Pediatric Dentistry

Current Practices & Trends

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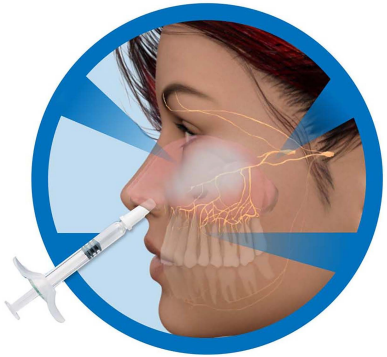
New Trends in Procedures & Materials

Anesthesia

Painless Injection Techniques



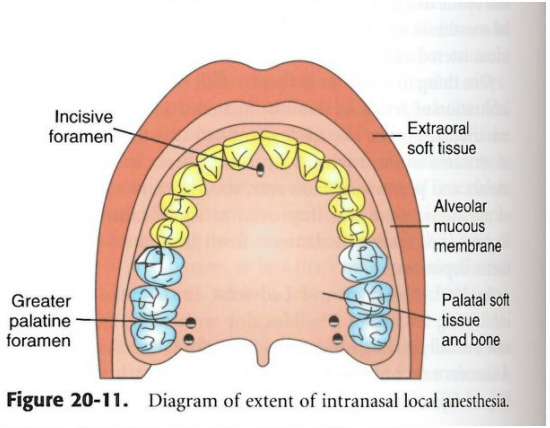


Figure 20-11. Diagram of extent of intranasal local anesthesia.

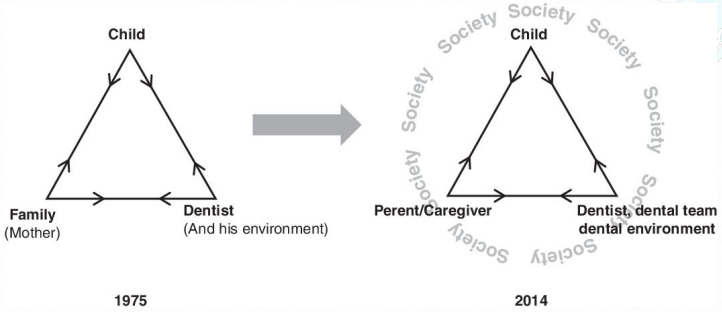
The Wand STA™

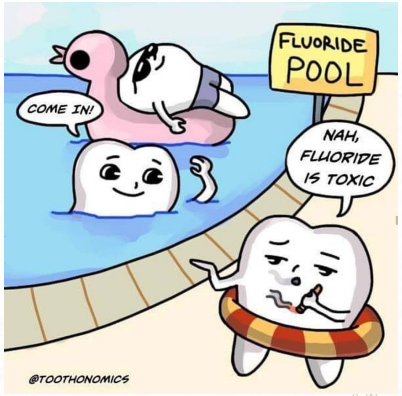
Controlled Dental Anaesthesia

Behavior Guidance

Attitudes toward Dentistry

- Dr. Google
- More concern regarding amalgam and mercury, resins and BPA, metal, esthetics etc.
- Trend for more preventative or minimally invasive measures
- COVID-19 → shift to more teledentistry
- Anti-fluoride, anti-vaxx etc.
- More substance use





Techniques

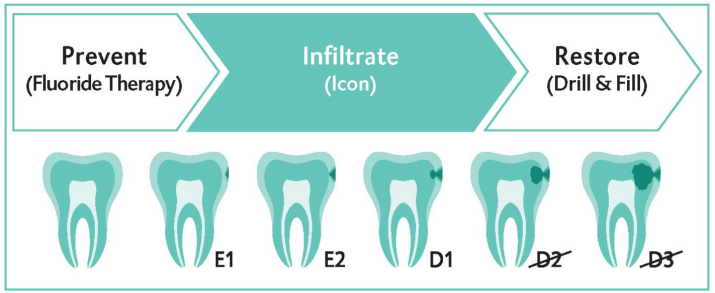
- **Tell-Show-Do**
  - Get on eye level
  - Age appropriate language
- **Positive encouragement**
- **Voice control** - telling the patient respectfully yet firmly that some behaviors are unacceptable)
- **Memory restructuring**
- **Behavior guidance for parent** - silent supportive partner, let the provider explain procedure, warn them to not squeeze when anesthesia is given/extraction
- Less medical stabilization and conscious sedation → more GA

Goals are not to “deal with” a child’s behavior but rather to enhance communication and partner with the child and parent to promote a positive attitude and optimal oral health

Materials & Procedures

Resin Infiltration

- Conservative treatment for early enamel and interproximal lesions
- Goal is to allow penetration of a low viscosity resin into the porous lesion body of enamel caries
- Esthetic results on smooth surfaces
- Arrests caries at an early stage [micro-invasive technology fills and reinforces demineralized enamel up to the first third of dentin (D1)]
- Preserves healthy tooth structure
- No anesthesia or drilling
- One quick patient visit



SMART
(SILVER MODIFIED ATRAUMATIC RESTORATIVE TECHNIQUES)
& SILVER DIAMINE FLUORIDE (SDF)

Patients who may benefit from SDF include those:

- With high caries risk who have active cavitated lesions
- Presenting with behavioral or medical management challenges
- Multiple cavitated lesions that may not all be treated in one visit
- With dental caries lesions that are difficult to treat
- Without access to or with difficulty accessing dental care

Criteria for **tooth selection** include:

- No clinical signs of pulpal inflammation or reports of spontaneous pain
- Cavitated caries lesions that are not encroaching on the pulp
    - Radiographs should be taken to assess depth of caries lesions
- Cavitated caries lesions on any surface as long as they are accessible with a brush for applying SDF (orthodontic separators may be used to help gain access to proximal lesions)

Active cavitated caries lesions before application of SDF

SDF-treated lesions with temporary gingival staining

Hall Technique

- Cementation of a SSC over a caries-affected primary molar without local anesthetic, caries removal, or tooth preparation
- May reduce discomfort from local anesthetic and caries removal at the time of treatment compared to fillings
- May add discomfort of placement of separator bands prior to the SSC, as well as the pain from biting crown into place
- 95.8% of primary teeth restored using the HT remained asymptomatic after a follow-up period of up to 77 months, compared to 95.3% in the conventional methods
- Associated with reduced treatment costs if general anesthesia or sedation is considered
- Both approaches were accepted favorably by the children and care providers

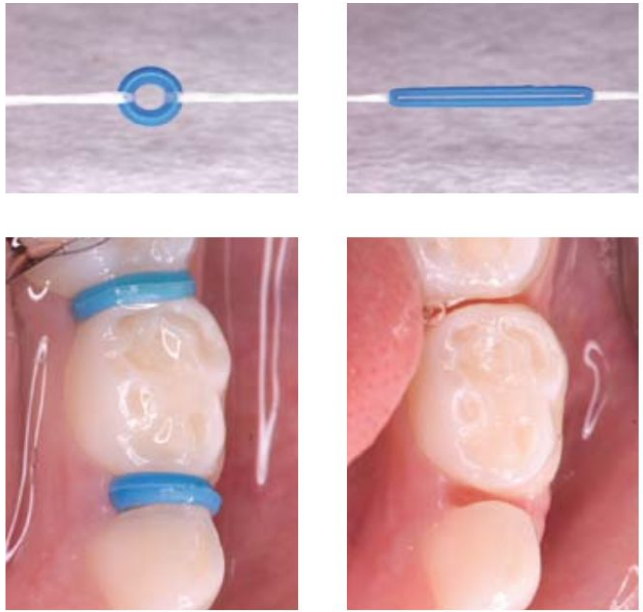


Figure 28.
The use of orthodontic separators to create space for fitting a Hall crown

The practical aspects of fitting a Hall Crown can be broken down into the following seven stages:

Step 1.
Assessing the tooth shape, contact points/ areas and the occlusion

Step 2.
Protecting the airway

Step 3.
Sizing a crown

Step 4.
Loading the crown with cement

Step 5.
Fitting the crown, and first stage seating

Step 6.
Wipe the excess cement away, check fit, and second stage seating

Step 7.
Final clearance of cement, check occlusion (adjusting crown if necessary) and discharge

Esthetic Restorations in Pediatric Dentistry

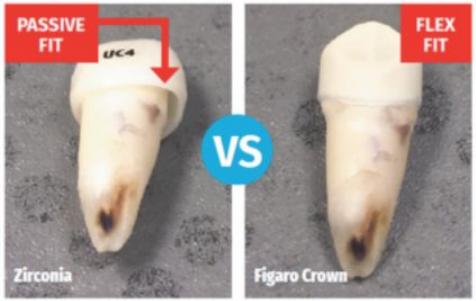
- Indications are the same as for SSC except where esthetic are also important
  - Extensive caries
  - Post pulp therapy
  - Tooth surface loss (erosion, abrasion)
  - Primary molar hypoplasia
  - Inherited defects of dentition
  - Traumatic injuries

Veneered SSC	Aesthetic, Restores form and function, all surfaces protection	Increased labial reduction, facing may fracture, damaged by heat sterilization	Allergy to metal and/or nickel
Zirconia Crowns	Aesthetic, biocompatible, Restores form and function, all surfaces protection	Equal reduction, and adjement requires special burs	Not knows

Figaro Crowns

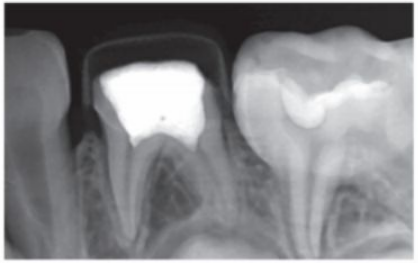
- ❏ Reinforced fiberglass
- ❏ Tooth colored
- ❏ BPA free
- ❏ Non-metallic
- ❏ High strength
- ❏ Flex-fit technology (crimpability)
- ❏ Thin margins
- ❏ Radiolucent on radiographs

Flex Fit Technology



With Figaro Crowns Flex Fit you can achieve a nice friction snap fit when seating the crown without the need to crimp.

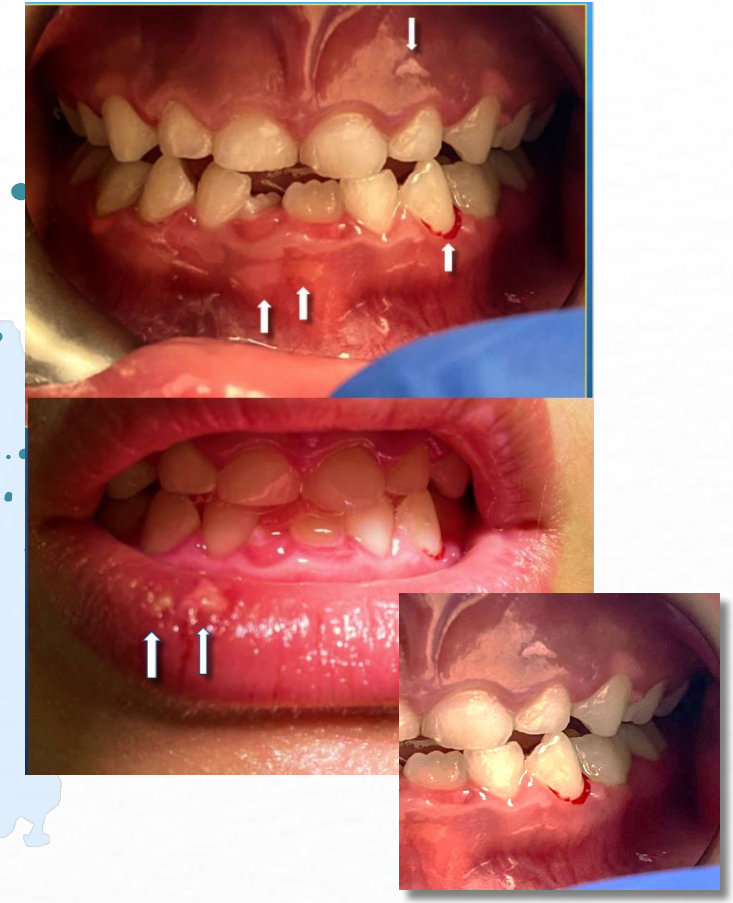
Less Retakes = Less Radiation



Figaro Crowns are radiolucent in x-rays. This allows the provider to monitor the entire tooth and interproximal caries without overlap.

Things to Look Out For

Primary Herpetic Gingivostomatitis



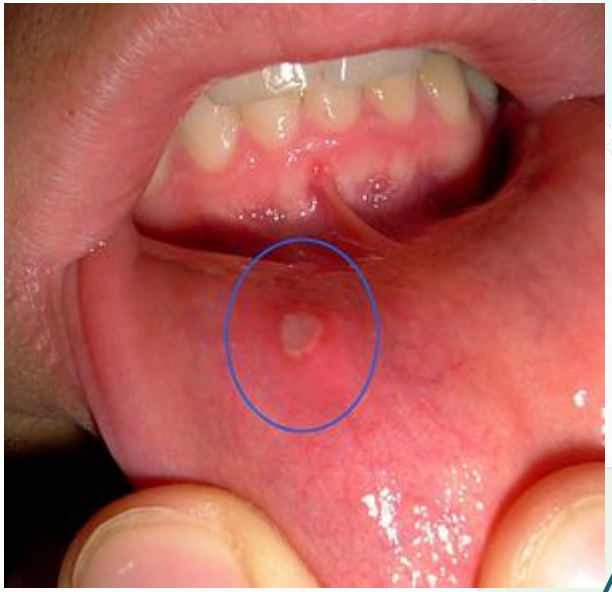
- Acute **viral** infection of the oral mucous membrane
- Common in ages **6 months to 5 years**
- Can recur as herpes labialis (cold sores) with intermittent re-activation

- **Signs & Symptoms**
  - Fever (>38℃ or >100.4℉)
  - Malaise, lethargy, irritability, lymphadenopathy
  - Painful, erythematous, and swollen gingivae
  - Multiple ulcers (painful small, round, shallow, covered by yellowish white fibrin) on lower lip and also in upper and lower labial and buccal vestibules
  - Erythematous halo surrounding the lesions
  - Beware of dehydration from anorexia

- **Treatment**
  - Palliative and supportive treatment
  - Tylenol's prescribed (10-15 mg /kg/dose every 4-6 hr)
  - Clean child's mouth by gently brushing teeth
  - Avoid salty, acidic or spicy food, carbonated beverages
  - Plenty of fluids to prevent dehydration and enough rest
  - 1 week-follow up

Recurrent Aphthous Stomatitis

- Unknown etiology
- Not contagious
- Small well defined round shallow ulcers, yellowish grey central areas with red halo
- No diffuse erythematous involvement of the gingiva
- No acute symptoms
- Not preceded by vesicles and occur exclusively on non-keratinized mucosal surfaces
- Tx: topical analgesics, antiseptics, mild corticosteroids, orabase

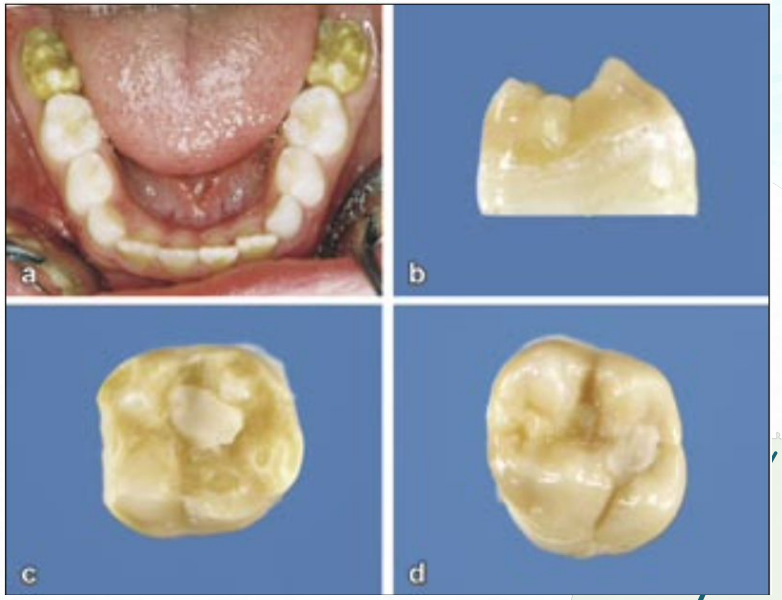


Molar-Incisor Hypomineralization

Molar-Incisor Hypomineralization

2001 introduction of the term

Clinical picture of enamel hypomineralization of systemic origin affecting one or more first permanent molars that are associated frequently with affected incisors



Also called:

- Hypomineralized permanent first molars
- Idiopathic enamel hypomineralized
- Dysmineralized permanent first molars
- Non-fluoride hypomineralization
- Cheese molars

Prevalence:

- Ranges from 4%-25%
- More molars affected = increased likelihood that incisors are affected

Molar-Incisor Hypomineralization

Etiology

- Casual relationships cannot be definitively assigned
- Systemic conditions and environmental insults influencing natal and early development: 22q11 Microdeletion Syndrome, upper respiratory diseases, **asthma**, otitis media, tonsillitis, **chicken pox**, measles, rubella, bronchitis, asthmatic bronchitis, pneumonia, frequent **use of antibiotic therapy**, poor general health - **nutritional deficiencies**, brain injury, neurologic defects, cystic fibrosis, syndromes of **epilepsy** and dementia (Kohlschutter-Tonz syndrome), nephrotic syndrome, atopia, lead poisoning, repaired CL/P, radiation treatment, rubella embryopathy, epidermolysis bullosa, ophthalmic conditions, **celiac disease, and GI disorders, preterm birth, low birth weight**, polychlorinated dibenzo-p-dioxins in breast milk **(environmental pollutant)**

	Mild MIH	Moderate MIH	Severe MIH
First Permanent Molars Clinical appearance			
Enamel loss	Isolated opacities	Occlusal/incisal without initial breakdown	Post eruptive initial breakdown
Caries	No caries	Post eruptive breakdown without cuspal involvement	Widespread caries of affected enamel
Sensitivity	Normal sensitivity	Usually normal sensitivity	History of dental sensitivity
Esthetics	Not an issue	Parents express concern	Parents typically concern

Diagnosis

- Clean 4 permanent first molars and 8 erupted incisors and examine wet for demarcated opacities, post-eruptive breakdown and atypical restorations
- Demarcated opacities are defects of altered enamel translucency that look as white-cream or yellow-brown color defective enamel with normal thickness & smooth surface
  ** Yellow-brown defects show lower values for hardness & greater porosity than white defects
- Opacities are usually limited to incisal or cuspal one third - rarely involve cervical one third
- Intact enamel surface - typically hard, smooth and often hypermineralized following post-erupted maturation (subsurface enamel is soft and porous)

Similar appearance: <u>enamel hypoplasia</u>

- Quantitative defect associated with a reduced localized thickness of enamel, following disruption of the secretory phase of amelogenesis,
- Enamel is translucent or opaque, single or multiple pits or grooves and complete or partial absence of enamel over dentin

Challenges

Challenges:

1. Sensitivity and rapid development of caries
2. Limited cooperation of a young children
3. Difficulty in achieving anesthesia
4. Repeated marginal breakdown of restorations
5. Limited research on restorative materials for restoring affected teeth

Management

6 Step Management Approach:

1. Risk identification
2. Early diagnosis
3. Remineralization and desensitization
4. Prevention of caries and post-eruption breakdown
5. Restorations and extractions
6. Maintenance

Diagnosis & Prevention

- Children at risk for MIH should be identified prior to eruption of 6s based on **relevant medical history** in the first 3 years of life and careful study of radiographs

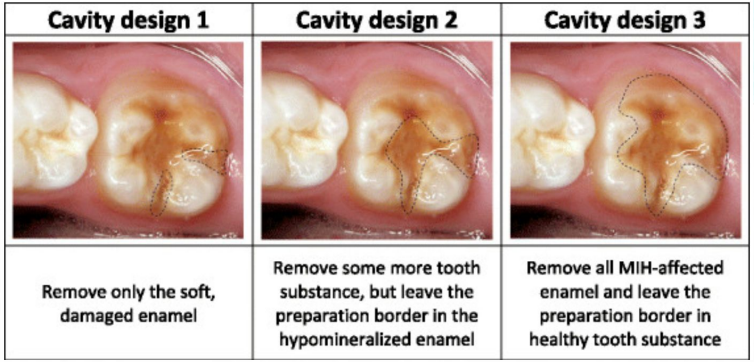
- During eruption - hypomineralized surface is very susceptible to caries and erosion
  - Cariogenicity & erosivity of **diet** should be assessed and recommendations made
  - Optimal oral hygiene with remineralizing desensitizing toothpaste such as **Casein Phosphopeptide-Amorphous Calcium Phosphate Oral Care Products**
    - Provides soluble calcium fluoride and phosphate ions to promote remineralization with fluorapatite that is more acid resistant
    - Available: daily use MI paste, sugar-free chewing gum, lozenges
  - **Topical fluoride (varnish or gel)** can help
  - For partially erupted PFMS with moisture control that is suboptimal - **GI cement sealants** (need to replace with resin sealant that is more durable later on)

Restorative Considerations

- **Anesthesia**
  - Porous exposed subsurface enamel or dentin may promote chronic inflammation of pulp - complicating anesthesia
  - Use nitrous oxide, sedation - may help reduce anxiety and pain
  - Consider general anesthesia with pediatric dentist if extensive treatment needed
- **Behavior**
  - MIH patients linked to pain, difficulty with anesthesia and multiple treatment visits → poor behavior and dental anxiety
  - Consider referral to pediatric dentist for advanced behavior management techniques

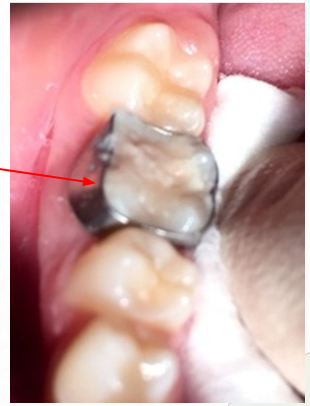
Restorative Considerations

- **Cavity Margin Placement**
  - A) All defective enamel is removed
    - Pro: may avoid premature restoration failure
    - Con: sacrifice tooth structure
  - B) Only very porous enamel is removed (felt by good resistance to bur)
    - Pro: conservative
    - Con: risk of marginal breakdown
  - ** Removal of all defective enamel is recommended when bonding resin composite restorations to hypomineralized PFMs due to poor bond strength of resin adhesives to hypomineralized enamel (want margin on sound enamel)



Restorative Considerations

- **Restorative Materials:**
  - **Amalgam**
    - Not good - poor retention in shallow preps, inability to protect remaining tooth structure
  - **Glass Ionomer Cements & Resin Modified Glass Ionomer Cements**
    - For dentin replacement as interim restorations
      - GIC provides: 1) placement ease 2) fluoride release 3) chemical bonding
      - RMGIC similar with better handling, wear resistance, fracture toughness
      - Not recommended in stress bearing areas for long-term
  - **Resins/Polyacrylic Modified Resin Composites**
    - Material of choice where defective enamel is well demarcated and confined to 1 or 2 surfaces with supragingival margins and without cuspal involvement
    - PMRCs: good handling, release and take up fluoride, tensile and flexural strength properties ** good for non-stress bearing areas



Restorative Considerations

- **Full Coverage SSCs**
  - Pro: prevent further deterioration, control sensitivity, establish correct contacts and occlusal relationships, not as technique sensitive, require little time to prep and insert (careful not produce open bite, gingivitis etc.)
- **Partial or Full Coverage Indirect Adhesive or Cast Crowns or Onlays**
  - Considered in late mixed or permanent dentition
  - Shown to be successful
  - Rarely used due to: 1) short crowns 2) large pulps 3) long treatment time 4) high cost 5) child's limited cooperation
- **Extraction**
  - When restorations are impossible
  - Early orthodontic assessment is recommended
  - Factors affecting prognosis: vitality, restorability, dental age, crowding, occlusal relationship and condition of other unerupted teeth

Restorative Considerations for Incisors

- **Acid/pumice microabrasion**
  - Shallow defects
  - Very limited use because it usually extends the full enamel thickness
- **ICON**
  - Shallow defects
- **Bleaching**
  - Etching lesion with 37% phosphoric acid → bleaching with 5% sodium hypochlorite → re-etching the enamel prior to placing sealant over surface to occlude porosities and prevent staining
- Enamel reduction and using **opaque resins (composite restorations/ veneers)**
- **Porcelain veneers**
  - Typically delayed until late adolescence when teeth are fully erupted and gingival architecture is established

Restorative Considerations

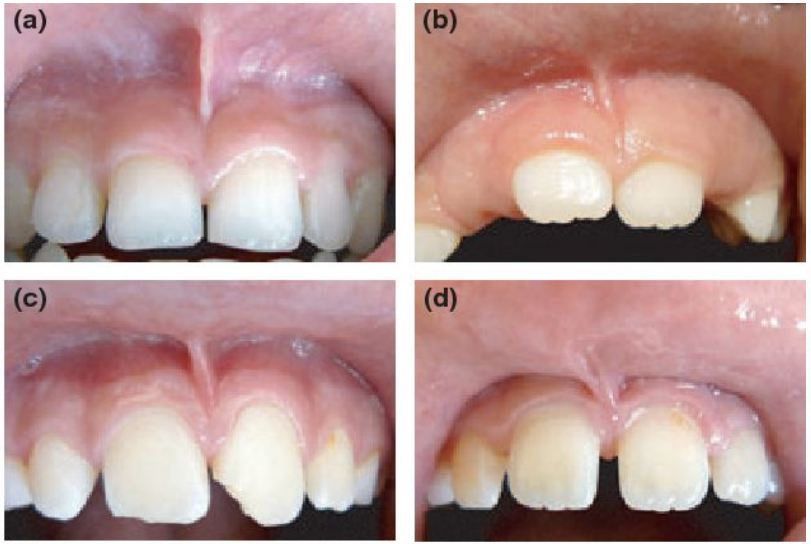
- **Adhesion Issues**
  - Limited literature
  - Bond strengths of composite to hypomineralized enamel with MIH are significantly less than bonding to normal enamel
  - After etching - hypomineralized enamel showed limited microtag formation (important for bonding effectiveness)

  - Suggestions:
    - Enamel pretreatment with 5% sodium hypochlorite to remove protein encasing hydroxyapatite
    - Removal of all hypomineralized enamel has been recommended

  - **After removing all discolored hypomineralized enamel the cavity margin should be placed on apparently sound enamel and resin should be bonded with a self-etching primer adhesive**

Frenal Attachments

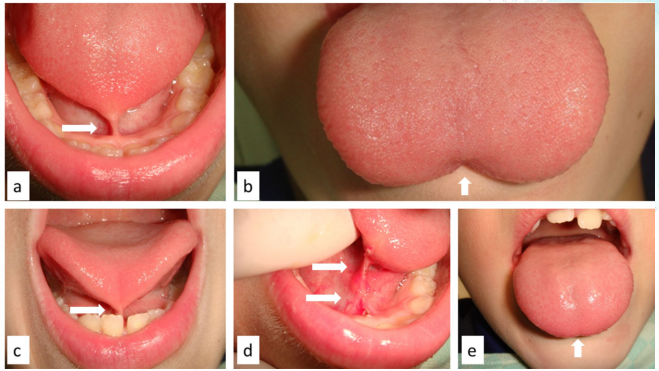
- Food retention
- Difficult to clean this area
- Esthetic concern
- Speech Impediment



- Abnormal frenum has been found to be associated with:
  - **Loss of papilla**
  - **Recession**
  - **Functional problem: speech, eating**
  - **Persistence of midline diastema**
  - **Difficulty in brushing**
  - **Malalignment of teeth**
  - **Compromised appliance fit or retention**
  - **Easily traumatized when learning to walk and aggressive oral hygiene practices**

Tongue Tie

- Consequences:
  - Stripping of the lingual tissues
  - Nursing difficulties
  - Swallowing difficulties
  - Speech difficulties
  - Predisposition to sleep disordered breathing
  - Difficulties with oral clearance
  - Social considerations



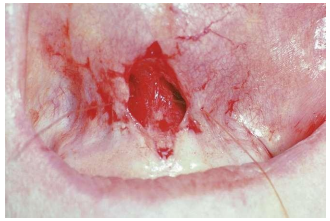
Treatment

- **Frenectomy**:
  - Complete removal of frenum, including its attachment to the underlying bone
  - It is required in the correction of abnormal diastema between maxillary central incisors

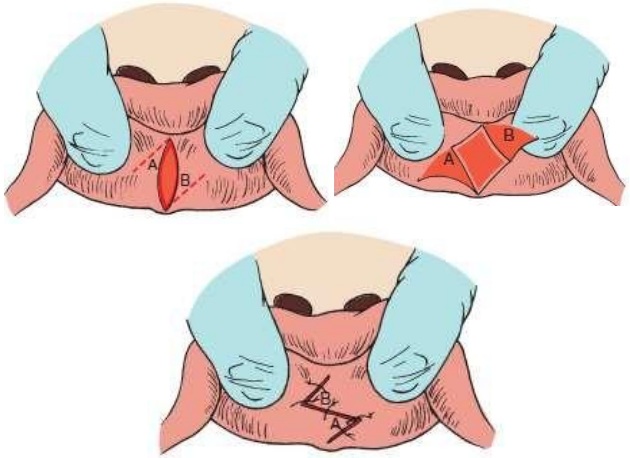
- **Frenotomy**:
  - Incision of the frenum
  - It is usually done to relocate the frenal attachment so as to create a zone of attached gingiva between the gingival margin and the frenum

Simple Excision

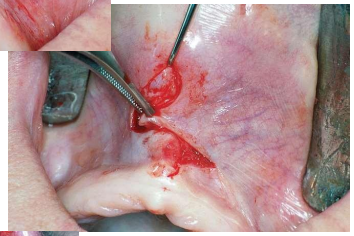
A narrow elliptical incision around the frenal area down to the periosteum is completed



Z-Plasty Technique

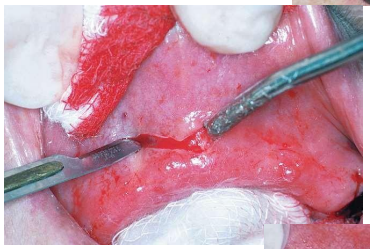


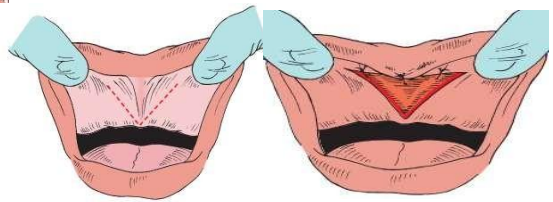
Small elliptical excision of mucosa and underlying loose connective tissue. Flaps are undermined and rotated to desired position.



Wedge Resection

Wide V-type of incision made at most inferior portion of frenal attachments in area
Mucosal margins sutured to periosteum at depth of vestibule





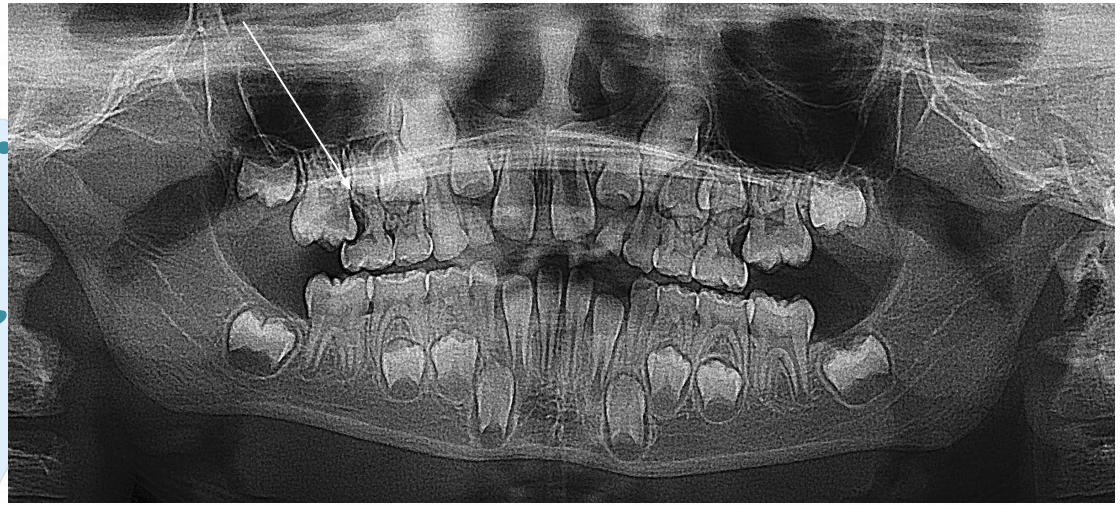
Laser

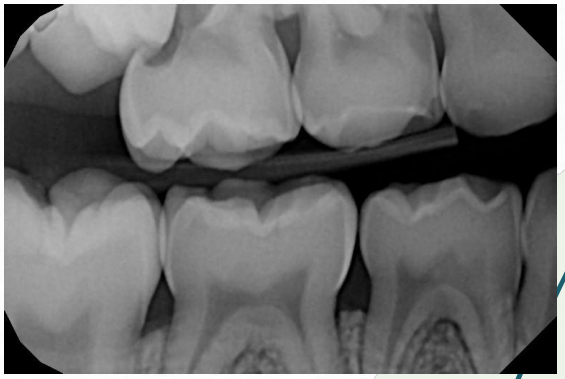
- Less or no bleeding, resulting in a dry surgical field
- Reduction of surgical time due to better visibility
- Reduced swelling
- Reduced pain due to the fact that superficial nerve endings are coagulated
- Less or no sutures, resulting in shorter treatment time
- Less scaring

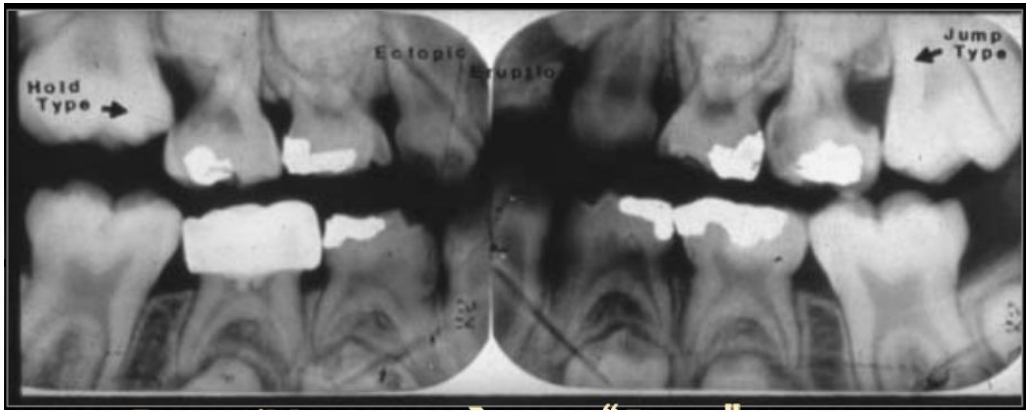
Ectopic Eruption

When 1st molars are malpositioned and cause atypical resorption of adjacent 2nd primary molar

Occurs 20 times more frequently in maxillary first molars than for mandibular first molars







Reversible Type = Jump Type

- After resorbing distal root surface of second primary molar, permanent molar becomes free & erupts into a normal position (“self-corrects”)
- ⅔ of cases, occurs until age 7

Irreversible type = Hold Type

- Molar becomes blocked by 2nd primary molar and remains in a “locked” position until treatment or premature exfoliation of the primary molar
- Potential sequela:
  - Blocked eruption of 6’s
  - Resorption and early loss of 2nd primary molar
  - Space Loss → blockage of 2nd bicuspid
  - Supra-eruption of lower 6
  - Disruption of arch integrity & malalignment → expect further crowding

Oral Habits

Thumb and Finger Habit

- ⅔ end the habit by age 5
- Dental outcomes influenced by intensity, frequency & duration
- **More critical role played by duration of sucking (months)**

- **Posterior crossbite** → caused by maxillary constriction due to the lack of a counterbalancing force from the tongue

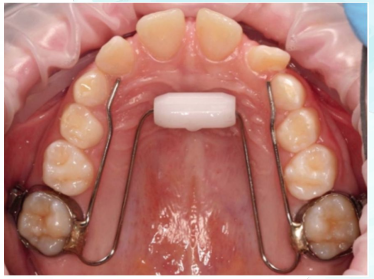
- **Anterior crossbite** → caused by the digit resting between the maxillary & mandibular incisors → prevents continued eruption of incisors, while posterior teeth erupt normally **OR** anterior incisors become intruded (latter associated with greater duration of digit sucking)

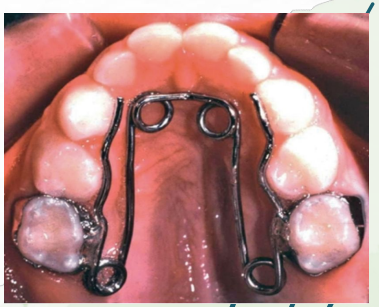
- **Increased overjet -** caused by the digit resting between the maxillary & mandibular incisors

Thumb & Finger Habit - Treatment

- Allow child to discontinue habit spontaneously; habit best eliminated before full eruption of the permanent incisors

- **Counseling**: dentist-patient discussions
- **Reminder therapy**: children who want to stop but need to be reminded (e.g. adhesive bandage)
- **Reward system**: less successful for children who suck fingers to sleep
- **Adjunctive therapy**
  - Elastic bandage on arm or bandaid on finger
  - Intraoral device (6-12 months)
    - Quad helix - adv. also treats crossbite
    - Palatal crib
    - Bluegrass appliance (± W-arch)





Pacifier Habit

- Dental changes similar to those caused by digit sucking (anterior & posterior crossbite with maxillary constriction) → increased prevalence associated with increased duration of use
- 90% end by the age of 5 yrs, 100% by age 8 yrs

- **Early = Beneficial**
  - Associated with reduced risk of sudden infant death syndrome (SIDS)
- Recommended to discontinue use between **18-36 months** due to more pronounced dental changes

- TX: parent withdraws use gradually/completely with discussion & explanation to the child

Lip Habits

- **Lip licking:**
  - Signs: red, inflamed, and chapped lips
  - TX: palliative (moisturization)
- **Lip biting:**
  - Body-focused repetitive behaviors
  - Signs: hyperkeratosis or ulcerations & sores (maybe infected)
  - TX: palliative, referral for cognitive behavioral therapy
- **Lip sucking:**
  - Milder form of lip sucking & biting; can maintain existing malocclusions
  - Force may lead to proclination of the maxillary incisors, a retroclination of the mandibular incisors, & increased overjet
  - TX: dental malocclusion: fixed/removable appliance, skeletal malocclusion: growth modification

Tongue Thrust

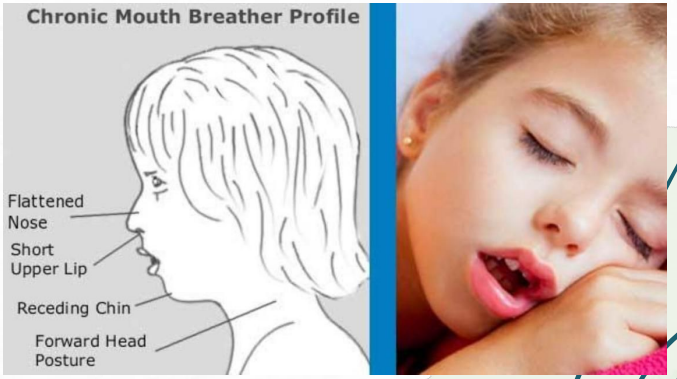
- **Active tongue thrust**
  - AKA “atypical swallow”
  - Normal in early development
  - Decreases from 55% to 35% in children 3-5 yrs old
  - In older children and adults - associated with prolonged breastfeeding, short frenulum, hypertrophic adenoids and tonsils, oral breathing, allergic rhinitis, abnormal head, lower jaw, and tongue posture and nonnutritive sucking habits > 5 yrs of age
  - Correlated with posterior crossbite, open bite & excess overjet

- **Passive tongue thrust** believed to have a greater influence on malocclusion than the atypical swallow

- TX: cessation of concurrent nonnutritive sucking habit, treat mouth breathing, interceptive ortho if there is malocclusion, myofunctional therapy

Mouth Breathing

- Common in young children, maybe a transitional developmental finding; prevalence in children < 8 yrs equivalent to nasal breathers
- Mostly due to nasal airway obstruction (72% → tonsil or adenoid obstruction, 19% → allergic rhinitis)
- Established association with gingival inflammation
- Important for dental practitioners: assess for risk of obstructive sleep apnea (OSA) in patients who are mouth breathers



Nail Biting

- Nail biting (onychophagia): is a body-focused repetitive behaviors (like lip biting)
- Prevalence: 20% -30%, rare in <4 years, incidence increases 4-6 years
- M & F equal until age 10 yrs, then males become predominant
- Etiology: manifestation of increased stress
- Dental manifestations: incisor malocclusion, bacterial infections, gingivitis, and minor enamel fractures are more commonly associated
- TX:
  - Encourage cessation of habit
  - No recommended protocol for the dental professional because dental complications are so mild

Bruxism

- Common among children with musculoskeletal disorders (cerebral palsy) and severely developmentally disabled

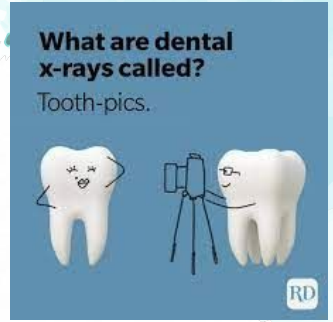
- **Dental manifestations:**
  - Wear of primary canines and molars (pulp exposure is rare because secondary dentin forms faster)
  - Masticatory muscle soreness and TMJ pain

- **Etiology:**
  - Local theory: reaction to an occlusal interference
  - Systemic factors: intestinal parasites, subclinical nutritional deficiencies, allergies & endocrine disorders, smoking, alcohol and caffeine use
  - Psychological theory: personality disorder or increased stress

- Treatment
  - "Boil and bite" mouth guard (remodelled with growth), if unsuccessful, refer to appropriate medical personnel, refer to a child development expert (if habit is psychological), SSCs for extensive bruxism

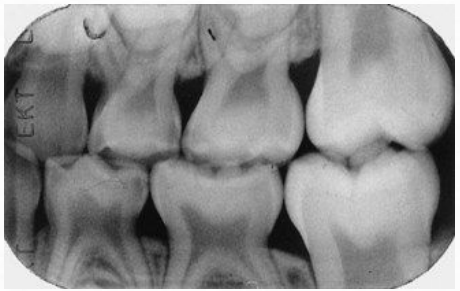
Treatment Planning

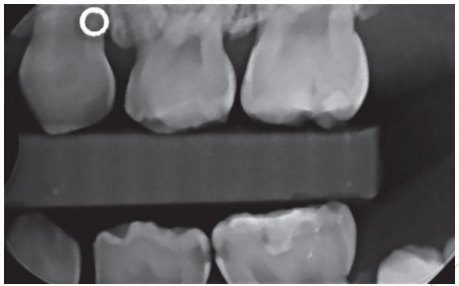
Tips from Pediatric Dentist



- **Ask about fluoridation of community drinking water!**

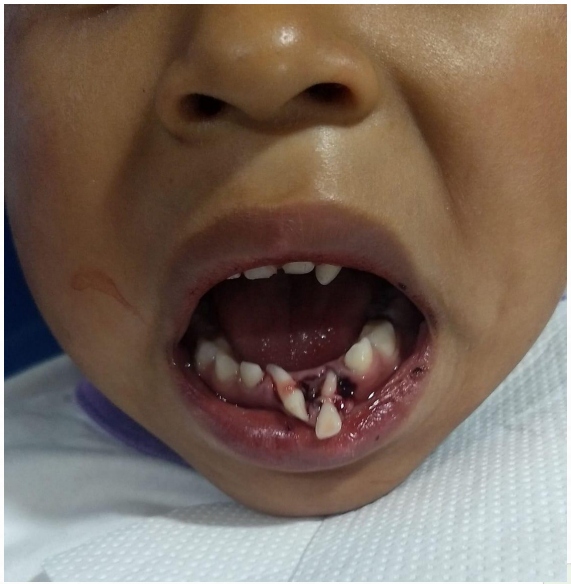
- **Restorative & Radiographs**
  - If unable to take radiographs for patients with closed contacts, don't attempt restorative procedures
  - Start with max occlusals to gain trust → added benefit of evaluating for supernumerary especially with maxillary midline diastema
  - No slot preparations for primary teeth
  - If nothing else can be done - place SDF and refer to pediatric dentist





Tips from Pediatric Dentist

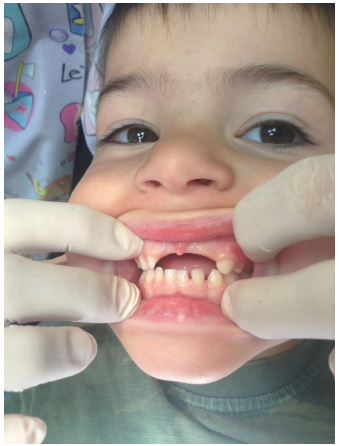
- **Trauma**
  - Don’t reimplant primary teeth
  - Don’t splint primary teeth
  - Treatment plan mouthguards

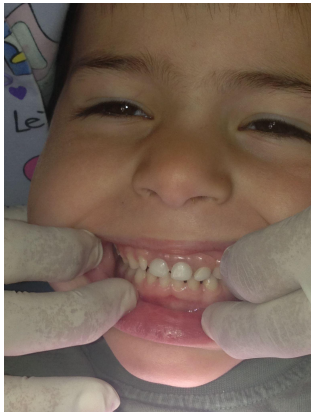


Space Maintainers

Helpful Tips for Space Maintainers

Missing Primary Incisors





- Early loss of **mandibular** primary incisors
  - Generally due to ectopic eruption of permanent incisors
  - May result in anterior space loss if it occurs before primary canine stabilization has occurred (aka if loss is due to trauma, caries etc.)
  - Tx. monitor development and generally not intervene (may want to extract antimere to help positioning & symmetry)

- Early loss of **maxillary** primary incisors
  - Does not generally result in decreased upper intracanine dimensions if loss occurs after primary canines have stabilized ~2 years of age
  - Delayed eruption timing of the permanent successors likely
  - Unattractive appearance & potential development of deleterious habits (tongue-thrust swallow, forward posture of tongue, improper pronunciation of fricative sounds)
  - Tx. anterior appliance may be considered for aesthetic and functional needs (fixed pedo denture aka Hollywood bridge)

Helpful Tips for Space Maintainers

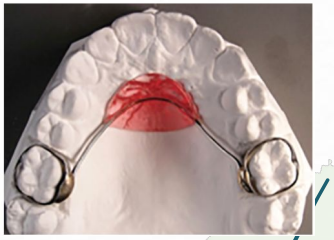
Missing Primary Canines

- Most often due to ectopic eruption of permanent lateral incisors
- Early loss of a mandibular primary canine is an indicator of a tooth size–arch size discrepancy
- **Mandibular**
  - Unilateral loss → shift in midline toward side of loss, lingual movement of incisors, deepening bite
  - Bilateral loss → pronounced lingual inclination and distal drifting of the permanent incisors, deepening of overbite, increased overjet, and significant loss of arch perimeter
  - Treatment Options
    - If unilateral, may be desirable to extract contralateral primary canine to help maintain symmetry
    - Lingual holding arch with spur attachments to control incisor positioning
- **Maxillary**
  - Occurs less frequently than does mandibular loss
  - Typically reflects a very distal eruptive displacement of the permanent lateral incisor
  - Atypical upper anterior alignment may occur, with resultant crowding and blockage of the permanent canine because it erupts so late in normal transition
  - Indicator for early orthodontic treatment and future comprehensive treatment

Helpful Tips for Space Maintainers

Missing Primary First Molar

- Important to identify whether the 6 and the permanent lateral incisor have erupted into stable position (class I occlusion, minimal to no crowding in anterior)
  - If NO = space maintenance is required
- Space maintainer of choice for this scenario is the Band and Loop (if bilateral loss then lingual holding arch or TPA/nance appliance)
- Without space maintainers
  - Eruption of the 6 will move the E mesially into the space
  - Potential for the primary canine to be forced distally with the eruption of the permanent lateral incisor



Helpful Tips for Space Maintainers

Missing Primary Second Molar

- **SPACE MAINTAINER IS ALMOST ALWAYS REQUIRED** if lost prematurely
- If the 6 has already erupted prior to loss → Band and Loop placed on the 6
- If the second primary molar is lost prior to the eruption of the 6
  - **If 6 is partially erupted** (mesial surface exposed) → **Reverse Band and Loop**
    - On the D with loop directed distally to passively contact mesial surface of erupting 6
  - **If the 6 is completely unerupted → Distal Shoe**
    - Not commonly utilized
    - Many choose to wait until the 6 is fully erupted to place a Band and Loop understanding that space regaining (distalization of 6) will be needed
    - Example where this treatment is needed is in the case of second primary molar loss secondary to the ectopic eruption of the adjacent first permanent molar

Denovo Space Maintainers

Pulp Therapy

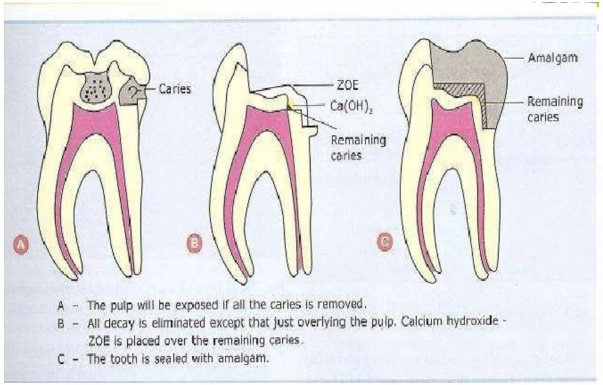
Indirect Pulp Treatment

- Indications**:** Deep caries close to pulp, asymptomatic tooth or reversible pulpitis, chronic/ arrested/inactive/slowly progressing lesion, no periradicular pathosis, well-defined radiopaque dentinal bridge between pulp chamber and caries, no Hx of pain although patient may have no lingering cold sensitivity

- Technique: Remove soft infected dentin but leave affected dentin → clean periphery and DEJ → GI or Ca(OH)2 is placed to stimulate odontoblasts to form reactionary dentin and promote remineralization of existing dentin → place well sealed restoration

- Pros: 1 visit, low cost
- Cons: more tooth structure removed, doesn't promote sclerosis of dentin tubules + dentin formation, greater risk of pulpal exposure

- Success rate of MTA > CaOH2



Stepwise Caries Removal

- Indications: Active/ soft/ rapid progressing carious lesions, primary varies or recurrent caries under shallow restoration, reversible pulpitis, no periradicular pathosis

- Requires 2 appointments:
  - 1st appt: place transitional restoration
  - 2nd appt: Re-evaluation after 6-12 mo before final restoration placement

- Pros: preserve tooth structure, minimally invasive, promotes formation of 2ndary/sclerotic dentin, maintains thicker remaining dentin, clarifies pulpal diagnosis and prognosis

- Cons: 2 visits/ time, patients compliance needed, higher costS

Direct Pulp Cap

- Indications: Permanent teeth with normal pulp w/ small mechanical or traumatic exposure
- Technique: Pinpoint exposure occurs after trauma or during cavity prep → hemorrhage control obtained and pulp capped w/ Ca(OH)2 or MTA → final restoration placed
- 5 year success rates:
  - Ca(OH)2 = 59-69%
  - MTA = 78-98%

Partial Pulpotomy for Carious Exposures

- Indications: Young permanent tooth with immature root development with carious pulp exposure, vital tooth with a diagnosis of normal pulp or reversible pulpitis
  - Pulpal bleeding should be controlled within several minutes
  - If there is persistent hemorrhage from pulp stumps → may have to do partial pulpectomy

- Technique: Inflamed pulp tissue beneath exposure removed to reach healthy pulp tissue → Pulp bleeding controlled by NaOCl or CHX → place covered by Ca(OH)2 or MTA → placed light cured RMGI

- Success rate: 91-96%
  - Ca(OH)2: 91-100%) after 2 years
  - MTA: 95-100%

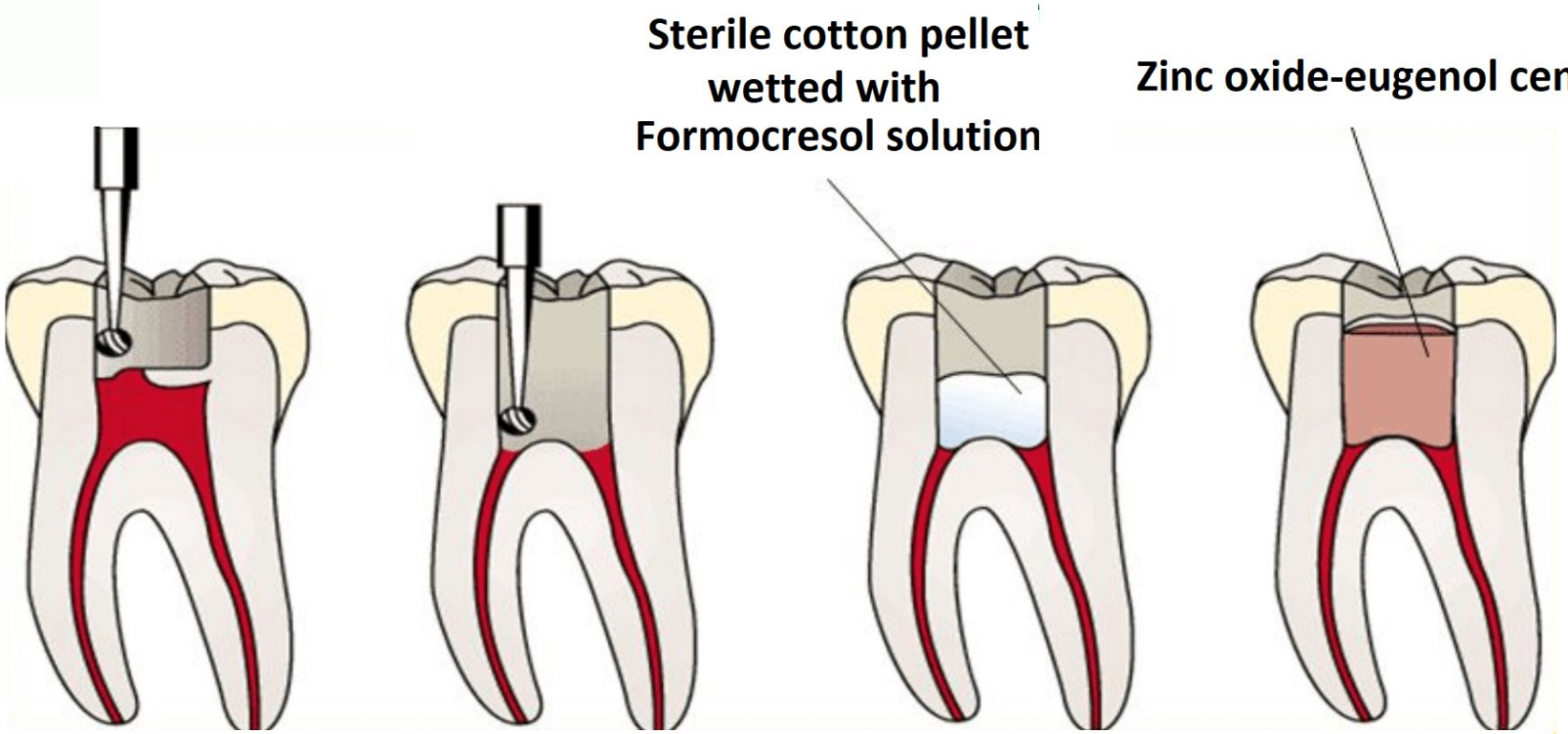
Partial Pulpotomy for Traumatic Exposures (Cvek Pulpotomy)

- Indications: Vital, traumatically exposed, young permanent teeth (incompletely formed apex)
- Technique: Inflamed pulp tissue beneath a pulp exposure is removed (1-3mm) to reach healthy pulp tissue → Pulpal bleeding is controlled with NaOCl or CHX → Place MTA or Ca(OH)2 to cover the exposure → place light-cured RMGI
- Success rate 91-98%
- Benefits
  - Neither time nor exposure size is critical if healthy pulp is reached
  - Preservation of cell rich corona pulp
  - Increased healing potential due to preserved pulp
  - Physiological apposition of cervical dentin
  - Obviate need for RCT
  - Natural color and translucency preserved (white MTA recommended)
  - Maintenance of pulp test responses

Characteristics of successfully treated tooth with partial pulpotomy:

- No symptoms of sensitivity, pain, or swelling
- ~ after 1 year:
  - Have normal periodontal ligament and lamina dura
  - Radiographic evidence of calcified bridge
  - No radiographic evidence internal resorption or external resorption, abnormal canal calcification, or post-op periapical radiolucency

Pulpotomy


Sterile cotton pellet wetted with Formocresol solution
Zinc oxide-eugenol cement

Recommendations

Consider when treatment planning:

1. Patient's medical history (pulpectomy not for immune-compromised)
2. Level of patient/parent cooperation and motivation
3. Value of each involved tooth in relation to dental development (e.g. second primary molar in 4 y.o. vs. first primary molar in 8 y.o.)
4. Alternatives to pulp treatment (LSTR or EXT)
5. Degree of difficulty anticipated to perform pulp therapy (instrumentation)
6. Restorability and Periodontal health

How to Differentiate between Reversible Pulpitis and Irreversible Pulpitis in Primary Teeth?

Because primary teeth *do not* respond to *electric or cold pulp testing* the same way that *permanent* teeth do, the diagnosis is made from clinical signs and symptoms.

Signs and symptoms of *reversible* pulpitis include *stimulated pain of short duration* (<5 sec) and pain that is adequately *controlled by OTC analgesics*.

Signs and symptoms of *irreversible* pulpitis include *spontaneous pain* that is *not well controlled with OTC analgesics* or pain that *wakes a child at night*

Why Rubber Dam is Necessary when Treating Teeth with any Possibility of Pulp Therapy?

Rubber dam placement helps to *prevent or reduce*:

1. *Aspiration* or swallowing of instruments/materials used during procedures
2. Chemical *leakage* or pulpotomy medicaments onto oral pharyngeal tissues
3. *Contamination* of cleaned pulp chamber/root canals by bacteria from oral fluids

Decision Time: Pulpectomy vs. Extraction

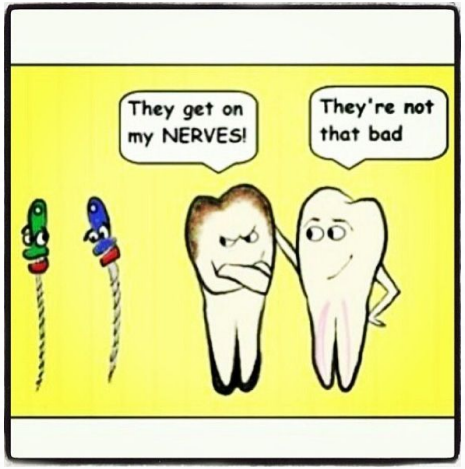
Necrotic or Irreversibly Inflamed Primary Tooth

Pulpectomy

Objectives

- Remove necrotic or irreversibly inflamed coronal and radicular tissue due to caries or trauma
- Halt spread of infection
- Maintain a healthy, asymptomatic tooth and normal exfoliation
- Treatment should permit resorption of the primary tooth root and filling material to permit normal eruption of the succedaneous tooth
- No pathologic root resorption or furcal/apical radiolucencies

Fig 2. Radiograph showing a mandibular right second primary molar



Indications

- To preserve a tooth with irreversible pulpitis or necrosis
  - May be performed on primary teeth showing signs of hyperemia indicating irreversible pulpitis
  - May be performed on primary teeth if the root canal exhibit evidence of necrosis (suppuration)
- Good option for tooth treatment planned for pulpotomy in which the radicular pulp exhibits clinical signs of irreversible pulpitis (ex. excessive hemorrhage that is not controlled with damp cotton pellet applied for several minutes) or pulp necrosis (ex. suppuration, purulence)
- Good option for restorable teeth with minimal root resorption
- Good option for “key teeth” for arch development
- Evidence of normal bone support is present, canals are accessible for proper instrumentation and can be adequately filled

Contraindications

- Teeth with periapical infection
- Teeth with gross loss of tooth structure or advanced, internal or external root resorption
- Not for seriously/chronically ill patients
  - Subacute bacterial endocarditis
  - Nephritis
  - Leukemia
  - Solid tumor
  - Idiopathic cyclic neutropenia
  - Depressed PMN

Case of the Second Primary Molar

- Special effort should be made to treat and retain the second primary molar, even if it has necrotic pulp
- This is done since premature loss of the second primary molar could allow for the mesial drifting of the first permanent molar
- Longer-than-normal retention of the second primary molar may be desired when the succedaneous second premolar is congenitally missing

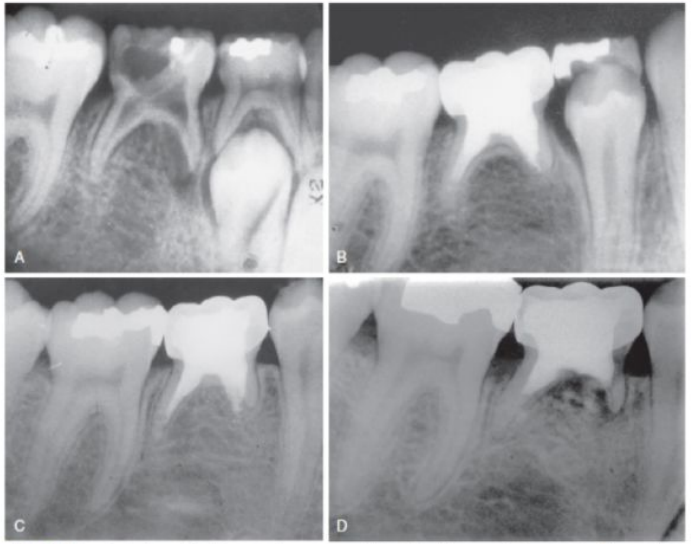
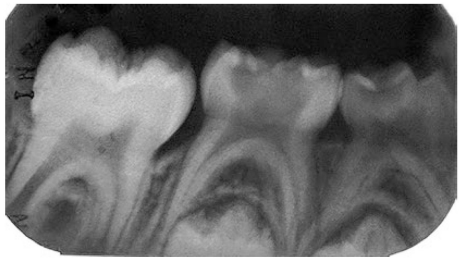


Figure 13-15 **A,** Necrotic tooth resulting from a carious exposure of the pulp of the second primary molar. Because the succedaneous second premolar was congenitally missing, a decision was made to attempt to save the tooth as a functional space maintainer through the growing years, if possible. Note the evidence of internal resorption at the floor of the pulp chamber. **B,** Radiograph made 1 year and 7 months after the pulp canals were treated and filled. The mesial canal was treated with complete pulpectomy; the distal canal was treated with partial pulpectomy. **C,** Six years and seven months after treatment, the tooth is asymptomatic; the supporting tissues appear normal, but some root resorption has occurred. **D,** Fourteen years and six months postoperatively, the tooth was extracted because of the development of symptoms and loss of bone support. At this time, the patient was a young adult, and a fixed bridge was made.

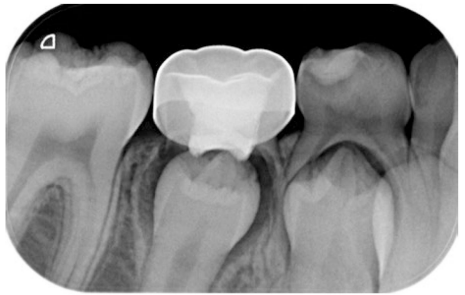
Case Selection: Preoperative Radiograph



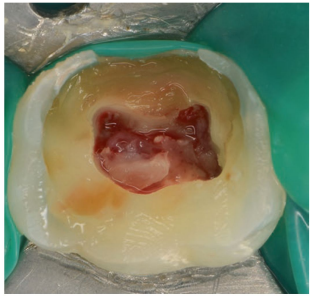
Step 11: Postoperative Radiograph

Three-Year Follow-Up Radiograph

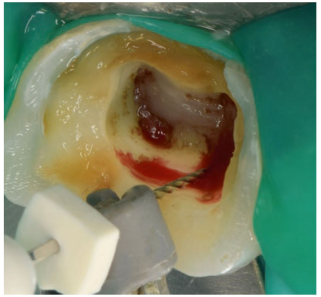
Five-Year Follow-Up Radiograph



Step 1: Access Opening

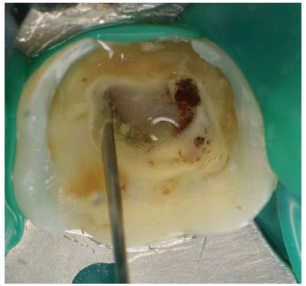


Step 2: Determining the Working Length

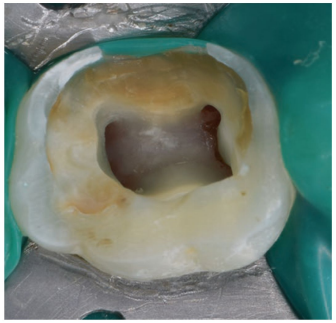


Step 3: Canal Preparation

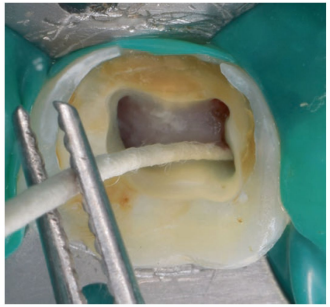
Step 4: Irrigation



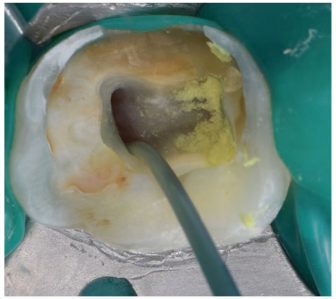
Step 5: Biomechanical Preparation Complete



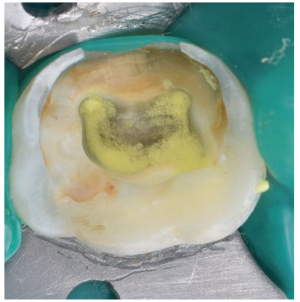
Step 6: Drying the Canals



Step 7: Obturation



Step 8: All Canals Obturated



Step 9: Core Buildup

Step 10: Preformed Metal Crown Cemented

Materials

Ideal Requirements for Pulpectomy Filling Materials

1. Resorbable
2. Biocompatible
3. Harmless to succedaneous tooth
4. Easy to place
5. Easy to remove
6. Antiseptic

Options

1. Zinc Oxide Eugenol (ZOE)
2. Calcium Hydroxide ($CaOH_2$)
3. Kri or Maisto Paste (Zinc Oxide & Iodoform)
4. Vitapex (Calcium Hydroxide & Iodoform)
5. Endoflas (ZOE, Calcium Hydroxide & Iodoform)

Evaluation of Success

Following Treatment:

- Good fill without gross over-extension
- Protect developing succedaneous tooth
- Radiographic bone deposition in pretreatment radiolucent areas should improve in 6 months
- Normal root resorption of primary tooth roots
- Pretreatment clinical signs and symptoms should resolve within a few weeks

Radiographs:

- 6 month - 12 month intervals at regular recall visits
- If clinical symptoms or signs warrant

Complications

- Endodontic procedures of primary teeth are often complicated due to morphology of canals
- High endodontic treatment failure if the canals cannot be properly cleansed and adequately filled or if the supporting bone is compromised
- Mature first primary molars are difficult to instrument due to small canals

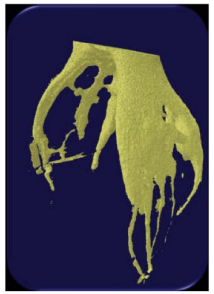


Figure 13-13 Micro-computed tomography of a mandibular second primary molar root canal system. (Courtesy of Dr. Ashraf Al-Hosainy, Mansoura University School of Dentistry, Egypt.)

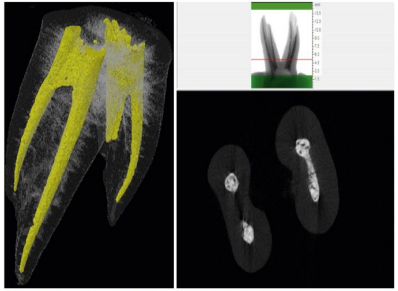


Figure 13-14 Three views of micro-computed tomographs of a mandibular second primary molar root canal system obturated with Vitapex. (Courtesy of Dr. Ashraf Al-Hosainy, Mansoura University School of Dentistry, Egypt.)

Alternative option: Extraction

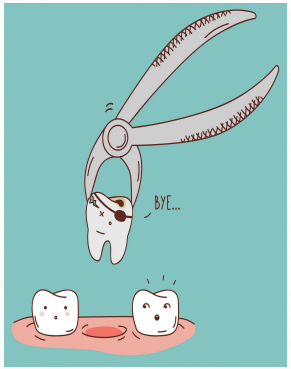


Figure 3: Radiograph showing obstruction of second premolar from eruption by the intra-alveolar extension.

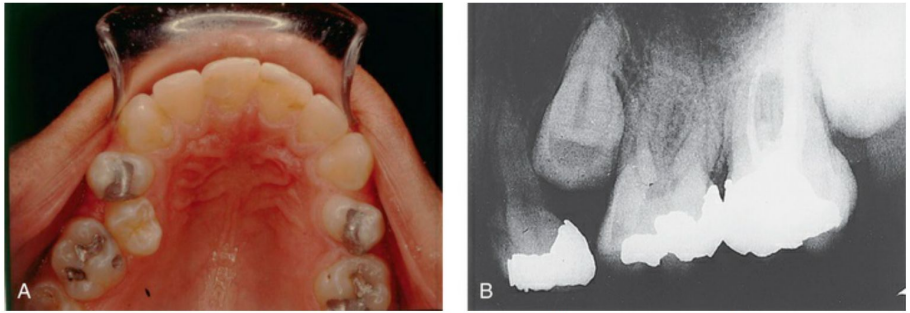


FIGURE 23.16 (A) Occlusal view of the permanent dentition following bilateral premature extractions of the maxillary primary second molars. The right second bicuspid erupted ectopically, and the left is impacted. (B) Radiograph of the area showing the impacted left

FIGURE 23.19 (A) Maxillary primary central incisor with excessive zinc oxide–eugenol (ZOE) immediately after pulpectomy. (B) Permanent successor of the root-treated primary tooth showing remnants of ZOE in the alveolar bone. (From Fuks AB, Eidelman E. Pulp therapy in the primary dentition. *Curr Opin Dent.* 1991;1:556–563.)

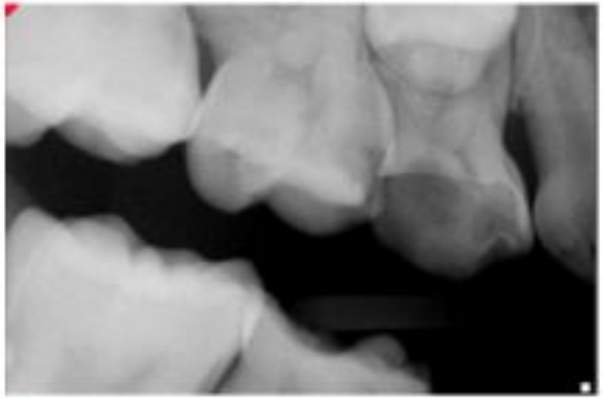
UL: Jafri SAH (2016) Unsupervised Distal Shoe Appliance: A Case Report. Pediatr Dent Care 1: 122.
UR and LL: Nowak, Pediatric Dentistry, infancy through adolescence, 6th ed.

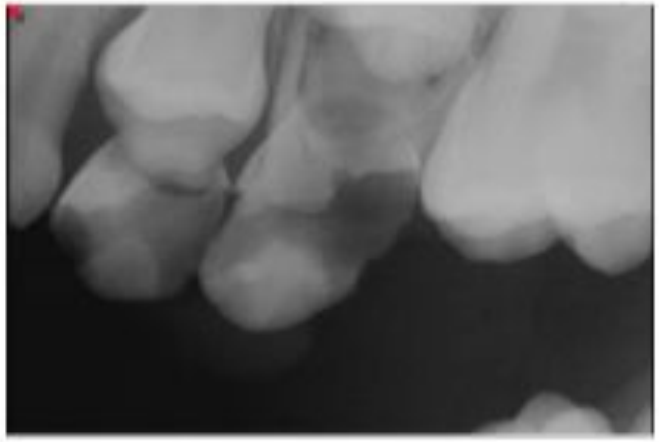
Case Discussion

Intraoral Exam

Intraoral Exam

Radiographic Exam – Selected PAs





Radiographic Exam - Panoramic