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Case Report

Surgical and orthodontic treatment of an impacted permanent incisor: case report

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Abstract – This case report presented a combined surgical/orthodontic treatment of an impacted permanent incisor of a 10-year-old boy. Trauma to the primary dentition caused the impaction of the maxillary left permanent central incisor. Application of push coil spring between the adjacent teeth created space for the impacted tooth. A button with an extension of ligature wire was bonded to the maxillary left permanent central incisor to bring it into the arch. The maxillary left permanent central incisor was brought to its proper position after 16 months of active orthodontic treatment.

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Traumatic injuries are common in children with up to 30% of children sustaining injuries to their primary dentition and 22% to the permanent (1). As there is a close relationship between the primary teeth and permanent teeth germs, any injury during primary dentition can influence the eruption of the permanent teeth (2, 3).

Dilacerations with root deformations and changes in the axial inclination of the permanent incisor are uncommon and may cause impactions (4, 5). The treatment alternatives are extraction of the impacted tooth if the dilaceration is very severe, surgical exposure followed by extrusion or spontaneous eruption if the dilaceration is less severe (3, 4, 6, 7).

An impacted incisor often causes tilting of neighboring teeth followed by unfavorable tooth migrations (8). To avoid such migrations space maintenance becomes important during the eruption of the upper front teeth. If tilting has occurred, expansion with up-righting of the incisors with an orthodontic appliance becomes necessary. Space deficiency and midline deviations can complicate treatment (9).

Surgical exposure of impacted incisors or surgical repositioning have been used to bring impacted teeth into occlusion (10–12). Surgical repositioning is a rapid treatment alternative but has a possible risk of damaging the periodontal ligament causing ankylosis which is accompanied by infraposition of the tooth and tilting of the adjacent teeth (13, 14).

The following case report presents a combined surgical/orthodontic treatment of an unerupted maxillary permanent incisor caused by trauma in the primary dentition.

Case report

A 10-year-old boy was referred to the orthodontic clinic regarding treatment for anterior irregularity. The patient had Angle Class I malocclusion (Fig. 1) and a balanced face (Fig. 2). Examination of the oral cavity showed that the periodontium had been maintained in good health and the maxillary left permanent central incisor was clinically missing (Figs 3 and 4). The parents remembered a traumatic injury and stated that he had fallen from a swing when he was 5 years old.

The patient was in late mixed dentition. The molar and canine relationships were Angle Class I

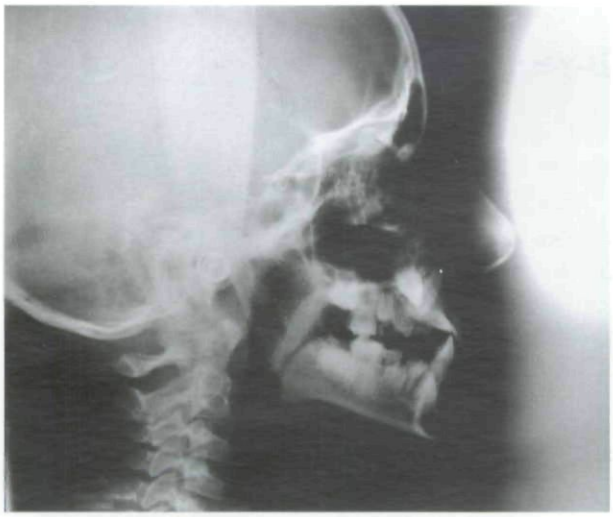

Fig. 1. Lateral cephalogram of the patient showing Angle Class I malocclusion.

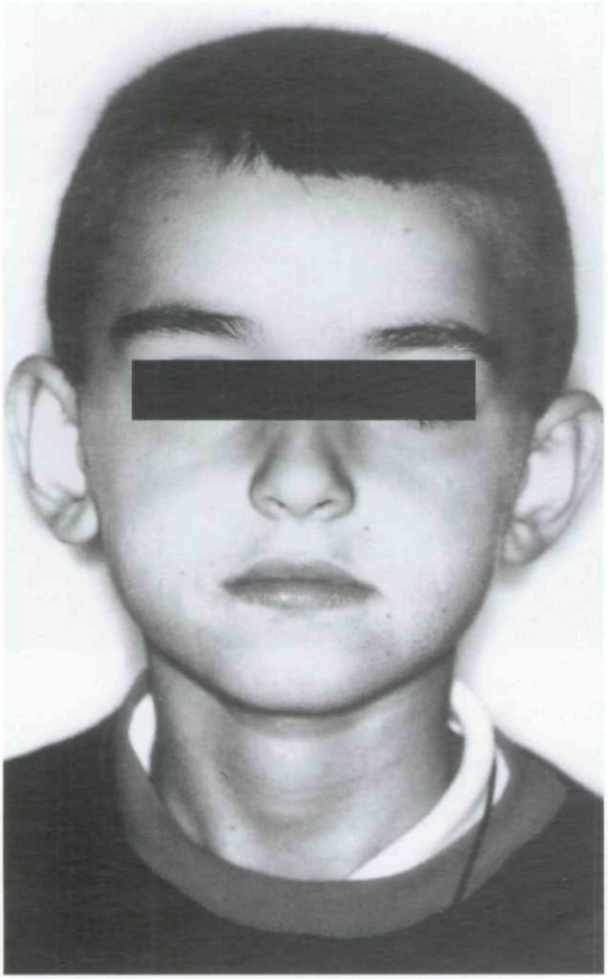

Fig. 2. Extraoral view of the patient.

(Figs 5 and 6). Radiographic examination showed that the maxillary left permanent central incisor was so impacted that it was nearly horizontal

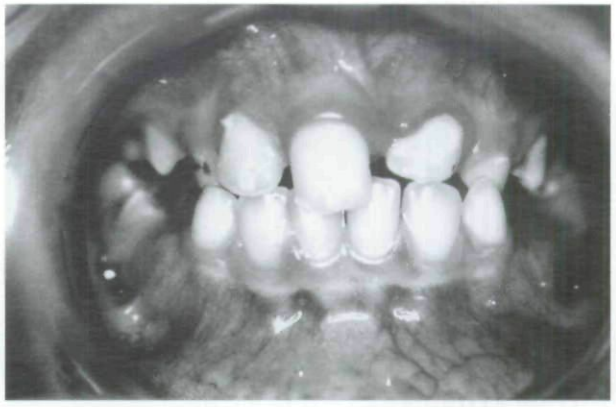

Fig. 3. Pretreatment photographs of the patient showing the mesially tilted maxillary right central incisor and left lateral incisor.

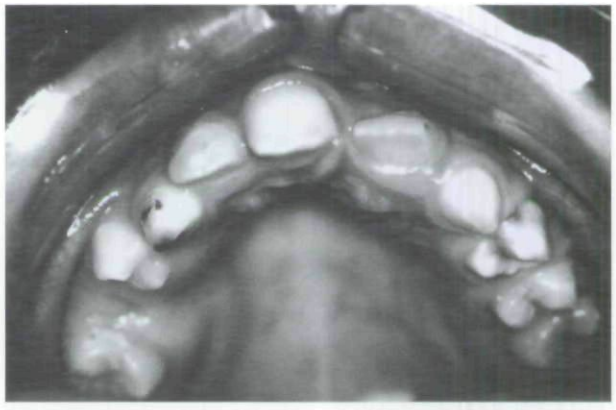

Fig. 4. Pretreatment photographs of the patient showing the clinically missing maxillary left central incisor in the occlusal view.

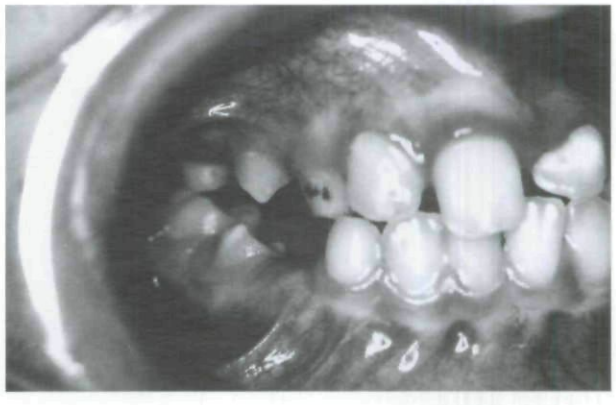

Fig. 5. Class I molar and canine relationships in the right segment.

(Figs 7–9). Clinical examination and the analysis of the diagnostic casts revealed that there was lack of space for the maxillary left permanent central incisor.

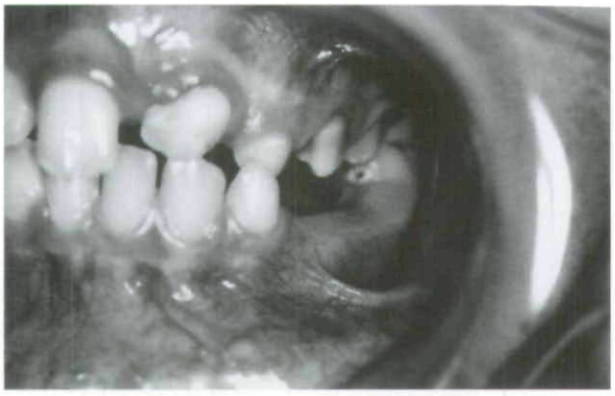

Fig. 6. Class I molar and canine relationships in the left segment.

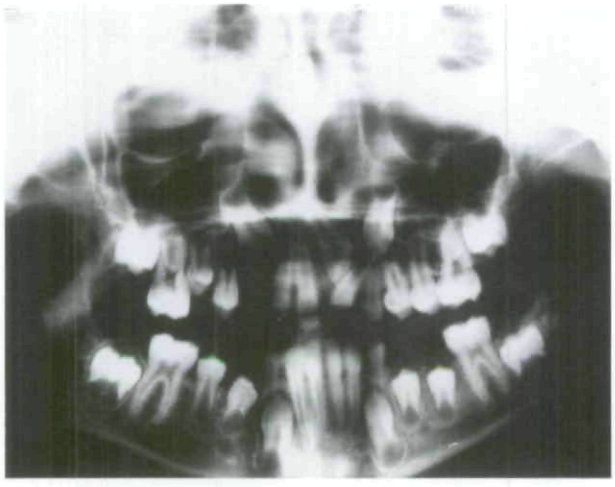

Fig. 7. Pretreatment panoramic radiograph of the patient.

Diagnostic summary

1 The skeletal pattern was Angle Class I.
2 The molar and canine relationships were Class I.
3 The permanent maxillary left central incisor was impacted.
4 There was lack of space for the permanent maxillary left central incisor.

Treatment objectives

1 Creation of space for the maxillary left central incisor.
2 Surgical exposure of the maxillary left central incisor.
3 Forced eruption of the maxillary left central incisor.
4 Achievement of balanced and functional occlusion.

Fig. 8. Periapical radiograph revealing the impacted maxillary left central incisor.

Fig. 9. Occlusal radiograph of the affected area.

Course of treatment

The first objective was the creation of space for the maxillary left central incisor. The maxillary molars were banded and the other maxillary permanent teeth were bonded with 0.018×0.25" metallic edgewise brackets (Roth 0.018"; Dentaurum, Pforzeheim, Germany). Push coil spring was applied between the maxillary right permanent central incisor and the maxillary left lateral incisor (Fig. 10). When the space was created for the maxillary left central incisor the surgical procedure was performed. A full-thickness mucoperiosteal flap

Fig. 10. Periapical radiograph showing the push coil spring.

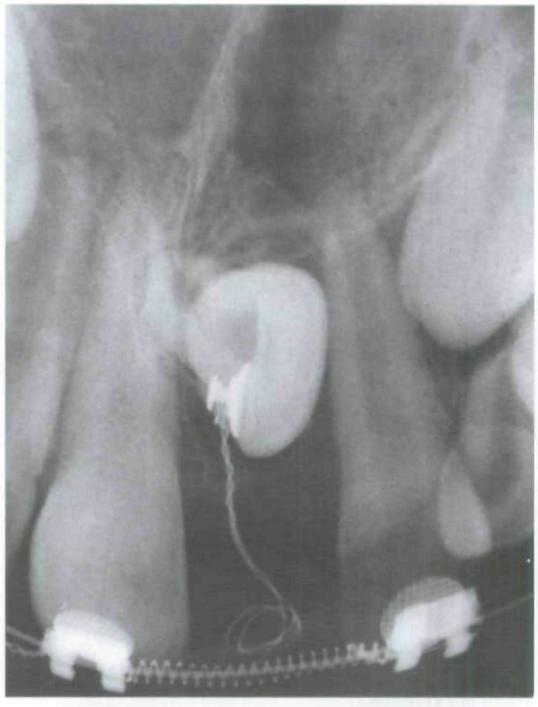

Fig. 11. Periapical radiograph showing the button and the ligature wire bonded to impacted tooth.

was made to gain access. A button with an extension of the ligature wire was bonded onto the lingual surface of the maxillary left central incisor. Then, the flap was replaced (Fig. 11). Orthodontic force was applied in order to erupt the tooth after tissue healing. It took 16 months to bring the maxillary left central incisor into the arch (Fig. 12). The total treatment time was 30 months. Maxillary and mandibular Hawley retainers were placed after debonding.

Treatment results

1 Enough space was created for the impacted maxillary left permanent central incisor.
2 The impacted maxillary left central incisor was erupted by orthodontic forces.
3 The patient gained a functional occlusion and esthetics at the end of the treatment (Figs 13 and 14).

Minimal amount of gingival recession was observed at the labial gingiva of orthodontically erupted tooth.

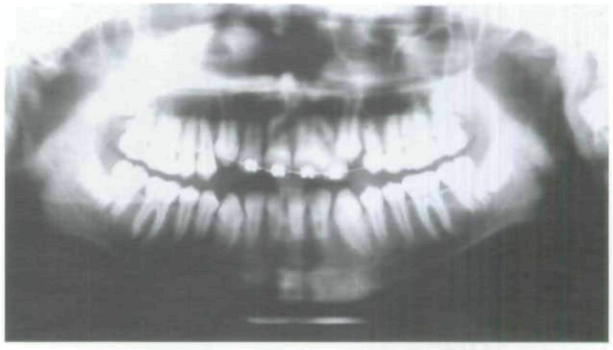

Fig. 12. Panoramic radiograph showing the force-erupted maxillary left central incisor.

Discussion

Early treatment of impacted teeth is recommended in order to prevent or even limit subsequent complications (9). In the present case, space deficiency and midline discrepancy occurred as a result of the migration of the adjacent teeth. Therefore, after creation of space for the unerupted tooth orthodontically, surgical exposure followed by orthodontic therapy was performed to bring the impacted maxillary left central incisor to proper alignment.

The combined surgical/orthodontic therapy requires a longer treatment period. Ankylosis, nonvital pulps and root resorptions may occur with this method (14). Gingival recession, delay in periodontal healing, gingivitis, bone loss and decrease in the width of keratinized gingiva are the periodontal complications of orthodontically erupted teeth (9, 15–18). These periodontal complications occur most commonly when an extensive amount of bone is removed or an open approach method is used to expose the impacted teeth, surgically. In the open

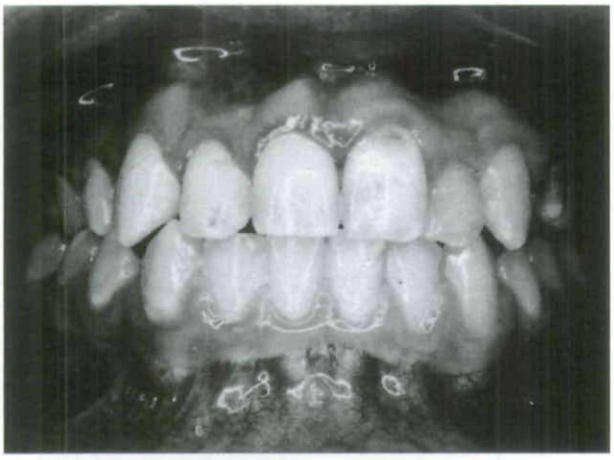

Fig. 13. Intraoral photograph of the patient taken at the end of the treatment.

Fig. 14. Final extraoral photograph of the patient.

approach method a space is created either by placing a periodontal pack or by means of an apically positioned flap. With his technique a crater-like soft tissue damage was reported to be created, which facilitates plaque accumulation (14). In the present case, the closed approach was preferred. Thus, a button with an extension ligature wire was placed on to the lingual surface of the unerupted tooth and the flap was replaced. In this method although plaque accumulation is less, removal of it is more difficult compared with the open approach method (14). In the present case, minimal amount of gingival recession, approximately 2 mm, was observed at the labial gingiva of orthodontically erupted tooth. However, gingivoplasty was not planned as gingival recession did not compromise esthetics. Periodontal probing of both the orthodontically erupted tooth and the adjacent teeth showed normal pocket depths (<3 mm) at the end of the orthodontic treatment.

The combined surgical and orthodontic therapy or surgical repositioning has been the method of choice for many clinicians (10–12, 19–22). When these treatments are impossible or undesirable or the impacted tooth had to be extracted, autotransplantation with premolars/supernumerary teeth or autoalloplastic tooth transplantation are the alternative methods (8, 23–25). In the autotransplantation method, anatomic shape and root development stage of the donor tooth, how it matches with the recipient site and possible surgical damages to the donor tooth at the time of removal must be taken into consideration (24). In the autoalloplastic tooth transplantation method, the root of the impacted tooth, except for the coronal 3 mm of the periodontal ligament, is removed. The remaining part of the root is reformed with a porcelain post cemented into the root canal. The root is then transplanted into the arch. Successful results were reported with this technique (25).

According to Betts and Camilleri (26), the most common cause of lack of eruption of maxillary incisors is the presence of supernumerary teeth – affecting 47% of 47 unerupted maxillary incisors, with one case reported as a result of trauma to the primary tooth. Trauma as an etiologic factor is generally determined with parental history or clinical evidence. Traumatic injuries may cause disturbances such as odontoma-like malformations and dilacerations, which are classified as other factors (3). However, the ratio of traumatic cases would probably be increased if trauma and subsequent traumatic changes are considered together.

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