ENDODONTOLOGY

VOLUME 17 • ISSUE 2 | ISSN 0970-7212 | DECEMBER 2005

'National Conference' 20th Federation of Operative Dentistry of India and 13th Indian Endodontic Society Lucknow 2005

Padmabhushan Dr. Anil Kohli
President, Dental Council of India
President, Indian Endodontic Society
Elected as Chairman of Commission for **Education,** Asia Pacific and CommonWealth **Countries.** Declared elected unopposed from among 32 Nations at Karachi

6th National Post Graduate Student's Convention Federation of Operative Dentistry of India and Indian Endodontic Society, Chennai

'Issues Pertaining to Dental Education' - A Deliberation jointly Organised by RGUHS, Karnataka and Directorate of Medical Education Govt. of Karnataka

A Publication of Indian Endodontic Society

Editor:
Dr. B. Sureshchandra M.D.S.
Principal, Prof. & Head, A. J. Institute of Dental Sciences Mangalore - 575 004.

NEWER CLASSIFICATION OF ENDODONTIC FLAPS

Authors:
Dr. Gopikrishna,MDS *
Dr. D. Kandaswamy, MDS, **
Dr. S. Nandini, BDS ***

ABSTRACT

This classification helps in easy understanding and is self-explanatory. It includes all the currently existing flap designs, which is lacking in the previous classification. This classification has the advantage that any newer flap designs that can be introduced in future can be easily included in this classification. This article gives a brief overview on the evolution of flap designs also. It alsoassesses the advantages and shortcomings of the various flap designs

INTRODUCTION

A *flap* is defined as a section of gingiva and or mucosa surgically elevated from the underlying tissues to provide visibility and access to the bone and root surface[1]. The two major components of surgical access are visual and manipulative. Visual access enables the endodontist to view the entire surgical field in entise. Manipulative access helps the surgeon to carry all the surgical steps without hindrance.

Selecting an appropriate flap design determines the success of surgery. Various flap designs exist at present but an endodontist should know that[2],

- ❖ Every flap design has its own advantages and disadvantages.
- ❖ It is not possible to use a single flap design to all clinical situations.

The various flaps are:

- ❖ Mini vertical
- ❖ Envelope
- ❖ Semilunar
- ❖ Triangular
- ❖ Rectangular
- ❖ Trapezoidal
- ❖ Leubke-Oschenbein
- ❖ Papilla base flap

What is the need for various flap designs?

Numerous variations occur both anatomically and physiologically in the oral cavity. These variations should be considered in the pre surgical planning to achieve good surgical access. Various complicating factors like dehiscence, gingival recession and other complicating factors must be anticipated and incorporated into the pre surgical planning. To manage the various complications and to achieve unimpeded access a full mucoperiosteal flap or a split thickness flap should be elevated. Except for a suspected dehiscence, the need to do a free gingival graft or the performance of a crown lengthening procedure, a split thickness flap is rarely indicated in endodontic surgical situations.

Existing classification

Various classifications are incirculation but the main criteria for a classification should be *simple of understanding of the salient differentiating features amongst the various entities.* **For easy clinical application three parameters are important**

- ❖ The anatomical position of the incision
- ❖ The number of vertical incisions in a flap
- ❖ The shape of the flap

According to Gutmann and Harrison[2]:

Gutmann & Harrison proposed the most commonly

* Professor and Head, **Lecturer, *** PG student, Dept. of Conservative Denlistry and Endodontics, Meenakshi Academy of Higher Educalion and Research

followed classification. This classification is mainly based on the anatomical position of the horizontal incision. It also gives the shape of the flaps used in endodontic surgery. This classification even though followed widely has few drawbacks. It does not include two flaps namely, Mini vertical and the Papilla Base flap. It also does not give information about the number of horizontal and vertical incisions used.

According to Franklin. S. Weine[4]:

– categorization by Franklin. S. Weine

- **Semilunar**
- **Full vertical**
- **Leubke-Oschenbein**

This grouping of flaps is not based on any criteria and does not include all the flaps existing currently. It does not give information about the anatomical position of the incision, number of vertical incisions or about the shape of the flap. Thus, this classification is not followed widely.

Proposed Newer classification

Fig. I – The newer Classification.

Horizontal and vertical components of a flap form the basis of any flap. This classification is based on the number of horizontal and vertical incisions in a flap, thus this classification has the advantage that any type of flap can be included in this. This is the only classification, which includes minivertical and papilla base flap. It also gives the description of the shape of flaps; additionally it also classifies them on basis of anatomical position of incision. Thus by just knowing the classification a brief idea about the flap can be known. This is the only classification that has taken all three parameters mentioned before thus making the understanding and clinical application of flaps more easy.

A brief outlook on the flap designs:

INCISION AND DRAINAGE:

(One vertical component)

It is the first recorded endodontic surgical procedure. Aetius, a Greek physician – dentist around 1500 years back, performed it[5]. The main objective is to establish a communication between an internally pressurized highly inflamed or infected area to the oral cavity. The abscess is pricked with the point of a number 11Bard - Parker blade. The blade is designed to puncture tissue and can pierce mucosal and sub mucosal swellings without pressurizing the base of the abscess. Main advantage of this technique is that the procedure does not need anesthesia and the patient experiences minimal discomfort. The point of the blade is used to puncture the centre and lifting the cutting edge widens the incision. The incision is mainly **vertical**. It is also called as **buttonhole incision**[6].

In 1890's **Partsch** used a **vertical incision** directly over the root and packed the surgical site with iodoform to suppress hemorrhage. This approach was common with a cyst and is similar to our present day decompression or marsupilization[2].

Buckley indicated an incision for **root amputation** by either a **vertical** incision or a circular incision[7]. The vertical incision was placed about ½ - ¾ of an inch in length directly over the affected root. A bistoury was used for this purpose and care should be taken to make the incision as high as possible.

Buccal and labial flaps

In 1935, Ottohofer gave a thorough review of flap design. He gave description of anterior surgical entries. They are of 3 types[8]:

- **Csernyi flap or Osteoplastischen**, which involved raising a partial thickness flap and selectively raising the periosteum and bone intact over the area of lesion.

- **Periostalplastischen flaps** which includes **pichler flap** and **wassmund flap**. In both these techniques the flaps are split and layered into the osseous cavity with the anticipation of providing drainage and stimulating the internal to external granulation and enhancing healing. In Pichler technique the flap is split before the root apex is exposed and lesion is removed. In Wassmund technique the flap is split after the root end treatment is finished.

The other two important flaps that are of historical interest, which was elevated in relation to buccal or labial surfaces, are the **SEMILUNAR** and **TRAPEZOIDAL FLAPS**.

SEMILUNAR FLAP

(one horizontal component – mucogingival)

The first known record about endodontic flaps was by Partsch. He is ultimately credited with the **Partsch incision** or **Semi lunar incision** or **Bogenschitt incision**[2]. It is a submarginal curved flap. There are no primary advantages to this design but lots of disadvantages exist for this flap. It is a combination of disadvantages of trapezoidal and sub marginal rectangular flaps and few of its own, which include poor wound healing, limited surgical access and maximum disruption of the blood supply to unflapped tissues.

TRAPEZOIDAL FLAP:

(2 vertical + 1 horizontal – mucogingival)

Neumann and Elkan in 1940 described a facial flap, which is similar to that of trapezoidal flap with two vertical incisions and one horizontal incision with a wide base towards the vestibular sulcus[2]. Main disadvantage is the compromise in blood supply; the angulated vertical incision makes the unflapped tissue deprived of adequate blood supply and leads to sloughing. This in turn may lead to tearing out of sutures, delayed wound healing by secondary intention, soft tissue clefting or pockets could result when a dehiscence is uncovered[9]. It is also called as **apron flap**[6].

ENVELOPE FLAPS:

(one horizontal – sulcular)

It is a flap consisting of only horizontal intrasulcular incision. Main advantage is minimal disruption of vascular supply to flapped tissue, ease of wound closure and good post surgical stabilization. The limited surgical access is the main disadvantage of this flap design. The flap is recommended for corrective endodontic surgery[2].

TRIANGULAR FLAPS:

(1 vertical + 1 horizontal)

Facial flap according to Fischer:

In 1940, Fischer described a submarginal triangular flap with one horizontal and one vertical incision. The vertical incision placed towards the midline and horizontal incision is a submarginal curved incision placed along the crown of teeth in the attached gingiva preserving the marginal gingiva. The modern day triangular flap is formed by a horizontal, intra sulcular incision and a single vertical releasing incision. This flap has two main **advantages**. Placing a relaxing incision, which is a short incision, made in attached and marginal gingiva helps the operator to extend the flap for access if needed. It also decreases the flap tension.

Triangular flap also enhances rapid wound healing. This flap is mainly indicated for maxillary anteriors and posterior teeth. It is the only flap that can be used for mandibular posteriors. It cannot be used in maxillary canine region due to long roots and mandibular anterior region due to lingual inclination of roots[2].

RECTANGULAR FLAPS:

(2 vertical + 1 horizontal – Sulcular)

From the terminal point of horizontal incision of a triangular flap a second vertical incision is made which forms a rectangular flap. Main **advantages** are increased visibility, good access, and simultaneous periodontal surgery can be done. This flap gives greater access for lateral root repairs and long roots. **Disadvantages** include soft tissue clefting and pocket formation if a dehiscence is uncovered and elevation is more difficult. Involving the marginal gingiva can lead to crestal bone loss. This flap design is mainly indicated for maxillary canine region and mandibular anteriors[3].

OSCHENBEIN – LUEBKE:

(2 vertical + 1 horizontal –mucogingival)

In **1926** Neumann published a text, which dealt primarily with the surgical management of periodontal disease. He proposed a split thickness surgical flap, which is now in modern day similar to Ochsenbein - Luebke flap[10].

This flap design has a scalloped horizontal incision in the attached gingiva that joins two vertical incisions made on each side of surgical site. Main **advantage** of this flap is that it provides good access, does not involve marginal gingiva so crestal bone loss is not seen This flap is indicated in presence of prosthetic crowns and existing nonpathogenic dehiscence are avoided. The main **disadvantage** is that an unaesthetic scar may form. Muscle attachments and frenum present anatomic obstructions and hinders the reflection of flap[3]. This flap is essentially limited only to maxillary anteriors and posteriors. It is not used in mandibular anteriors because the tissue in this region is thin and friable and wound closure is difficult.

PAPILLA BASE FLAP

(2 vertical + 3 horizontal – sulcular + mucogingival)

Loss of interdental papilla is a consequence of normal intrasulcular incision. According to periodontist reconstruction of lost interdental papilla is one of the biggest challenges in periodontal reconstructive surgeries. Loss of interdental papilla can lead to esthetic and phoenetic problems. So **Velvart** introduced this flap design, which prevents the loss of interdental papilla[11].

It consists of 2 vertical incisions connected by the papilla base incision and intrasulcular incision. PBF requires two different incisions at the base of the papilla

1. First a shallow incision of 1.5 mm depth is placed on the lower third of the papilla in a slight curved line going from one side of papilla to the other
2. Second incision is placed at the base of first incision and scalpel subsequently inclined apically, parallel to the long axis of tooth aiming at the crestal bone. This creates a split thickness flap in the apical third of the flap. From that point the flap is elevated as a full thickness muco periosteal flap

Disadvantages

1. Two different incisions are needed to

achieve good healing which makes the flap design technique sensitive.

2. Proper attention should be given not to undermine th flap an make it thin, which leads to difficulty in handling the flap
3. More number of sutures are needed
4. Even though no inter dental papillary recession is not present, there is mild recession in the cervical area of the flap.

PALATAL FLAPS:

In **1940's** various designs were put forward[2]

Palatal flap by Wustrow:

Wustrow described a flap similar to the triangular flap of modern day. A horizontal non – scalloped incision was placed few millimeters below the marginal gingiva and vertical incision towards the midline

Palatal flap by Wassmund:

Wassmund described a rectangular flap with two horizontal incisions one along the gingival crevice of tooth and one vertical incision made just before upto the midline, then the other horizontal incision parallel to the first one along the midline extending backward.

Palatal flap by Wilger and Partsch:

They described a semilunar shaped flap that is placed only in the attached gingiva without involving the marginal gingiva. The base of the flap should face the midline.

Palatal flap according to Fischer:

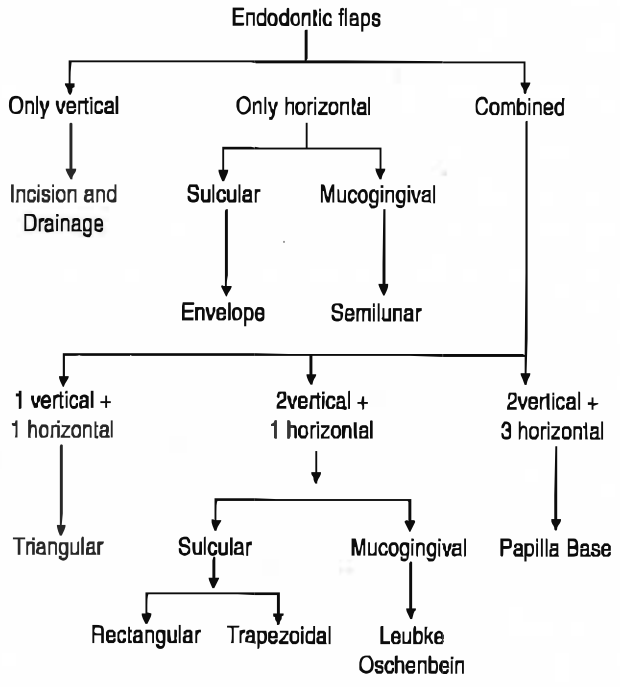
He described a rectangular flap with two non-scalloped horizontal incisions parallel to each other made in attached gingiva and a vertical incision connecting these two.

Nowadays the only two flap designs indicated for palatal surgery are ***triangular and horizontal*** designs. Palatal surgical approach is limited only to posterior teeth and contraindicated in anterior teeth, which should be ideally accessed from buccal side. The vertical releasing incision of the triangular flap extends from the marginal gingiva mesial to the first premolar to a point near the palatal midline and is joined by a horizontal intrasulcular incision, which extends distally as far as to provide access.

SUMMARY

A single flap design cannot be used for all surgical cases. Thorough knowledge of the various flaps helps us in proper selection of the flap design for each case and enhances the success of the surgery. The proposed newer classification helps us not only to understand the extent of anatomical involvement of each flap but also enables a learner to appreciate the design in a simplified manner.

Fig. I – Proposed newer Classification



REFERENCES

1. Fermin A. Carranza, Michael G. Newman (1996) Clinical Periodontology, 8 thedn. W.B. Saunders: 592.

2. Gutmann JL, Harrison JW (1999) Surgical Endodontics, 1st ed. Ishiyaku EuroAmerica, Inc. St.Louis. Tokyo, All India Publishers, 17, 7, 162 - 167.

3. Donald E Arens Practical lessons in Endodontic Surgery, 1stedn: Quintessence Publishing Co, Inc, 51 – 56.

4. Franklin S. Weine (1998) Textbook of endodontology, 5th edn: Mosby 553

5. Guerini V (1909) A history of dentistry, Philadelphia: Lea and Febiger, 117

6. David M. Nosonowitz, Pleasant valley, N.Y.(1983) Flap designs for gaining access to periapical lesions. Oral surgery November, 537 – 541.

7. Buckley JP (1914) Root amputation. Dent Summary 34 , 964 – 965

8. Hofer O. (1935) Wurzelspitzenresektion und Zystenoperationen. Z. Stomatol 32, 513 – 533

9. Gutmann J, Harrison J(1985) Posterior Endodontic Surgery: Anatomical consideration and clinical techniques. International Endodontic Journal 18, 8 – 34.

10. Neumann R (1926) Atlas – der radikal chirurgischen Behandlung der Paradentosen. Berlin. Hermann Meusser, 14

11. P. Velvart (2002) Papilla base incision: a new approach to recession free healing of the interdental papilla after Endodontic surgery. International Endododntic Journal 35, 453 – 460.