

Flap Designing for Dental Implants: A comprehensive review

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Corresponding Author: Yashodeep Chauhan, Department of Periodontology and PG Student, Govt. College of Dentistry, Indore, India.**Type of Publication:** Original Research paper**Conflicts of Interest:** Nil**Abstract**

Usual surgical procedure of Dental Implant placement involve flapless or flap techniques. Flapless technique includes use of punch drill to remove a mucosal layer over bone followed by placement of implants. Routine surgical incisions such as crestal or paracrestal incisions are given to raise the flap thereafter placing the implant. This basic incisions are evolved with time. Second stage implant placement surgery should also not be overlooked. Ridge augmentation with Guided Bone Regeneration is sometimes necessary, which needs special flap design to promote tensionless closure and primary healing. This review includes various flap design for implant placement.

Keywords: Flap, Surgical Flap, Dental Implant, Surgical Incision, Bone Regeneration, and Prosthesis.**1. Introduction**

Dental implants serves as an important treatment modalities in today's era. Over the last few decades Dental Implants has taken a good attention among dentists as well as patients. One of the primary step in implant placement is placement of incision for raising adequate flap. A good exposure of bone is required so as to place implant. Various flap designs were proposed in past not only to improve accessibility but also to minimize invasiveness of surgical procedure. Flap designing serves as important step both in first stage and second stage implant surgery. Proper flap designing is necessary for avoiding any

untoward complications post operatively such as bleeding, necrosis etc.

Principles of flap designing for Dental Implants

Among various principles of Dental implant flap designing as given by Mohammed JA et al¹ some important principles are mentioned:

1. Minimal amount of periosteum should be removed if necessary, as periosteum serve as major vascular supply to bone.
2. Vertical incisions if given should be oblique to ensure broad base of flap.
3. Important structures such as major blood vessels, nerves etc. should be preserved.
4. Edges of flap should be clean which in turn helps in proper wound closure by primary intension.
5. Flap should have adequate blood supply for nourishment.
6. Such Flap should not be design which alters the vestibuler debth.
7. Suturing of plap should cause no or minimum tension after approximation.
8. In case of inadequate keratinized tissue crestal incision should be given more palatally.
9. Tissue trauma should be avoided during manipulation of flap.

Classification of flaps in dental implantology

1. Basic Flaps.
2. Flaps specific for second stage implant surgery.
3. Flaps for Guided bone regeneration.

Basic Flaps/Basic assess techniques

1. **Mid Crestal incision (flap):** It is generally given at the middle of height of crest of alveolar ridge. Full thickness mucoperiosteum flap is reflected both buccally and lingually.
2. **Para Crestal incision (flap):** Incision is given buccally or lingually to the middle of height of crest of alveolar ridge.
3. **Punch technique:**

(a) Incision technique: A rotary blade is used with 100 rpm to make a circumferential incision over the implant placement site to remove a circular soft tissue. A bard parker blade can also be used for making a circumferential incision. After the incision soft tissue is removed with the help of hemostat.

(b) Punch drill technique: With the help of surgical template, outline over the soft tissue at implant site is marked. A punch drill is used to remove the soft tissue.²

Second stage Flaps/Incisions techniques

1. **Key hole technique:** With the help of 15 no. Blade an incision of area 1 mm² is given over the implant mucosa and the tissue is removed. With the help of microraspatory the mucosa is stretched to increase the size of hole. After few minutes the hole will be large enough to place the healing abutment.³

2. **Minimally invasive second-stage procedure:** Position of the cover screw is detected first, then the primary incision is extended palatally towards alveolar ridge. This primary incision is extended 0.5mm buccally from cover screw. Than a circular incision is given to remove soft tissue over implant surface with a diameter of incision in range of 1mm-3mm. With the help of probe

identify the hexagonal of cover screw. Expose entire cover screw in distal, buccal, and mesial directions with the help of a blunt instrument [Figure 1 (a), (b), (c)]. Entire cover screw is exposed followed by placement of healing abutment.⁴

3. **Palatal sliding strip flap:** Two intrasulcular incisions are given on adjacent teeth of the implant. Horizontal incision is given extending distally to mesially (about two third of adjacent teeth distance) on the palatal aspect. Now, two parallel incisions are given labiopalatally. These two incisions are joined with a horizontal incision. Between two parallel incision only partial thickness flap is raised rest mucoperiosteal flap is raised [Figure 1 (d), (e), (f), (g)].⁵

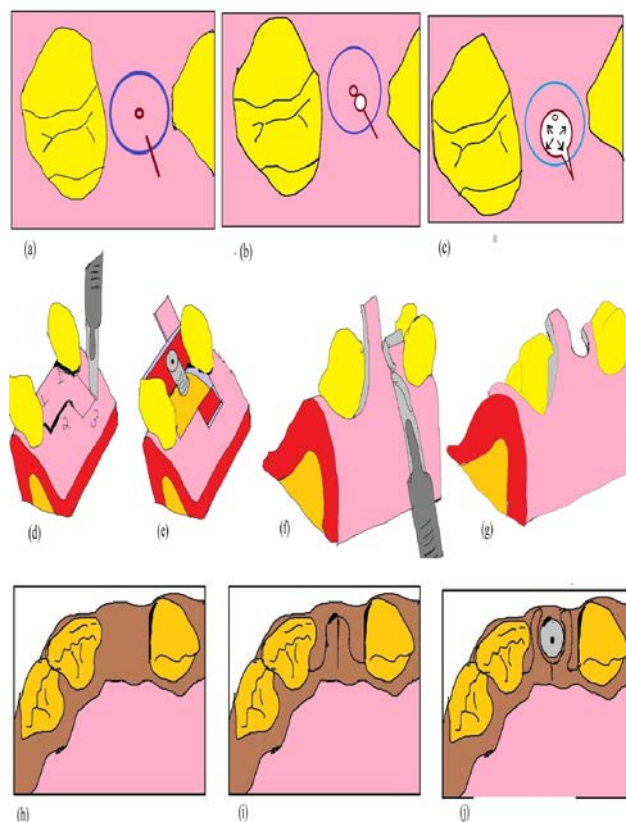


Figure 1 (a) Schematic drawing of first incision carried out to expose single-tooth implant in region of first premolar tooth.(b) Schematic drawing of first and second incision. (c)Schematic drawing of procedure used to

stretch supraimplant soft tissue. Arrows indicate directions in which tissue is stretched.

Figure 1(d) (1) Full-thickness sulcular and palatal displaced incision. (2) At two-thirds of the distance between the 2 teeth, a full-thickness horizontal incision is prolonged on the palatal side. (3) Two incisions, parallel to each other in a buccopalatal direction, are made to create a partial-thickness flap extending in the palate, leaving the periosteum intact. (e) The healing abutment is inserted. (f) A semilunar incision is made in the direction of the contralateral side of the strip. (g) The pedicles are disengaged and rotated toward the palatal direction to fill the interproximal space. (h) Edentulous ridge (i) Incision (j) Single implant.

4. **Split finger technique:** It is given by Carl E. Misch. Firstly, two intrasulcular incisions are made to the teeth adjacent to Implant. Then buccally at the implant site a semicircular incision is made. This semicircular incision is joined palatally by two incision one at mesial and another at distal to semicircular incision. In this way three fingers are created one towards palatally known as Palatal finger, two towards buccally known as Buccal finger. Palatal finger is then split and is reflected to respective mesial and distal sides (about 2-2.5mm wide) [Figure 1 (h), (i),(j)]. The soft tissue raised so maintains its original position after placement final abutment. A modified vertical mattress suture is then used for suturing.⁶

5. **U-shaped Incision Technique:** A u shaped incision is given, including palatal, mesial, and distal aspect of Implant covered with mucosa. Then, these two incision are extended just above the vestibule. The flap so raised is divided into two fingers one covering mesial aspect of implant and other at distal aspect of implant [Figure 3 (a), (b)]. These fingers are sutured. In this way mesial and mesial papilla is preserved.⁷

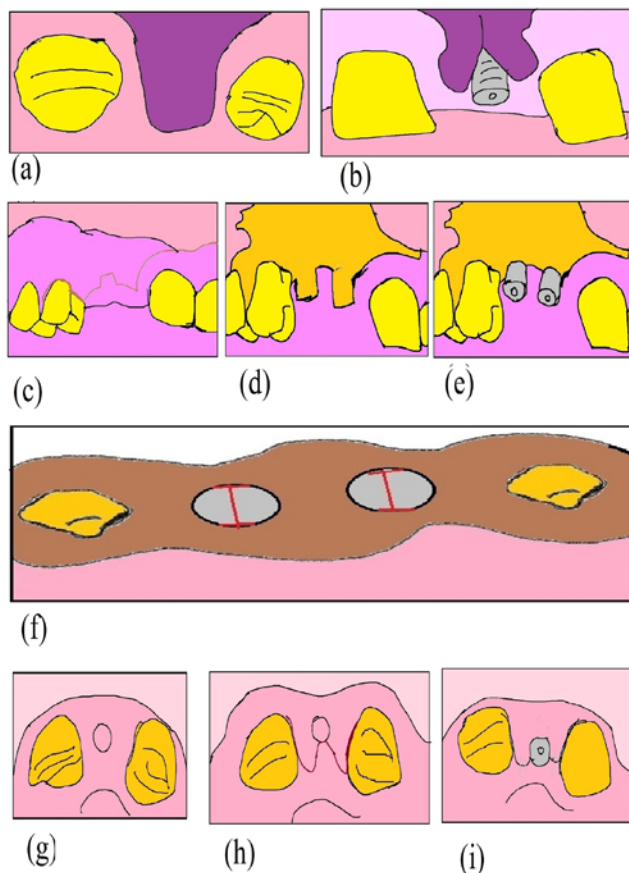


Figure 2 (a) U-shaped incision (b) Implant placement (c) Omega-shaped incision performed by sparing a 4-mm 4-mm area of soft tissue between the anticipated implant positions. (d) A full-thickness flap was raised around the intact area of soft tissue. (e) Two implants placed adjacent to each other. (f) Schematic drawing of I-type incision. Labial horizontal incision: 0.5-1 mm inside from the border of implant. Vertical incision: middle line. Palatal horizontal incision: border of implant. (g) A M-shaped flap is performed. (h) Suture is used at the gingival papilla to stabilize the flap around the healing cap.

6. **Omega shaped Incision:** It is generally given where gingival aesthetic is of concern. It is indicated when two implants needs to be replaced. To understand, omega shaped incision let us take an example of missing teeth i.e. lateral incisor and canine of one side. So, assuming that if these two teeth need to be replaced by implant first we

measure the distance between first premolar and central incisor (about 14.5 mm). Starting incision from mesiobuccal sulcus of first premolar the incision is extended at buccal aspect of crest of alveolar ridge at a distance of 5.5mm then palatally extended upto 4mm from here the incision is extended 4 mm mesially than 4 mm buccally. From here, incision is extended mesially at 3.5 mm then and finally a vertical incision is given buccally preserving the mesial papilla of implant. In such a way omega shaped incision is given. The flap is reflected buccally so that space between two implants is covered with mucosa of $4 \times 4 \text{ mm}^2$ area which will form future interdental papilla between implant [Figure 2 (c), (d), (e)].⁸

7. I-Shaped incision: It was first given by Eun-Kwonlee et al in 2010. At the labial border of the implant a horizontal incision is performed (mesiodistally - of the 0.5 to 1.00mm). Similar horizontal incision is performed at palatal border of implant. This two incision is connected with the help of buccolingual incision at the midline of implant. The flap is raised and cover screw of implant is removed. The flap after placement of the healing abutment flaps are folded around implant without any need of suture [Figure 2 (f)].⁹

8. M-Shaped Incision: It is given by Guerino Paolantino et al. Firstly two intra sulcular incision is given around adjacent teeth to the implant. Two round incisions are given palatally and one round incision given buccally so as to form M- shape. The flap is raised and after placement of healing abutment suture is given [Figure 2 (g), (h), (i)].¹⁰

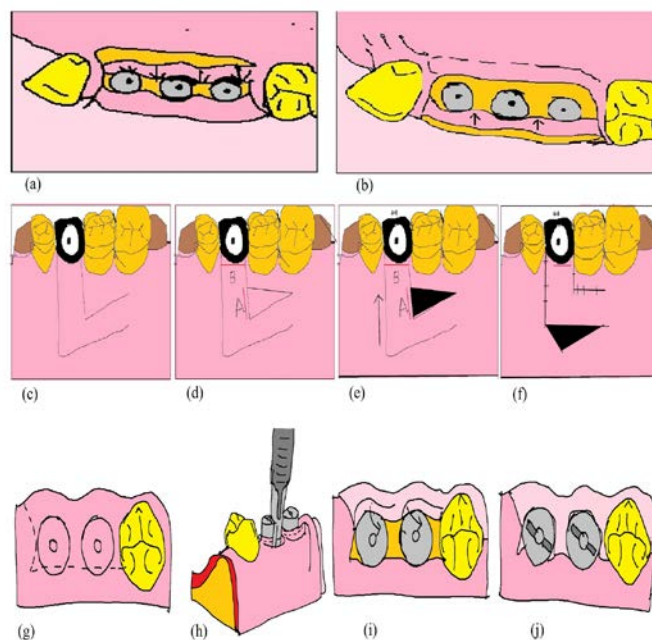


Figure 3 (a) Palatal location of crestal incision relative to implants. Tissues buccal to crestal incision are labially positioned (arrows). Palatal pediculated flap delineated. (b) Rotated palatal flap is closely adapted to healing abutments (arrows). Final relative locations of rotated palatal and buccal flaps after suturing. Adequate zone of keratinized tissue around implants is achieved, while a large zone of exposed implant-supporting bone is avoided. (c) Flap outline. (d) Outline of triangle a should be similar to distance b, which is the implant area. (e) Epithelium removed from sliding area. (f) Dissection and buccal sliding for complete coverage of implant area. (g) to (j) Steps of Palacci and Nowzari technique.

9. Rotated Palatal Flap: An incision is given palatal to crest of alveolar ridge and implants. Two vertical incisions and terminating buccal preserving both the papillae mesially and distally. After giving the incisions buccal flap is raised exposing the implant surface. Palatally again an oblique incision is given which facilitated the rotation of the pediculated flap, which is wider than 5 mm. Full thickness palatal pediculated flap is raised and rotated to

cover exposed implant-supporting bone. Palatal donor site is left uncovered and it is healed by secondary intention [Figure 3 (a), (b),(c)].¹¹

10. Pouch roll technique: It is given byh Sang-hoon park et al. 2012. Outline of full thickness flap about 1 mm wider is marked surrounding the implant cover screw. Incision is given to raise a full thickness buccal flap. Partial incision is given at the hinge of flap. A pouch is created buccally . After depithelization of buccal flap, the flap is rolled with in the pouch and healing abutment is placed.¹²

11. Palatal Advanced flap: It is given by Goldstein et al. in 2002. It is a pedicle flap for primary coverage of immediate Implant site. Mesiodistal and labiopalatal dimensions of extraction site are measured. Two L shaped incisions are given which are parallel to each other. With distal short arm and mesial long arm . Now, the flap is reflected. A triangular area adjacent to L-shaped incision with triangular's base towards long arm buccally is de-epithelized. The flap is advanced towards extraction site. After advancement a denuded area is left palatal to L-shaped incision [Figure 3 (c), (d), (e), (f)]. This area is healed by secondary intension.¹³

12. Palacci and Nowzari technique: [Figure 3 (g), (h), (i), (j)]. This technique is implicated where restoration of interdental papilla is of primary concern around implant. Firstly buccal flap is reflected. Healing abutments would emerge from the tissues and hold them in place. To maintained the scallop margin of buccal flap around the implant similar tothat of natural tooth semilunar incision is given so as to recreate scallop shape. Later the pedicles would be rotated to fill the inter abutment and abutment-tooth spaces.¹⁴

Flaps for Guided bone regeneration.

1. Vascularized periosteal membrane: Buccal & Palatal mucoperiosteum flap is raised. Palatal flap is splitted to

form a pedicle. The elongated palatal flap is used to cover graft material. Finally suture is given.¹⁵

2. Hockey stick flap: The full thickness buccal flap is raised which is having a hockey stick extension apical to vertical incision. The lingual flap reflection involves raising mylohyoid muscle. Lingual flap is splitted into periosteum and mucosa to increase the mobility of flap. Grafting is performed and suture is placed.¹⁶

3. Mucogingival pouch flap: A semilunar incision is given adjacent to the teeth where implant has to be done. Than two incision preserving both the papilla is given followed by two vertical incision which extends upto mucogingival junction. Buccally a pouch is formed which help in retention of graft material. Finally, periosteal scoring is done. After placement of implant and graft material suturing is done.¹⁷

4. Esthetic Buccal Flap: [Figure 4] Firstly, 2 verticle releasing incisions are given 2-3mm below gingival margin and these two verticle incisions are joined by single horizontal incision. Buccal flap is raised. After placing the implant bone deficiency is corrected with the help of bone graft and collagen membrane and suture are placed.¹⁸

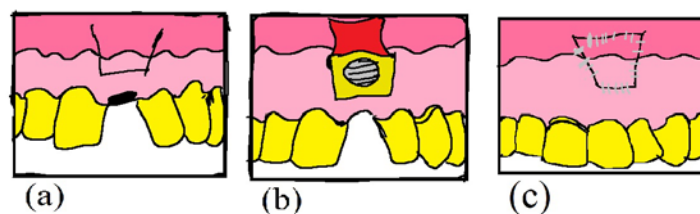


Figure 4 (a) Flap incision design that includes two vertically beveled releasing incisions placed in the mucosa along the tension lines and one horizontal connected incision (1 to 2 mm below the mucogingival junction [MGJ]) to connect both vertical incisions; in addition, the horizontal incision should be at least 3 mm away from the gingival margin to ensure that the supraosseous soft tissue

is not disturbed. (b) Flap reflected to expose defect. (c) Flap closure with temporary restoration in place.

5. Periosteal pocket flap: Buccal flap is raised than flap is divided by splitting periostium and mucosa, thereby increasing flap motility. Than two vertical incisions are given one mesially and other distally. After GBR procedure flap is sutured. It is generally used for correction of knife edge ridges.¹⁹

Conclusion

Various flap designing have been proposed by authors for both first and second surgical stage. For aesthetic reasons specially to preserve interdental papilla a number of flap designs has been proposed. Primary closure after GBR is the important criteria for selection of flap. Flap should be designed such that a tensionless closure is achieved. This review presented advancements in flap designing for implant placement.

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