

Crowns in Paediatric Dentistry – A Review

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ABSTRACT

Over the years, there have been numerous studies regarding the restoration of primary teeth. Some of them recommended the need of a full coverage crown for restoration over the conventional class I, class II and class V restoration, others pointed out over the need of aesthetic restorations for Pediatric patients. As the technology advanced, the level of parental satisfaction with the conventional stainless steel crowns lowered, this made the Pediatric dentists to search for an aesthetic restoration for the decayed primary tooth like zirconia crowns, pediatric jacket crowns, strip crowns, glass tech crowns etc. The advent of such advanced techniques, devices and material helps in creating beautiful restorations which help children and adolescents improve their self image as we know that the child esthetics is the guide to the adult esthetics.

Keywords stainless steel crowns, aesthetic, strength, zirconia, strip crown.

INTRODUCTION

The presence of decayed or deformed teeth leads to a negative impact to infants and adolescents due to rejection by their peer group because of unpleasant dental appearance, which is reflected in their adulthood. Seehraj et al stated that dental appearance of a child influences bullying in school which has its long term and short term psychological impact.¹ Besides that, decayed tooth also leads to development of parafunctional habits like tongue

thrusting, reduced masticatory efficiency, loss of vertical dimension of occlusion and speech problems.² Humphrey in 1950 introduced stainless steel crowns, which proved to be a boon to clinical Paediatric dental practice. The stainless-steel crowns are most frequently used in deciduous dentition than permanent dentition because of the reason that even a small carious lesion can destroy the integrity faster in deciduous dentition than in the permanent teeth. But the lack of aesthetics, unacceptable metal appearance to parents, patient and beholders, limited their use to posterior teeth only.³ Due to this Open faced stainless steel crowns evolved, which involves the placement of tooth coloured material by fenestrating the labial aspect of the stainless steel crowns, this combined aesthetics along with durability to stainless steel crowns.⁴ Apart from the above mentioned crowns more aesthetic crowns includes Bonded crowns, this includes Polycarbonate crowns. These are heat bonded acrylic resins mainly used to restore anterior teeth, these are more aesthetic than Stainless steel crowns, easy to trim and can be adjusted using pliers.⁵ Another aesthetic approach is Strip crowns, which constitutes the most commonly used variety of Bonded crowns. These are filled with composite and bonded to tooth this imparts superior aesthetics. However, it is technique sensitive and any lapses in patient selection, isolation, tooth preparation and resin bonding can lead to failure.⁶ Pedojackets, new millennium and glass tech are other forms of Bonded crowns. Ongoing researches in the field of material sciences have led to the introduction of preformed All-Ceramic and Zirconia crowns in Paediatric Dentistry. It has similar mechanical properties like metals along with tooth coloured appearance and extreme biocompatibility.⁷

CLASSIFICATION OF CROWNS

Paediatric crowns can be broadly classified as luted or bonded depending upon the mechanism of adhesion to the tooth, in case of luted crowns the adhesion is purely physical or mechanical where as in bonded crowns, the crown is bonded to the etched enamel surface, thus establishing a mechano-chemical adhesion to the tooth surface.⁸ (Figure 1)

STAINLESS STEEL CROWN

Stainless steel crowns (SSC) are considered to be the most durable, economical and reliable for restoring severely carious and fractured primary teeth. They are easy to place, fracture proof, wear resistant and attached firmly to tooth until exfoliation.¹

Types of stainless steel crowns:

Stainless steel crowns type is based on shape:

Untrimmed crowns

The untrimmed crowns are neither trimmed nor contoured, need a lot of adaptation and are time consuming. Example of untrimmed crowns is Rocky mountain.

Pre-trimmed crowns

The pre-trimmed crowns are non-contoured but festooned to follow a line parallel to the gingival crest. They still require contouring and some trimming. Examples of pre-trimmed crowns are Unitek, 3M Co., St.paul, MN

Pre-contoured crowns

The pre-contoured crowns are festooned and are also pre-contoured though a minimal amount of festooning and trimming may be necessary. Examples of pre-contoured crowns include Ni-Chromium.

PRE-VENEERED STAINLESS STEEL CROWNS

Preformed metal crowns (stainless steel / nickel chrome crowns) out-performs the intra coronal restorations in terms of longevity as are reliable and durable. Pre-veneered stainless steel crowns provide full coverage, durability, easy placement and aesthetics. These crowns are nickel chrome crown having an aesthetic facing, mechanically and / or chemically bonded.

OPEN FACED STAINLESS STEEL CROWN

To take advantage of the strength and durability of preformed stainless steel crowns with improved aesthetics Open Faced Stainless Steel Crowns were developed. Here a composite material is bonded on the labial surface of Stainless steel crown. Open faced stainless steel crowns can be used for both anterior and posterior teeth, this involves creation of a window or labial fenestration on the cemented crown, followed by removal of the cement used for crown cementation, to make the underlying tooth tissue visible, in cases where the only little amount of tooth tissue is left and the crown is cemented using glass ionomer cements,⁹ the composite can be bonded directly over the cement after creating a few retentive grooves around the gingival areas of the crown.¹⁰

ZIRCONIA CROWNS

Zirconium oxide crowns have exceptional properties such as high flexural strength and fracture toughness, high hardness, excellent chemical resistance and good conductivity ions. Different oxides, such as Yttrium Oxide (Y₂O₃), Calcium Oxide (CaO) or Magnesium Oxide (MgO), can be added to Zirconia to stabilize it. Cyclical stresses are also well tolerated by this extremely biocompatible material. In this way it can be said that this material has the potential to be used for larger restorations and in the molar area.¹¹

POLYCARBONATE CROWNS

Polycarbonate crowns are heat-molded acrylic resin shells that are adapted to teeth with self cured acrylic resin. Though poor in strength, the polycarbonate crowns provide excellent aesthetics as compared to the conventional stainless steel crowns. They can be good restorations in anterior teeth as it presents much less masticatory load as compared to posterior teeth. If combined with microglass fibres, the microglass fibres improves the impact strength and flexibility of the crown.

STRIP CROWNS

Pediatric Strip Crowns are transparent plastic crown forms used for restoring primary anterior and posterior teeth, these crowns accounts for the most commonly used bonded crown to restore primary anterior teeth. These are the first choice restoration for many clinicians, mainly because of the superior aesthetics and the ease of repair if the crown subsequently chips or fractures.¹² Strip crowns are an easy chair side procedure and final restorations are more compatible with gum tissue than stainless steel crowns.⁴ Presently strip crowns for primary teeth are being marketed by 3M ESPE (only anteriors) and Success Essentials (both anterior and posteriors), Dentsply professionals, Directa, Unitek Strip Crown, Nowak Crowns Nowak Dental Supplies Inc. and Carriere, MS.

PEDO JACKET CROWNS

The Pedo Jacket is a crown form similar to the resin bonded strip crown, the only difference is of the "jacket" which is made up of a tooth-colored co-polyester material and is filled with resin material and left on the tooth after polymerization instead of being removed. These crowns are thin yet have a strong inter-proximal wall which allows an easy placement of

multiple adjacent restorations with a minimum amount of tooth reduction. These crowns are cost effective and are easily sized and trimmed with scissors and can be readily adapted over irregular teeth. Polyester is a synthetic polymer made of purified terephthalic acid (PTA) or its dimethyl ester dimethyl terephthalate (DMT) and monoethylene glycol (MEG).¹³

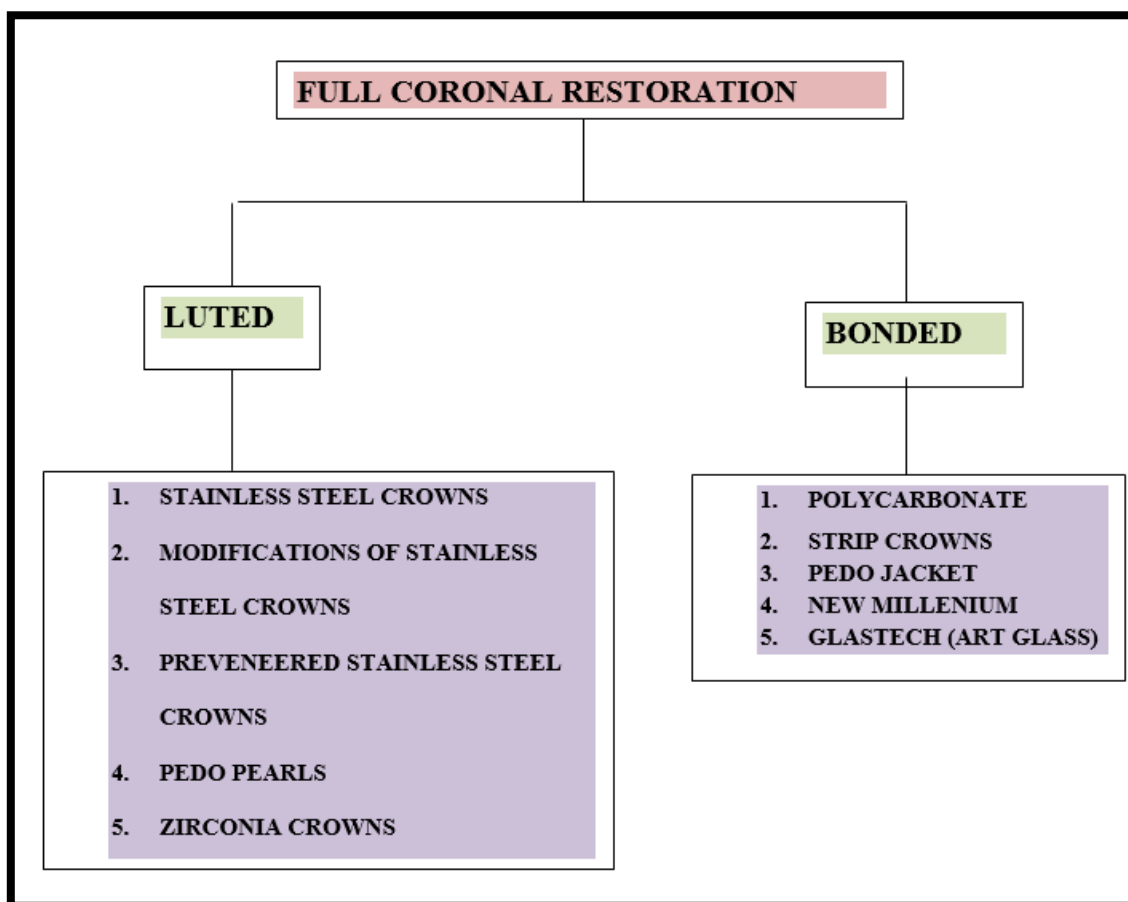
NEW MILLENNIUM CROWNS

This crown is another modification of strip crowns and similar in form to the Pedo Jacket crowns except that it is made of a laboratory-enhanced composite resin material. In contrast to the Pedo jackets these crowns can be easily finished and reshaped with a high-speed bur and a greater degree of aesthetics can be achieved. These Crowns are being marketed by success essentials, space maintainers laboratory and are available for all anterior and posterior teeth.¹⁴

PEDO PEARL CROWNS

It is a metal crown form similar to a stainless steel crown, but it is completely coated with a tooth-colored epoxy powder i.e. Polytetrafluoroethylene (PTFE), a synthetic Fluoropolymer in specific. These crowns are made of heavy gauge aluminum instead of stainless steel because the epoxy coating adheres much better to the aluminum. These crowns are being manufactured by Pedo Pearls, 6111 FM 1960 West Suite 215 Houston, TX 77069, USA, for Anteriors. Its available in sizes 1- 4 and in universal form, for Posterior 5,6.¹

Figure 1- Classification of Paediatric Crowns



GLASS TECH CROWNS

Glass tech crowns are the preformed crowns made of Artglass, which is a polymer glass, it gives a natural feel, bond ability and kindness associated with composite but the esthetics and longevity of porcelain. It is color stable, wear of polymer glass is similar to enamel, kind to opposing dentition, plaque resistant and without any composite interface. The unique filler materials of microglass and silica are proposed to provide greater durability and excellent esthetics than the strip crowns.¹²

RECENT ADVANCES IN PAEDIATRIC CROWNS

Flex crowns

They are white faced, overcome the aesthetics problems associated with plain stainless-steel crowns. These crowns can be manipulated and handled similar to the conventional stainless-steel crowns.¹⁵

Life like paediatric crowns

They are highly durable and aesthetically translucent thus are claimed to deliver natural tooth like appearance to the restored tooth. These crowns have a stable color which does not stain, discolor or fade.¹⁶ Fuks AB et al., assessed the clinical performance of esthetic crowns and to compared these to conventional stainless steel crowns, for this purpose they placed twenty two crowns (11 conventional and 11 esthetic) in mandibular primary molars obeying these criterias; the tooth was not mobile; no fistulae were present; the tooth had at least one caries free or properly restored antagonist and had to be in contact with one adjacent tooth mesially, in the case of the primary second molars or distally in the case of the primary first molars and evaluated them clinically and radiographically after 6 months and concluded that the esthetic crowns assessed had several inconveniences, as they resulted in poor gingival health, are very expensive, and, although not measured, are bulky and without a natural appearance.¹⁷

Krämer et al., evaluated the effect of thermo-mechanical loading (TML) on marginal quality and wear of different crown types for primary molars. For this purpose they used eighty extracted human primary molars. After preparation, five groups received different crowns (n=16): preformed metal crowns (3M ESPE) and NuSmile crowns (Orthodontic Technologies Inc.) were inserted as preformed metal crowns; as semi-preformed crowns Protemp crowns (3M ESPE) were luted, the specimens were subjected to 2,500 thermal cycles between 5–55°C and chewing simulation for 100,000 cycles at 50N at a frequency of 0.5 Hz. Before and after thermo-mechanical loading, impressions of the teeth were taken and replicas were made. The replicas received marginal quality evaluation under a SEM at ×200 magnification and depending upon their findings they concluded that the different crown types under investigation showed a good performance concerning the evaluated parameters marginal quality and wear.¹⁸

CONCLUSION

The Paediatric dentists have the responsibility and ability to create beautiful smile for young patients. By far numerous literatures are available regarding the use and introduction of various crowns for restoring the Primary teeth but very few studies are available regarding the clinical longevity and success of these restorative technique, making it difficult to recommend any one type of restorative option over the other thus the ultimate choice of

restorative technique depends upon the operator preferences, aesthetic demands by the parents, cost and child's behaviour that affect the final outcome of which ever restorative material chosen.

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