

## Zirconia Crowns - An Esthetic and Resistant Restorative Alternative For ECC Affected Primary Teeth

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*The present report discusses briefly the problem of ECC in very young children and the recommended approaches for prevention and treatment.*

*The esthetic restoration of the maxillary incisors with Zirconia Nu Smile™ crowns is described. It is also stressed that the luxation injury two months after placement did not damage the appearance nor the stability of the crowns.*

**Keywords.** Early childhood caries, children, zirconia, restoration.

### INTRODUCTION

**C**aries in very young children, known as early childhood caries (ECC) is defined by the American Academy of Pediatric Dentistry (AAPD) as “the presence of one or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger”.<sup>1,2</sup>

ECC is a complex disease, which involves maxillary primary incisors within a month after eruption and spreads rapidly to involve the other primary teeth. Because of the aggressive nature of ECC, areas of demineralization and hypoplasia can rapidly develop cavitation. If untreated, the disease process can rapidly involve the dental pulp, leading to dental infection and possibly life-threatening fascial space involvement. Such infections may result in a medical emergency requiring hospitalization, antibiotics, and sometimes extraction of the offending tooth.<sup>3</sup>

Those children at risk for ECC should have care provided by a practitioner who has the training, experience, and expertise to manage both the child and the disease process<sup>1</sup> (AAPD). To perform treatment safely, effectively, and efficiently, the pediatric dentist often must employ advanced behavior guidance techniques, protective stabilization and/or sedation or general anesthesia.<sup>1</sup>

Stainless steel crowns (SSC) are often indicated to restore teeth with large carious lesions and extensive white spot lesions and, at this early age, are less likely than other restorations to require retreatment.<sup>4,5</sup> Low levels of compliance with follow-up care and

a high rate of children requiring additional treatment also can influence a practitioner’s decisions for a more definitive restorative management of ECC.<sup>6</sup>

SSC however have poor esthetics, and for restoring primary incisors with large or multisurface caries, resin composite strip crowns are an excellent treatment choice for carious primary incisors with adequate tooth structure after caries removal.<sup>7</sup> When not enough enamel is present for bonding pre-veneered esthetic crowns is a favorable solution. SSCs with a cosmetic facing have good esthetics, have good retention even with minimal remaining tooth structure, moisture and hemorrhage control are not critical, chair time is minimal and offer full coverage protection.

More recently Zirconia esthetic crowns appeared in the market. Zirconia is a crystalline dioxide of zirconium that has mechanical properties similar to those of metals and its color is similar to that of teeth. Ready-made primary zirconia crowns are now available for both, primary incisors and molars.

The purpose of this report was to present a case of esthetic rehabilitation of severely decayed primary incisors in a 20 months old girl affected by ECC using Nu Smile™ zirconia crowns.

### Case report

A 20 months old girl was brought to the pediatric dentist’s clinic with the complaint of severely decayed primary teeth. Medical history was non-contributory, and the mother revealed that the child was breast fed at demand till the first visit to the dentist. Intraoral examination revealed the presence of badly broken down maxillary incisors and extensive decay on the maxillary first molars. (Figures 1 A –B) The second primary molars were not fully erupted, yet, and the girl was diagnosed as affected by ECC. The treatment plan suggested to the parents included diet counseling, oral hygiene instructions and full rehabilitation under general anesthesia (GA).

As the maxillary first primary molars were restored with conventional SSC and composite resin restorations were placed in the mandibular molars. Technique details will be only described for the zirconia anterior crowns.

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**Figure 1- A:** Labial view of the maxillary central and lateral incisors showing extensive decay. **B:** Another view of the same teeth revealing extensive palatal demineralization particularly of both lateral incisors.



**Figure 3- A:** Post treatment photograph taken immediately after a traumatic injury 45 days after the GA treatment. Notice swelling and laceration of the gum above the right maxillary lateral incisor. **B:** General view of the restored maxillary arch at the day of the injury. Notice the inflammation of the gingiva of the right primary lateral incisors and the plaque accumulation over the SSC on the affected side due to improper brushing and sensitivity.

The incisal edges were reduced approximately 1-2 mm, interproximal contacts were broken followed by labial and lingual reduction by 25-30%. A 1-2 mm subgingival featheredge was created to facilitate a passive fit.



**Figure 2 –A:** Clinical photograph one week after treatment under GA. Notice the excellent fit of the crowns and the healthy gums. **B:** Lateral view taken at the same date showing good occlusion at the canine area.

After completion of the preparations the crowns were cemented with Ketac Cem,<sup>TM</sup> a glass ionomer cement by 3M. A week after treatment the child was examined and the crowns showed a perfect fit and the gums looked excellent (figure 2: A-B).

Forty five days after treatment the child presented for an emergency consultation after having suffered trauma to the anterior teeth. Intraoral examination revealed that the maxillary right lateral incisor had suffered lateral luxation and was sensitive to percussion (figure 3: A- B). This diagnosis was confirmed radiographically (figure 4). At this occasion it could be observed that the crown was stable and did not show any crack or damage.

At the two month post-trauma check-up the tooth was stable and the zirconia crown showed complete integrity, without any cracks and there was an improvement on the marginal gingiva of the traumatized lateral incisor (Figure 5).

### DISCUSSION

The esthetic restoration of severely decayed primary anterior teeth has for a long time been a challenge for the pediatric dentist, not only because the materials available are technique sensitive, but also because the children who require these restorations are usually among the youngest and least manageable group of patients.<sup>8,9,10</sup>

As mentioned previously resin composite strip crowns are an excellent treatment choice when adequate tooth structure remains after caries removal.<sup>7</sup> When not enough enamel is present for bonding, pre veneered esthetic crowns is a favorable solution and more recently, a new type of ceramic material crown based on zirconium dioxide, has been developed.<sup>11</sup>

Yttria-stabilized tetragonal zirconia polycrystal, Y-TZP, has a unique ability to resist crack propagation by being able to transform from one crystalline phase to another, and the resultant volume



**Figure 4:** Radiograph of the traumatized lateral incisor. Slight enlargement of the PDL confirms the diagnosis of lateral luxation

increase stops the crack and prevents it from propagating.<sup>12</sup>

This characteristic is particularly important when restoring primary incisors in very young children. These children are prone to trauma particularly to their anterior teeth as in the present report, and no cracks or dislodgement of the crown were observed despite the trauma.

Cementation of zirconia crowns has been an important issue. Zirconia cannot be etched and bonded because of lack of silicone of the glass ceramic. Sandblasting has been reported to introduce micro-cracks into the zirconia and is not recommended. Acid etching either with phosphoric acid or hydrofluoric acid will not alter the intaglio surface of the restorations and therefore have no effect on the overall retention of the restorations. Conventional or self-adhesive resin cements have been recommended as luting agents for zirconia crowns.<sup>13</sup>

The cementation technique with resin cements demands several steps and can be too difficult to be used in young children. A much easier and simplified technique has been recommended using a bio-ceramic luting cement, Ceramir Crown and Bridge. This biomimetic material creates an alkaline environment (high pH) to resist acid and bacteria, has thermal properties similar to dental tissues, is biocompatible and does not require optimal conditions for a good seal.<sup>14</sup> The manufacturers claim it is easy to handle because no etching or priming is required and its viscoelastic consistency helps the crown to slip easily in its place. In addition, it is easy to remove the excess during the “rubbery phase”.

Another important point to consider is that zirconia crowns not contaminated with blood or saliva have better adhesion to cement. To solve this problem Nu Smile™ came up with a brilliant solution: using a try in pink crown for pre-cement trial fittings, so that the crown to be placed remains untouched until final cementation.

In the present case, no try in crowns were available and the crowns were cemented with Ketac Cem.™ Although the crowns remained intact despite the trauma, there is a need for a longer follow-up to assess their long term performance.



**Figure 5:** Clinical photo of the traumatized lateral incisor two months post trauma. The injury has been resolved. Gingival tissue looks healthy and the zirconia crown is esthetic and stable.

## CONCLUSION

Zirconia crowns are a new and most esthetic pediatric dental crowns available on the market today. These crowns represent a new approach and another alternative to restore the natural appearance of a child ‘s ’teeth compromised by caries and /or trauma.

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