Modified Esthetic Splint Design for Management of Multiple Traumatic Injuries in Children: A Case Report

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Abstract:
Traumatic injuries to the dento-alveolar structures are emergencies that compromise the quality of life of the patients. In addition to symptomatic management, definitive functional restoration and suitable rehabilitation becomes a major treatment objective in such cases. The dynamics of the traumatic forces may cause multiple injuries of different grades to the oral and para-oral structures, which makes comprehensive management a greater challenge to the dentist. The present case report elaborates a modified esthetic splint designed to treat multiple dental injuries in children, which can promote healing, restore optimal functionality along with esthetic rehabilitation to psychologically benefit the child during the time of recovery.

Key Words: Avulsion, dental traumatic injuries, esthetic splint

Introduction
Avulsion of the permanent teeth account for about 0.5-3% of all dental injuries. The prognosis of avulsion injuries is dependent on the amount of extra oral time elapsed since the avulsion of the tooth and the actions taken after the avulsion of the teeth.¹,² In most of the cases reimplantation is the treatment of choice, but it is not only treatment option as various other factors have to be considered so as to obtain favorable outcome. Repositioning or reimplantation, followed by stabilization is the standard protocol followed in most of the cases. Non rigid fixation is considered to be most favorable. However some cases may require a modification of these conventional splinting designs to attain favorable results.³ Successful outcome can be expected when there is minimal extra oral time with proper storage media used. If the periodontal ligament is well preserved, these cells can reattach particularly when reimplanted within 15-20 min. However if there is prolonged extra oral dry storage time, favorable outcome cannot be expected. In such cases, it is essential for the clinician to not only maintain the space till a fixed appliance can be delivered, but also to restore the esthetics, form and function.

This paper describes a case of avulsion with extended extra-oral dry storage time which could not be reimplanted hence a modified splint was designed, which could maintain form, function, esthetics and also could support the adjacent traumatized teeth.

Case Report
A 10-year-old boy reported to private dental clinic due to missing upper front teeth following self-fall (Figure 1). The time lapsed following the trauma was 4 days. Dental examination revealed clinically missing 21 and 22. 11 was extruded, palatally displaced and mobile. The avulsed permanent teeth (21 and 22) were stored in dry condition for 4 days and were brought to the hospital in a match box (Figure 2). Clinical and radiographic maxillofacial examination revealed that there was no fracture of the maxilla, mandible or other facial bones. However, the radiograph confirmed the diagnosis done during the clinical examination. He had no other injuries and his medical records were uneventful. Poor prognosis was expected if the avulsed teeth were reimplanted, since there was prolonged extra oral dry storage time and conditions in which the teeth were stored was also not favorable. Considering the above factors decision was made not to reimplant the avulsed teeth. The treatment plan was to reposition the extruded 11 followed by splinting for stabilization. However, conventional splinting was not

Figure 1: Intraoral photograph of avulsed of 21, 22 and extruded and palatally luxated 11 causing occlusal interference.
favorable in this case as 21 and 22 were avulsed. Hence a modified splint was planned. After administration of local anesthesia, the extruded 11 was repositioned using axial finger pressure on the incisal edge of the tooth (Figure 3). Splinting was done with acrylic anterior teeth placed in the region of the missing 21 and 22 (Figure 4). Glass ionomer cement bite plane was given on 36 and 46 to relieve occlusion. Patient was advised to consume soft diet and was instructed to maintain meticulous oral hygiene. This splint served the purpose of esthetics as well could help in the stabilization of the extruded 11. Post-operative phase (Figure 5) was uneventful with subsequent reduction in the pocket depth both labially and linguually indicating successful reattachment of periodontal ligament fibers. After 3 weeks radiographs were repeated to evaluate the pulpal and periodontal status. There was neither any periapical radiolucency nor any marginal breakdown. This was followed by removal of the splint. The missing teeth were later replaced by removable partial denture which will be continued till it can be replaced by fixed prosthesis.

### Discussion

When a tooth is avulsed, it is separated from the socket as a result of a tear in the periodontal ligament fibers; also some amount of damage occurs to the cementum of the bone. The untoward consequences of the reimplantation are minimal when the periodontal ligament cells remain viable. The dried, dehydrated tooth loses the viability of the cells. The severe inflammatory response is elicited if the tooth is reimplanted following prolonged dry storage. Hence, the treatment of avulsion is aimed at minimizing the amount of damage occurring as a result of inflammation so that minimum possible complications result. In the present case, the extra oral dry storage time was prolonged, and the conditions in which the teeth were stored was also not favorable. Reimplantation of this tooth would result in a severe inflammatory response. Hence reimplantation was not considered in this case.

Extruded 11 could be repositioned even after 4 days as the secondary healing following trauma had not yet initiated. This was because the tooth was extruded and lingually displaced and was interfering with occlusion resulting in constant occlusal trauma. Hence, it was favorable to reposition the tooth back. Conventional splinting in this case, would have required relief to be provided in the region of the avulsed tooth which would have compromised the esthetics of the child. The addition of

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**Figure 2:** Extra oral dry storage of avulsed teeth in a match box for 4 days.

**Figure 3:** 11 repositioned such that the occlusion and its functionality is restored.

**Figure 4:** Modified esthetic splint in position (with the acrylic teeth) stabilized with composite in the position of lost 21, 22.

**Figure 5:** 3 weeks following trauma – Modified esthetic splint is intact and has aided in uneventful healing of the traumatic injuries.
the acrylic teeth in the splint improved the stabilization of the adjacent extruded tooth as well maintained the esthetics of the child during the post trauma phase. The demand of flexibility of the splint is also fulfilled with this design of the appliance. The other advantages of the design being simple procedure, does not traumatize other teeth, helps in maintaining speech and esthetics, additional efforts not required for maintaining the oral hygiene and vitality testing and endodontic procedures can be performed without any interference.4,5

Conclusion
Conventional splinting has certain limitations in multiple dental injuries. In cases of avulsion coupled with luxation injuries, the conventional splint leaves behind a gap in the area of avulsed tooth that can compromise the functionality, appearance as well as reduce the efficiency of the splint in terms of its rigidity and anchorage. By incorporating a suitable acrylic tooth in the region of avulsion, the shortcomings of the conventional splint can be overcome to a certain extent functionally and to a greater extent esthetically. With better esthetics, it is definitely a better motivated child and hence better acceptance of treatment in the further course of comprehensive trauma management.

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