

# Recent trends of Esthetics in Pediatric Dentistry

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## ABSTRACT

A number of conditions can lead to aesthetically unacceptable dentitions like dental caries, discoloration, trauma, early loss of teeth, misalignment and any abnormality of shape and size. Today there are many solutions available for aesthetic problems in Pediatric Dentistry. But the biggest dilemma is choosing the best treatment modality for a particular patient and situation. Dental esthetics is synonymous with facial esthetics. Cosmetic problems at an early age have a huge impact on the psychological development and social interaction with other children at same age. In this respect, the advent of different techniques, devices, and materials help in creating beautiful restorations which help children and adolescents to improve their self-image. Thus, this review highlights the various recent advances in the field of pediatric aesthetic dentistry along with their indications, advantages, and disadvantages.

**KEYWORDS:** Primary dentition, Esthetic restorations, dental materials, smile, children

## INTRODUCTION

In today's era, there is a multitude of options available for treatment of conditions like nursing bottle caries, enamel hypoplasia, discolourations, fractured teeth and bruxism which cause esthetic impairment in children thereby, leading to demand of better and superior materials which could compensate for the problem.<sup>1</sup>

Although, introduction of latest methodologies for restoration of decayed teeth have been a boon to the field but still it is difficult to please the patient who desires superior esthetics.<sup>2</sup> With the advent of globalization, dentistry enters into a new field of awareness where pediatric population with age as less as 3 years want to look even better and are now aware that the Pedodontist can help by providing the best solution to complex problems of space management, carious exposed anterior teeth, broken teeth, etc. which is challenging in all respects for the clinician as well.<sup>3</sup>

According to Chaudhary *et al.* (2015), stated that roughly one-quarter of children under 8 years of age suffered injury in their anterior teeth. Thus establishing that trauma to anterior teeth was the most common injury in children.<sup>4</sup>

The restoration of these anterior teeth undergone trauma is difficult in the respect that the primary teeth are very small in size, have a thinner enamel covering for etching and bonding and easier pulp exposures because of higher pulp horns and thinner enamel and dentin surface layers thereby increasing the chairside time making the child undergoing treatment anxious and also an increase in the treatment costing.<sup>2</sup>

## MATERIALS USED IN ESTHETICS

Thus, the requirement for superior esthetics restorations offering a delightful smile is now the modern day demand of parents and children both alike all over the world.<sup>5</sup> Various recent advances in the field of esthetic dentistry are as follows:

### I. Restorative Materials

**1) Glass Ionomer Cement:** Glass ionomer cements were developed by Wilson & Kent and have been in use in dentistry since 1969. To overcome drawback of conventional GIC material recent advancement are as follows:-

**A. Metal Modified Glass Ionomer Cement:** The addition of metal powders or fibers to glass ionomer cements can improve strength; **Sced & Wilson (1977)** found that metal fibers were best for increasing flexural strength. **Simmons (1983)** suggested mixing amalgam alloy powders into the cements and developed this system clinically under the name "miracle mix."

**B. Cermet (glass sintered with silver):** In order to improve the strength which is both tensile and compressive of conventional glass ionomer cement, cermet has been introduced by **McLean & Gasser (1985)**, by fusing glass powder with silver particles. The abrasion resistance of cermet is greater than glass ionomer cement.

**C. Resin-Modified Glass Ionomer Restorative Cements:** Resin-modified glass ionomers have the capability of "command cure" with a light-initiated curing of the resin composite component.<sup>7</sup> Vitrabond, a resin-modified glass ionomers cement and is recommend

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for use as a liner or base under composite, amalgam, metal and ceramic restorations. The material is available in powder and liquid form. Resin modified cements have the advantages of both such as greater working time, command set on application of visible light, good adaptation and adhesion, acceptable fluoride release, and superior strength characteristics.

#### D. "High Strength," "Packable," or "High Viscosity" Glass Ionomers

These ionomers are particularly useful in atraumatic restorative treatment technique (ART). Setting is rapid, early moisture sensitivity is considerably reduced and solubility in oral fluids is very low compared to conventional glass ionomers.<sup>7</sup>

**2. Composite Resin:** The acid-etch technique, originally recommended by **Buonocore (1955)**, aids in providing retention for esthetic restorations in both primary and permanent dentition.<sup>8</sup> These materials are available with several types of fillers, and have significantly higher strengths which means more resistant to fracture than conventional glass-ionomers and provides excellent esthetics.<sup>9</sup>

Although conventional composites provide good esthetics they possess various disadvantages like high coefficient of thermal expansion and greater occlusal wear in areas of high occlusal stress.<sup>10</sup> To overcome these problems modifications were made in their composition and newer materials were introduced which are as follows.

#### Recent Advances in Composite Resins

##### (i) Advances in direct composite resin materials

**a) Flowable composite resins:** Flowable composite resins were introduced in 1996 by reducing the filler content. The resin matrix in flowable composites is TEGDMA which has very low viscosity and thus contributes to the flow of the material.<sup>11</sup>

**b) Packable composite resins:** These are a special category of composite resins developed in the late **1990s** for use in posterior teeth. The fillers of packable composites is present as a continuous network of short fibers of silica and alumina.<sup>11</sup>

**c) Ormocers:** Ormocers, which is an acronym for organically modified ceramic. It is synthesized through a solution and gelatin process from multifunctional urethane and thioether(meth)acrylate alkoxysilanes. Ormocers basically consist of three components—organic and inorganic portions and the polysiloxanes.<sup>12</sup> It reduces shrinkage and shrinkage stress by up to 50% compared to conventional composites and leads to an outstanding shade stability.

**d) Ion-releasing composite resin:** In 1998, a new approach was begun with the development of an ion-releasing composite resin called Ariston pH. Composite resin has an alkaline glass filler which releases calcium, hydroxyl and fluoride ions at low pH.

**e) Nanofilled composites:** These have nanofillers that are 0.005 to 0.04µm in size. Nanofilled composites do not absorb visible light as they exhibit small filler size as compared to wavelength of visible light.

**f) Compomer:** Compomers are a new variety of tooth-colored restorative materials introduced in the early **1990s**. They were developed to combine the durability of composite resin and fluoride-releasing capability of glass ionomer cements. Hence the name "compomers."<sup>11</sup> These are commercially available as tooth-colored compomers named Dyract-Xtra, Compoglass-F, etc. Recently colored compomers have also been made available with the name of MagicFil and Twinky Star.<sup>13</sup>

##### (ii) Advances in indirect composite resin systems

**a) Ceromer:** In **1996** a ceramic optimized polymer was developed for indirect composite restorations. These consist of a conventional Bis GMA or UDMA resin matrix and filler comprising of barium glass, spheroidal silica and colloidal silica. Ceromers are employed for indirect veneers, inlays and onlays without a metal framework.

**b) Single crystal modified composites:** Single crystals generally have symmetric shapes like long plates and behave like fibers. These are silanized and incorporated into the resin matrix. Single crystal modified composites are useful for indirect composite restorations due to their improved properties like high flexural strength, increased fracture toughness.

**c) Fiber-reinforced composites (FRC):** In **1998**, a novel approach was developed in composite resin technology. This consisted of fibers of glass or polyethylene and resin matrix being coupled during the manufacture of the composite resin. They are used in metal-free restorations, periodontal splinting and the restoration of endodontically treated teeth.<sup>11</sup>

**d) Giomers:** Giomer is a resin-based dental adhesive material releases fluoride that comprises of pre-reacted glass ionomer (PRG) fillers.<sup>14</sup> The advantages are fluoride release, biocompatibility, excellent aesthetics.<sup>15</sup>

**3. Crowns:** A primary objective of placing crown is to achieve an esthetic improvement. A remarkable change is also seen in the patient's self image after correction of the texture, shade and shape along with good physiological form and function which prevents further breakdown.<sup>16</sup>

#### Classification:

- Bonded crowns – Pedo Jacket Crowns, Polycarbonate Crowns, Artglass Crowns, Strip Crowns.
- Luted crowns – Stainless Steel Crowns with facing, Kinder Crowns, Cheng Crowns, Nu-Smile Crowns, Dura Crowns, Whiter Biter Crown, PedoCompu Crowns, High Density Polyethylene Veneered Crowns

**i) Polycarbonate Crowns:** In children, the most common lesion in anterior teeth are nursing bottle caries. These

lesions begin on the labial surface of all anteriors. Polycarbonate crowns are the temporary crowns and made of a polycarbonate resin incorporating microglass fibers which can be given in such situation as a fixed prosthesis to deciduous anterior teeth which will get shed off subsequently in future.<sup>16</sup>

**ii) Strip Crowns:** Strip crowns are plastic mould which is used in the restoration of front teeth. They are also called celluloid crowns and restore the upper anteriors in a highly aesthetic way compared to the other available methods. These are most commonly used crown forms filled with composite & bonded on the tooth. They are simple to fit and trim and are easy to repair.<sup>16</sup>

**iii) Pedo Jacket Crowns:** Pedo Jacket crown is made up of tooth colored polyester material and is filled with resin material. The crown placement can be completed in a single sitting and can be trimmed with scissors. These crowns are available in a single color so shade selection is not possible.<sup>1</sup>

**iv) Artglass Crowns:** Artglass is commonly called as “organic crowns”. It consists of 55% microglass and 20% silica filler.<sup>2</sup> It is a new multifunctional methacrylate with the ability of forming cross linked three dimensional molecular structure.<sup>16</sup>

**v) Stainless Steel Crowns:** These crowns were first introduced by Engel and pursued by Dr. William Humphrey (1950). They were made of stainless steel and were referred to by an acronym of SSC. They provide protection to the residual tooth structure that may have been weakened after excessive caries removal and have a low failure rate.<sup>17</sup>

**v) Open Faced Stainless Steel Crown: Hartmann in 1983** introduced Stainless steel crowns which are most long-lasting, cost effective and reliable for restoration of rigorously carious primary incisors that are fractured.<sup>1</sup> These crowns have superior esthetics than conventional SSC and tooth structure have a facial window for pulp testing.

**vi) Preveneered Stainless Steel Crowns:** Preveneered stainless steel crowns (PVSCCs) served to be esthetic solution to the complicated challenge of restoring severely carious primary incisors. Crowns manufactured with composite resins and thermoplastics bonded to the metal are pre veneered stainless steel crowns.

**vii) Pedo Compu Crowns:** Pedo Compu crowns are stainless steel anterior crowns with high quality composite facing and mesh based with a light cured composite crown, easily matches natural dentition and helps to reduce plaque accumulation.

**viii) High Density Polyethylene Veneered Crowns:** These type of crown accommodate the tooth by mechanical retention and does not separate easily and has greater density over the composite facing that is commonly used.<sup>1</sup>

**ix) Pedo Pearls:** These crowns are made of aluminum instead of stainless steel because the epoxy coating adheres much better to the former. This was first introduced in 1980.<sup>1</sup> They are easy to cut and crimp without chipping and the composite can be added afterwards also.<sup>18</sup>

**x) New Millennium Crown:** They were introduced in market by the Success Essentials, Space Maintain Laboratory. They are having resemblance to Pedo jacket crown and strip crown. They can be finished and reshaped with a high-speed finishing bur. They are very brittle and more expensive than other crown forms.<sup>16</sup>

**xi) Zirconia Crown:** Zirconia crown was developed by John P Hansen & Jeffery P Fisher (2010).<sup>3</sup> Zirconia is a dioxide form of zirconium.<sup>1</sup> possessing both esthetics and strength. Zirconia crowns is the strongest material used in dentistry and can be used for both primary as well as for permanent dentition.<sup>17</sup>

**xii) Cerec Crowns–All Ceramic Crowns:** The fabrication of the Cerec crowns is based on CAD/CAM technology. These crowns have no metal in them, and thus are reasonably esthetic and available in variety of shades.<sup>1</sup>

**4. Biological Restorations:** Biological restoration can be defined as proper reconstruction of extensively damaged teeth through the fragment.<sup>19</sup> Biological restorations are not preserve the tooth structures but also provide natural colour and anatomic form.<sup>3</sup> The technique requires professional expertise to adequately prepare and adapt the natural crowns to the cavity.

**Fragment reattachment-** Fragment reattachment is the most conservative option which establishes functional as well as esthetic harmony. Chosack & Eildeman published the first case report on reattachment of a fractured incisor fragment in 1964.<sup>20</sup> Tooth fragment reattachment is a conservative approach which allows the tooth restoration with minimal loss of remaining tooth structure.<sup>21</sup>

**Natural Tooth Pontic-** Natural Tooth Pontic could be a alternative technique as it provides the benefits of being the right size, shape, colour and economically feasible.<sup>22</sup> It can be easily modified for a temporary fixed replacement which reduces the psychological impact on the patient .

## II. Prosthetic Rehabilitation of missing primary teeth

Prosthetic treatment can play an important role in cases where normal dentition fails to develop. Indeed being edentulous has many consequences like, handicapped child, deforming lingual habits, and a poor nutrition, due to the fact that mastication is difficult or impossible.<sup>23</sup>

**Modified Hawley’s Appliance-** This appliance is most often used, constructed in 1920’s is an active removable appliance. It incorporates clasps on molar teeth and a

characteristic outer labial bow with adjustment loops, extend from canine to canine.<sup>24</sup> In case of intrusion, luxation, or avulsion, extensively carious and fracture of teeth in children creates psychological impact on both the parents and the child especially tooth structure. These factors necessitate the replacement of the anterior teeth by an appliance that satisfies the aesthetics and functional needs. Thus, a modification of the appliance is done wherein acrylic teeth are embedded onto acrylic and stabilized on the labial bow of Hawley's appliance to restore anterior aesthetics and functions.

**Modified Nance Palatal Arch-** It was first described by Nance in 1947, and it is very popularly used in pediatric dentistry even today. The palatal arch is attached to first molar bands, acrylic button is embedded in rugae area.<sup>25</sup> The modified nance palatal arch appliance is simple to construct, easy to maintain and a cost-effective, intermediate tooth replacement option. In modified nance palatal arch, acrylic teeth were placed in anterior extension of acrylic button. The fixed prosthesis is given because it does not need the patient to be compliant and hence cannot be lost or broken, as in the case of a removable partial denture.<sup>26</sup>

**Glass Fiber-Reinforced Composite Resin Space Maintainer-** The fibers most commonly used in dental practice. Composite resin space maintainers reinforced with are polyethylene fibers or glass, fibers and were fixed to the neighboring teeth via composite material. These maintainers are clinically acceptable and convenient alternative to the conventional band and loop appliance.<sup>27</sup>

**Removable Partial Denture (RPD):** A RPD is defined as a dental prosthesis that restores one or more but not all of the natural teeth. Many patients require replacement of missing teeth and associated structures to enhance appearance, improve masticatory efficiency, and to improve the esthetics.<sup>28</sup>

#### Advantages:

- Can replace many teeth
- Cost – cheap when compared to bridges or implant
- Quick & can be made simply

#### Disadvantages:

- Limited loading potential
- Causes bone resorption
- exacerbate plaque retention problem
- Poor clasping & support
- Limited lifetime<sup>28</sup>

**Complete Denture:** In the cases of edentulous young patients, who do not finish their craniofacial growth, treatment with conventional complete denture is a suitable alternative. Ectodermal dysplasia is not a single disorder, but a group of syndromes all deriving from abnormalities of the ectodermal structures. Typical features, such as frontal bossing, depressed nasal bridge, protuberant lips, scarce hair, and brittle nails, are visualized during the extraoral examination. The intraoral inspection and radiographic analysis reveals oligodontia,

dental malformation, and prolonged retention of deciduous teeth at maxilla and total edentulism at mandible.<sup>29</sup> To treat such cases complete denture is a viable option and can be used effectively for recovery.

### III. Alternative Techniques To Improve Esthetics Of Pediatric Patients:

**Bleaching Of Discolored Tooth:** There are number of techniques for improving the colour of tooth such as whitening toothpastes, oral prophylaxis and polishing, bleaching which can be internal or external bleaching.<sup>30</sup> “The lightening of the color of tooth through application of a chemical agent to oxidize the organic pigmentation in the tooth is referred to as *Bleaching*.” (Sturdevent-4<sup>th</sup> edition). There are two types of bleaching-

Non vital bleaching is indicated for endodontically treated non vital teeth that are discoloured, provided that well condensed root canal filling must be present, unsatisfactory filling should be replaced.

Vital bleaching can be chairside, office bleaching, power bleaching and is best suited for stains seen in prolonged tetracycline usage, fluorosis and sclerosis of pulp chamber/ageing.

**Veneering:** “A veneer is a layer of material placed over a tooth, to improve the esthetics and/or protect the tooth's surface from damage.” Porcelain veneers were introduced by Dr. Charles Pincus in Hollywood in 1930s. The concept of laminate veneers although existing long back, got surface in 1975 by Rochette.

Veneers is of two types:

Partial veneers- Partial veneers are preferable for intrinsic stains and reconstruction of localized defects.

Full veneers- Full veneers are indicated for the restoration of generalized defect or areas of intrinsic staining involving the majority of the facial surface of the tooth.<sup>5</sup>

**Lasers In Esthetic Dentistry:** Lasers are the acronym for “light amplification by stimulated emission of radiation” named in 1957 by Gordon Gould. The first laser to be used was that introduced by Theodore Harold Maiman in 1960 was ruby laser.<sup>31</sup> There are three main types of lasers being used as instruments for surgical therapy in the oral cavity: The neodymium lasers - YAG (Nd: YAG), of argon (Ar) and carbon dioxide (CO<sub>2</sub>).<sup>18</sup>

#### Laser In Esthetics:

I. Laser Pediatric Crown- Jacobson (2003) revealed the contemporary technique of performing laser pediatric crowns. This technique eliminates local anesthesia, thereby providing optimal patient comfort and compliance.<sup>32</sup>

II. Laser Bleaching- The objective of laser bleaching is to achieve power bleaching process using the most efficient energy source, while avoiding adverse effects. Application of laser on teeth activates the chemical. The light speeds up the reaction of the whitening product and the colour change can be achieved.<sup>33</sup>

**Cosmetic Contouring:** Cosmetic contouring is the reshaping of natural teeth for esthetic purposes. It focuses on improvement dental aesthetics in color, position, shape, size, alignment and overall smile appearance.

## CONCLUSION

In restorative dentistry, choosing the correct restorative material is one of the primary variables that determine its success. Many new developments have occurred in restorative dentistry for children in recent years. Along with the development of newer restorative material the Pedodontist has a wide array of esthetic crowns available for restoring primary anterior teeth. Thus, esthetics has become a respectable and mandatory concept in dentistry today.

The present era of dentistry relies extensively on aesthetic principles because of increasing patient demands. A restorative dentist should try to meet these demands, while simultaneously considering the patient's socioeconomic status.

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