SURGICAL SOFT TISSUE MANIPULATIONS

For Osseointegrated Dental Implants

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The surgical aspects of the first and second stages of the osseointegration technique can be divided into: i) flap management, ii) implant placement and iii) ancillary (e.g. mucogingival) procedures. The implant placement and suturing techniques have been described elsewhere[1] and thus will not be addressed here. This article will emphasize certain mucogingival and improved flap procedures in relation to the two surgical stages of the osseointegration technique.

FLAP DESIGN – Stage I Surgery: The first surgical stage includes the initial placement of the implant(s). The flap design according to the "classical" Branemark technique, utilizes an initial curve-linear, mesio-distal incision placed in the buccal vestibule, such that it is located approximately 10 millimeters apical to the osseous crest. The advantages with this flap approach include: a) excellent access (e.g. sinus, mental foramen), b) complete post-surgical tissue coverage of the implant sites, and c) a suture line that is remote from the implant sites (thus reducing the chance of premature implant exposure as well as minimizing potential suture-related contamination). The disadvantages with this type of flap design may include: a) increased post-operative swelling, b) decreased post-operative vestibular depth, and c) difficult suture removal, especially if horizontal mattress sutures are utilized. (Figs 1, 2). Clinically these disadvantages may result in increased post-operative discomfort, difficulty in wearing a removeable prosthesis and potential post-operative infection if all suture remnants have not been removed.

Other flap designs have been recently suggested in order to overcome some of the aforementioned disadvantages. One such design has been described[2] and is called "THE OVERLAPPED FLAP." This technique can be utilized only if the tissue is of adequate thickness (Fig. 3). Interested readers are referred to the article that describes and illustrates this technique in detail (in The International Journal of Periodontics and Restorative Dentistry, Vol. 10, #3, 1990, pg. 209).

In the maxilla, this author utilizes a palatally placed horizontal (i.e. mesiodistal) incision rather than a vestibular one. As with the vestibular approach, this design provides: a) excellent access, b) complete post-surgical tissue coverage, and c) a suture line that does not directly overlie the implant sites. The palatal approach however has the advantage of minimizing post-operative swelling and facilitating suture removal. The initial palatal incision should be located a minimum of 6 mm palatal to the soft tissue ridge crest and should extend mesially and distally several millimeters beyond the anticipated implant sites. A flap is then raised, starting with a bevelled palatal incision that angles toward the crest of the ridge. (The bevelled incision allows a greater connective tissue surface area for flap closure.) A full thickness flap is then carefully dissected over the ridge, which then continues up onto the buccal aspect (Figs. 4,5). In most

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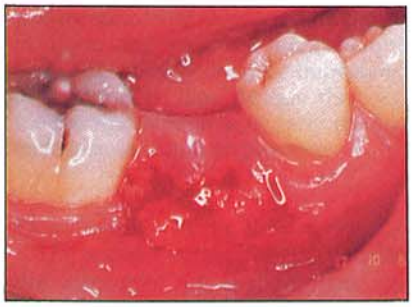

Fig. 1. Horizontal mattress sutures have just been removed (10 days post-operatively). In this case a flap design incorporating a horizontal curve-linear (i.e. mesiodistal) vestibular incision was utilized during the initial surgical implant placement.

Fig. 2. A suture remnant is visible at 24 days after the initial surgery (i.e. corresponding to 14 days after the suture removal appointment as shown in Fig. 1). Retained sutures can create a "point of entry" for bacteria to migrate into the implant site and potentially lead to infection.

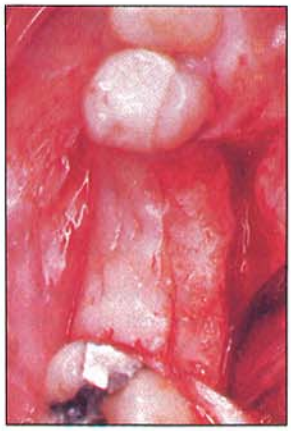

Fig. 3. The Initial incision may be placed just palatal to the crest, but only extends 1-2 mm into the connective tissue. A palatal split thickness dissection is carved 4-6 mm to the palatal aspect. A full thickness flap is raised from the palatal aspect towards the buccal. Upon closure, the exposed connective tissue will be "overlapped" by the palatal epithelium and connective tissue.

partially edentulous cases, bilateral buccal releasing incisions are utilized to allow adequate flap reflection. It is sometimes worthwhile to suture the flap to the vestibular mucosa, to allow atraumatic reflection throughout the surgical procedure (Fig. 4). The palatally-placed incision will delay revascularization of the palatal tissue and thus at 7-10 days post-surgically, some epithelial denudation will be evident (Fig. 6). In the author's experience, however, the exposed palatal connective tissue does not perforate and thus there is no oral communication with the implants. The palatal regeneration of the epithelium proceeds uneventfully on a routine basis.

In the mandible the author most often utilizes a horizontal vestibular incision as described in the Branemark technique[1]. Some clinicians however, prefer to utilize a mid-crestal incision because of the ease of manipulation and closure. Most dentists with experience in the surgical phases of implantology however, will agree that there is an increased incidence of early implant exposure with the crestal incision (Fig. 7). To this author's knowledge there have not been any scientifically valid published studies that correlate early implant exposure with higher rates of implant failure. It seems prudent however, that until this question is definitively answered, one should strive to maintain a "closed" healing environment for the implant during the prescribed healing period. In the event that the exposed implant does perforate through the soft tissue within the first two months, an attempt can be made to close the perforation. The technique involves creating a circumferential fresh wound margin, and then suturing the wound closed. In most cases, however, the procedure will not be successful (Fig. 8) and at times it is prudent to leave the implant. The

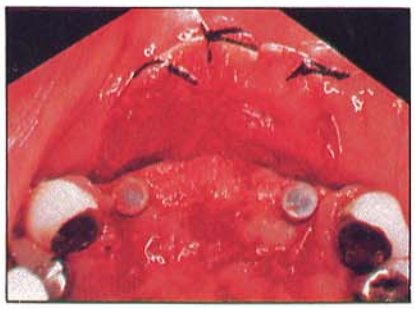

Fig. 4. The flap may be sutured to the vestibular mucosa throughout the surgical procedure to facilitate atraumatic flap reflection. Similarly in the mandible, the flap can be lingually retracted with the use of sutures.

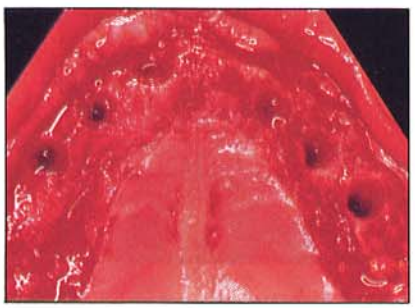

Fig. 5. The initial incision is placed well palatal to the crest of the ridge and a bevelled incision is angled toward the osseous crest. A full thickness flap is then raised over the crest of the bone and extended up into the vestibule.

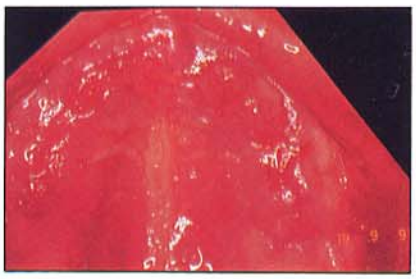

Fig. 6. The same case as in Fig. 4, but 11 days post-surgically, illustrates some sloughing of the palatal epithelium. This is expected when one utilizes the type of flap design as seen in Fig. 4. The connective tissue exposure is superficial and not significant, as routinely there is uneventful healing and no implant exposure.

patient should be instructed on how to maintain the exposed area plaque-free. This underscores the importance of the initial flap design that will reduce the incidence of early implant exposure as much as possible.

Flap design – Stage II Surgery

The second surgical stage includes the exposure of the implant and attachment of an abutment or insert after the prescribed healing period (usually 3-9 months). The two most common techniques to expose healed implants utilize either a tissue punch or a flap approach. The tissue punch is a slightly less traumatic procedure, but should only be considered under the following conditions: a) the implant can be accurately located, b) the top of the implant has not been counter-sunk too far sub-crestally, and c) the keratinized gingiva will not be totally eliminated by the punch procedure. If the implant cannot be accurately located, the advantage of a flap is obvious. If the implant has been submerged into the bone, the implant may be difficult to locate (without the aid of a small flap). As well, it is common for some bone to form over the coronal aspect of the implant. Bone that prevents proper seating of the abutment or insert, *must* be removed at this second surgical stage (Figs. 9, 10). This delicate procedure must be done accurately so as to remove adequate bone, yet not damage the implant. This is only possible with a flap approach. It is wise for the surgeon to verify complete seating of the insert or abutment with a radiograph prior to suture placement (Fig. 11).

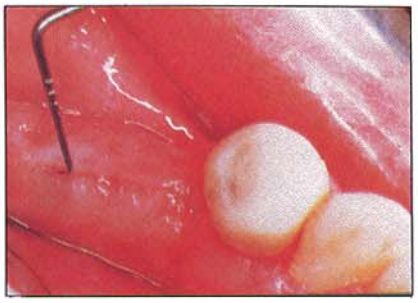

Fig. 7. View of the posterior mandibular region, four weeks after placement of two "Swede-Vents". (Core-Vent Corp.) A flap design utilizing a mid-crestal incision was employed. The periodontal probe demonstrates an opening (located along the line of the initial crestal incision) that communicates with the cover screw of one of the implants.

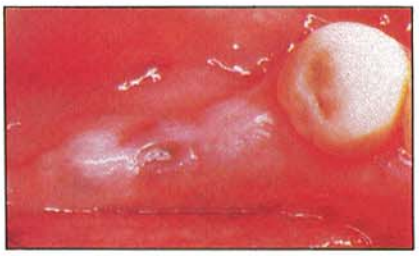

Fig. 8. Same case as in Figure 6. Note the exposure of the cover screw of the implant 3 months after the attempted repair procedure. Clinical experience seems to indicate however, that early implant exposure is not a significant factor in causing failure. In this case, both implants were successful.

Mucogingival procedures

A frequently encountered problem in the resorbed mandible is the presence of minimal keratinized gingiva. It is probably fair to say that the literature does not indicate that the presence of keratinized gingiva around the implant is a critical factor that influences success rates. Clinically, however, a keratinized gingival margin is preferable to alveolar mucosa because periodontal maintenance and optimal restorative procedures are facilitated[3]. Attached keratinized gingiva is relatively non-mobile and firm, being attached to the underlying alveolar ridge. Alveolar mucosa on the other hand, is more mobile and may make it more difficult to remove plaque around the implant[3]. As well, a keratinized gingival margin may provide a more stable position, which in turn allows a more predictable and esthetic prosthetic margin placement[3].

In clinical situations where the overlying soft-tissue in the implant site is non-keratinized, a free gingival graft can be placed in order to convert

Fig. 9. A flap approach is utilized to expose the healed "Screw-Vent" (Core-Vent Corp.) implants. It is not uncommon for bone to grow over implants during the healing period. This is more likely when implants have been submerged below the crest of the bone (note the mesial aspect of the mesial implant).

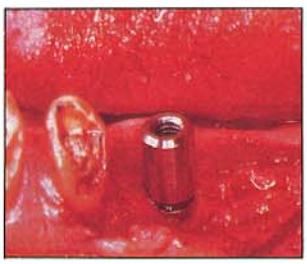

Fig. 10. Same case as in Figure 8. The insert (TSI or titanium straight insert) does not fully seat on the implant due to the interference of the bone on the mesial aspect. (see Fig. 8). Any bone that prevents proper seating of the insert (abutment) must be carefully removed at the second surgical stage. With a flap approach, the surgeon has idealized the access and visibility.

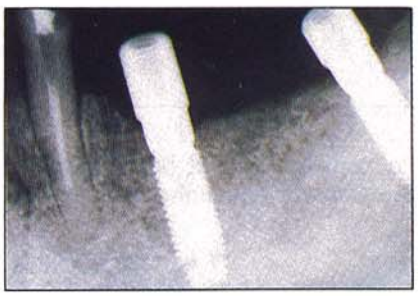

Fig. 11. Same case as in Figs. 8 and 9. It is wise for the surgeon to verify that the insert (abutment) is properly seated on the implants both clinically and radiographically. A periapical radiograph should be taken prior to suture placement. It is essential to attain accurate seating of the insert (abutment) prior to proceeding with any further prosthetic therapy.

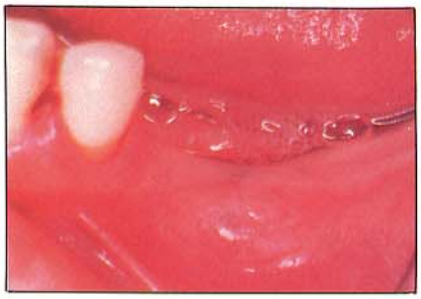

Fig. 12. Note the lack of keratinized gingiva in this buccal view. A free gingival graft may be placed at this time and must sufficiently mature before undertaking the implant surgical procedure.

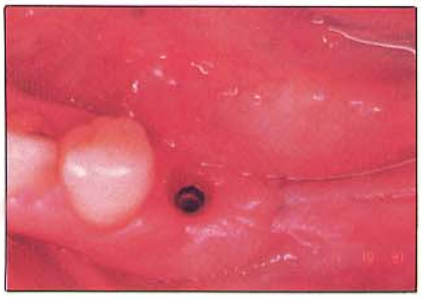

Fig. 13. Same case as in Fig. 11. Eight weeks after the free gingival graft procedure (corresponding to 6½ months after the initial implant placement) the implant has been exposed. The results would usually be less than ideal if the graft was attempted after the insert (abutment) was already in place.

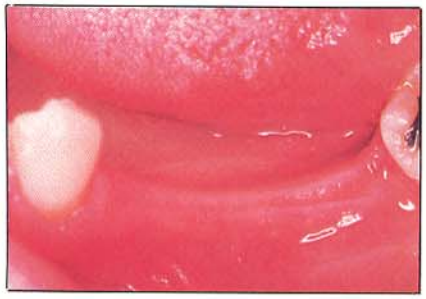

Fig. 14. Pre-surgical buccal view of the posterior mandible. Note the narrow band of keratinized tissue located on the crest of the ridge.

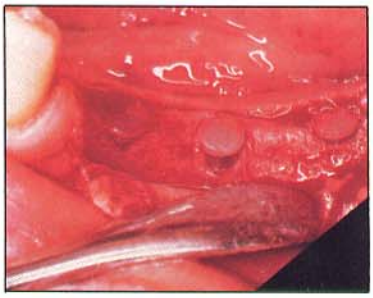

Fig. 15. Buccal view during the second stage of surgery (4½ months after initial placement) in the posterior mandible, illustrating a "Micro-Vent" (Core-Vent Corp. mesial position) and two "Screw-Vents" (Core-Vent Corp.) with plastic surgical inserts still in place. The implants have been exposed via a specialized flap approach that is designed to preserve keratinized gingiva.

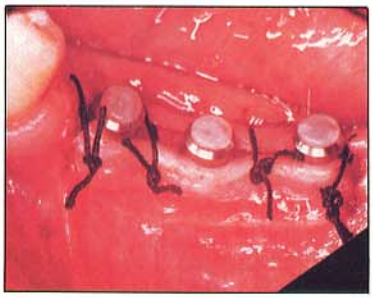

Fig. 16. Same view and case as Figs. 13 and 14 illustrating the TSIs (titanium straight inserts) in place. Note that the keratinized gingiva has been preserved with the buccal flap and is subsequently apically positioned and sutured (4-0 silk). To assure accurate positioning, certain cases will require the use of any of the following: split thickness flap design, periosteal sutures, histoacryl, retention devices and/or a firm periodontal dressing.

Fig. 17. Same view as Figs. 13, 14, 15 four weeks later. Note the presence of the buccal keratinized gingiva. In this case, all keratinized gingiva would have been eliminated if during exposure, a punch technique or mid-crestal incision flap design had been utilized.

the non-keratinized tissue to one that will be firm and keratinized. The free gingival graft should be placed at least 4-6 weeks prior to the first stage of the implant surgery. Alternatively, the free gingival graft procedure can be carried out after complete healing of the first stage, but at least 6 weeks prior to the second stage of implant surgery (Figs. 12, 13).

Sometimes there is a narrow band of keratinized tissue present overlying the implant site. In this case, a specialized flap approach should be utilized during the second stage of the implant surgery. The technique involves strategically positioning a crestal incision such that the existing band of keratinized tissue is preserved and becomes incorporated as part of the vestibular flap (Figs. 14, 15). A full thickness or split thickness vestibular flap is then apically positioned such that the keratinized gingival margin rests around the vestibular aspects of the abutments or inserts (Figs. 16, 17). This flap approach also provides the surgeon with access and visibility, should it be necessary to recontour hard or soft tissue and/or reduce sulcus depth.

Summary

Soft tissue manipulations are an important component of implant surgery. This article has described several techniques and highlighted their respective indications and advantages. □

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