Comparative Study Between Two Flaps—Trapezoidal flap (TZF) and Ocshenbein-Leubke Flap (OLF) in Periapical Surgeries

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Abstract The ultimate goal in surgical endodontics is not only the eradication of periapical pathosis but also preservation of periodontal tissues using suitable surgical techniques. Treatment outcomes are no longer acceptable without considering the esthetic consequences of all involved dentoalveolar structures. It is critical that incisions and tissue elevations and reflections are performed in a way that facilitates healing by primary intention. The large variety of flaps available for periapical surgeries reflects the number of variables to be considered before choosing an appropriate flap design. In this study; Ocshenbein-Leubke (OL) and trapezoidal (TZ) flaps have

been compared in terms of their efficacy and comfort. Twenty patients of ASA category I, between the age group of 12–40 years were randomly selected to undergo periapical surgery by utilizing one of two flaps. All the subjects were free of periodontal disease. Demographic variables were found to be statistically similar. OL flap was found to be better than TZ flap with respect to time of flap reflection, accessibility, duration of surgery and post-operative pain. The OL flap takes less time for reflection with nearly the same accessibility, less post-operative pain and less complication as compared to TZ flap. We conclude that OL flap gives better results when compared to TZ flap.

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Introduction

The incision and flap design is one of the important steps in periapical surgery. Each type of incision is associated with complications like wound dehiscence, gingival recession and scarring. These complications must be anticipated and incorporated into pre-surgical planning [1]. A good flap design with less aesthetic consequences and adequate access will help in minimizing intra-operative complications and improve post-operative healing.

In the present study we have compared two flap designs: Ocshenbein-Leubke (OL) and trapezoidal (TZ) flaps for cases which were diagnosed with periapical lesions associated

with non vital upper and lower anterior teeth and undergoing periapical surgeries.

Material and Methods

The present study was undertaken in the Department of Oral and Maxillofacial Surgery, Al Badar Dental College and Hospital, Gulbarga, Karnataka, India. Twenty patients were selected with non-vital maxillary or mandibular anterior teeth with associated periapical pathology.

Patients were randomly allotted into two groups, with 10 patients each. In Group I the OL flap was utilized and in Group II the TZ flap was utilized to access the periapical area (Tables 1, 2).

A detailed preoperative assessment was carried out including digital photographs, IOPA radiograph, and CBC with clotting profile. Informed consent was obtained from all patients.

In Group I, a horizontal scalloped incision on the attached gingiva following the contour of the marginal gingiva above the free gingival groove and two releasing incisions placed at the terminal ends of the horizontal incision were given as described by OL. A full thickness mucoperiosteal flap was then raised (Figs. 1, 2, 3).

In Group II, a standard trapezoidal flap was raised in which a horizontal intra-sulcular incision and two vertical releasing incisions at the line angles of the adjacent teeth were given and a full thickness flap developed (Figs. 4, 5, 6).

Time taken to raise the flap, from commencement of incision till complete visualization of the operating site was

Table 1 Inclusion criteria

(1) Co-operation of the patients with the study and post-operative follow up
(2) Patients in the age group between 12 and 40 years
(3) Patients under ASA I category
(4) Patients with periapical lesions associated with non-vital maxillary or mandibular anterior teeth
(5) Presence of a periradicular lesion that could not be treated by a non-surgical procedure

Table 2 Exclusion criteria

(1) Patients below age of 12 years and above 40 years
(2) Patients suffering from any systemic disease
(3) Patients with pre existing periodontal diseases
(4) Patients with periapical lesions localized to posterior teeth of upper and lower jaws

Fig. 1 OL flap case—pre operative

Fig. 2 OL flap case—IOPAR

Fig. 3 OL flap case—1 month post-operative

Fig. 4 TZ flap case—pre operative

recorded in both groups. The total time recorded was divided in two groups: between 5–10 and >10 min.

Accessibility and visibility of the surgical site in both OL and TZ flap groups were evaluated as either adequate or inadequate. A flap was defined as adequate when it provides an easy reflection with minimal or no trauma to the adjacent tissue, and complete visualization of the operation site thus allowing an efficient sectioning of the diseased part of the root.

The total time taken for surgery was also noted from commencement of incision to placement of last suture. The duration of procedure was divided into three groups : 30–45, 45–60 min and >1 h.

All patients in both groups were prescribed antibiotics and analgesics consisting of one gram of amoxicillin and 400 mg of Ibuprofen started 1 hour preoperatively. Post-operative evaluation of pain as well as the need for analgesia was done on an hourly basis for 12 h using visual analogue scale. None of the patients were asked to take non-prescribed medication.

Fig. 5 TZ flap case—IOPAR

Fig. 6 TZ flap case—1 month post-operative

The surgical site was assessed at 24 h, 3, 7, 15 days and 1 month for quality of healing by evaluating tenderness of teeth to percussion, tenderness of the adjacent tissues to palpation, development of sinus, tooth mobility, gingival recession, scarring, wound dehiscence and obliteration of sulcus. Gingival recession was assessed by Smith [1], who included both the horizontal and vertical components of recession based on numerical values [1]. The system has been termed as the index of recession or IR and describes the recession defect in two digits separated by a dash. The first digit represents the horizontal component while the second denotes the vertical component. The components of

Table 3 Horizontal component of recession

Score	Criteria
0	No clinical evidence of root exposure
1	No clinical exposure of root plus a subjective awareness of dentinal hypersensitivity in response to one second air blast is reported and or there is clinically detectable exposure of CEJ for upto 10 % of the estimated mid mesial to mid distal distance
2	Horizontal exposure of the CEJ more than 10 % but not exceeding 25 % of estimated mid mesial to mid distal distance
3	Exposure of CEJ more than 25 % of mid mesial to mid distal distance but not exceeding 50 %
4	Exposure of CEJ more than 50 % of mid mesial to mid distal distance but not exceeding 75 %
5	Exposure of the CEJ more than 75 % of the mid-mesial to mid-distal distance up to 100 %

Table 4 Vertical component of the recession

Score	Criteria
0	No clinical evidence of root exposure
1	No clinical exposure of root plus a subjective awareness of dentinal hypersensitivity in response to one second air blast is reported and or there is clinically detectable exposure of CEJ not extending more than 1 mm vertically to the gingival margin
2–8	Root exposure 2–8 mm from the CEJ to the base of the defect
9	Root exposure more than 8 mm from the CEJ to the base of soft tissue defect
10	An asterisk is used next to second digit wherever the vertical component of the soft tissue defect encroaches into the mucogingival junction or extends beyond it into the alveolar mucosa

Table 5 Age-wise distributions of both flaps

Age groups	OL flap	TZ flap
12–18	6	3
19–24	4	4
25–40	0	3
Total	10	10

this classification are listed in Tables 3 and 4. Scarring was assessed on visual analogue scale by two independent individuals over the period of 1 month.

The data was entered into a Microsoft Excel Worksheet and analyzed using SPSS (version 7.5) statistical package. Proportions were compared using Chi square (χ^2) test of significance. Proportion of cases belonging to specific group of parameter or having a particular problem was expressed in absolute number and percentage. The results were averaged (mean + standard deviation) for each parameter between the groups. Student's *t*, test was used to find a significant difference between the two means. A *P* value <0.05 was considered significant.

Results

Tables 5 and 6 show the demographic details of all the 20 patients. Patients were divided into three age groups that is 12–18, 19–24 and 24–40 years. With respect to age and sex

there was no statistically significant difference among the total sample.

Table 7 shows time taken for complete flap reflection from the time of incision till complete raising of flap. Of the total 10 pts in OL flap group; flap reflection were completed within 10 min in 8 patients while in two patients more than 10 min was required. In TZ flap group, the evaluated time of flap reflection was more than 10 min in 5 patients. A *P* value of <0.001 was found when the average time of flap reflection was compared between OL group and TZ group, thus statistically favouring OL flap.

Table 8 depicts the accessibility and visibility of both OL and TZ flap groups. Although statistically insignificant, accessibility and visibility was found to be adequate in 9 patients in OL flap group as compared to 7 patients of the TZ group.

Table 9 shows the total time taken from the incision to the placement of the last suture. Duration of procedure was between 45–60 min in 3 patients out of the 10 patients of the OL flap group while a relative longer duration was needed in 8 patients of the TZ flap group. The difference in the duration was statistically significant.

Table 10 shows an hourly pain assessment over 12 h which was done using visual analogue scale and the sum total pain scores tabulated. Patients in OL flap group fared better than TZ flap group in terms of pain, although the difference was statistically insignificant.

Among the parameters used for assessing post-operative healing, visible scar developed in 2 patients of OL flap and

Table 6 Sex-wise distribution of both flaps

Sex	OL flap	TZ flap
Male	3	6
Female	7	4
Total	10	10

Table 7 Time of flap reflection

Groups	5–10 min	>10 min	Total
OLF	08	02	10
TZF	05	05	10
Total	13	07	20

gingival recession was observed in two patients with TZ flap (score 2 by index of recession given by Smith [1]). None of the patients in both groups developed a sinus tract, wound dehiscence or obliteration of sulcus.

Discussion

Periapical surgery is commonly performed in oral and maxillofacial surgical practice. A proper surgical plan is important for the selection of flap design, adequate exposure of field, ease in surgery and finally good closure resulting in good healing [2]. A variety of flaps have been employed in the past and in earlier days TZ was favoured owing to satisfactory visibility, easy suturing and tissue handling. Since the introduction of OL flap, some limitations of TZ flap e.g. difficulty in reapproximation of flap, violation of the interdental attachment and recession of gingiva have been successfully overcome. However, no studies have compared the two techniques objectively with regard to the ease of raising the flap, accessibility, patient comfort and quality of healing.

In the present study, the time taken for flap reflection was significantly less in the OL group. The extra time consumption in TZ flap was due to reflection of interdental papilla and attached gingiva, which is not required in the OL technique as the incision lies below the marginal gingiva.

Good access and visibility of the surgical field is one of the principle requirements of periapical surgery and the manipulation of the soft tissues must be performed without compromising the requirements for optimal access to the periapical region and perfect visibility of the involved apical structures [3, 4]. Although the results of comparison were statistically insignificant; OL flap was found to be adequate in 9 patients as compared to 7 patients of the TZ flap group. In a similar study visibility was assessed by the operator's personal experience during holding of flap by

Table 8 Accessibility and visibility

Groups	Adequate	Inadequate	Total
OLF	9	1	10
TZF	7	3	10
Total	16	4	20

Table 9 Duration of procedure

Groups	35–45 min	45–60 min	>1 h	Total
OLF	7	3	0	10
TZF	2	8	0	10
Total	9	11	0	20

Table 10 Post-operative pain for 12 h recorded every hour

	Mean $\pm$ SD		
OLF	55.3 $\pm$ 3.31	$t = 1.72$	$P > 0.05$
TZF	58.4 $\pm$ 4.8		

assistant, facilitation of visibility during cutting bone and assistance in lip retraction and it was found that OL flap is much better in all the respects [4].

In another study Vreeland and Tidwell [5], stated that proper alignment of flap is necessary for good aesthetics and it is not easily achieved with TZ flap. In OL technique, re-approximation of flap and wound closure is easily achieved.

In this study, comparison regarding post-operative pain revealed that OL flap when used for periapical surgeries resulted in lesser degree of pain than when a TZ flap was used. Similarly, Fabbro et al. noted a comparatively higher degree of pain with the usage of intrasulcular incision when compared against papilla base incision [6]. In another study on 62 patients Penarrocha et al. found that pain was greater when treating anterior teeth with trapezoidal incision and it increased with the number of teeth and with the duration of surgery [7].

Higher pain scores in TZ flap group may be due to longer duration of surgery, excessive tissue manipulation, severing of the gingival fibers and a comparatively excessive exposure of bone. Apart from above mentioned reasons, smoking can also be responsible for higher degree of pain, since in 2 patients of the TZ flap group, who smoked in the post-operative period against medical advice, highest pain score were recorded.

In 1991 Harrison and Jurosky speculated that the reason for gingival recession could be due to excessive force on marginal tissues during flap elevation, exposure of marginal bone tissues for 45–90 min with possible tissue dehydration and bone remodelling during healing [8]. In

our study gingival recession was observed in 2 patients of TZ flap, more in a male patient, in whom an adverse habit of smoking could be considered as a relevant reason.

Chindia et al. conducted a study to compare between semilunar flap and TZ on 20 patients aged between 16–44 years and found no loss of attachment in both flaps [9]. However Velvart et al. conducted a comparison of the long term papillary healing following sulcular full thickness flap and papilla base flap in endodontic surgery. It was found that the papilla base incision allows a predictable recession free healing of the interdental papillae as compared to a marked loss of papillary height with complete mobilization of the papilla [10–12]. Velvart et al. observed the same complication associated with intrasulcular incision. They proposed that during the complete mobilization of the papilla, the coronal portion is frequently severed from the body of the papilla and these fragments owing to their small size frequently necrotize resulting in decreased height [13].

In one more study Velvart [10] observed that gingival recession may not be solely due to the kind of incision used that is intra-sulcular incision, but it could be due to size of scalpel and blade, needle size, type of suture material, number of sutures placed and day of suture removal may also increase in gingival recession [14].

Von Arx1 et al. conducted a study to assess the scarring of gingiva and alveolar mucosa following apical surgery with three incisions: submarginal incision, papilla base incision and intrasulcular incision on 72 cases in the anterior maxilla and they have correlated the changes in scarring of gingiva with surgical parameters like age, gender, smoking, biotype, antibiotics, incision, flap, duration of surgery, suture removal [15]. A similar study by Kramper et al. [16] evaluated three commonly used incisions and found very little or no scar with intrasulcular incision, while scarring was quite evident with submarginal and semilunar incisions.

In our study, appreciable gingival scarring was documented in 2 patients of OL group at 1 month follow-up. All 20 patients had undergone suture removal on 7th post-operative day. Both patients were young females aged 12 and 24 respectively and scarring may be due to different healing mechanism. Wound healing in the dermis of aged individuals has been reported with minimal scarring. Female patients had a tendency towards more substantial scarring of gingiva (10 %) than males (3.1 %), but this difference was not statistically significant [16].

Healing mechanisms in females might be due to hormonal modulation from those in males [17]. Importantly, both these patients had the highest duration of surgery i.e. 55 and 54 min respectively, which could be a significant factor in scarring. Other factors which could be a possible cause of scarring in our patients were longer duration of surgery, excessive manipulation and retraction of the flap.

All available flaps used for apicoectomy have their own merits and demerits. It is often difficult to select an entirely satisfactory approach. OL flap has the intention of maintaining the attachment level and avoiding post-operative recession after surgical endodontic therapy. In this study, OL flap has given better results when compared with TZ flap except for the possibility of short-term scarring.

Conclusion

With the present sample size we conclude that both OL and TZ flaps can be used for periapical surgeries with an overall satisfactory outcome; though at comparison, in this study, the OL flap has been found to be better than TZ flap. In extensive crown and bridge work OL flap has got an added advantage as there is no exposure of the restorative margins by avoiding the exposure of crown since there is no post-operative recession after surgical endodontic therapy.

Conflict of interest None.

References

1. Smith RG (1997) Gingival recession. Reappraisal of an enigmatic condition and a new index for monitoring. *J Clin Periodontol* 24:201–205
2. Deschner J, Wolff S, Hedderich J, Kreusch T, Jespen S (2009) Dimensional changes of periodontal soft tissue after intrasulcular incision. *Clin Oral Invest* 13:401–408
3. Mushtaq I, Malik A (2003) Evaluation of Ochsenbein-Leubke flap technique in periapical surgery. *J Ayub Med Coll Abbottabad* 15:50–53
4. Velvart P, Christine IP, Peters OA (2005) Soft tissue management: flap design, incision, tissue elevation, and tissue retraction. *Endod Top* 11:78–97
5. Vreeland DL, Tidwell E (1982) Flap design for surgical endodontics. *Oral Surgery* 54:461–465
6. Fabbro MD, Taschieri S, Weinstein R (2009) Quality of life after microscopic periradicular surgery using two different incision techniques: a randomized clinical study. *Int Endod J* 42:360–367
7. Penarrocha M, Garcia B, Marti E, Balaguer J (2006) Pain and inflammation after periapical surgery in 60 patients. *J Oral Maxillofac Surg* 64:429–433
8. Harrison JW, Jurosky KA (1991) Wound healing in the tissues of the periodontium following periradicular surgery. 1. The incisional wound. *J Endod* 17:425–435
9. Chindia ML, Valderhaug J (1995) Periodontal status following trapezoidal and semilunar flaps in apicoectomy. *East Afr Med J* 72:564–567
10. Velvart P (2002) Papilla base incision: a new approach to recession-free healing of the interdental papilla after endodontic surgery. *J Int Endod* 35:453–460
11. Velvart P, Ebner-Zimmermann U, Ebner JP (2003) Comparison of papilla healing following sulcular full-thickness flap and papilla base flap in endodontic Surgery. *J Int Endod* 36:653–669
12. Velvart P, Ebner-Zimmermann U, Ebner JP (2004) Comparison of long-term papilla healing following sulcular full-thickness flap and papilla base flap in endodontic surgery. *Int Endod J* 37:687–693

13. Velvart P, Ebner-Zimmermann U, Ebner JP (2004) Basal Papilla healing following sulcular full thickness flap in endodontic surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 98:365–369
14. Velvart P, Christine I (2004) Soft tissue management in endodontic surgery. *J Endod* 31:4–16
15. Von Arx1 T, Salvi2 GE, Jannerl S, Jensen SS (2008) Scarring of gingival and alveolar mucosa following apical surgery: visual assessment after one year. *Oral Surg* 1:178–189
16. Kramper BJ, Kaminski EJ, Osetek EM, Heuer MA (1984) A comparative study of the wound healing of three types of flap design used in periapical surgery. *J Endod* 10:17–25
17. Makimura H, Kikuchi N, Nishtani N, Somel C, Kono R, Kimura K, Murakami S, Nagahama F, Wada M (2009) Comparison study between Leubke-Ochsenbein and semilunar flap in periapical surgery. *J Jpn Assoc Regen Dent* 7:18–24