

Biological Considerations

- Effect of tooth reduction.
- Gingival reaction to restorative procedure.
- Split and cracked teeth.
- Effect of provisional restorations.
- Effect of various dental materials.
- Effect of luting cements



Effect of tooth reduction on hard& soft tissues:

- . Effect of preparation depth.
- . Patient age.
- . Dry versus wet cutting.
- . Cleansing of tooth preparation .
- . Dentinal pain versus pulpal pain.
- . Effect of clamps and rubber dam applications



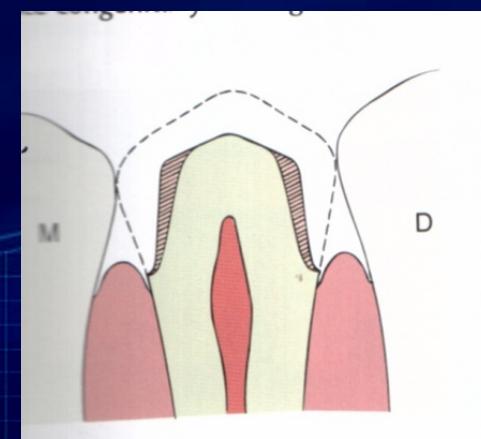
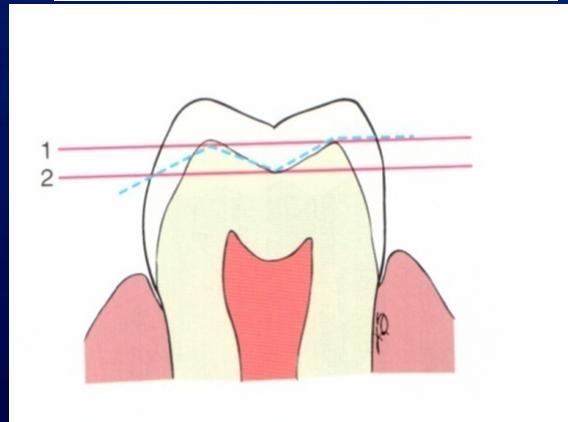
Effect of preparation depth.

- The thickness of remaining dentin is proportional to pulpal response.
i.e. reductions within $50\mu\text{m}$ of the pulp → as harmful as bloodless exposures.

So avoid unnecessary tooth cutting by:

- P.C. instead of F.C.
- Minimum taper reduction
- Follow anatomic occlusal reductions
- Conservative margin design
- Reduction along D.E.J → intense pain →

It decreases once past D.E.J.





Patient age:

- Pulp recedes with age.
- Cutting dentinal tubules previously exposed by attrition or very slow caries is less painful → reparative dentin.

Dry versus wet cutting.

Dry cutting causes:

- Aspiration of the odontoblast nucleus into D.T.→ very painful response→ 2 or 3 days until nucleus returns to its original space.
- Excessive dehydration of the cut D.T.→ flow of liquid from the pulpal end into the dentinal floor.
- Wet cutting preserve vitality of protoplasm & cells.



Cleansing of tooth preparation :

- Cutting E& D → debris (0.5-20) μm cling to dentinal floor
→ prevent cement from adhering to D.
- Flushing preparation with warm water & moistened cotton pellets → remove large E. debris (15-20 μm).
- Acids may remove smaller adherent particles (0.5-2 μm)
→ softening of D. & increases in its permeability.
- The 3 % peroxide (safer) → bubbling action of oxygen.

Effect of clamps and rubber dam applications:

(gingival protection)

- Careful placement of the clamp to avoid → Cementum injury & gingival laceration.
- Avoid forceful →
 - Tissue retraction
 - Matrix band & wedge insertion



Dentinal pain versus pulpal pain :

Dentinal pain	Pulpal pain
- Sharp lancinating pain	- Dull throbbing pain
- Easily localized	- Diffuse
- Inducing stimulus : -Touch - Cold - Acid -Dehydration	- Heat or pressure - Pain is ↑ during sleep→↑venous return. -Cold relieves pain
- Origin : nerve fibers around odontoblasts	- Origin : nerve fibers around arteries.



Gingival reactions to restorative procedure:

Termination of gingival margins:

***Supragingival**

-Is the optimum position of the finish line for the health of the gingiva.

***Subgingival:**

-Midway in sulcus between gingival crest & depth of sulcus.

-Some conditions such as :

1. Caries.
2. Erosion.
3. Esthetics.
4. Insufficient retention →



short occlusogingival height .

5. Root sensitivity.



- Iatrogenic tearing of E.A. → its apical migration and pocket formation.
- Margins → smooth, blunt, round and polished.

Gingival Retraction:

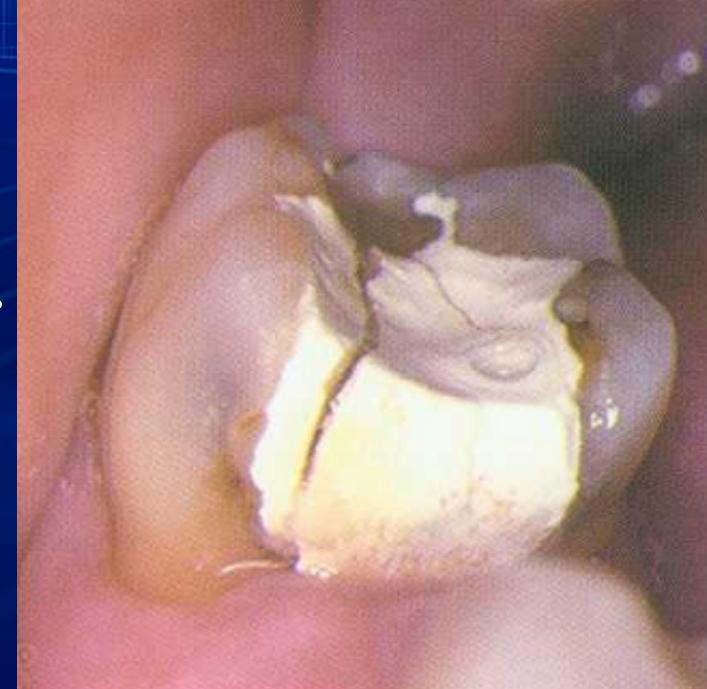
- Retraction → as atraumatic as possible to expect gingival recovery.
- Age also plays a role :
 - * Young patients → Recovery from retraction is fast .
 - * Middle Age → Ischemic gingiva may delay healing .
- Forceful retraction → - gingival atrophy with exposure of restoration margin or cementum.
 - cervical hypersensitivity.



Split and cracked teeth:

Enamel Cracks:

- Enamel cracks & incisal chipping → ↑ age.
- Cracked enamel can be very painful → reach D.E.J
- Enamel cracks → visualized by dye (toluidine blue).
- Caused by → biting on nuts , chicken bones .
- Pain ↓ → topical application of stannous fluoride sol.(4-8 %)



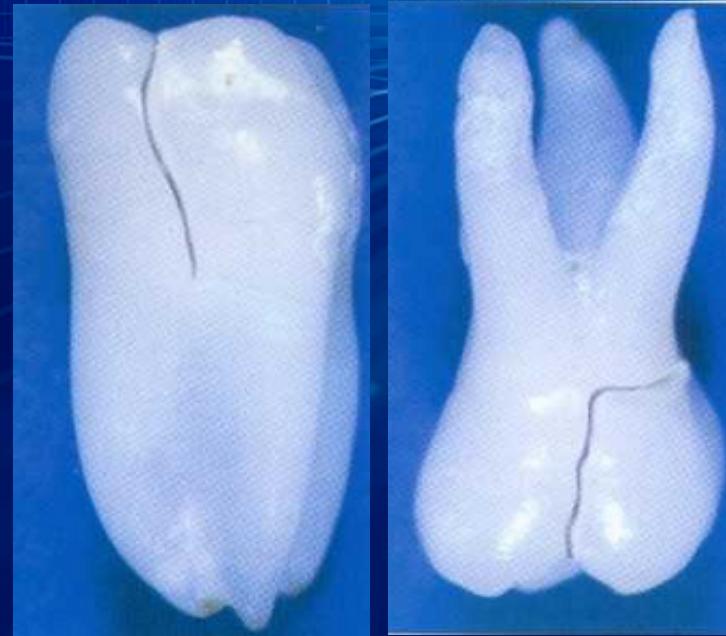
Cusp Fracture :

- Cusps adjacent to wide metallic fillings → crack & split during chewing.
- Caused by → over expansion of filling, caries or undermining.
- Weak undermind cusp → crowned or treated with onlay.



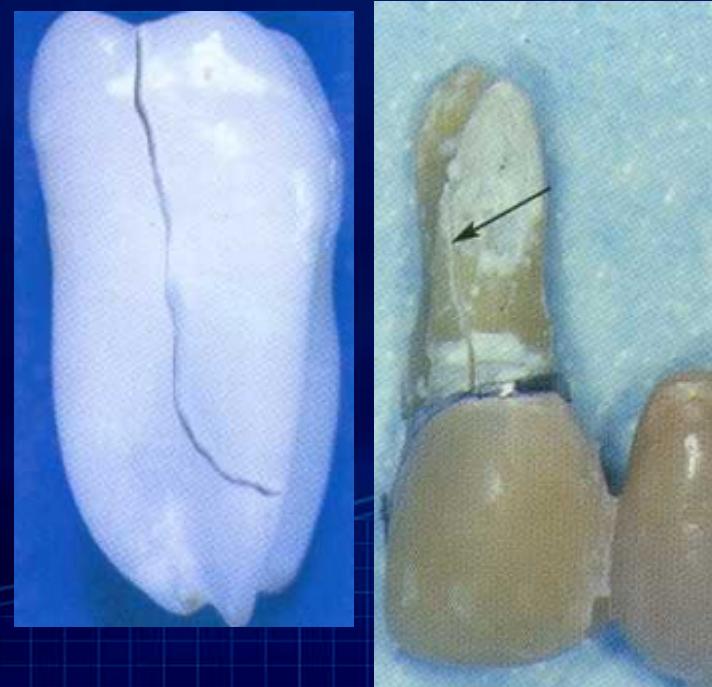
Split Crown & Root:

- Wn deep narrow metallic fillings in premolar teeth with high cusps → ↑ forces force the cusp apart & split the crown .
- A sharp lancinating pain is felt at moment of cracking, on biting & chewing & disappears as the elastic dentin close the crack
- Difficult diagnosis as fracture is vertical → not visible clinically or in x-ray.
- Detected by patient biting on a wooden prop (push tooth segments apart).



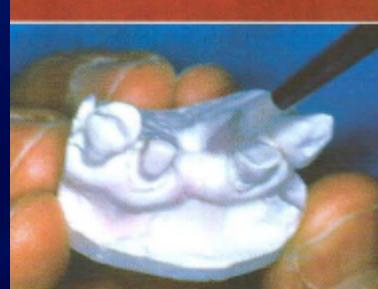
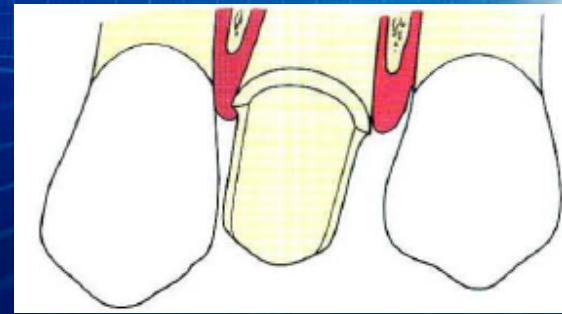
Split roots :

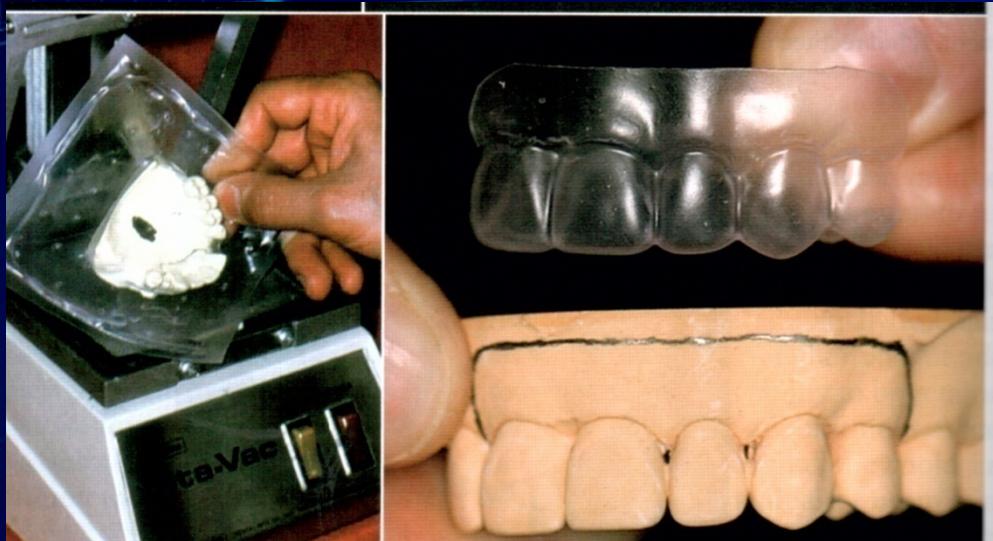
- More difficult to diagnose than split crown.
- Caused → forceful insertion of large screw pins.
- Sharp pain → upon release of chewing pressure.
- Pulp tests are normal.
- Split crown & root → tied together by crown or onlay.
- R.C. treatment is contraindicated → as it increases splitting.



Effect of provisional restorations

- Temporary crowns & bridges → protect reduced Ab. against thermal, chemical & mechanical insults.
- Prevent any movement of the opposing, neighboring teeth .
- There are 2 types of temporary R. → prefabricated and custom-made → direct or indirect .
- T.R. → well-fitted with all the margins smooth & rounded o.w. → gingival inflammation .
- Direct provisionals (chemical resin) → more harmful than indirect (laboratory processed resin).
- The use of zinc oxide eugenol cement under acrylic crowns is forbidden.





Effect of various dental materials :

1) Impression compound :

- May cause thermal shock to the pulp.
- Soft tissue trauma → copper band and compound.
- Cutting P.M. attachment → repeated impression taking.
- Gingival recession.

2) Amalgam:

- Discoloration of Dentin → penetration of tin & mercury ions.
- Initial Marginal leakage → ↓ due to corrosion products.
- Marginal percolation → difference in C.T.E between amalgam & tooth.
- High galvanic action.



3) Composite:

- Marginal Leakage → bacterial invasions → caries .
- Chemical Irritation to the pulp → residual monomer if incompletely cured.

4) Acrylic resin :

- The monomer → injurious to the pulp.

5) Gold casting :

- The highly polished gold does not irritate the gingival.
- The cementing media →
 - chemical irritation to the pulp.
 - marginal decay → cement solubility



6) Non-precious alloys :

- Nickel → allergy to patients (10-20%).
- Beryllium → carcinogenic .

7) Titanium:

- Most biocompatible & corrosion-resistant metallic material
→ thin , tenacious , protective passive surface oxide layer .

8) Ceramics:

- Main disadvantage → abrasive damage to opposing dentition.
- Glazed porcelain → least amount of plaque retention.



Effects of luting cements :

Pain after cementation may be caused by:

- Acidity → zinc phosphate.
- Over-reduction.
- Dry cutting.
- Minute exposure.

Zinc Phosphate cement :

- Irritant to the pulp → acidic at time of placement →
↑ PH within 24 hours.
- Frozen-slab technique accelerates PH rise.
- Application of varnish → ↓ pulpal irritation.



Polycarboxylate cement :

- Excellent biocompatibility →
 - Rapid rise in PH.
 - Large mol. size of P.A.A

- It can be used safely as a base under composite resin, amalgam restorations.

- **Zinc oxide-eugenol cements :**

- Type 1 (un modified)** → temporary cementation

- Type 2 (modified)** → E.B.A , Alumina, A.R.

- Final cementation or long-term provisional cementation.
- It is biocompatible → palliative & sedative effect on the pulp .



Glass ionomer cements :

- It is anti-cariogenic → fluoride release.

A . Conventional :

- Bonds chemically to E.&D.→ ionic exchange with calcium .
- Least soluble cement.
- Not irritant → initial sensitivity.

B. Resin Modified Cements:

- * Resin is added → HEMA or BIS-GMA.
- * Insoluble .
- * Reduced post cementation sensitivity .

Resin Luting Cement :

A- Conventional Composite resin

- Mechanical retention only.

B- Adhesive composite resin :

- Chemical & micromechanical retention.
- Both are irritant to the pulp.



Thank You