

## High Patient's Acceptance of Maryland Bridge: A Minimal Procedure Following Dental Trauma

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### ABSTRACT

Traumatic dental injuries are more prevalent in permanent than primary dentition, in which maxillary incisors are more affected. The global prevalence of traumatic tooth injuries ranges from 6 to 37%. According to one study, out of 1,657 schoolchildren (aged 5-8 years) surveyed, 2.7% had traumatic injuries to their anterior teeth. A completely knocked-out front tooth often occurs as a result of a traumatic dental injury, which produces psychological and functional distress for the patient and should be treated immediately. There are various treatment options such as reimplantation, removable partial dentures, or fixed dentures, which are often not applicable or inconvenient for the patient, especially in young patients where bone growth is ongoing. Therefore, a resin-bonded fixed partial denture such as Maryland bridge is a treatment option for young patients who needed a replacement for missing anterior teeth before their growth and development was fully complete.

**Keywords:** Maryland bridge; traumatised front teeth; avulsion; missing tooth; a resin bonded fixed partial denture

### INTRODUCTION

School-age children often suffer injuries to their front teeth, but this issue is often overlooked. Traumatic dental injuries (TDIs) occur most often in children and young adults. TDI mainly affect the anterior maxillary teeth, which are mainly predisposed by falls, sports activities, cycling and motor vehicle accidents.[1], [2] Predisposing factors of dental trauma could be related to the person's anatomic features such as increased overjet, inadequate lip coverage of the anterior teeth, etc.[1], [3]

Traumatic dental injuries are more prevalent in permanent than primary dentition, which maxillary incisors are more affected than mandibular incisors.[4] The global prevalence of traumatic dental injuries ranges from 6 to 37%. [5] One study reported that out of 1,657 schoolchildren (aged 5-8 years) surveyed, 2.7% were found to have traumatic injuries to their anterior teeth, while in another study it of 10-35% prevalence of traumatic injuries was reported [1], [2], [5], [6],[7]

Besides TDI, congenital absence and caries, are other potential causes of tooth loss.[7], [8] From the literatures it was also reported that premature loss of permanent incisor might consequent the quality of life, feeding, speech development, arch integrity oral habit, physiological issues and appearance.[2], [7]–[9] Therefore, as a dental service provider, it is essential to be able to perform an immediate and appropriate emergency management after TDI as the first steps towards improving patient outcomes. Immediate management can keep the occlusion in right alignment, restored oral health, and full functionality like eating or speaking.

At the same time, maintain support to the surrounding teeth, ensuring that they remain stable, properly positioned, and eliminates any food debris potential in getting in the empty gap, also improved appearance.[8], [10], [11] Late management of tooth loss can impact masticatory system such as loss of arch length, negative effect of occlusion and alignment, difficulty of chewing and swallowing, altered bite, loss and deterioration of bone, weaken jaw muscle and structure and lowered self-esteem or sense of attractiveness.[11]

Resin-bonded bridges such as Maryland bridge was introduced as an alternative to traditional fixed partial dentures by Livaditis for the replacement of anterior missing teeth. Hence, this case report aimed to demonstrates the management of a single missing tooth in anterior region of upper jaw with Maryland bridge.

### CASE REPORT

A 7-year-old girl was referred to the Department of Pediatric Dentistry, Universitas Airlangga with a history of complete dislodge of upper front tooth from its socket since a week ago due to fall while riding bicycle. The parents defined the patient as healthy without any significant medical and dental history. Intraoral clinical examination revealed that the avulsion of tooth #21 and leaving a gap on the maxillary anterior region (Figure 1). Positive dental pulp sensibility tests of teeth #11 and #22 were reported, with both teeth positioned in correct alignment. Soft tissue surrounding the gap healed uneventful. Radiographic investigation through orthopantomogram confirmed complete dislodged of tooth #21 (Figure 2).

As a result of TDI, the patient became self-conscious about her appearance and had difficulty biting on food, she demanded a tooth replacement immediately.

Thus, Maryland bridge was planned for replacement of her left maxillary central incisor. Details on the materials picked and procedure were informed to the patient.



**FIGURE 1:** Extra oral photo of edentulous ridge of #21 (A) meanwhile intraoral view (B) a week post trauma has been shown visible contours on the gingiva region #21 while the wound is not detected.



**FIGURE 2:** Pre-operative orthopantomogram showed no alveolar fracture presented nor the radiolucency of periodontal ligaments on socket #21.

Informed consent was obtained prior to the active management. Teeth preparation was performed on both #11 and #22 using standard techniques [12]. Initially, contact areas on the palatal cusps were marked up with the opposite tooth in centric and eccentric movements. Following that using the diamond bur, the palatal surfaces of the abutment teeth (tooth #11, #22) were prepared with approximately 0.3 mm lingual chamfer and 0.5-1 mm supragingival from mesial to distal. Care was taken to ensure conservative preparation, limited to the enamel layer using the fine diamond bur. The mesial grooves in the enamel were prepared at 0.5 mm depth in the middle of the mesial surface and in line with long axis of the tooth and incisal to the finish line.

Mesial slice preparation was done to eliminate convexity and allow flat surface to bind while the groove is placed only lingual to the edge of the slice prep. Mesio-palatal and disto-palatal grooves were made to prevent the lingual shift of the Maryland wing. The palatal groove was 1 mm deep into dentin and finishes 2 mm below incisal edge with an undercut and light chamfer finish line (Figure 3). Palatal groove was made to prevent rotational displacement.

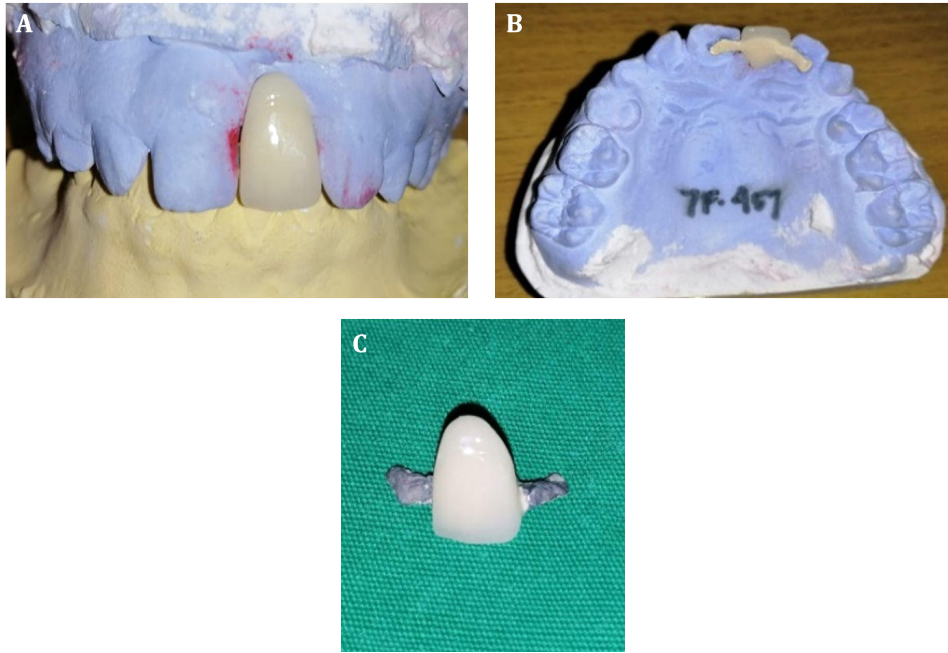
The dental impression of the maxillary arch was taken following completion of the preparation to record all the fine details of the prepared abutment teeth. After spraying debubbler on the impression, cast was poured into the gypsum product. To achieve natural visual appearance, shade selection has to be accurate. Vita 3D Master A2 was used as the shade guide for tooth #21. The next stage was sending the cast to a dental laboratory for the construction of a Maryland bridge which was made of porcelain fused to metal materials. A modified ovate pontic was designed for tooth #21, which was then invested and casted in a metal framework with a porcelain tooth connected onto the front of the framework (Figure 4 A, B, C).

Subsequently, trial fitting of the Maryland bridge was carried out in patient's mouth and then, aesthetics and speech were evaluated. The bonding method carried out once patient satisfaction, function, and aesthetics were attained. The enamel on the palatal surface was first etched with 37% phosphoric acid for 30 seconds, followed by thorough rinsing and drying. Resin cement was applied onto the etched and bonded tooth, fitting surfaces of the Maryland bridge which was then securely seated onto the



palatal aspect of the abutment tooth (tooth #11, #22) confirming no occlusal premature contact. (Figures 4 and 5). The removal of excess cement was done using a dental prob and the resin cement was then light cured following

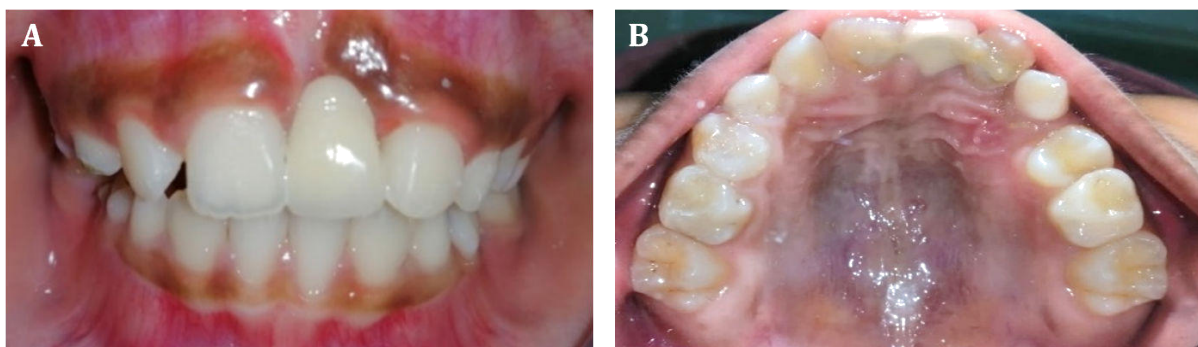
manufacturer's instructions. Subsequently composite restorations of teeth #55, #54, #53 and #65 were done to accomplish patient dental care.



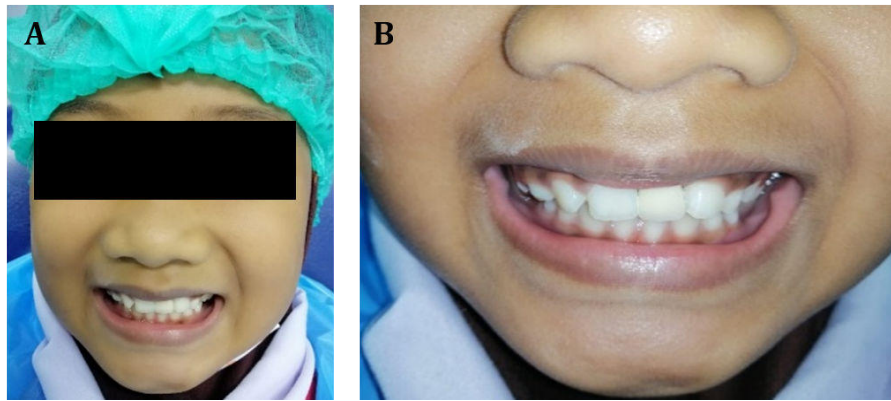
**FIGURE 3:** Laboratory-processed of Maryland bridge. (A) Maryland bridge using porcelain fused to metal (PFM) with ovate pontic on left maxillary central incisor; (B) Cantilever retainer wings on abutment teeth (#11, #22) made from PFM; (C) A modified ovate pontic for tooth #21 with thin metal wings.



**FIGURE 4:** Try in facing. Preoperative (A) and Post-operative (B). Maryland bridge is used to replace the missing tooth. Natural smile demonstrating the aesthetic outcome of a Maryland bridge.



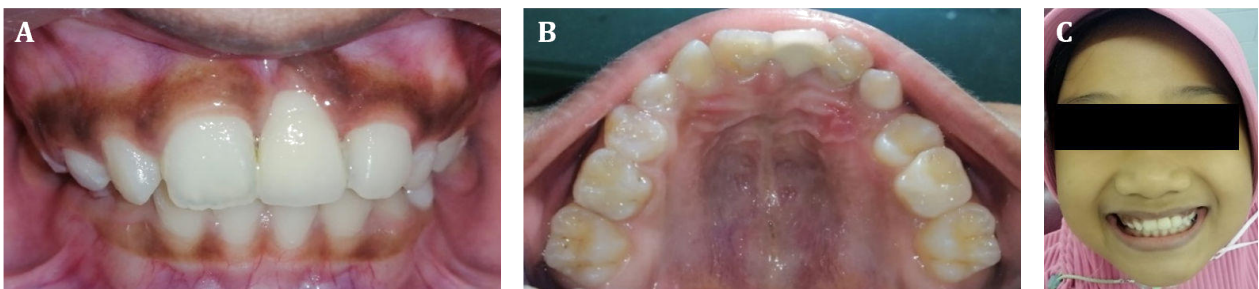
**FIGURE 5:** Post-operative intraoral photograph on labial (A) and (B) occlusal view after Maryland bridge's cementation on tooth #11, #22, and #21 as a pontic.



**FIGURE 6:** Intra oral images at 3 months follow-up. Patient's profile (A) and (B) Maryland bridge was found to be intact and retentive.

Post cementation instructions were given, and regular follow-up was advised. for every 3 months (Figure 7 and Figure 8) was proposed until the patient is ready to replace the Maryland bridge with a permanent dental restoration solution. E.g.: dental implant.

The result of the prosthesis was found to be satisfactory as no issues were reported by the patient after 12 months of follow-up (Figure 9).



**FIGURE 7:** Labial (A) and occlusal (B) view on patient follow-up after 6 months; an extra oral view (C) reveals Maryland bridge is still functional and in good shape.



**FIGURE 8:** (A) There were no issues with the patient at 9 months after the post-operative procedure. Neither the pontic (tooth #21) nor the abutment teeth (tooth #11, #22) had any discoloration or caries (B).



**FIGURE 9:** Patient feels confident and satisfied with the interim prosthesis. No issues were found in patient even after 1-year post-operative followed up.



## DISCUSSION

The resin-retained bridges or Maryland bridges are often used as a temporary measure for restoration to replace a missing single maxillary anterior tooth. It acts as permanent tooth replacement options in a young patient prior to the completion of growth and development. This case report marked the conformity of using Maryland bridge as conservative and conventional approach for children who needed anterior tooth loss replacement. This statement is entirely consistent with a Guttman and Ghimire which support the importance of patient comfort while undergo this treatment.[13], [14] Despite the limitation of retrospective data regarding this patient's intra and extra oral condition soon after the accident, anterior tooth loss demands prompt attention due to function and appearance. In general, missing single teeth can be treated with various treatment options like reimplantation, removable partial denture, or fixed dentures. Prosthesis like partial denture remained as the simplest and cheapest option, but they are unsuitable for this 7-year-old patient because of bulky in shape, uncomfortable and unappealing.[15] Fixed partial denture can also be considered as an alternative option.

However, due to the child's large pulp chamber, deterrents may also include increased pulpal sensitivity during tooth preparation and potential crown margin exposure due to age-related apical migration of the epithelial attachment.[16] Furthermore, due to the additional loss of tooth structure and the stated life of the fixed partial denture of 8.3 to 10.3 years, a young patient would need to replace the denture three or four times over the course of their lifetime.[17] Currently, dental implants are among the most popular and cost-economical tooth replacement solutions; in this case, dental implant was not an option due to the patient's approaching growth. Growing youngsters experience ongoing bone growth, similar to the anterior maxilla's transverse expansion, which may be influenced by the surrounding teeth's vertical emergence. In addition, due to remodeling alterations, maxillary implants also have a propensity to puncture the floor of the nose.[18] Consequently, the problems involved in attempting to restore function and appearance are greater than usual, because the children's face and jaws are constantly growing and undergoing changes in dentition.[19]

Resin-bonded bridges were introduced as an alternative to traditional fixed partial dentures by Livaditis for the replacement of anterior missing teeth since in the early 1980s.[13] Therefore, Maryland bridge was used as treatment option in this patient since it is minimal invasive and conservative to tooth tissue, minimizing pulpal trauma with pain-free procedure compared to other alternative dental procedures.[13], [14] Local anaesthesia is often not required, leaving the children at comfort of undergoing the dental treatment during teeth preparation of the Maryland bridge. Other benefits include less periodontal irritation results compared with the conventional bridge.[20] The restoration material used by the authors was porcelain fused to metal (PFM) due to its aesthetic and desirable results compared to other material. Behr stated that out of all the aesthetic options for dental crowns. PFM is the strongest and most resistant to chips and cracks. Because of this strength, PFM crowns are the ideal choices for restoring teeth located at the back of the mouth. [21]-[23] Vyas also indicated that PFM has greater strength and resistance to fracture. The combination of porcelain and metal fused is found stronger than porcelain alone. There has also been significant interest in the way they are bonded together.[24] For example, the adhesive resin cement (dual cure bonding system) was used for the cementation of Maryland bridge as it provided high adhesion, long-term stability or bond strength better than

glass ionomer cement or zinc cement.[25], [26] This patient was then closely monitored and reviewed. The Maryland bridge remained intact, functional and in good condition with no complications up to 12 months of follow-up.

## CONCLUSION

Maryland bridge provides a fixed and conservative solution for young patient due to traumatic dental injury. It was reflected as cost –economical, requiring less chair time and less damage to the abutment tooth suitable for children with avulsion as a temporary restorative solution. It has also been proven to be well-tolerated by young patients

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