Management of midfacial recession defects around adjacent maxillary implants using ‘screw tent-pole technique

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Fig. 1-2: Patient with gingival recession and discoloration due to exposure of the underlying dental implants ( teeth No. 7, 8, 9) three years after implant placement. Note the lack of esthetic peri-implant mucosa. (Photos/Provided by Dr. Bach Le)

Fig. 3-4: Patient with gingival recession and discoloration due to exposure of the underlying dental implants ( teeth No. 7, 8, 9) three years after implant placement. Note the lack of esthetic peri-implant mucosa. (Photos/Provided by Dr. Bach Le)

Fig. 4-5: Flap elevation illustrating labial bone dehiscence and implant exposure.

Fig. 6: Screw ‘tent-pole’ grafting technique; placement of three titanium tenting screws placed 3-4 mm below the gingival margin.

Fig. 7: Placement of a mineralized allo-graft material over the defect site with coverage with a peri-implant membrane.

Fig. 8: Re-entry at four months after grafting showing excellent graft healing and consolidation over the previous defect.

Fig. 9: The middle implant at the maxillary right central incisor position was removed in the second surgery to create a pontic site.

Fig. 10-11: A consolida- tion period of 21 months was allowed to ensure proper maturation of the bone and covering soft tissue. (Fig. 12) Screw-retained provisional restoration were utilized (Fig. 13) for six months to develop the soft-tissue architecture prior to the delivery ofFig. 12: Screws tent-pole technique was again utilized with mineralized allograft and a collagen membrane for additional vertical augmentation of the pontic site. (Fig. 10) A consolida- tion period of 21 months was allowed to ensure proper maturation of the bone and covering soft tissue. (Fig. 12) Screw-retained provisional restoration were utilized (Fig. 13) for six months to develop the soft-tissue architecture prior to the delivery of

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Soft-tissue recession around dental implants often results in metal exposure and can present a major aesthetic challenge.1-3 Unfortunately, soft-tissue recessions around implants have been frequently observed with one study reporting midfacial recessions greater than 1 mm were present in 64 percent of the cases.1 Treatment and coverage of peri-implant soft-tissue recessions can be challenging despite reports in the literature indicating that recessions up to 2 mm can be successfully grafted with a combination of coronally advanced flap and subepithelial connective tissue grafts.4 Long-term data on the success of these grafting techniques is limited.4-6

Thoma, et al. conducted a systematic review7 and reported that the combination of apically positioned flap/ vestibuloplasty and soft-tissue augmentation using a free gingival graft, subepithelial connective tissue graft or collagen matrix resulted in a 1.4-3.3 mm increase in keratinized tissue. Overall, soft-tissue connective tissue augmentation resulted in the best gains in soft-tissue volume at implant and partially edentulous sites, and a combination of better papilla fill and higher marginal mucosal levels as compared to non-grafted sites around immediately placed dental implants.8 A recent systemic review9 did not find a single acceptable randomised-controlled clinical trial (RCT) in the world literature to recommend the best incision designs, suturing techniques or materials to correct or augment peri-implant soft tissues.

One of the aim of soft-tissue augmentation procedures is to correct mucosal recession. To address bone loss and associated gingival recession around implants in the aesthetic zone, a combination of guided bone regeneration (GBR)10 and soft-tissue augmentation11 are often performed. When multiple implants are placed in the aesthetic zone, vertical and horizontal bone augmentation of more than 2 mm from the implant platform is often necessary to overcome the normal pattern of bone remodeling and soft-tissue recession.11 The use of coronally advanced flaps and connective tissue grafts can sometimes jeopardize the aesthetic appearance of the treatment site by altering the colour and thickness of the transplanted tissues.12,13

The use of a particulate mineralized bone allo graft covered with a collagen membrane (GRF) for the correction of gingival recession has been reported in the dental literature by Le, et al.4 This case report demonstrates an innovative surgical technique to restore hard tissue and increase mucosal height using a custom made titanium framework implant.

Case report
The patient was a healthy 20-year-old man nonsmoker with a history of traumatic fracture of the maxillary right lateral incisor and two central incisors. The teeth were extracted with immediate placement of three external hex dental implants (Bi-omet 3i Dental, Palm Beach Gardens, Fla). Three years after abutment was seated, the patient presented with a chief complaint of, “I can see the metal portion of my implants.” Examination at this time revealed long unesthetic maxillary crowns with visible abutment metal and a dark shadow along the gingival sulcus (Figs. 1-4). Clinical and radiographic evaluations were conducted to assess the patient’s soft-tissue health, position and emergence profile of the implant relative to the alveolar housing and adjacent teeth, gingival contour, amount of gingiva visibility when the patient smiled, and the shapes of the prosthetic and clinical crowns. There were no active signs of inflammation or infection around the peri-implant mucosa and all three implants appeared to be in good three dimensional position.

A two-stage surgical approach was planned. The first stage would involve augmentation of the missing labial bone using guided bone regeneration with tenting screws (“screw tent-pole” technique described by Le, et al.12), followed by a second stage surgery to remove the middle implant with additional bone augmentation to develop a pontic site. Following a healing period, provisional restorations would be used to sculpt the soft-tissue architecture prior to definitive restorations.

On the day of surgery, the patient was asked to rinse with 0.12 percent chlorhexidine gluconate (15 mL) prior to IV sedation. A crestal incision was made after the patient was sedated. A minimally invasive surgical technique was used to develop a pontic site. Following a healing period, provisional restorations were utilized (Fig. 13) for six months to develop the soft-tissue architecture prior to the delivery of

reduce tension over the graft (Fig. 6). Mineralized bone allo graft was placed over the defect sites and over contoured by approximately 20-30 percent to compensate for the anticipated apical migration and partial resorption of the augmentation material during remodeling (Fig. 7). Prior to use, the allo graft material was hy- drated according to the manufacturer’s directions and mixed with the patient’s blood, which served as a coagulant. After graft placement, the material was covered with a perac- dial membrane. The mucoperiosteal flap was ap-proximated and sutured in place. The patient was provided with an interim prosthesis to be worn during four months of healing and was dis- missed with postoperative instruc- tions, antibiotics and analgesics until the follow-up visit seven to 10 days later.

After a four-month healing period, a second stage surgery was performed to remove the middle implant in the maxillary right central incisor position to create a pontic site (Figs. 8-9). The “screw tent-pole” technique was again utilized with mineralized al-
the definitive restoration (Fig. 14).

The final restoration with soft-tissue precision was shown at eight years (Figs 15-16) and 13 years (Fig. 17) follow-up, along with CBCT and periapical views (Figs 18-20). There were no complications or adverse events during surgery or postoperative healing. The preoperative crestal bone thickness for both implants increased to 2.3 and 2.2 mm, respectively, approximately one year after treatment. Significant increases in soft-tissue thickness, keratinized tissue width and gingival height were also unexpectedly achieved and maintained through 12 years of follow up.

Discussion

This clinical case reports on unexpected improvements in peri-implant soft-tissue dimensions after GBR procedures to correct labial dehiscences around implants in the maxillary anterior area. Peri-implant bone loss can result in soft-tissue resorption followed by plaque attachment at or near the implant-abutment interface. This, in turn, can trigger soft-tissue inflammation with additional bone loss and gingival recession. It has been reported that gingival margin levels may be affected by the thickness of the gingival tissues and that a thin tissue type may favor apical displacement of the soft tissue margin. To maintain gingival health, maintaining an adequate width (1-2 mm) of keratinized gingiva around dental implants has been suggested; however, this has been disputed. A correlation has been reported between the presence of keratinized tissue and plaque levels and the incidence of mucositis. It has been suggested that sites with minimal keratinized tissue might be prone to a lower incidence of periodontal pocket formation.

In the anterior maxilla, as labial bone thickness resorbs, there is a corresponding loss in labial soft tissue with the implant. Moderate recession can make thin, pink gingival tissues appear dark because of the presence of the underlying meaty abutment and implant, and further bone loss can cause unsightly metal exposure above the gingival margin. In general, implants carried on the exposure site and the tissue complications when placed in thin tissue bio types or with labial inclinations carry a higher risk of soft tissue complications. When placed in thin tissue, a thin tissue type may favor apical displacement of the soft tissue margin. To maintain gingival health, maintaining an adequate width (1-2 mm) of keratinized gingiva around dental implants has been suggested; however, this has been disputed. A correlation has been reported between the presence of keratinized tissue and plaque levels and the incidence of mucositis. It has been suggested that sites with minimal keratinized tissue might be prone to a lower incidence of periodontal pocket formation.

The goal of the GBR procedures in the present case was to treat the facial bone defects as well as restore the aesthetic gingival margin. The efficacy of allografts and GBR surgical protocols in repairing alveolar defects has been reported in the literature. While some allografts and xenogenic tissues have demonstrated efficacy in soft-tissue augmentation, the use of collagen membranes with a mineralized allo- graft for soft-tissue augmentation is not well documented. In the present case, use of a collagen membrane in combination with the mineralized bone allograft resulted in gain in keratinized tissue width and gingival height. While the goal of the GBR procedure was to treat the bone defect in the present case, improvements were coincidentally observed not only in the soft tissue dehiscence, but also in the keratinised tissue width and soft-tissue thickness. The use of mineralized allograft placed around 1.5 mm titanium screws (‘screw tempode’) to tent out the soft-tissue matrix and periosteum has been previously reported for successful alveolar ridge reconstruction. Although there are no reports of a GBR procedure resulting in clinical increases in both of the latter soft-tissue dimensions, a limited number of retrospective studies have reported an increase in soft-tissue thickness around dental implants primarily in the anterior maxilla after increasing the thickness of the facial bone through GBR.

Furthermore, the membrane placed over the particulate graft in the present clinical case was essentially a collagen matrix similar to a connective tissue graft, which adds to the thickness of the overlying tissue. Scoring of the periosteum and underlying bone tissue prior to grafting and foreign body reaction from placement of a graft and membrane may result in scar tissue formation that augments the soft-tissue profile. The present technique is not ideal for restoring the gingival margins for poorly positioned implants or when there is significant thread exposure. For example, implant placed outside of the alveolar housing or with significant labial inclination associated with labial bone loss should be excluded.

Zucchelli et al. reported on a surgical-prosthetic treatment for implants with buccal soft tissue deficiency defects in the aesthetic zone. The technique involved removing the crown, shortening the abutment and then treating the dehiscence defect with a coronally advanced flap and connective tissue graft. After one year, mean soft tissue dehiscence coverage was 96.3 percent with complete coverage in 75 percent of the treatment sites. While patients were satisfied during short-term follow-up, the ability to camouflage a bony defect with or without exposed implant threads is highly limited without the support of the underlying bone, which is the main cause of soft tissue recession.

In addition to soft-tissue recession, marginal bone loss has been associated with increased peri-implant stress concentrations in the crestal bone region. Over time, elevated stress concentrations can trigger additional bone loss and further soft-tissue recession. If left untreated, increased stresses can result in screw loosening, metal fatigue and compensatory fracture over time. Implants placed in the anterior maxillary jaw with thin buccal plates are highly susceptible to the adverse effects of marginal bone loss.

In summary, the use of a mineralized bone allograft and a collagen membrane effectively increased alveolar hard- and soft-tissue dimensions in the aesthetic zone of the anterior maxilla. Restoring the missing bony grafts and decreased the risk of developing peri-implantitis from bacterial biofilm attachment to the underlying bone tissue. The use of connective tissue and free gingival grafts in this phenomenon has not been previously reported after guided bone regeneration procedures around dental implants. The author has reported the results of using this same technique in 11 patients who achieved similar outcomes after short-term follow-up.

The value of individual clinical case reports is that their anecdotal data can provide preliminary evidence for developing new hypotheses that lead to larger, randomized controlled clinical trials, which are needed to determine if the present approach will effectively serve as an alternative for soft tissue augmentation in instances where tissue thickness is needed.

References


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