

Decoronation as a Treatment Option for Replacement Root Resorption Following Severe Intrusive Trauma: A Case Report

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Abstract

This article reports a clinical case of a 13-year-old girl, who was referred with chief complaint of a non-esthetic maxillary central incisors position. Five years ago, her maxillary right and left central incisors and left lateral incisor intruded into the maxilla. The intruded teeth were splinted for a month. After splint removal, the patient lost follow up. The aim of this work is to report the successful conservative management of severe intrusion in developing dentition.

Review

Traumatic dental injuries to the young people are a significant problem. Approximately 50% of children are exposed to dental trauma before reaching school-leaving age [1]. The most common injuries to permanent teeth occur secondary to falls, followed by traffic accidents, violence, and sports. The permanent incisors were the most commonly injured teeth [2].

Replacement root resorption is a common complication of a severe dental trauma. It has been reported that intrusion and avulsion injuries carry a high-risk of replacement root resorption and ankylosis due to irreversible damage to the periodontal ligament [3]. Replacement root resorption is characterized by direct connection between alveolar bone and tooth, resulting in dental ankylosis. The resorption occurs due to the absence of vital periodontal ligament and bone remodeling during which osteoclastic activity causes tooth resorption while osteoblastic activity creates a new bone in the resorbed area. The root is continuously resorbed and replaced by bone. When the damage to the periodontal ligament is limited, this process may be reversible, and the root surface may repopulate with new periodontal ligament cells. However, when the damage is extensive, the replacement resorption cannot be transient and progresses until the root substance is totally remodeled to bone. The tooth presents no symptoms, without physiologic or pathologic mobility and metallic sound in response to percussion. An infra-position of the damaged tooth will develop. Replacement resorption is greatly related to age. There is a high risk of infraocclusion when ankylosis is diagnosed before 10 years of age or prior to the peak of growth [4]. When replacement resorption occurred, the normal alveolar development will be disrupted and prosthetic treatment will be compromised.

Decoronation is a surgical method for treating an ankylosed tooth that the alveolar ridge is preserved. The crown is removed, leaving the root to be resorbed and covered with a mucoperiosteal flap [5]. The alveolar ridge was maintained and the bone level increased after decoronation in patients treated before or during pubertal growth periods. In addition, vertical bone apposition is frequently observed on top of the decoronated root [6]. The normal alveolar condition is important for successful prosthetic treatment later.

When the immature teeth with incomplete root formation suffer pulp necrosis secondary to traumatic injuries, the apical closure cannot be developed. That is difficult to root canal treatment because of the thin dentine walls, the size of the canal and the open apex. Therefore one of the aims of root canal treatment is to form an apical barrier against which root canal filling material avoiding overextrusion, a technique known as apexification. Apexification is defined as a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp [7]. Calcium hydroxide is currently the most widely accepted material for this purpose [8]. This technique is associated with the long period required for treatment, which the patient's absolute cooperation. In addition, during the apexification phase, due to the thin walls of the root, the tooth is susceptible to fracture [9].

Biodentine® (Septodont, France), a root end filling, consists mainly of a tri- and dicalcium silicate powder, which is mixed with an aqueous calcium chloride solution and hydrosoluble polymer. The company claims that it is biocompatibility, short setting times, high mechanical properties, long-term impermeability, antibacterial properties, induction of hard tissue regeneration, stability, low solubility, non-absorbability and ease of handling [10,11].

Case Report

A healthy 13-year-old girl was referred to Department of Restorative Dentistry, Faculty of Dentistry, Khon Kaen University with chief complaint of a non-esthetic maxillary central incisors position and root canal treatment on left lateral incisor. Five years ago, she fell from the roundabout and the maxillary right and left central incisors and left lateral incisor intruded into the maxilla. The intruded teeth were splinted for a month. After splint removal, the patient lost follow up.

First visit

The clinical examination of the patient revealed an infra-occlusion of right and left central incisors about a half of the crown height of the neighbouring teeth and open bite (*Figure 1*). The teeth was clinically asymptomatic, no response to electrical pulp test and no sensitivity to percussion or tenderness to palpation. A metallic sound was noted during percussion. The

adjacent teeth were asymptomatic and responded normally to electrical pulp test except the left lateral incisor was non-vital. Radiographic examination demonstrated disappearance of the periodontal ligament space and severe replacement root resorption at the cervical area on mesial of right central incisor and distal of left central incisor. The left lateral incisor showed apically diverging walls with apical radiolucency size 10×10 mm. and radiopaque material size 1×2 mm. The pulp chamber and half of a root canal length was obstructed by radiopaque material (*Figure 2*).



Figure 1. *Infra-occlusion of right and left central incisors at the initial examination, five years after trauma.*



Figure 2. *Periapical radiograph demonstrated disappearance of the periodontal ligament space and cervical replacement resorption on mesial of right central incisor and distal of left central incisor. The right lateral incisor showed apically diverging canal walls with apical radiolucency size 10×10 mm. and radiopaque material size 1×2 mm. The pulp chamber and half of a canal length was obstructed by radiopaque material.*

Diagnosis: Right and left central incisors: Pulp necrosis with asymptomatic apical periodontitis with replacement root resorption due to intrusive luxation.

Left lateral incisor: Previously initiated therapy with asymptomatic apical periodontitis with incomplete root formation due to intrusive luxation.

The temporary filling of left lateral incisor was removed under rubber dam isolation. The root canal was irrigated with 2.5% sodium hypochlorite. The working length was determined at 17 mm (*Figure 3*) and the canal was instrumented to an apical size 80 K-flex files. The root canal was medicated with calcium hydroxide mixed with normal saline and the access cavity sealed with Cavit® and IRM®.

Second visit

The treatment plan was discussed with the patient's parents, it included decoronation of right and left central incisors in the reasons of the patient's jaw growth was not yet completed, implants were planned in the future, and the malpositioned teeth were not esthetically acceptable. The treatment followed by prosthetic treatment with an immediate acrylic partial denture to restore the esthetics until completion of the patient's developmental growth in an attempt to place implants supported porcelain crowns. Apexification with Biodentine® was chosen for treatment of left lateral incisor in the reasons of incomplete root formation.

The left lateral incisor was isolated with rubber dam. The root canal was wet, canal was re-instrumented to an apical size 80 K-flex, irrigated with 2.5% sodium hypochlorite and

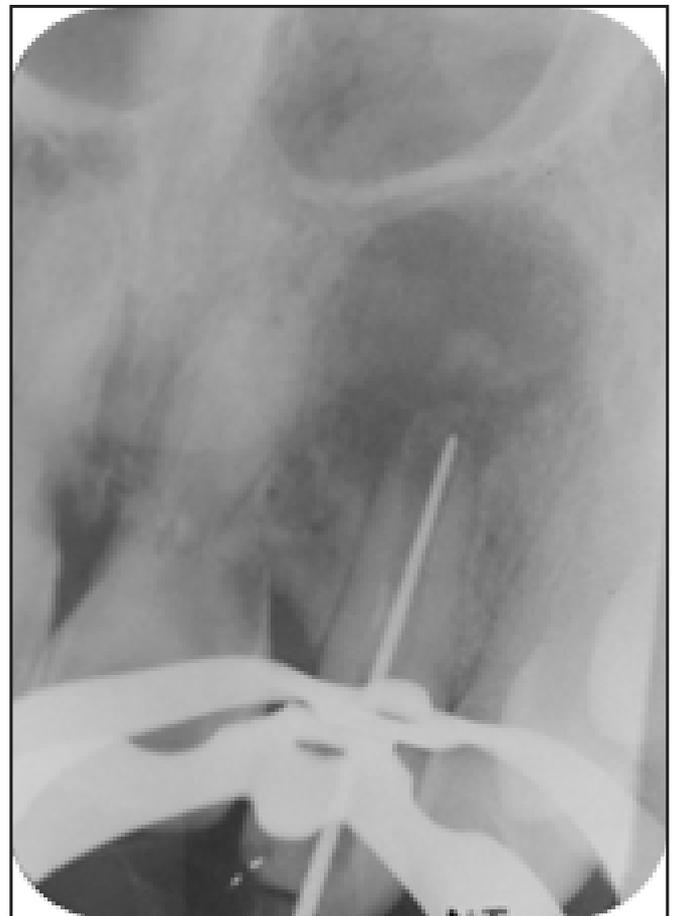


Figure 3. *Periapical radiograph of the working length determination of right lateral incisor.*

a calcium hydroxide dressing placed. The access cavity was sealed using Cavit® and IRM®.

Third visit

The left lateral incisor was isolated with rubber dam. The root canal was still wet, re-irrigated with 2.5% sodium hypochlorite without instrumentation and a calcium hydroxide dressing placed. The access cavity was sealed using Cavit® and IRM®.

Fourth visit

The surgical procedure was performed after obtaining parental consent. The patient was given 400 mg ibuprofen and 500 mg amoxicillin 1 h prior to treatment. Under local anesthesia, an intrasulcular incision from left lateral incisor to right lateral incisor and a vertical incision at distal of left lateral incisor to right lateral incisor were performed. A full-thickness buccal mucoperiosteal flap was elevated, the crown of both right and left central incisors were removed about 1 mm. under the buccal alveolar bone crest. The root canals of left and right central incisors were instrumented with a size 20 K-file beyond the apex to create bleeding (Figure 4). Primary closure was done using 4-0 silk sutures. The immediate acrylic partial denture was adjusted and inserted (Figure 5). The patient was given ibuprofen 400 mg tid, amoxicillin 500 mg tid and chlorhexidine mouthwash for 5 days.

Fifth visit

The patient was followed up 1 week for stitches off and denture adjustment. The surgical wound was normal healing with mild inflammation (Figure 6).

Sixth visit

One month follow up, the wound was complete healing. Patient has no symptom. The left lateral incisor was re-entered under rubber dam. The root canal was dry and an apical barrier was felt using a size 25 K-file. Biodentine® was prepared under manufacturer's instructions. The root canal apex was obturated with Biodentine® using a mesingun to the thickness of 4 mm. under microscope. Radiographically, check the extension and quality of fill and wait for 15 minutes for the setting of the material. The remained root canal was obturated with gutta-percha and resin-based root canal sealer (AH plus®) using lateral compaction technique. The coronal cavity was sealed with Cavit® and IRM® (Figure 7).

Seventh visit

Three months follow up, the patient was asymptomatic and the wound was normal edentulous area (Figure 8). Radiographically, check the healing of bone and root surface. The decoronated roots showed further replacement resorption at the cervical area of right and left central incisors (Figure 9).



Figure 4. Clinical photograph of the decoronation procedure.



Figure 5. An immediate acrylic partial denture was immediately inserted.



Figure 6. One week follow up for stitches off and denture adjustment.

The access cavity of the left lateral incisor was lined with glass ionomer cement (Vitrebond®) and filled with resin composite (Z350XT® shade A2) (Figure 10). The patient was scheduled for follow up 6 months and every year until completion of the growth.

Discussion

The management of the traumatized teeth requires an interdisciplinary approach to maximize the treatment options. Ankylosis and replacement root resorption are following tooth injuries in the growing child lead to loss of the affected teeth and interfere the localized jaw development. The most accepted treatment option of ankylosed teeth has been surgical removal. But, removal of ankylosed teeth may lead to esthetic bony ridge deformities and might interfere with optimal prosthetic treatment. The decoronation procedure is a reliable

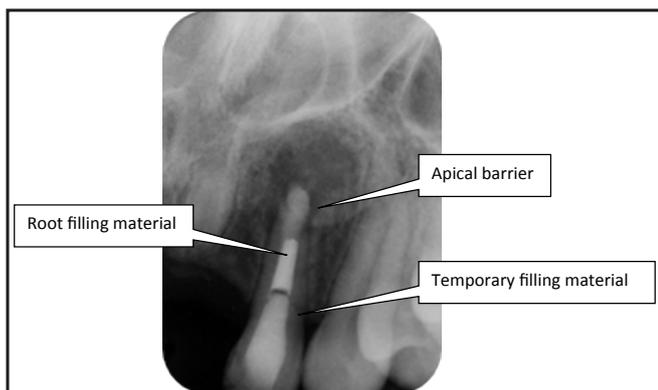


Figure 7. Periapical radiograph of left lateral incisor.



Figure 8. Clinical photograph of the follow up appointment in 3 months.



Figure 9. Periapical radiograph of the follow up appointment in 3 months. The decoronated roots showed further replacement resorption at the cervical area of both right and left central incisors.

technique in terms of preservation of the width and height of the alveolar process [12]. The procedure is a simple and



Figure 10. Periapical radiograph of the follow up appointment in 3 months. The apex of left lateral incisor revealed the bone trabeculae in the radiolucency area.

less traumatic technique compared to the surgical removal. In addition, coronal bone apposition is noted in many cases, thereby enhancing the bone volume of a future implant site [6].

In this case, the decoronation surgery was performed under antibiotic medication because this procedure was long. This is an important factor, as the longer procedure takes the greater possibility of contamination therefore infection. A double-blind placebo-controlled randomized clinical trial study of efficacy of antibiotic in preventing infectious and inflammatory complications following minor oral surgery such as impacted mandibular third molar extraction showed that antibiotic postoperative medication is efficacious in reducing the incidence of infectious and inflammatory complications [13,14].

The goal of endodontic treatment in immature teeth is to form an apical barrier and place a biocompatible seal in the form of root end filling. Biodentine® was chosen because the setting is faster and it requires only one visit for root canal obturation [10]. It is recommended to apply Biodentine® under microscope, to ensure that the materials are placed in the apical of root canal. Cold lateral compaction was used as an obturation technique because of its advantage of controlled placement of gutta-percha in the root canal and low cost. A meta-analysis study of outcome of root canal obturation by warm vertical versus cold lateral condensation demonstrated that postoperative pain prevalence, long-term outcomes and obturation quality were similar between the two techniques. But, warm vertical condensation showed a higher rate of overextension than lateral condensation [15].

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