Restoring Primary Anterior Teeth: Updated for 2015

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Received input and slides/photos from all the manufacturers

Have lectured for the NuSmile company in the past

Over the past 18 years I have used NuSmile products the most

I have received no sponsorship for this lecture from any company.
Give a review of the literature of the current state of the art with regard to restoring primary anterior teeth

Ask and answer a lot of questions about primary zirconia crowns
Anterior Esthetic Coverage
What would you do?
Brief Overview

- What has changed since 2002?
- Increasing demand for cosmetic procedures.
- Why is there so little good science on restorative options?
- Intracoronal restorations
- Full coronal restorations
Scientifically, what has changed since 2002 with anterior restorative dentistry?

Very Little!!
Full Coronal Restorations

- Restorations bonded to the tooth
  - Strip crowns
  - Pedo Jackets (SML Global)
  - Life-Like Crowns (SML Global)
- Restorations luted to the tooth
  - SSCs/Open Face SSCs
  - Polycarbonate Crowns
  - Preveneered Crowns
  - Zirconia Crowns
Brief Overview

- Material Selection
- Risk assessment and anterior restorations
- Conclusions
- Recommendations
What has changed since 2002?

- From an evidenced based perspective… very little.
- Lit review in 2002 (Lee) AAPD Sympos.
- Lit review in 2006 (Waggoner)
  - No prospective clinical studies reported
  - At best, marginally controlled retrospective studies
- Since 2006?
  - 1 prospective clinical study with 6 month FU, (Walia et al. 2014)
What hasn’t changed?

- While we have new restorative options (e.g., Zirconia crowns) we still have little well supported evidence of a superior restorative technique.

- Therefore, any policy statement will be based largely on anecdotal evidence, clinical experience and “expert” opinion, rather than well controlled science.
What can be used to best restore primary anterior teeth?

- What does “best restore” mean?
  - Most durable?
  - Most esthetic?
  - Most conservative?
  - Most cost effective?
  - Least technique sensitive?
Increased Demand for Esthetics

- Easily seen with adult dentistry
- Dramatic increase in dollars spent in last decade (Am Academy Cosmetic Dent)
  - Invisalign
  - Veneers
  - Bleaching

- As adults become increasingly aware of their own teeth, they will become more concerned about their child’s teeth
Increased Demand for Esthetics

- Woo, Sheller et al (2005)--Parents ranked attractiveness and health similarly. They viewed SSCs as unhealthy

- Holan, Rahme, Ram (2009)--Parents advocated dental tx to save a primary tooth, even if chances for success were only 50%.

- It is very likely that demand for pediatric esthetic restorations and resulting cosmetics will increase.
Why So Little Science?

- Difficulties in carrying out prospective clinical studies with anterior restorative options

  - The young age and cooperative abilities of the patient population
  - Behavior can definitely affect outcome
  - Parental Consent: Unwillingness of parents to have their child be "guinea pig"
Why So Little Science?

➤ These restorations will likely be placed in “high caries risk” children, may not be transferable to low risk
➤ These children are often low SES, so follow up can sometimes be challenging
➤ Reluctance of a clinician to place a restoration not as esthetic as usual
➤ Letting each child serve as their own control could give an esthetically unpleasing result
Why So Little Science?

- Controlling the amount of tooth structure present, pulp tx vs non tx’d
- Cost! To manage the behavior can be expensive.

These impedances will not go away, so it won’t get any easier!
Intracoronal Restorations of Primary Incisors

- **Class V**—little debate, can be restored with just about anything.
- **Class III**
  - Can be very challenging
  - Prep and technique are both very demanding
  - Prep outline is of some debate
Class III Preparation

- Dovetail vs Slot design

2 studies have found no clinical differences between slot vs dovetail preps
Mandibular Incisors

- Virtually nothing in literature
- Disc interproximals—F- application
- Very small Class IIs or Vs
- Full coverage
Full Coronal Restorations

**Indications**
- Caries on multiple surfaces
- Incisal edge involvement
- Extensive cervical decalcification
- After pulpal therapy
Full Coronal Restorations

Indications

- Caries minor, but OH very poor
- Large single surface carious lesions
- Behavior makes moisture control or precision preparations difficult
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<th>ANTERIOR?</th>
<th>POSTERIOR?</th>
<th>BONDED OR CEMENTED?</th>
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Crowns that are Bonded

- Strip Crowns
- Pedo Jackets (Space Maintainers Global)
- Life-Like Crowns (Space Maintainers Global)
Strip Crowns

* The #1 choice of 46% of ped DDS for full coronal restoration according to 2010 survey.

* Advantages
  * Excellent esthetics
  * Multiple shade selection
  * Fit into crowded spaces
  * Ease of repair
  * Relatively inexpensive
Strip Crowns

**Disadvantages**

- Very technique sensitive
- Moisture and hemorrhage control very important
- Adequate tooth structure necessary for bonding
Strip Crowns

- Retrospective studies
- Overall parental satisfaction was excellent, but loss of crown or part of crown most likely lead to dissatisfaction
  - Kupietzky and Waggoner 2004
- Esthetics most compromised after pulpal therapy with iodoform based paste
  - Kupietzky, Waggoner, Galea 2003
Strip Crowns

- Overall retention was 80% after 24-36 mo.
  - Ram and Fuks 2006
  - Kupietzky, Waggoner, Galea 2005

- The more surfaces cariously involved, the greater the likelihood of failure
  - Ram and Fuks 2006
Strip Crown

- Usually restored with resin based composite
  - Kupietzky 2002

- It has been suggested to use RMGI as in interim restoration
  - Nelson 2013
  - Jeong, et al, 2014
Bonded Alternatives to Strip Crowns

❖ Pedo Jackets (SML)
❖ Crown form is tooth colored plastic which is bonded with resin. Form is not removed from the tooth.
❖ Only 1 shade
❖ Can not be reshaped or trimmed with a HS bur
Bonded Alternatives to Strip Crowns

Life-Like Crowns (SML)
- Made of lab enhanced resin based composite material
- Also filled with resin and bonded to the tooth.
- Esthetics can be very nice, they can be reshaped
- Are brittle and can crack or fracture if forced onto a prep that is too large.
Core Build ups of Pulpally Involved Teeth

- Placing composite 3-4 mm into the canal space
- Glass fiber reinforced composite posts
- Ortho wire bent into an omega shape and held in place with flowable composite
- All appear to provide clinically acceptable results
- Composite short posts and GFRC posts seem slightly better
Crowns Luted to the Tooth with Cement

- SSCs
- Open-face SSCs
- Polycarbonate crowns
- Pre-veneered Crowns
- Zirconia crowns
SSCs and Open Face SSCs

- Easiest, most durable
- Can be crimped
- Place on little tooth structure
- Not hindered by blood or saliva
- Retention –93% after 26 months

Lopez-Loverich, Garcia and Donly, abs. 2014
SSCs and Open Face SSCs

- Least esthetic
- SSCs not acceptable to many parents
- OFSSCs are more esthetic, but time consuming
  - Hemorrhage control very important
  - Esthetics still compromised
Pre-Veneered SSCs

- Cheng Crowns (Cheng Labs)
- NuSmile Signature Crowns (NuSmile)
- Kinder Krown (MayClin Lab)
- Flex White Faced Crowns (SML)
  - Available for over 20 yrs
  - Very esthetic
  - Placed with little tooth structure
  - Not affected by heme or saliva
Pre-veneered SSCs

- Disadvantages
  - Can be difficult to fit
  - Available in 2 shades only, shade matching may be more difficult than strip crowns
  - Can fracture the facing if forced onto prep
  - Cost/unit ($18-24)
  - Minimal crimping
  - Repair of fracture is difficult
Pre-veneered Crowns

2010 survey, 41% of Ped DDS chose them as their first choice of full coverage

Oueis, Atwan et al, 2010
Pre-veneered Crowns

- Retrospective Studies
  - Most common problems: fracture and loss of some of the veneer, attrition at incisal edge
  - Parental satisfaction high
    - WB -- Roberts, Lee, Wright 2004
    - KK -- Shah, Lee Wright, 2004
    - NS -- Champagne, Waggoner et al, 2007
Parental Satisfaction with Pre-Veneered Stainless Steel Crowns for Primary Anterior Teeth

**Parental Satisfaction** –
- The study included 54 patients and 238 NuSmile® Crowns over an average of 13 months.
- First year pediatric dental residents treated 43% of the patients, 48% were treated by second year residents, and 9% were treated by a private practice dentist.
- Each patient had an average of 5 crowns placed.

**Conclusion** – Parental satisfaction with pre-veneered stainless steel crowns was highly positive and most parents would choose the same restoration for their child again.
Pre-veneered Crowns

Durability

Partial loss of facing
- 8% WB -- Roberts, Lee, Wright 2004
- 11% KK -- Shah, Lee, Wright, 2004
- 12% NS -- MacLean, Champagne, Waggoner et al, 2007

Complete loss of veneer
- 24% WB -- Roberts, Lee, Wright 2004
- 13% KK -- Shah, Lee, Wright, 2004
- 0% NS -- MacLean, Champagne, Waggoner et al, 2007
Clinical Outcomes for Primary Anterior Teeth Treated with Pre-Veneered Stainless Steel Crowns

Clinical Results –
- The study included 46 patients and 226 NuSmile® Crowns over an average of 12.9 months.
- First year pediatric dental residents treated 43% of the patients, 48% were treated by second year residents, and 9% were treated by a private practice dentist.
- Each patient had an average of 5 crowns placed.

Conclusion – NuSmile® Crowns are a clinically successful restoration for primary anterior teeth and successful results may be obtained by both the experienced clinician and the novice.
Pre-veneered Crowns

Retention (% lost)

- 0% WB -- Roberts, Lee, Wright 2004
- 0% KK -- Shah, Lee, Wright, 2004
- 1% NS -- MacLean, Champagne, Waggoner et al, 2007
- 9% NS -- Lopez-Loverich, Garcia, Donly, 2014
Polycarbonate Crowns

- Heat molded acrylic resin crowns
- Do not resist strong abrasive forces
- Not as esthetic as many options
- No long term studies
- Use in the US is very limited
Pre-made Zirconia Crowns

- Available through 4 US manufacturers
  - EZ Pedo, Loomis CA
  - Cheng Crowns, Exton PA
  - Kinder Krowns, St Louis Park, MN
  - NuSmile Pediatric Crowns, Houston, TX
Zirconia Crowns

▶ Used in adult dentistry for many years
  ▶ Clinically equivalent to PFM
  ▶ Excellent clinical survival
▶ Esthetically pleasing, natural appearance
▶ Highest strength/fracture resistance of any ped crown
▶ Biocompatible
▶ Color stable
Zirconia Crowns

- **Disadvantages**
  - Inability to crimp
  - Prepare the tooth to fit the crown, rather than fitting the crown to the tooth
  - Cost/crown $22-25
  - Need for good hemorrhage control
  - Need for remaining tooth structure
  - Longer prep and fit time for most practitioners
Zirconia Crowns

- Virtually nothing in the literature RE: pediatric application
  - 2 case reports
  - 1 lab study on molar ZR crown fracture resistance and thickness
    - EZ Pedo was the thickest and most resistant to fracture. None of the ZR crowns were as resistant to fracture as preveneered molars.
Zirconia Crowns

Literature

1 prospective clinical study (6 mo FU)

Walia et al, 2014

- 0 loss or fracture of ZR
- 22% of Strip Crowns were lost or fractured
- 5% of PVC had lost portion of veneer
Luting Cements

확실한 첨가물

Adhesive cements, (GI, RMGI, Bio-active) seem to provide better retention AND less microleakage than non-adhesive cements (ZnPO₄, polycarboxylate)
Luting Cements

- Bio-Active cements (RMGI)
  - Ceramir (Doxa)
  - BioCem (NuSmile Pediatric Crowns)
- Excellent bonding/integration with dentin
- Calcium aluminate and GI materials
- Dual cure
- Good biocompatibility
- Excellent strength
- Bonds well to SS and Zirconsia
Hydroxyapatite Formation at Tooth/Cement Interface within 72 hours
Another Note on Luting Cements

There is laboratory evidence that when saliva or blood comes in contact with zirconia the bond strength of the cement to the zirconia diminishes significantly, therefore when cementing zirconia avoid salivary and bloody contamination of the crown.
Material Selection for Anterior Primary Teeth

- Resin based composites
- Compomers
- RMGI
- GI

- Depends on esthetic concerns, strength, moisture control, desire for F release, bonding to the tooth
Little data published

Children with ECC have greater risk for new and recurrent caries. (Johnsen et al, 1986, Almeida et al, 2000)

Seems prudent to treat children with ECC with “restorative prevention”, particularly if they have active, acute caries, poor OH, decalcification, and suspect follow up.
Conclusions

Many options exist to repair carious primary incisors, but there is insufficient controlled, clinical data to suggest that one type of restoration is superior to another. This does not discount the fact that dentists have been using many of these crowns for years with much success.

Operator preferences, esthetic demands by parents, the child’s behavior, amount of remaining tooth structure, and moisture and hemorrhage control are all variables which affect the decision and ultimate outcome of whatever restorative outcome is chosen.
Conclusions

- Clinical studies of all of the restorative techniques which are currently utilized are definitely warranted, though they are, and will continue to be, difficult to carry out.
- Though caries in the mandibular region is rare, restorative solutions for mandibular incisors are limited. Fortunately, there now exist zirconia crowns that are made specifically for lower incisors.
Conclusions

- Adhesive luting cements, such as glass ionomer cements, resin modified glass ionomers, and bioactive cements, minimize microleakage and are recommended for cementing primary crowns.

- A variety of esthetic restorative materials are available to utilize for restoring primary incisors. Recognition of the specific strengths, weakness, and properties of each material will enhance the clinician’s ability to make the best choice of selection for each individual situation.
Resin-based composites may be used for:

- Class III restorations in the primary and permanent dentitions.
- Class V restorations in the primary and permanent dentitions.
- Strip crowns the primary anterior dentition.
- Class IV restorations in the primary and permanent dentitions.
Although minimal clinical data is available, glass ionomer material or resin-modified glass ionomer material may be used for Class III and V restorations for primary teeth, particularly those that can not be isolated well.
Full coverage crowns for primary anterior teeth may be recommended for teeth with:

- Multiple carious surfaces
- Incisal edge involvement
- Extensive cervical decalcification
- Pulpal therapy
- Hypoplastic enamel
- Poor moisture or hemorrhage control
- Large single surface carious lesions
Recommendations

With the increase in demand for esthetically pleasing dental restorations, when clinical conditions allow, it is recommended that primary anterior teeth be restored with durable, esthetic restorations.
Questions