North Carolina Dental Society

Clinical Techniques in Pediatric Dentistry

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May 16, 2019

Evidence-Based Treatment & Clinical Experience

"The AAPD has stated that the clinical practice of pediatric dentistry has to be driven by science and evidence-based dentistry (EBD). However, our specialty must recognize the need for both EBD and age proven clinical experience."

Kupietzky A, Fuks, A. The keeper of the meaning and the era of evidence based dentistry. Pediatr Dent 2018;40:250-252.

Non-Invasive Treatment

The body of evidence is growing with recommendation for non-invasive treatment such as chemical treatment or Hall technique.

Banerjee A, Frencken JE et al. Contemporary operative caries management: Consensus recommendations on minimally invasive caries removal. Br Dent J 2017;223:215-222.

Chemomechanical - CMCR

- Tissue specific action with ability to discern between infected and affected dentin
- Good antimicrobial activity
- Non-irritating to pulp
- No discoloration to tooth structure
- No interference with properties of restorative materials
- Long shelf-life

Reddy MVC, Shankar AJS, Pentakota VG et al. Efficacy of antimicrobial property of two commercially available caries removal agents. J Int Soc Prev Community Dent 2015;5:183-189.

- Carisolv gel and Papacarie gel
- Rubber dam required
- Gel applied, rinsed away, reapplied until gel no longer cloudy
- Papacarie removed more bacteria and less expensive than Carisolv

El-Tekeya M, El-Habashy L, Mokhles N et al. Effectiveness of 2 chemomechanical caries removal methods on residual bacteria in dentin of primary teeth. Pediatr Dent 2012;34:325-330.

Carisolv gel with hand instruments was compared to restoration with rotary bur.

MTA applied with depth of 2mm and restored with composite.

Ali AH, Koller G et al. Self-limiting versus conventional caries removal: A randomized clinical trial. J Dent Res 2018;97;97:1207-1213

Hall Technique

American Academy of Pediatric Dentistry. Pediatric restorative dentistry Pediatr Dent 2018/19;40(6):330-342.

Hall Technique

Preformed stainless steel crowns placed without local anesthesia, caries removal or tooth preparation. (Out of UK-48% using in Scotland-success rates up to 5 years).

Innes NP, Evans DJ, Stirrups DR. Sealing caries in primary molars:randomized control trial, 5-year results. J Dent Res 2011;90:1405-1410.

Hall Technique

Highly controversial in the United States

American Academy of Pediatric Dentistry. Pediatric restorative dentistry Pediatr Dent 2018/19;40(6): 330-342.

Open bite results due to no occulsal reduction.

Occlusion adjusts to normal occluso-vertical dimension in 15-30 days.

van der Zee V, van Amerongen WE. Influence of pre-formed metal crowns (Hall technique) on the occlusal vertical dimension in the primary dentition. Eur Arch Paediatr Dent 2010;11:225-227.

May use orthodontic separators for a few days before procedure to open interproximals.

Crown filled with glass ionomer cement.

Finger pressure to seat and then child's own biting force.

Seale NS, Randall R. The use of stainless steel crowns: A systematic literature review. Pediatr Dent 2015;37:147-162.

Hall Technique with SDF

Lesion progression and bacterial toxins could produce a pulpitis.

SDF application would kill the bacteria and deactivate the remaining nutrients.

Horst J, Frachella JC, Duffin S. Response to letter to the editor. Pediatr Dent 2016;38:462-463.

Stainless steel crowns placed using the Hall technique vs conventional showed greater marginal leakage--buccal margin most.

Resin cement showed least microleakage, followed by glass ionomer and polycarboxylate cement.

Erdemci ZY, Cehreli SB, Tirali RE. Hall versus conventional stainless steel crown techniques: In vitro investigation of marginal fit and microlekage using three different luting agents. Pediatr Dent 2014;36:286-290.

Hall stainless steel crowns (SSC's) showed similar success rates to conventionally placed SSC's.

Clark W, Geneser M et al. Success rates of Hall technique stainless steel crowns in primary molars: A retrospective study. Gen Dent 2017;65:32-35.

Both had success rates of 95%.

The Handbook of Pediatric Dentistry. AJ Nowak & PS Casamassimo, eds. p. 160. American Academy of Pediatric Dentistry, 2018.

ITR
Interim Therapeutic Restoration

American Academy of Pediatric Dentistry. Policy on early childhood caries (ECC): Unique challenges and treatment options. Pediatr Dent 2018/19;40(6):63-64.

Handbook of Clinical Techniques in Pediatric Dentistry ed. Jane A. Soxman Wiley Blackwell, 2015

W.H.O.

Alternative/Atraumatic Restorative Technique (ART)

For restoration or prevention in populations who have little access to dental care or settings where traditional care can not be performed

"The atraumatic restorative technique can be considered an effective approach to treating early childhood caries in young children."

Arrow P. Restorative outcomes of a minimally invasive restorative approach based on atraumatic restorative treatment to manage early childhood caries: A randomized controlled trial. Caries Res 2016;50:1-8.

Interim Therapeutic Restoration

When traditional cavity preparation and restoration can not be performed due to behavior, young age or special needs.

Can buy some time if definitive treatment is not able to be performed or must await availability of anesthesiologist for office procedure or operating room time.

Not a definitive restoration. Follow-up planned with final restoration in future.

Glass ionomer caries control (GICC). Glass ionomer is the material of choice for restoration.

Takes less than 5 minutes and can be performed at the initial visit for a child with one or more open, *asymptomatic* carious lesions confined to dentin.

No history of unprovoked/spontaneous pain.

Performed without a rubber dam & without local anesthesia.

Provides higher long-term success prior to or avoidance of vital pulpotomy treatment.

95-97% survival after one year.

Two surface ART in primary molars has been shown to be a reasonable alternative to conventional restoration for up to 2 years.

Raggio DP, Hesse D, Lenzi TL, Guglielmi AB, Braga MM. Is atraumatic restorative treatment an option for restoring occlusoproximal caries lesions in primary teeth? Int J Paediatr Dent 2013;23:435-443.

Cement an orthodontic or space maintainer band to hold GI for 2-surface.

The use of glass ionomer to restore interproximal caries in primary molars is a treatment option.

Teeth were followed for 2-3 years.

There was no statistically significant difference between GIC and composite.

Tedesco TK, Calvo AFB et al. ART is an alternative for restoring occlusoproximal cavities in primary teeth. Int J Paediatr Dent 2017;27:201-209.

Atraumatic restorative treatment with glass ionomer cement and amalgam restorations had the same levels of microleakage after 2.5 years.

Multiple surface restorations had more gaps and microleakage than single surface restorations with both restorations.

Mijan MC, Leal SC, et al. Are clinically successful amalgam and ART restorations in primary molars microgap free? J Adhes Dent 2018;20:25-32.

Study compared microbial counts with total or partial removal of carious dentin in order to avoid pulpotomy treatment.

No difference in microbial counts under restoration after 3-6 months with or without complete removal of carious dentin.

Lula EC, Monteiro-Neto V, Alves CM, Ribeiro CC. Microbiological analysis after complete or partial removal of carious dentin in primary teeth: A randomized clinical trail. Caries Res 2009;43:354-358.

Cotton pellet soaked with 1% chlorhexidine applied for one minute, air dried & glass ionomer placed in prep.

Cavity disinfection with chlorhexidine reduced microbial counts beneath the restoration.

Joshi JS, Roshan NM, Sakeenabi B et al. Inhibition of residual cariogenic bacteria in atraumatic restorative treatment by chlorhexidine disinfection or incorporation. Pediatr Dent 2017;39:308-312.

Low-cost brands of glass ionomer have lower survival rates compared to the traditional brand of glass ionomer cements.

Buy the Best!

Olegario IC, Pacheco A et al. Low-cost GIC's reduce survival rate in occlusal ART restorations in primary molars after one year. J Dent 2017;57:45-50.

Non-painful superficial decay is removed with a spoon excavator or slow speed with a #4 or #6 round bur.

SmartBurs II SS WHITE- removes decayed dentin only. Access opening must be present or would have to be created with carbide bur.

Glass ionomer is the preferred restorative material. Resin modified glass ionomer also recommended due to longer setting (working) time & more esthetic.

Glass Ionomer

Capsules with rechargeable fluoride release.

Mix/triturate according to manufacturer's instructions and place immediately in prep .

Working time varies with material, but usually about 1 minute 15 seconds from start of mixing.

Finish (if you dare) after material's set time.

Capsule Applier/Capsule Extruder

Glass ionomer is left in place until child can cooperate for final restoration or sedation/ operating room is scheduled.

The bacterial counts significantly decrease within the carious lesion.

The dentin will remineralize and pulpotomy may be avoided.

Code D2941 Interim Therapeutic Restoration - primary dentition -"Placement of an adhesive restorative material following caries debridement by hand or other method for the management of early childhood caries. Not considered a definitive restoration."

High viscosity glass ionomer provides over 90% success rate over 3 years.

These restorations are an acceptable alternative to amalgam single-surface restorations.

Hilgert LA, deAmorim RG, et al. Is high-viscosity glass-ionomer-cement a successor to amalgam for treating primary molars? Dent Mater 2014;30:1172-1178.

Resin-Modified Glass Ionomer

Addition of the resin component with glass ionomer decreases initial hardening time and handling.

Significantly increases wear resistance and physical strengths of the cement.

Croll TP, Nicholson JW. Glass ionomer cements in pediatric dentistry: review of the literature. Pediatr Dent 2002;24:423-429.

Glass Ionomer

Fluoride releasing
Coefficient of thermal expansion like tooth structure
Chemically adheres to tooth structure
Sets through acid-base reaction
Bonds to composite resin

BUT

Low compressive and flexural strength- poor wear

Resin-modified improves physical properties

Resins improve flexural strength and reduce solubility

Light cure

Resin-Modified Glass Ionomers properly set with two different mechanisms.

RMGI *acid-base reaction and visible light polymerization reaction* compete and inhibit one another during setting.

Findings recommend that some of the self-curing GI reactions should be permitted to occur for many seconds prior to light curing in order to enhance the unique benefits of the RMGI.

Berzins DW, Abey S, et al. Resin-modified glass-ionomer setting reaction competition. J Dent Res 2010;89:82-86.

New lesions at the margins of composite restorations are the predominant cause for failure and replacement of restorations in primary teeth.

There is a moderate strength of evidence that glass ionomer cements may reduce the incidence of recurrent caries in the margins of occlusoproximal restorations in primary teeth.

Raggio DP, Tedesco TK, Calvo AFB et al. Do glass ionomer cements prevent caries lesions in margins of restorations in primary teeth? JADA 2016:147;177-185.

Conventional vs Biologic Treatment

Asymptomatic primary molars with lesions extending into dentin.

Conventional approach - Complete caries removal w. pulp therapy when indicated.

Biologic approach - Indirect pulp cap (Interim Therapeutic Restoration) or Hall technique.

Both approaches excellent results.

Banihani A, Duggal M et al. Outcomes of the conventional and biological treatment approaches for the management of caries in the primary dentition. Int J Paediatr Dent 2018;28:12-22.

Silver Diamine Fluoride

Became available August 2015
Marketed as Advantage Arrest by Elevate Oral Care LLC

Soxman JA. Noninvasive treatment for cavitated lesions in primary molars. Gen Dent 2016;64:8-9.

American Academy of Pediatric Dentistry. Policy on use of silver diamine fluoride for pediatric dental patients. 2018/19;40(6): 51-54.

Non-invasive procedure w/o local anesthesia for asymptomatic caries. “Buy Time”

Can be applied anywhere.

Simplicity of tx - Applied w. micro sponge.

Low cost (similar to fluoride varnish).

Evidence-based arrest of caries progression.

Both fluoride and silver ions contribute to mechanism of action as antimicrobials.

Hydroxyapatite is transformed to Fluoroapatite, which is less soluble in an acid environment.

Silver ions act on the bacterial cell wall and inhibit DNA replication, killing bacteria.

Carious dentin is stained black.

Fung MHT, Wong MCM, Lo ECM, Chu CH. Arresting early childhood caries with silver diamine fluoride- A literature review. Oral Hyg Health. 2013;1:1-5

D1354 Interim Caries Arresting Medicament Application. About 160 drops per 8ml vial. Unit dose available. Shelf life is 3 years.

"When bacteria killed by silver ions are added to living bacteria, the silver is re-activated so that effectively the dead bacteria kill the living bacteria in a "zombie effect"."

This aids in explaining how the silver deposited on the bacteria and dentin proteins within the lesion provides sustained antimicrobial effects.

Apply one to two times per year until tooth exfoliates.

Horst JA, Ellenikiotis H, Milgrom PM. UCSF protocol for caries arrest using silver diamine fluoride. From PA Dent Jour 2017; Jan/Feb:14-27.

Ag(NH3)2F - pH 10 Ammonia stabilizes the Fl

Silver allergy is contraindication.

Relative contraindications are mucositis or any inflammation that disrupts the protective barrier provided by stratified squamous epithelium. Would cause increased absorption and discomfort with contact.

Safety margin dose is 0.95mg/kg.

Recommendation is one drop per 10kg per treatment visit.

Smallest child with caries may be about 10kg.
Average weight for 1-year old(22pds girl & 23 boy)

One drop is 9.5mg Ag & treats 5 teeth.

Weekly intervals at most.

Horst JA, Ellenikiotis H, Milgrom PM. UCSF protocol for caries arrest using silver diamine fluoride: rationale, indications and consent. PA Dent Jour 2017;Jan/Feb:14-26.

When dentin is dried, the SDF penetrates the porous body of the lesion. The drier the lesion, the more penetration of the silver.

For example, think of a crack in cement that would be filled with cement, the liquid penetrates the dentinal tubules with a capillary-like action. Silver precipitates in the tubules and plugs.

After initial application, do second application in a week or two to check hardness.

Hardness of dentin shows lesion arrested. Silver is essential for the hardening of the lesion.

Protect tissues. Cotton roll isolation. Vaseline on gingiva.

*Clean & dry with compressed air.

Microsponge (2 sizes) to apply or microfiber brush, rubbing for one minute. Do not dry with compressed air after application.

Dry 1-2 minutes. No light cure! Immediate discoloration.

Do not permit saliva to touch.

Application twice per year is most effective.

Application time between 31.2 & 83.5 seconds.

No association found between application time and caries arrest.

Patients checked at 3 weeks to determine need for reapplication. Efficacy evaluated by dentin color, texture and presence of any pain.

Most parents agreed or strongly agreed that is an easy, painless procedure and not concerned with dark color of teeth.

Clemens J, Gold J, Chaffin J. Effect and acceptance of silver diamine fluoride treatment on dental caries in primary teeth. J Public Health Dent. 2018;78:63-68.

Clear liquid stains skin, clothes & all surfaces.

- Wipe face/lips w. 2X2 dipped in salt water
- Mr. Clean Magic Easer with pumice and water for countertops

Skin exfoliates within 2 weeks. Stain must be drilled out of tooth.

Color change of dentin occurs over one week.

Anyone licensed to place topical fluoride can apply.

Concerns are: Lack of follow-up, SDF does not restore form and function and how long duration of caries arrest.

Written consent, which includes colored photographs of teeth post-application, should be obtained.

When applied twice annually, most effective in primary incisors and buccal/lingual smooth surfaces.

Nelson T, Scott JM, Crystal YO, Berg JH, Milgrom P. Silver diamine fluoride in pediatric dentistry training programs: survey of graduate program directors. Pediatr Dent 2016;38:212-217.

Stain on primary molars more acceptable than incisors, but parents preferred stain to sedation/general anesthesia.

Crystal YO, Janal MN, Hamilton DS et al. Parental perceptions and acceptance of silver diamine fluoride staining. JADA 2017;148:510-518.

SDF “bleeds” and can discolor “pre-clinical” white spot lesions. This stain can polished off with a finishing bur.

Failures d/t:

- Food impaction with large occlusal lesions (ITR)
- High cariogenic diet
- Low fluoride exposure
- Poor oral hygiene

Twice the fluoride as fluoride varnish - 44,800ppm vs 22,600 ppm

Preventive effects greater with one application of SDF than 2-4 times with fluoride varnish or chlorhexidine varnish.

Horst JA. The use of silver diamine fluoride for early childhood caries. Oct. 30, 2016. Audio presentation. Oakstone Publications. Practical Reviews in Pediatric Dentistry. 2016; Vol. 30. No. 10.

10%-38% formulations

38% SDF more effective treatment for caries arrest. 44,800ppm Fluoride

When applied twice per year provides 80% reduction in caries progression and new lesions, which is twice that of fluoride varnish.

Crystal YO, Niederman R. Silver diamine fluoride treatment considerations in children's caries management. Pediatr Dent 2016;38:466-471.

Combine with Fl varnish at 3 mo. intervals for high CRA.

Ammonium hexafluorosilicate (SiF) contains silica rather than silver; so does not cause the stain of SDF.

The antibacterial activity is not has high as SDF.

Antibacterial agents can be added.

Needs more investigation before clinical use.

Savas S, Kucukyilmaz E, Uzer-Celik E. Effects of remineralization agents on artificial carious lesions. Pediatr Dent 2016;38:511-518.

Pretreating dentin with SDF does not impede the bonding strength of composite resin to dentin.

Esthetic concern d/t composite will be dark.

Wu DI, Velamakanni S, Denisson J, et al. Effect of silver diamine fluoride (SDF) application on microtensile bonding strength of dentin in primary teeth. Pediatr Dent 2016;38:148-153.

SDF releases silver ions which inhibit growth of S mutans and reduce metabolic activity of plaque.

SDF does not interfere with the bond strength between glass ionomer cement and carious primary dentin.

When the child can co-operate, final restorations can be performed.

Puwanawiroj A, Trairatvorakul C, Dasanavake AP. Microtensile bond strength between glass ionomer cement and silver diamine fluoride-treated carious primary dentin. Pediatr Dent 2018;40:291-295.

SMART

Silver Modified
Atraumatic Restorative Technique

SDF and Conventional Glass
Ionomer Cement

INDICATIONS/PROCEDURE

Silver diamine fluoride (SDF) is an antibiotic liquid. SDF is used on cavities to help stop tooth decay. SDF may need to be applied every 6-12 months and follow-up is necessary 2 weeks after application. In some cases, fluoride varnish may be alternated with SDF application every three months. Monitoring is essential and your child must be seen every three months to evaluate efficacy of the SDF.

The tooth or teeth to be treated are dried and cotton rolls and/or gauze are used to isolate the tooth or teeth. SDF is applied for one minute and dried. The tooth or teeth are then rinsed with water.

SDF does not eliminate the need for fillings or crowns. Form and function are not restored. Once behavior permits, if additional procedures can be performed, a fee for that treatment will be incurred.

CONTRAINDICATIONS

SDF is contraindicated with an allergy to silver or if any irritation or ulcers are present in the oral cavity.

RISKS

Permanent black stain will occur on the tooth or teeth that are treated with SDF. SDF can shed into the saliva and cause stain on the other teeth. If the SDF accidentally touches the gums, stain may occur but should be gone within a few weeks.

ALTERNATIVES

No treatment, but decay will likely progress resulting in pain or abscess requiring an extraction.
Restoration with tooth-colored fillings or crowns if behavior permits.
Referral for sedation for definitive treatment.

I have read the indications/procedure, contraindications, risks and alternatives to treatment. I have seen a photograph of stained teeth treated with SDF.
All questions have been answered to my satisfaction.

I UNDERSTAND THE TREATED TEETH WILL BE PERMANENTLY STAINED BLACK.
I UNDERSTAND THAT SDF DOES NOT RESTORE THE TOOTH (TEETH) BUT SLOWS THE DECAY PROCESS AND THAT DECAY CAN STILL PROGRESS, ESPECIALLY IN CAVITATED AREAS (TEETH WITH HOLES IN THE CHEWING SURFACE).

Indirect Pulp Therapy
for Young Permanent Molars

American Academy of Pediatric Dentistry. Pulp therapy for primary and immature permanent teeth. Pediatr Dent 2018/19;40(6):343-351.

Handbook of Clinical Techniques in Pediatric Dentistry ed. Jane A. Soxman Wiley Blackwell 2015

Indications for IPT

No symptoms of pulpitis and PA does not show carious involvement of pulp chamber.

Instead of creating a pulp exposure, requiring endodontic treatment with complete excavation of caries, the deepest decay is left in place.

Some state that by continuing excavation into the pulp, infected dentin chips are displaced into the pulp, thus increasing the risk of pulpal inflammation.

After exposure due to caries, the pulp's repair capacity is questionable.

Young permanent molars/ hypoplastic molars.

IPT for Young Permanent Molars

Allows completion of root maturation prior to endodontic treatment.

Persistent long-term follow-up is required with PA every 6 months.

One-step now recommended over stepwise.

In an asymptomatic young permanent molar, leaving some caries behind and placing a final restoration with a good seal has a better outcome than stepwise caries removal.

Maltz M, Garcia R, Jardim JJ, et al. Randomized trial of partial vs. stepwise caries removal: 3-year follow-up. J Dental Res 2012;91:1026-1031.

Partial caries removal with amalgam or composite restoration had 99% success rate with a single session vs 86% success rate with step-wise excavation.

Single session is better for behavior considerations, cost and follow-up.

Maltz M, Jardim JJ, Mestrinho HD et al. Partial removal of carious dentine: a multicenter randomized controlled trail and 18-month follow-up results. Caries Res 2013;47:103-109.

Tooth treated on first appointment.

No plan to re-enter tooth for pulpotomy.

Large round bur w. slow speed preferable to spoon for caries excavation.

May leave 1-2mm of leathery dentin over pulp.

Affected dentin should be able to remineralize due to decreased number of micro-organisms.

Some Indirect Capping Agents

Glass ionomer
Calcium hydroxide- Dycal, UltraCal XS
Bio-Cap -Resin-ionomer adhesive liner with fluoride
Geristore
MTA
TheraCal LC
Biodentine
NeoMTA & NeoMTA Plus

To Stimulate Healing and Repair

Biodentine (calcium silicate) and Fuji IX performed the same clinically, but radiographically Biodentine showed improved "healing" of lesions.

Biodentine is more alkaline.

Hashem D, Mannocci F et al. Clinical and radiographic assessment of the efficacy of calcium silicate indirect pulp capping:A randomized controlled clinical trail. J Dent Res 2015;94:562-568.

Sterile wax, calcium hydroxide and glass ionomer cement used as a dental liner for stepwise excavation to prevent pulpal exposure with complete excavation of deep caries.

All three showed increase in dentin hardness, total or partial obliteration of dentinal tubules and decrease in bacteria.

Corralo DJ, Maltz M. Clinical and ultrastructural effects of different liners/restorative materials on deep carious dentin: A randomized clinical trial. Caries Res 2013;47:243-250.

Glass ionomer & inert wax placed after partial caries removal.

Restored with composite.

Opened after 60 days.

Sealing the cavity isolates the bacteria from the oral cavity and biofilm.

Cessation of the carious process permits biological response of the tooth.

Dentin reorganization and mineral changes were not dependent on the indirect pulp capping material providing evidence that the arrest of the caries is not material-driven but host-driven.

Repair and regeneration in the dentin/pulp complex is similar to natural wound healing.

Kuhn E, Reis A, Chibinski ACR, et al. The influence of the lining material on the repair of infected dentin in young permanent molars after restoration: A randomized clinical trail. J Conserv Dent 2016;19:516-521.

Glass Ionomers: Material of Choice

Simple placement.

Minimizes possibility of post-operative sensitivity in deep restorations.

Layering not necessary due to no polymerization shrinkage.

In large restorations with thin outer walls, the polymerization shrinkage with composite can cause fracture of cusps.

97

Coefficient of thermal expansion similar to tooth structure.

Fluoride-releasing and anti-microbial properties---restoration of choice when cariogenic properties are important.

Ionic bond with tooth surface that is consistent throughout the life of the restoration.

98

Resin Modified Glass Ionomer

Must be 70-80% glass ionomer in order to be called a resin modified glass ionomer.

20% polyacrylic acid- Increases the bond by conditioning collagen and dentin.

RMG bonds chemically to tooth structure.

Fluoride releasing restorative materials have an anti-caries effect, reported mostly as their remineralization.

But also…

Glass-ionomer cements (GIC) can prevent cariogenic bacteria from *making as much acid*.

Nakajo K, Imazato S, Takahashi Y, Kiba W, et al. Fluoride released from glass-ionomer cement is responsible to inhibit the acid production of caries-related oral streptococci. Dent Mater 2009;25:703- 708.

A well-sealed restoration is critical for the success of IPT.

Bjorndal, L. Indirect pulp therapy and stepwise excavation. Pediatr Dent 2008;30:225-229.

Calcium hydroxide is very soluble and not a good choice adjacent to resin, which has hydroscopic properties that make water available within the restoration. (CaOH interferes with composite set - Robert Lowe DDS)

Glass ionomer cement (GIC) is a good base or liner with resin-based composite.

Donly K, J, Garcia-Godoy, FG. The use of resin-based composite in children: an update. Pediatr Dent 2015;37:136-143.

Lamination
Sandwich Technique
Stratification

Combination of glass ionomer for dentin replacement and bonded resin-based composite enamel replacement.

Croll TP, Nicholson JW. Glass ionomer cements in pediatric dentistry: review of the literature. Pediatr Dent 2002;24:423-429.

Placement of a adhesively bonded resin-based composite over a resin-modified glass ionomer dentin replacement layer almost guarantees no post-operative sensitivity for the young patient.

Croll TP, Nicholson JW. Glass ionomer cements in pediatric dentistry: review of the literature. Pediatr Dent 2002;24:423-429.

GIC or resin-modified GIC photochemically bonds to the dentin. The need for dentin bonding adhesive is eliminated with GIC.

Bonding agent for the composite is placed over the GI or RMGI.

Donly K, J, Garcia-Godoy, FG. The use of resin-based composite in children: an update. Pediatr Dent 2015;37:136-143.

Criteria for Success

Vitality is preserved.

No pain, sensitivity or swelling.

No radiographic evidence of internal or external resorption or other pathologic changes.

Continued apexogenesis.

Obtain PA every 6 months (if possible!).

Vital Pulp Therapy
for Primary Molars

American Academy of Pediatric Dentistry. Pulp therapy for primary and immature permanent teeth. Pediatr Dent 2018/19;40(6): 343-351.

Handbook of Clinical Techniques in Pediatric Dentistry ed. Jane A. Soxman Wiley Blackwell 2015

Consent

Illustrations increased parental acceptance/ cooperation and decreased parental anxiety for recommended dental treatment.

Children's behavior improved as well.

Wang SJ, Briskie D, Chun Hu JC, Majewski R, et al. Illustrated information for parent education: Parent and patient responses. Pediatr Dent 2010;32:295-303.

"The coronal pulp is amputated, and the remaining vital radicular pulp tissue surface is treated with a long-term clinically-successful medicament such as Buckley's Solution of formocresol or ferric sulfate."

American Academy of Pediatric Dentistry. Pulp therapy for primary and immature permanent teeth. Pediatr Dent 2018/19;40(6):343-351.

Indications for Pulpotomy

*Complaint of spontaneous (unprovoked) pain in a carious primary molar.

Radiographic evidence of pulpal involvement. (careful re false involvement with occlusal caries)

Carious pulp exposure during preparation.

No mobility or pain with percussion.

Complaint of Pain

Children may not recall experiences of pain and difficult to obtain accurate history of pain.

Parent will be more reliable for child's history of complaint regarding pain.

Verghese ST, Hannallah RS. Acute pain management in children. J Pain Res 2010;3:105-123.

Caries may extend into the furcation without any painful symptoms.

Figueriredo MJ, de Amorium RG et al. Prevalence and severity of clinical consequences of untreated dentine carious lesions in children from a deprived area of Brazil. Caries Res 2011;45:435-442.

Radiographic Evaluation

The bone in the furcation of the primary molar is affected by the toxins that travel through the accessory canals in the floor of the pulp chamber.

This results in loss of the lamina dura and decreased radiopacity.

Extraction indicated for int/ext resorption.

Internal Resorption

Always associated with extensive inflammation in the primary dentition.

The roots of the primary molar are very thin.

If internal resorption can be seen on a radiograph, a perforation has usually occurred.

Extraction is indicated.

Camp J. Diagnosis dilemmas in vital pulp therapy. Pediatr Dent 2011;30:197-205.

In addition to bitewing radiographs, a periapical radiograph should also be obtained prior to a pulpotomy procedure.

If more than six months time has elapsed since films obtained, obtain another film prior to a two-surface restoration in a caries active child.

Caries may have progressed, and a pulpotomy may now be necessary.

Indirect Pulp Therapy - IPT

No signs or symptoms of pulpal degeneration.

Caries closest to the pulp is left in place.

Infected dentin is removed.

Affected dentin, which has the potential to remineralize remains.

Caries less than 1mm away from the pulp.

Covered with a biocompatible material.

Calcium hydroxide has been material of choice in the past due to alkaline biocompatible properties and induction of reparative dentin.

Resin-modified glass ionomer has comparable success to calcium hydroxide but is better at preventing microleakage.

Less painful since no pulpal entry.

Significantly greater survival rate after 3 years compared to formocresol or ferric sulfate pulpotomy.

Coll JA. Indirect pulp capping and primary teeth: Is the primary tooth pulpotomy out of date? Pediatr Dent 2008;30:230-236.

Wunsch PB, Kuhnen M, Brickhouse TH. Retrospective study of the survival rates of indirect pulp therapy versus different pulpotomy medicaments. Pediatr Dent 2016;38:406-411.

A good coronal seal post vital pulp therapy is essential to decrease leakage and bacterial contamination.

Stainless steel crowns provide a better seal than amalgam and have fewer restoration failures.

Sonmez D, Duruturk L. Success rate of calcium hydroxide pulpotomy in primary molars restored with amalgam and stainless steel crowns. Br Dent J 2010;208:E18; discussion 408-409.

Proximal carious lesions on primary molars are associated with greater pulpal inflammation compared to lesions of the same depth on the occlusal surface.

Kassa D, Day P, et al. Histological comparison of pulpal inflammation in primary teeth with occlusal or proximal caries. Int J Paediatr Dent 2009;19:26-33.

Caries in the primary dentition will predict caries in the permanent dentition.

Start with caries-free primary dentition to have caries-free permanent dentition.

Hall-Scullin E, Whitehead H et al. Longitudinal study of caries development from childhood to adolescence, J Dent Res 2017;96:762-767.

Carious Pulp Exposure

In primary molars, pulpotomy is best choice if clinical exposure with bleeding.

Infected dentin is propelled into the pulp chamber, infecting the tissue.

Pulpotomy vs Pulpectomy?

No gingival/mucobuccal swelling
No sinus tract/parulis
No excessive mobility
No acute pain

When a pulpotomy is performed, the coronal pulp is cariously involved, and the radicular pulp is considered to be free of infection.

Medicaments

Pulpotomy

Formocresol
MTA: Mineral trioxide aggregate
Portland Cement
Ferric sulfate
Glutaraldehyde
Electrosurgery
Laser
Sodium Hypochlorite
Biodentine
NeoMTA & NeoMTA Plus

Pulpectomy

Zinc oxide eugenol
Calcium hydroxide
Iodoform paste:
Kri-paste
Vitapex/Metapex-CaOH plus iodoform

In 2013, 82% of residency programs taught the use of formocresol (Fc) for pulpotomy.

Mineral trioxide aggregate and ferric sulfate ranked next in use.

Walker LA, Sanders BJ et al. Current trends in pulp therapy: A survey analyzing pulpotomy techniques taught in pediatric dental residency programs. J Den Child 2013;80:31-35.

Formocresol (Fc) still most commonly taught medicament for pulpotomy.

The Handbook of Pediatric Dentistry. AJ Now & PS Casamassimo, eds. p. 140. American Academy of Pediatric Dentistry, 2018.

MTA vs Ferric Sulfate vs Formocresol

MTA resulted in higher radiographic success at two years than Ferric Sulfate or Formocresol.

Erdem AP, Guven Y, Balli B, et al. Success rates of mineral trioxide aggregate, ferric sulfate, and formocresol pulpotomies: A 24-month study. Pediatr Dent 2011;33:165-170.

MTA

MTA resulted in 100% success rates at 36 months.

Primary molars restored with SSC.

Promotes dentin-bridge formation.

Godhi B, Tyagi R. Success rate of MTA pulpotomy on vital pulp of primary molars: A 3-year observational study. Int J Clin Pediatr Dent 2016; 9: 222-227.

MTA was compared to IRM for quality of seal.

Teeth soaked in methylene blue for 24 hrs and 28 days.

Teeth sectioned and evaluated for dye penetration.

MTA provided better seal than IRM.

Farto J, Sahli CC, Boj JR. Microleakage of MTA in primary molar pulpotomies. Eur J Paediatr Dent 2017;18:183-187.

Early childhood caries with highly virulent bacterial strains.

Circulating microorganisms may localize in areas of inflammation. Kumar Subramanian, DDS

Microleakage at crown margins may result in failure of pulp/SSC. “Clinically closed” margin may be open 30-50 micrometers & bacteria may be 1 micrometer in diameter. Robert A. Lowe, DDS

Use bioactive cement ACTIVIA BioACTIVE CEMENT (Pulpdent), Ceramir Crown and Bridge (Doxa), BioCem Universal BioActive (NuSmile)

Ferric Sulfate

Hemostatic agent that agglutinates blood proteins.

The blood reacts with both ferric and sulfate ions and the agglutinated protein forms plugs that occlude the capillaries.

Offers a non-aldehyde option for those who are concerned about formocresol's controversy.International Agency for Research on Cancer classified formaldehyde as carcinogenic for humans in June 2004.

Ferric Sulfate for vital pulpotomy has been challenged because FS application does not allow for proper clinical evaluation of the quality of the hemorrhage from the radicular pulp.

Doyle TL, Casas MJ, Kenny DJ, Judd PL. Mineral trioxide aggregate produces superior outcomes in vital primary molar pulpotomy. Pediatr Dent 2010;32:41-47.

Ferric Sulfate was found to cause internal resorption and subsequent failures.

Wunsch PB, Kuhnen MM, Brickhouse TH. Retrospective study of the survival rates of indirect pulp therapy versus different pulpotomy medicaments. Pediatr Dent 2016;38:406-411.

? Calcium Hydroxide

Over 3-year follow-up, after pulpotomy with ferric sulfate, formocresol, laser and calcium hydroxide.

Ferric sulfate most successful and CaOH least effective.

Huth KC, Hajek-Al-Khatar N, Wolf P, et al. Long-term effectiveness of four pulpotomy techniques:3-year randomized controlled trail. Clin Oral Invest 2012;16:1243-1250.

Biodentine

Tricalcium-silicate material similar to MTA.

Better ease of handling and color stability.(No bismuth oxide and sets up in minutes)

Has performed well as pulp-capping agent.

De Rossi A, Silva IAB et al. Comparison of pulpal responses to pulpotomy and pulp capping with biodentine and mineral trioxide aggregate in dogs. J Endod, 2014;40:1362-1369.

Biodentine vs MTA

Both performed clinically and radiographically equally as well after 24 months.

Main advantage of biodentine over MTA is higher viscosity and no discoloration.

Bani M, Aktas N, Cinar C et al. The clinical and radiographic success of primary molar pulpotomy using biodentine and mineral trioxide aggregate: A 24-month randomized clinical trial. Pediatr Dent 2017;39:284-288.

Primary molar pulpotomy requires a vital radicular pulp no matter what medicament is used.

If the pulp chamber is dry, has an odor, or contains purulent material, extraction is indicated.

*****Seale NS, Coll JA. Vital pulp therapy for the primary dentition. Gen Dent 2010; 58:194-200.

Mobility

Evidence-Based Guidance

Panel was unable to make recommendation of superiority of any medicament due to lack of studies for comparison.

Mineral Trioxide Aggregate (MTA) and formocresol had highest (moderate) quality of evidence.

Ferric Sulfate and lasers followed.

Dhar V, Marghalani AA, Crystal YO et al. Use of vital pulp therapies in primary teeth with deep carious lesions. Pediatr Dent 2017;39(5):E146-E259. (Panel)

Pulpotomy Armamentarium

Local anesthesia w. epinephrine

Rubber dam

Curette/Spoon for tissue tags

Sterile #6 or #8 round bur in high speed

Sterile saline, 2% chlorhexidine or NaOCL for irrigation with monoject syringe

4% articaine infiltration vs block with 2% lidocaine for pulpotomy were compared.

The two anesthesia techniques showed equivalent efficacy for both pulpotomy and extraction of mandibular primary molars.

Alzahrani F, Duggal MS, et al. Anesthetic efficacy of 4% articaine and 2%lidocaine for extraction and pulpotomy of mandibular primary molars: An equivalent parallel prospective randomized controlled trail. Int J Paediatr Dent 2018;28:335-344.

Pulp Bleeding Color

Pulpal blood was collected in a capillary tube and color measured with LED spectrophotometer.

Darker the color, the more inflammation with higher white blood cell count.

If still bleeding after 5 minutes and dark red, pulpectomy should be performed.

AAminBdi NA, Parto M et al. Pulp bleeding color is an indicator of clinical and histohematologic status of primary teeth. Clin Oral Investig 2017;21:1831-1841.

"No direct link between achievement of hemostasis and inflammatory status of the dental pulp seems to exist."

Mutluay M, Arikan V, Sari S et al. Does achievement of hemostasis after pulp exposure provide an accurate assessment of pulp inflammation? Pediatr Dent 2018;40:37-42.

Cotton pellets- size 1

Cotton forceps

Preferred medicament

(2x2 to squeeze out formocresol from cotton pellet if using formocresol)

IRM (reinforced ZOE with polymer fibers) MTA or NeoMTA

Wet cotton tipped applicators for compressing IRM/NeoMTA

Pulpotomy Procedure

Perform 1mm occlusal reduction for SSC.

Remove all peripheral & superficial caries prior to entering the pulp chamber with sterile #6 or #8 round bur in high speed.

Create large enough access opening to permit visualization of canal orifices and remove ledges that could hide tissue tags.

Contaminated water from dental unit water lines introduced Mycobacterium abscessus during irrigation and drilling in pulpotomy procedures. (Ferric Sulfate)

Peralta G, Tobin-D'Angelo M et al. Notes from the field: Mycobacterium abscessus infections among patients of a pediatric dentistry practice-Georgia 2015. MMWR Morb Mortal Wkly Rep. 2016;65:355-356.

A size 1 cotton pellet is dipped in the Buckley's formocresol and compressed in a 2x2 because formocresol is very caustic. *FUMES ONLY*

The pulpal floor is very porous in infected primary molars. If the pellet is saturated with formocresol, the drug can penetrate through the accessory canals in the furcation and cause a severe reaction in the furcation tissue.

A one-minute application of full-strength Buckley's formocresol showed comparable success rates to a five-minute application of the one-to-five dilution of full-strength Buckley's formocresol.

Kurji ZA, Sigal MJ, Andrews P, et al. A retrospective study of a modified 1-minute formocresol pulpotomy technique. Part I: Clinical and radiographic findings. Pediatr Dent 2011;33:131-138.

Place the FC pellet snugly over the pulpal stumps and cover with dry pellets for 1 minute.

Be sure lip is covered with the rubber dam. The lip will be numb in the mandible, so the child would be unaware of burning if using formocresol & it contacts the lip.

An explorer or cotton pliers may be used to remove the cotton pellets.

The FC pellets are never left in the pulp chamber until a second visit and formocresol is never mixed with the IRM.

The pulp chamber is completely filled with a thick mix of ZOE and packed tightly with a wet cotton-tipped applicator.

Primary Molar Pulpectomy

Reduce or eliminate the infecting bacteria

Thorough root canal debridement with barbed broach or endo file-GENTLY!

1mm short of apex. size 25-35 endo file. (40)

Appropriate antibacterial irrigation-NS/NaOCl.

Dry with sterile paper point.

Vitapex & Metapex

Iodoform 40.4%, calcium hydroxide 30.3%, silicone 22.4%. Highly radiopaque.

Premixed paste in syringe with flexible tips--get curved--and plunger-type dispensing for access to apex.

Extra and intraradicular resorption by macrophages.

Iodine in iodoform has antibacterial properties.

Irrigate with sodium hypochlorite. (3% ChlorCid)

Estrela C, Rodrigues de Araujo Estrela C, Hollandra ACB, et al. Influence of iodoform on antimicrobial potential of calcium hydroxide. J Appl Sci 2006;14:33-37.

Bacteria colonize in the pulp canal space & biofilm of bacteria forms. Copious & repeated irrigation necessary to remove biofilm. Kumar Subramanian Endodontic Challenges in Pediatric Dentistry Annual AAPD meeting

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Very sticky when injecting. Continue to extrude from syringe as pulling out of canal.

Press extruded paste in coronal area back down into the roots.

Condense thick mix of ZOE (IRM is reinforced ZOE) over orifices and fill coronal area.

Place SSC/pre-veneered or zirconia crown.

Can also use ZOE paste in the canals.

Vitapex resolved furcation pathology at a faster rate than ZOE at 6 months but at 12 months both materials had similar results.

Trairatvorakul C, Chunlasikaiwan S. Success of pulpectomy with zinc oxide-eugenol vs calcium hydroxide/iodoform paste in primary molars: a clinical study. Pediatr Dent 2008;30:303-308.

Full Coverage Restorations

Handbook of Clinical Techniques in Pediatric Dentistry ed. Jane A. Soxman Wiley-Blackwell 2015

High Caries Risk Assessment

Large Preparation/Wide Isthmus

Pulpotomy/Pulpectomy

Severe Hypoplasia in Permanent Molar

If General Anesthesia Necessary to Treat

Early Childhood Caries - ECC

"One or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six."

American Academy of Pediatric Dentistry. Early childhood caries (ECC): classifications, consequences, and preventive strategies. Pediatr Dent 2018/19;40(6):60-64.

Severe Early Childhood Caries S-ECC

Any sign of smooth-surface caries in a child younger than 3 years of age.

Ages 3-5 years- One or more cavitated, missing (due to caries) or filled smooth surfaces in maxillary primary anterior teeth or dmf score > or = to 4 at age 3

5 at age 4

6 at age 5

American Academy of Pediatric Dentistry.Early childhood caries (ECC): classifications, consequences, and preventive strategies. Pediatr Dent 2018/19;40(6):60-64.

There is a potential for significant increase in intrapulpal temperature when light curing a composite in a moderately deep preparation in primary molars.

Occlusal preparations 1.5mm in depth with 1mm of pulpal floor thickness.

Vinall CV, Garcia-Silva TC, Lou JSB et al. Intrapulpal temperature rise during light activation of restorative composites in a primary molar. Pediatr Dent 2017:39;E125-E130.

Composite Resin Restoration & Secondary Caries

Dentin-resin margins create an area that permits secondary bacterial infection and recurrent caries in a high caries risk child.

Bourbia M, Ma D, Cvitkovitch DG et al. Cariogenic bacteria degrade dental resin composites and adhesives. J Dent Res 2013; 92:989-994.

Biofilm, number of restored surfaces, and pulp therapy affect the survival of composite resin restorations in early childhood caries.

34.8% of restorations survived at 30 months.

Campagna P, Pinto LT, Lenzi TL et al. Survival and associated risk factors of composite restorations in children with early childhood caries: A clinical retrospective study. Pediatr Dent 2018;40:201-214.

Biodegradation occurs in time due to uptake of water and breakdown by salivary enzymes and acid from bacteria. (DieCal)

Mechanical degradation occurs with thermal stress and occlusal forces.

GAP FORMATION

Nedeljkovic I, Teughels W et al. Is secondary caries with composites a material-based problem? Dent Mater 2015;31:e247-e277.

S. Mutans has esterase activity at levels that degrade resin-based restorative materials, contributing to secondary caries.

Composites do not have the ability to increase the local pH, which leads to increased levels of the acidogenic bacteria and higher cariogenicity of the biofilm.

Recurrent caries occur more often with composite than with amalgam.

Restoration with SSC provides longer success than composite restoration in mandibular fist primary molars.

Survival rates were > 90% over 5 years.

Maupome G, Yepes JF et al. Survival analysis of metal crowns versus restorations in primary molars. JADA 2017;148:760-766.

Resin-based composite (CC), glass ionomer (GI) and resin-modified glass ionomer cement (RMGIC) were compared.

RMGIC most resistant to biodegradation followed by GI and CC.

Gautam AK, Thakur R et al. Degradation of resin restorative materials by streptococcus mutans. J Clin Pediatr Dent 2017;41:225-227.

A two-year trial showed no significant difference in survival rate between preformed metal crowns (95%) vs resin modified glass ionomer/ composite restorations (92.5%) after pulpotomy.

American Academy of Pediatric Dentistry. Pediatric restorative dentistry. Pediatr Dent 2018/19;40(6):330-342.

Enamel prisms are disorganized with lower enamel hardness, contributing to continued enamel breakdown.

Bacteria found deep in porous enamel contribute to hypersensitivity.

Conventional amalgam or resin restoration may not have a positive outcome--SSC

Fagrell TG, Dietz W, Jalevik B et al. Chemical, mechanical and morphologic properties of hypomineralized enamel if permanent first molars. Acta Odontologica Scandavica 2010;68:215-222.

234

Stainless steel crowns provide a viable interim restoration until laboratory fabricated crowns can be placed on young permanent molars with severe hypoplasia, multisurface caries, cuspal fracture or ameolgenesis imperfecta.

SSC's had an 88% success rate over a 45.18 month period.

Discepolo K, Sultan M, et al. Investigation of adult stainless steel crown longevity as in interim restoration in pediatric patients. Int J Paediatr Dent 2017;27:247-254.

Ceramics have better marginal fit and are less plaque retentive. Normal crown contour offers improved periodontal health and esthetics.

Preformed SSC's are preferable to cast-metal ceramic or all-ceramic crowns during childhood and adolescence, but periodontal status must be followed.

Koleventi A, Sakellari D, Arapostathis KN et al. Periodontal impact of preformed metal crowns on permanent molars of children and adolescents. Pediatr Dent 2018;40:117-121.

Crown Selection

Before the preparation, measure the M-D width of the primary molar with a mm ruler or Boley gauge.

May not be able to use the correct crown for a maxillary first primary molar due to M-D tooth loss with caries or unusual morphology.

- Use a crown from opposite side/ opposite arch

Crimp M-D with Howe plier w. space loss.

SSC Armamentarium

- Mirror/Explorer
- Pre-contoured/pre-crimped SSC's
- Local anesthesia
- Rubber dam isolation
- #6 or #8 round carbide bur for 1mm occlusal reduction
- #170 or 169L carbide bur for interproximal reduction

- Wooden wedge for distal of second primary molar if the first permanent molar is erupted and contacting distal of primary molar
- Crown crimper/Howe plier
- Cement - GI, polycarboxylate or *self adhesive resin cement (dual cure and do not over-dry tooth)
- Bite stick
- Wet cotton tipped applicators/2x2's
- Floss with 4-5 knots segmentally tied

"Esthetic Crowns require a new mind set"

Quote from Dr. Anne C. O'Connell

Handbook of Clinical Techniques in Pediatric Dentistry ed. Jane A. Soxman Wiley Blackwell 2015

Pre-Veneered Primary Molar Crowns

- Light and extra light colors
- Can appear bulky
- Gingival health may be compromised (?)
- Higher cost
- Require more tooth reduction
- Can not crimp or place strong occlusal force to seat
- Passive fit with finger
- Insurance code: D2934

- Do first primary molar for first time.
- Select the crown size prior to prep. Use a cotton forceps to compare the crown with the child's primary molar. Choose a crown size that looks most like the child's tooth.
- *Requires much more reduction than SSC.*
- *Prepare set-up and parent for pulp exposure.

Reduce occlusal 2mm with football diamond or donut bur.

Reduce mesial and distal with fine tapered round end diamond.

Reduce buccal and lingual with coarse tapered round end diamond.

Feather edge sub-gingival 1-2mm with fine tapered round end diamond.

Try-in crown. *Passive fit with finger pressure.*

Check that inter arch distance is 2mm with try-in.

If doing more than one crown, try-in all crowns at same time in case need to do more M-D reduction.

Check occlusion with articulating paper.

Glass ionomer cement. *Load crown fully* to be sure no voids. Use cotton tipped applicator to seat with slight pressure from opposite arch.

Clean excess cement with wet 2x2.

Check occlusion. White rubber point to adjust and/or adjust opposing primary molar.

Repairing Chipped Facings

Place a rubber dam

Roughen the facing adjacent to the exposed metal with an abrasive bur

The exposed metal is sandblasted

ESPE Sil, a silane coupling agent for bonding to metals, is applied and left to dry for 30 seconds

Opaque composite applied and light cured

Composite to match veneer applied and cured

Kratunova E, DentSc B, O'Connell AC. Chairside repair of preveneered primary molar stainless steel crowns: A pilot study. Pediatr Dent 2015;37:46-50.

Zirconia Preparation

Donut or football bur for 2mm occlusal reduction.

Coarse round end tapered diamond for 0.75-1.5mm entire circumference starting at the gingival margin. Keep bur straight up & down.

Fine round end tapered diamond for 1-2mm subgingival prep to CEJ. IMPORTANT STEP!!!

Prep *only* counterclockwise when do subgingival preparation to reduce tissue maceration.

Common Problems

Inadequate subgingival preparation.

Inadequate prep around the collar of the tooth. Proper reduction with this step will not only make prep smaller, but permit use of a crown closer in size to the original tooth.

Inadequate interproximal reduction and must keep bur vertical, not slanted.

Vertical walls of prep should be rounded near occlusal to avoid internal binding.

Did not prepare care-giver or obtain consent for pulpotomy.

Use pink try-in crown(s)

Passive fit

Check occlusion before cement

Occlusal or interproximal adjustment will remove glaze and create weakened areas with thin ceramic

MAKE THE TOOTH FIT THE CROWN

Rinse tooth thoroughly. Saliva and blood will bind to the internal area of the zirconia crown and impede bond.

Blood may show through zirconia. Hemostasis must be achieved prior to cementation.

If do not have try-in crowns, clean inside of zirconia crown with alcohol, peroxide, or sandblast with aluminum oxide prior to placing cement.

May reduce collar with diamond in high speed with copious water coolant-excessive heat will cause micro-fracture of zirconia. (Probably not a good idea!)

Better to adjust occlusion of opposing tooth

Fill crown completely with glass ionomer cement or resin-modified glass ionomer cement.

Various cements were compared for microleakage.

Resin cement is most optimum luting agent.

Al-Haj Ali SN, Farah RI. In vitro comparison of micro leakage between preformed metal crowns and aesthetic crowns of primary molars using different adhesive luting cements. Our Arch Paediatr Dent. 2018 pub ahead of print

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Do not disturb until cement set--hold with finger pressure

Remove size with spoon or prophy paste

Autoclave for sterilizing

Code D2929

Zirconia primary molar crowns show similar performance to SSCs at 24 months.

Donly KJ, Sasa I, Contreras CI et al. Prospective randomized clinical trial of primary molar crowns: 24-month results. Pediatr Dent 2018;40:253-258.

Zirconia crowns have advantage of esthetic appearance.

Zirconia crowns showed less plaque accumulation and better gingival health than SSC.

Fracture and mild staining may occur with zirconia crowns.

Taran PK, Kaya MS. A comparison of periodontal health in primary molars restored with prefabricated stainless steel and zirconia crowns. Pediatr Dent 2018;40:334-339.

Primary tooth enamel is thinner, less mineralized, more porous and aprismatic compared to permanent enamel.

Zirconia crowns do not cause excess enamel loss to occluding primary molars.

Johnson-Harris D, Chiquet B, Flaitz C et al. Wear of primary tooth enamel by ceramic materials. Pediatr Dent 2016;38:519-522.

Extraction of Primary Dentition

Handbook of Clinical Techniques in Pediatric Dentistry
ed. Jane A. Soxman Wiley Blackwell 2015

In this Happy Tooth Chest you will find
a teeny, tiny tooth of mine.
And while I lay where dreams are made,
maybe we can make a trade.

Local Anesthesia

Handbook of Clinical Techniques in Pediatric Dentistry
ed. Jane A. Soxman Wiley Blackwell 2015

The number one reason children give for fear of going to the dentist is the fear of the injection.

AlShareed M. Children's perception of their dentists. Eur J Dent 2011;5:186-190.

Combative Behavior and/or Avoidance Behavior

Topical Anesthesia

Temporary loss of sensation 2-3mm in depth.

Contact for minimal duration of 2 minutes.

No direct proportional relationship between duration of contact and clinical effectiveness.

Decreases discomfort for needle penetration & rubber dam clamp placement.

Priyatham S, Nuvvula S. Intraoral topical anesthesia in pediatric dentistry. Int J Pharm Bio Sci 2016;7:346-353

Vibration

Vibration stimulus is counter-stimulation that reaches the brain before pain sensation.

Attributed to gate control theory.

Stimulation of the larger diameter A beta fibers can close a neural "gate" to nociceptive signals, reducing pain perception.

Pain relief enhanced by simultaneous activation of nerve fibers that conduct non-noxious stimuli.

Vibration stimulus has been shown to significantly reduce pain with injection compared to use of topical anesthesia alone.

Priyatham S, Nuvvula S. Intraoral topical anesthesia in pediatric dentistry. Int J Pharm Bio Sci 2016;7:346-353

DentalVibe significantly reduced injection discomfort in patients 10-17 years of age.

Ching D, Finkelman M, Loo CY. Effect of dentalvibe injection system on pain during local anesthesia injections in adolescent patients. Pediatr Dent 2014;36:51-55.

DentalVibe significantly reduced injection pain in 6-12 year-old children.

Shilpapriya M, Jayanthi M, Reddy VN et al. Effectiveness of new vibration delivery system on pain associated with injection of local anesthesia in children. J Indian Soc Pedod Prev Dent 2015;33:173-176.

Bone is very porous with rapid uptake.

Inject slowly

Buccal infiltration usually adequate in mandible rather than block under age 8

Panoramaic Films &Models Analyzed

1.26mm below occlusal plane in full primary dentition.

0.33mm above the occlusal plane as first permanent molar erupts.

1.54mm above occlusal plane when first permanent molar fully erupted.

1.64mm above occlusal plane as permanent lateral incisors erupt.

1.98mm above occlusal plane as permanent second molar erupts.

2.9mm above occlusal plane when permanent second molar fully erupted.

Shukla RH, Tiku A. Correlation of mandibular foramen to occlusal plane as a clinical guide for inferior alveolar nerve block in children: A digital panoramic radiographic study. Centemp Clin Dent 2018;9:372-375.

Place thumb extra-orally on posterior border of ramus and index finger in the coronoid notch, the deepest depression on the anterior border of the ramus.

Barrel of syringe on opposite corner of mouth.

Short 27 gauge needle for young pediatric patient. Usually do not need block under age 8.

Mandibular foramen lies 1/2 to 2/3 of the total width of the width of the ramus measured from the anterior border.

Epars J-F, Mavropoulos A, Kiliaridis S. Influence of age and vertical facial type on the location of the mandibular foramen. Pediatr Dent 2013;35:369-373.

5-7 year old children receiving IAN.

Distraction with audiovisual glasses was an effective means to reduce pain with injection of local anesthesia.

El-Sharkawi HFA, Housseiny AA, Aly AM. Effectiveness of new distraction technique on pain associated with injection of local anesthesia for children. Pediatr Dent 2012;34:142-145.

Prolonged numbness with 4% Septocaine from 3 to 5 hours.

Primarily in children younger than 7 years of age.

Lip most common site for accidental injury.

Not related to injection site.

Inform parents - Include with Consent.

Adewumi A, Hall M, Guelmann M et al. The incidence of adverse reactions following 4% septocaine (Articaine) in children. Pediatr Dent 2008;30:424-428.