Endodontic Surgery

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EndodonEnEEtic Surgery

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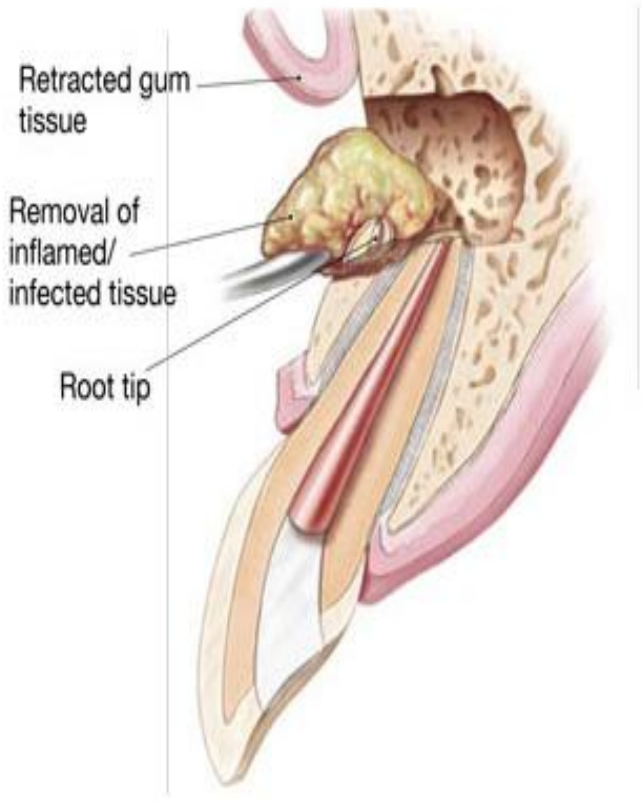
II. Apical surgery (periradicular) 60-80% of endodontic surgery.

Definition:

- Surgical management in the apical part of the roots of the teeth.

Aim:

- Deals with the defect or excision of the tissue related to the apical part of the roots of the teeth.



Any apical surgery includes

Pre-surgical work-up :

1- The surgeon must explain to the patient the procedures & all available alternative treatments .

2- Patient should be informed by any changes in the daily activities(drug regimen).

3- (Medical history, blood pressure). Should be recorded to predict if any complications.

Disinfection of the operating theatre

1- Scrubbing all areas where surgical instruments will be placed & any area touched by the operator during the surgery .

2- Instruments must be kept covered with a sterile towel .

3- A complete sterile set of Surgical armamentarium should be available

Patient preparation

1- Patient must wear a sterile gown

2- Towels with antiseptic solution are used to scrub the exposed area of the face & around the lip & mouth.

3- Patient must rinse with a mouth wash, to decrease the number of micro organisms.

A complete sterile set of Surgical armamentarium

Surgeon preparation

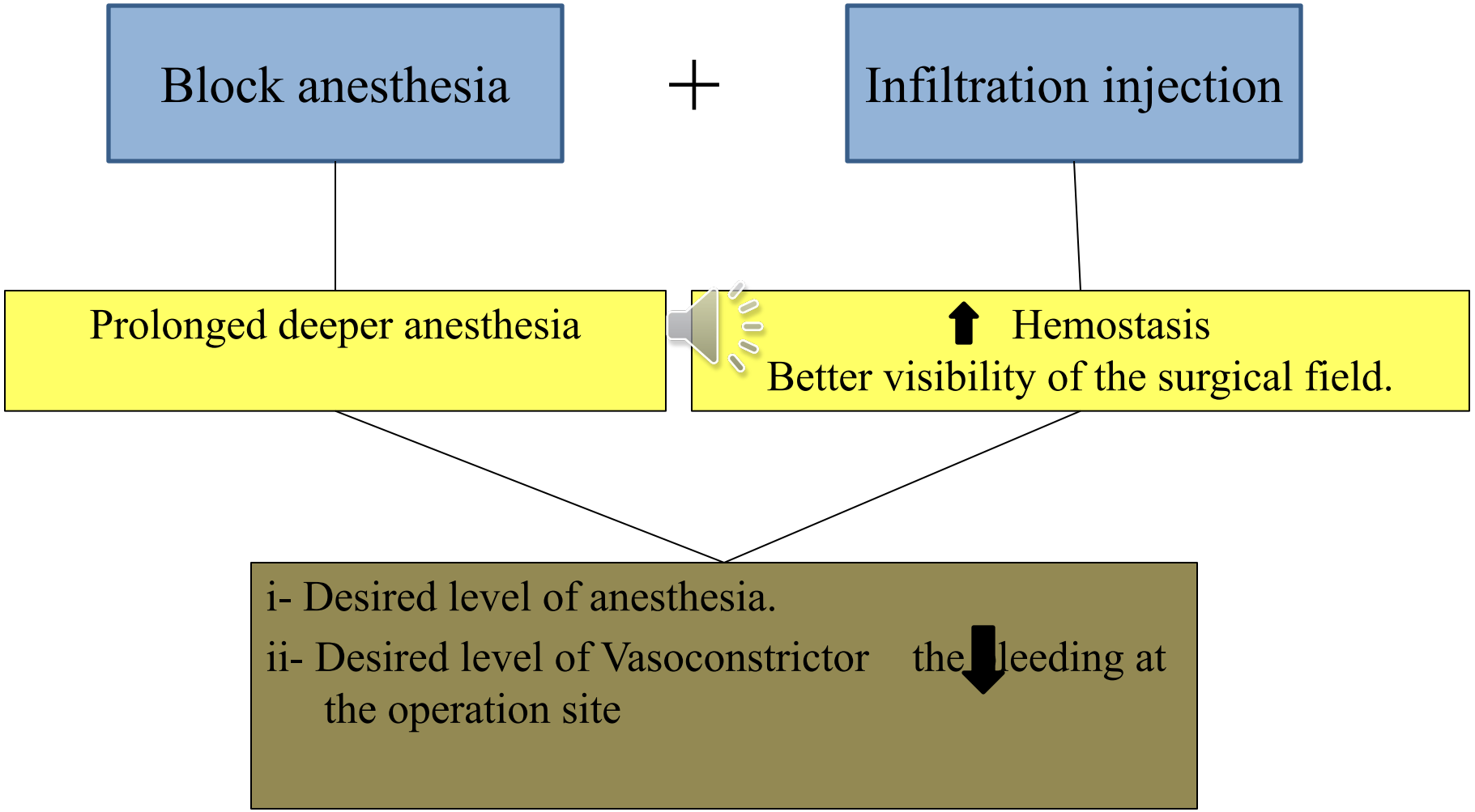
Disinfecting soap (Betadine) with a brush will be used to scrub from the elbow down .

After scrubbing, the hands are washed , air dried with sterile towel.

Surgeon washes his face & puts on a mask & cap.

Sterile gloves are then worn.

Anesthesia & pain control (Local anesthesia)



Surgical Procedure
I- Incision

- A cut made with a sharp blade through the tissue.
- Firm incision with no. 15 blade.
- Incision must be :

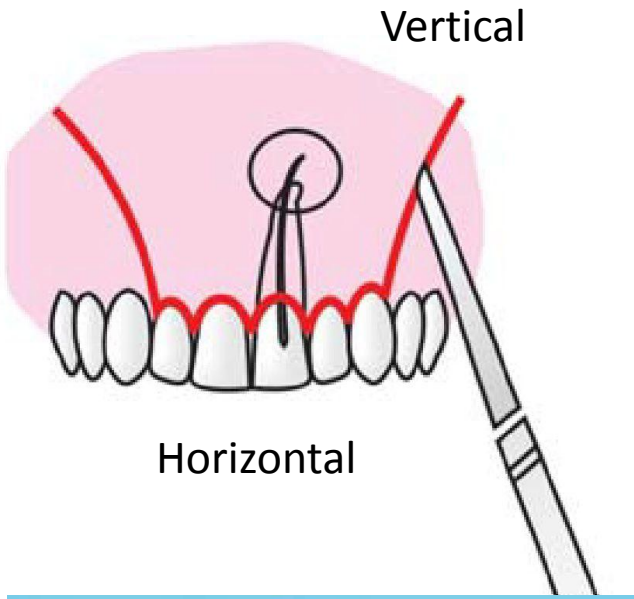
I. Made through the mucosa, connective tissue & the periosteum.

II. Blade edge should touch the bone & not removed until the cut is complete .

III. Pen grasp for better control.

- Types of Incisions according to direction to the teeth

Vertical Horizontal



II- Flap design
Exposure of surgical site

Aim

1) Reflection of the soft tissue overlying the surgery site in order to give the best visibility.

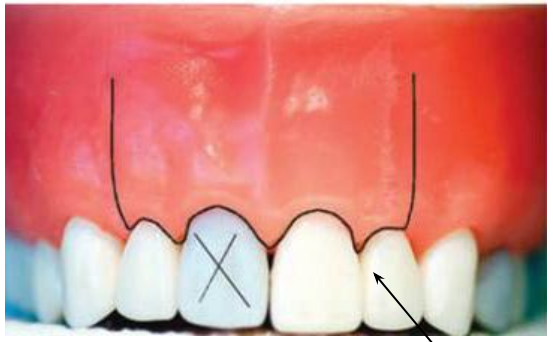
2) To maintain healthy flap tissue to cover the surgical site → decrease pain and allow optimum healing.

Principles and Guidelines for Flap Design

1- **Wide flap base** for adequate blood supply

⬆ Healing

3-Width of the flap must include at **least one tooth** on either side of the surgical sites.



2-Incisions should be **over healthy solid bone**.

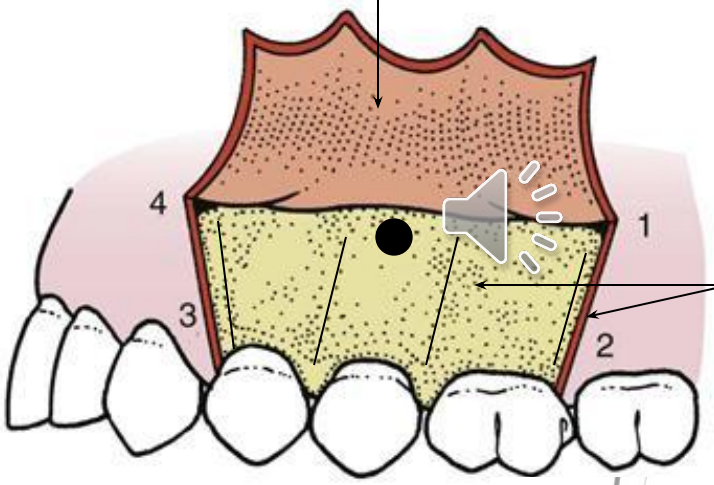
Avoid incision over the bony defects/ periapical lesion

4- **Never incise through the inter-dental papilla** either include or exclude the interdental papilla.

5-**Avoid** horizontal and severely angled vertical incision.

Principles and Guidelines for Flap Design

6- **Full thickness flap** should be raised to maintain the integrity of the periostium and promote bone healing.



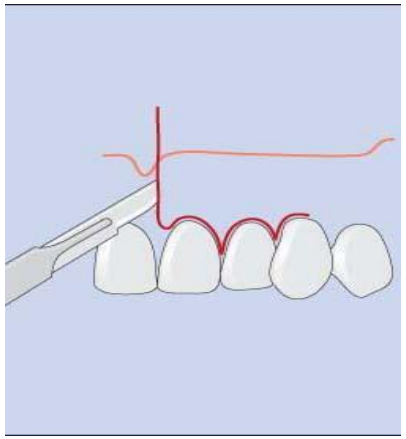
7. **Vertical incisions** should be made **parallel or slightly oblique** to long axis of the teeth and placed in the bony concavities between the bony eminencies.

8-**Vertical incision** must extend to allow the **bone retractor to rest on solid bone**.

Types of flaps of Surgical flap

1. Full mucoperiosteal flaps

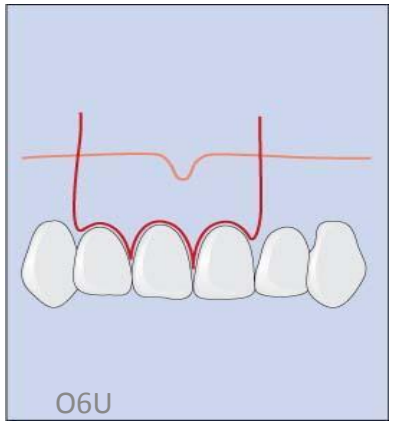
A. Triangular (one vertical releasing incision+ horizontal incision)



Advantages:
1. Easy to reposition
2.Minimal number of sutures required.
2. Suitable for treating short roots.
3. Blood supply to flap is maximal.

• *Disadvantages:*
1. Limited surgical access (single vertical incision).
2. Limited surgical access to expose the root apexes of long teeth (maxillary canine).
3. More difficult retraction.
4. Difficult Suturing between teeth.

B. Rectangular (two vertical releasing incisions + horizontal incision).

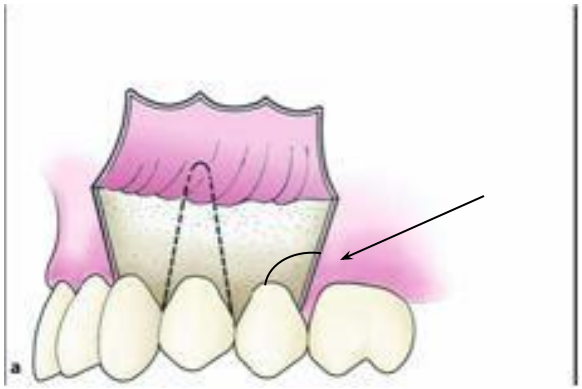


Advantages:
1. Increased surgical access to the root apex.
2. Convenient for treating more than one teeth and large lesions.
3. Facilitate periodontal curettage.

• *Disadvantages:*
1. Difficult in reapproximation
2. Difficult in post-surgical stabilization than triangular flap result in high potential for flap dislodgment.

Types of flaps of Surgical flap
1. Full mucoperiosteal flaps

C. Trapezoidal (Broad-based rectangular).



Vertical incisions making an obtuse angle with horizontal incision

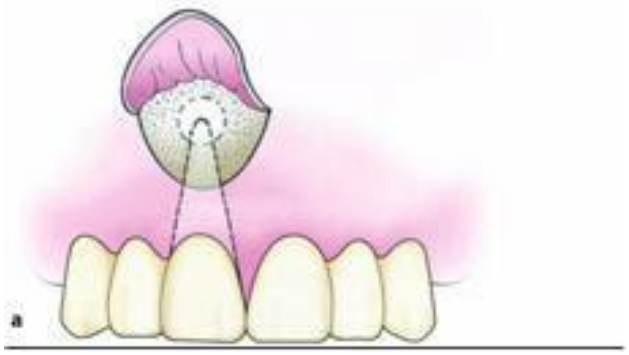
D. Horizontal/Gingival/Envelope (Intrasulcular incision no vertical releasing incision).

Indicated in repair of cervical defects :
1. Root perforation.
2. Root resorption.
3. Root caries.

Types of flaps of Surgical flap

2-Limited mucoperiosteal flaps

A-Submarginal curved (Semilunar flap):



- It is formed by a curved incision in the alveolar mucosa and the attached gingiva.
- The incision begins in the alveolar mucosa extending into the attached gingival and then curved back into the alveolar mucosa.

Advantage:
1-Simple to incise & reflect.

2-Gives direct access to root apex.

3-Patient able to maintain good oral hygiene.

Disadvantage:
1. Minimal visibility.
2. Poor surgical access.
3. Placing the line of incision over the bony defect(wound cannot be closed over the sound bone).
4. Excessive force for retraction ➡ tearing at the corner.
5. ⬆ Tension ⬇ impaired healing
6. No reference points for replacing the flaps.

Types of flaps of Surgical flap
2-Limited mucoperiosteal flaps

B- Luebke-Ochsenbein (Submarginal scalloped rectangular)

- Modification of rectangular flap.
- Horizontal incision is scalloped and follows the contour of the marginal gingiva.

Advantages:

1. Decrease the gingival recession Esthetics.
2. Good accessibility and excellent visibility to surgical site.
3. Simple to incise and reflect.

Disadvantages:

1. Vertical BV and collagen fibers are severed, resulting in more bleeding
2. Possibility of flap shrinkage, delayed healing, and scar formation.
2. Crossing any bony eminence by incision line result in delayed healing.

Flap reflection

It is the process of separating the soft tissues (gingiva, mucosa and periosteum) from the surface of the alveolar bone.

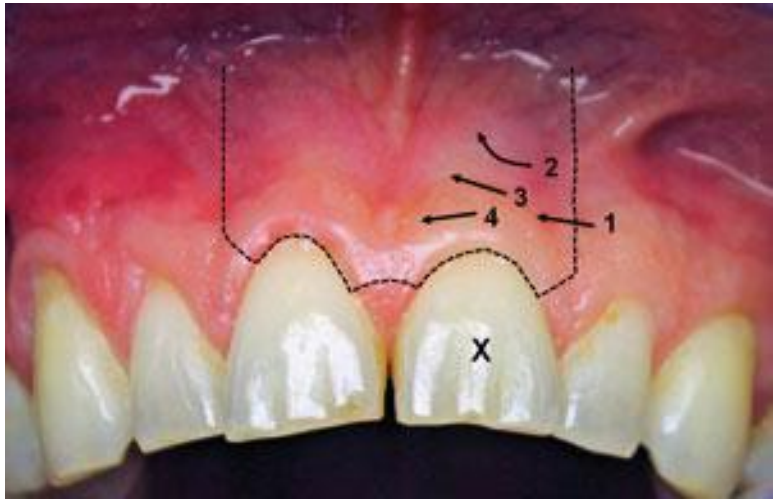
Flap reflection

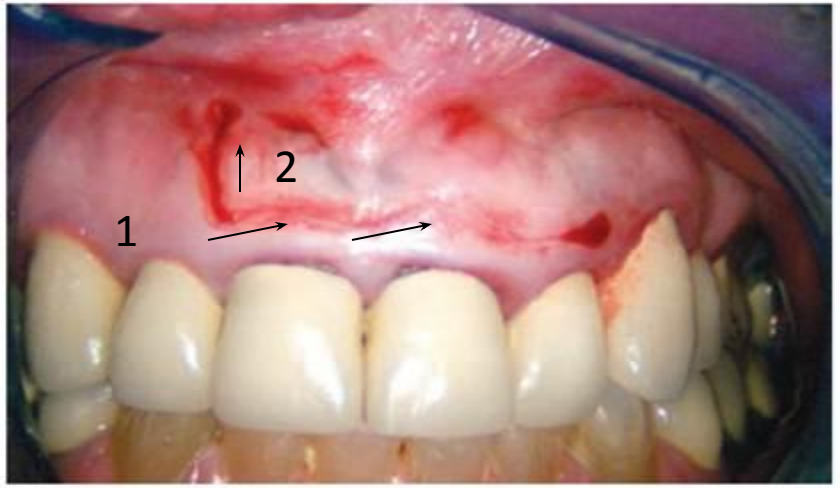
Mucoperiosteal flaps

- It begins in the vertical incision few mm apical to the junction of the horizontal and vertical incision.

Submarginal flaps

- Starts in horizontal since the horizontal incision is placed in the attached gingiva.





Flap retraction

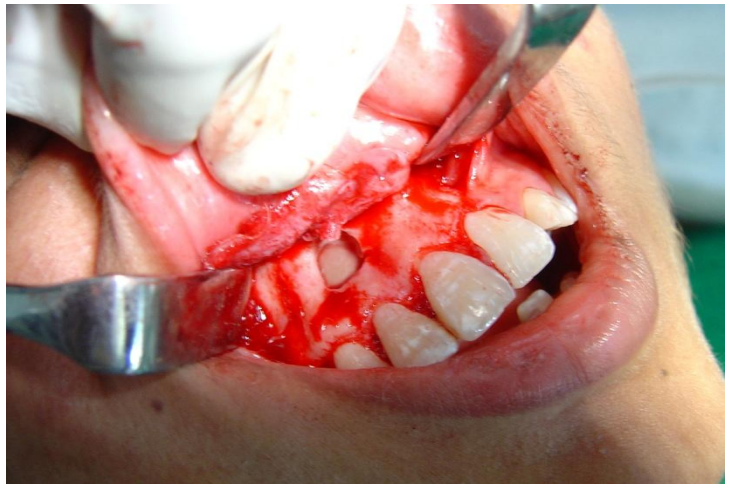
It is the process of holding in position the reflected soft tissues.

Aim:

- Provides both visual and operative access to the periradicular and radicular tissues.

Instruments:

- Endodontic tissue retractors (Arnes/ Seldon /Minnesota retractor.



Proper retraction depends on:

- 1. Adequate extension of the flap incisions.
- 2. Proper reflection of the mucoperiostium.

Principles of tissue retraction

- 1. Retractor should rest on **sound bone with light pressure**
- 2. Small groove by round bur can be cut in the bone to stabilize the retractor
- 3. Crushing tissue should be avoided
- 4. Sterile physiological saline is used to maintain tissue hydration .

Hard tissue management (Locating the apex)

1. Apex location: (Always search for bony defect)

- Periapical lesion results in loss of buccal or labial cortical plate.
- Probing with a small sharp periodontal curette

Thin fragile undermined cortical plate.

The apex can be located by:

- a) Measurement by well angled radiograph
- b) Sterile ruler alongside the long of the tooth to mark root apex.
- c) A small defect is created on the surface of the cortical plate.
- d) Radiopaque marker(small piece of lead foil / small piece of GP is placed in the bony defect and a direct radiograph is exposed.
- e) Measurement of last file used for canal enlargement.

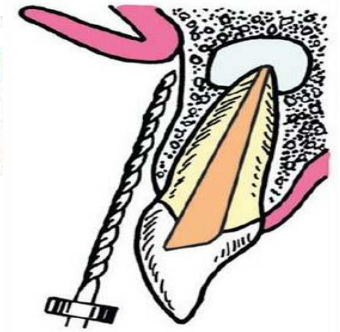


Figure 6-56B. Endodontic explorer breaking through the thin buccal plate and confirming the exact location of the lesion and the apex.

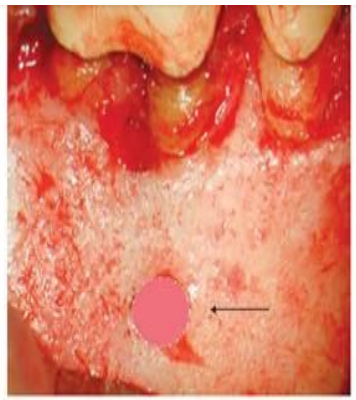


Figure 6-57A. Gutta-percha (arrow) placed into the indentation prepared over the estimated location of the apex.

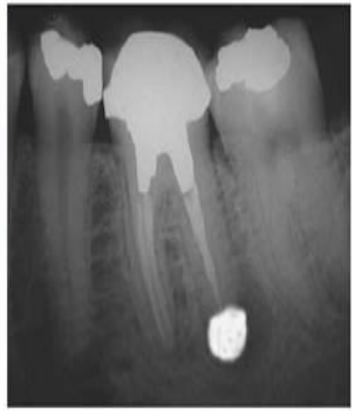


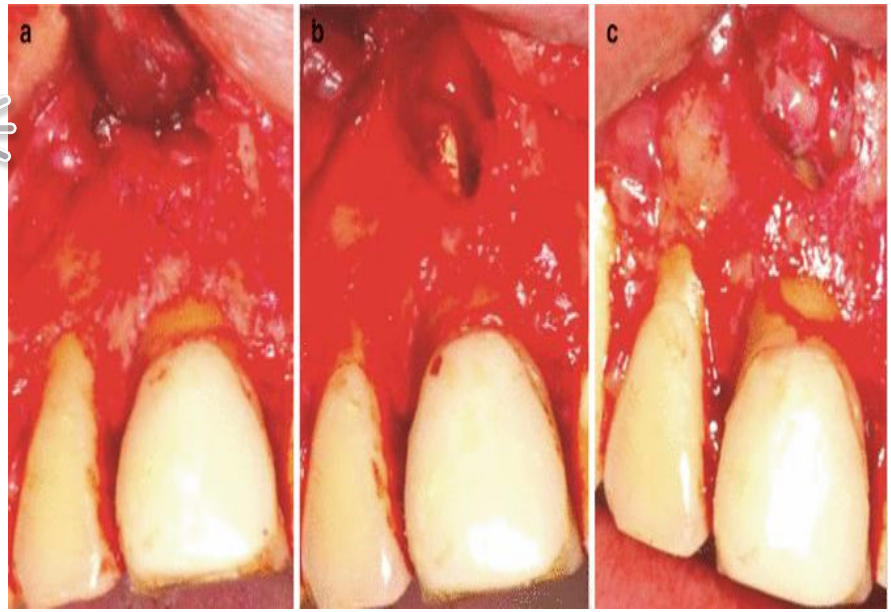
Figure 6-57B. The marker location is verified radiographically.

Hard tissue management
(Locating the apex)

2. Osseous entry:

- Bone is removed using round surgical burs and sufficient coolant at high speed to reduce vibration and heat generation.
- **Impact Air 45°** or **Air king hand piece**

Advantage : Air is exhausted to the rear of the turbine rather than toward the surgical site ⬇ Emphysema



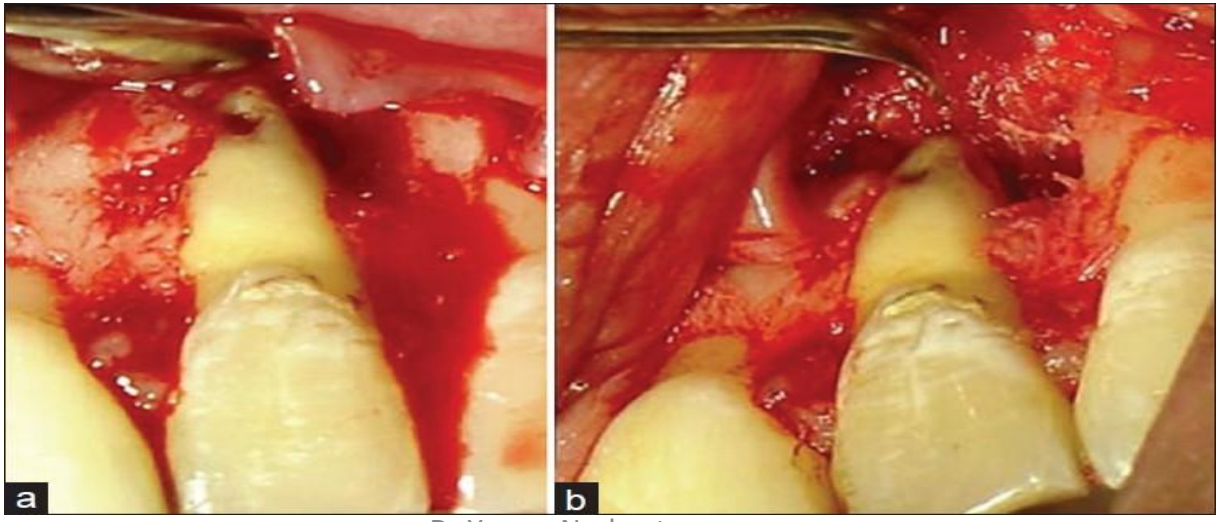
Surgical curettage

Excision or inoculation of pathological tissue related to the apical part of the root, using a sharp curette of suitable size.

Indications:

1. Gain access and visibility of the apex.
2. Remove the inflamed tissue.
3. Obtain biopsy.
4. Reduces hemorrhage.

Technique: (Better removed in one piece)



Surgical curettage

Curved bone curette is placed between the soft tissue mass and the lateral wall of the bony crypt with the concave surface of curette facing the bone.

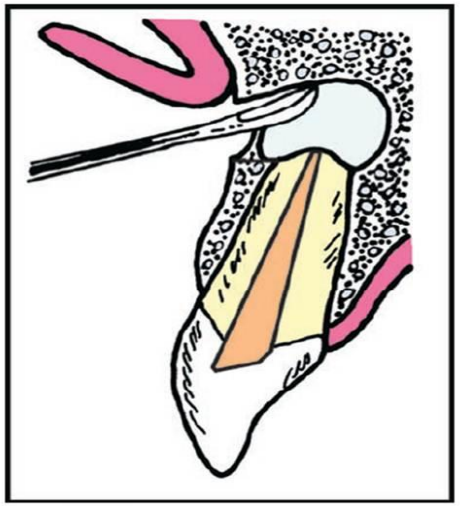
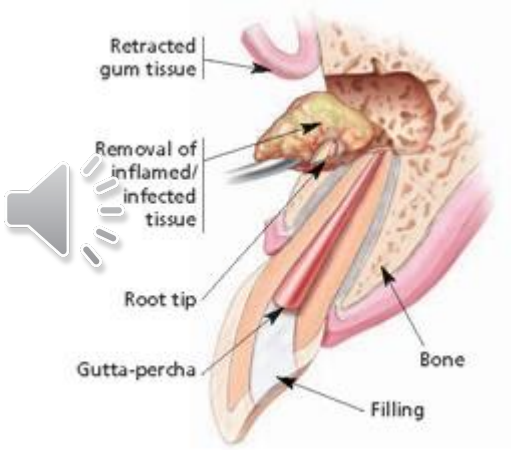
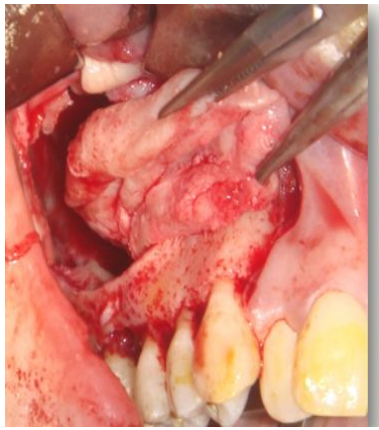


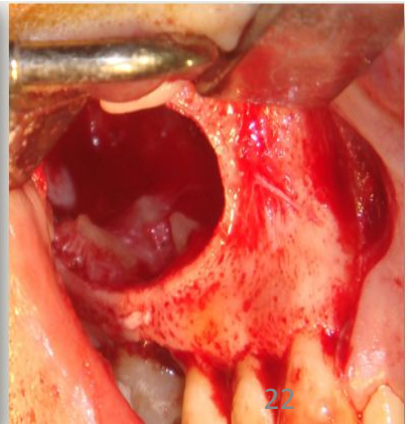
Figure 6-59. Apical curettage (adapted from *Practical Lessons in Endodontic Surgery* by D.E. Arens).

Once the soft tissue is freed, the bone curette should be turned with the concave portion toward the soft tissue and tissue is scooped out of the cavity



- Frequent irrigation (saline)and proper suction
- Proper visualization :Bony cavity and the apex of treated tooth.
- Tissues should be immediately placed in a bottle containing 10% buffered formalin solution for transportation to the pathology laboratory.





Root end management
1- Root resection /Apicectomy

Definition: Resection of the apical part of the root & removal with the attached pathological tissue.

Objectives

1. To gain access to pathologic tissue behind apex.
2. Removal of anatomic variations.
3. Removal of operator errors.
4. To gain access to the canal for examination and restoration.

Instruments for root resection

1. Tapered fissure bur at high speed under sterile saline.
2. Lasers (ER-YAG , CO2 laser).

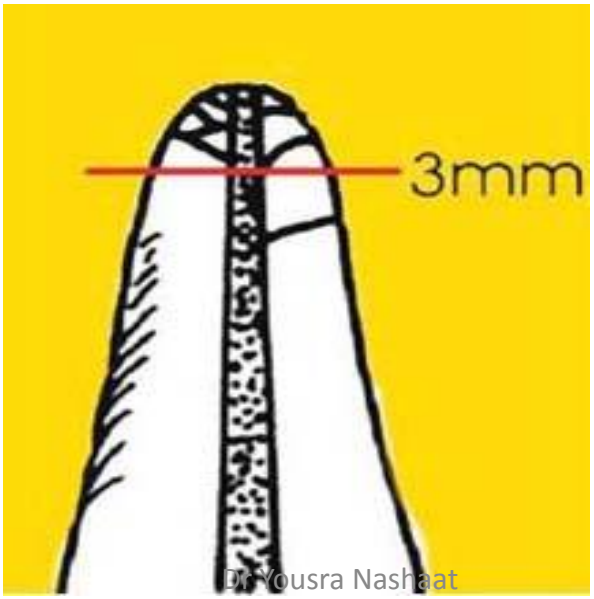
Advantages of laser:

- 1. Seal dentinal tubules.
- 2. ↓ Bacterial contamination.
- 3. ↓ Postoperative pain.
- 4. ↑ Homeostasis and visualization
- 5.Sterilization of the contaminated root apex.
- 6. ↓ Risk of contamination of the surgical site.

Root end management
1- Root resection /Apicectomy

Extent of resection:

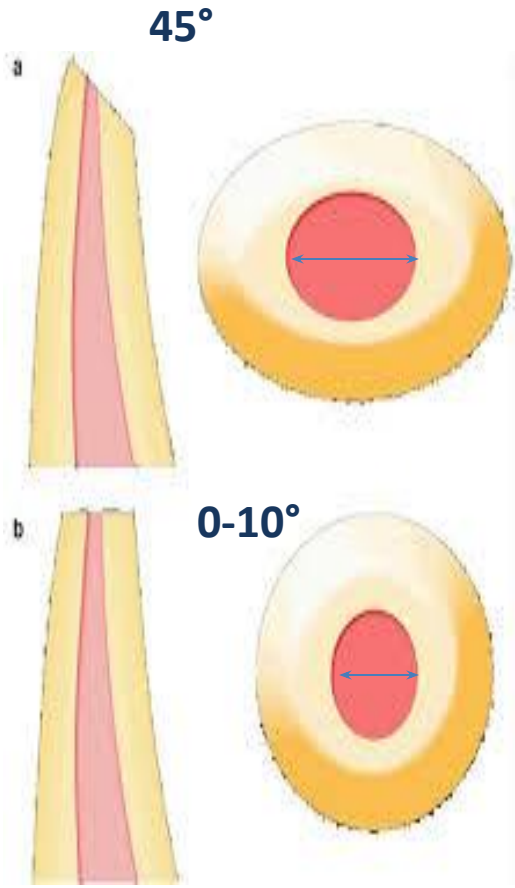
- Removal of 3mm of the root end to expose the canal and eliminate accessory canals.



Root end management
1- Root resection /Apicectomy

Angle of root resection:

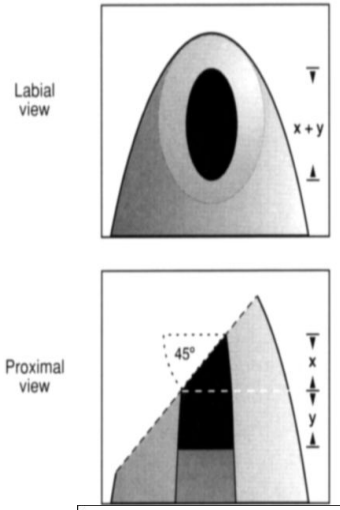
- Historically: angle of root-end resections is 45° from the long axis of the root facing toward the buccal aspect of the root.
- Recently : (Microscope and Ultrasonic)
- Resection can be done perpendicular to long axis of the root 0° - 10°

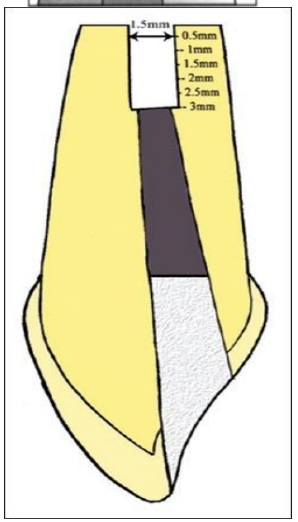


Advantages of 0° degree over 45°:

- 1) Maintain maximum root length.
- 2) Fewer dentinal tubules exposed thereby reducing leakage.
- 3) Reduced osteotomy size (less damage to buccal cortical plate).
- 4) Better healing.

Root end management
2- Root end preparation





Requirements:

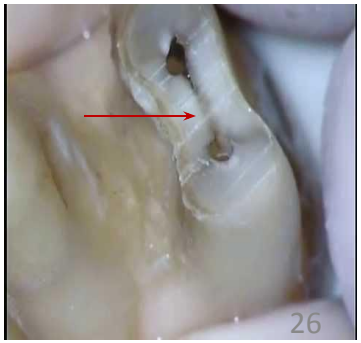
1. The apical 3mm of the **root canal** must be freshly cleaned and shaped.

2. Parallel preparation to long axis.

3. Adequate retention form must be created.

4. All isthmus **tissue** when present must be removed.

5. Remaining dentin walls must not be weakened.

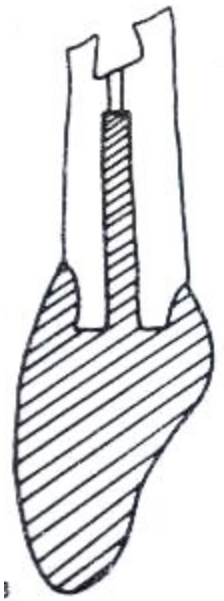


Root end management
2- Root end preparation

Cavity designs:

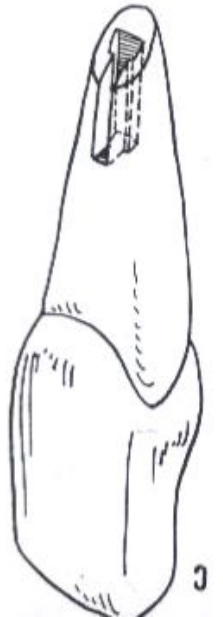
1) Class I type :

- Small cavity is prepared parallel to long axis of the root using the miniature hand piece with **round** or **inverted cone** bur at a depth of 2-3 mm in the centre of the root.



2) Vertical Slot prepration (Matsura prepration):

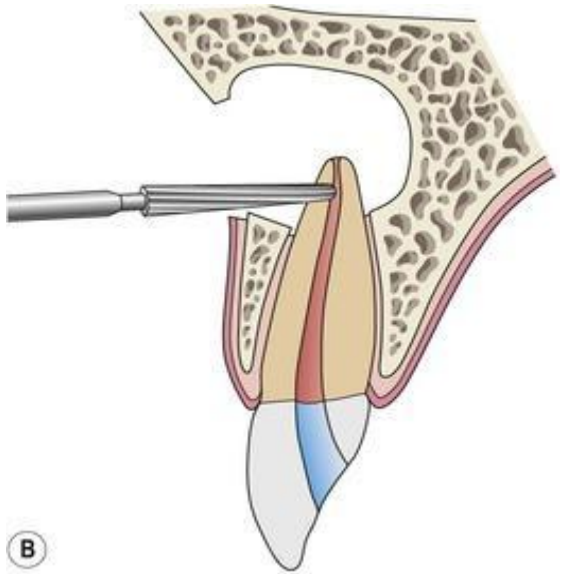
- Vertical cut is made 5-7mm with **parallel fissure bur** from the buccal surface to the depth of the lingual wall of the canal.



Root end management
2- Root end preparation

3) Tunnel preparation:

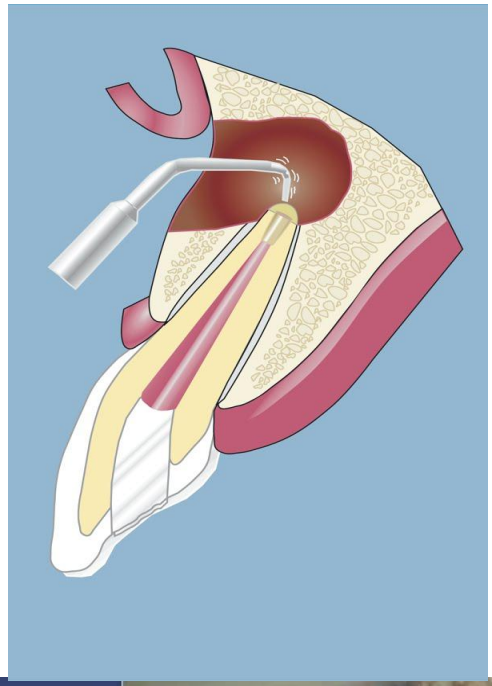
- Drilling a hole extending from labial surface of the root peripendicular to long axis of the root canal reaching root canal.
- Undercut is made at the end of the tunnel, then fill root end.
- Root apex is resected to level of the filling.



Root end management
2- Root end preparation

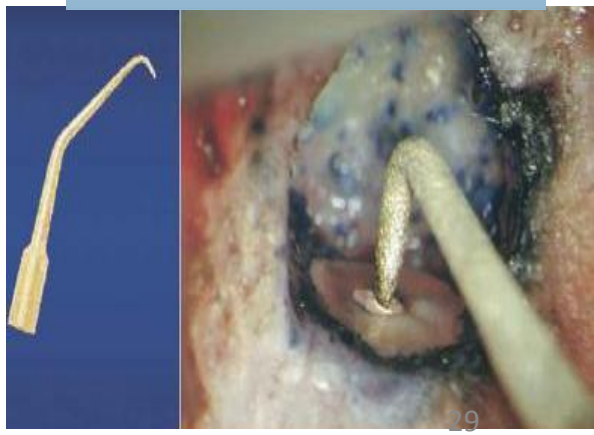
4) Ultrasonic preparation:

- Specially designed ultrasonic root end preparation tips are used.



Advantages of ultrasonic tip over bur:

1. Less need for root beveling
2. Placing the preparation within the confinement of the root.
3. Conserve root structure
4. Reduce possibility of root perforation.
5. Deeper preparation
6. Parallel walls for better retention of root end filling material.
7. Clean cavity free from debris & smear layer.
8. Precise isthmus preparation.

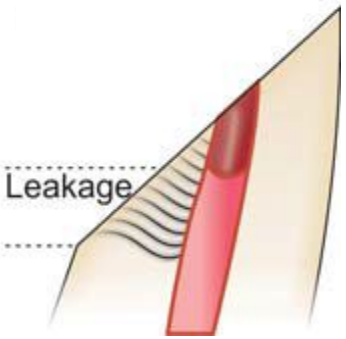


Root end management
2- Root end preparation

- 0° degree bevel expose less of dentinal tubules to oral environment.
- Beveling results in opening of dentinal tubules on resected tooth surface.

Technique:

- 1) Stain root end with methylene blue.
- 2) Explorer is used to make tracking groove 0.5-1mm in depth when there are 2 canals in 1 root.
- 3) Ultrasonic tip under water is used in light touch.
- 4) Ideal retro preparation depth is 3mm.



3- Root end filling

Aim

- To establish a seal between the root canal space and the periapical tissues.

Ideal requirements of retrograde filling material: (It should)

1. Biocompatible.
2. Adher to the tooth structure (well sealing ability).
3. Dimensionally stable.
4. Insoluble in tissue fluids.
5. Easily introduced.
6. Unaffected by moisture during application or after setting.
7. Radio-opaque.
8. Does not stain tooth or periradicular tissue (tattoo).
9. Noncorrosive.
10. Bacteriocidal or bacteriostatic.

3- Root end filling

Root end filling materials

Material	Advantages	Disadvantages
1) Amalgam (Zinc free).	1. Easy to manipulate 2. Available 3. Well tolerated by soft tissues 4. Radiopaque 5. Initially provides tight apical seal	1. Slow setting 2. Dimensionally unstable 3. It shows leakage 4. Stains overlying soft tissues, resulting in formation of tattoo. 5. More cytotoxic than IRM, super EBA or MTA.
2) Zinc Oxide Eugenol Cements		1. Unmodified ZOE cements are weak and have a long setting time. 2. High solubility. 3. On contact with moisture releases free eugenol, which is irritant to tissues.

3- Root end filling

Root end filling materials

Material	Advantages	Disadvantages
IRM : ZOE cement reinforced by addition of 20% polymethacrylate by weight to ZnO powder.	2. Less absorbable. 3. Milder reaction than unmodified ZOE . 4. Mild to zero inflammatory effect after 30 days. 5. Higher success rate compared to amalgam.	
Super EBA ZOE + ethoxy benzoic acid (EBA) to alter the setting time and ⬆ strength *Powder contains:* • 60 % zinc oxide • 34 % silicone dioxide 6%natural resin.	1. Neutral pH 2. Low solubility 3. Radiopaque 4. ⬆Yield compressive and tensional 5. Less leakage than amalgam 7. Non resorbable 8.Good adaptation to canal walls compared with amalgam	1. Difficult to manipulate short setting time 2. Affected by humidity. 3. Tends to adhere to all surfaces(Difficult to place)

3- Root end filling

Root end filling materials

Material	Advantages	Disadvantages
Mineral trioxide aggregate.	1) Least toxic. 2) Biocompatible. 3) Hydrophilic. 4) High PH may induce hard tissue formation. 5) High sealing ability.	1) Longest setting time. 2) Difficult in manipulation. 3) Expensive.

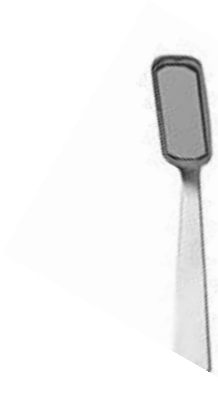
3- Root end filling

Technique

- Put bone wax in the cavity during condensation to attain a clean surgical wound , free from retrofilling material remenants.

USE

Retro-mirrors



Retro-carrier

Retro-plugger

Retro-filling material is burnished.

THANK YOU

FOR YOUR

ATTENTION

ANY QUESTIONS?