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Bioflx: A Novel Pediatric Dental Crown

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ABSTRACT

Bioflx crowns represent an innovative advancement in pediatric dentistry, addressing the growing demand for aesthetic and functional solutions in the restoration of primary molars. Combining the desirable features of traditional stainless steel crowns and zirconia crowns, bioflx crowns are designed to be highly flexible, visually appealing, and durable. This paper reviews the characteristics, benefits, and clinical applications of bioflx crowns in pediatric dental practice.

Introduction:

The significance of aesthetics in dentistry is growing, driven by increased awareness and the influence of social media. This trend is leading to a higher demand for fast, minimally invasive, and visually pleasing tooth restorations. To address this need, dentists are utilizing advanced technology to ensure optimal results. When treating decayed teeth, the primary objective is to preserve the integrity of the dental arch and support overall health in children. However, pediatric dentists face challenges in restoring decayed primary molars, primarily due to the difficulties in managing children's behavior during treatment.[1,2]

There are various options for restoring primary molars (PMs), each differing in function, technique, and aesthetics. Stainless steel crowns (SSCs), which have been in use for decades, continue to be the gold standard for full coverage restorations. They provide advantages like durability,

excellent retention, and a conservative tooth preparation method. However, their aesthetic shortcomings are a notable drawback. To address this concern, several modifications have been explored over the years, including open-faced SSCs and strip crowns. Unfortunately, these alternatives have also encountered their own challenges.[3-5]

Zirconia crowns (ZrCs) have transformed the field of dental aesthetics, recognized as the most visually appealing choice for treating primary molars. These crowns are durable, tooth-colored, and have a highly polished surface.[6,7] However, they lack flexibility, require significant tooth preparation, and are quite expensive. Additionally, ZrCs can potentially harm opposing teeth. In 2017, Figaro introduced fiberglass crowns, which are tooth-colored, nonmetallic, and the first preformed flexible crowns for PM. While they provide a tooth-colored appearance, they do not have the polished finish of ZrCs and are more prone to wear and fracture.[8]

Bioflx crowns present a promising alternative—offering highly flexible, aesthetically pleasing options that combine the best characteristics of stainless steel and zirconia. This literature review will explore Bioflx crowns, emphasizing their unique blend of flexibility, aesthetics, and durability.

Bioflx Crown: Bioflx crowns, developed by Kids-e-Dental, LLP in Mumbai, India, are at the forefront of innovation in pediatric dentistry, featuring a flexible, durable, and aesthetically pleasing design. Made from a high-impact hybrid radiopaque polymer resin, these crowns are recognized for their strength and flexibility, making them ideal for situations where these qualities are crucial. Importantly, they contain no metals or bisphenol A-glycidyl methacrylate and showcase a uniform tooth-colored design that effectively masks discoloration caused by arrested caries.

Manufacturers emphasize the crowns' ease of adaptation, allowing for a snug and active fit, while enabling adjustments in occlusal height by adding a dimple where required. With a radiopacity of 1 mm, these crowns aid in assessing crown margins and pulp capping materials. Compared to traditional stainless steel crowns, Bioflx crowns require fewer adjustments, presenting a considerable advantage in pediatric dental procedures.[9,10]

Indications of Bioflx crowns[11]

1. Hypoplastic or malformed primary teeth
2. Extensive multi-surface caries in primary anterior or posterior teeth
3. Children or parents with high esthetic demand
4. Traumatized primary teeth
5. Primary teeth with post-pulpotomy/pulpectomy procedure
6.

Contraindications of Bioflx crowns[11]

1. Severe bruxism or parafunctional habits
2. Deep subgingival caries requiring extensive crown lengthening.
3.

Clinical Steps Employed for Placement of Bioflx Crowns:[11-14]

Occlusal Evaluation and Crown Selection: Before applying the rubber dam, evaluate the occlusal relationship. Measure the mesio-distal dimensions to determine available space between adjacent teeth. Select the smallest bioflx crown that will effectively restore the proximal contacts.

Occlusal Reduction: Administer local anesthesia as needed. Ensure uniform occlusal reduction of 1.5-2 mm, maintaining natural occlusal contours. Use a flame-shaped bur to reduce the buccal and lingual cusps, including the central groove and marginal ridges.

Proximal Reduction: Utilize a tapered fissure bur to slice through the proximal contacts on the mesial and distal surfaces without creating a ledge or damaging adjacent teeth. Ensure the proximal slice

slightly converges towards the occlusal surface.

Buccal or Lingual Reduction: Remove buccal bulges and lingual convexities while ensuring a snug fit.

Round Off Line Angles: Smooth all sharp edges and line angles, and perform a final check of the preparation.

Adjusting Bioflex Crown: Avoid crimping the crown; instead, make slight contour adjustments with a Howe plier if needed. If the crown is too small, choose the next larger size, or further reduce the tooth circumferentially. For hyperocclusion issues, check for possible ledges on the preparation, consider more occlusal reduction, or ensure proximal contacts aren't too tight with adjacent teeth. Excessive gingival blanching indicates the crown is too long or bulky. The crown should extend approximately 1.0 mm into the sulcus. Trim it with scissors or a stone if necessary. Do not adjust or crimp other areas of the bioflx crown.

Trial Fitting: Begin by placing the posterior crowns from lingual to buccal. Ensure they do not spring back once fully seated, with the margin positioned 0.5-1 mm subgingivally. A correctly fitted crown should resist dislodgment slightly. Check that the occlusion is not high, and the crown must not be the first contact point in occlusion.

Cementation: Clean the prepared teeth and crown of saliva, blood, or debris. Control gingival haemorrhage. Use a self-setting RMGIC or GIC for cementing the bioflex crown. Fill the crown about two-thirds full with cement to ensure excess flows out, minimizing voids. Use knotted floss to clear residual interproximal cement, and check occlusion.

Advantages of Bioflx Crown[11-14]

Superior Aesthetics: BioFlx crowns offer a natural tooth-like appearance, making them preferable for anterior restorations over unsightly stainless steel crowns.

Biocompatibility: They are more biocompatible than polycarbonate crowns and are unlikely to cause allergic reactions in children.

Minimal Tooth Preparation: These crowns require less tooth reduction compared to zirconia crowns, preserving more of the natural tooth structure.

Durability and Strength: The Nickel Chromium sublayer ensures fracture resistance, while the composite layer contributes to wear resistance.

Sterilization: They can be sterilized using an autoclave, similar to stainless steel crowns.

Easy Contouring: Crimping is unnecessary, with only slight contouring recommended using Howe pliers.

Trimming Flexibility: The crowns can be easily trimmed with scissors for a customized fit.

Limitation of Bioflx Crown[11-14]

Longevity and Survival Rates: Manufacturers report a longevity and survival rate of 85-90% over a period of 3-5 years.

Causes of Failure: Failures are primarily attributed to debonding or veneer chipping rather than structural damage.

Future Improvements: Ongoing challenges focus on enhancing composite materials for better wear resistance and implementing CAD/CAM customization for improved crown fit.

Discussion:

In the realm of pediatric dentistry, selecting an appropriate crown for restoring primary molars is a critical decision that impacts both health and aesthetics. Traditionally, stainless steel crowns have been the standard, known for their durability and resilience to the forces of chewing. They have been a trusted choice for decades, offering a reliable option backed by extensive clinical experience. However, the aesthetic limitations of SSCs, which feature a metallic appearance, can be a drawback for both children and parents, especially when used for anterior teeth. Additionally,

the significant tooth preparation required for SSCs may compromise the integrity of the remaining tooth structure.[1-3]

Zirconia crowns have emerged as a notable alternative, primarily valued for their aesthetic appeal. These crowns closely resemble natural teeth, making them an attractive choice for anterior restorations where appearance is paramount. Zirconia crowns are also biocompatible, devoid of metals, and tend to elicit fewer allergic reactions. However, the cost of zirconia crowns typically exceeds that of SSCs and Bioflx crowns, which can be a consideration for families. Furthermore, zirconia crowns often require more extensive tooth reduction compared to Bioflx crowns, which may further compromise the natural tooth structure.[7,8]

Bioflx crowns, developed by Kids-e-Dental, LLP, represent an innovative advancement in pediatric restorative options. They provide an excellent aesthetic outcome, closely mimicking the natural appearance of teeth, thus addressing one of the principal concerns associated with SSCs. Made from a high-impact hybrid radiopaque polymer resin, Bioflx crowns are free from metals and harmful additives, enhancing their biocompatibility and reducing the risk of allergic reactions in children. One of the most significant advantages of Bioflx crowns is their minimal tooth preparation requirement, which helps preserve more of the natural tooth structure compared to both SSCs and zirconia crowns. Additionally, Bioflx crowns are generally more cost-effective than zirconia crowns while still delivering comparable aesthetics. These crowns also demonstrate good durability due to a combination of a Nickel Chromium sublayer that provides fracture resistance and a composite layer that offers wear resistance. Unlike traditional crowns, Bioflx crowns can be easily adjusted with minimal contouring and trimming, streamlining the placement process in clinical settings.[13]

While Bioflx crowns show promising longevity—and manufacturers report survival rates of 85-90% over a period of 3-5 years—challenges remain, primarily concerning failure modes, which often result from debonding or veneer chipping rather than structural damage. Ongoing research and development focus on enhancing composite materials to improve their wear resistance even further, addressing one of the key issues tied to crown longevity. Furthermore, the potential integration of CAD/CAM (Computer-Aided Design and Computer-Aided Manufacturing) technology stands to revolutionize the customization of crowns, allowing for precise fittings that could minimize placement time and maximize effectiveness. As awareness of Bioflx crowns increases among dental practitioners, it is likely that their adoption will grow in pediatric practices, ultimately enhancing patient satisfaction and health outcomes.[9,11,14](Table 1)

Table 1: Comparison of Stainless steel, Zirconia and Bioflx crown

Feature	Stainless steel	Zirconia	Bioflx crown
Aesthetic appearance	Limited	Excellent	Excellent
Durability	High	High	High
Cost-effectiveness	High	Moderate (Higher then SSC)	Moderate (Higher then SSC)
Tooth reduction	Minimal	Higher than SSC	Higher than SSC
Parental Satisfaction	Low	High	High
Caries prevention	High	High	High
Long Term Stability	High	High	High

Risk of hypersensitivity	Yes (Due to Presence of Nickel)	No	Noi
Plaque Accumulation	Moderate	Less	Less

Conclusion: In conclusion, while traditional stainless steel and zirconia crowns continue to play significant roles in pediatric dentistry, Bioflx crowns offer a compelling alternative that blends aesthetics, minimal invasiveness, and cost-effectiveness. As advancements in materials science and technology pave the way for future innovations in pediatric restorative care, the prospect of improving crown options is bright, promising better solutions for both dentists and young patients alike.

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