Crowns in Pediatric Dentistry: A Review

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Abstract

Dental caries is the most common chronic disease of childhood. To treat such severely destructed teeth is a challenge for most pediatricians because of three important considerations-patient's behavioral management, tooth structure preservation, and satisfaction of parents. Various efforts have been made for full coverage restorations in pediatric dentistry. Every material has its own merits and demerits. Various options available nowadays are stainless steel crowns and its various forms like strip crowns, zirconium crowns, etc.

Keywords: *Crown, Pediatric, Stainless Steel, Caries.*

Introduction

According to the WHO report, 2003 60% to 90% of school children are affected by dental decay in industrialized countries.[1] Nowadays different techniques and method are available for primary teeth restoration. Stainless steel crowns have been used for restoration since 1947 when it was first introduced by Rocky mountain company but familiarized by Humprey and Engel. But they have been recommended where pulp therapy has been performed or where other restorations are likely to fail. Despite all the biggest drawback of stainless steel crown is–poor esthetics.[3] This article aims to discuss the advancements regarding restorations of full coverage in pediatric dentistry.

Pre-Formed Metal Crowns: These were referred to be an acronym of SSC. It was first described by Engel followed by Dr. William Humphrey in 1950.[4] The metal used in preformed crown was soon transformed to nickel-chromium and nowadays also popularly named as preformed metal crown (PMC).

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Indications (Use In Deciduous Teeth)[5]: Stainless steel crowns are preferred in these situations as procedures like pulp therapy as a restoration for prevention, extensive decay in primary tooth, as an abutment for a denture or space maintainer in children requiring general anesthesia for dental treatment should be given consideration, in severe bruxism, in rampant and recurrent caries, inherited or acquired enamel defects,as part of a space maintainer. Advantages are durability is similar to that of the deciduous tooth, it protects the remaining tooth structure which was weakened by excessive caries removal, less technique sensitive,cost effective, and has a low failure rate. Disadvantages are Unesthetic due to metallic appearance andcannot be used in partially erupted tooth. Different types of stainless steel crowns according to shape are as follows:

Untrimmed Crowns: These crowns are neither trimmed nor contoured. It is time-consuming and requires a lot of time for adaptation. Example – Rocky mountain.

Pretrimmed Crowns: These crowns have straight, non-contoured sides. These are designed to follow a line parallel to the gingival crest. They still need some trimming and contouring.

Precontoured Crowns: These crowns are festooned and are also pre-contoured, though a minimal amount of festooning and trimming may be required. Example–Ni-Chro Ion crowns and Unitek stainless steel crowns

Open-Faced Stainless Steel Crowns: he crowns which are preformed though are the most reliable and durable restoration for a primary incisor but have poor aesthetics. To take advantage of its strength and to make it attractive, the cosmetically prominent aspect of the crown should be cut away by the dentist, enough of luting cements to be removed and the void is filled with bonded resin composite.[6]

Success of Open Face Stainless Steel Crown is by:

- Using dentin bonding
- Helps bond resin to teeth tissue.

Phosphoric acid etching: A porous and rough structure layer on remaining glass ionomer cement. Holding tags are formed by unfilled resin, and thus bonding occurs.

Advantages: Appearance is a lot more appealing than the plain metallic appearance of the stainless steel crown.

Disadvantages:

- Time-consuming procedure
- Metal margins can still be seen
- Lifespan is short
- Poor color stability under oral conditions.

Preveneered Stainless Steel Crown: Preveneered stainless steel crowns are more appealing because they have the combined effect of the durability of conventional stainless steel crowns and esthetics of composite resin. A variety of mechanical and chemical bonding approaches retain esthetic veneers on stainless steel crowns. Initially, these were developed for primary anterior only but later were also designed for primary molars. Different types of PVSSCs available depend on the use of facing attachment to the SSC, clinicians ability to crimp crown[8],shades available, and crown length.

Advantages: Good esthetics with relatively short operating time. Durability is long. It can be used with ease where moisture condition is difficult.

Disadvantages: PVSCCs have more thickness than conventional SSC due to the addition of resin,which results in more extensive tooth preparation for proper fit and occlusion.[9] It is more expensive so not cost-friendly. Dentists don't have many options on resin shade, so at times supplied crowns look artificial.[9] Crown forms that are tried in,cannot be sterilized under pressure with high heat, as such treatment will destroy the resin layer. These crowns have overly convex appearance so re-shaping is required,which takes additional laboratory or clinical time. Multiple approximating crowns are difficult to place in people with loss of space due to bulk or crowding. Inflexibility and brittleness seen on resin facing material has a tendency of breakage when subjected to heavy force.

Polycarbonate Crowns: In pedodontic practice, most common lesions which occur are due to nursing bottle caries. More severely carious teeth require either composite crowns, stainless steel crowns, or polycarbonate crowns. Polycarbonate crowns are 'temporary crowns given as fixed prosthesis to primary anterior teeth which are likely to get exfoliated in future'. These are linear polyesters of carbonic acids. These are termed as thermoplastic resins as exhibit high impact strength and rigidity and can be molded into solids by pressure and heat into the required form. Esthetically these were appealing but disadvantage being brittle and no resistance against strong abrasive forces.

Polycarbonate Crowns Include:

- 3M ESPE Polycarbonate
- Kudos polycarbonate crowns
- PedoNatural Crowns

Uses: Extensive caries requiring full coverage restorations like nursing bottle syndrome. It can be used in fractured or malformed teeth,in discolored teeth, in teeth requiring restoration after pulpotomy or pulpectomy procedures.

Contra Indications: Bruxism, Deep bite, Abrasion

Zirconia Pediatric Crown: These are crowns made of zirconia and donot contain metal. These are utilized for a variety of computer-aided manufacturing/computer aided design restorations, including framework/ hand veneer,implant abutments, full-contour fixed prosthodontics. Though zirconia is widely being used for permanent dentition but primary dentition it is a new restorative material. Zirconia has demonstrated superior corrosion-resistant, high wear resistance, and excellent biocompatibility. Some of the commercially available pediatric zirconia crowns are: E Z Pedo Crowns, NuSmile Crown, Cheng pediatric crowns, Kinder crowns.

Strip Crowns: Strip crowns were first introduced

in 1979 by Webber et al. These are crown forms filled with composite and are bonded onto the tooth and the crown form is then removed. These are considered to be the most popular and esthetic restorations for deciduous anterior incisors. Although esthetically appealing, but its retention depends on the amount of tooth structure remaining after excavation of caries. This is the first choice of most clinicians as it can be easily repaired if the crown fractures or chips off. This is but technique sensitive.

Figure 1. Strip crowns

Pedo Jacket Crowns: Use of pedo jacket crown is similar to that of celluloid crown form, except for thepedojacket is made up of a tooth-colored copolyester material, which is filled with resin and left on the tooth after polymerization instead of being removed.

Disadvantage: It can neither be contoured nor aligned with a high–speed bur used for finishing as it will cause the material to melt onto the bur[11]. It is available in only one shade, which is very white, so shade matching of correspondent, non-restored tooth is challenging.

New Millenium Crowns: These are similar to pedo jacket crowns only for it constitutes laboratory –an enhanced composite material made of resin and bonded to the tooth. The crowns are esthetic and even can be trimmed and reshaped with a high-speed bur. These crowns are more susceptible to fracture or crack if forced into a preparation that has not been reduced adequately.

Advantage: It is highly esthetic and parenteral satisfaction is high.

Disadvantages: Technique sensitive and for successful treatment, proper isolation, and achievement of hemostasis are required.

Figure 2. Pedo Jacket Crowns

Indications: It can be used in discolored primary incisors. Also indicated in multisurface or extensive caries in deciduous incisors. Fractured incisors following trauma can b restored with these crowns**.** In developmental defects like Amelogenesis imperfect[12], these crowns can be used.

Contra Indications: Not adequate if excavation of caries results in less remaining tooth surface area. Not indicated in impinging deep bite and in the presence of periodontal disease.

Nusmile Crowns: These were introduced in the year 1991[13]. Used when a full-coverage restoration is required for longevity and to protect the remaining tooth structure. They are available in 2 forms Nusmile Signature and Nusmile ZR.

Advantages: These are anatomically correct, color-compatible tooth colors, can be easily placed,less time consuming,less technique sensitive, and durable. It has color stability.

Cheng Crowns: These were developed by Peter Cheng in the year 1982. These are crowns with a facing of pure resin which makes them stain resistant. These can be used for both anterior and posterior teeth. Advantages are less time consuming,less technique sensitive,require a single patient visit,less patient discomfort, and is stain resistant.

Dura Crowns: These preveneered crowns are esthetic and can be placed with poor moisture or hemorrhage control. These are made up of high-density polyethylene veneered crown.

Advantages:

- Facial and lingual surfaces may be crimped.
- Easily festooned
- Easily trimmed
- Full knife-edged margin capabilities

Kinder Crowns: These are known for providing shades that appear natural and good contour for the patient. These were introduced in 1989. Kinder crowns are known for their finely feathered margins, scientifically developed shades, incisal edge. They come as zirconia Kinder crowns or a preveneered Kinder crown and are available for anterior or posterior teeth.

Figure 3. Kindler crowns

Pedopearls: These are aluminum crown forms having a coating of a tooth-colored epoxy paint. These are relatively softer and may cause the epoxy paint to wear off in areas of heavy occlusion. As they are softer can be easily crimped and cut but durability is poor.[14]

Conclusion

This article throws light onto various aspects for restorations of full coverage in pediatric dental practice. There isa wide range of articles and materials to rehabilitate carious lesions but each has its advantages and disadvantages. Research is still going on different crowns and materials to be used for full coverage .clinicians have used these above-mentioned crown for decades with success. The choice of material depends on clinician preference, skill,functional and esthetic needs of the child and parent.

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References

1. Innes NP, Ricketts DN, Evans DJ. Preformed metal crowns for decayed primary molar teeth. Cochrane Database Syst Rev. 2007;(1):CD005512.
2. Castro A, Badr SB, El-Badrawy W, Kulkarni G. Clinical Performance of Pedo Jacket Crowns in Maxillary Anterior Primary Teeth. J Dent Child (Chic). 2016;83(3):125-131.
3. Randall RC. Preformed metal crowns for primary and permanent molar teeth: review of the literature. Pediatric Dentistry 2002; 24:489-500
4. Myers D. The restoration of primary molars with stainless steel crowns. ASDC JDentistry Children 1975; 43:406-9.
5. Subramaniam P, Kondae S, Gupta KK: Retentive strength of luting cements for stainless steel crowns:an in vitro study. Journal of Clinical Pediatric Dentistry 2010, 34:309-12.
6. Gilchrist F, Morgan AG, Farman M, Rodd HD. Impact of the Hall technique for preformed metal crown placement on undergraduate pediatric dentistry experience. Eur J Dent Educ. 2013;17(1):e10-e15.
7. Champagne C, Waggoner W, Ditmyer M, Casamassimo PS: Parental satisfaction withpreveneered stainless steel crowns for primary anterior teeth. Pediatric dentistry 2007, 29:465-9.:e10-e5.
8. Evans D, Southwick C, Foley J, Innes N, Pavitt S. The Hall technique: a pilot trial of a novel use

of preformed metal crowns for managing carious primary teeth. Tuition Online, December 2000.

9. Randall RC: Preformed metal crowns for primary and permanent molar teeth: review of the literature. Pediatric Dentistry 2002, 24:489-500.
10. Yang JN, Mani G. Crowns for primary anterior teeth. Int J Pedod Rehabil 2016;1:75-8
11. Subramaniam P, Kondae S, Gupta KK: Retentive strength of luting cements for stainless steel crowns an in vitro study. Journal of Clinical Pediatric Dentistry 2010; 34:309-12
12. Dawson L, Simon Jr J, Taylor P: Use of amalgam and stainless steel restorations for primary molars. ASDC Journal Dentistry Children 1980; 48:420-2.
13. NuSmile ZR. Zirconium Milk Front Tooth Crown Extra Light; 2016. Available from: http://www.kinderdent.com/nusmile-zr-milchfrontzahnkronen-extra-light-zum-nachbestellen.html. [Last cited on 2020 July 13].
14. Babaji P. Crowns in Pediatric Dentistry. 1st ed. New Delhi: Jaypee Publishers; 2015.
15. Mink JR, Hill CJ. Modification of stainless steel crown for primary teeth. J Dent Child 1971; 38(3): 197-205.
16. Mcdonald RE, Avery DR. Restorative Dentistry. In Mcdonald RE, Avery DR, Dean JA. Ed. Dentistry for the Child and Adolescent .8th ed. Mosby International Ltd; 2004. p.376-82.