Papilla Base Incision: An Evaluation of Post-Operative Healing of Interdental Papilla after Endodontic Surgery

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Abstract:
Aims and objectives: The purpose of this study was to describe and evaluate a novel marginal incision technique—the papilla base incision, which preserves the integrity of the interdental papilla during and after endodontic surgery in cases where there is no evidence of marginal periodontitis.

Methodology: Fifteen patients in general good health referred to the department of endodontics with periradicular pathology where endodontic surgery was indicated were selected for the study irrespective of age, sex and socioeconomic status.

Results: The visual observation of the incisions at one month recall demonstrated one site with visible defects (grade 1), five sites with partially detectable incision defect (grade 2) and nine sites with perfect healing (grade 3).

Conclusion: Papilla based incision is an excellent method of elevating the mucoperiosteal flap with excellent esthetics and without any postoperative loss of papilla height or gingival recession.

Keywords: Papilla Preservation, Interdental Papilla

Background:
Surgical endodontic therapy is the treatment of choice to remove disease and prevent recurrence when teeth have responded poorly to conventional treatment or non-surgical means of treatment to ultimately facilitate the healing so that the tooth returns to function.¹ As surgical procedure has some inevitable complications like loss of interdental papilla height, gingival recession; once the practitioner is certain that no better result can be achieved by using nonsurgical treatment, then and only then should the surgical option be considered.²,³,⁴,⁵

The two major components of surgical access are visual and manipulative. Visual access enables the endodontist to view the entire surgical field and manipulative access helps to carry out all the surgical steps without hinderance. Flaps for endodontic surgery require a horizontal and a vertical component. It is the site of the horizontal component that determines the type of flap.⁶,⁷ Loss of the interproximal dental papillae may cause functional, phonetic and aesthetic problems. Complete and predictable restoration of lost interdental papillae remains one of the biggest challenges in endodontic and periodontal reconstructive surgery.⁸ The interdental papilla is the portion of the gingiva between two adjacent teeth, functioning as a biologic barrier to protect periodontal ligament, cementum and alveolar bone from the oral environment.⁹ To achieve access for endodontic surgery, a full thickness flap must be raised, which consists of gingival and mucosal tissue as well as periosteum. To mobilize the flap, various modes of incisions can be selected including horizontal incisions (sulcular and submarginal) and vertical releasing incisions.¹⁰,¹¹ There are two basic types of flap sulcular and mucogingival. Though sulcular flaps remain most frequently used in endodontic surgery, it has disadvantages like recession and unpredictable shrinkage of papilla during healing.¹² A triangular/rectangular flap with a sulcular incision provides the best access of all flaps. Of utmost concern when utilizing this design is the health of the gingival tissues. If the tissues that comprise the attachment apparatus are handled with skill during incision and elevation, healing by primary intention will occur, provided no other surgical principle is violated.¹¹ To prevent the post-surgical complications a new incision for the marginal mucoperiosteal flap was designed to prevent loss of interdental papilla height, which involves the preservation of the entire papilla, thus eliminating any potential loss of height as a result of the surgical or healing process.¹³ The purpose of this study was to describe and evaluate a novel marginal incision technique—the papilla base incision, which preserves the integrity of the interdental papilla during and after endodontic surgery in cases where there is no evidence of marginal periodontitis.

Methodology:
Fifteen patients in general good health referred to the department of endodontics with peri-radicular pathology where endodontic surgery was indicated were selected for the study irrespective of age, sex and socioeconomic status. The age of the patients ranged between 15 and 60 years, with a mean age of 29.6 years. The teeth consisted of maxillary anteriors and premolars. All teeth had persisting symptoms and peri-apical
radiolucency. A conventional non surgical treatment had either been performed or failed, or was not feasible because of canal obstruction. Only patients without signs of periodontal disease were included in the study. Periodontal health was defined as absence of bleeding on probing and probing depths not exceeding 3 mm on any of the teeth in the area of the surgery. Interdental papillae were healthy and occupying the interproximal space below the contact area. All teeth were anaesthetized with 2% lidocaine with 1:80,000 adrenaline infiltration, which apart from anesthesia also provided profound hemostasis. A no.3 Bard parker handle with no.12 and no.15 blades were used for placing incisions: no.12 for intrasulcular incision and no.15 for releasing incisions. The papilla base incision consists of a papilla base incision and an intrasulcular incision and two vertical releasing incisions at least one tooth distal and mesial to the tooth to be treated. The papilla base incision requires two different incisions at the base of the papilla. Initially a shallow incision is placed to severe the epithelium and connective tissue to the depth of 1.5 mm from the surface of the gingiva at the level of the lower third of the papilla in a slight curved line going from one side of the papilla to the other (Fig. 1). Then scalpel is placed towards the base of the previously created shallow incision at the base of the papilla and subsequently inclined apically, almost parallel to the long axis of the tooth, aiming at the crestal bone margin using a no.12 blade. With this second incision a split thickness flap was prepared in the apical third of the base of the papilla. The incision ended at the crestal bone level, where the periosteum was separated from the bone (Fig. 2). From there on the preparation continued in a full thickness mucoperiosteal flap (Fig. 3). Buccally an intrasulcular incision joined the papilla base incision and vertical incision. The scalpel was moved within the sulcus, dissecting the gingiva to the crestal bone. The sulcular incision reached from the releasing incision to the start of the papilla base incision, or from one papilla to the next papilla. The flap was mobilized and retracted, during the root-end resection and filling. Closure was done using 5-0 silk sutures both for the vertical releasing incisions and papilla base incision with simple interrupted sutures. The flap closure was initiated from the releasing incisions, taking great care in passive reapproximation and perfect adaptation of the wound margins without tension to the sutures (Fig. 4a). The flap was compressed for 1 min at the conclusion of the surgery for absolute hemostasis. Patients were instructed to apply a cold compress to the face for 5 min every 20 min for the rest of the day and were prescribed NSAID three times per day for 72 hours. Following this, patients only took the analgesics when required. Patients were instructed to refrain from mechanical oral hygiene in the operated area and rinse twice daily with 0.2% chlorhexidine during the first week after the surgery. The sutures were removed 5 days post operatively (Fig. 4b).

Fifteen sites were evaluated. The surgical areas were photographed perpendicularly to the interproximal area: Great care was taken to maintain the same angulation and magnification of the photographs. The pictures enlarged to 3 times were compared for increase of the space between the papilla and contact area as a sign of loss of height. The change of the position of the most coronal point of the papilla was determined by measuring the distance between a reproducible point on the tooth and papilla tip using a periodontal probe. The precision of the measurement reading was an approximation to 0.5 mm. Wound healing complications, such as excessive swelling, infections, wound dehiscence and necrosis, were recorded at all times. Probing depths were measured at recall appointments, except at the suture removal.

Figure 1: Papilla base flap consisting of two releasing incisions and the papilla base incision. The papilla base incision is placed in the lower third of the interdental papilla.

Figure 2: Longitudinal section through the interdental papilla. (adapted from P. Velvart13 (2002)) (a) marks the initial shallow incision through the epithelium and connective tissue to the depth of 1.5 mm. (b) second incision directed to the crestal bone which will prepare a split thickness flap reaching from the first incision to the crestal bone level.
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Figure 3: Clinical photograph after complete reflection of the papilla base flap. Note the elevated split thickness flap from the incision to the Crestal bone level. Apical to the Crestal bone area the full thickness flap exposes the bone over the roots.

Figure 4: (a) Wound closure of the papilla base incision with three 5-0 silk sutures;

Figure 4: (b) sutures removed after 5 days.

Results:
Complete closure of the wound was achieved in all cases and no severe complications such as papilla necrosis occurred (Fig. 5). The patients were evaluated and grouped in to three grades depending on postoperative healing at one month. Grade I – sites with visible defects Grade II – sites with partially detectable incision defects Grade III – sites with perfect healing.

One patient exhibited delayed healing at suture removal along the entire margin of the flap, leading to visible and persistent scar formation. Further healing in this patient was uneventful. All other patients displayed rapid healing. The photographs did not reveal any noticeable opening of the space between the papilla and contact area as a result of the loss of papilla height at any observation time. The visual observation of the incisions at one month recall demonstrated one site with visible defects (grade 1), five sites with partially detectable incision defect (grade 2) and nine sites with perfect healing (grade 3). (Graph-I)

Figure 5: post-operative healing after one month

Graph I: comparative pie chart showing postoperative healing at one month.

Discussion:
During the last three decades, endodontics has seen a dramatic shift in the application of periradicular surgery and the part it plays in the delivery of endodontic services. Previously, periradicular surgery was commonly considered the treatment of choice when nonsurgical treatment had failed or if existing restorative or prosthetic treatment would be endangered by orthograde treatment. Grossman et al included in a list of indications for endodontic surgery the presence of large and intruding periapical lesions, overfilled canals, incomplete apical root formation, and destruction of the apical constriction by overinstrumentation. It is of utmost importance to preserve epithelial and connective tissue attachment at its original level and traumatize the attachment apparatus as little as possible during the incision in order to obtain rapid healing through primary intention.

With the papilla base incision it is possible to prevent any noticeable recession of the papilla following endodontic periapical surgery. The interdental papilla, as well as the raised flap, should be handled with great care, kept moist, and retracted without pressure during suturing. The wound edges are perfectly reapproximated without tension to
prevent compromising blood circulation on both the papilla and the split flap which can cause delayed healing.

**Conclusion:**
Based on the results of this study we can conclude that, papilla based incision is an excellent method of elevating the mucoperiosteal flap with excellent esthetics and without any postoperative loss of papilla height or gingival recession. Further studies with a larger sample size can analyze the long term healing after the papilla base incision; comparing it with standard marginal mucoperiosteal flaps and may replace it as a primary method of flap elevation in endodontic periapical surgeries.

**References**