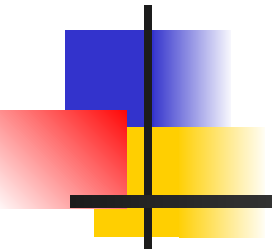
REVIEW OF OPERATIVE DENTISTRY

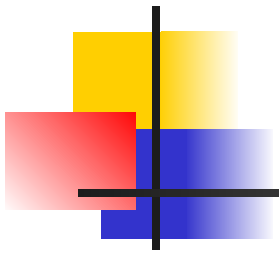


Introduction to Operative Dentistry

Definition *(3 parts)*

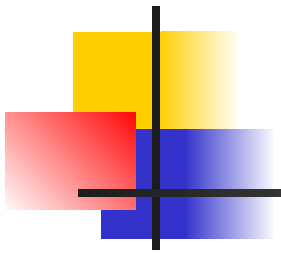
1st part

- Art and science of the DIAGNOSIS, TREATMENT, and PROGNOSIS of defects of teeth.



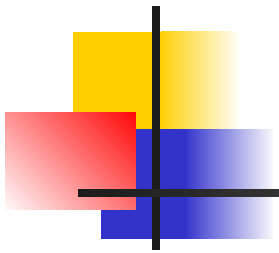
2nd Part

- Treatment should result in the restoration of proper tooth form, function, and esthetics, while maintaining the physiologic integrity of the teeth in harmonious relationship with the adjacent hard and soft tissues.



3rd part

- All of which should enhance the general health and welfare of the patient



Operative Dentistry also known as Restorative Dentistry or Conservative Dentistry

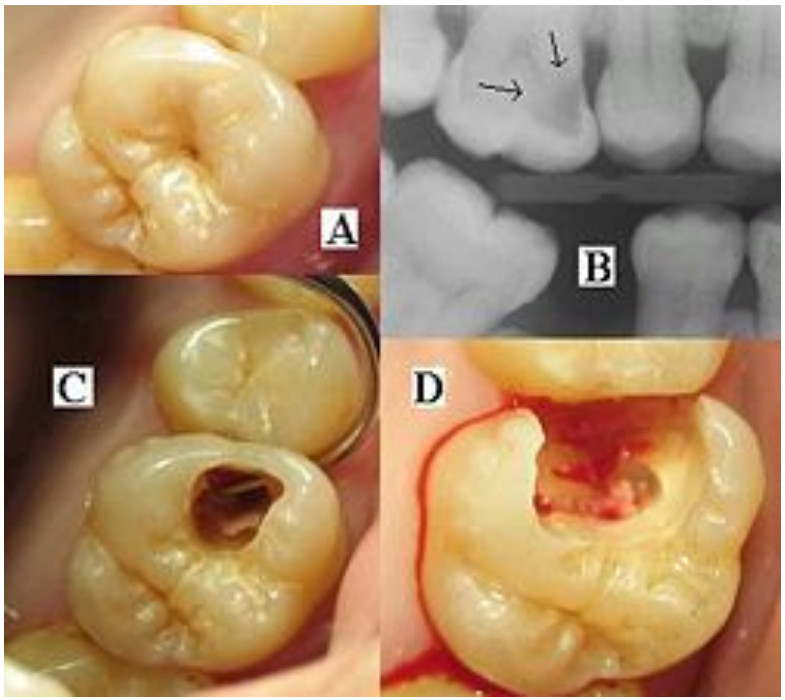
Indications for Operative Treatment

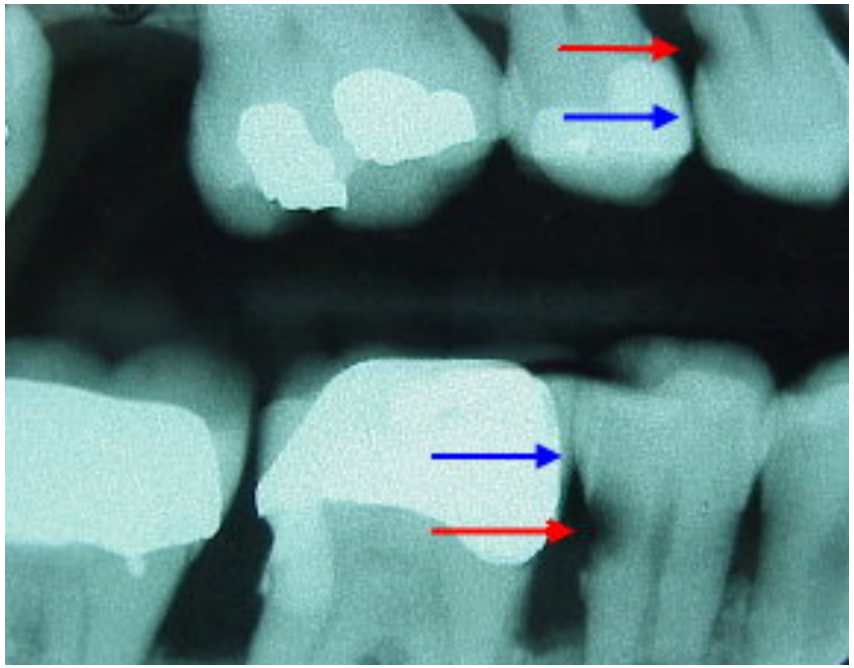
- Caries,
- Malformed, discolored, non esthetic, or fractured teeth,
- Wearing of teeth (attrition, abrasion, etc.)
- Restoration replacement or repair.

Pit and fissure caries

Rampant smooth surface caries


A


A
B
C
D



Attrition in Anterior Teeth

Crevical Abrasion

Fig. 1: Attrition

Attrition in Posterior

Procedures

Procedures commonly done are

- Direct restoration – Amalgam, Composite resin, GIC.
- Indirect restoration – Inlay, onlay, crowns (base metal, precious metal, porcelain fused to metal, or metal free ceramic)
- Veneers – Direct or indirect

- Direct Restoration – After tooth preparation, the restoration is placed in a moldable stage in the prepared tooth to recreate normal contours.

Adv. *– easy to place, less time consumed, and cost effective.*

Disadv. *– compromised mechanical properties*

- Indirect Restoration- After tooth preparation, it involves making of impression, pouring of cast, die preparation, wax pattern, investing, casting, finishing, polishing and cementing (or luting) of restoration. (restoration is fabricated outside and cemented to prepared tooth)

DISESES AFFECTING TOOTH STRUCTURE

Dental Caries (disease process)**:** The localized destruction of susceptible dental hard tissue by acidic byproducts from bacterial fermentation of carbohydrates. (FDI).

Caries Lesion: Is the manifestation of the stage of the process at one point in time (active or arrested)

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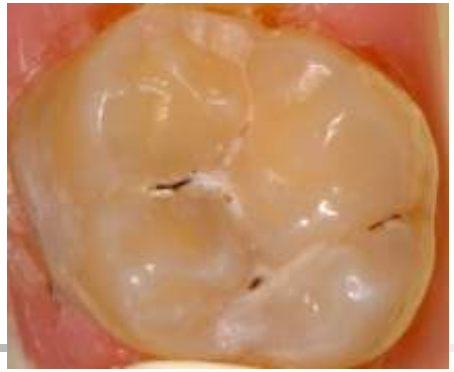

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What is Dental Caries?

What is Dental Caries?

Dental caries is a:

1) **chronic**
2) **site-specific**
3) **multifactorial**
4) **dynamic (but not necessarily continuous)**
5) **disease process that involves the shift of the balance between protective factors (remineralization) and destructive factors (demineralization) to favor demineralization of the tooth structure over time.**
6) **The disease can be arrested at any point in time.**

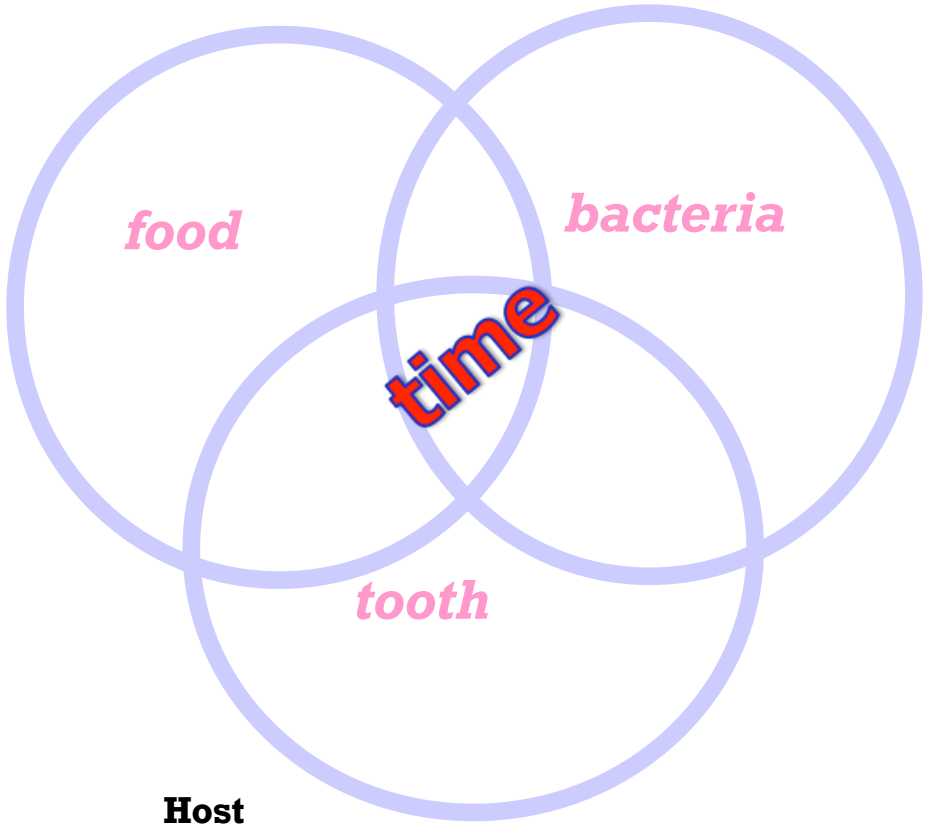
Etiology

Diet

Composition

Frequency

Amount



Agent

Plaque Quantity/Quality

S. mutans

Lactobacilli Other

Bacteria

Host

Tooth

Saliva Quantity/Quality

Immune response

Behavior

Attitude

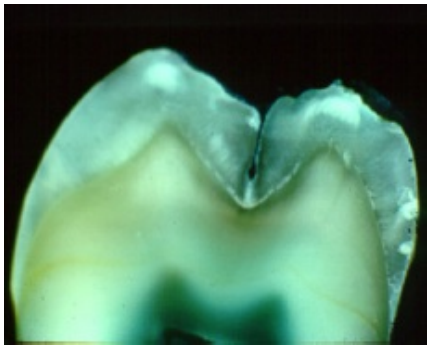
Principles of caries lesion classification

TABLE 1

Principal carious lesion classification criteria.*

CLASSIFICATION BASIS	CLASSIFICATION
Treatment of Caries	D = decayed or caries lesions, M = missing owing to extraction, F = filled or restored caries lesions
Morphology (Location of the Lesion)	Occlusal caries, smooth-surface caries and root caries
Prior Condition of the Tooth	Primary caries, secondary (recurrent) caries
Severity and Rate of Caries Progression	Acute caries, chronic caries, active caries and arrested caries
Extent of the Lesion	Incipient caries, advanced caries
Chronology or Age	Early childhood caries, adolescent caries, adult caries
Etiology (Causes or Origins of Caries)	Baby bottle tooth decay
Affected Tissues	Enamel, dentin, cementum

* Source: Fejerskov and Kidd.[7]



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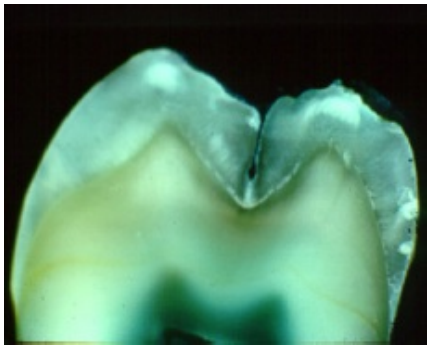
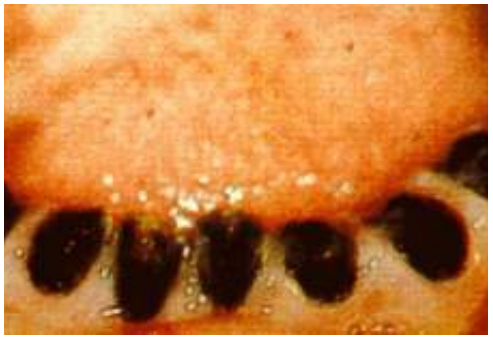
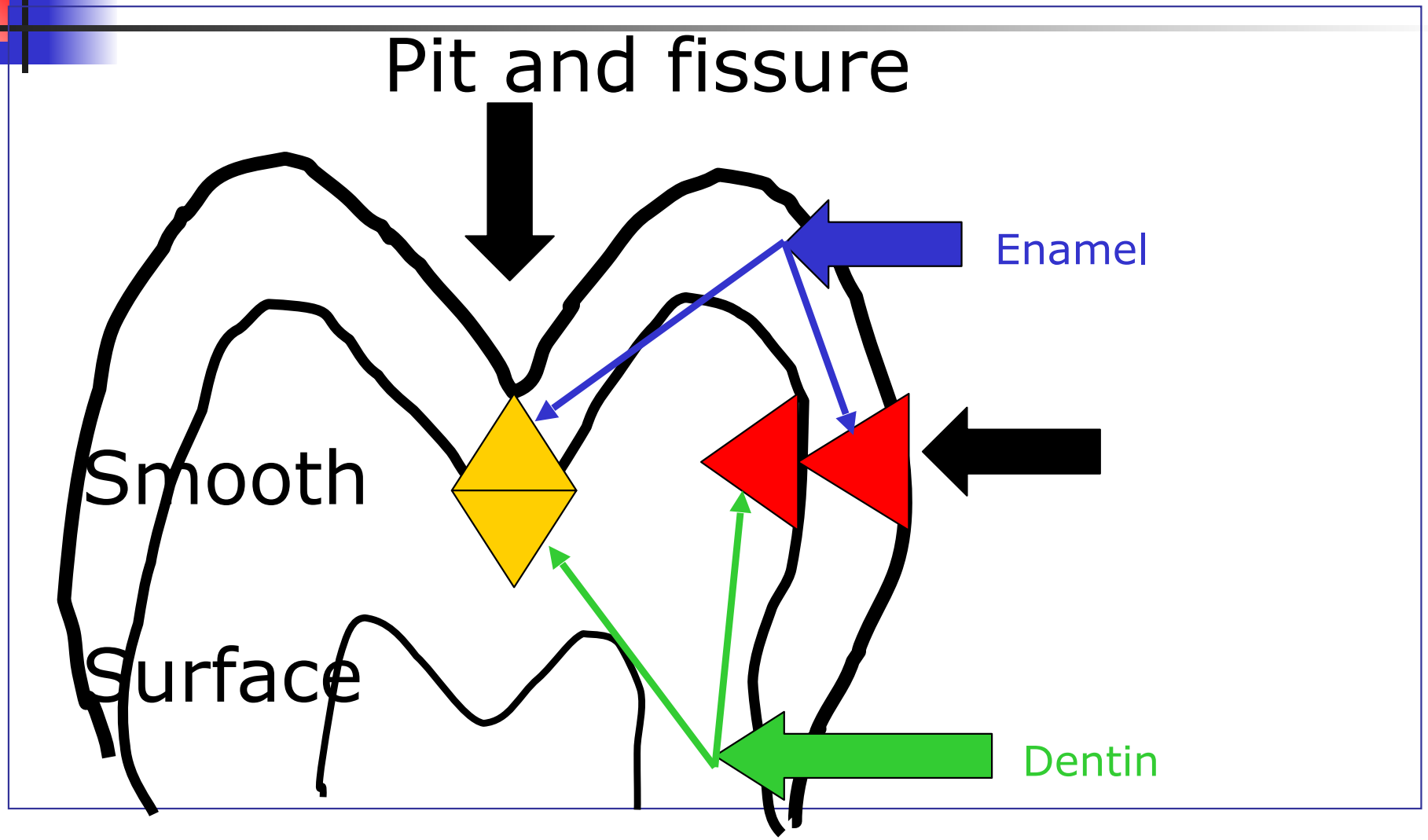


Caries Spread Diagram



Black's Cavity Classifications

- Class I- involves a pit or fissure on a posterior or anterior tooth
- Class II- involves a proximal surface of a posterior tooth
  - Takes precedent over a Class I
  - Generally, involves the occlusal surface also
- Class III- involves the proximal surface of an anterior tooth
- Class IV- involves the incisal angle of an anterior tooth
- Class V- involves the cervical third of a anterior or posterior tooth, generally on the buccal or lingual
- Class VI- involves any other situation that does not fit into I-V, generally cusp tip pits on canines and or molars

Cavity Classifications

Class I

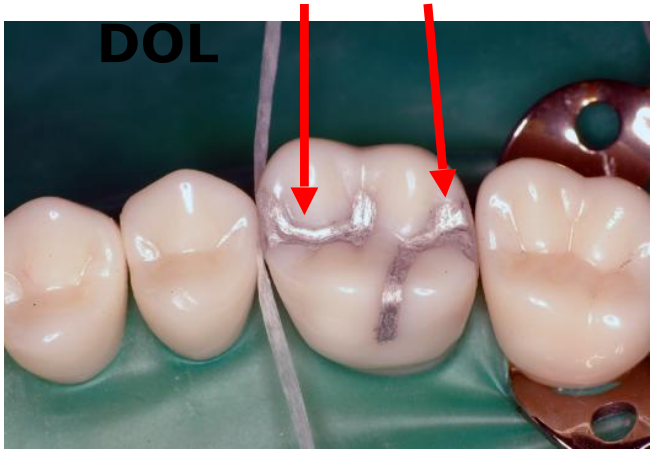
 # 31- O

 # 4- O & 3 O-OL

Class II

 # 29- MO

 # 14 MO-DOL



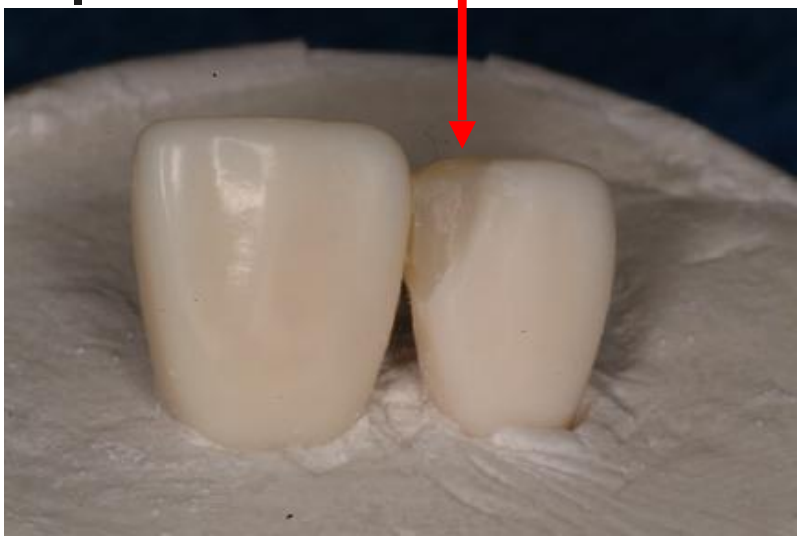
Class III

 # 8- M

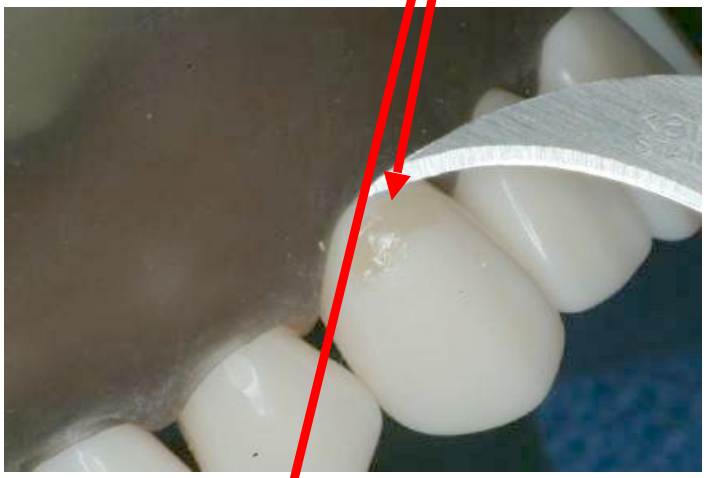
#8-M

Cavity Classifications

Class IV



Class V



Class VI- anything else, generally cusp tip pits on canines or molars

ALTERATION OF TOOTH: various causes

- ACIDS- bulimia, lemons,etc.
- HORMONAL, AGE
- MEDICATIONS- tetracycline stain
- HABITS- wear, erosion, pin holding, etc.
- TRAUMA- fractures
- DEVELOPMENTAL
  - enamel hypoplasia, dentinogenesis imperfecta, amelogenesis imperfecta

DENTAL DEFECTS

- FLUOROSIS: “mottled enamel”, form of enamel dysplasia
  - High fluoride uptake during enamel calcification
  - Teeth are resistant to caries
  - Brown stain, ca c
  - Intrinsic stain

DENTAL DEFECTS

- EROSION: acid or chemical induced
  - Agent eats away enamel, dentin, and cementum
  - Important factors:
    - Time factor: how long tooth in contact with acid
    - Location of acidic agent on tooth
  - Some offending agents:
    - Acid: bulimia, lemons,
    - Carbonated beverages
    - In BULIMIA: lingual enamel gone

DENTAL DEFECTS caused by medications

- Drug: tetracycline
  - given to mother or infant
  - teeth affected are the ones undergoing development at the time the drug is taken
  - affects DENTIN
- Primary and/ or permanent teeth affected

DENTAL DEFECTS

- CERVICAL ABRASI0N of tooth structure
  - May affect enamel, dentin or cementum
  - Important factors: location and time
  - Habits like toothbrush abrasion, pin holding, tooth pick use or holding, occlusion
- CLASS V LESIONS: NOTCHED APPEARANCE

POSSIBLE RESTORATIVE OPTIONS

- RECONTOURING: ENAMEL HYPOPLASIA
- BLEACHING: FLUOROSIS, ENAMEL HYPOPLASIA
- COMPOSITE RESINS OR GLASS IONOMERS: EROSION/ ABRASION LESIONS
- VENEERS, CROWNS: TETRACYCLINE STAINING, ENAMEL HYPOPLASIA, FLUOROSIS

Treatment of the Cavity Preparation Prior to Restoring

Remaining Dentinal Thickness (RDT)

- Dentin
  - Buffers the effects of cariogenic acids
  - Insulates from temperature increases
- **RDT is the single most important factor in protecting the pulp**

RDT's Impact on the pulp effect of toxic substances

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- < 0.5 mm RDT
  - Significant pulp reaction

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- < 0.5 mm RDT
  - Significant pulp reaction
- 0.5 mm RDT
  - 75% reduction

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  - Significant pulp reaction
- 0.5 mm RDT
  - 75% reduction
- 1.0 mm RDT
  - 90% reduction

RDT's Impact on the pulp effect of toxic substances

- < 0.5 mm RDT
  - Significant pulp reaction
- 0.5 mm RDT
  - 75% reduction
- 1.0 mm RDT
  - 90% reduction
- ≥ 2.0 mm RDT= ideal
  - Little pulp reaction

- Liners: cement or resin coating of **minimal thickness (usually less than 0.5 mm)** usually applied only to dentin cavity walls that are near the pulp to achieve

1. a physical barrier to bacteria and their products
2. to provide a therapeutic effect, such as an antibacterial or pulpal anodyne effect.
3. They also contribute initial electrical insulation.
4. Generate some thermal protection.

McCoy RB. Bases, liners and varnishes update. Oper Dent 1995;20:216.

Bases

- Materials to replace missing dentin, used for bulk buildup and/or for blocking out undercuts in preparations for indirect restorations. Cement bases typically **1-2mm.**
- They are used to:

1. **Provide thermal protection for the pulp.**
2. **Supplement mechanical support for the restoration by distributing the stresses from the restoration across the underlying dentin surface.**

- This mechanical support provides resistance against disruption of the thin dentin layer over the pulp during condensation of amalgam or cementation of indirect restorations.

DIRECT RESTORATIVE MATERIALS

- 1- AMALGAM
- 2- GIC
- 3- COMPOSITES

1- Dental Amalgam

DENTAL AMALGAM

- Dental amalgam – historically - an alloy of mercury, silver and tin
  - Prepared by mixing liquid Hg with Ag-Sn alloy powder

DENTAL AMALGAM

- Advantages
  - fast, easy to place, inexpensive
  - long history of use and longevity of service - 15 years typical
  - microleakage between tooth and amalgam decreases with time - self sealing
  - relatively insensitive to operator skill
  - very low risk of adverse patient response

DENTAL AMALGAM

- Disadvantages
  - non aesthetic
  - no bond to tooth??
  - slow hardening 8-24 hrs to reach 95% of final strength
  - corrosion products may discolor tooth structure
  - brittle material
  - although very low probability for allergic reaction to components; components constitute environmental and occupational hazard (Hg)

Properties of dental amalgam

- strong in compression
- weak in tension or bending
  - tensile strength ~ 20% of compressive strength
- a brittle material
- no adhesion to tooth structure
- very small dimensional change upon hardening
- high thermal conductivity compared to tooth (a metal)
- coefficient of thermal expansion 2.2X tooth

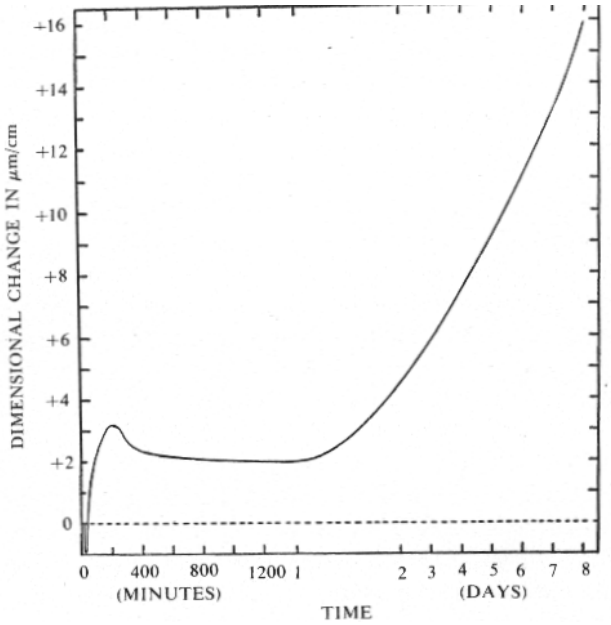
High Copper Amalgam

- a high-copper amalgam contains enough copper to eliminate the gamma-two phase. currently: 11< Cu wt% <30
- clinically amalgams with little or no gamma-two have shown better clinical performance and less marginal deterioration
- These observations support the use of high copper content amalgam alloys
- now called simply “high-copper alloys”

Delayed expansion of amalgam

- If alloy contains Zn and is contaminated with moisture during placement:

$$Zn + H_2O \rightarrow ZnO + H_2\uparrow$$

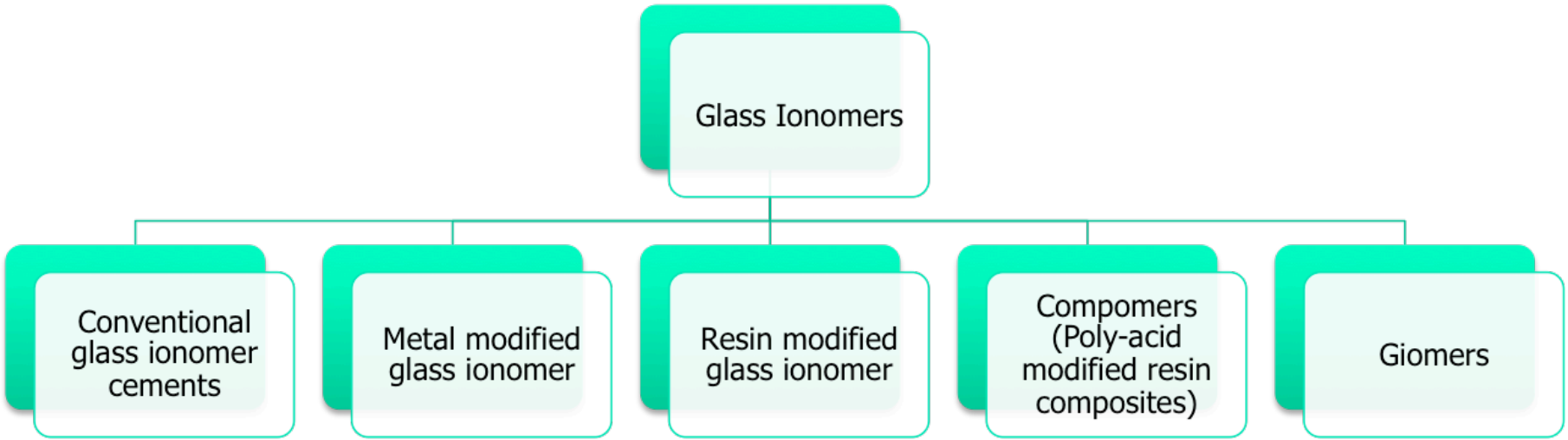


Safety

- mercury toxicity
  - MSDS sheet for Hg
  - Hg is a toxic heavy metal; high density; high surface tension; high vapor pressure
  - use is being limited/eliminated in most areas - thermometers, antifungal agents
  - mechanisms for toxicity
    - skin contact; ingestion; inhalation
    - acute/chronic
    - elemental/ionic/organo-metallic

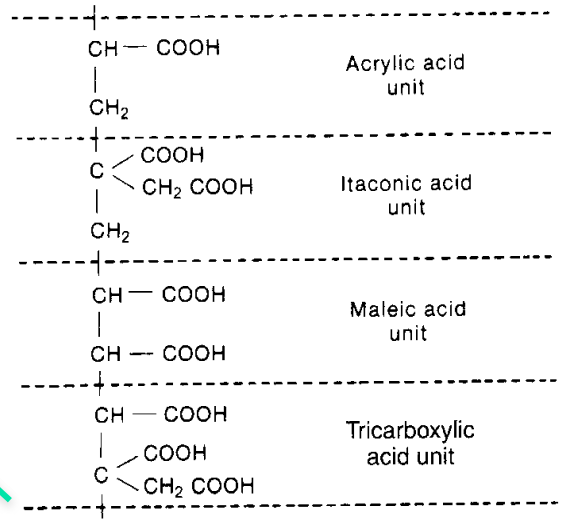
2- Glass Ionomer restorations

Types of Glass Ionomer



Conventional GIC

Aqueous solution of Poly (alkenoic)



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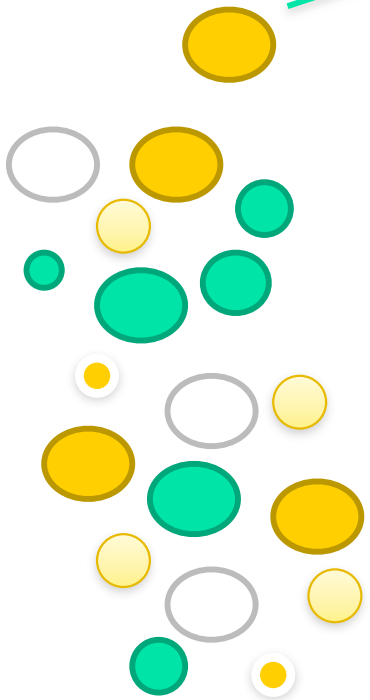


Oxygen
Fluoride
Calcium
Aluminum
Silicon
phosphorus
Sodium

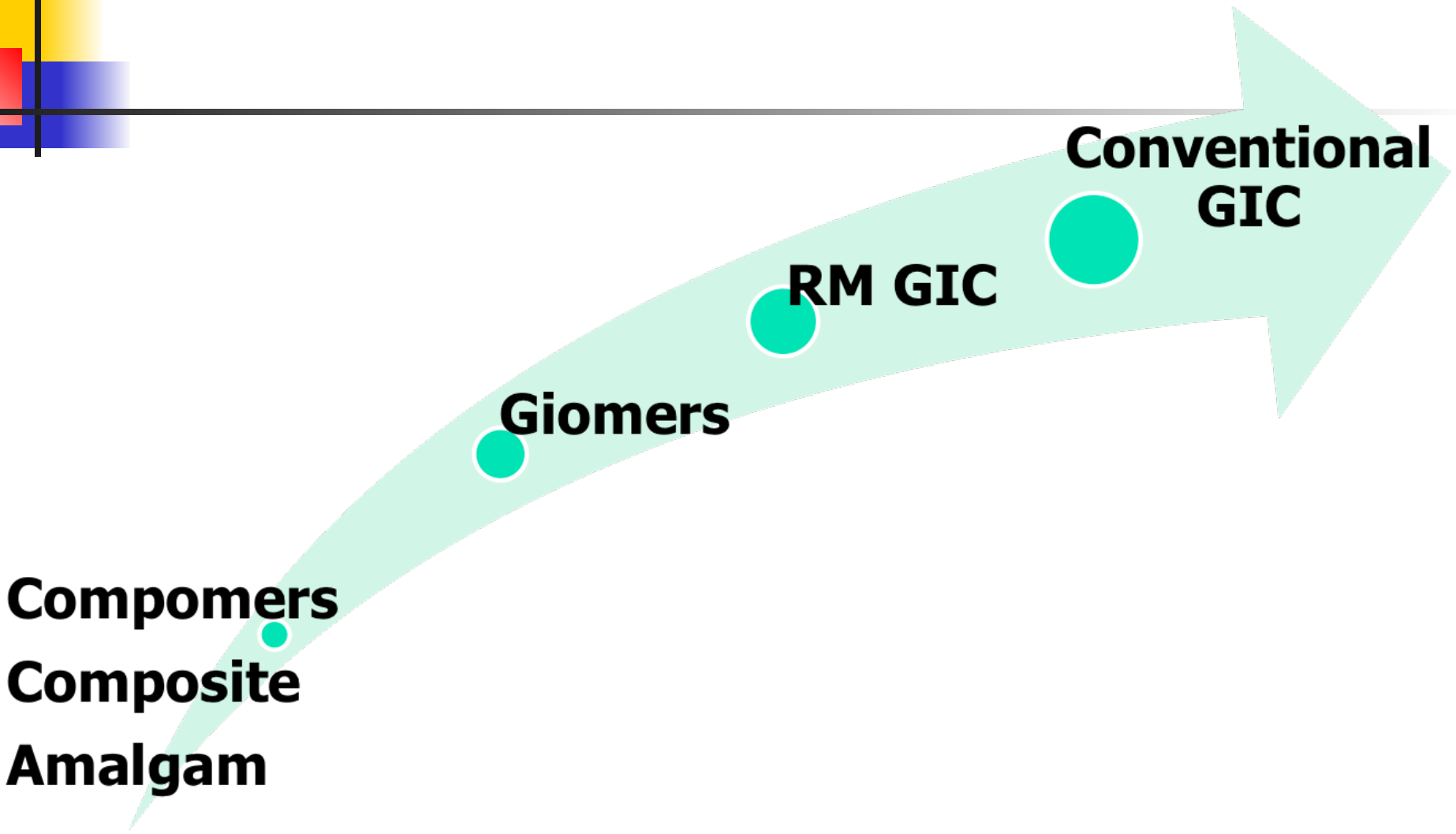
- Water based (hydrophilic)
- Alumuno-silicate glass with high fluoride content which reacts with poly (alkenoic) acid.

Advantages of GIC Filling Materials

- They seal well, they bond both to enamel and dentine

  (bond strength 6-12MPa < than dentine bonding agents).
- Place little stresses on tooth structure when setting
- Buffer acidic conditions in their vicinity
- Flouride release?

Fluoride Release



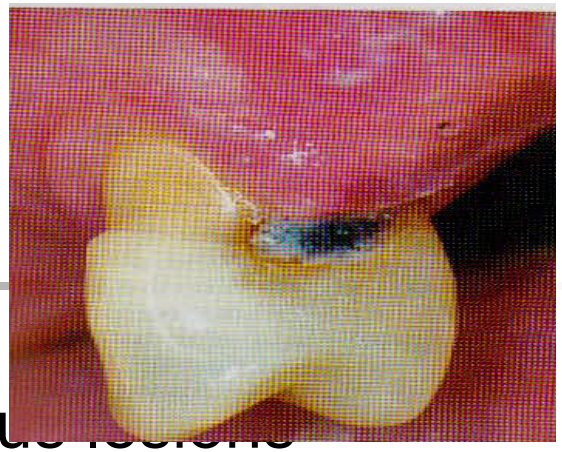
Disadvantages

- Esthetics, they are inferior to composites and not usually recommended for use in areas of significant esthetic concern
- Physical properties, limited strength and wear resistance.
- Dehydration and cracking during setting.

Conditioning The Dentine

- During the restoration of teeth where little or no cavity prep is required some sort of conditioning or cleaning is required since the tooth may be covered with a pellicle and other surface debris.
- The use of strong acids is contraindicated because they will cause exposure of the collagen network in dentine & reduce the bonding potential

Uses of glass ionom



- Fissure sealant
- Restoration of free smooth surface carious lesions

both enamel and root caries, they are considered the material of choice for the restoration of root caries.

- Erosion and abrasion lesions
- They can be used as cements, bases and

3- COMPOSITES AND BONDING CONCEPT

Acid-etch Technique

- Michael Buonocore (1955)
  - **85%** phosphoric acid on enamel
  - Acrylic resins
  - Resin tags

Etchants

- Organic acids
  - maleic, tartaric, citric, EDTA, acidic monomers
- Polymeric acids
  - polyacrylic acid, copolymers
- Mineral acids
  - hydrochloric, nitric, hydrofluoric,
  - **PHOSPHORIC ACID 37%**, 35%, 10%
- Gel Vs liquid
  - Provides better control
  - Contains colloidal silica, polymer beads or cellulose thickening agent.

Enamel Etching

- Surface pretreatment
- Increases surface area
- Provides for mechanical retention to combat hydrolytic degradation of the adhesive joint
- Removes contaminants inaccessible to prophylaxis = increased surface energy
- Dissolution rates within the hydroxyapatite structure vary greatly resulting in pits and pores being developed = differential etching

- Facilitates wetting and resin penetration into the microporosities; 10-20 microns.

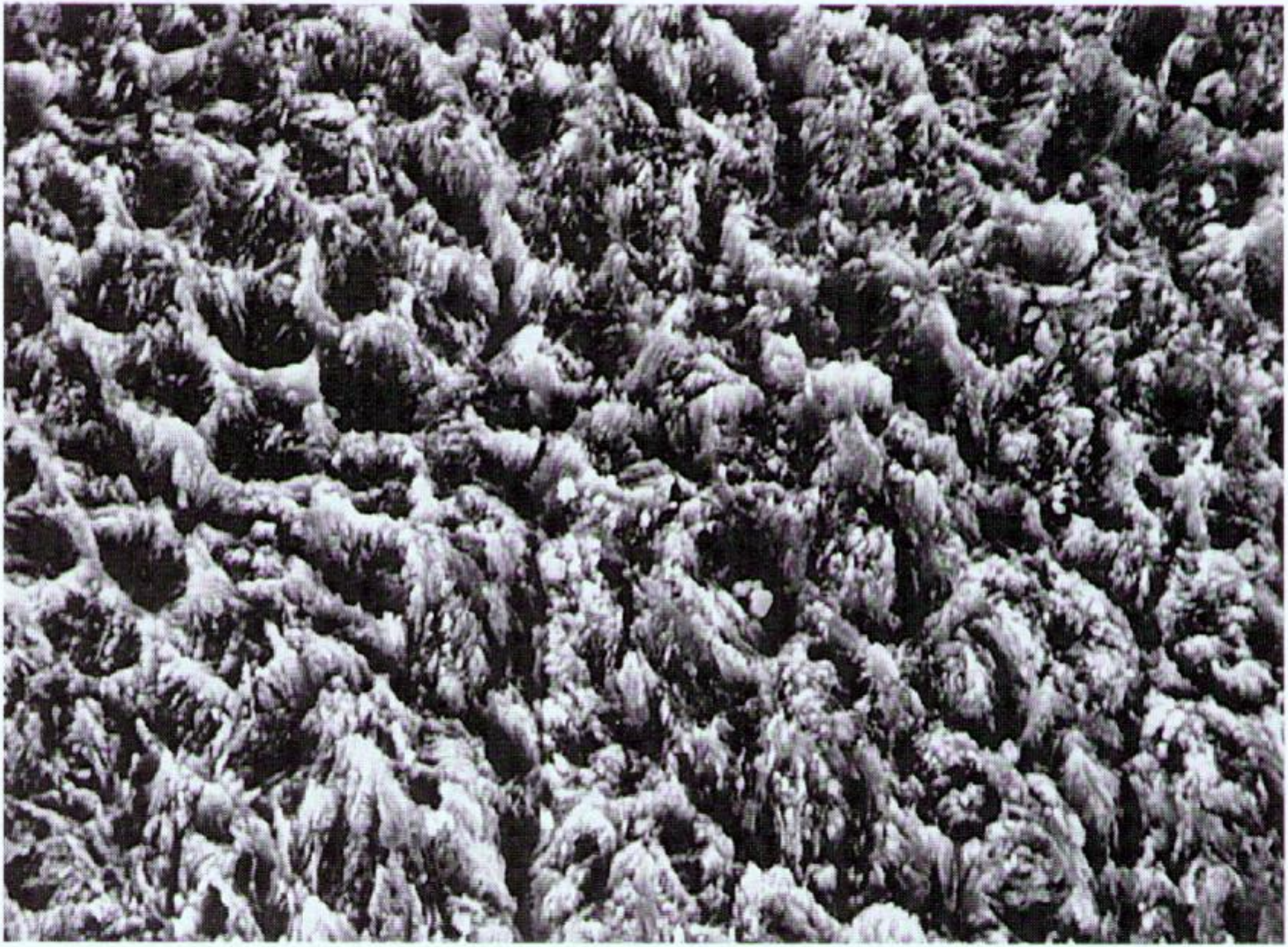
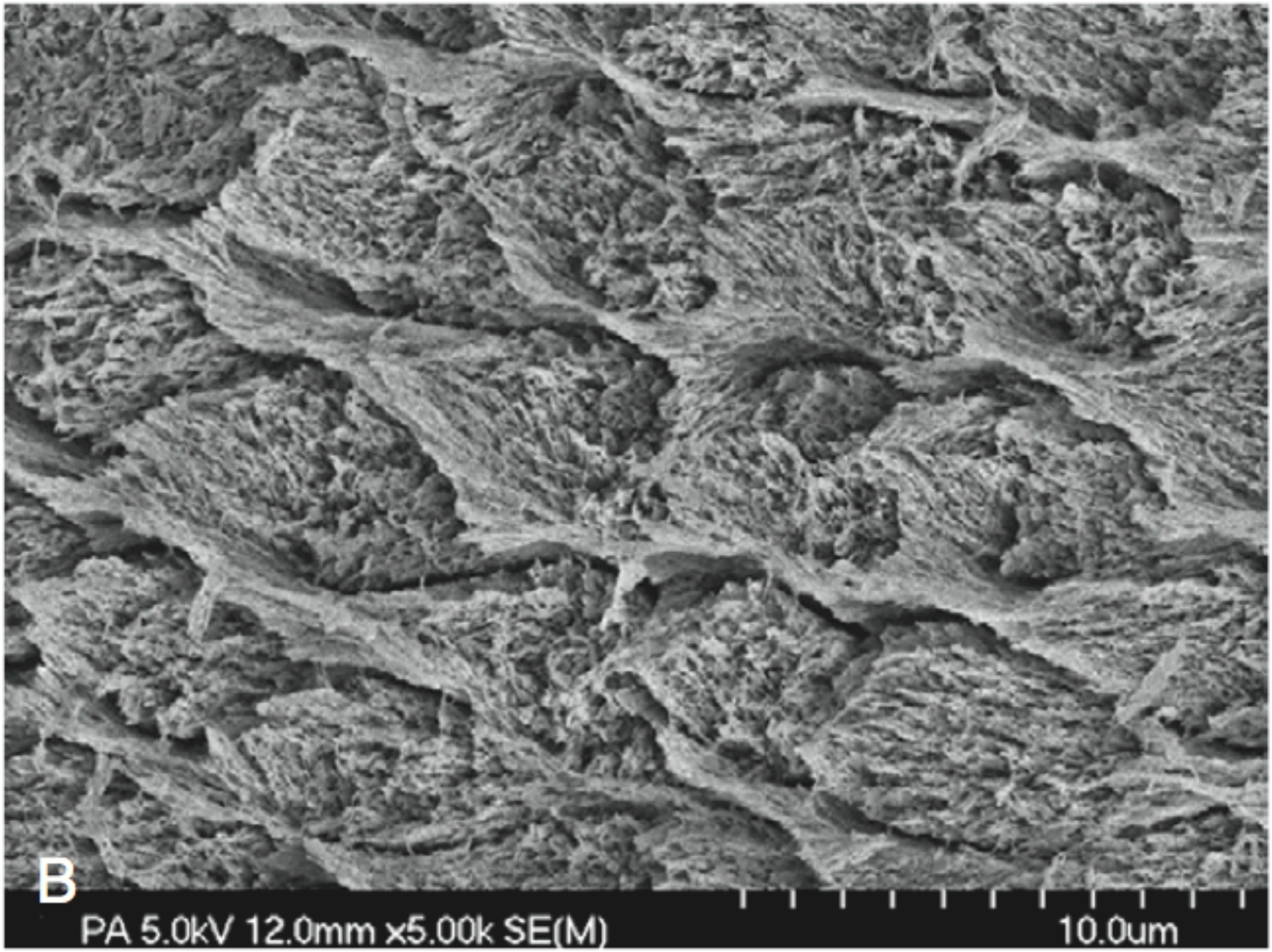


Figure 13–2. Surface of etched enamel in which the centers of enamel rods have been preferentially dissolved by the phosphoric acid.


B
PA 5.0kV 12.0mm x5.00k SE(M)
10.0um

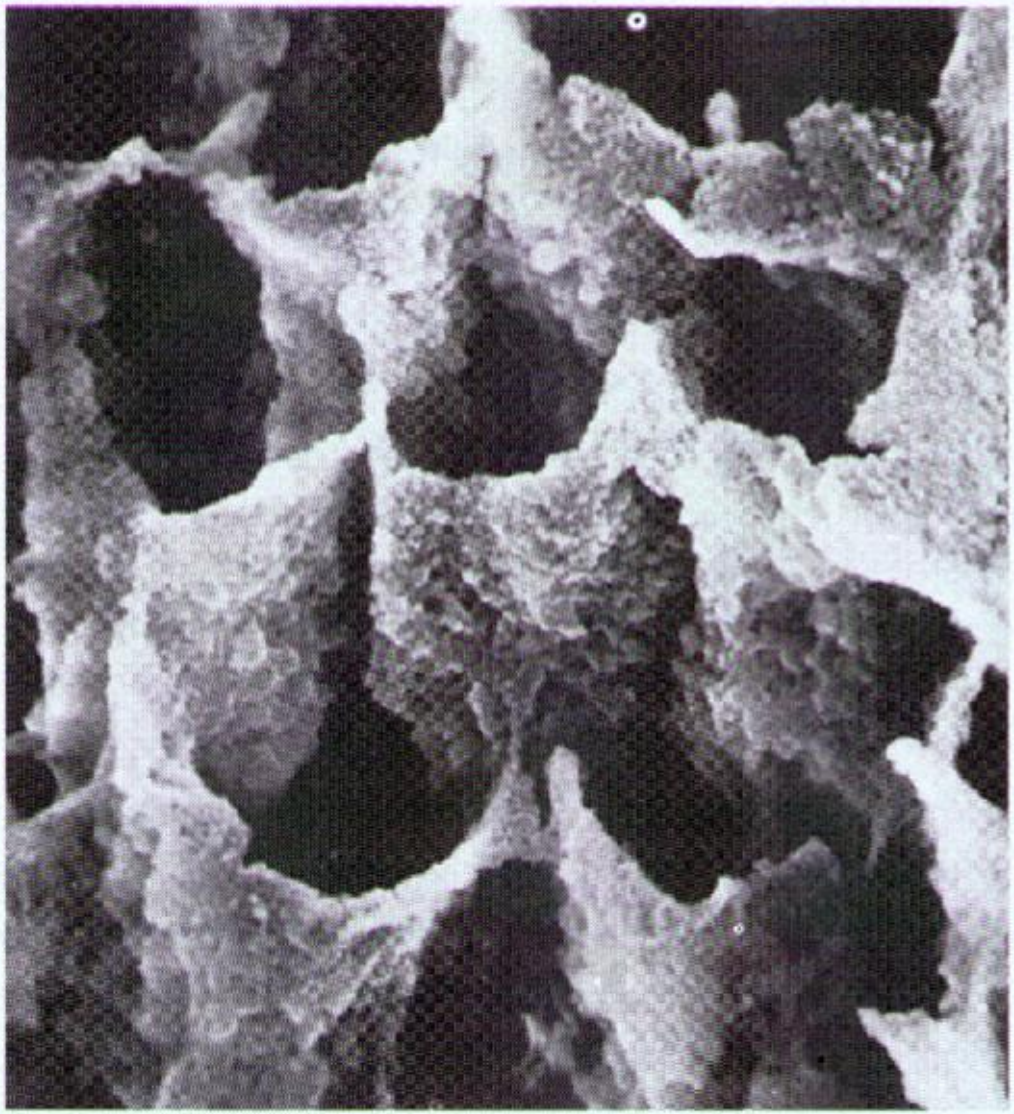


Figure 13–3. Scanning electron microscopy of tags formed by the penetration of resin into etched areas of enamel. The resin was applied to the etched enamel, and the enamel was then dissolved by acid to reveal the tags. ×5000.

Dentin Etching

- Heterogeneous
  - <70% inorganic hydroxyapatite
  - >20% organic – mainly Type I collagen
  - 10% fluid
  - Smear layer from mechanical preparation
- Tubules (0.5-1.5 μm in diameter) supply a continuous flow of fluid to the surface

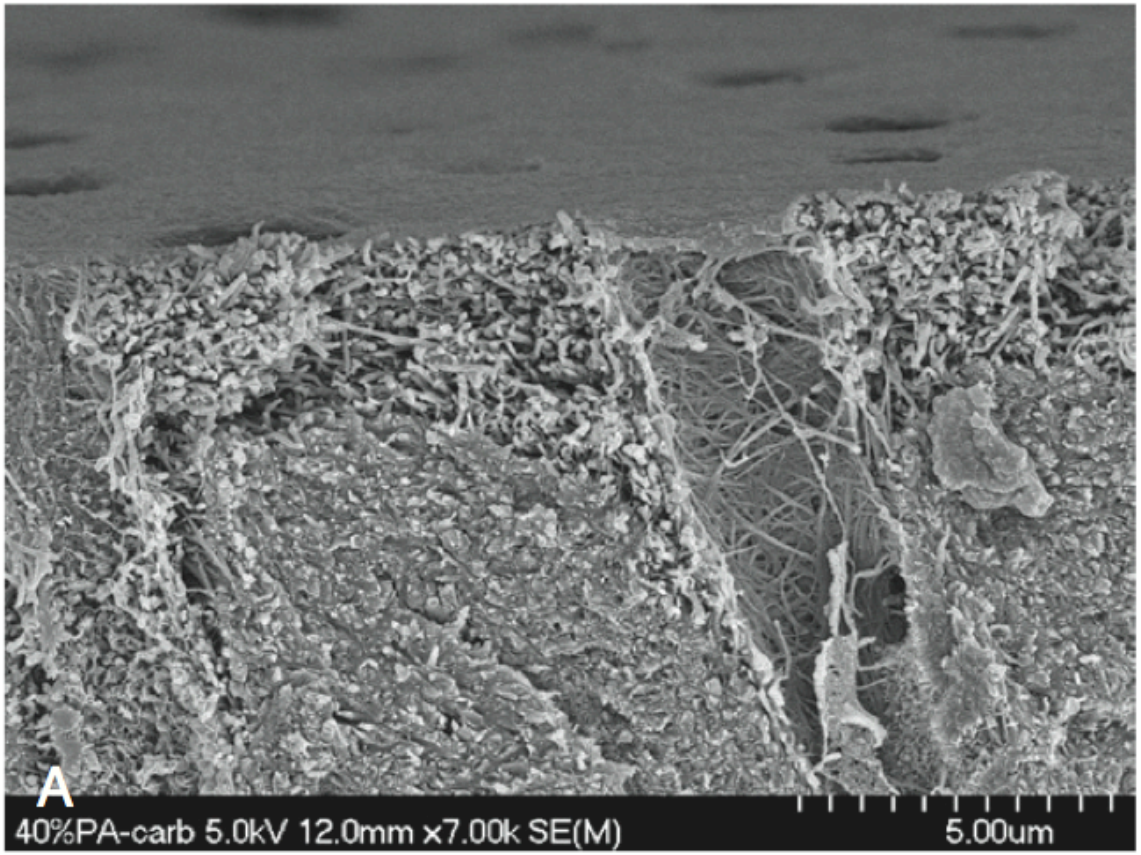
Total Etch
Fusayama - 1978

- 37% Phosphoric acid on enamel and dentin
  - Improved restoration retention
  - No increased frequency of pulpal damage
  - Widely accepted in early-mid 1990's

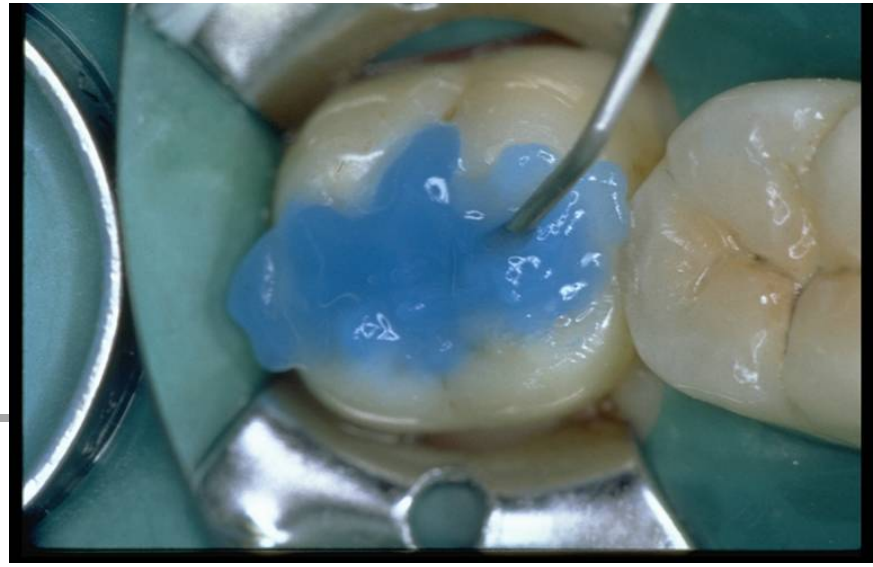
Dentin Etching

Etchants are stronger

acids that remove the smear layer and plugs and remove significant amounts of mineralized tissue leaving an exposed collagen network.



Technique



- Application time will vary with the condition of the tooth
  - Most teeth are adequately etched with 15 seconds of acid exposure
  - Deciduous teeth and teeth with fluorosis require longer times: - 2x

Technique

- Rinse thoroughly
  - 15 seconds
- Prevent contamination
  - Saliva
  - Blood
  - Oil or water in compressed air
- Contamination requires re-etching for 10 seconds

Technique

- Dry
  - **When etching enamel only**, air is used
    - Enamel surface should appear chalky white
  - **When dentin is involved, blot dry** with a cotton pellet to avoid dessicating the dentin
- Apply bonding agent

Adhesives (bonding agent)

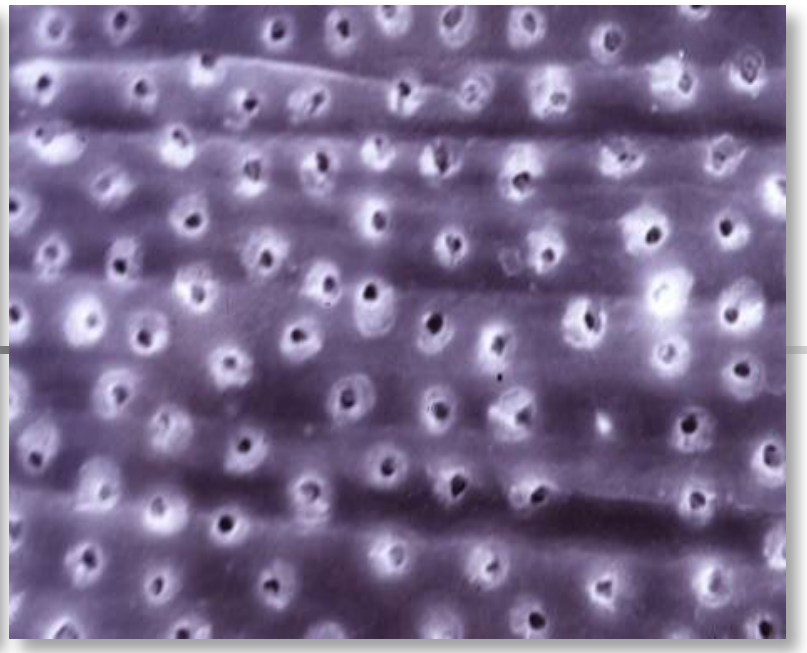
- Hydrophobic dimethacrylate oligomers
  - bis-GMA
  - TEGDMA
- Initiator activator: Light activator/Organic amine. Catalyst in dual-cured systems.
- Fillers: May be up to 40 wt% filled
  - aids handling
  - increases bond strengths\
- fluoride
- antimicrobials
- glutaraldehyde

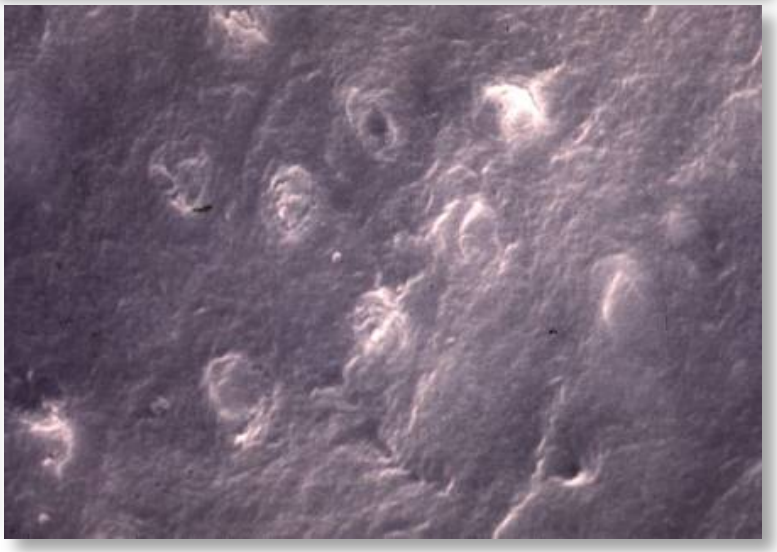
Enamel Bonding Agent

- Traditionally: bis-GMA – TEGDMA resins
  - Relatively Hydrophobic in nature
  - **Not used when dentin is involved**
  - Orthodontic applications

  - Mechanism:
    - Bonding to enamel occurs by micromechanical retention after acid etching
    - Fluid adhesive constituents penetrate into the newly produced surface irregularities and become locked into place after polymerization of the adhesive.

Whatever system is used, it must be able to work on different types of tooth structure, enamel, permeable dentin and sclerotic dentin.



Whatever system is used, it must be able to work on different types of tooth structure, enamel, permeable dentin and sclerotic dentin.

Bonding to dentin

- The high water content in dentin represents an extra challenge for the establishment of an interdiffusion zone. To manage this problem, primers have hydrophilic components, such as HEMA, that wet dentin and penetrate its structure was used.
- The primer stabilizes collagen and facilitates the penetration of the bonding resins.

Bonding to dentin

- Primers contain solvents to displace the water and carry the monomers into the microporosities in the collagen network.
- During application of the primer, most of the solvent evaporates quickly. Thus several layers usually must be applied to ensure a complete impregnation.

Primers

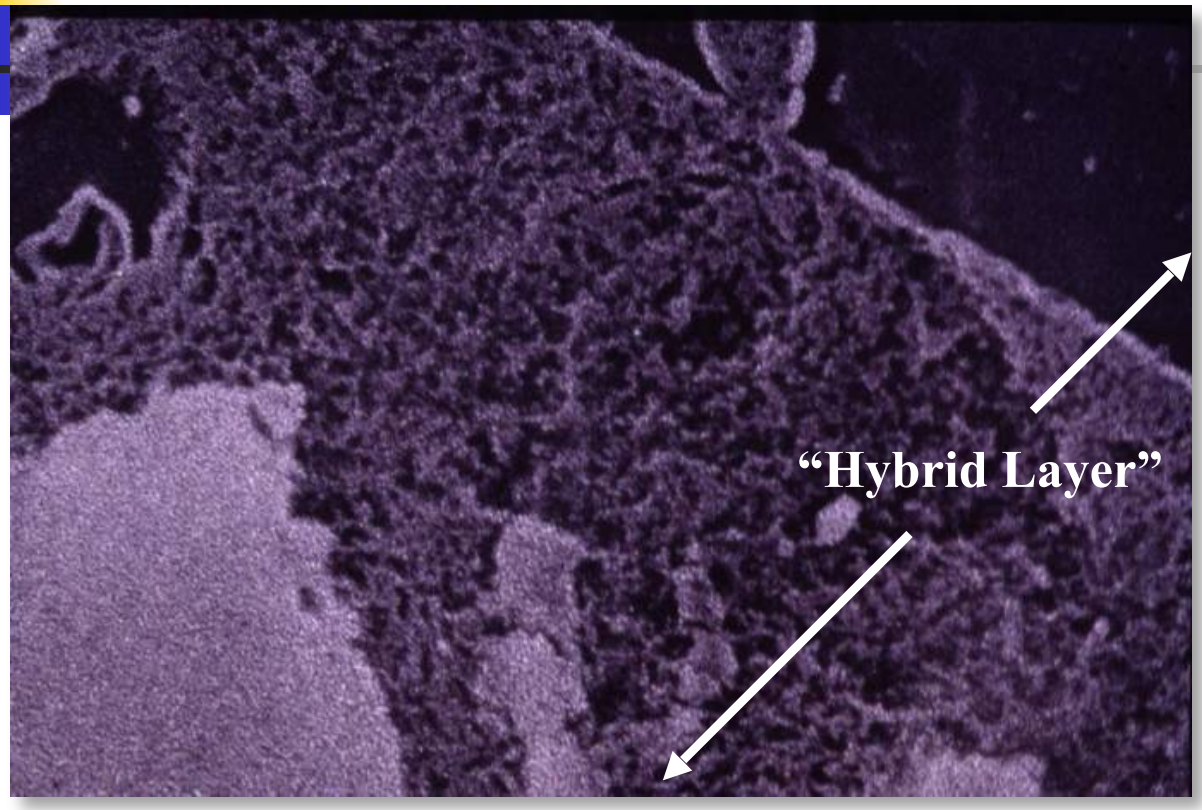
- Hydrophilic monomers
  - HEMA, BPDM etc
- Acidic monomers in self-etching
  - carboxylic acid or methacrylated phophates
- Solvent – up to 90%
  - acetone
  - ethanol-water
  - primarily water

Hybridization of Dentin

hybrid zone A layer of dentin that contains resin. Produced by etching and resin diffusion.

Nakabayashi showed
- the acid demineralizes the dentin
- collagen fibers are exposed
- hydrophilic resins infiltrate the collagen
- bonding agent must be hydrophilic and hydrophobic

Hybridization of Dentin



hybrid zone A layer of dentin that contains resin. Produced by etching and resin diffusion.

Nakabayashi showed

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- collagen fibers are exposed
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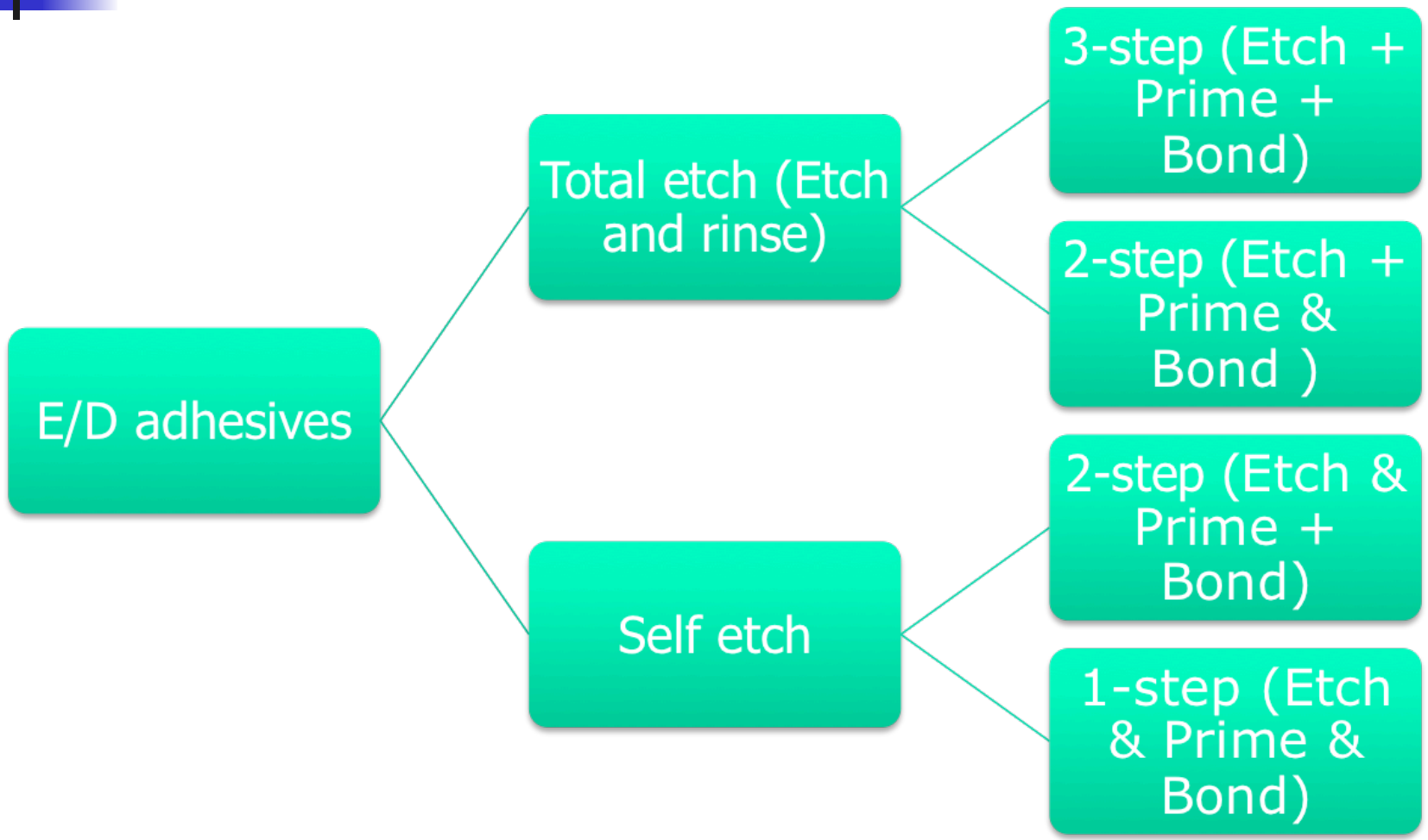
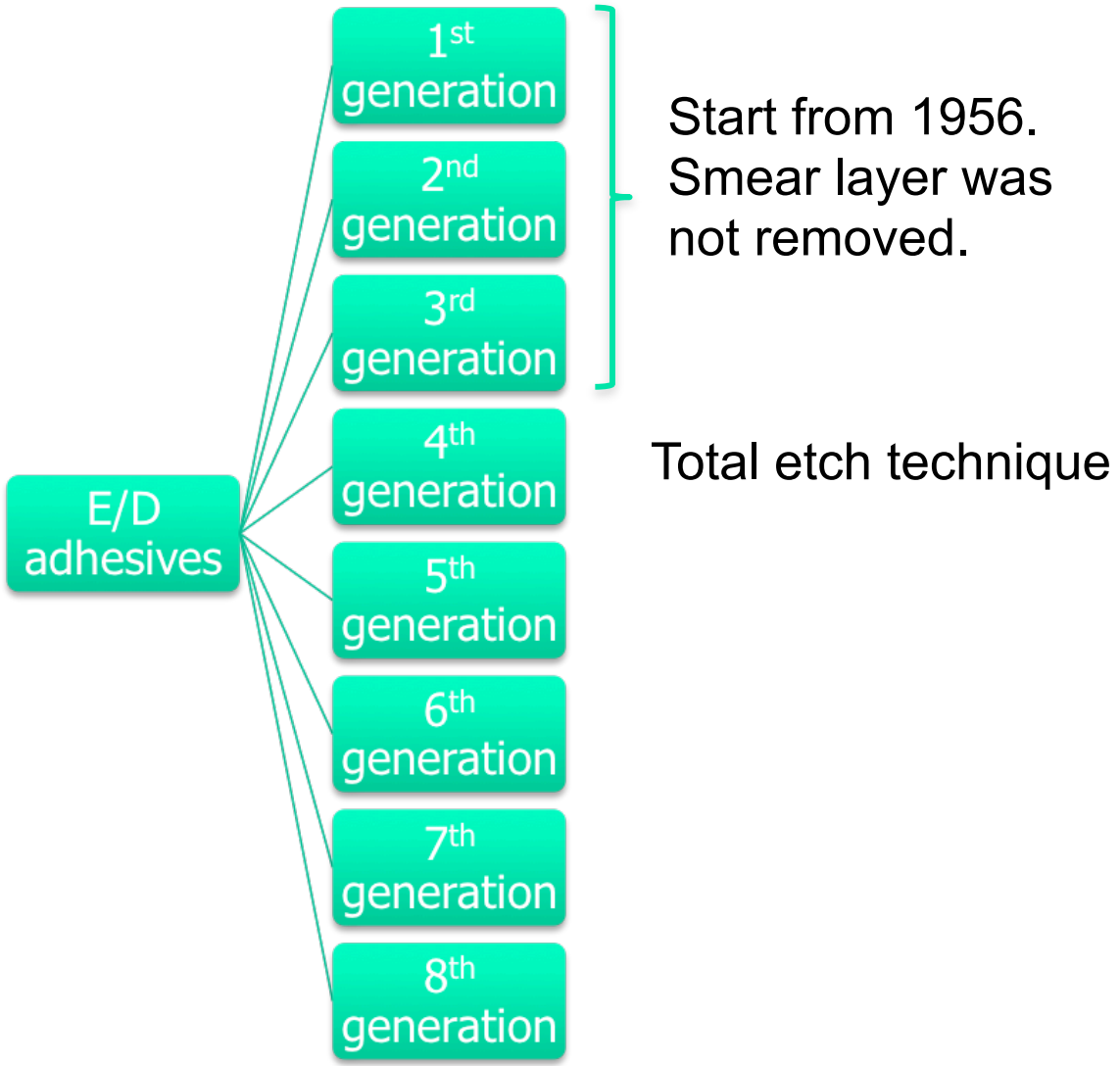
- bonding agent must be hydrophilic and hydrophobic

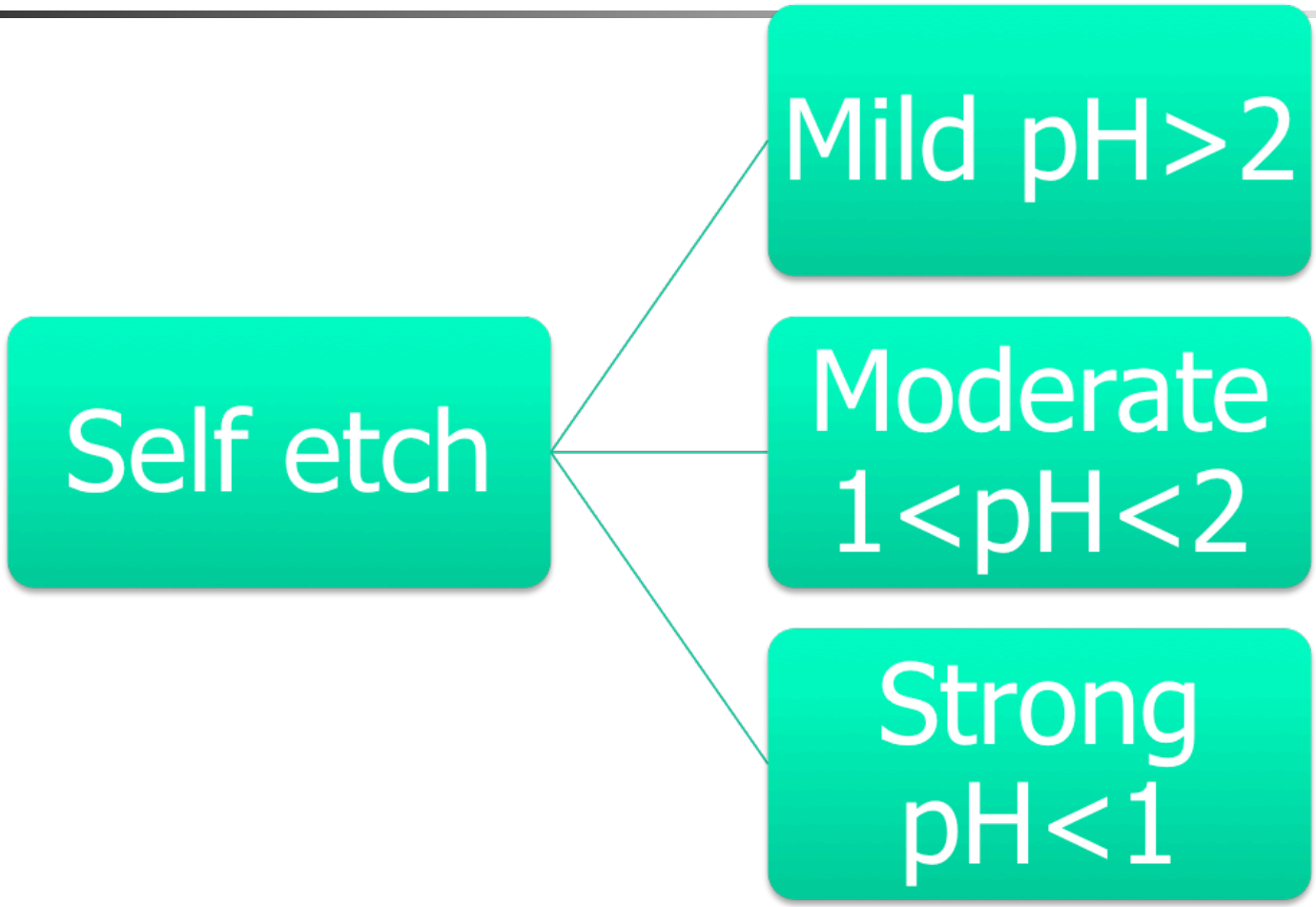
Enamel/Dentin Adhesive Systems



Enamel/Dentin Adhesive development



Self-etch Classification #2



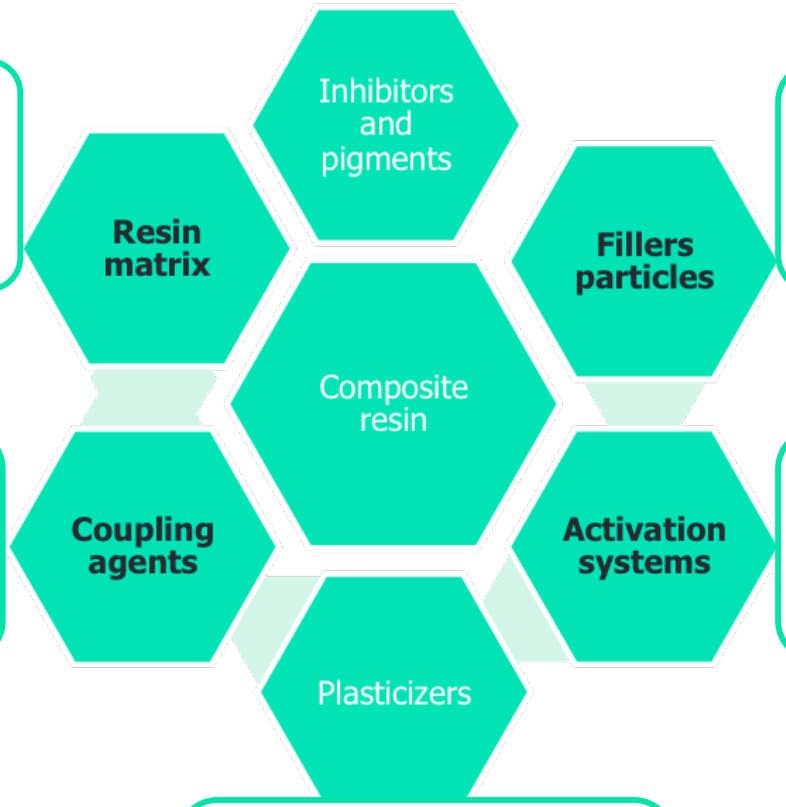
Composite

- A material composed of 2 or more constituents: dispersed phase and a matrix phase.

- The term resin composite refers to the cross-linked polymer matrix reinforced by a dispersion of inorganic fillers.

Craig's, 2012)

COMPOSITE CHEMISTRY



Monomer joined together to form a polymer, Physical characteristics improve by combining more than one type of monomer

reduce shrinkage upon curing and improve Physical properties

improve adherence of resin to filler surfaces.

systems including heat, chemical and photochemical initiate polymerization.

solvents that contain catalysts added into resin.

INDICATIONS OF DENTAL COMPOSITES

- 1) Class-I, II, III, IV, V & VI restorations.
- 2) Foundations or core buildups.
- 3) Sealant & Preventive resin restorations.
- 4) Esthetic enhancement procedures.
- 5) Luting
- 6) Temporary restorations
- 7) Periodontal splinting.

CONTRAINDICATIONS OF DENTAL COMPOSITES

- 1) Inability to isolate the site.
- 2) Excessive masticatory forces.
- 3) Restorations extending to the root surfaces.

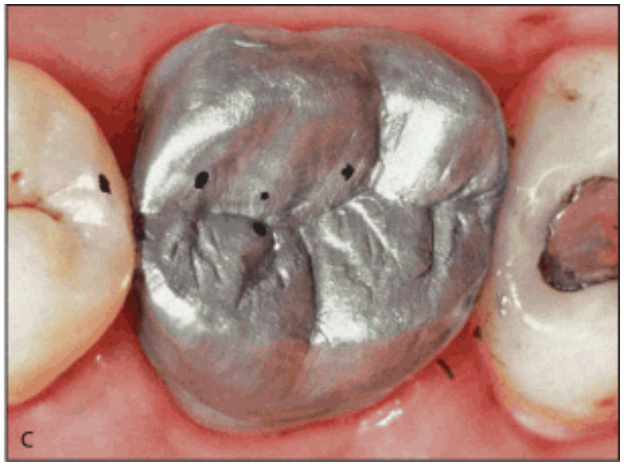
ADVANTAGES OF DENTAL COMPOSITES

- 1) Esthetics
- 2) Conservative tooth preparation.
- 3) Insulative.
- 4) Bonded to the tooth structure.
- 5) repairable.

DISADVANTAGESOF DENTAL COMPOSITES

- 1) May result in gap formation when restoration extends to the root surface.
- 2) Technique sensitive.
- 3) Expensive
- 4) May exhibit more occlusal wear in areas of higher stresses.
- 5) Higher linear coefficient of thermal expansion.

Treatment of Grossly Carious Teeth

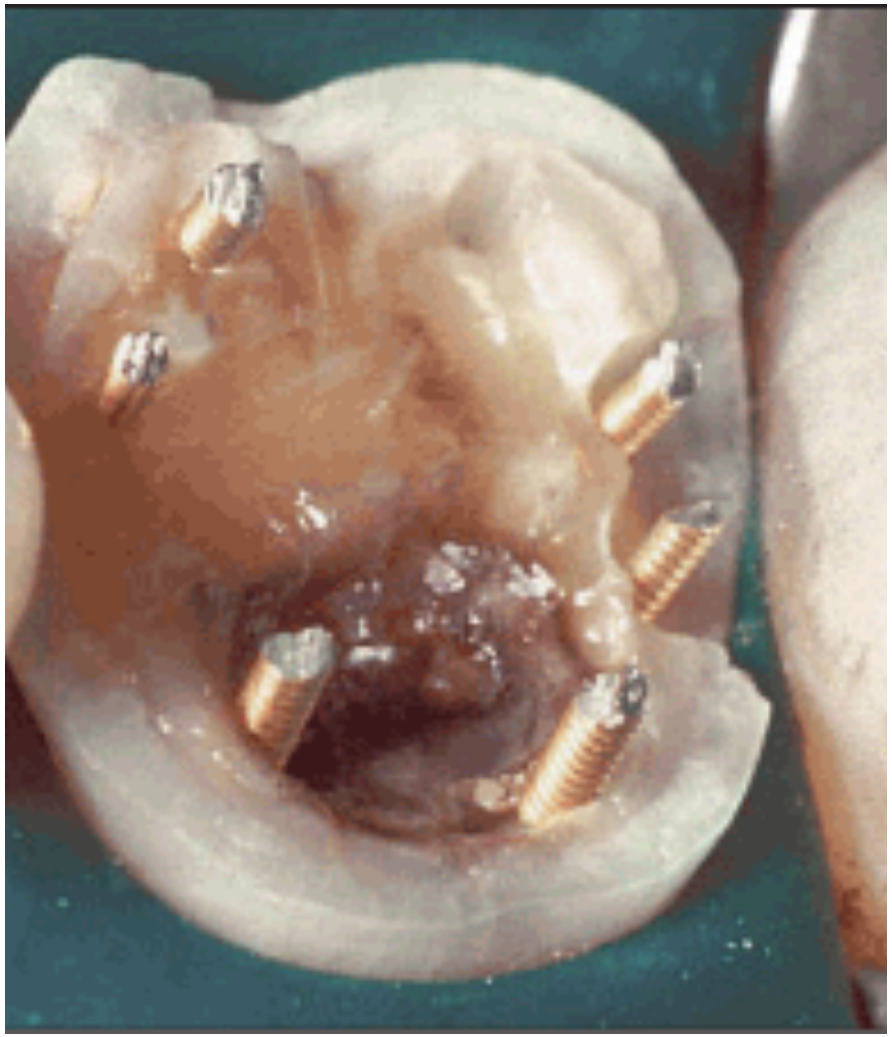


Treatment options for grossly carious teeth

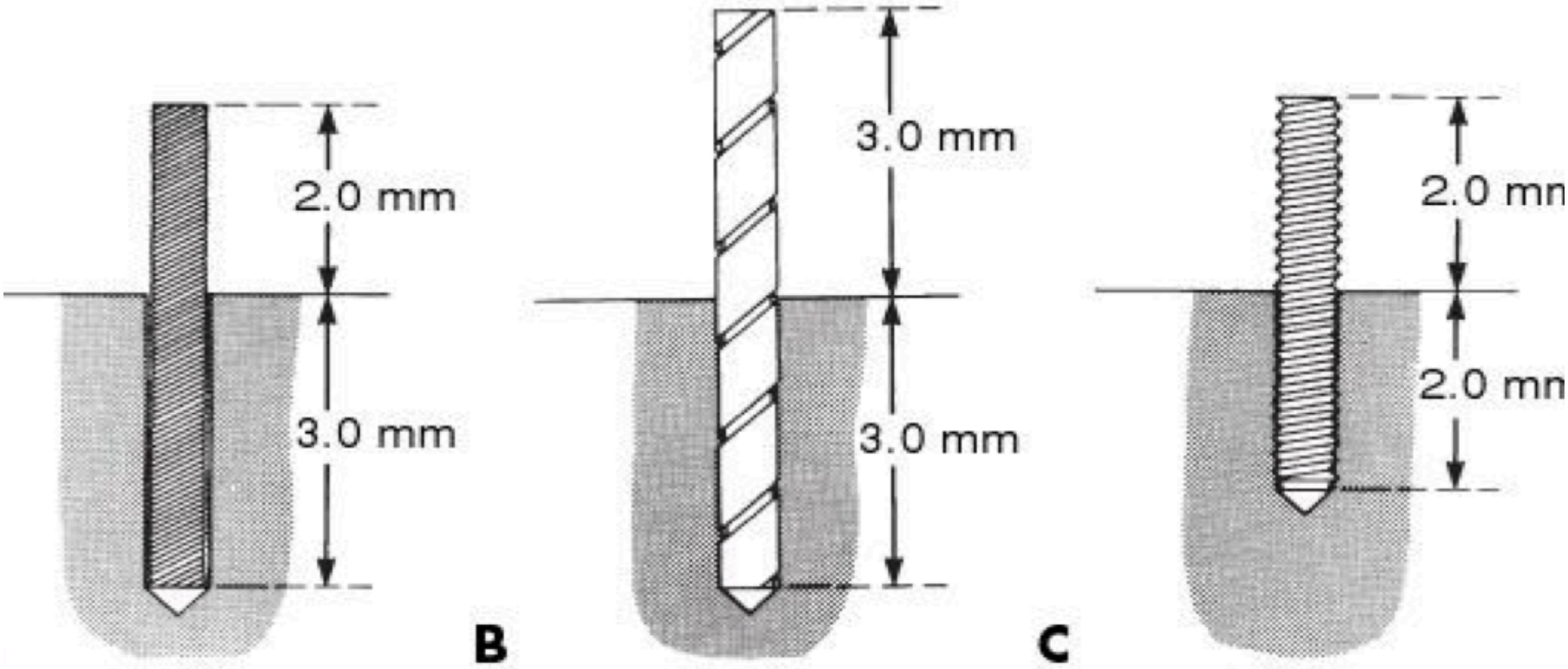
- **Direct restorations**
- Amalgam (bonded, pin retaind, slot retained, and Amalgam foundation)
- Composite (restorative material or foundation under indirect restorations).

- **Indirect restorations**
- Indirect composite
- Inlays
- Onlays
- ¾ crowns
- crowns

Generally pins are placed whenever satisfactory retention and resistance forms cannot be established with other means of Retention such as undercuts, grooves, slots…



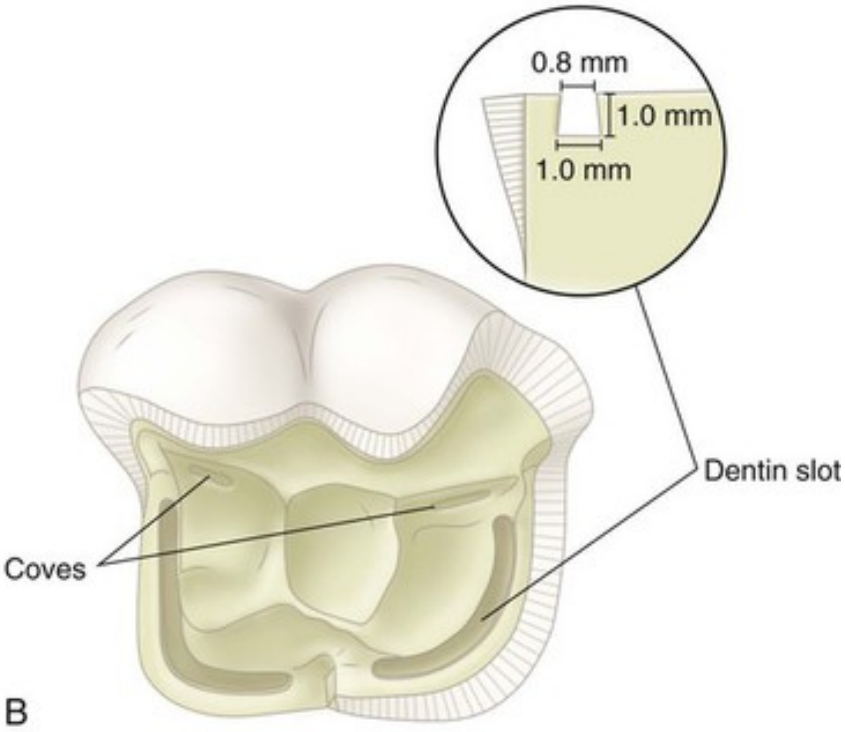
Types of pins



-11 **Three types of pins. A,** Cemented. **B,** Friction-locked. **C,**

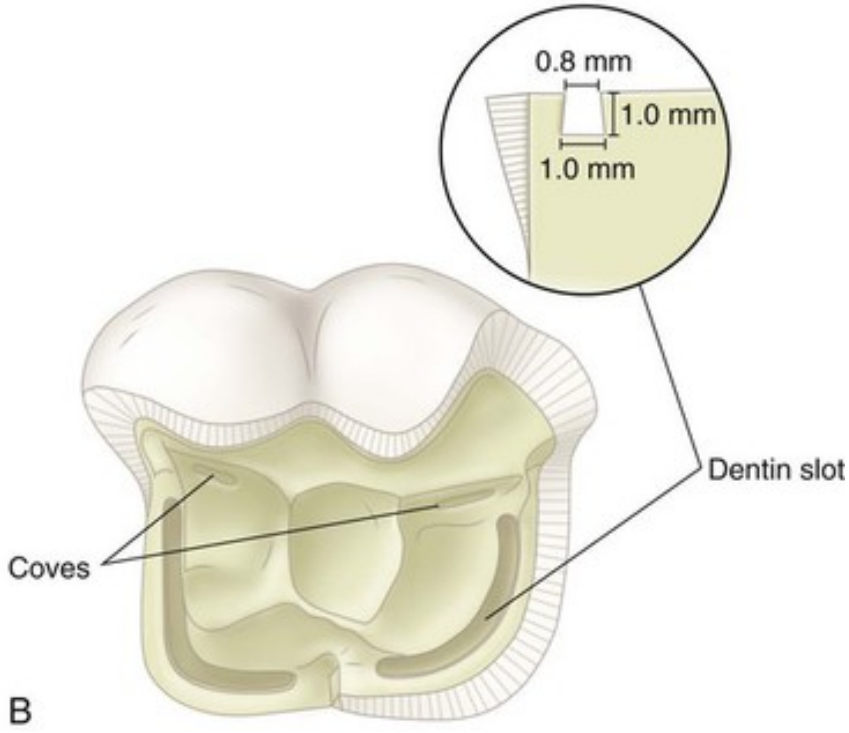
2. Slot retained amalgam

- A slot is **a retention groove placed in dentine in a horizontal plane.**
- It may be **used in conjunction with pin retention or as an alternative to it.**
- Slots are particularly **indicated in short clinical crowns** and **in cusps that have been reduced 2-3 mm for amalgam**
- More tooth structure is removed in making slots than pins.
- Slots are less likely to create microfractures, to perforate the tooth or penetrate the pulp.



Tooth preparation for slot retained restoration

- They are usually placed **on any aspects of the preparation on the gingival floor 0.5mm axial to the DEJ.**
- It may be **continuous or segmented** depending on the amount of tooth structure missing and whether pins are to be used or not.
- It should be **at least 0.5mm in depth and 1mm long.**



Retentive means for composite

1. Grooves
2. Slots
3. Locks
4. Pins (not as esthetic as previous options).
5. Wider bevels or flares on accessible enamel margins to increase the surface available for bonding
6. Using the root canals.

should be place in sound areas of dentin to avoid undermining enamel.

Teeth Discoloration etiology and diagnosis

Alaa Sabrah
BDS, MSD, PhD

Discoloration: the process of changing to a different, less attractive color.

Intrinsic

- located within the tooth
- accessible only by bleaching.

extrinsic

- located on the surface of the tooth
- most easily removed by external cleaning.

Discoloration: the process of changing to a different, less attractive color.

- Poor oral hygiene (chromogenic bacteria).
- Dietary and environmental factors (tobacco use, coffee, tea, cola, chemical reagents, fumes or pigment aerosols).
- Saliva, mucin, plaque and blood pigments.
- Medications.

Discoloration: the process of changing to a different, less attractive color.

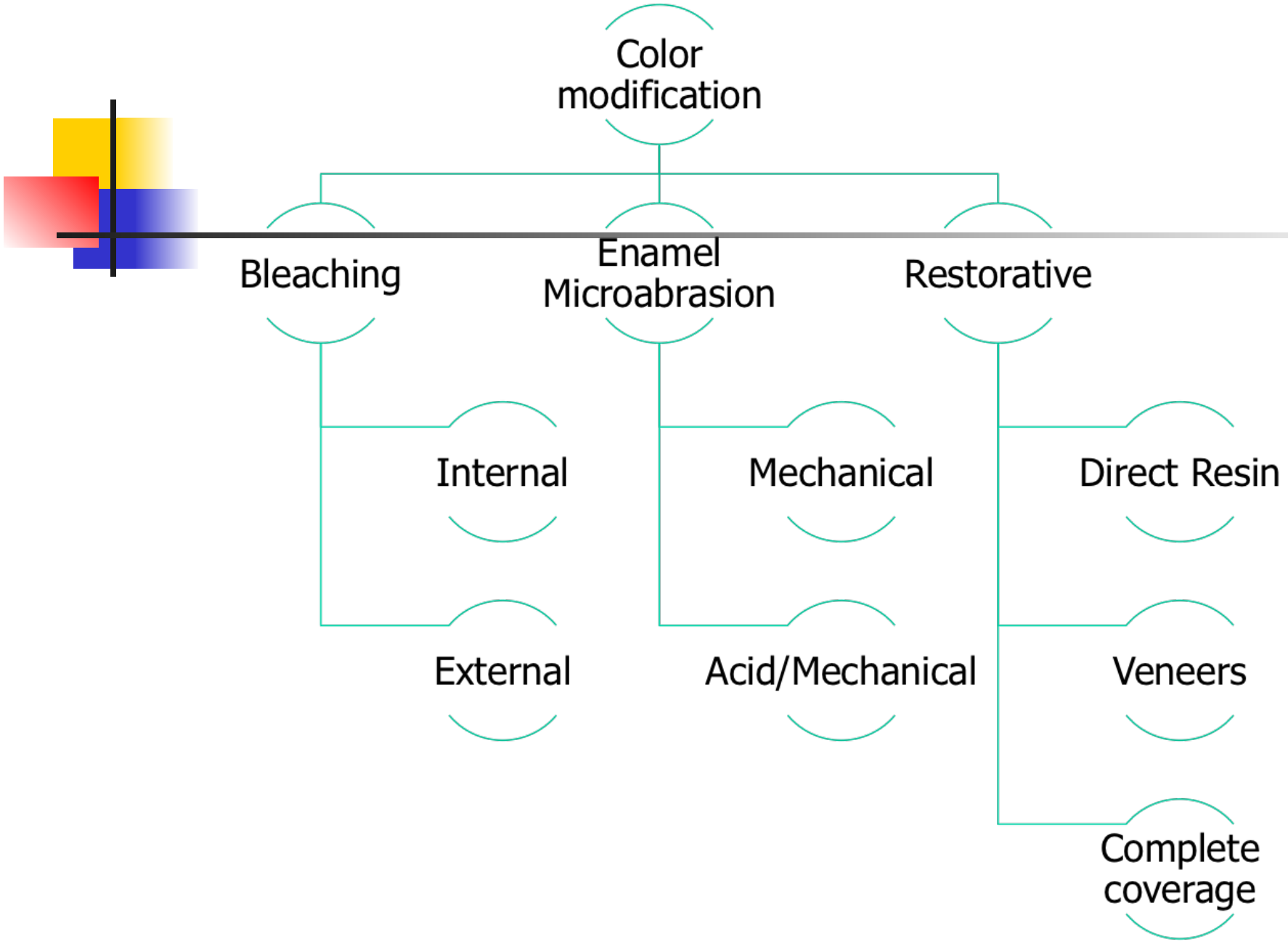
Pre-Eruptive Discoloration

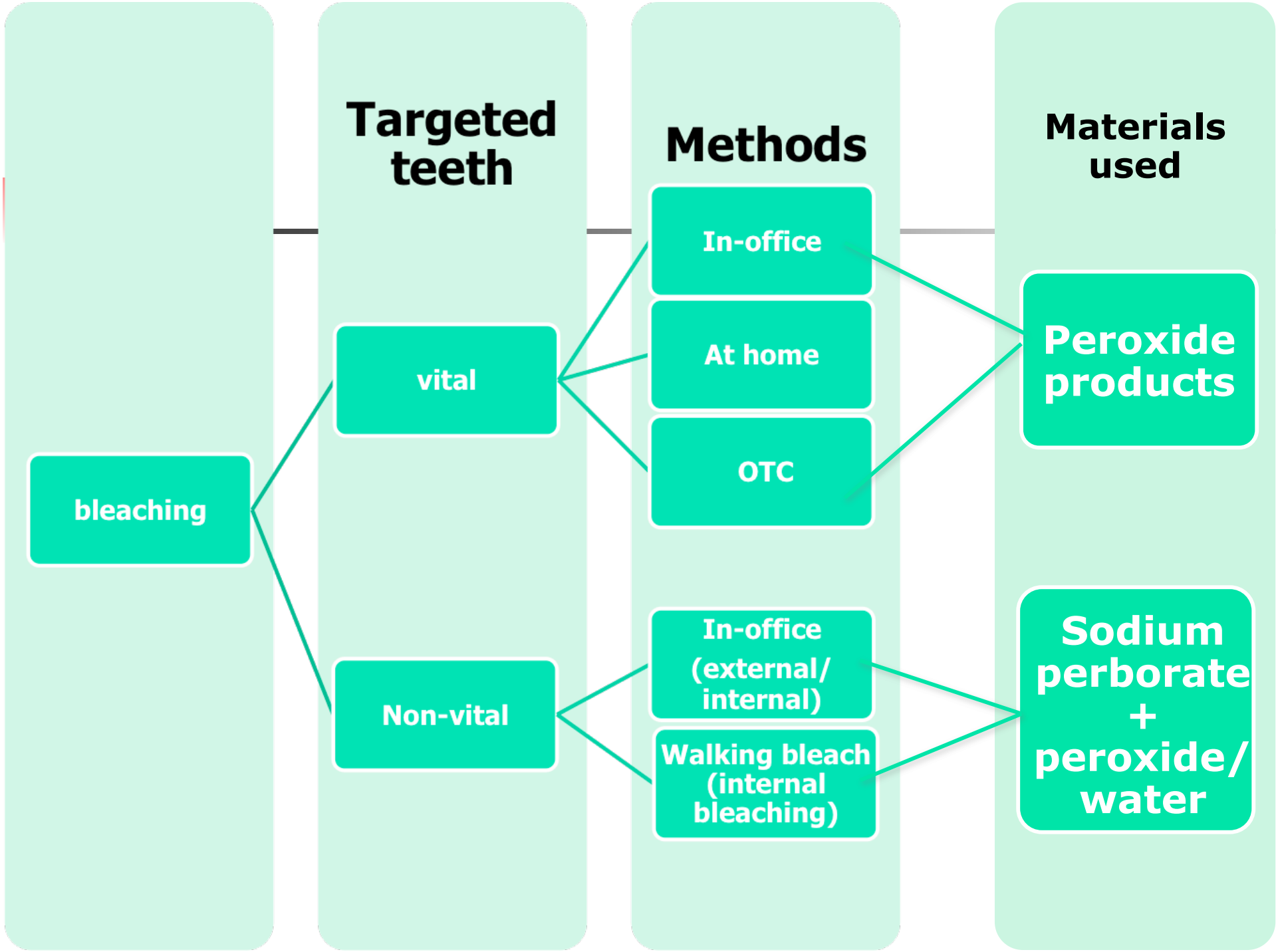
- Tetracycline medication,
- Endemic fluorosis.
- Severe jaundice in infancy.
- Porphyria.
- Erythroblastosis fetalis.
- Alkaptonuria.
- Sickle cell anemia
- Thalassemia
- Amelogenesis imperfecta.
- Dentinogenesis imperfecta.

Discoloration: the process of changing to a different, less attractive color.

Post-Eruptive Discoloration

- Aging,
- Microcracks in the enamel,
- Tetracycline medication,
- Dental caries.
- Restorations
- Thinning of the enamel layer
- Ingestion of chromogenic foods and drinks.
- Tobacco use.
- Medical situations and conditions.
- Traumatic injury.
- Idiopathic pulpal recession.


Color modification
Bleaching
Enamel Microabrasion
Restorative
Internal
External
Mechanical
Acid/Mechanical
Direct Resin
Veneers
Complete coverage


bleaching
Targeted teeth
vital
Non-vital
Methods
In-office
At home
OTC
In-office (external/ internal)
Walking bleach (internal bleaching)
Materials used
Peroxide products
Sodium perborate + peroxide/ water

MICROABRASION

INDICATIONS

- Superficial discolorations in enamel
- Permanent removal of stains 0.1-0.2mm deep.
- Fluorosis stains/ Hypocalcified (white) spots.

MICROABRASION

MECHANISM

- Physical removal through:
  - STRIPPING action of acid (Plus oxidation)
  - ABRASIVE action of pumice.

NOTE: Combination of acid/pumice less destructive to tooth structure than abrasives alone.

MICROABRASION

MATERIALS/PRODUCTS

- "MIX IT YOURSELF" – 18% HCl
- **36% hydrochloric acid (Pharmacy/chemical supply)- Mix 1:1 with distilled water = 18% HCl.**
- **Mix acid with flour of pumice – apply by hand rubbing only- NO ROTARY APPLICATION.**

MICROABRASION

MATERIALS/PRODUCTS

- COMMERCIAL PRODUCTS – 6-8 % HCl

  - **PREMA – Premier Dental Products**

  - **OPALUSTRE – Ultradent Products**

USE EITHER HAND OR ROTARY APPLICATION.

MICROABRASION

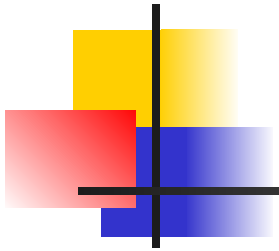
RISKS

- EXCESSIVE REMOVAL OF ENAMEL.
- CHEMICAL BURNS/ SOFT TISSUE IRRITATION
- INCRESED ROOT SURFACE SENSITIVITY

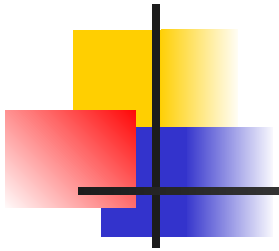
INDIRECT RESTORATIONS

Metal-ceramic Restorations

- Became viable in the late 1950's
- Relatively long track record
- Reported survival rate of 94.5% after 5 years
  - Sailer I et al. A systematic review of the survival and complication rates of all-ceramic and metal-ceramic reconstructions after an observation period of at least 3 years. Part II: Fixed dental prostheses. *Clin Oral Implants Res*. 2007 Jun;18 Suppl 3:86-96.



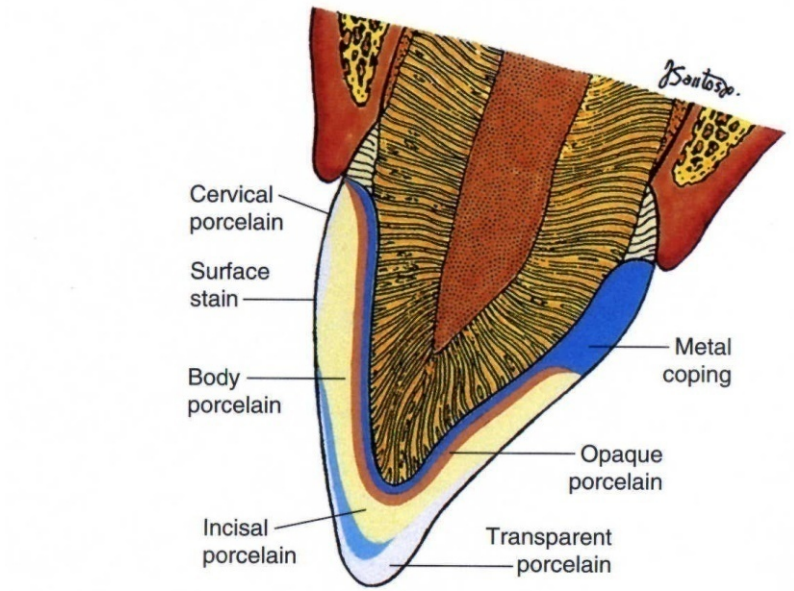
- Adaptation of the intaglio (internal) surface needs to be same as cast
- Metal strength and ductility compensates for brittle behavior of ceramic
- Mechanical properties suitable to support occlusion and FPD



- Low wear of occlusal surface, risk of increased opposing wear – particularly with high-fusing porcelain
- No staining at M-C interface
- Reasonably conservative preparations

Esthetic Challenge

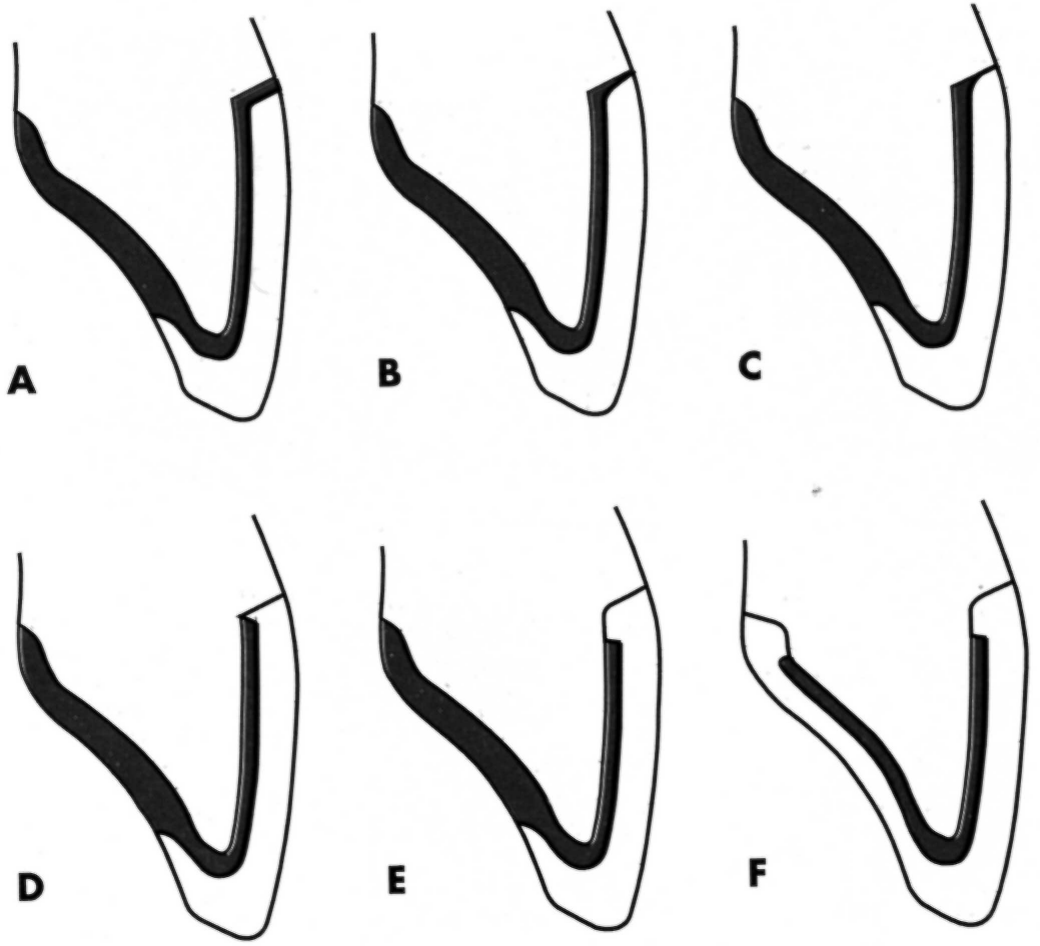
- Masking the color of the dark metal coping
- Significant problem: alloys with dark oxides
- Significant problem: labial margin



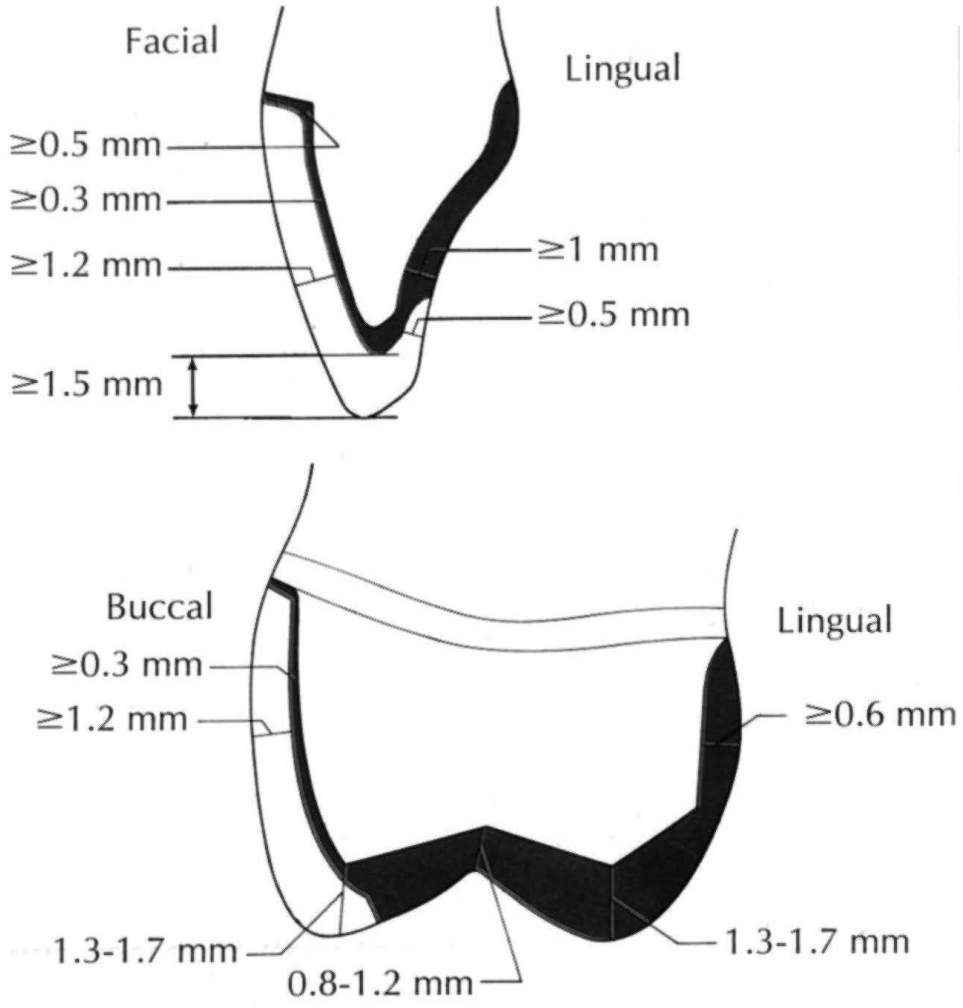
Cross-section of a metal-ceramic crown.

Alternative labial margin designs

- Subgingival labial margin
  - Periodontal concerns
  - Gingival recession
  - Excessive tooth reduction
- Supragingival labial margin
  - Hiding the metal collar



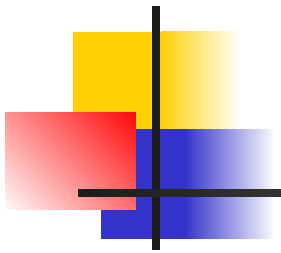
Mechanical and aesthetic considerations



- To insure good esthetics and adequate strength, significant tooth reduction is required

Disadvantages of the metal-ceramic FPD

- More tooth reduction than all metal restoration
- Esthetics may be compromised by dark metal coping, particularly at labial margin
- Expensive to fabricate
- May be objectionable to patients who want metal free dentistry



- Many m-c restorations fabricated with base metal copings, usually Ni-Cr.
  - Allergic potential of Ni based alloys
- Noble metal m-c alloys often contain significant amounts of Pd
  - Some evidence for reaction of Pd alloys with gingival tissues.

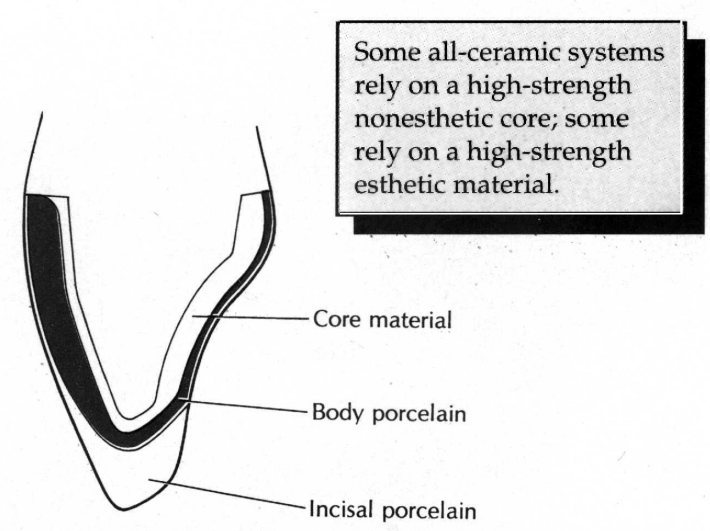
All-Ceramic Restorations

- Provide the most esthetically pleasing restorations currently available
- Restoration of choice for anterior fixed restoration?
- Historically - porcelain jacket crown was earliest esthetic fixed restoration
  - 1887: CH Land - patent on Pt foil matrix technique for PJC

PJC

- high fracture incidence
- Suitable only for low stress applications
- Relatively poor marginal adaptation
- Difficult to fabricate
- Development of m-c system significantly reduced use

- Approaches to improved ceramics
  - Develop stronger ceramic materials
  - Use a two material approach
    - High strength, opaque core material
    - Lower strength esthetic veneer porcelain
    - Similar in principle to m-c system; has some of same disadvantages – masking core, tooth reduction needed for two layers



Stronger ceramics

- Early dental porcelains were primarily feldspathic glasses (SiO_2) with small amounts of crystalline leucite
- McLean (1965) introduced alumina ceramic core material overlaid with feldspathic glass veneer.
  - Improvement over feldspathic porcelain but still limited to low stress applications
  - Problems with marginal fit
  - Difficult and expensive to fabricate
- Glass-ceramic composites
  - Dicor
  - High leucite content feldspathic porcelain – IPS Empress

- High lithium disilicate glass ceramics
  - Empress 2; e-max
- Lithium phosphate glass ceramics
  - Empress Cosmo (ceramic posts)
- Glass infiltrated alumina core ceramics
  - In-Ceram Alumina
  - In-Ceram Spinell
  - In-Ceram Zirconia
- Zirconium Oxide ceramics
  - Lava
  - Cercon
  - BruxZir

Ceramic Structure Options

- Feldspathic — VITABLOCS Mark II and Esthetic Line; VITA TriLuxe
- Leucite — IPS Empress and ProCAD; Optimal Pressable Ceramic
- Lithium disilicate — IPS Empress 2 and e.max
- Alumina — In-Ceram Alumina, Procera
- Zirconia — In-Ceram Zirconia, Lava, Cercon

PORCELAIN VENEERS

Common Indications

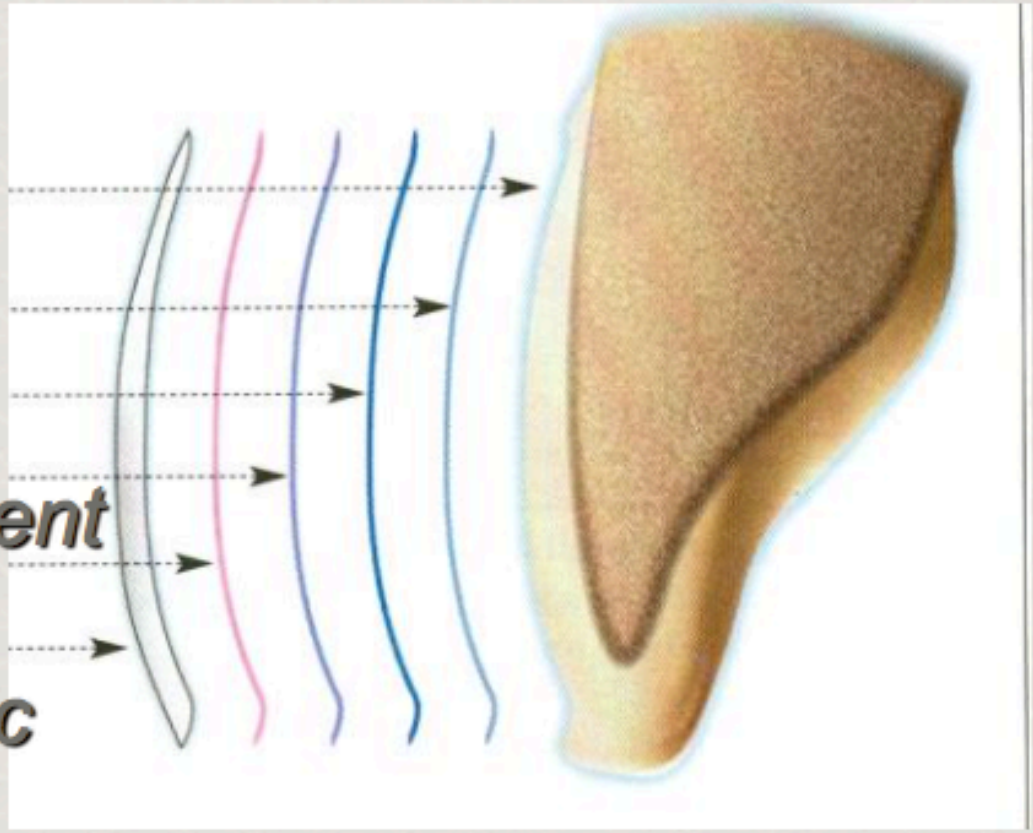
- *Discoloration*
- *Enamel Defects*
- *Diastema*
- *Multiple Resin Restorations*
- *Slight Malposition and Malformation*

Contraindications

- *Lack of enamel*
- *Deciduous teeth*
- *Excessive wear*
  - *Parafunctional habits (eg. nail biting)*
  - *End to end occlusion*
  - *No posterior teeth*

Porcelain Veneer Anatomy

Etched enamel
Bonding agent
Resin cement
Bonding agent
Silane coupling agent
Etched porcelain/ceramic



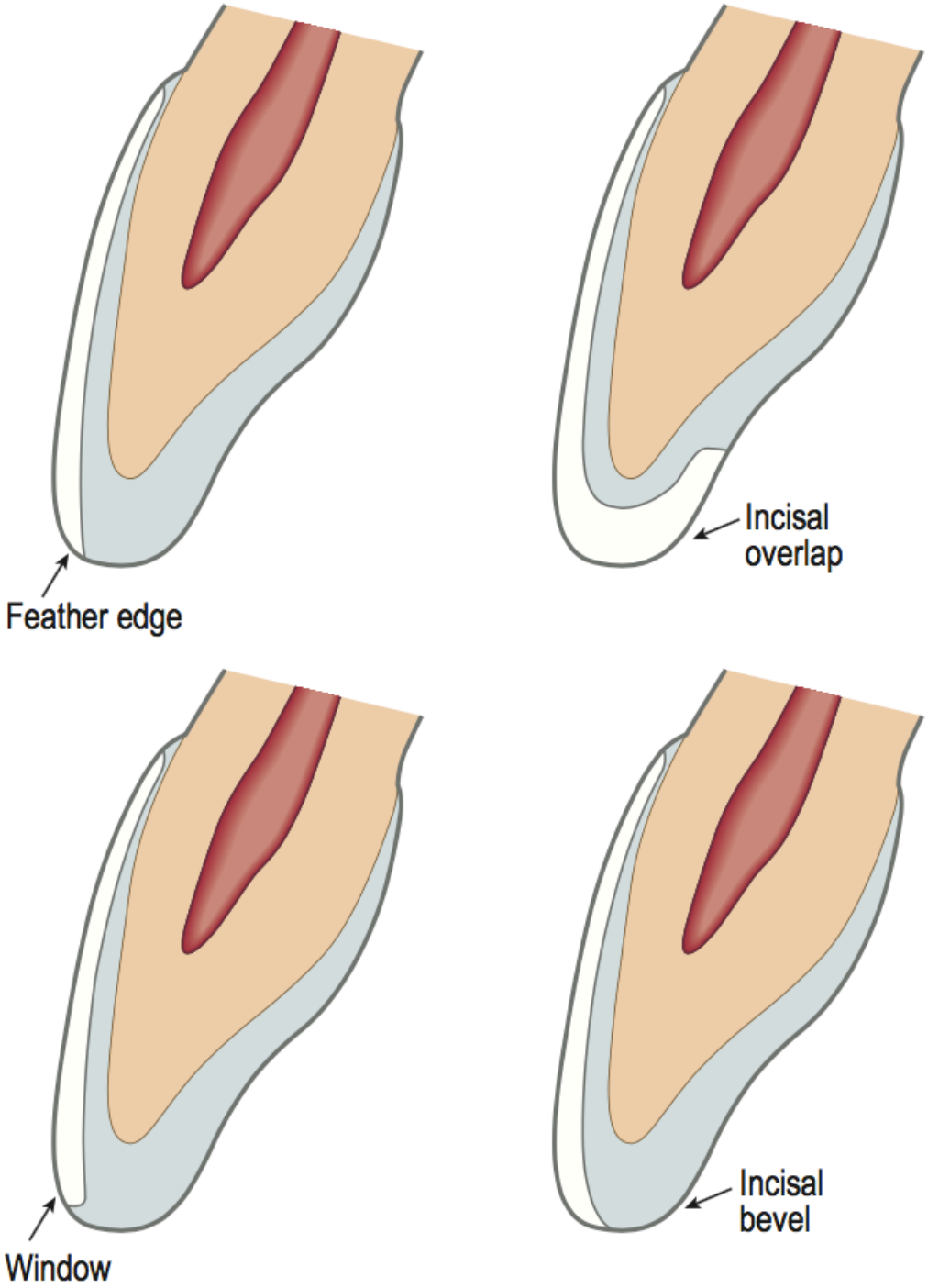


Figure 12.21 Various types of incisal preparation that have been described for veneers.

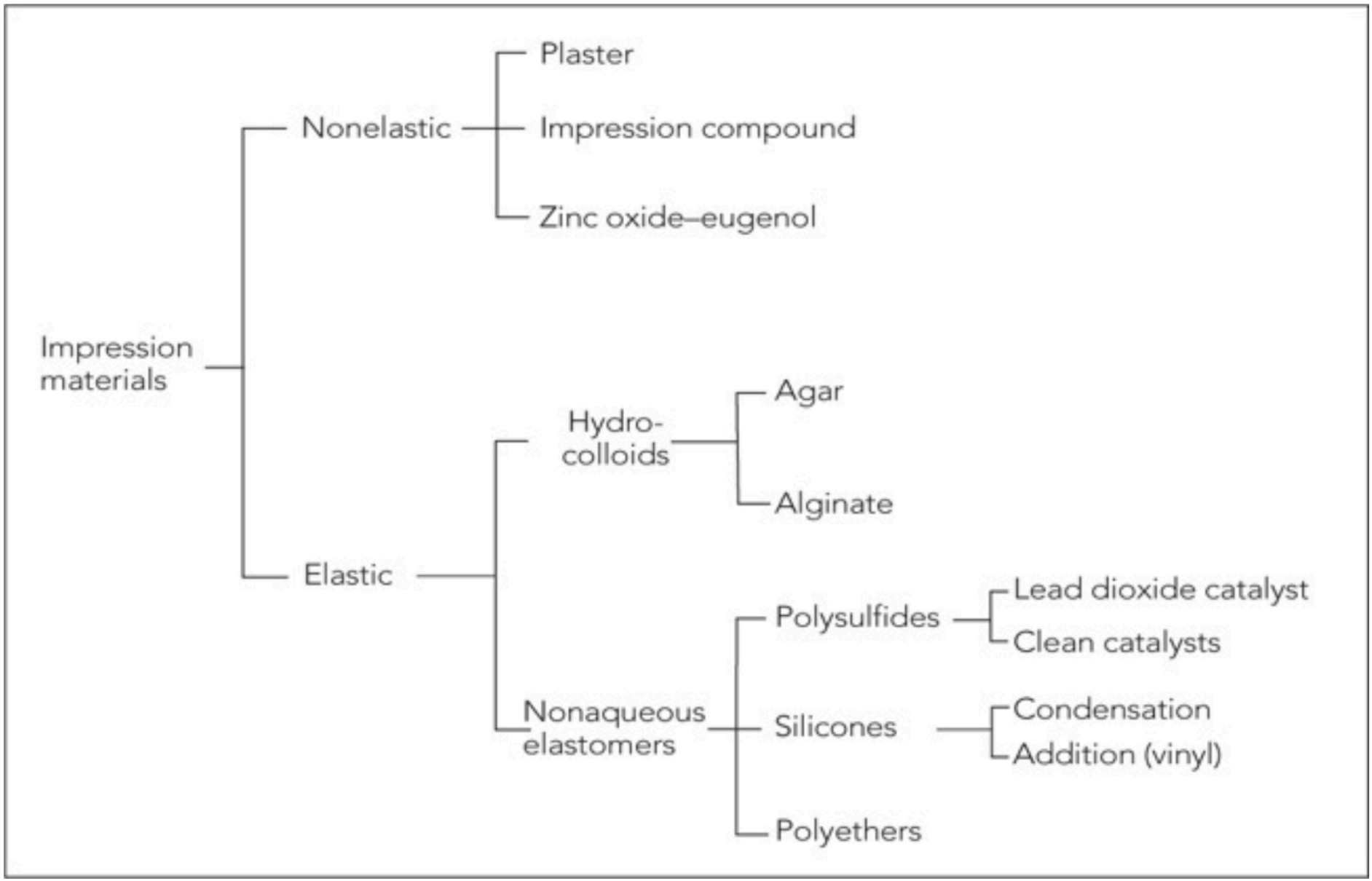


Fig 7-1. A classification for impression materials.

Table 7-1. Properties of elastomeric impression materials*

	AGAR	ALGINATE	POLYSULFIDE	CONDENSATION SILICONE	ADDITION SILICONE	POLYETHER
Elastic recovery (%)	98.8	97.3	96.9-94.5	99.6-98.2	99.9-99.0	99.0-98.3
Flexibility (%)	11	12	8.5-20	3.5-7.8	1.3-5.6	1.9-3.3
Flow (%)	—	—	0.4-1.9	< 0.10	< 0.05	< 0.05
Reproduction limit (um)	25	75	25	25	25	25
Shrinkage, 24 hours (%)	—	—	0.4-0.5	0.2-1.0	0.01-0.2	0.2-0.3
Tear strength (g/cm)	700	380-700	2,240-7,410	2,280-4,370	1,640-5,260	1,700-4,800

*See glossary for definitions of terms.

Table 7-3. Handling properties of elastomeric impression materials*

	AGAR	ALGINATE	POLYSULFIDE	CONDENSATION SILICONE	ADDITION SILICONE	POLYETHER
Preparation	Boil, temper, store	Powder, water	2 pastes	2 pastes or paste-liquid	2 pastes	2 pastes
Handling	Complicated	Simple	Simple	Simple	Simple	Simple
Ease of use	Technique sensitive	Good	Fair	Fair	Good	Good
Patient reaction	Tedious, thermal shock	Pleasant, clean	Unpleasant, stains	Pleasant, clean	Pleasant	Unpleasant, clean
Ease of removal	Very easy	Very easy	Easy	Moderate	Moderate	Moderate to difficult
Working time (min)	7-15	2.5	5-7	3	2-4.5	2.5
Setting time (min)	5	3.5	8-12	6-8	3-7	4.5
Stability	1 h at 100% RH	Immediate pour	1 h	Immediate pour	1 w	1 w kept dry
Wetting and ease of pouring	Excellent	Excellent	Excellent	Fair	Fair to good	Good
Die material	Stone	Stone	Stone	Stone	Stone	Stone
Electroplating	No	No	Yes	Yes	Yes	Yes
Disinfection	Poor	Poor	Fair	Excellent	Excellent	Fair
Comparative	Low	Very low	Low	Moderate	High to very high	Very high