

Reposition of intruded permanent incisor by a combination of surgical and orthodontic approach: a case report

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This report presents a case of a completely intrusive luxation of an immature permanent central incisor in a 7 years 9 months-old girl. Because there are severe intrusive trauma and cortical alveolar bone fracture, it was impossible to reposition with orthodontic or surgical method alone. The intruded tooth was repositioned to healthy alveolar bone level by using surgical extrusion and stabilization with sutures and periodontal pack. After healing of adjacent bone, the intruded maxillary central incisor erupted orthodontically by removable orthodontic appliance. It was moved from a high position to level of adjacent tooth in about 7 months. A radiograph was taken 6 months after ceasing forced eruption, which demonstrated minor root resorption, but the alveolar bone height had increased.

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INTRODUCTION

Traumatic intrusive luxation, an occurrence common in the primary dentition, but one that occurs in only 3% of all mechanical injuries to the permanent dentition, is usually accompanied by

fracture of the alveolar process and soft tissue laceration, and has a poor prognosis.^{1,4} Common sequelae to the traumatic intrusion are ankylosis (replacement resorption), external root resorption, pulpal necrosis, inflammatory resorption.^{1,5}

Historically, suggested treatment methods of intruded teeth have been spontaneous re-eruption, immediate surgical repositioning and fixation, orthodontic repositioning, and a combination surgical and orthodontic therapy.⁵

Andreasen^{3,4} and Hollan⁶ reported that spontaneous re-eruption was common in the primary dentition and the spontaneous re-eruption of permanent teeth occurred mostly in immature teeth and rarely in teeth with closed apices.

Skieller⁷ advocated immediate surgical repositioning, but Andreasen⁴ recommended immediate orthodontic traction, because immediate surgical repositioning may increase the possibility of root resorption and ankylosis. Taintor⁸, however, suggested leaving the tooth alone to allow for spontaneous re-eruption. If that failed, eruptive orthodontic force would then be applied.

Turley⁹ reported that immediate orthodontic traction should be applied in addition to surgical luxation in cases of severe intrusion because the tooth cannot erupt spontaneously and may become histologically ankylosed 5-6 days after intrusion.

In cases of complete intrusive luxation, it would be not feasible to bond an orthodontic button or bracket on the tooth directly and if there is cortical alveolar bone fracture, it was impossible to reposition with orthodontic or surgical method alone.

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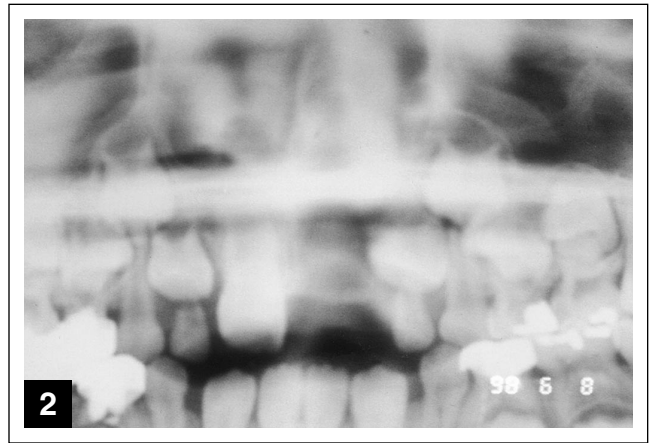
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Figures 1 to 3. Intraoral photo and radiographic image at examination one week after trauma.

CASE REPORT

A girl aged 7 years and 9 months was transferred to Seoul National Hospital Pediatric Dentistry Department. She had fallen down in the bathroom at home and injured herself 1 week previously. The initial impression at the local clinic was probable avulsion of left maxillary central incisor, lower lip laceration, upper labial and palatal laceration. However, clinical and radiographic examination revealed that left maxillary central incisor was intrusively luxated with cortical bone fracture (Figures 1 to 3). There seems to be intruded incisor in the floor of the nasal cavity in radiograph (Figures 2, 3) but it was not observed clinically. There were no specific findings in physical and neurological assessment.

Because there were severe intrusion and cortical plate fracture, it was impossible to reposition with

orthodontic or surgical method alone. It was decided to reposition the intruded left maxillary central incisor by combination of surgical and orthodontic methods.

The full flap was raised and the left maxillary central incisor was repositioned surgically to the healthy alveolar bone level (Figures 4 to 5), a button was bonded on it and the tooth splinted (Figure 6). After suturing, periodontal dressing was applied and a radiograph was taken (Figure 7). After 1 month, extrusive force was applied to the incisor using an elastic and a removable orthodontic appliance with palatal hook (Figure 8). The force to extrude the incisor did not exceed 20g.

Seven months later, the left maxillary incisor was positioned to level of adjacent tooth (Figures 9, 10). The application of extrusive force was stopped and



Figures 4 to 7. The full flap was raised and left maxillary central incisor was repositioned surgically, a button was bonded on it and the tooth splinted.

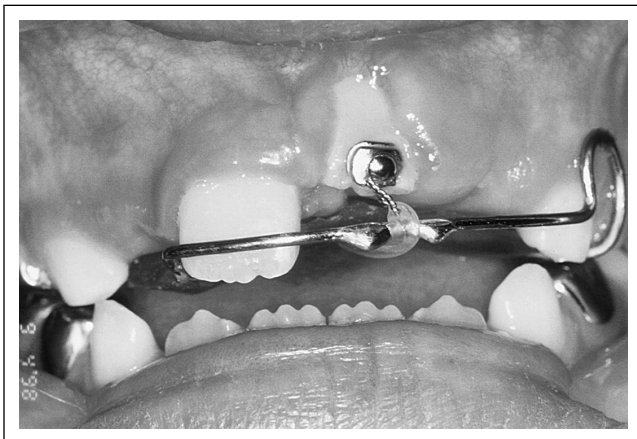
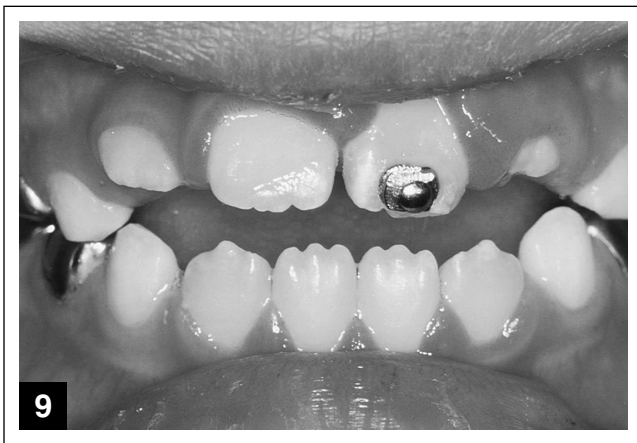


Figure 8. A removable orthodontic appliance was placed for the forced eruption of left maxillary central incisor.

the bonded button was removed. A radiograph was taken 6 months after ceasing forced eruption, which demonstrated that the alveolar bone height had increased in the mesial area. However, there was minor root resorption and arrested root formation of the left maxillary central incisor (Figure 11). Endodontic treatment was postponed, as there were no discernable signs of pulpal inflammation or necrosis.



Figures 9, 10. Forced erupted left maxillary incisor to original position.



Figure 11. Six months later, radiography showed some root resorption and infra-occlusion.

DISCUSSION

Andreasen¹⁴ and Saad¹⁵ reported that it would not be desirable to reposition surgically since ‘extensive marginal bone loss’ would occur. In Andreasen’s research, a replantation study using mature teeth of monkeys, splinting did not improve periodontal healing, but actually did the periodontal healing harm, i.e. ankylosis. Minoru¹⁶ reported that, in 13 patients from 9 to 17 years of age, who had impacted teeth, satisfactory results were obtained by applying orthodontic traction 2 to 5 months after repositioning the teeth still deep in the socket, without exposing the cemento-enamel junction. In particular, he claimed that satisfactory adjustment of supporting bony loss was observed following orthodontic treatment. Andreasen^{17,18} reported that periodontal membrane in the cervical area is regenerated mainly through supracrestal connective tissue, and this may have something to do with the adjustment mentioned above.

In the present case, the reason for combination of surgical and orthodontic repositioning the tooth at the original site was that there is not enough surrounding alveolar bone. The intruded tooth was repositioned to healthy alveolar bone level by using surgical extrusion and stabilization. After healing of adjacent bone, the intruded maxillary central incisor erupted orthodontically by removable orthodontic appliance.

There was worry that the tooth might become ankylosed in spite of having been surgically repositioned before orthodontic treatment. Andreasen¹⁹ classified ankylosis into two types, temporary replacement resorption and permanent replacement resorption. Minoru¹⁶ reported that, in these cases, it would be mainly temporary resorption that occurred at the histological level, and successful repositioning would possible when started 2 to 7 months after the surgical procedure.

In this case, orthodontic force was not applied immediately after surgical repositioning. The trauma of surgical repositioning causes total pulpal damage, which could be healed by various pulpo-dental reactions.^{20,21} Skoglund²² reported that after repositioning, initial revascularization started on the 4th day, extending into half the entire pulp cavity on the 10th day. By the 30th day, revascularization had extended into the entire pulp cavity.

Breivik²³ reported that reparative dentin could be observed in the apical third in as early as 2 weeks, suggesting it might be possible for the odontoblasts to survive after repositioning. According to Schatz,²⁰ pulpal healing could decide the prognosis of endodontic treatment as well as pulpal healing. That is, help by coagulum existing after repositioning, reorganization by young connective tissue and reattachment of cemento-enamel junction would be possible in 1 week and healing would be completed in 2 weeks.

The purpose of dis-impaction in this case was to decrease the chance of ankylosis and to minimize pressure necrosis of the periodontal ligament.²⁴ Biederman⁹ stated that the object of luxation was to break the bony bridge of ankylosis without injury to nutrient vessels at the apex.

With regards to endodontic treatment, Kristerson and Andreasen^{19,25} reported that surface root resorption could be stopped only if the tooth received endodontic treatment before pulpal necrosis. Minoru¹⁶ reported that root resorption could be arrested and asserted that it is not necessary to perform a preventive endodontic treatment in every case.

In the present case, endodontic treatment was postponed, as there were no discernable signs of pulpal inflammation or necrosis and it has been expected root growth. Further follow-up is needed to check root resorption and inflammation. Besides, if root resorption and extraction occur in the future, it was worth retaining the tooth as a space maintainer in this growing child.

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