, implant in the esthetic zone, one-time protocol, peri-implant tissue

The clinical success of implant prosthetics is based on the principle of osseointegration and the stability of the peri-implant soft tissues.[1] Peri-implant soft tissue integration is as important as osseointegration in implant success.[2]

Cochran et al,[2] in an experimental study conducted on dogs, showed that there is a peri-implant biologic width around implants, anatomically consisting of sulcular epithelium, junctional epithelium, and connective tissue in direct contact with the implant surface. Soft tissue integration after implant placement begins within the first week, consisting of an initial mucosal seal by leukocytes infiltrated in a dense fibrin network. Two weeks after surgery, the fibroblasts are the most represented cell population; they form connective tissue rich in cells and vascular structures. Simultaneously, during the first week, the first signs of epithelial proliferation are evident. At 4 weeks the density of fibroblasts decreases, and the junctional epithelium increases and occupies approximately 40% of the mucosal interface. After 6 to 8 weeks the junctional epithelium is complete, and between 6 and 12 weeks connective tissue in contact with the implant undergoes further maturation of fibroblasts, vascular structures, and fibers. Collagen is mainly aligned parallel to the implant surface.[3] Soft tissue needs about 12 weeks to achieve an optimal peri-implant mucosal seal.[4]

Most of the protocols used in implant prosthetics involve repeated detachment of healing screws or temporary abutments, before delivery of the final prosthesis. Instead, the "one abutment–one time" protocol involves screwing in of the final abutment at the time of implant placement or in the reopening

- Preoperative impression
- Development of the plaster cast and assembly on the articulator
- At the implant site, the plaster cast must be aligned
- A transfer key that reflects the adjacent teeth is created on the plaster cast
- The transfer key is used to identify the implant position, transferring it to the photopolymerizing composite resin

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Fig 1 Master cast with transfer key, and access channels for transfer.

phase, once osseointegration has taken place, without any further removal in the subsequent stages, leading to the definitive prosthetic integration. This protocol results in less crestal bone resorption[5] and increased stability of peri-implant soft tissue.[6] A systematic review[7] reported that detachments and repositioning of the abutments resulted in an average difference of 0.2 mm marginal bone resorption, and the same authors concluded, considering this significant variation in peri-implant bone levels, that it is necessary to consider revising the current implant restoration protocols. A 5-year randomized controlled multicenter study concluded that detachments and repositionings of the abutments resulted in an average marginal bone loss of 0.37 mm, and that this difference cannot be considered clinically relevant.[8] However, the authors recommended avoiding unnecessary disconnections of the abutments whenever possible, whether the side effects of this procedure were clinically significant or not.[8]

Method and materials

Between July 2017 and December 2019, seven patients (four men and three women) aged between 40 and 60 years who needed implants in the esthetic zone were treated. The patients were subjected to a thorough general anamnesis, which was found to be noncontributory, and were not taking any medication. Four patients smoked approximately 10 to 15 cigarettes per day. Patients underwent intraoral and extraoral clinical examination including radiography. Patients were informed of the different treatment options for the replacement of their missing teeth. All patients chose rehabilitation with immediately or conventionally loaded implants using the one-time-abutment therapeutic protocol with the SKY elegance abutment.

Initially, maxillary and mandibular impressions were taken, and used to create a master cast with extra-hard type IV plaster (Fig 1). The casts were drilled in the implant region and mounted on a semi-adjustable articulator. From the plaster cast, a transfer key with low-shrinkage (Pi-Ku-Plast, bredent) was made, and perforated in the area of the implants (Fig 1) to allow for the positioning of the transfer key for the pick-up impression. The transfer key had to be stable so that it adhered correctly to neighboring teeth or the edentulous area to allow a precise and secure fit intraorally and on the cast. The transfer key was later used for the implant impression. The technician created shell provisional restorations, including the emergence profiles, and mirroring the adjacent tooth (Fig 1).

Clinical phase

One hour preoperatively, patients underwent antibiotic prophylaxis with 2 g of amoxicillin and clavulanic acid. For one patient antibiotic therapy started 5 days earlier due to previous infection.

Patients rinsed with chlorhexidine 0.12% mouthwash for 1 minute. After anesthesia, four of the immediate implants, were placed with flapless surgeries and with maximum caution to safeguard cortical integrity of the buccal, mesial, and distal marginal bone crests. The remaining six implants were placed using the conventional technique with mucoperiosteal incision.

Implant osteotomies were prepared with calibrated drills and under copious irrigation with saline solution, to accommodate implants (blueSKY, bredent medical) 3.5 to 4.0 mm in diameter and 10 to 12 mm in length. The implants were placed with a torque of between 25 and 45 N/cm. The implant shoulder was positioned 2 mm subcrestally, at a distance of 1.5 to 2.0 mm in relation to adjacent teeth. The jumping distance (gap) around the two postextraction implants was filled with osteoinductive material (osteOXenon gel, Biotek). Five implants did not have an insertion torque sufficient for the performance of immediate load-

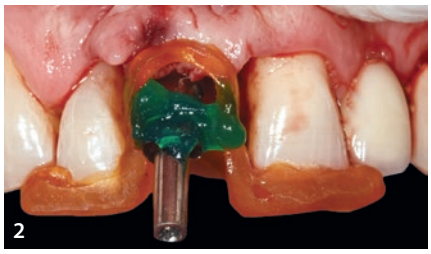


Fig 2 Transfer key position, transfer set with light-curing, low-shrinkage resin in an immediately loaded implant.

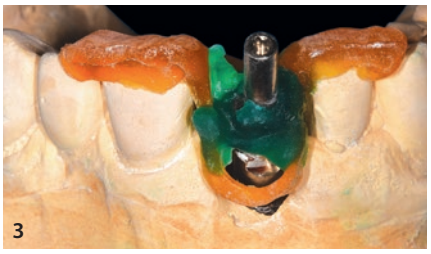


Fig 3 Implant analog blocked to the model with low shrinkage, quick-setting resin.

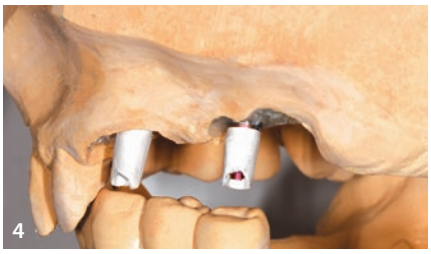


Fig 4 BioHPP abutment blocked on the model for customization according to the clinical requirements.

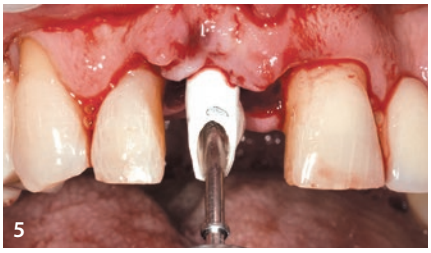


Fig 5 Customised BioHPP implant abutment definitively screwed with a torque of 25 N/cm.

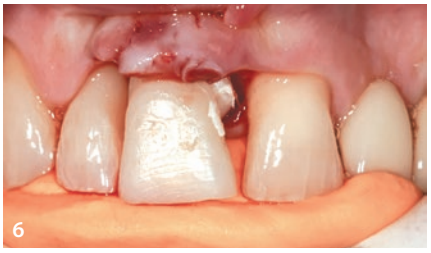
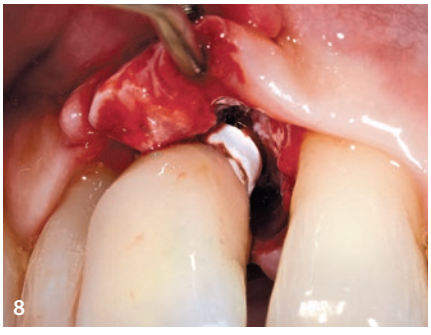


Fig 6 Relining of the provisional shell with methylmethacrylate-based resin.

Fig 7 Finished provisional restoration.



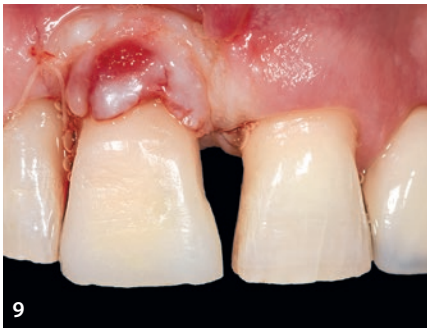
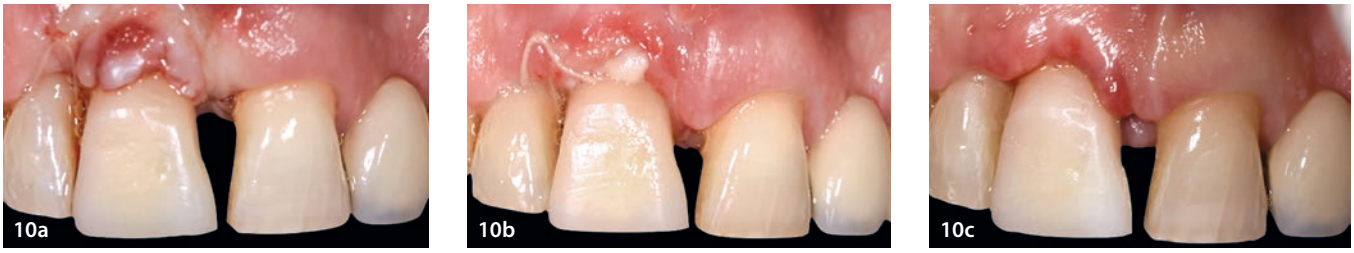


Fig 8 BioHPP abutment is 1 to 2 mm narrower than the implant platform for platform-switch to encourage peri-implant soft tissue healing.

Fig 9 Cementation of the provisional before suturing to remove excess cement while flap is still open. Thereafter, the flap is sutured to the emergence profile of the provisional restoration.

ing; they were therefore submerged for 6 months. For the other five implants with a torque of 40 N/cm, immediate loading was performed with the "one abutment–one time" protocol with the analog procedure described above,[9] which included testing the transfer key (Fig 2) to ensure the correct fit and stability. The transfer key was then removed and screwed on to the pick-up impression, repositioned, and splinted with light-curing resin (compoForm UV, bredent) (Fig 2). After unscrewing, the implant analog was screwed in the dental laboratory to the transfer, the transfer key was placed, with transfer and analog blocked on the model, taking care to insert the analog through the channel in the model, without any interference. The analog was blocked with low-shrinkage, fast-curing resin in the socket (Qu-resin, bredent) (Fig 3).

Once the model had been obtained, the BioHPP abutment was screwed onto the analog clamped in the model, to trim and shorten it according to clinical requirements (Fig 4). Abutment preparation was performed (taking into account the principles of stability and retention of the abutment) with little or no finishing margin to avoid conditioning of the finishing margin in the construction of the element's emergence profile, which had to be mirrored in the provisional contiguous structures (Fig 4). The abutment, thus prepared, was permanently screwed onto the implant with a torque of 25 N/cm (Fig 5). Next, the preliminary provisional restoration was relined with methyl methacrylate-based resin (Unifast III, GC Dental Products) (Fig 6), finished, and polished. Detailed attention was paid to the construction



Figs 10a to 10c Postoperative clinical images at baseline, 72 hours, and 2 weeks.

Fig 11 Peri-implant soft tissue at 6 months in an immediately loaded implant after removal of the provisional restoration.

Fig 12 Occlusal view of the peri-implant soft tissue around an immediately loaded implant at 6 months after the removal of the provisional restoration.

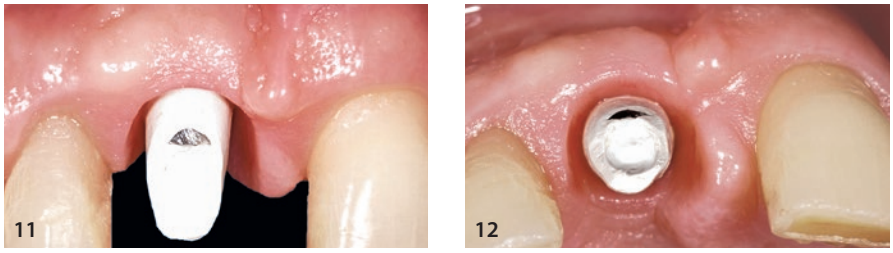
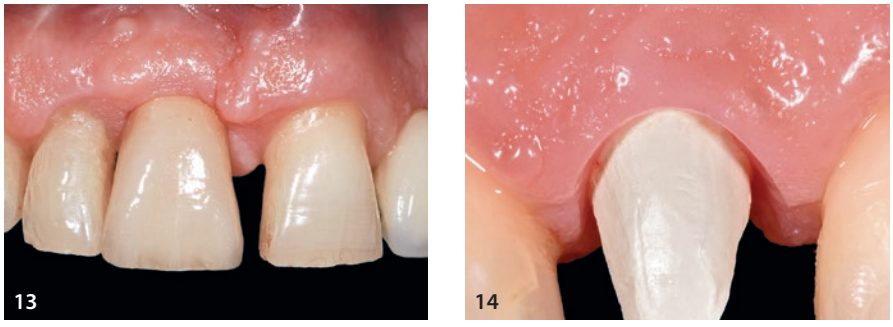


Fig 13 Zirconia ceramic definitive crown of the maxillary right central incisor immediately loaded implant.

Fig 14 Peri-implant soft tissue of the maxillary right central incisor immediately loaded implant at 12 months.



and finishing of the emergence profile of the provisional, which had to accurately reflect adjacent elements to promote gingival healing (Fig 7). In addition, the finishing margin of the provisional crown began approximately 1 to 2 mm from the implant platform, allowing tissues to heal around the BioHPP abutment (Fig 8). The provisional restoration was cemented with glass-ionomer cement (Fuji I, GC), with care taken not to encroach on spaces meant for the peri-implant tissues and to avoid excess cement. A fundamental element in the procedure was to avoid accidental detachment of the provisional or unscrewing of the abutment. It was necessary to screw in the abutment at 25 N/cm and cement the provisionals to prevent instability of the implant-abutment system, which could compromise healing around the abutment and the emergence profile of the provisional.

Occlusion was checked to eliminate nonphysiologic contact. For conventionally loaded implants, the same abutment preparation procedure was carried out; the abutment was screwed permanently to the implant; the provisional was reattached and fixed with cement before suturing to allow open flap removal of possible excess cement, then the flap was sutured by attaching it to the emergence profile of the provisional (Fig 9).

After 72 hours there was good tissue healing (Fig 10). After 6 months for immediately loaded implants and 3 months for conventionally loaded implants, the provisional restorations were removed (Fig 11). A precision impression of the abutment was taken, without removing it, using the double retraction

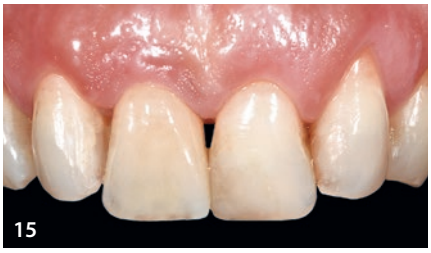


Fig 15 Zirconia ceramic definitive crown of the maxillary right central incisor immediately loaded implant.

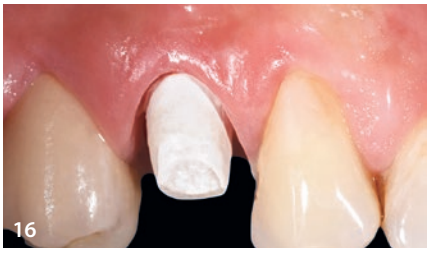


Fig 16 Peri-implant soft tissue of the maxillary right first premolar immediately loaded implant at 12 months.

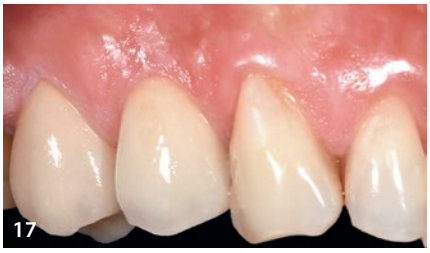
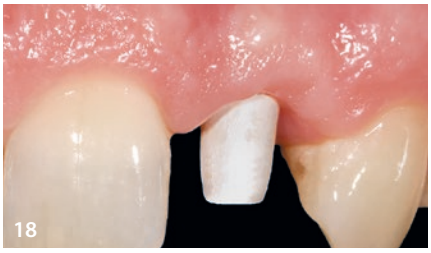


Fig 17 Zirconia ceramic definitive crown of the maxillary right first premolar immediately loaded implant.



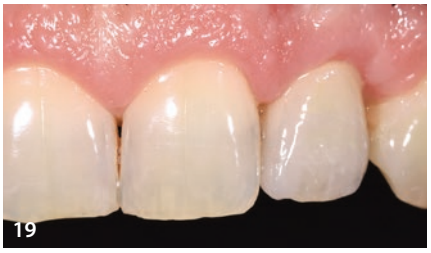


Fig 18 Peri-implant soft tissue of the maxillary left lateral incisor immediately loaded implant at 15 months.

Fig 19 Zirconia ceramic definitive crown of the maxillary left lateral incisor immediately loaded implant.

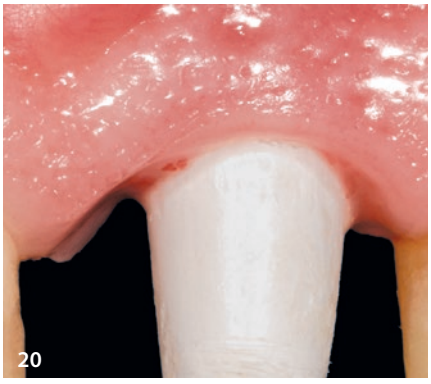


Fig 20 Peri-implant soft tissue of the maxillary left central incisor immediately loaded implant at 24 months.

thread technique. The dental technician fabricated definitive prostheses with zirconia ceramic, which were cemented with ImplaCem Automix Precision (Dentalica).

Results

None of the treated patients reported spontaneous pain or pain on percussion, for implants and peri-implant soft tissue inflammation during follow-up. None of the prostheses had any biomechanical complications apart from a decementation of one definitive crown. Periodic follow-ups (Figs 11 to 27) showed no bone resorption and no bleeding on probing, with a periodontal probing depth of 1 mm for nine implants and 1.5 mm for one implant.

Discussion

To reduce the trauma to the soft tissues[7] that detachment and repositioning of implant prosthetic components may cause, the "one abutment–one time" protocol was proposed, which involves the insertion of abutments at the same time as implant placement without removing them during successive phases

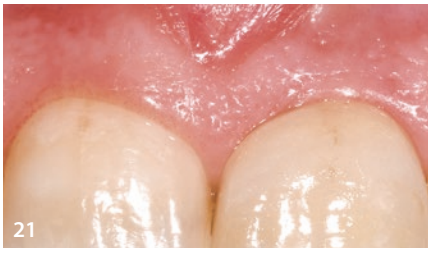


Fig 21 Details of the soft tissue and emergence profile of the maxillary right central incisor implant with definitive zirconia ceramic crown.

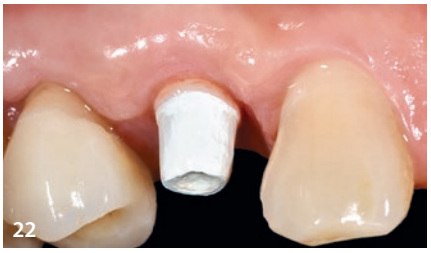


Fig 22 Peri-implant soft tissue of the maxillary right first premolar conventionally loaded implant at 12 months.

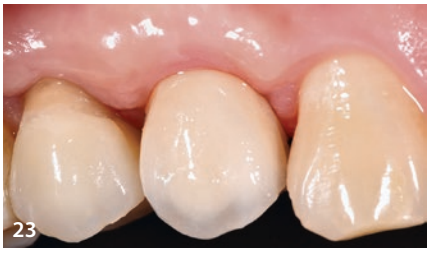


Fig 23 Zirconia ceramic definitive crown of the maxillary right first premolar conventionally loaded implant.

Fig 24 Peri-implant soft tissue of the maxillary left first premolar and first molar conventionally loaded implants at 36 months.

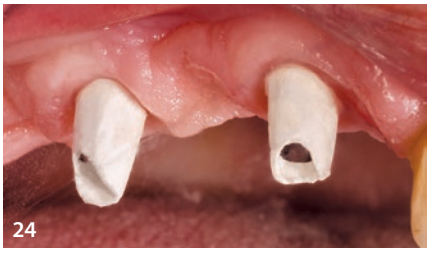


Fig 25 Zirconia ceramic definitive prosthesis on conventionally loaded implants spanning from the maxillary left first premolar to the first molar.

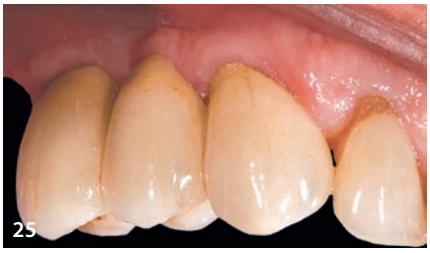


Fig 26 Peri-implant soft tissues around the maxillary right canine and first premolar conventionally loaded implants at 18 months.

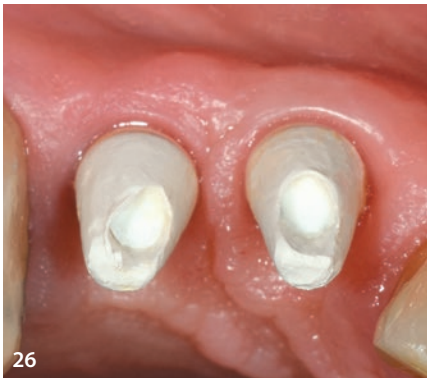
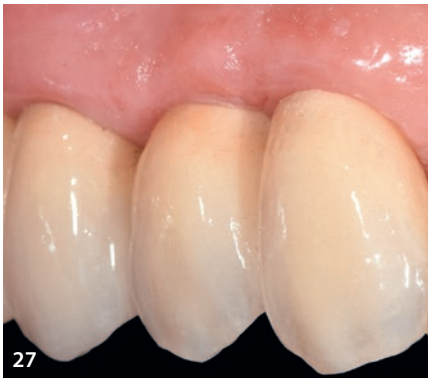


Fig 27 Zirconia ceramic definitive crowns on the maxillary right canine and first premolar conventionally loaded implants.



of prosthetic rehabilitation.[10-12] The procedure described uses a hybrid abutment called BioHPP.

BioHPP is derived from PEEK with the addition of ceramic micro-fillers to improve its physical characteristics. PEEK is a bioinert material, which has been used in medicine for more than 35 years.[13-16] In a preclinical study with dogs,[17] the quantitative histomorphometric evaluation of soft tissues showed that there were differences in favor of the BioHPP abutments compared to traditional titanium abutments. There was increased peri-implant soft tissues thickness around BioHPP abutments, creating a biologic seal between the abutment and the soft tissue. A recent experimental study compared hybrid abutments made of BioHPP (test group) with those made of titanium (control group), with the following result: "The analysis with immunofluorescence performed with confocal microscope showed that the fluorescent pattern of the test group seems to be more uniform and intense than in the control group. The implication of the clinical outcome is that there is an improved proliferation and attachment of fibroblasts, increased neoangiogenesis and an extracellular matrix on BioHPP, which is directly linked to an increase in the quantity and quality of soft tissue on the transmucosal side of the abut-

ments that provide a better protective seal between the oral environment and the implant."[18]

Conclusions

The "one abutment–one time" protocol with SKY elegance implant abutments can be considered a viable alternative to titanium abutments in immediate loading procedures. However, clinical trials are needed for the long-term validation of the results obtained with reinforced PEEK abutments because conventional titanium abutments have been in use for over 50 years.

Declaration

The author declares that there is no conflict of interest.

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