Dental Implant : Minimally Invasive Flapless Approach

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Introduction

Over the past 30 years, research has validated the success of osseointegrated implants as a viable alternative to fixed or removable prosthetic restorations. Placement of endosseous implants has become an option in comprehensive periodontal treatment plans for both fully and partially edentulous patients.[1] In the late 1970s, Branemark established the use of extensive surgical flaps to visualize the surgical field during implant surgery. According to this protocol, an incision in the mucosa or the mucobuccal fold was made, and then a flap was reflected to expose the underlying bone. The implants were then placed and the flaps repositioned with sutures.[2] Since the beginning of implantology, the technique has been gradually modified and refined to the one or two stage procedures most frequently used today. Despite these modifications, the surgical process has remained remarkably constant. Initial bone loss seems to be caused by interrupted blood supply that follows removal of the periosteum.[3]

To minimize the possibility of post-operative peri-implant tissue loss and to overcome the challenge of soft tissue management during or after surgery, the concept of flapless implant surgery has been introduced for the patients with the sufficient bone volume in the implant recipient site.[4] However, the true quality and quantity of bone underlying the mucogingival covering cannot be directly observed. Plane film radiographs can depict some information about the bone site.

Patient selection

Some authors believe that there are no absolute contraindications for dental implant treatment. Most dental implant patients are classified in the American Society of Anesthesiologists (ASA) class I, II, and some in III. These patients are healthy or have medically controlled mild diseases. Smokers and patients with interleukin (IL)-1 cytokine (IL-1 genotype polymorphism) expression may be at higher risk of implant failure to osseointegrate. However, there is recent evidence that IL-2 (T-330G) and IL-6 (G-174C) genes are not associated with early implant failure so that these single polymorphisms are not a genetic risk factor. Patients with a history of vertigo may need surgical caution for an osteotome procedure. Patient expectations should be discussed. The patient needs to understand and accept the procedures, proposed outcome and the possibility of complications. The patient should be appropriate for implant surgical and prosthetic procedures.[6]

Advantages and Disadvantages : Although flapless technique was initially suggested for and embraced by novice implant surgeons, a successful outcome requires advanced clinical experience & surgical judgement. Flapless surgery has several potential advantages and also some shortcomings.[2] (Fig. 1)

Advantages	Disadvantages
Reduction of complications at the patient level, i.e pain and swelling	The inability of the surgeon to visualize anatomical landmarks and vital structures

Reduction of intraoperative bleeding	The potential for thermal trauma to the bone due to limited external irrigation during preparation of the osteotomy
Reduction of surgical time and need for suturing	An inability to ideally visualize the vertical endpoint of the implant placement
Preservation of soft and hard tissue	Decreased access to the bony contours for alveoloplasty
Maintainance of blood supply	Difficulties in performing an internal sinus lift with a stablilze template

Fig 1.

Guidelines on the selection of technique for flapless implants

The choice of a soft tissue punch technique or a mini-incision technique is dependent on bone quality and primary implant stability. The following guidelines are intended to help clinicians to make the best choice.[5](Fig. 2)

Guideline 1 : Select the soft tissue punch technique for a one-stage approach. The soft tissue punch technique is used for a one-stage surgical approach, whereas the mini-incision technique is used for either a one-stage or a two-stage surgical approach. The two-stage surgical process places the implant body below the soft tissue until bone healing has occurred. It is prudent to use the two-stage surgical approach when implants are not adequately stabilized or if the patient wears a soft tissue-borne partial denture.

Guideline 2 : The mini-incision technique is preferred in areas with insufficient amounts of keratinized mucosa. The amount of keratinized tissue should be adequate and ideally patients need at least 1.5 mm of keratinized tissue on the facial aspect of the healing abutment. The mini-incision technique is beneficial in saving the keratinized mucosa. Therefore, the soft tissue punch technique must be used in cases where at least 1.5 mm of keratinized tissue is left on the buccal side of this incision line of the punch.

Guideline 3 : Select the mini-incision technique in the posterior maxilla.

On rare occasions, an implant in the maxilla may not remain rigid after implant placement. A nonsubmerged, mobile implant may not heal predictably with a direct bone interface. Any implant that is not adequately stabilized should be submerged during healing, which reduces the risk of micromovement and early implant failure.

Therefore, the mini-incision technique is selected for implants in the posterior maxilla in order to place the implant body below the soft tissue. The mini incision technique is the best approach in the posterior maxilla where deficient osseous structures and an absence of a cortical plate on the crest of the ridge further compromise the initial implant stability at the time of insertion.

Guideline 4 : In the mandible, a one-stage approach offers more advantages

The most common complication of a two-stage approach in the mandible is the risk of fistulas or gumboils, which can develop in the mucosa covering the cover screws, because the mandible contains thick cortical bone, thin mucosa, and a 12 mm wide avascular zone in the crestal area of the edentulous alveolar ridge.

Fistulas or gumboils that develop in the mandible are dangerous because they can destroy bone Therefore, when the implant is threaded into position with 20 Ncm or more, a one-stage approach is used in the mandible. This approach eliminates the risk of postoperative infection and allows the peri-implant soft tissue to be mature at the time of implant placement. When an implant in the mandible is not rigid after implant placement, the implant should be submerged. Periodic, meticulous observation is necessary to check for the formation of a gumboil or fistula.

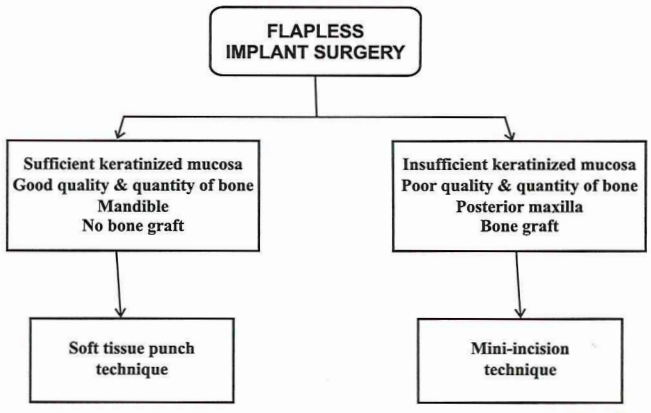

Fig 2.

Challenges for the flapless technique in stage II surgery and solutions

Misch recommended reflection of a full-thickness flap for stage II surgery to identify and correct any bone defects around an implant, to reposition keratinized tissue and to decrease the amount of thick mucosa. However, the necessity of using flap reflection in stage II surgery appears to be questionable after flapless implant placement.[5]

Identifying and correcting peri-implant bone defects

Peri-implant defects can be identified without flap elevation. Radiographs are used to closely evaluate the crestal, mesial and distal bone implant interfaces before the stage II uncovering procedure. Probing is used to evaluate the facial and palatal conditions. Reflection of a full-thickness flap is unnecessary to identify these defects. In animal and clinical studies by the authors, there was little or no crestal bone loss identified at stage II uncovering after the mini-incision submerged procedure. Indeed, there were no bony defects around the mini-incision submerged implants that required treatment. Therefore, there is no need to reflect a mucoperiosteal flap in order to identify a defect after the mini-incision submerged procedure. It should be noted that additional surgery can lead to additional bone loss when a full-thickness flap is reflected. If a bone defect around the implant at stage II uncovering requires a bone graft, it can instead be reconstructed using a subperiosteal tunneling procedure.[5]

Site Evaluation Technique

A technique by Flanagan[7] to reveal the underlying bone contour is briefly described as follows. First a fast set polyvinyl siloxane (Blu-Mousse, Parkell, Farming- dale, NY) is used to make a dual arch impression of the site. The impression mass is removed and the site length is measured. The impression mass is then bisected faciolingually with a laboratory Bard Parker knife to give two arch forms of the proposed site. The gingival interocclusal space is measured and will be added to the gingival thickness to give the bone opposing dentition distance (which should be at least 5 mm to allow a cemented type restoration). The arch form is then traced on paper (in the patient's record), which is in fact, the gingival contour of the site. Then, bone sounding is done to find the overlying gingival thickness. These measurements are noted and recorded as points on the tracing. So, each recorded measurement is noted as a point under the arch tracing. The points are then connected to give another form which is an approximation of the underlying bone contour (Fig. 3). The faciolingual bone dimension can now be measured on the tracing to give the surgeon in formation as to appropriate implant sizing diameter. A too large diameter implant or too thin of a ridge may produce a dehiscence (Fig. 4). The 5-mm level is the depth to which the implant should be placed to avoid subsequent exposure of the implant threads due to resorption of thin bone (Fig. 5). A 1.4-mm osseous gap may be produced from resorption of thin bone.

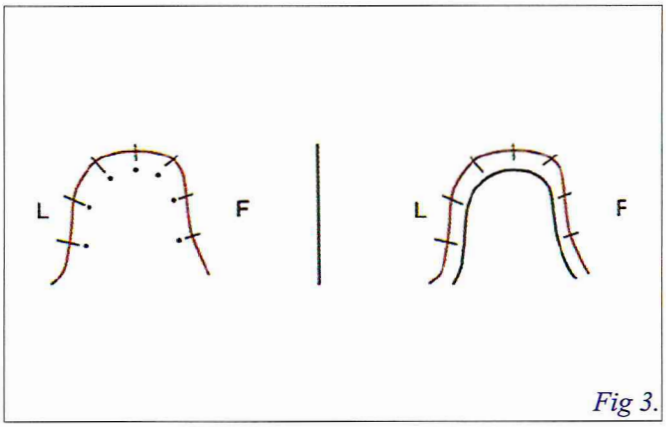

Fig 3.

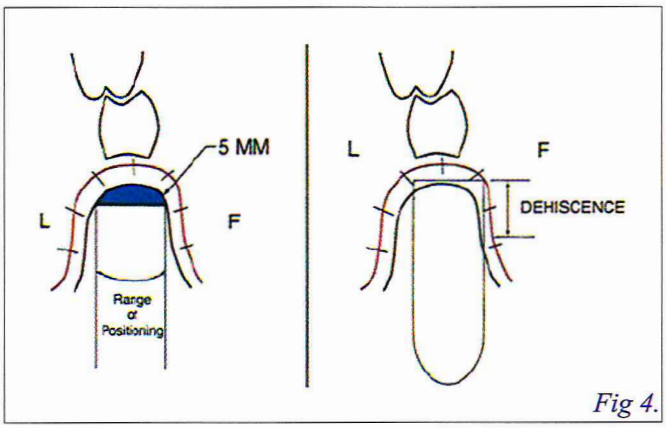

Fig 4.

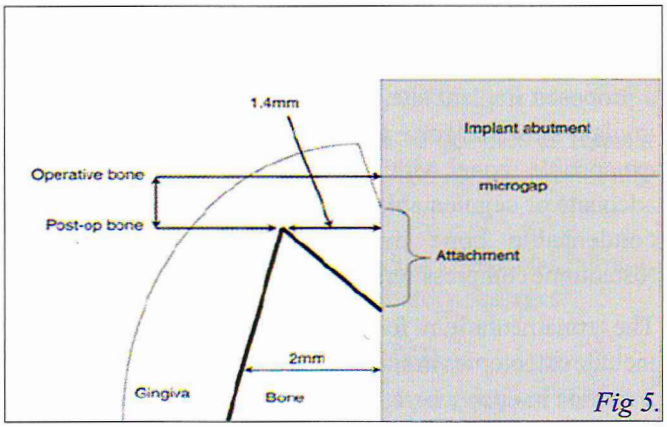

Fig 5.

(Dennis Flanagan, Journal of Oral Implantology 2007;33(2): 75-83)

Implant companies have transparencies that depict their array of available implants. The transparency can be placed over the tracing to ascertain which implant size is most appropriate for the bone site. Dehiscences, fenestrations, and a range of positions can be predicted and planned for in the treatment (Fig. 4). Osteotomies can be avoided that produce thin facial and/or lingual cortices that may resorb and expose the implant threads. Sites that accept multiple implant placements may have computerized tomography (SimPlant, Columbia Scientific, Columbia, Md) to reveal bone dimensions and quality that can facilitate and expedite the operative procedure. A diagnostic wax-up of the proposed final restoration may be important for a successful outcome.

Complications

Infection is unusual and may be controlled by use of antibiotics and local debridement or implant removal. Malposition of the implant may not be compatible with a successful prosthetic outcome. Steps should be taken to insure appropriate implant placement for a functional and esthetic result. Intraoperative repositioning of the scalpel, osteotome or implant may be easier during surgery than later dealing with the result. Alternatively, if the malposition is too great, grafting, healing and a later re-entry may be appropriate.[6] Benign positional vertigo may occur in patients subjected to osteotome ridge expansion.[8] The force of the surgical mallet may induce a dislodgement of labyrinthine otoliths producing a feeling of vertigo in the patient during head-turning movements. This condition is usually self limiting or may be treated by head maneuvers to reposition the otoliths.

Conclusion

Patient and site selection are primary concerns for flapless implant surgery. Assuming appropriate length and height of a proposed implant site, the suggested criteria for flapless implant placement are; an appropriate patient, adequate or expandable bone width (ridge expansion, split ridge), adequate or augmentable attached gingiva and adequate or condensable bone density for implant immobility (osteotome compression).

The armamentarium for flapless implant placement can include osteotomes in sites where the bone width is less than 5 mm or in sites where there is less bone density. Careful directing of the scalpels and osteotomes should be observed to prevent malposition of the implant. Surgical guides are very useful for implant positioning. Implants may need to be placed slightly deeper in sites with parabolic shaped ridges to avoid crestal bone loss and subsequent implant thread exposure. Sites that are 2 to 5 mm wide that have less dense bone and/or inadequate attached gingiva that may be correctable or augmented can be considered for flapless implant placement. Bone widths of 2 mm or less may not be appropriate for a flapless approach and require open flap augmentation or site development. Single and multiple sites can be treated flaplessly. Infection is unusual but may be controlled with antibiotic coverage, debridement or implant removal.

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