Pediatric Dentistry: Pulp Therapy and the Stainless-Steel Crown

by Josh Wren, DMD

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Two of the most important treatment procedures used by pediatric dentists are pulp therapy and the stainless steel crown. However, confusion often arises among some general dentists as to the indications and the most efficient and predictable steps in performing these procedures.”

**Abstract**

Pulp therapy and use of stainless-steel crowns are two vital procedures that pediatric dentists provide. Even with experience in these procedures it can be difficult to know which steps to follow and how to follow them. Efficiency can also be a challenge. With some key information and practice, a dentist’s efficiency, know-how and treatment success in these procedures can increase significantly.

**Educational Objectives**

1. Identify the indications for pulpotomy, pulpectomy and indirect pulp therapies.
2. Identify the indications for stainless steel crowns or fillings after pulpal treatment.
4. Learn techniques to place stainless steel crowns.
5. View photos and radiographs to diagnose proper pulpal treatments on pedodontic teeth.
**Introduction**

Two of the most important treatment procedures used by pediatric dentists are pulp therapy and the stainless-steel crown. However, confusion often arises among some general dentists as to the indications and the most efficient and predictable steps in performing these procedures. Moreover, pulp therapy has evolved over the past 5-10 years from prophylactic pulpotomies to indirect pulp therapy. I’ll discuss how to efficiently and predictably perform these procedures by using pictorials, intra-oral photos, and radiographs, in lieu of attempting word-driven descriptions.

**Pulp therapy: indirect pulp therapy (IDPT)**

**Indications:** Deep decay approximating the pulp, asymptomatic or symptoms of reversible pulpitis.

**Material:** Glass ionomer—I use ionoseal—or glass ionomer cement if restoring with stainless steel crown (Ketac-Cem Maxicap or Relyx by 3M ESPE).

**Procedure:** Good access, remove all decay at the DEJ, remove soft decay approximating the pulp, being careful to avoid a pulp exposure, place glass ionomer, and restore. I strongly recommend placing a stainless-steel crown (SSC) if tooth needs to be maintained two years or more (simply offers the best seal).

*Fig. 1* Asymptomatc with deep decay approximating the pulp (perfect indication for IDPT).

*Fig. 2* Decay at DEJ not completely excavated.

*Fig. 3* Black circles indicate where DEJ needs to be thoroughly excavated.

*Red circles* indicate decay approximating the pulp that needs to be left to prevent pulp exposure.

*Fig. 4* Pre-op BW of #8 with decay approximating the pulp and #5 with distal and deep 0 decay at mesial pit.

*Fig. 5* Two years post-op today, I would perform IDPT on #5 instead of just #8. #8 can be considered a prophylactic pulpotomy.

**Note:** Indirect pulp capping has been shown to have a higher success rate than pulpotomy in long-term studies. Therefore, indirect pulp treatment is preferable to a pulpotomy when the pulp is normal or has a diagnosis of reversible pulpitis.\(^{1,2}\)
Therapeutic pulpotomy

Indications: When caries removal results in pulp exposure in a primary tooth with a normal pulp or reversible pulpitis. Pulpotomies are used very seldom in most pediatric dental offices at the current time due to the long-term studies of indirect pulp therapy showing higher success rates. Be sure to check the furcation and if you see questionable radiolucency, be thinking irreversible pulpitis and/or necrosis.

Material: Formocresol or ferric sulfate are the most popular (I use viscostat simply as a personal preference. Most pediatric dentists still consider formocresol as the gold standard) and zinc oxide eugenol or other temporary restorative material (I personally use Tempit).

Procedure: Good access, remove soft decay, assuming pulp exposure—remove the pulp in the chamber with 6 or 8 round, remove 2-3mm of pulp in the canals with 2 round, assess for tissue tags and remove accordingly, cotton pellet to assess the health of the pulp (if hyperemic, consider extraction or pulpectomy after verifying that there are no hidden tissue tags present). If pulp appears healthy and bleeding is controlled easily with the cotton pellet, place medicament of choice (3-5 minutes for formocresol and a 10-15 second scrub with viscostat), rinse thoroughly, place temporary material (ZOE or Tempit), restore with SSC. Resin or amalgam can be considered if the tooth needs to be maintained for two years or less.

Pulpotomy cases

Case #1: 5-year-old male

Symptoms included: Persistent pain with cold drinks, pain when brushing. Despite appearance of likely IDPT, I chose a pulpotomy based on symptoms. I assumed aberrant pulp horn and likely microexposure.

Fig. 6 Pre-op BW
Fig. 7 Pulpotomy after damp cotton pellet
Fig. 8 After viscostat scrub
Fig. 9 After rinsing
Fig. 10 After cementing SSC
Fig. 11 Post-op BW
Note: Some practitioners do not excavate past the chamber. Note in figure 11, I have removed pulp tissue 2-3mm down each canal—critical to success in my opinion. I have found that entering the canals 2-3mm (in addition to thoroughly washing the medicament out) greatly decreases internal resorption often associated with viscostat. You don’t want black coagulum left behind after using viscostat!

Case #2: 6-year-old male
Persistently symptomatic

Fig. 12 DO decay
Fig. 13 Occlusal reduction
Fig. 14 Unroofing chamber
Fig. 15 Removing pulp to floor of chamber with 6 round
Fig. 16 Pulp tissue removed 2-3mm down into each canal
Fig. 17 MB canal after viscostat scrub and rinse
Fig. 18 DB/palatal canal ribbon
Fig. 19 Tempit and rest of decay excavated ... I waited until the chamber was sealed for sub G decay removal due to the hyperemic gingival tissue. Personal preference of mine to increase success of pulpotomies.
Fig. 20 SSC preparation (after wedge removal)
Fig. 21 SSC cemented

“I have found that entering the canals 2-3mm (in addition to thoroughly washing the medicament out) greatly decreases internal resorption often associated with viscostat. You don’t want black coagulum left behind after using viscostat!”
**Pulpectomy**

**Indications:** A tooth treatment planned for a pulpotomy that is found to have a hyperemic pulp, a necrotic tooth or one with irreversible pulpititis. In my practice, any anterior tooth with a carious pulp exposure undergoes pulpectomy or extraction. I don’t perform pulpotomies on anterior teeth. In posterior teeth, I use the pulpectomy procedure to maintain the E (or primary 2nd molar) for a couple of years until the permanent 1st molar erupts.

**Material:** Anterior tooth—large broach, fine broach, 25 file. Posterior tooth: #10 and #25 file. Or use rotary in the posterior with a #25 file. Antimicrobial medicament—either 1 percent sodium hypochlorite or chlorhexidine (CHX). I use CHX due to the risk of NaOCl going out of the apex and causing problems with the soft tissue or to the succedaneous tooth. Paper points, CaOH/iodoform paste such as vitapex, tempit, restoration of choice. SSC or zirconia in the posterior. Resin crown or zirconia in the anterior.

**Procedure:** Anterior: place large broach to the apex, place fine broach to the same stop, twist the two files around each other 1-2 times. Pull out the pulp in one piece if still intact. Then gently clean the walls with a 25 file while using CHX. If necrotic or late irreversible pulpititis, use the large broach to get any tissue tags and gently file with a #25 file with CHX. Dry with paper points and fill canal with vitapex/tempit/ionoseal and restore with a resin crown or a zirconia crown.

**Posterior:** Get good access, file canals with #10 and #25 files to the apex or just short of apex while using CHX (if rotary, simply use a #25 file and CHX), dry with paper points until no bleeding then place vitapex/tempit and restore with a full coverage restoration.

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Fig. 22 Pre-op of #5’s E and F symptoms of irreversible pulpititis.
Fig. 23 Post-op of #6’s E and F (not ideal crown seat angulation!) Bulky cosmetic faced stainless steel crowns.
Fig. 24 Post-op of pulpectomy and resin crown #D.
Fig. 25 #E pulpectomy and resin crown and #F resin crown.
Fig. 26 Pre-op BW of 4-year-old with reversible pulpitis #A and irreversible pulpitis #T (#T was hyperemic).
Fig. 27 Post-op BW 14 months later.
Fig. 28 Post-op pan 14 months later.
Fig. 29 5-year post-op pan ... notice the washout of the vitapex. Notice the 6-year molar.
Stainless steel crowns

**Indications:** High-caries-risk children with decay, multi-surface decay and any other decayed or fractured teeth in which other restorative means would likely fail, teeth treated with pulpotomy or pulpectomy (posterior teeth) and also permanent posterior teeth in the high-caries-risk patient.

**Material:** Burs of choice, SSC kit and biocompatible cement.

**Procedure:** Occlusal reduction 1.5-2mm, bevel the facial and lingual, remove decay, proximal slices, round line angles, try in SSC, crimp and cement.

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“Occlusal reduction 1.5-2mm, bevel the facial and lingual, remove decay, proximal slices, round line angles, try in SSC, crimp and cement.”

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Fig. 30 Pre-op of #’s A, S and T needing SSC.
Fig. 31 Post-op BW of properly fitting SSC’s.
Fig. 32 Four-year post-op BWs.
Fig. 33 Occlusal reduction.
Fig. 34 Beveling of buccal and lingual.
Fig. 35 Beveling of buccal and lingual.
“Occasionally, there will be a tooth with very little mesiodistal width due to anatomy or space loss from caries. “

Fig. 36 IPR without wedge (be careful to avoid adjacent tooth).
Fig. 37 IPR with wedge.
Fig. 38 Crimping pliers.
Fig. 39 Crimping the SSC.
Fig. 40 Crown cemented.
Fig. 41 Pre op BW of case with little mesiodistal width tooth #1.
Figs. 42-44 Howe plier to make an 8mm wide SSC about 6.5mm wide.
Fig. 45 Post op after slenderizing the SSC and heavy crimping of buccal and lingual.

Note: Occasionally, there will be a tooth with very little mesiodistal width due to anatomy or space loss from caries. When this occurs, it becomes necessary to squeeze the SSC mesiodistally with Howe pliers to make the crown narrower in the M-D dimension to allow an ideal fit. Crimping the buccal and lingual usually then becomes necessary to prevent an overhanging margin.

“Crimping the buccal and lingual usually then becomes necessary to prevent an overhanging margin.“
Conclusion

Knowing how to properly diagnose and perform the common pedodontic pulpal therapies and restorative can be helpful to a general dentist treating young patients in their practice. I have found these materials and techniques to give consistent results in my pedodontic practice.

References
1. Macobi J, de Araújo FB, Froner AM, Strassen LH, Nor JE. Indirect pulp capping in the primary dentition: A 4-year follow-up study.
3. AAPD reference manual Volume 34; 6 page 222-229

Author Bio

Dr. Josh Wren received his DMD from the University of Mississippi Medical Center in 2005. Afterwards, he attended the University of Kentucky and obtained his certificate in pediatric dentistry. Upon graduation, he started Wren Pediatric Dentistry in Brandon, Mississippi, in 2007 and became a diplomate of the American Board of Pediatric Dentistry in 2008. Dr. Wren is honored to be the Mississippi representative to the Southeastern Society of Pediatric Dentists.
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1. Which of the following is not considered among the most common procedures used by pediatric dentists today?
   a. Indirect pulp therapy
   b. Stainless steel crowns
   c. Prophylactic pulpotomies
   d. Early orthodontic care

2. A stainless steel crown should be placed if the tooth needs to be maintained:
   a. A few months
   b. Less than six months
   c. Up to a year
   d. Two years or more

3. True or False: Indirect pulp capping has been shown to have a higher success rate than pulpotomy in long-term studies.
   a. True
   b. False

4. Questionable radiolucency in the furcation is a sign of:
   a. Reversible pulpitis
   b. Irreversible pulpitis
   c. Necrosis
   d. B and C
   e. None of the above

5. To greatly decrease internal resorption associated with viscostat:
   a. Enter the canals less than 1mm
   b. Enter the canals 2-3mm
   c. Enter the canals 3-4mm
   d. Do not excavate the chamber at all

6. Which is not an indicating symptom of a common pulpotomy case?
   a. Constant pain with cold drinks
   b. Pain while eating
   c. Pain while brushing
   d. None of the above

7. A treatment plan calling for a pulpotomy should be based on findings of:
   a. Hyperemic pulp
   b. Inflamed gums
   c. Necrotic qualities in the anterior
   d. Irreversible pulpitis
   e. A and D

8. True or False: Stainless steel crowns are the best option when other restorative means would likely fail.
   a. True
   b. False

9. When a tooth has very little mesiodistal width and the placement of a stainless steel crown becomes challenging, you should:
   a. Explore restorative options
   b. Use Howe pliers to narrow the crown mesiodistally
   c. Extract
   d. Use Howe pliers to adjust the crown buccolingually

10. True or False: When placing a stainless steel crown, you don’t need to crimp.
   a. True
   b. False

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