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Esthetic Outcomes Following Immediate Implant Combine with Soft Tissue Augmentation

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Objective

Studies demonstrated immediate implant sites commonly have ridge dimensional alterations accompanied with post-op mucosal recession that compromise esthetic outcomes. The use of an autogenous tissue graft or an acellular dermal matrix was proposed to compensate these changes. However, the results of studies were equivocal. This randomized controlled trial was aimed to evaluate the impact of immediate implant combined with soft tissue augmentation on preserving tissue contour.

Methods

This study had three groups: immediate implant (IM), immediate implant combined with the subepithelial connective tissue graft (IMCT), and immediate implant combined with the acellular dermal matrix (IMAD). The included patients had a single unrestorable tooth in the esthetic zone (maxillary incisors, canines and premolars) with adjacent teeth. The surgical sites should have acceptable buccal gingival level, interproximal bone level (recession or bone loss≤ 2mm) and mostly intact buccal plate. All implants were immediately placed following extraction and xenografts were placed to fill in any bony defects. Each implant was randomly assigned to one group (the size of the graft was standardized). A healing abutment was placed and allowed to heal for six months before the permanent crown delivery (Figure 1). Smokers (≤10 cigarettes per day) were included.

The primary outcome was ridge dimensional alteration while the secondary outcomes were changes of peri-implant mucosal level, mucosal thickness, bone level and bone dimension. Based on the power calculation, 15 patients in each group was planned to be recruited. Ridge dimensional changes were measured by computer-assisted scanned images of dental models. The images of periapical radiographs and cone beam computed tomography were used to measure bone levels and dimensions. All clinical measurements were performed by a single examiner using a stent with reference marks at four visits (baseline, 3, 6, 12 months following the surgery) (Figures 2, 3, 4).

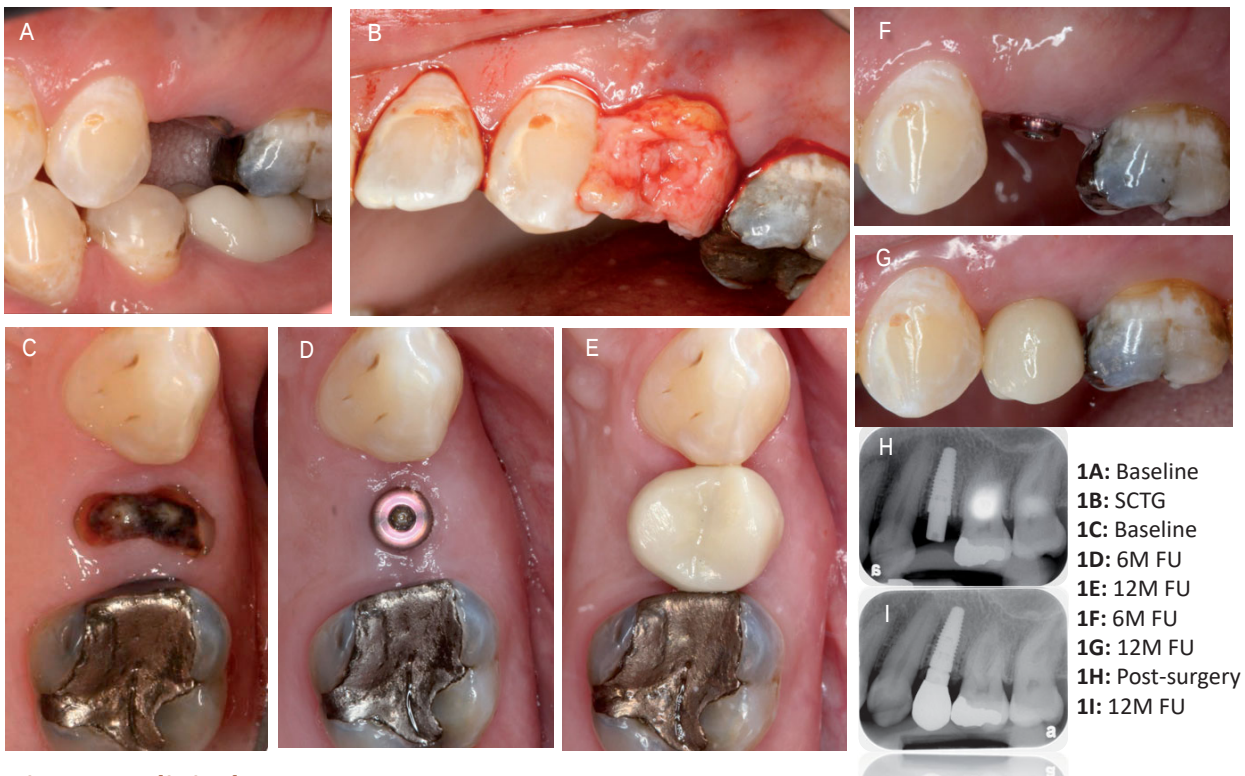
Results

To date, fifteen patients completed the 12-month visit and nineteen patients completed the 6-month visit. Only 6-month results of these nineteen patients (n=9, 6, 4 in the IM, IMCT, and IMAD groups) were reported (Table 1). The reduction of buccal horizontal ridge dimension (BHRD) or buccal horizontal bone dimension (BHBD) did not seem to be different between groups (mean BHRD: 0.65±0.66, 0.47±0.95, 0.12±1.16mm; mean BHBD: 0.42±1.21, 0.05±1.69, 0.78±0.71mm in the IM, IMCT, and IMAD respectively). The mean changes of peri-implant mucosal levels were within 1mm (mean mid-buccal mucosal recession: -0.33±1.03, 0.50±0.77, 0.16±1.55 mm; mean mesiobuccal mucosal recession: 0.61±0.65, 0.33±0.52, 0.75±0.65mm; mean distobuccal mucosal recession: 0.44±0.81, 0.33±0.61, 0.63±1.60mm in IM, IMCT and IMAD respectively). Soft tissue augmentation appeared to increase peri-implant mucosal thickness (mean mucosal thickness gain: 0.18±0.15, 0.78±0.34, 1.27±0.83mm in IM, IMCT and IMAD respectively). Radiographic alveolar bone levels appeared to be stable (mean marginal bone loss at the mesial site:0.99±1.34, 0.07±0.16, 0.75±1.07mm; at the distal site: 0.73±1.15, 0.02±0.04, 1.23±1.13mm in the IM, IMCT and IMAD respectively). No further statistical analysis was performed since the study was not finished.

Conclusions

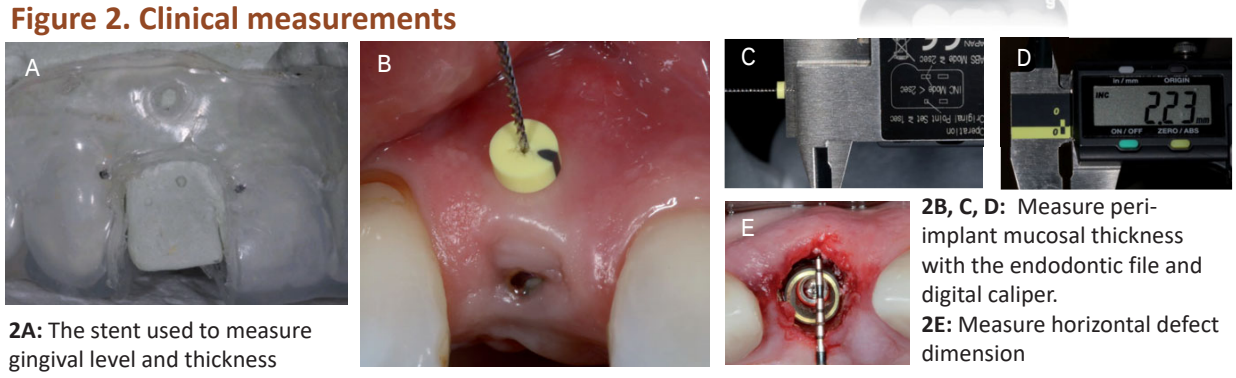
The preliminary results demonstrated soft tissue augmentation increased tissue thickness but did not appear to have significant impact on preserving peri-implant mucosal level, bone level, bone dimension and ridge dimension. No conclusive statement could be made until the study is finished.

Figure 1. Immediate implant placement with the subepithelial connective tissue graft.



1A: Baseline
1B: SCTG
1C: Baseline
1D: 6M FU
1E: 12M FU
1F: 6M FU
1G: 12M FU
1H: Post-surgery
1I: 12M FU

Figure 2. Clinical measurements



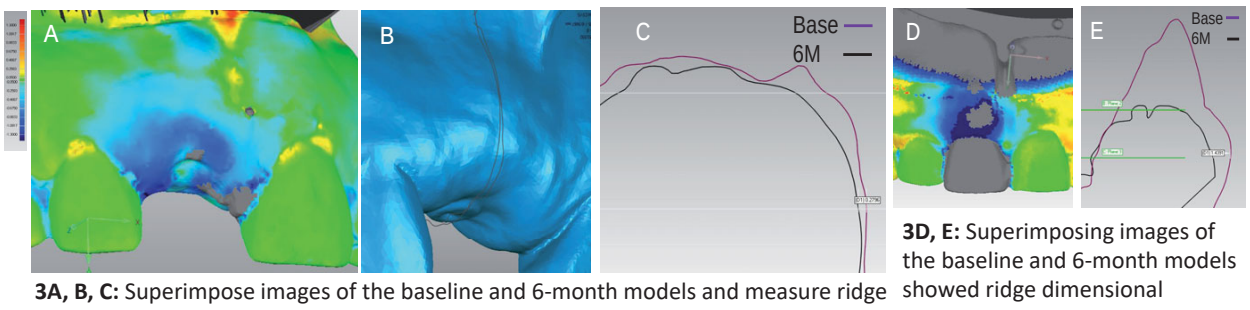
2A: The stent used to measure gingival level and thickness

2B, C, D: Measure peri-implant mucosal thickness with the endodontic file and digital caliper.
2E: Measure horizontal defect dimension

Table 1. Alterations of bone and soft tissues

Base-6M (mm)	IM (n=9)	IMCT (n=6)	IMAD (n=4)
Peri-implant mucosal recession (Midbuccal)	-0.33±1.03	0.50±0.77	0.16±1.55
Peri-implant mucosal thickness augmentation	0.18±0.15	0.78±0.34	1.27±0.83
Buccal horizontal bone dimension reduction	0.42±1.21	0.05±1.69	0.78±0.71
Buccal horizontal ridge dimension reduction	0.65±0.66	0.47±0.95	0.12±1.16

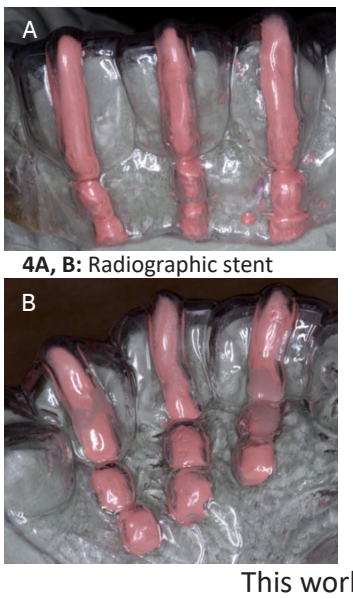
Figure 3. Measurement of ridge dimensions



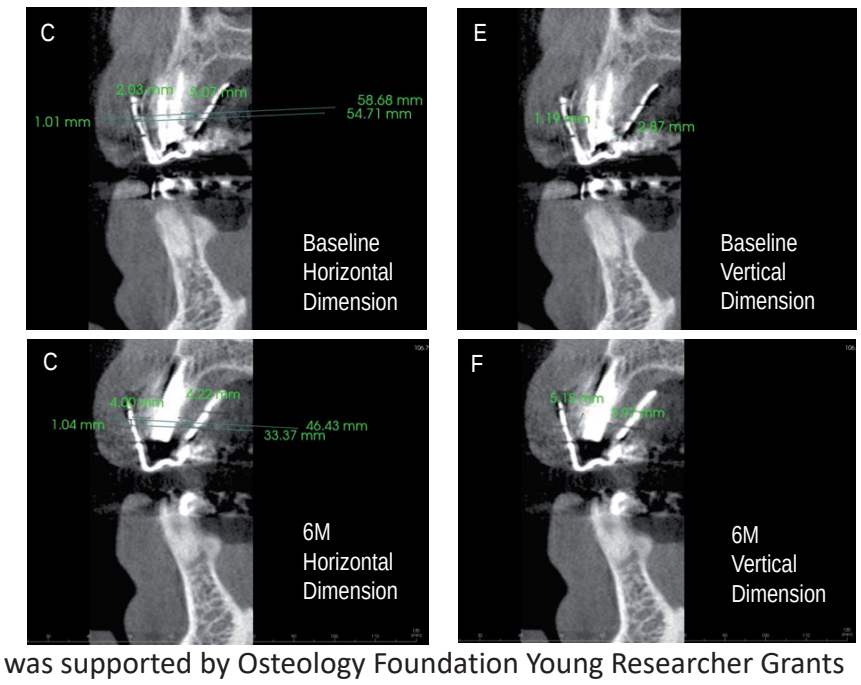
3A, B, C: Superimpose images of the baseline and 6-month models and measure ridge dimensional change (Geomagic control, 3D system, Carry, NC, USA) in an IMAD case.

3D, E: Superimposing images of the baseline and 6-month models showed ridge dimensional reduction in an IM case.

Figure 4. Measurement of bone dimensions



4A, B: Radiographic stent



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