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Temporary management of permanent central incisors loss caused by trauma in primary dentition with natural crowns: a case report

CASE REPORT

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Abstract – Primary teeth injuries may cause developmental disturbances in the permanent dentition and loss of permanent incisors could be treated with different options. In this case report, an 11-year-old boy, with a history of trauma at the age of 4 years, is presented. Premature loss of permanent upper right central and upper left central teeth because of the mobility and arrest in root development were treated using patient's own natural crowns on a removable appliance. This treatment option could be considered as an esthetic and functional temporary management of permanent central incisors loss until the definitive treatment will be completed in the future.

Trauma by forceful impaction of maxillary anterior primary teeth is a common occurrence in children during the first 3 years of life (1, 2). Incisors are the most frequently affected teeth in primary dentition because of their exposed position in the dental arch (3). As is known, the developing permanent incisor tooth germs are in close relationship with the primary central incisors; thus any trauma to the primary teeth can result in developmental permanent teeth disturbances in the anterior maxilla (4, 5). The specific type of injury to the primary dentition is related to the various disturbances observed in the permanent dentition. Intrusion and avulsion of the primary incisors have the most serious effect on the permanent dentition, with more than half of the permanent successors demonstrating developmental disturbances; on the other hand, subluxation and extrusive luxation resulted in considerably fewer complications, with 25–33% involvement of the permanent incisor (6). After trauma, several sequelae such as enamel hypoplasia, dilaceration, delay in eruption, dental deformities, arrest in root development, and retention of the secondary teeth caused by ankylosis may occur in developmental teeth (5, 7–10). Enamel hypoplasia including discoloration usually range from white to yellowish-brown staining and labial surfaces of the crowns are usually affected (5, 11). Trauma to the epithelial root sheath of Hertwig during development may cause to root dilaceration or arrestment of root formation. In addition, short roots may develop and tooth eruption will be destroyed (11). Several options are available for the treatment of accidentally lost maxillary central incisors in children and adults. This is the most challenging treatment situation to dental traumatology. In the maxillar anterior region, there is a maximum demand for an esthetically satisfactory solution that mimics the contralateral non-injured incisor (12). Following the loss of anterior teeth in a growing child, although treatment skill is limited, miscellaneous treatment modalities have been attempted in the literature, such as autotransplantation (13–16), orthodontic space closure (17–19), implant treatment (21–23), and the prosthetic rehabilitation (12, 24–26). In such cases, to avoid the problems of esthetics, phonetics, and space-maintenance, the natural crowns of patients have been used with fixed appliances as temporary prosthetic rehabilitation in a growing child (24, 25).

In this case report, the temporary management of permanent central incisors loss due to trauma in the primary dentition using individual natural crowns on a removable appliance is presented.

Case report

An 11-year-old male with no systemic problem was referred to the pediatric dentistry clinic because of mobility of the permanent upper right central incisor and an esthetic problem with the upper left central incisor. The patient's history indicated that he fell from a tree at the age of 4 years and crown fractures occurred. In the emergency clinic, roots of the primary central and

Fig. 1. Intraoral view of upper right central and rotated upper left central, enamel discoloration in upper left lateral.

lateral incisors were extracted and the gingiva was sutured.

Clinical evaluation revealed mobility in the permanent upper right central incisor, a rotated upper left central incisor and enamel hypoplasia involving discoloration on the enamel surface area of the upper left lateral incisor were noted. The patient was in the mixed dentition period in both jaws (Fig. 1). According to radiographic findings, the permanent upper right central tooth had no root formation, and short root formation with resorption had occurred in the rotated upper left central incisor (Figs 2 and 3). After consulting the orthodontic department, the upper right central and rotated upper left central teeth (Fig. 4) were extracted. The crowns of the upper right and left centrals were separated from the root and both crowns were stored in sterile saline solution in +4°C for 21 days. Before implementing teeth to the removable appliance, flowable resin composite material (3M ESPE, St Paul, MN, USA) was placed into the crowns in increments and cured for 40 s each (Fig. 5). For the upper jaw, 0.7 mm round orthodontic wires (LewaDental, Remchingen, Germany) as Adams clasps on the first permanent molars and C shaped on the left primary canine and right premolar were applied to the removable space-maintaining partial denture with central permanent natural crowns (Fig. 6). For lower jaw, a removable space retainer was applied, and the space management combined with an esthetic concept was started (Figs 7 and 8).

Fig. 2. Ortopantomograph.

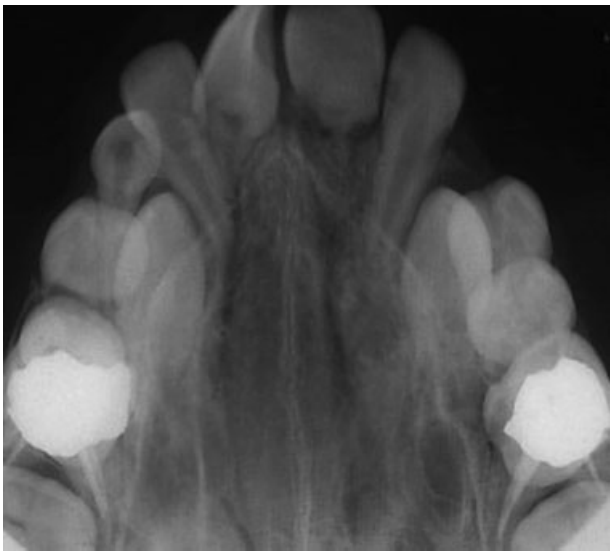

Fig. 3. Occlusal radiograph.

Fig. 4. Extracted upper right central and rotated upper left central teeth.

Fig. 5. Natural crowns appearence with resin composite flowable material.

Discussion

Living and growing carry a high risk of trauma, and as a result, children are not likely to learn to walk without

Fig. 6. Removable appliance with central permanent natural crowns of patient.

Fig. 7. Intraoral view of the removable appliance with natural crowns and space management.

Fig. 8. Extraoral view of the removable appliance.

falling; few children reach 4 years of age without having received a blow to the mouth (27). In a clinical and radiographic study of 213 teeth, investigators demonstrated that more than 40% of their young patients had changes in the permanent teeth that could be traced to injury in the primary dentition (10). In addition, the disturbances in permanent teeth are highly associated with the developmental stage of teeth. If the injury occurs during the initial stage of development, enamel formation can be seriously disturbed; moreover, in later stages, morphologic and eruption disturbances can occur (6). In the present study, the patient's trauma occurred at the age of 4 years, a period characterized by root malformations in the permanent central teeth (11).

Tooth loss requires a combination treatment addressing both esthetics and function. The methodology depends upon the patient's age, and location and extent of traumatic injury (12). Therefore, this was considered as an esthetic and functional problem in the developing dentition for this patient. For this reason, in the present study, to avoid atrophy of the alveolar process and as a temporary solution until definitive treatment could be carried out, space management procedure with esthetic concept was applied.

In growing patients, autotransplantation of teeth to replace missing incisors can be considered if suitable donor teeth are available in the mouth. It allows normal alveolar bone development and a future option of permanent restoration without implants or partial dentures (13–16). Andreasen et al. (28) reported survival rates of 95% and 98% for teeth transplanted with incomplete and complete roots, respectively. The transplant can replace missing teeth to ensure preservation of bone until growth has ceased and then, if necessary, the patient can become a candidate for implants (14, 15). However, despite some advantages over the tooth replacement, inflammatory or replacement resorption of teeth in this treatment skill are recognized as the major complications (29). In the present report, the patient was in mixed dentition stage and probably, the usage of donor teeth and the remaining space would affect the future definitive treatment decision. Meanwhile, the implant treatment replacement gives a more tolerable opportunity to preserve the dimension of the alveolar process from further alveolar ridge resorption (20, 22). However, the obstruction of normal growth in the patient is debated, so it should normally not be placed until the skeletal growth is completed (30). Another choice for this situation, which includes closing a space by moving the lateral incisors into the arch space of the centrals, is known as orthodontic space closure. This treatment plan should be based on a comprehensive evaluation including the age of the patient, the occlusion and space requirements as well as the shape and size of the adjacent teeth (19, 31). However, because dental asymmetry and decreased cervical width and height of the lateral incisor compared with the central incisor result in a poor gingival contour in this approach, it is difficult to achieve orthodontic treatment esthetically (19). In this case, orthodontic treatment with enlarging the lateral incisors or moving them to the central region could not be performed because the patient had unerupted permanent canines and premolars, which would influence the orthodontic treatment outcomes in the future. However, when space closure is contraindicated, a space maintainer can be constructed. This situation arises if more than one incisor is lost in the same arch (32). For this purpose, in this case, two natural central

teeth were used with space maintainer for temporary reason.

In the literature, the use of several fixed appliances after a traumatic tooth loss in the anterior maxillary region and the advantages of using natural crowns on these have been reported, together with the patients' satisfaction (24, 25, 33, 34). Furthermore, the utilization of natural crowns instead of acrylic teeth on a fixed appliance is of psychological benefit to the patient and can be better tolerated because of their shape, size, and color (24, 25). Thus in this case, to ensure an esthetic solution for the patient, natural teeth were used instead of acrylic. Recently, in an effort to maintain the edentulous space of anterior teeth in a growing patient, fiber-reinforced bridges have frequently been constructed (24, 26). Although these have some advantages over the removable appliances, such as enhanced esthetic concept and avoidance of renewing the appliance, their local adverse effect on maxillary growth in the anterior region is known as a specific restriction factor for a growing child (25, 26). For this purpose, without restricting intercanine arch dimension growth, an alternative interim designed fixed-appliance has been used in daily practice (25). Nevertheless, in place of fixed appliances, the presented acrylic denture space maintainer is not without its disadvantages. In addition to their disposition to fracture and dependence on patient cooperation (25, 35), loss of hygiene, tissue inflammation, and papillary hyperplasia (36) are known as the other main factors contributing to failure in this approach. When removable appliances are utilized for these purposes, problems related to lack of stability and unfavorable distribution of stress may arise. If the removable appliance is not changed synchronously with the healing phase of the edentulous region, atrophy of the alveolar process could occur in a long period (37).

After a trauma in the primary dentition, potential developmental disturbances in permanent teeth should be carefully followed (6). When permanent anterior teeth loss is seen in developing dentition, the space must be maintained until skeletal growth is complete for the artificial implant restoration to be successful. As a result, to overcome problems of esthetics and phonetics, the patient's own natural crowns could be applied with removable space maintainers. Moreover, this seems to be a more tolerable temporary management of anterior teeth loss in children which could easily be renewed during the developing dentition until the completion of definitive treatment.

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