

Bridging Aesthetics and Function : Full-Coverage Restoration Using Bioflx and Zirconia Crowns in Primary Molars - A Case Report

Abstract:

Aims and Objectives: In the aesthetic world of today, both prefabricated Zirconia and Bioflx crowns have emerged as promising options, as alternatives to stainless steel crowns. The aim of this case report is to compare the clinical effectiveness of these crowns in restoring primary molars in children, based on FDI World Dental Federation criteria over a 6-month period.

Materials and Methods: Four pediatric patients, aged between 4 to 9 years, requiring caries or endodontic management were selected. Standardized protocols for prefabricated Zirconia crowns or Bioflx crowns placement were followed. Clinical evaluations were conducted on the basis of Functional, Biological and Aesthetic parameters at baseline, 3 months, and 6 months follow-up period.

Results: Zirconia crowns demonstrated superior aesthetics, color stability, and long-term durability, whereas Bioflx crowns offered advantages in terms of minimal tooth preparation, ease of placement, and adaptability. Both crown types performed satisfactorily across all clinical parameters.

Conclusion: Both Zirconia and Bioflx crowns are effective aesthetic alternatives for restoring primary molars. Their selection should be based on clinical needs and patient-specific factors.

Key-words: Bioflx crown, Zirconia crown, Pediatric dentistry, Aesthetic full-coronal restorations, FDI criteria

Introduction:

Primary dentition plays a crucial role in a child's oral and general health, supporting essential functions such as mastication, speech development, and the proper eruption of permanent teeth. One of the most prevalent challenges in Pediatric Dentistry is Early Childhood Caries (ECC), which frequently affects primary molars and, when severe, requires full-coronal restorations to maintain structural integrity, function, and aesthetics.

Stainless Steel Crowns (SSCs) have long been regarded as the gold standard for restoring extensively carious or endodontically treated primary molars, due to their proven clinical success, durability, cost-effectivity and ease of placement. However, their metallic appearance has become a growing concern among parents and children seeking more natural-looking restorations. This has led to a rising demand for aesthetic alternatives, that not only restore function but also improve visual appeal.

Among these alternatives are the recently introduced Prefabricated Zirconia crowns and the Bioflx crowns. Prefabricated Zirconia crowns are made of high-strength ceramic and are praised for their durability, biocompatibility, and superior aesthetic outcomes. However, their placement requires aggressive and precise tooth preparation. Bioflx crowns, a recent innovation composed of fiber-reinforced hybrid polymers, offer an attractive balance between flexibility, marginal adaptability, and minimal tooth preparation. Though their early clinical feedback is


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promising, comprehensive long-term studies are still needed to validate their performance.

This case report compares the clinical performance of prefabricated Zirconia and Bioflx crowns in the restoration of primary molars. It includes four pediatric cases, with two cases each utilizing Zirconia and Bioflx crowns, involving children aged 4 to 9 years. The restorative or endodontic procedures were planned based on clinical and radiographic findings, followed by full-coronal crown placement. Each case followed standard protocols for tooth preparation and cementation as recommended by the respective manufacturers'. The clinical evaluation of the crowns was conducted using the FDI World Dental Federation criteria, assessing Functional, Biological, and Aesthetic properties.² Follow-up assessments were performed at baseline, 3 months, 6 months, and 12 months to monitor outcomes related to crown retention, marginal adaptation, gingival health, color match, and patient acceptance.(Fig. 1)

CLINICIAN EVALUATION FORM					
NAME :		AGE/SEX :			
CROWN MATERIAL PLACED :		TOOTH NUMBER :			
PARAMETERS	FOLLOW-UP	PLACEMENT DAY	3 MONTHS	6 MONTHS	12 MONTHS
FUNCTIONAL PROPERTIES					
Fracture of material and retention					
Marginal adaptation					
Proximal contact point					
Form and Contour					
Occlusion and Wear					
BIOLOGICAL PROPERTIES					
Caries at restoration margin					
Dental hard tissue defects at restoration margin					
Postoperative hypersensitivity/pulp status					
AESTHETIC PROPERTIES					
Surface luster and surface texture					
Marginal staining					
Color match					

Figure 1 : Clinical assessment form



Figure 2: A – Zirconia Crown B – Bioflx Crown

Zirconia Crown :

Prefabricated Zirconia crowns (Kids-E crowns) have emerged as a highly effective option for restoring carious, fractured, or developmentally deformed primary molars in children. These crowns provide an aesthetically pleasing alternative to traditional stainless steel crowns. Their superior biocompatibility and smooth surface texture aids to minimize plaque accumulation, contributing to improved periodontal outcomes. Moreover, the aesthetic advantage significantly enhances parental acceptance and child's confidence, making them an ideal choice in modern Pediatric Dentistry. However, despite of their many clinical benefits, Zirconia crowns are not without limitations. They lack the ability to flex, crimp or contour, which limits intraoral adjustments. Additionally, their rigid structure necessitates more aggressive tooth preparation compared to metal crowns, which may pose a challenge in young or uncooperative patients. Nonetheless, they remain a valuable restorative option where aesthetics and long-term durability are prioritized.

Bioflx Crown :

Bioflx crowns, developed by Kids-e-Dental, represent an innovative advancement in pediatric restorative dentistry, by being the first crowns designed specifically for children that integrate flexibility, durability, self-adaptability, and aesthetic appeal. These monochromatic, tooth-colored and biocompatible crowns are known for their ability to mask discoloration from various conditions. They offer an active snug fit and can adapt easily to the natural contours of the tooth, simplifying placement procedures. Their design allows for easy occlusal adjustment—a small dimple can be seen if the crown is too high—making them highly adaptable in clinical settings. Additionally, with a radiopacity equivalent to 1 mm of aluminum, these crowns facilitate effective radiographic evaluation of crown margins and underlying pulp treatments, offering clinicians both functional and diagnostic advantages. Their unique combination of properties makes Bioflx crowns a promising option for restoring primary molars with minimal invasiveness and improved comfort.

Table 1 : Patients data

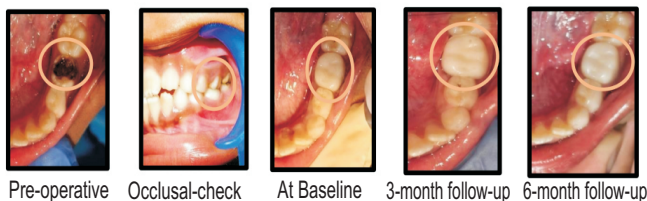
S. No.	PATIENT NAME	AGE/SEX	TOOTH NUMBER	TREATMENT DONE	FINAL RESTORATION
1.	Iqra	9/Female	75	Pulpectomy	Zirconia crown
2.	Devanjana	5/Female	54	Pulpotomy	Zirconia crown
3.	Advik	7/Male	64	Pulpectomy	Bioflx crown
4.	Hemang	5.5/Male	85	Multisurface caries	Bioflx crown

Procedures done prior to crown placement:

- Carious primary molars involving 2 or more walls were restored with GIC or Composite.
- Endodontic procedures were planned in teeth with pulpal exposure.

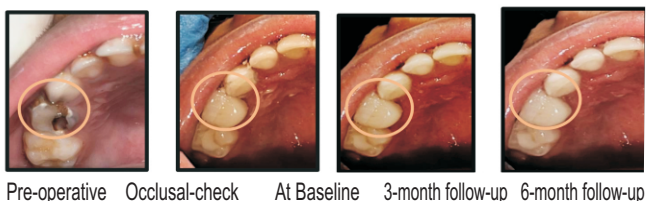
Case 1 :

A 9-year old girl reported to the Department of Pediatric and Preventive Dentistry, BBDCODS, Lucknow, with a chief complaint of pain on mastication and consuming cold beverages in her lower left back region of the jaw. The pain was dull and continuous in nature which aggravated on mastication and relived on taking medication. Radiographically, there was radiolucency involving enamel, dentin and pulp. According to the findings, pulpectomy was performed in the left mandibular second primary molar (75) under local anesthesia. A prefabricated Zirconia crown (KIDS-E-DENTAL) was selected by measuring the mesiodistal width of the tooth and the crown reduction was done according to the manufacturers' instructions. The crown was placed using luting cement (HY-BOND GIC CX-SMART) and the follow-up was done at baseline, 3-months and 6-months.



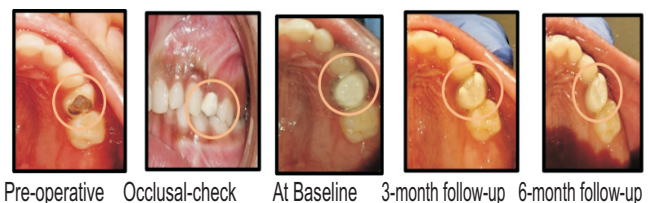
Case 2 :

A 5-year old girl reported to the Department of Pediatric and Preventive Dentistry, BBDCODS, Lucknow with a chief complaint of pain in her upper right back region of the jaw. The pain was sharp-shooting in nature and aggravated on taking cold beverages. It got relived on its own. On radiographic examination, radiolucency involving enamel and inner third of dentin (approaching pulp) was found. Pulpotomy was performed in the right maxillary first primary molar (54) under local anesthesia followed by prefabricated Zirconia crown (KIDS-E-DENTAL). The crown was selected by measuring the mesiodistal width of the tooth and the crown was luted using a luting cement (HY-BOND GIC CX-SMART). Follow-up at baseline, 3-months and 6-months was done.



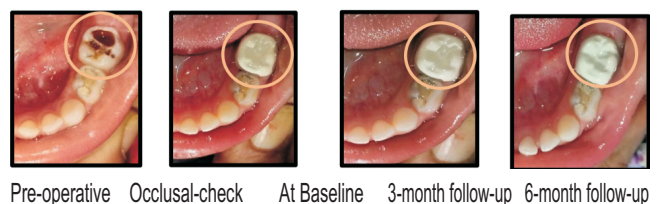
Case 3 :

A 7-year old boy reported to the Department of Pediatric and Preventive Dentistry, BBDCODS, Lucknow, with a chief complain of pain at night while sleeping in his upper right back region of the jaw. The pain was dull and intermittent in nature and it aggravated on mastication. Radiographical findings showed radiolucency involving enamel, dentin and pulp. Following the examinations, pulpectomy was performed in the right maxillary first primary molar (54) under local anesthesia. Prefabricated Bioflx crown (KIDS-E-DENTAL) was selected by measuring the mesiodistal width of the tooth and the crown was luted using a luting cement (HY-BOND GIC CX-SMART). Follow-up at baseline, 3-months and 6-months was done.



Case 4 :

A 5.5-year old boy came to the Department of Pediatric and Preventive Dentistry, BBDCODS, Lucknow, with a chief complain sensitivity to cold beverages which relieved on removal of stimulus in his lower left back region of the jaw. On the basis of clinical findings, selective caries removal was done followed by GIC restoration (GC GOLD RESTORATIVE GIC) in the left mandibular second primary molar (85). Prefabricated Bioflx crown (KIDS-E-DENTAL) was selected and the crown was luted using a luting cement (HY-BOND GIC CX-SMART). Follow-up at baseline, 3 months and 6 months was done.



Discussion :

When comparing Zirconia and Bioflx crowns for pediatric dental restorations under the FDI World Dental Federation criteria, each material presents distinct strengths suited to different clinical needs. The parameters used for evaluation in our study are Functional (fracture of material and retention, marginal adaptation, proximal contact point, form & contour, occlusion & wear); Biological (caries at restoration margin, postoperative hypersensitivity) and Aesthetic (surface luster & surface texture, marginal staining, color match).²In

our cases, we found that both the crowns are clinically good in terms of functional, biological and aesthetic parameters.

Zirconia crowns are known for their high durability, and long-term biological compatibility and excellent aesthetics. Their strength makes them especially suitable for high-load posterior teeth where functional demands are significant. The smooth surface of Zirconia promotes minimal plaque retention and supports better gingival health, an important factor in pediatric patients with developing oral hygiene habits. Moreover, their natural appearance makes them highly acceptable to parents & patients concerned about aesthetics.

Bioflx crowns offer enhanced flexibility and are easy to place, making them ideal for use in younger children, trauma cases, and situations where patient cooperation may be limited. These crowns require minimal tooth preparation, reducing chair time and preserving more natural tooth structure. Their self-adaptive properties allow for a snug and comfortable fit, which can be especially beneficial in children with erupting or partially developed dentition. Bioflx crowns are less technique-sensitive and thus more forgiving during placement.

In our case report, evaluation of functional parameters showed that Zirconia crowns demonstrated less favorable outcomes as compared to Bioflx crowns. This can be attributed to Rahate et al. (2023)¹, who attributed the superior performance of Bioflx crowns compared to Zirconia crowns to their high-impact hybrid polymer matrix, enhancing stress distribution, exceptional durability, wear resistance and reducing fracture risk. Abo-Elsoud et al. (2024)[3] corroborated these findings, emphasizing the elasticity of Bioflx as a key factor in resisting crack propagation under occlusal stress. However, they also observed occlusal failures in Bioflx crowns, characterized by fatigue and permanent deformation, which may be linked to their hybrid resin polymer composition providing flexibility and elasticity. Marginal adaptation of both Zirconia and Bioflx crowns maintained excellent integrity throughout the 6-month follow-up period. Dapaulaudi et al. (2024)[4] highlighted that the passive fit and sandblasted inner surfaces of Zirconia crowns ensure a tight seal, retentive micro mechanical features, and crimp-lock margins, improving mechanical adhesion and crown stability. Almajed et al. (2024)[5] emphasized the flexible nature of Bioflx crowns as instrumental in achieving superior marginal adaptation. Furthermore, Möhn et al. (2021)[6] concluded that Zirconia crowns exhibited the least wear compared to other aesthetic crowns namely strip crowns, noting no visible wear on Zirconia crown surfaces. The result was similar in our case

showing more occlusal wear in Bioflx crowns than Zirconia crowns, but within clinically acceptable limits.

While evaluation of biological parameters, both Zirconia and Bioflx crowns showed clinically acceptable results. These findings were consistent Alzanbaqi et al. (2022)[9], who in their systematic review, concluded that Zirconia crowns are associated with improved gingival health, excellent retention, high fracture resistance, color stability, parental acceptance, superior marginal adaptation, a smooth cosmetic surface, and minimal recurrent caries.[8] In our cases, we found that postoperative sensitivity was minimal with Zirconia crowns, showed better biocompatibility and excellent marginal seal. Bioflx crowns cases showed less secondary caries, due to their snug marginal fit and smooth surface texture. Goswami et al. (2024)[8] suggested that Bioflx crowns may offer enhanced protection against caries at restoration margins due to their bioactive and flexible properties, which improve adaptability and reduce gap formation. Lastly, Abdelhafez et al. (2024)[14] emphasized that the bioactive surface of Bioflx crowns could support better gingival adaptation and reduce plaque accumulation, contributing to long-term periodontal health.

While evaluating the aesthetics parameters, we found that Zirconia crown outperformed Bioflx crown. The color of Zirconia (pearl-white) was more pleasing than Bioflx (yellowish-white). In the follow-up visits, we observed that Zirconia crowns have negligible plaque accumulation and maintained its surface luster and texture, while the cases of Bioflx crowns showed marginal staining and shift in shade to more yellowish-white than earlier. Diener et al. (2019)[13] stated that the low surface energy of Zirconia crowns inhibits plaque and bacterial adherence, thereby preventing staining and color deterioration. Vaghela D et al. (2021)[11] & Gupta Met al. (2020)[12] stated that Zirconia crown demonstrated the most durable results, attributed to its glazed surface and low surface roughness which made them resistance to plaque accumulation and staining whereas Bioflx crown experienced moderate staining.

However, each crown type has its own limitations. Zirconia crowns are strong and aesthetically superior, but they require an extensive tooth preparation for the passive fit to avoid fracture of the crown. Therefore, it is advised they should ideally be used for cases of pulpotomy or non-vital teeth as extensive reduction in vital teeth may lead to sensitivity. Bioflx crowns are flexible in nature & leave a dimple on the occlusal surface after placement. This indicates a self-adjusting feature for high points, although it raises concerns about long-term wear and structural reliability over extended

periods. Minimal tooth preparation makes them suitable for a full coverage restoration both in cases of multisurface caries and endodontically treated teeth.

Ultimately, the decision between Zirconia and Bioflx crowns should be tailored to each child's specific clinical scenario. Factors such as age, extent of decay, aesthetic concerns, cooperation level, and parental preferences should all be considered. Both types of crowns fulfill high standards for pediatric dental restorations and have demonstrated positive outcomes. The clinician's judgment, based on clinical indications and long-term goals for function and aesthetics, remains paramount in choosing the most appropriate restorative material.

Conclusion:

In conclusion, the comparative evaluation of Zirconia and Bioflx crowns based on the FDI criteria demonstrates distinct clinical outcomes that can guide material selection in restorative dentistry. Zirconia crowns exhibited superior performance in terms of aesthetics, surface integrity, and functional stability over time, making them highly suitable for long-term posterior restorations. In contrast, Bioflx crowns, while offering greater flexibility and ease of adjustment, showed slightly lower scores in surface quality and wear resistance. Both materials fulfilled essential functional and biological criteria, but Zirconia's overall performance positions it as a more durable and aesthetically reliable option.

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