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AN INTERIM AESTHETIC REPLACEMENT TO MISSING PERMANENT ANTERIOR TOOTH- A CASE SERIES

Pedodontics

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ABSTRACT

The loss of permanent anterior teeth in pediatric patients due to trauma or failed endodontic treatment presents functional, aesthetic, and psychological challenges. Fixed fiber-reinforced composite (FRC) bridges serve as a minimally invasive, effective interim solution until definitive treatment is possible. This case series presents the management of three pediatric patients with anterior tooth loss. In the first case, a 13-year-old male with an extensively fractured and mobile upper central incisor (11) and missing 21 due to traumatic avulsion underwent repositioning and splinting, followed by root canal treatment (RCT) on 11 and an FRC Maryland bridge for 21. At the four-month follow-up, the restoration remained intact with no complications. The second case involved an 8½-year-old female with total avulsion of 11 and displacement of 21 due to trauma. After repositioning and splinting of 21, an FRC Maryland bridge was fabricated for 11. A six-month follow-up confirmed excellent functional and aesthetic outcomes. The third case featured a 10-year-old female with a missing upper central incisor (21) due to failed endodontic treatment following trauma. An FRC bridge using a strip crown was fabricated, ensuring aesthetic rehabilitation. A three-month follow-up demonstrated stability, with no signs of failure or complications. FRC bridges offer numerous advantages, including minimal tooth preparation, reparability, and superior mechanical properties compared to traditional prosthetic options. Studies have reported survival rates of up to 75% after five years, making them a reliable interim solution until permanent prosthetic options can be provided post-growth. FRC bridges offer minimal invasiveness, reparability, and favorable long-term survival rates, making them a reliable interim prosthetic option in pediatric dentistry.

KEYWORDS

Fiber-reinforced composite (FRC) bridge, Anterior tooth loss, Interim prosthesis, Traumatic dental injuries

INTRODUCTION

The loss of a permanent anterior tooth in children is a significant concern, affecting not only function but also aesthetics and psychological well-being. Missing anterior teeth can result from congenital agenesis, dental caries, or traumatic dental injuries, with avulsion being one of the most severe forms, accounting for 0.5% to 16% of all dental trauma cases. Children between the ages of 7 and 14, particularly those with upper central incisor involvement, are at the highest risk. Studies highlight that adolescents with untreated dental trauma experience social isolation, embarrassment, and a diminished oral health-related quality of life. In fact, research suggests that adolescents with broken teeth face up to 20 times more disruption in daily life compared to their peers without dental trauma.

Since definitive tooth replacement is often postponed until the eruption of adjacent permanent teeth and the completion of skeletal growth, interim aesthetic solutions play a crucial role in maintaining oral function and appearance. Various provisional treatment options, including resin-bonded Maryland bridges, removable partial dentures, orthodontic mini implants, modified Hollywood bridges, and fixed fiber-reinforced composite (FRC) bridges, provide effective temporary solutions. Among these, FRC bridges stand out due to their bondability, reparability, minimally invasive nature, and cost-effectiveness, making them a preferred choice for interim tooth replacement.

This article presents a case series exploring different interim aesthetic solutions for missing permanent anterior teeth in children, emphasizing their clinical effectiveness and impact on functional, psychological, and social well-being.

Case Report

Case 1

A 13-year-old male patient reported to the Department of Paediatric Dentistry with a complaint of a mobile, broken tooth in the upper anterior region due to trauma sustained one week prior. On extraoral examination, no soft tissue injuries or facial asymmetry were noted. Intraoral examination revealed a mobile tooth (11) with extensive crown fracture involving considerable dentin except the pulp and missing 21 due to traumatic avulsion. [Fig- 1]

Fig 1. Pre-operative Intra-oral Image

The patient underwent radiovisiography (RVG) for teeth 11 and 21, which confirmed root integrity of 11 and the complete loss of 21. [Fig- 2] A vitality test on 11 showed a negative response, confirming pulpal non-vitality. Based on these findings, a diagnosis of Ellis Class IV fracture for 11 and Ellis Class V injury for 21 was established.

Fig 2. Pre-operative X-ray

Phase 1 of the treatment involved the immediate management of the trauma, including the repositioning of the mobile tooth (11) and splinting it using a flexible splint for two weeks to stabilize the tooth. [Fig- 3]

Fig 3. Phase 1 Treatment: Repositioning and Flexible Splinting of Tooth 11 Following Trauma

After one week, the patient returned for Phase 2, which included endodontic and prosthetic rehabilitation. A root canal treatment (RCT) was performed on 11 to maintain function and aesthetics. [Fig- 4, 5]

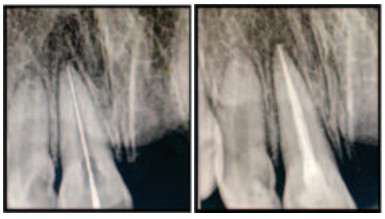

Fig 4. & Fig 5. Phase 2 Treatment: Root Canal Therapy on Tooth 11 for Functional and Aesthetic Rehabilitation

Following two weeks of stabilization, the splint was removed, and an immediate fiber-reinforced composite (FRC) Maryland bridge was fabricated to replace the missing 21.

The procedure for the bridge placement included clinical assessment and abutment tooth preparation, where enamel modification was done on the palatal surfaces of 11 and 22 to improve retention. The prepared teeth were then isolated and etched using 37% phosphoric acid for 15 seconds, followed by thorough rinsing and drying. A light-cured adhesive bonding agent was applied to enhance adhesion. Pre-impregnated FRC strands were positioned onto the prepared teeth to create a semi-rigid framework for the bridge. [Fig- 6] Composite resin was incrementally applied over the fiber framework, sculpted to match the natural contour of the missing tooth, and light-cured. [Fig- 7] Finally, the restoration was finished and polished using polishing discs and burs to ensure optimal aesthetics and occlusal harmony.

Fig 6. FRC Framework Placement

Fig 7. Incremental Composite Build-Up Over the FRC Framework

Postoperatively, the patient was advised to maintain good oral hygiene and avoid excessive loading on the bridge. Regular follow-ups were scheduled to assess occlusion, gingival health, and bridge integrity. [Fig- 8]

Fig- 8 Composite Build-Up and Finishing

At the four-month follow-up, the FRC Maryland bridge was intact, with no signs of debonding, fractures, or marginal discoloration. [Fig- 9]

Fig 9. Four-Month Follow-Up of FRC Bridge

The surrounding gingival tissues were healthy, and the patient reported no discomfort or functional limitations. The aesthetic outcome remained satisfactory, reinforcing the effectiveness of FRC Maryland bridges as a reliable interim prosthetic solution.

Case 2

An 8½-year-old female patient reported to the outpatient department with a complaint of tooth displacement in the upper anterior region due to trauma sustained four days prior. Extraoral examination revealed no facial asymmetry, swelling, or soft tissue injuries, and the patient exhibited normal jaw movements without tenderness. Intraorally, there was a complete loss of tooth 11, confirming avulsion, and displacement of tooth 21 without any visible crown or root fracture. Mild gingival laceration was also observed. [Fig- 10]

Fig 10. Clinical Presentation of Avulsed 11 and Displaced 21

Radiographic investigations, including an intraoral periapical radiograph (IOPAR) of 11 and 21 and an occlusal radiograph of the upper arch, confirmed the total avulsion of 11 and displacement of 21 without any root fracture. [Fig- 11, 12]

Fig 11. IOPAR Showing Avulsion of 11 and Displacement of 21

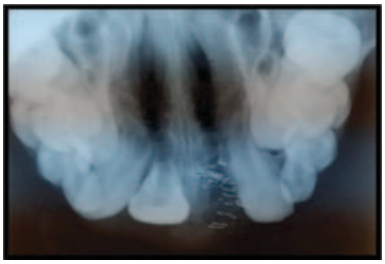

Fig 12. Occlusal Radiograph Confirming Displacement Without Root Fracture

Based on clinical and radiographic findings, a diagnosis of Ellis Class VI injury for 11 and Ellis Class V injury for 21 was made. Under local anesthesia, tooth 21 was carefully repositioned, and a semi-rigid splint was applied for four weeks to stabilize the tooth. Sutures were placed to facilitate proper healing. [Fig- 13]

Fig 13. Repositioning and Splinting of Tooth 21 with Sutures Placed

At the four-week follow-up, healing was satisfactory, with radiographic evidence of new bony apposition at the injury site. [Fig- 14, 15]

Fig 14. & Fig 15. Clinical Healing at Four-Weeks Follow-Up & Radiographic Evidence of Bony Apposition

Given the patient's young age and ongoing growth, an FRC Maryland bridge was chosen as an interim prosthetic replacement for the missing 11. The abutment teeth were prepared, and pre-impregnated fiber-reinforced composite (FRC) strands were positioned [Fig- 16, 17] to create a semi-rigid framework for the bridge. Composite resin was incrementally applied, sculpted to mimic the natural tooth, light-cured, and subsequently finished and polished to ensure optimal function and aesthetics. [Fig- 18, 19]

Fig 16. Abutment Tooth Preparation

Fig 17. Placement of FRC Framework

Fig 18. Composite Build-Up and Sculpting

Fig 19. Final Finishing and Polishing of FRC Bridge

At the six-month follow-up, the FRC Maryland bridge remained intact, with no signs of debonding, fractures, or marginal discoloration. [Fig- 20] The gingival tissues appeared healthy, and the patient reported no discomfort or functional limitations.

Fig 20. Six-Month Follow-Up of FRC Bridge

The restoration successfully preserved aesthetics and function, demonstrating the effectiveness of FRC Maryland bridges as a minimally invasive, aesthetic, and conservative interim prosthetic solution in pediatric patients.

Case 3

A 10-year-old female patient reported to the outpatient department with a complaint of a missing tooth in the upper front region for the past two months. Her past dental history revealed a history of trauma one year prior, following which she underwent endodontic treatment. However, due to treatment failure, the affected tooth was eventually extracted. On intraoral examination, tooth 21 was missing, with healthy adjacent teeth and gingival tissues. [Fig- 21]

Fig 21. Intraoral View Showing Missing Tooth 21

Considering the patient's age and ongoing jaw growth, a fiber-reinforced composite (FRC) bridge using a strip crown was chosen as an interim prosthetic replacement for 21. The procedure involved the preparation of abutment teeth, followed by the fabrication of a strip crown to mimic the natural appearance of the missing tooth. [Fig- 21, 22] Fiber reinforcement was placed within the prepared region, and composite resin was incrementally applied to create a strong and aesthetic restoration. [Fig- 23] The final build-up was sculpted, cured, finished, and polished to achieve proper form, function, and occlusal balance. [Fig- 24]

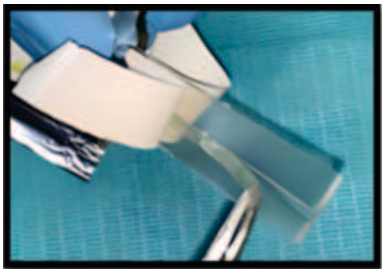

Fig 21. Preparation of Abutment Teeth

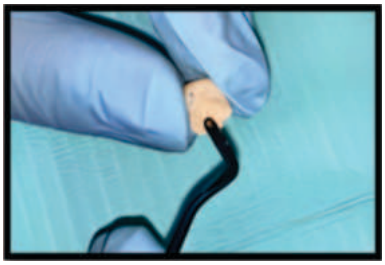

Fig 22. Fabrication of Strip Crown for Tooth 21

Fig 23. Placement of Fiber Reinforcement and Composite Build-Up

Fig 24. Final Curing, and Polishing of FRC Bridge

At the three-month follow-up, the FRC bridge remained intact, with no signs of debonding, fractures, or marginal discripencies. [Fig- 25]

Fig 25. Three-Month Follow-Up of FRC Bridge 4o mini

The patient was comfortable, and the prosthesis provided satisfactory aesthetics and function. The surrounding gingival tissues appeared healthy, and the patient reported no speech or mastication difficulties. This case highlights the effectiveness of FRC bridges with strip crowns as a minimally invasive, aesthetic, and conservative interim solution for anterior tooth loss in pediatric patients.

DISCUSSION

Fixed FRC bridges serve as an effective interim solution for replacing missing permanent anterior teeth in growing children, ensuring functionality and aesthetics until a definitive prosthesis can be placed after growth is complete.

Several studies have demonstrated the clinical longevity and durability of FRC bridges. Research conducted by Unlu and Belli and Freilich has reported an average survival period of 3 and 4.5 years, respectively, for fixed FRC bridges, making them an appropriate interim treatment choice. Additionally, clinical studies have indicated a survival rate of approximately 75% after five years, which is notably higher than fixed partial dentures (FPDs) with metal frameworks. This superior performance can be attributed to the biomechanical properties of fiber reinforcement, which enhance the resilience and longevity of the restoration.

The effectiveness of FRC bridges is supported by the material properties of fiber-reinforced composites. Studies by Isaac DH and Gordon JE suggest that fibers within the composite structure play a critical role in load distribution, acting as the primary stress-bearing component. These fibers contribute to the reinforcement of the composite matrix, preventing crack propagation through crack-stopping and crack-deflecting mechanisms. This results in an improved fracture resistance, ensuring the long-term stability of the bridge under functional occlusal loads.

Moreover, the noninvasive or minimally invasive nature of FRC bridges makes them an ideal choice for young patients. If required, they can be easily modified, repaired, or replaced without compromising the remaining dentition.

In conclusion, replacement of a missing tooth using the FRC technique is an innovative and conservative treatment modality in pediatric dentistry. By eliminating the need for extensive tooth reduction, it preserves the natural tooth structure while providing excellent aesthetics and functionality. Its adaptability allows for easy repairs, modifications, and removability without the risk of iatrogenic damage, making it a versatile and patient-friendly interim prosthetic solution.

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