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# Healing of soft tissue after different types of flap designs used in periapical surgery

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## ABSTRACT

Healing following apical surgeries depend t a large extent on the soft tissue flap design. Different flap designs have been advocated and used, depending on the location and size of the peri-radicular lesion.

A new flap design, which used sub-marginal straight incision was compared with intra-sulcular rectangular/triangular flap and scalloped, sub-marginal flap. Post - Operative healing was compared for swelling, alternation of colour, recession of marginal gingival and extent of scarring.

It was found that sub-marginal straight horizontal incision showed better healing with lesser scarring. It is concluded that the new flap design can provide an alternative.

Key words: Soft tissue healing, periapical surgery, flap design, muco-gingival flap

## Introduction

Periapical surgery has become an integral part of comprehensive dental treatment. Its primary purpose is to remove the causative agents of periradicular pathosis and to restore the periodontium to a state of biologic and functional health.

But, little attention has been given to the treatment of gingival tissue that must be incised and reflected to surgically gain access to the lesion. The design of the surgical flap greatly influences the healing process. Surgical flaps on the basis of horizontal incision can be classified into two major types<sup>1</sup> i.e.

1. Full mucoperiosteal flaps:
  - a. Triangular (one vertical releasing incision).
  - b. Rectangular (two vertical releasing incision).

- c. Trapezoidal (broad based rectangular).
  - d. Horizontal (no vertical releasing incision)
2. Limited mucoperiosteal flaps:
    - a. Submarginal curved (Semilunar)
    - b. Submarginal scalloped (Ochsenbein-Luebke)

The dentist has to decide the design of the flap keeping in mind certain factors like number of teeth involved, extent of the lesion, sulcular depth, location and size of frenum and muscle attachments, approximating anatomic structures and the width of attached gingival.

Regardless of the flap design used, certain principles should be followed while incising and reflecting the gingiva<sup>2</sup>.

- Incision should be made with a firm, continuous stroke.
- Incision should not cross underlying bony defect that existed prior to surgery, or would be produced by the surgery.
- Vertical incisions are made in the concavities between bony eminences.

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- Termination of vertical incision at the gingival crest must be at the line angle of the tooth.
- Vertical incision should not extend beyond the depth of the muco-buccal fold.
- Base of the flap must be as wide as the width of the free edge (supraperiosteal vessels running vertically should not be transected).
- Periosteum must be reflected as an integral part of the flap.

Some disadvantages exist with benefits of the traditionally and widely used rectangular flap in which the incision is given in the intrasulcular area<sup>3</sup>. Though it allows enhanced surgical access and excellent visibility yet it has certain disadvantages such as :

- More difficult to incise and reflect
- Possibility of gingival recession
- Flap re-approximation, wound closure, suturing and post-surgical stabilization is difficult.
- Severely angled flap deprives unreflected tissues of some of its blood supply.

Submarginal scalloped flap is formed by scalloped horizontal incision in attached gingiva with vertical releasing incisions. Scalloping corresponds to the contour of the marginal gingiva. There must be an adequate band of attached gingiva present (3-5 mm). This requires a very careful analysis of attachment level along the entire length of the horizontal incision. It is advantageous, that it does not involve marginal or interdental gingiva and therefore does not expose crestal bone, as a result of which the gingival recession is minimized<sup>4</sup>. But its disadvantages are<sup>5</sup>:

- Unable to extend flap, if needed.
- Disruption of blood supply to marginal gingival tissues, must rely on collateral circulation (which may not exist-resulting in sloughing of marginal gingiva).

- Possible delayed healing, scarring and flap shrinkage may be seen<sup>6</sup>.
- Difficult to visualize and treat periodontal defects and root fracture.

The purpose of this study was to evaluate the clinical features of healing of two conventional surgical flaps i.e. triangular or rectangular with intrasulcular incision and submarginal scalloped flap when compared with a new experimental flap design.

A new experimental flap, anticipated to be more beneficial in terms of healing, was designed. This is a mucogingival flap, but the horizontal incision is straight, unlike scalloped in Ochsenbein-Luebke flap.

The possible advantages are :

- Single, clean incision.
- Flap provides sufficient access and visibility to the pathosis.
- Less soft tissue trauma
- Easy reapproximation with better chances of healing by primary intention
- Minimal tension of the sutures
- Recession free healing

## **Material and Methods**

A total of 15 patients coming to the Department of Endodontics with periradicular pathosis where endodontic surgery was indicated were selected for the study. Mandibular molars were not chosen for the study as this area does not allow for the incision to be placed within the attached gingival.

The subjects were randomly distributed into 3 groups of 5 cases each as follows:

Types of incision	
Group I	Triangular/rectangular (intrasulcular)
Group II	Submarginal scalloped
Group III	Experimental flap

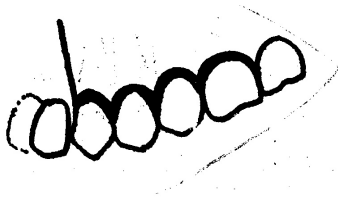


Fig. 1. Horizontal intrasulcular incision.

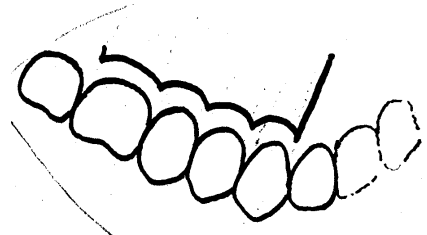


Fig. 2. Submarginal scalloped incision.

Patients' informed consent was taken. Adequate anaesthesia of the area to be operated was obtained. For incision, sharp No. 15C blade was used. All the patients included in this study were free of any systemic disease so that there could be no variable in healing pattern with different systemic disease.

In Group I, the intrasulcular horizontal incision with two vertical relaxing incision was given. The horizontal incision began in the gingival sulcus and was extended through the fibres of gingival attachment to the crestal bone. Care was taken to ensure that the interdental papilla was incised through mid col area, incising the fibres of epithelial attachment to crestal bone. The vertical incisions were placed at the line angles of the teeth adjacent to the involved teeth, pressing firmly enough to ensure that the scalpel was cutting down to the cortical bone. Then the periosteal elevator was used to gently elevate the periosteum and its superficial tissues from the cortical plate (Fig. 1a)

In Group II, the submarginal scalloped flap design was used. The scalloped incision was given in the attached gingiva following the contour of marginal gingiva, above the free gingiva groove. Incision was given through the gingiva and periosteum to cortical bone using firm pressure and a single smooth stroke. Vertical incisions were placed at each of the terminal ends of the horizontal incisions. Then the flap was reflected carefully (Fig 1b).

In group III, cases were chosen in which, teeth required either cervical restoration or crown. Here the straight firm continuous incision was given in the attached gingiva, apical to free gingival groove. The vertical relaxing

incisions were given at the end of the horizontal incision. Then the periosteal elevator was used to gently raise the flap (Fig. 1c)

During the procedure, constant irrigation with physiologic saline was done to prevent dehydration of flap. Apical curettage / apicectomy was performed. Before reapproximation of the flap, a wet gauge was placed for few minutes to minimize hematoma and to enhance reattachment of flap to the underlying bone.

Suturing of the flap was done using 4-0 silk suture. Interrupted, interdental sutures were given for horizontal incision of full thickness flap and single interrupted suture was given in vertical incision and horizontal incision of submarginal flap. These sutures were removed after 5 days.

## Results and Discussion

The healing was evaluated clinically after 5 days and 15 days post-operatively. Criteria for postoperative healing used were;

- Presence or absence of swelling
- Alteration of colour
- Recession of marginal gingival
- Extent of scarring

### Group I

The inflammatory changes of redness and swelling were more severe during the early wound repair with intrasulcular incision. Recession of the marginal gingiva was observed in two cases of intrasulcular incision. Their return to normal appearance was delayed when compared with submarginal incision wounds,



Fig. 3. Experimental design.

but very little, if any, scarring was evident with this incision (Fig. 2a)

### **Group II**

Little inflammation and swelling was evident at 5 days. No recession was observed with submarginal incision either at 5 or 15 days. Scarring and tissue shrinkage was evident in each case of group II at 5 days. At 15 days time interval, though the return to normal appearance was seen, some residual scarring was observed (Fig. 2b)

### **Group III**

No recession was observed in any case in this group, either at 5 or 15 days. Some scarring was observed at 5 days. But when submarginal incisions were compared, it was found to be more in scalloped incision than in the experimental flap design. At 15 days, scarring was negligible. More rapid healing with little tissue shrinkage was observed in the new experimental flap design. Also the restoration placed in the cervical abrasion did not interfere in healing process. (Fig. 2c)

Intrasulcular incision revealed more inflammation, swelling and marginal gingival recession, as post surgical stabilization is more difficult, primarily due to the fact that the tissue is held in position solely by sutures. This results in a greater potential for post surgical flap dislodgement. Redness observed was due to the increased blood supply in an attempt to repair.

Submarginal incisions demonstrated better healing as compared to intrasulcular incision. There was very little inflammation and no marginal recession was observed. Scar formation was observed as vertically oriented

blood vessels and collagen fibres were severed, resulting in more bleeding, and in greater potential for flap shrinkage.

Incision given in group 3 healed quicker, probably because it results in a single clean incision with lesser soft tissue trauma. Also case of reapproximation lead to healing by primary intention. Though scarring was observed at 5 days, it diminished significantly at 15 days. The scarring observed may not be of an esthetic concern because it is not easily visible. This flap has an added advantage over other flaps where cervical abrasion is present since in the design, flap is not reflected at intrasulcular level, so placing restoration in cervical area does not impede healing whereas in other conventional flap designs, marginal gingival recession takes place post-surgically.

### **Conclusion**

A recession free healing with complete return to normal appearance was observed in a short interval in the incision given in group III as compared to other incisions.

From the evidence presented it would appear that the experimental flap can be a choice in periapical surgery when not contraindicated by anatomic location of the lesion or by insufficient attached gingival.

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