

## Review Article

# An insight into *flapless* implant placement technique

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Routine surgical procedure for the placement of dental implants involves the reflection of a mucoperiosteal flap, thereby exposing vital and viable bone to the external environment. This practice of reflection of flap has evolved from periodontal and surgical procedures involving treatment of osseous defects and fractures, treatment of tumors, removal of impacted tooth, or fragments or other pathologies. Many authors have consistently reported resorption of the bone following flap reflection. Therefore, when the highly successful treatment modality of replacement of tooth with a biocompatible dental implant-supported prosthesis is to be planned, maximum attention should be focused on minimizing the trauma to the supporting bone and surrounding soft tissues. This article reviews one approach of implant placement with this requirement in mind, i.e. the placement of implants without the elevation of a mucoperiosteal flap, or so called flapless implant surgery.

**Key words:** Crestal bone loss, dental implants, flapless

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## INTRODUCTION

Oral rehabilitation with implants generally involves surgical fixture placement, abutment connection, and prosthodontic procedures. The surgery is usually performed in two stages - implant placement and abutment connection, both procedures being carried out on an outpatient basis, under local anesthesia.<sup>[1]</sup>

Generally during these procedures, a mucoperiosteal flap is elevated to visualize the structures underneath. For this, various types of incisions and flap designs have been explained in the past. Crestal and Remote incisions<sup>[2]</sup> and incisions within Linea Alba<sup>[3,4]</sup> were suggested by Han *et al* and Cranin respectively. Flap designs include Resective Contouring, Papilla Regeneration and Lateral Flap Advancement,<sup>[5]</sup> Widely Mobilized Flap and Limited flap design for preventing interproximal crestal bone loss<sup>[6]</sup> and preserving the interdental papilla,<sup>[7]</sup> Coronally Repositioned Flap and Buccally Repositioned flap with approximal pedicles.<sup>[8]</sup>

Reflecting the flap has been a cause of concern regarding bone resorption around the implants. Campelo and Camara<sup>[9]</sup> explained this phenomenon in their ten-year retrospective study to show bone loss in the crestal area. Van der Zee *et al.*,<sup>[10]</sup> in their study, concluded that bone loss occurs after flap reflection, along with gingival recession.

An innovative technique of implant placement without elevating a mucoperiosteal flap, described as *flapless implant surgery*, has been introduced recently. It has the distinct advantage of reduced bone loss

and increased patient comfort.

It is a relatively new technique and literature lacks sufficient documentation for its credibility to be implemented in routine clinical practice. The purpose of the present article is to review and compare this treatment modality and its effect on the bone, with conventional procedure.

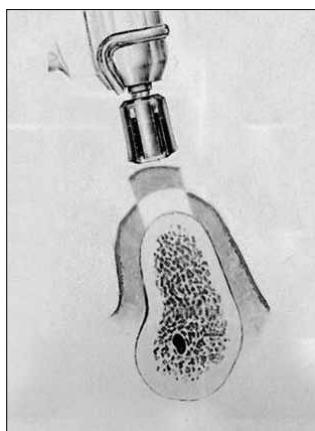
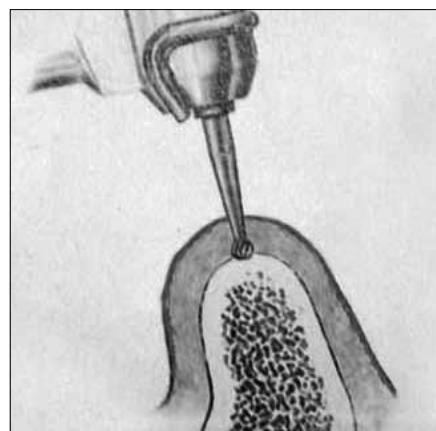
## Flapless surgical procedure

*Flapless* surgery involves accessing the bone by either (a) punching out a small amount of soft tissue, just the amount required for osteotomy preparation and implant placement<sup>[9,11-13]</sup> or (b) preparing the osteotomy site by drilling directly through the soft tissue.<sup>[14,15]</sup>

- (a) In the punch technique, a circumferential incision is made on the gingiva at the center of the implant site using a surgical template. The cut is made with a circumferential rotary blade at low speed (100 rpm). The circumferential scalpel should be at least 1 mm wider than the implant to be placed. The incised gingival tissue is removed with a curette or mosquito hemostat [Figure 1].
- (b) In the second technique, the area of placement of implant is marked on the soft tissue using a surgical template and then the osteotomy site preparation is done with conventional drills, drilling directly through the soft tissue in the marked area [Figure 2].

## Requirements

The *flapless* technique may be considered in conjunction with either single-stage placement or immediate

**Figure 1:** Punching out the soft tissue**Figure 2:** Direct drilling through soft tissue

loading. The principles that must be observed in the procedure are:<sup>[5,9,11,14]</sup>

Keratinized, attached, and nonmobile tissue of at least 5 mm must be present, because the *flapless* procedure requires the actual removal of some of the tissue. This is important to provide the epithelial and connective tissue elements needed for soft tissue integration and the development of circumferential biological width, without sacrificing the underlying peri-implant supporting bone.

Bone width of at least 4.5 mm must be available without undercuts of more than 15°. Since visibility is limited when using the *flapless* technique, it is difficult to ensure that the implant is positioned in the center of the crestal bone. Greater ridge width offers the practitioner an extra margin of safety.

### **Advantages**

Generally, there is some swelling, pain, and discomfort associated with every surgical procedure. But with a *flapless* approach, surgical trauma is minimal because the incision is very small and soft tissue is not reflected.<sup>[11,12]</sup> The need for a second surgical procedure to place the abutment cylinder and to adjust the mucosal tissue to accommodate the abutment cylinder is also eliminated.

It also enables the possibility of using the cylinder abutment as a temporary component to aid in supporting the prosthesis for a short period of time during the healing period. In effect, the total management time is reduced, as also the number of visits and the materials required.<sup>[11]</sup>

Furthermore, leaving the periosteum intact on the buccal and lingual aspects of the ridge maintains a better blood supply to the site, reducing the likelihood of bone resorption.<sup>[11,12]</sup>

In addition to preservation of blood circulation, *flapless* implant surgery maintains the soft tissue architecture and hard tissue volume at the site. It also decreases the surgical time and accelerates recuperation, allowing

the patient to resume normal oral hygiene procedures immediately.<sup>[5]</sup>

### **Disadvantages**

However, *flapless* implant placement generally is a 'blind' surgical procedure and care must be taken when using this technique.<sup>[5,9]</sup> Angulation of the implants affected by drilling is critical for avoiding perforation of the cortical plates, both lingual and buccal, especially on the lingual in the mandibular molar area and the anterior maxilla. Potential for contamination of the implant upon placement also increases in this procedure, even though no studies have proved it.<sup>[13]</sup>

### **DISCUSSION**

In a reasonable percentage of cases, bone topography can be predicted, eliminating the need for reflecting a flap during implant fixture placement. Literature shows some evidences on the success of this new surgical approach. Al-Ansari and Morris<sup>[14]</sup> conducted a two-year clinical investigation of 20 maxillary and mandibular implants placed without elevating flap in seven adult male patients. The results showed normal clinical healing in the first week of re-examination of all implant sites. The authors concluded that the alternative surgical technique without elevating a flap could provide several advantages over the traditional two-step procedure. The avoidance of reflection of the flap eliminates the need for a second surgical procedure to place the abutment cylinder and also the need for adjusting the mucosal tissue to accommodate the abutment. It also enables the possibility of using the cylinder abutment as a temporary component to aid in supporting the prosthesis for a short period of time during the healing period. In effect, the total management time is reduced, as also the number of visits and the materials required.

Hahn<sup>[11]</sup> suggests that the *flapless* technique might

be considered in conjunction with either single-stage placement or immediate loading. He has also stated that avoiding the reflection of a flap results in less postoperative swelling and patient discomfort. Furthermore, leaving the periosteum intact on the buccal and lingual aspects of the ridge maintains a better blood supply to the site, reducing the likelihood of bone resorption.

Vascularity of cortical bone has important physiologic ramifications. Diffusion through bone is effective only up to about 100 $\mu$ m. To maintain internal vitality of osteocytes, the vascular supply of compact bone is organized into Haversian canals and Volkmann's canals. Although the Haversian/Volkmann network provides a collateral circulation within the compact bone, it is highly tortuous and easily compromised by surgical trauma and postoperative inflammation. A portion of the arterial supply and all the venous return is via the periosteum. Stripping the periosteum creates vascular stasis and compromises the vitality of the cortex.<sup>[16]</sup>

Periosteum is the vital reactive layer of connective tissue covering the cortical bone. When periosteum is stripped, the osteogenic layer immediately adjacent to the bone surface is destroyed, and the blood supply of the underlying compact bone is compromised. Minimal stripping, consistent with sound surgical principles of access and soft tissue management, is an important consideration in Implantology.<sup>[16]</sup>

When teeth are present, blood supply to the bone comes from three different paths: the periodontal ligament, the connective tissue above the periosteum, and inside the bone.<sup>[9]</sup> When a tooth is lost, blood supply from the periodontal ligament disappears; blood comes only from the soft tissue and bone. Cortical bone is poorly vascularized and has very few blood vessels running through it, in contrast to the marrow bone. When soft tissue flaps are reflected for implant placement, blood supply from the soft tissue to the bone is removed, thus leaving poorly vascularized cortical bone without a part of its vascular supply, prompting bone resorption during the initial healing phase.

This may have consequences on the long-term esthetic results through the effect of the distance from the contact point to the crest of the bone in the presence or absence of interdental papillae.<sup>[3]</sup> Sufficient interdental bone height is crucial for the morphology and nutrition of an intact interdental papilla. Following the loss of the interdental papillae, the interproximal root surface of the tooth adjacent to implants may become exposed and cause sensitivity and the implant itself may get exposed. This clearly indicates the significance of maintenance of the soft tissue configuration around the implant placed.

*Flapless* procedure deferred from the conventional

method in that the flap reflection was completely eliminated. This was done with the intention of circumscribing all the disadvantages of flap elevation mentioned above, thereby preventing bone loss around the fixtures.

Jeong *et al.*<sup>[17]</sup> conducted an experimental study to examine the effect of *flapless* implant surgery on crestal bone loss and osseointegration in a canine mandible model. In six mongrel dogs, bilateral, edentulated flat alveolar ridges were created in the mandible. After three months of healing, two implants on each side were placed by either flap or flapless procedures. After a healing period of eight weeks, micro-computerized tomography was performed. Bone height at the peri-implant site also was measured. It was found that the mean osseointegration and the mean peri-implant bone height were greater at the *flapless* sites than at the sites with flaps. They concluded that the *flapless* surgery could achieve results superior to surgery with reflected flaps.

In addition to preventing bone loss, this technique also offers the advantage of reducing post-operative complications. Fortin *et al.*<sup>[13]</sup> compared the amount of pain experienced after implant placement with a *flapless* procedure and an open-flap procedure. The pain experienced was evaluated using a Visual Analogue Scale (VAS) and also by assessing the number of analgesics taken postoperatively from the day of surgery to six days after surgery. The results showed that pain decreased faster and also that the number of patients who felt no pain was higher with the *flapless* procedure.

Sciar<sup>[5]</sup> reviewed the advantages and disadvantages and indications and contraindications for *flapless* dental implant surgery, with special emphasis on requirements for establishing or maintaining long-term health and stability of the peri-implant soft tissues. The author stressed on establishing an adequate zone of attached, keratinized soft tissue of thickness 2.5-3 mm. This greatly contributes to the maintenance of a stable peri-implant soft tissue environment.

Other advantages of *flapless* technique have been described by Campelo and Camara.<sup>[9]</sup> They carried out a retrospective clinical analysis of 770 implants in 359 patients placed with a *flapless* approach. The cumulative success rate after a 10-year period varied from 74.1% in the first year to 100% in the last year. The authors concluded that *flapless* implant surgery is a predictable procedure if patient selection and surgical technique are appropriate.

However, while *flapless* implant surgery may be clinically beneficial, it has generally been perceived as a blind procedure limited to straightforward cases that do not pose the risk of cortical plate perforation. Casap *et al.*<sup>[12]</sup> described a protocol for *flapless* implant placement in a completely edentulous mandible using

computerized navigation surgery (Image Guided Implantology system). The system provides real-time imaging of the dental drill and transforms flapless implant surgery into a fully monitored procedure. The highly accurate intraoperative navigation enables precise transfer of the detailed presurgical implant plan to the patient. The accurate positioning of the implants, based on the presurgical digital plan, allows fabrication of a provisional fixed prosthesis before the implant surgery, for immediate postoperative loading. Hence, this innovative protocol can enhance prosthodontic-driven placement of implants in a fully monitored flapless surgery.

Another concern regarding flapless technique is the presumption that some amount of epithelial tissue could be carried to the osteotomy site.<sup>[13]</sup> Such a situation is highly undesirable because it might affect the complete bone osseointegration onto implant surface and thereby result in implant failure. However, an animal study by Becker *et al.*<sup>[15]</sup> reported no epithelial or connective tissue residues within the histologic sections in implant sites placed with flapless technique.

Yet another cause for worry is the increased potential for contamination of the implant upon placement with this procedure, even though no studies have proved it.<sup>[13]</sup>

Any surgical procedure involving the treatment of bone defects, fractures, tumors or impacted tooth necessarily requires reflection of flap to aid in visibility and access for complete removal or management. However, implant procedure involves the placement of a biocompatible material into viable bone. Therefore, we recommend flapless surgery to be considered for all implant placements, except in conditions where the bone is considerably thin in width and minimum thickness of attached gingiva is not present.<sup>[5,9,11,14]</sup>

## Summary

In this review article, a new, novel and innovative technique of implant treatment method has been discussed in detail. The surgical procedure and its advantages and disadvantages have been compared with conventional method of implant placement with flap. Backed with a thorough knowledge of clinical anatomical structures around the implant site and sound surgical skills, the flapless technique is becoming more popular for single-stage implant procedures. However, considering the debate on its efficacy over conventional procedure, further research is indicated to evaluate the same.

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