Plastic Surgery at the Time of Membrane Removal Around Mandibular Endosseous Implants: A Modified Technique for Implant Uncovering

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Removal of barrier membranes may complicate second-stage implant surgery, particularly in mandibular areas characterized by a shallow vestibule and minimal amount of keratinized tissue. A new surgical technique that permits implant exposure and membrane removal combined with a plastic procedure to improve soft tissue quality both buccally and lingually is presented. A midcrestal incision preserving the keratinized tissue available on the lingual side is designed. A double-layer flap is elevated, allowing membrane removal. The inner, full-thickness layer is then sutured back into place, thus protecting the regenerated bone and allowing a recipient bed for a free gingival graft. The outer, partial-thickness flap is sutured apically, thus deepening the vestibule. The advantages and technical aspects of the procedure are discussed. (Int J Periodontics Restorative Dent 2001;21:281–287.)

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Placement of dental implants in narrow or atrophic edentulous ridges often requires the application of regenerative procedures.[1] Treatment of implant dehiscence and fenestration may be important to ensure successful osseointegration over time.[2] Nonresorbable expanded polytetrafluoroethylene (e-PTFE) membranes are still considered the gold standard in bone-regeneration procedures. These barriers are able to satisfy all of the criteria required to achieve regeneration.[3] One of the possible disadvantages of nonresorbable membranes is their need to be removed. If these types of barriers are used during implant placement, the time of removal coincides with implant uncovering. This may represent a complication in procedure selection. At the second stage, the clinician may be able to assess implant osseointegration, verify the successful treatment of dehiscences and fenestrations, and improve or correct soft tissue deformities. In spite of the lack of definitive scientific evidence on the role of keratinized gingiva around implants,[4–6] clinical

experience suggests that keratinized tissue around implants may improve implant maintenance.[7] Many different techniques have been advocated in the literature to achieve implant uncovering, often implying the use of an apically repositioned flap. The incision technique may vary according to the position and number of implants. Hürzeler and Weng[8] presented a new technique to simultaneously remove barrier membranes at the time of implant uncovering and increase the band of keratinized gingiva. A modification of that technique, which may be applied in mandibular cases where it is not possible to gain any keratinized tissue from the lingual aspect, is presented here.

Case report

A 56-year-old Caucasian woman presented, complaining of partial edentulism in the left mandible. The treatment plan included three implants in the positions of the mandibular left first molar, second premolar, and first premolar. Because of the narrow ridge, during implant placement dehiscences were created at the buccal aspects of the implants (Fig 1). The bone defects were treated with an e-PTFE membrane (Gore-Tex Augmentation Material, 3i/WL Gore) and a mixture of autogenous bone and demineralized freeze-dried bone allograft ([DFDBA] LifeNet). The membrane was trimmed and secured apically with a Memfix screw (ITI, Straumann) and coronally with the cover screw to prevent any micromovement (Fig 2). The site healed uneventfully for about 7 months, after which the second surgical phase was scheduled (Fig 3).

Implant uncovering

At the time of second-stage surgery, a few issues had to be evaluated: *(1)* the implants did not have any keratinized gingiva lingually, and the cover screws were almost perforating the tissue (Fig 4); *(2)* a full-thickness flap had to be elevated to remove the membrane; and *(3)* an apically repositioned flap was indicated to expose the implants. It was evident that a conventional procedure would result in no or minimal keratinized gingiva on the buccal and lingual aspects of the implants and exposure of interproximal bone, increasing the potential for resorption. To overcome all of these problems, a novel technique was developed to achieve keratinized tissue on the buccal and lingual aspects and protect the interproximal bone.

Surgical procedure

Local anesthesia was obtained by infiltration of articain 4% (Cabon) supplemented with epinephrine 1:200,000 to ensure proper hemostasis. A midcrestal partial-thickness incision was outlined to preserve a portion of keratinized tissue on the lingual side of the flap. Buccal and lingual releasing incisions were designed at the distal aspects of the

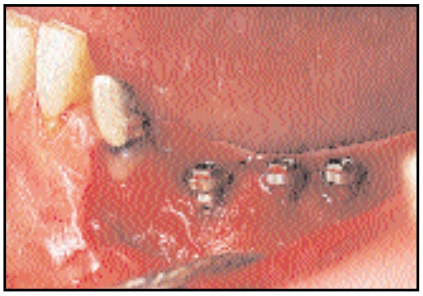

Fig 1 *After implant placement, a dehiscence is evident on the buccal aspect of the most mesial implant. A thin cortical plate also covers the other two implants.*

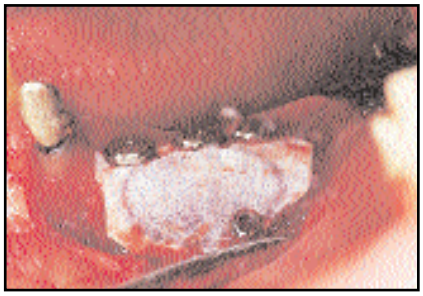

Fig 2 *e-PTFE membrane is placed over the implants. Autogenous bone and DFDBA are packed over the defects, and a membrane is secured coronally with the cover screws and apically by a Memfix screw to prevent any micromovement.*

Fig 3 *Radiograph of the surgical area just before uncovering, about 7 months after implant placement. Note that the cover screws are not fully seated over the implant because of the interposition of the e-PTFE membrane. Crestal bone level is just at the implant shoulder.*

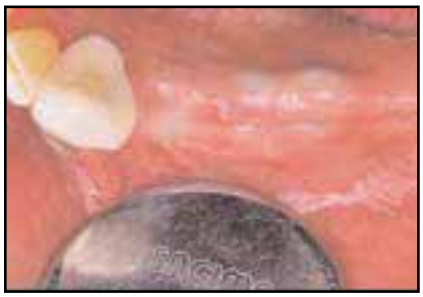

Fig 4 *Occlusal view of the area at uncovering. No keratinized tissue is present lingually. The tissue is very thin, and the cover screws are almost penetrating the mucosa.*

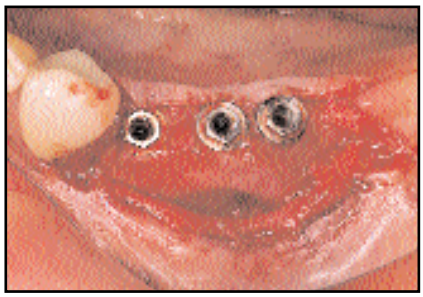

Fig 5 *e-PTFE membrane has been removed. Note the double-layer flap. The dehiscences are completely healed, and the width of the buccal cortical plate has been significantly enlarged. Note the vertical releasing incisions that limit the extension of the flap both buccally and lingually.*

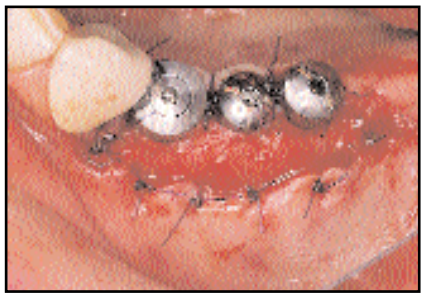

Fig 6 *Split-thickness flap (outer flap) is sutured at the base of the vestibule. This increases the vestibule depth and provides a recipient vascular bed for a free gingival graft.*

most mesial tooth and distal to the implant area. A split-thickness flap was elevated beyond the mucogingival line. The dissection of the flap ensured an adequate thickness of connective tissue overlying the periosteum. Then, an incision was outlined to the bone and to the heads of the implants. With a periosteal elevator, a full-thickness flap was gently elevated to expose the e-PTFE membrane. The cover screws and the apical Memfix screw were removed, and the membrane carefully taken out. No dehiscences were left at the implant surfaces, and the buccal area was covered by a hard, bone-like tissue that could be penetrated with a periodontal probe only for the first 0.5 mm (Fig 5). At this point, after the connection of temporary healing abutments, the inner, full-thickness flap was secured with simple 5-0 sutures to protect the regenerated bone at the buccal and interproximal aspects of the implants. Then, the partial-thickness, most superficial flap was sutured apically at the bottom of the vestibule with 5-0 resorbable interrupted sutures (Superamide, Genzyme). This increased the vestibule depth and prepared the recipient bed for the plastic procedure (Fig 6).

A free gingival graft was harvested from the palate. Its

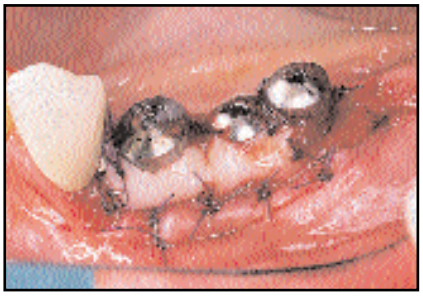

Fig 7 *Free gingival graft is positioned over the recipient bed and tucked down with simple sutures. Note that no graft is placed over the distal implant; just connective tissue and periosteum protect that area.*

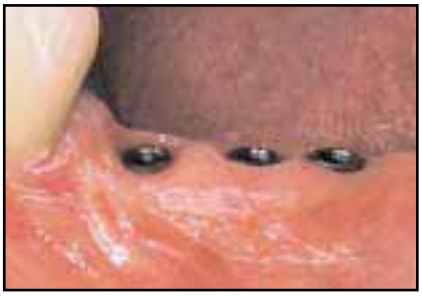

Fig 8 *Buccal view at 6 weeks of healing. Keratinized tissue is mainly present around the middle implant. Some keratinization is also present at the mesial (grafted) and distal (nongrafted) implants. The partial loss of keratinization evident at the mesial implant could be attributed to the presence of a frenum pull that may have interfered with graft stability and nourishment.*

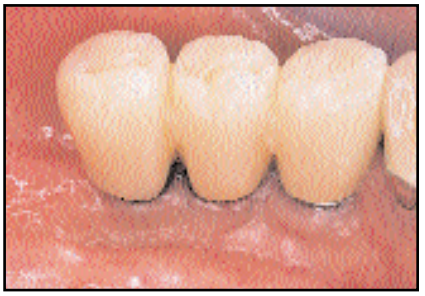

Fig 9 *Lingual view at 6 weeks of healing shows a nice band of keratinized tissue adapting to the implant convexity. This may facilitate home care procedures, thus contributing to the maintenance of soft tissue health over time.*

dimensions were such that only two of the three implants could be covered. The third and most distal implant was intentionally left exposed and served as a control to see if there was any difference in terms of keratinized tissue formation with or without the application of the graft. The donor site was sutured with silk sutures (4-0), and proper hemostasis was ensured with a collagen sponge. The graft was then trimmed to achieve perfect adaptation to the buccal aspects of the healing abutments. Then, the graft was sutured with resorbable 5-0 sutures to the recipient bed to prevent any movement of the tissue. A light compression was exerted on the graft with moistened gauze for about 5 minutes to reduce the thickness of the blood clot and enhance fibrin adhesion between the two tissue layers (Fig 7). The patient was instructed to refrain from any brushing on the area and to rinse with chlorhexidine solution 0.2% (Corsodyl mouthrinse, SmithKline Beecham) until mechanical plaque control could be resumed. An antiinflammatory drug was prescribed for the first 2 days. The patient was checked weekly for the first 4 weeks and then monthly until final restoration delivery.

Healing

The healing was uneventful during the first week, and at suture removal the graft appeared well integrated with the surrounding tissues. At 2 weeks, both the graft and the distal site that had been left exposed showed the same degree of healing. At 6 weeks, keratinized tissue was fully recognizable around all of the implants (Fig 8). However, the clinical impression was that a wider band of keratinized tissue was present at the grafted site. Lingually, a nice band of keratinized tissue could also be seen (Fig 9).

Discussion

Periimplant mucosa differs from that around natural teeth because of the lack of connective tissue attachment on implant surfaces. The lack of cementum determines the connective tissue fiber orientation parallel to the implant surface.[9] This difference has led to the hypothesis that a lack of attached or fixed mucosa on the lingual or buccal aspect of osseointegrated implants may increase their susceptibility to plaque accumulation. Warrer et al[4] reported in a dog model that implants affected by ligature-induced periimplantitis and surrounded by mobile and nonkeratinized gingiva are more prone to develop severe bone loss compared to implants with adequate keratinized tissue. These findings seem to be in contrast to what has been reported previously in the literature.[5,6] Longitudinal studies have failed to establish a clear correlation between the absence of keratinized mucosa and implant success rate.[10,11] However, from a purely clinical standpoint it seems accepted that, whenever possible, a band of keratinized tissue should be achieved. Particularly in the mandible, advanced bone resorption may reduce the vestibule depth, thus increasing the degree of difficulty in performing home care. A shallow vestibule combined with muscle or frenum pull on mobile mucosa may predispose soft tissue complications such as mucositis, hyperplasia, and even periimplantitis.[12] While it may be difficult to justify a second surgical intervention to increase keratinized tissue once the implants are exposed, this may be indicated during implant uncovering without increasing patient morbidity and surgical costs. It is worthy of notice that achieving keratinized tissue in the lingual aspect of the implant may be possible at this stage, whereas it may be extremely difficult at a later stage because of the technical and anatomic difficulties of the area. With the technique presented here, we were able to achieve several goals in a one-step procedure: *(1)* expose the implants and connect the healing abutments, *(2)* remove the barrier membrane, *(3)* protect the interproximal and regenerated bone, *(4)* deepen the vestibule, and *(5)* increase the width of keratinized tissue buccally and lingually.

Histologic studies demonstrate that leaving bone exposed results in more bone resorption.[13,14] Regenerated bone may be more susceptible to superficial resorption if it is not fully protected.[15] A double-layer flap, as described by Hürzeler and Weng[8] and modified by the authors, will be able to cover completely the interproximal area. However, this will not prevent in any way the crestal resorption that takes place during the first year of function around implants. In fact, this phenomenon is probably caused by a combination of factors such as the establishment of a biologic width,[16] biomechanical stress distribution,[17] and implant design.[18] Rather, the protection of the interproximal bone area will ensure the development of this crestal resorption physiologically over time and

not traumatically because of the surgical phase.

We also report that leaving connective tissue and periosteum denuded elicited keratinized tissue formation, although to a lesser extent compared to grafted sites. This isolated observation finds its biologic rationale in the ability of the periosteum to respond to denudation procedures by keratinized tissue formation.[19,20] Therefore, a free gingival graft on the denuded periosteum may not be needed to gain keratinized tissue. However, some authors report that even when alveolar bone is protected by a periosteal layer, a significant amount of resorption may take place.[19,21]

This brief report presents a surgical technique that may be applied in mandibular cases in which a barrier membrane has to be removed and keratinized tissue is inadequate to design a lingual flap to gain keratinized mucosa on the buccal aspects of implants. A double-layer flap combined with the placement of a free gingival graft buccally may be compatible with the goals that need to be achieved at the uncovering stage.

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