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CASE REPORT

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Rehabilitation of a lost immature permanent central incisor due to avulsion injury with a modified essix retainer: A case report

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Abstract

The type of injury in which a tooth is completely displaced from its alveolar socket following trauma is called avulsion. Traumatic injuries to permanent incisors are quite common during childhood, with 0.5–16% of children aged 7 to 14 experiencing permanent incisor avulsion. Tooth avulsion usually occurs due to road traffic accidents, falls, and other physical impacts. It can also happen during sports in schools or as a result of physical violence. Permanent incisors are important not only for aesthetics but also for phonetics, mastication, and the psychological health of young patients. Traumatic dental injuries should be thoroughly evaluated and managed by clinicians. An appropriate emergency intervention and treatment plan are crucial for a good prognosis. However, due to various reasons, this condition can result in tooth loss. It is essential to preserve the spaces of avulsed teeth with space maintainers until the patient reaches the appropriate age for permanent treatment. The aim of this study is to improve the quality of life of an 8 year old pediatric patient in the mixed dentition period, whose upper right permanent central incisor tooth was avulsed, by providing temporary oral rehabilitation with a modified essix retainer and to offer a qualified treatment alternative to the patient.

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Introduction

Avulsion refers to the complete displacement of a tooth from its socket in the alveolar bone. Avulsion is observed in 0.5% to 16% of dental injuries involving permanent teeth (1). It is most commonly seen in children aged 7 to 14 years, with anterior incisors being more frequently affected by this type of trauma (2). Therefore, achieving an aesthetically successful outcome in the treatment of avulsion cases is of great importance. Factors such as the immaturity of the periodontal ligament, short root length, and the flexibility of the bone surrounding the socket are among the reasons for the frequent occurrence of avulsion in immature permanent teeth as a result of trauma (3).

The prognosis of avulsed teeth is closely related to the timing of the intervention and where the tooth is stored before treatment. Immediate reimplantation is the best treatment option for avulsed teeth. However, parents, teachers, and even general dentists sometimes lack sufficient knowledge about appropriate emergency treatment following trauma (4,5). A lack of knowledge about emergency care can result in the tooth being left in a dry environment for too long, delayed reimplantation, and subsequent necrosis of the periodontal ligament. This initiates progressive processes leading to tooth loss, such as external inflammatory resorption and replacement resorption.

The early loss of an immature permanent incisor poses significant challenges for dentists, leading to both functional and aesthetic problems. In such cases, a number of problems, such as the ongoing growth of the alveolar process, pre-existing orthodontic disorders (especially alveolar protrusion), and partial eruption of neighboring teeth, need to be managed simultaneously (6).

Before making a treatment decision, factors such as the patient's age, medical history, attitude of the child and their family toward dental treatment, and the number of affected teeth must be evaluated. The primary goals of treatment are to preserve aesthetics and chewing function, prevent overeruption of opposing teeth, avoid space loss, maintain vertical dimension, prevent the development of harmful habits, and ensure the continued growth of the alveolar crest for future prosthetic or implant procedures (7).

The literature suggests various fixed and removable space maintainers for pediatric patients in cases of tooth loss (8,9). In this case, the use of a modified essix retainer serving as a space maintainer for a lost permanent central incisor is presented.

Case description

An 8 year old girl referred to our clinic from an external center due to trauma. Intraoral and radiographic examination revealed an avulsion of the upper right permanent central incisor tooth and a subluxation-type injury accompanied by an enamel-dentin fracture on the upper left permanent central incisor tooth. It was learned that the upper right permanent central incisor tooth had been reimplanted and splinted within 30 minutes of the trauma at the initial center (Figure 1). A detailed medical history revealed no significant medical or systemic conditions. Since it was determined that reimplantation and splinting had been successfully performed at the initial clinic, there was no need to repeat these procedures. Written informed consent was obtained from the patient's legal guardian for the presentation of the case and the use of relevant images. All procedures to be performed and their potential risks were explained to the patient and the legal guardian. Subsequently, only the upper left permanent central incisor tooth was covered with traditional glass ionomer cement to prevent sensitivity. The patient was then scheduled for follow-up appointments at 1 week and 2 weeks.

Figure 1: Diagnostic radiograph

At the end of the second week, the splint was removed.

Aesthetic restoration of the upper left permanent central incisor tooth was performed with composite, and apexification treatment was initiated for the upper right permanent central incisor tooth. However, the patient did not attend subsequent follow-up appointments, leaving the treatment incomplete. Nine months after the initiation of apexification treatment, the patient returned to our clinic with the complaint of the composite restoration breaking on the upper left permanent central incisor tooth due to a second trauma. Intraoral examination revealed a fistula and severe mobility in the upper right permanent central incisor tooth, making continued treatment impossible (Figure 2).

Figure 2: Intraoral image after the second trauma

Radiographic examination revealed severe external and internal resorption in the upper right permanent central incisor tooth (Figure 3).

Figure 3: Radiographic image after the second trauma

The restoration of the upper left permanent central incisor tooth was renewed, and the upper right permanent central incisor tooth was extracted. The root of the extracted tooth was sectioned using a separator, and the remaining crown portion was placed in distilled water to prevent dehydration. The patient refused to use a traditional space maintainer. Therefore, a quick space maintainer solution was planned to prevent space loss. Ten days were waited for the healing of the extraction socket, after which impressions of the upper and lower jaws were taken, and wax bite registration was performed. Upper and lower jaw models were prepared. Then, the crown sectioned on the upper jaw model was fixed with the help of pink wax. The plaster models were attached to the articulator, and occlusion was checked between the upper and lower jaw models using the wax bite. After ensuring that the occlusal relationship was correct, an essix retainer was applied to the upper jaw, leaving it inside the crown (Figures 4).

Figure 4: A. Occlusal view of the essix retainer, B. Labial view of the essix retainer

The space maintainer was delivered to the patient on the same day, and instructions regarding its use were provided (Figure 5). The patient was regularly scheduled for follow-up appointments.

Figure 5: Intraoral view of the space maintainer

Discussion

The essix retainer, designed by orthodontist J. Sheridan in 1993, was initially developed for long-term retention (10). Beyond its original purpose, its various applications

include appliances with pontics for a single missing anterior tooth, space maintainers, temporary bridges, and habit-correction appliances (11).

The essix retainer, an aesthetic and removable appliance, is made from plastic copolymer material using the thermoforming technique. Its retention in the mouth is achieved through natural undercuts at contact points. It maintains posterior stability while providing anterior flexibility, resulting in a lightweight and durable design that does not interfere with speech (12).

The modified essix retainer can serve as a temporary prosthesis to preserve the alveolar ridge and enhance aesthetics before the placement of permanent prostheses (13). It provides good retention without affecting speech or function and can be easily modified as teeth erupt or as the child grows. Additionally, it is cost-effective.

In a study by Banu et al., a modified essix retainer with pontics was used as a temporary prosthesis to manage partial edentulism and minor orthodontic corrections in a 7 year old child diagnosed with bilateral regional odontodysplasia (RO). The authors emphasized that treating a child with RO requires a multidisciplinary approach and that the modified essix retainer can be an effective management tool in pediatric cases (14).

In another study by Amitha et al., a modified essix retainer with an acrylic tooth was prepared as a temporary restoration for a 2.5-year-old child who experienced avulsion of the upper primary central incisor due to trauma. Since reimplantation is not recommended for primary teeth, this method was highlighted as a short-term treatment option for avulsion cases in the primary dentition (15).

We preferred to apply a modified essix retainer as a space maintainer for our patient due to its advantages, such as providing easy modification for the patient's ongoing teeth eruption, being aesthetically acceptable, and having a low cost.

Conclusions

The treatment of avulsed teeth should be individually planned based on the severity of trauma, as well as the functional and aesthetic needs of each case. Modified essix retainers, which are not recommended for long-term use in patients with poor oral hygiene, can be an ideal alternative, particularly for children, before the placement of a permanent prosthesis, offering promising results.

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