

Evaluation of Periodontal Indices Following Use of Two Incision Techniques in Apical Surgery

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Abstract

Introduction: It is important to preserve epithelial and connective tissue attachment at its original level after periapical surgery. The aim of this study was to compare the periodontal parameters after using the papilla base flap and the sulcular full-thickness flap procedures. **Methods:** Fourteen healthy patients with no periodontal disease referred for surgical treatment of periapical lesions, were included in this study. Periodontal parameters were measured preoperatively and at one-month postoperative interval. The patients were randomly divided into two equal groups. A sulcular full-thickness flap procedure was performed in the first group and papilla base flap procedure in the second. Data were analyzed using t-test, Fisher's exact test and Mann-Whitney U test. **Results:** The sulcular full-thickness flap procedure resulted in a significant decrease in papilla height and an increase in recession of marginal gingiva compared to the papilla base flap technique. There were no significant differences between the two flap procedures in bleeding on probing, attachment loss, probing depth and gingival index. **Conclusion:** The use of papilla base flap technique is recommended to prevent opening of the inter-proximal space, aesthetic and biologic problems after apical surgery.

Key Words: Papilla-base flap, periapical surgery, periodontal indices, sulcular full-thickness flap.

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Introduction

In specific situations that conventional root canal retreatment is not possible or would not achieve an appropriate result, apical surgery might be considered as an alternative treatment method (1). Different types of incisions can be used to reflect the flap, including horizontal incisions and vertical releasing incisions (2).

Certain basic principles must be considered before deciding on the type and outline of the flap: periodontal condition of the affected and adjacent teeth, location and extension of the periradicular lesion, and the adjacent anatomic structures (3). Flap elevation in apical surgery might result in changes in tissue levels around the teeth within the flap area. Some animal studies have documented the clinical and histological changes after mucogingival flap elevation in endodontic surgery (4-6). It is essential to take care of healthy periodontal tissues and to prevent attachment loss and gingival recession.

The assessment of success and failure following apical surgery is mostly based on clinical and radiographic criteria of healing of periradicular tissues; in this context, soft tissue healing has received little attention. Following endodontic surgery, it is very important to maintain the healthy periodontal tissue. The papilla base flap procedure has been introduced to prevent recession of the papilla as it essentially excludes the papilla (7). Only a few clinical studies have reported the periodontal parameters after apical surgery (8-11). The aim of this clinical study was to evaluate the periodontal indices following apical surgery using the sulcular full-thickness flap and papilla base flap procedures.

Materials and Methods

Fourteen patients including 12 females and 2 males, referred to the Department of Endodontics of Mashhad Faculty of Dentistry for surgical treatment, were included in this clinical trial. The patients had no problems in the medical history and signs of periodontal disease. The teeth consisted of maxillary and mandibular anterior, premolar and molar teeth (Table 1). Two weeks before surgery, scaling and oral hygiene instructions were provided for all the patients. The patients received full explanations about the surgical procedures and alternative treatment options. This study was approved by the Ethics Committee of Mashhad University of Medical Sciences.

Evaluation Parameters

The following periodontal data were collected at mesiobuccal, midbuccal, distobuccal, and lingual sites of the teeth:

1. Probing depth (PD): A periodontal probe was used to measure the PD.
2. Bleeding on probing: Score 0: no bleeding; Score 1: bleeding on probing.
3. Level of gingival margin: The distance from the CEJ to the gingival margin was measured using the same probe (negative values were assigned to sites with exposed root surfaces).
4. Clinical attachment level (CAL): These values were calculated by subtracting the level of gingival margin values from probing depth values.
5. Gingival index: Each of the four gingival areas of the tooth was scored for inflammation (12) 0: normal gingiva; 1: mild inflammation; 2: moderate inflammation; 3: severe inflammation. Then the four scores of each tooth were summed up and divided by four to achieve a tooth score: a score between 0.1 and 1: mild inflammation; 1.1 to 2: moderate inflammation; and 2.1 to 3: severe inflammation.

6. Height of papilla (the distance between a reproducible point on the tooth and papilla tip) was also measured using the periodontal probe (7).

Periodontal indices were evaluated preoperatively and at 1-month postoperative interval.

Surgical Technique

The patients were randomly divided into two equal groups. Sulcular full-thickness flap procedure was carried out in the first group and papilla base flap procedure in the second group. Apical surgery was performed under local anesthesia with the use of a surgical microscope (Carl Zeiss Surgical, GmbH, Oberkochen, Germany). All the periapical surgeries were performed by one experienced endodontist. Following flap reflection, osteotomy was done with round burs under copious saline irrigation. The affected roots were resected approximately 3 mm away from the apex. After debridement of the pathologic tissues, homeostasis was achieved and then root-end cavities were prepared with sonic-driven microtips (Spartan, Fenton, USA).

The root-end cavities were filled with white mineral trioxide aggregate (MTA) and the wound areas were cleaned. Primary wound closure was accomplished with multiple interrupted sutures. Great care was taken in passive re-approximation and good adaptation of the wound margins before suturing.

All the patients were given non-steroidal analgesics and instructed to rinse their mouth with 0.1% chlorhexidine digluconate twice a day up to 10 days. The sutures were removed 7 days after surgery.

The patients were recalled at a one-month postoperative interval and clinical re-examination was conducted by a third party using blind-examiner method. Finally, data was analyzed by t-test, Fisher's exact test and Mann-Whitney U test using SPSS 11.5.

Table 1. Frequency of applied tooth types in each of the two groups

		Flap type	Papilla base	Sulcular full-thickness
		Tooth type		
Maxilla	Central, Lateral		1	2
	Premolar		0	1
	Molar		2	1
Mandible	Central, Lateral		0	0
	Premolar		2	1
	Molar		2	2
		Total	7	7

Results

In the present study, the subjects consisted of 6 female patients and 1 male patient in each of the two experimental groups. The mean ages of the patients were 28 and 34 years in the sulcular and papilla base flap groups, respectively. There was no significant difference between the two groups in relation to age and gender distribution ($P>0.05$).

Healing of surgery wounds was observed in all the patients at one-month postoperative interval and no severe complications such as papilla necrosis or scar formation occurred. However, 42.9% of the patients with papilla base flap procedure and 57.1% with sulcular flap procedure showed bleeding on probing.

Mann-Whitney U test did not show a significant difference between the two groups ($P=1.00$).

In relation to measurement of papilla height and marginal gingival recession, significant differences were observed between the two incision techniques ($P<0.05$). Sulcular full-thickness flap led to greater gingival recession and loss of papilla height. There were no significant differences between the two flap procedures in attachment loss, probing depth and gingival index ($P>0.05$) (Table 2).

Regarding gingival inflammation severity, the most common inflammation grade was mild in both groups (Table 3).

Evaluation of periodontal parameters before surgery showed no bleeding on probing.

Table 2. The relation of periodontal indices and incision type

Flap type Variables	Papilla base		Sulcular full-thickness		P-value 2-sample t-test Mann-Whitney U test
	Mean	SD	Mean	SD	
Probing depth (mm)	0.26	0.67	0.20	0.19	0.80
Gingival recession (mm)	0.18	0.37	0.50	0.28	0.048*
Attachment loss (mm)	0.41	0.72	0.57	0.31	0.61
Gingival index**	0.82	0.62	0.76	0.48	0.85
Papilla height (mm)	-0.14	0.03	-0.38	0.19	0.02*

*Significant difference

** This is without unit, but shown as quantitative to calculate the average

Table 3. Frequency distribution of different degrees of gingivitis in each of the two groups one month after surgery

Flap type Gingivitis degree	Papilla base	Sulcular full-thickness
Normal	28.6%	14.3%
Mild	42.9%	57.1%
Moderate	28.6%	28.6%
Severe	0.0	0.0%

Discussion

This clinical study evaluated the changes in periodontal parameters following apical surgery at a one-month postoperative interval. In addition, the changes were assessed according to the type of incision used for flap elevation. Velvart et al. (13) reported that the bulk of vertical loss of papilla height occurs during initial healing phase during the first month following surgery.

In healthy periodontium, the papilla fills the entire interproximal space between two adjacent teeth (14). Recession is a threat when periradicular surgery is required in these sites, particularly when subgingivally positioned crown margins are present. Von Arx et al. (11) evaluated changes in periodontal parameters after apical surgery and reported that the major factor affecting healing of marginal tissues is the type of incision technique. Velvart (7) proposed the papilla base incision technique for marginal mucoperiosteal flap to prevent loss of interdental papilla height. Although this technique is challenging to perform because two different incisions are necessary to avoid excessive scar formation or an indentation at the site of the incision, it is conducive to periodontal healing without noticeable loss of papilla height.

In this study, papilla base incision resulted in a loss of papilla height of 0.14 ± 0.03 mm and a gingival recession of 0.18 ± 0.37 mm. These values for the full-thickness flap procedure were 0.38 ± 0.19 mm and 0.50 ± 0.28 mm, respectively. The full-thickness flap demonstrated more dramatic changes in papilla height and gingival recession compared to the papilla base flap procedure, with statistically significant differences. This finding has been confirmed by previous studies (13,15,16). It appears that loss of papilla height during complete elevation occurs despite the use of less traumatic new techniques. These changes might create phonetic and aesthetic problems and lead to food impaction (7). The reasons explaining more recession and loss of papilla height for the full-thickness flap could be excessive forces to the marginal tissues during flap elevation, insufficient adaptation of the papilla to the underlying tissues at flap closure, exposure of marginal bone tissues with possible tissue dehydration for 45-90 min, and bone remodeling during healing (5,13,17). Animal studies have shown that up to one millimeter of buccal bone tissue is lost following flap elevation (4,18).

Part of the attachment loss during the surgical periodontal flap occurs because of scaling and root planing procedures during the surgical periodontal treatment, which remove epithelial and connective tissue attachment (19), whereas in the endodontic surgery no scaling and root planing is performed. Based on the results of this study, the attachment loss with

papilla base flap procedure was less than that with the sulcular full-thickness flap, but it was not significant. Probing depth did not change significantly over time.

The present prospective clinical study demonstrated that the type of marginal incision is very important in relation to the degree of papillary and gingival recession. The full-thickness flap resulted in more recession in the papilla and gingival margin.

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References

1. Ingle JI, Bakland LK, Baumgartner JC. Endodontics. Hamilton: BC Decker, 2008.
2. Gutmann JL, Harrison JW. Surgical Endodontics. Boston: Blackwell Scientific Publications; 1991.
3. Velvart P, Peters CI. Soft tissue management in endodontic surgery. *J Endod* 2005;31:4-16.
4. Kramper BJ, Kaminski EJ, Osetek EM, Heuer MA. A comparative study of the wound healing of three type of flap design used in periapical surgery. *J Endod* 1984;10:17-25.
5. Harrison JW, Jurosky KA. Wound healing in the tissues of the periodontium following periradicular surgery. 1. The incisional wound. *J Endod* 1991;17:425-35.
6. Selvig KA, Torabinejad M. Wound healing after mucoperiosteal surgery in the cat. *J Endod* 1996;22:507-15.
7. Velvart P. Papilla base incision a new approach to recession-free healing of the interdental papilla after endodontic surgery. *Int Endod J* 2002;35:453-80.
8. Jansson L, Sandstedt P, Laftman AC, Skoglund A. Relationship between apical and marginal healing in periradicular surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1997;83:596-601.
9. Von Arx T, Vinzens-Majaniemi T, Beurgin W, Jensen SS. Changes of periodontal parameters following apical surgery: a prospective clinical

- study of three incision techniques. *Int Endod J* 2007;40:959-69.
10. von Arx T, Salvi GE, Janner S, Jensen SS. Gingival recession following apical surgery in the esthetic zone: a clinical study with 70 cases. *Eur J Esthet Dent* 2009;4:28-45.
 11. Von Arx T, Alsaeed M, Salvi GE. Five-year changes in periodontal parameters after apical surgery. *J Endod* 2011; 37:910-8.
 12. Newman M, Takei H, Klokkevold PR, Carranza F. *Carranza's clinical periodontology*. Philadelphia: W.B. Saunders Co; 2006.
 13. Velvart P, Zimmermann U, Ebner JB. Comparison of long-term papilla healing following sulcular full thickness flap and papilla base flap in Endodontic surgery. *Int Endod J* 2004; 37:687-93.
 14. Tarnow DP, Magner AW, Fletcher P. The effect of the distance from the contact point to the crest of bone on the presence or absence of the interproximal dental papilla. *J Periodontol* 1992; 63:995-6.
 15. Velvart P, Ebner JP, Zimmermann U. Papilla healing following sulcular full thickness flap in endodontic surgery. *J Endod* 2001;27:219-24.
 16. Velvart P, Ebner-Zimmermann U, Ebner JP. Comparison of papilla healing following sulcular full-thickness flap and papilla base flap in endodontic surgery. *Int Endod J* 2003; 36: 653-9.
 17. Levin MP, Grower MF, Cutright DE, Getter L. The effects of length of surgery on healing of full and partial thickness flaps. *J Oral Pathol* 1977;6:152-60.
 18. Cummings GR, Torabinejad M. Effects of systemic doxycycline on alveolar bone loss after periradicular surgery. *J Endod* 2000; 26:325-7.
 19. Philstrom BL, McHugh RB, Oliphant TH. Comparison of surgical and nonsurgical treatment periodontal disease. A review of current studies and conventional result after 2 years. *J Clin Periodontol* 1983;10:524-41.

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