Management of traumatic intrusion of permanent teeth with immediate surgical repositioning: A case report from Hasan Sadikin Hospital, Bandung-Indonesia

Labitta K, Sjamsudin E, Sylvyana M

ABSTRACT

Introduction: Traumatic dental injuries (TDI) of permanent teeth frequently occur in children and young adults. Intrusive luxation is one of the most severe forms of traumatic injuries in which the affected tooth is forced to displace deeper into the alveolus. As a consequence of this type of injury, maximum damage occurs to the pulp and all the supporting structures. The aim of this study is for proper diagnosis, treatment planning and follow up for improving a favorable outcome. Case: A 14 years old male patient came to the emergency department of Hospital Dr. Hasan Sadikin with bleeding from mouth due to an accident. Through clinical and radiographic examination discovered there was an intrusion of teeth 11,21. The intruded teeth were immediately repositioned and splinted within hours following injury with Arch Bar. Antibiotic therapy was initiated at the time of repositioning and maintained for five days. The splint was removed one month later. Clinical and radiographic examination one month after the surgical extrusion revealed satisfactory progressive apical and periodontal healing. Intrusion injuries have the poorest prognosis and complex treatment among all tooth injuries. No consensus has been reached on the optimal treatment of this type of injuries. The recommended treatment options for intruded teeth include the following such as allowing spontaneous re-eruption of the teeth, immediate surgical repositioning, and fixation and orthodontic repositioning. The treatment has to be adaptable according to complications. Conclusion: Further surgical repositioning in the presented case with one month follow up proved to be a viable treatment method for intruded teeth without any additional risk of resorption.

Keywords: Dentoalveolar fracture, intrusive luxation, splint, surgical extrusion.


INTRODUCTION

Dental trauma can result in some injuries involving the tooth and the supporting structures. Six types of luxation and seven types of tooth fracture have been described and are used to classify traumatic dental injuries.1 Intrusive luxation is one of the most severe types of traumatic dental injuries and is defined as a dislocation of the tooth in an apical direction into the socket.2-4 Intrusion rarely occurs in the permanent dentition when compared with other types of luxation injuries. It comprises 0.5–1.9% of all traumatic injuries in the permanent dentition and 5%–12% of dental luxations.2-4

Intrusion is a type of trauma that involves axial displacement of a tooth toward the alveolar bone. More properly named intrusive luxation, it usually affects the anterior teeth and is often associated with an impacted fracture of the alveolar bone.1 During intrusive luxation, serious damage to the pulp and supporting structures occurs because of the dislocation of the tooth into the alveolar process. As a consequence, pulp necrosis, radicular inflammatory resorption, replacement root resorption, loss of marginal bone support and gingival retraction may occur.5

Currently, consensus about the best approach to bring intruded teeth back to their normal position is lacking. Depending on the severity of the injury, treatment strategies include waiting for spontaneous re-eruption, surgical repositioning or repositioning with traction. Waiting for spontaneous re-eruption is especially indicated for immature permanent teeth with mild intrusion (less than 3 mm), because of their high potential for eruption and pulpal and periodontal repair.1,6 In cases of moderate intrusion (3–6 mm) with incomplete apex, teeth may re-erupt, or these teeth may be orthodontically repositioned. Finally, in severely intruded teeth (greater than 6 mm), often the soft tissue is severely displaced and the crown may be completely buried, making orthodontic repositioning difficult or impossible. Consideration should be given to surgically repositioning the tooth, regardless of the stage of root development.6

This paper describes a case report of Traumatic Intrusion of Permanent Teeth at 14 years old male patient with Immediate Surgical Repositioning.
CASE REPORT

A 14-year old male patient reported with an intruded both of maxillary central incisors, about 3.5 hours before admission when the patient was taking the stairs at his house at Padalarang area suddenly he slipped and fell with mechanism his mouth hit the floor first. The patient went to Private Hospital at Padalarang area, where the wound was cleaned and performed jaw X-ray, then referred to Hasan Sadikin Emergency Department. Her medical history was noncontributory.

Intraoral examination revealed lacerated wound at gingival of maxillary central incisors and bleeding from gingival sulcus of the incisors. There was 8.0–10.0 mm intrusion of the both of maxillary central incisors and half-crown fracture of left maxillary permanent central incisor (Figure 1). There was an additional injury to alveolar bone, teeth and surrounding soft tissues with minor lacerations on gingival of maxillary central incisors.

The radiographic examination showed intrusion of the maxillary right permanent lateral incisor and complete root formation, and the incisal edge of the intruded tooth was located at the cervical of the adjacent teeth. The root of the maxillary left central incisor was also displaced distally (Figure 2).

Because of the severity of intrusion and completed root development, immediate surgical repositioning of intruded incisors was planned. Before the surgical operation, the patient was given oral amoxicillin 500 mg and ibuprofen 400 mg. Local anesthesis was administered, the intruded tooth was initially luxated. An artery forceps was used for this purpose. The tooth was brought into a position by applying careful and very gentle force incisally. The teeth were repositioned to a level such that the cementoenamel junction (CEJ) was in plane with the free gingival margin. After bringing the central incisors into their respective positions, these teeth were splinted using Erich’s arch bar technique [Figure 3]. The arch bar was used in the upper teeth because of the associated alveolar fractures and extreme mobility of the teeth involved in intrusion and mobility of both the incisors as well.

Splinting was done with arch bar splint from the second premolar to the second premolar at a new restored level for three weeks. The splinted tooth was kept out of occlusion. Tetanus injection was administered at the same appointment. Antibiotic was prescribed (amoxicillin 500 mg, three times daily) for five days. Analgesics (ibuprofen 400 mg, three times daily) and mouth rinse (0.2% chlorhexidine gluconate solution) were also recommended. He was instructed not to bite with her anterior teeth and was encouraged to maintain good oral hygiene. His follow up visits were also scheduled.

After nine days recall visit the patient came to the Oral and maxillofacial polyclinic, the swelling had subsided, and new restored level of lateral incisor was confirmed. The patient also brought the newest panoramic X-Ray for evaluation. From radiographic examination showed that there were no signs to indicate resorption or infection (Figure 4).

As the teeth can be in a state of shock initially after trauma, pulp sensitivity was evaluated only after 15 days on maxillary anterior. Maxillary central incisor was found to be negative to the test.
Hence a diagnosis of non-vital pulp was made, and endodontic intervention was suggested. Splints were removed after four weeks. Both of maxillary central incisors were stable. Soft tissue injuries had healed. Teeth were stable, and the patient was completely asymptomatic one month postoperatively.

**DISCUSSION**

Intrusive luxation is one of the most severe types of traumatic dental injuries. Intrusion is considered to have the poorest prognosis of all dental traumas because it significantly damages the periodontal ligament (PDL), the pulp, or the alveolar bone.

In the management of intrusive luxation, extra- and intra-oral lacerations and wounds should be cleaned and sutured as appropriate. Systemic antibiotic treatment and tetanus boosting may be required if external contamination has occurred. The severity of intrusion and treatment method used for an intruded permanent tooth, have been reported as important predictors of pulp necrosis and subsequent tooth survival. The strategy of treatment depends on the stage of root development, the severity of intrusion, presence of alveolar fracture, single or multiple tooth/teeth intrusions, and must be focused on the elimination of post-injury complications. The possible treatment modalities could be: passive repositioning (PR), to allow the tooth to re-erupt. For a long time, it has been known that intruded primary teeth usually re-erupt spontaneously; this may also take place in cases of permanent intruded teeth, especially in instances with immature root formation. Thus, conservative management should always be tried as one of the treatment options.

Active repositioning of the tooth including immediate surgical repositioning (SR) or orthodontic repositioning using removable or fixed appliances (OR). The main advantage of surgically repositioning approach is that it will remove the bacteria contaminated crown surface from its position in the socket, the periradicular compression areas are released thereby osteoclast activity around the tooth may be reduced.

The repositioning of the tooth using an orthodontic appliance eliminates the trauma elicited by surgical repositioning. The term spontaneous eruption gives a false optimistic impression, as tooth movement after injury is unpredictable and pathological rather than developmental. Another imprecise term is orthodontic repositioning as the traction forces used to move intruded incisors exceed those of conventional orthodontic treatment and completely intruded teeth do not have
a functional PDL, a prerequisite for orthodontic movement. Current management strategies include surgical reduction (immediate repositioning), repositioning with traction (active repositioning) and waiting for the tooth to return to its pre-injury position (passive repositioning).14 Recently immediate surgical repositioning has been documented as the treatment of choice for completely intruded teeth.15,16

The International Association of Dental Traumatology (IADT) has developed a consensus statement regarding treatment of intruded teeth after a review of the dental literature and group discussions.20 The IADT recommendations regarding treatment of intruded teeth are as follows: Teeth with incomplete root formation must allow eruption without intervention, if no movement of the intruded tooth occurs within a few weeks, initiate orthodontic repositioning, if the tooth is intruded more than 7 mm, reposition surgically or orthodontically.

Teeth with complete root formation must allow eruption without intervention if tooth intruded less than 3 mm. If no movement is evident within 2 to 4 weeks, reposition surgically or orthodontically to prevent ankyloses, if the tooth is intruded beyond 7 mm—reposition it surgically.

The pulp will generally become necrotic in teeth with complete root formation. Root canal therapy using a temporary filling with calcium hydroxide is recommended, and treatment should begin 2 to 3 weeks after surgery.10

Humphrey et al. (2003) proposed that treatment methods cannot be reliable predictors of clinical outcomes as the injury-related variables, the degree of intrusion and stage of apical development affect outcomes sufficiently to confound predictions.15 Andreasen et al. (2007) in a prospective study of 140 permanent intruded teeth concluded that in patients with intruded teeth with incomplete root formation, spontaneous eruption should be expected. In patients with complete root formation and with an age of 12 to 17 spontaneous eruption can still occur, but must be monitored very carefully. In older patients (i.e., ≥17 years) with complete root formation, either surgical or orthodontic extrusion should be attempted as the latter appeared to lead to a slight reduction in the risk of complications, however, the extent and direction of the intrusion may favor surgical repositioning.11,20

There is often severe soft tissue displacement, and the crown may be completely buried. Hence, consideration should be given to surgical reconstruction (SR) of the tooth. Severely intruded teeth with complete apex need to be repositioned surgically, and appropriate tissue repair should be carried out as was done in this case. The difficulty in orthodontic repositioning of severely intruded teeth is the reason of suggestion for SR.18

Intruded teeth that are surgically repositioned require appropriate splinting. A nonrigid (flexible) splint should be used to stabilize the traumatized teeth while allowing physiological tooth movement. The choice of splint depends on the facilities available and clinical situation (e.g., patient in mixed dentition stage, multiple tooth injuries). The splinted tooth should be out of traumatic occlusion. In all cases, the tooth should be reviewed within one week of the accident to assess the healing process. Although Andreasen et al. recommend a splinting period of 6–8 weeks following SR, a shorter period of 10 days also has been shown to permit sufficient reduction in mobility to allow function.19

Teeth with incomplete root development should be monitored closely with root canal treatment being indicated only following diagnosis of pulp necrosis.16 In teeth with complete root development given the very high risk of loss of pulpal vitality, root canal treatment is often indicated in cases of moderate to severe intrusion. There is also a high risk of root resorption in these teeth. The recommended time to start root canal treatment is approximately two weeks after the injury. In cases of severe intrusion, this early endodontic therapy is facilitated by rapid surgical repositioning. In the presence of inflammatory root resorption, the canal should be dressed with nonsetting calcium hydroxide paste with appropriate replacement until root resorption is controlled before obturation.21

Intrusive luxation in permanent teeth has been associated with favorable and unfavorable outcomes. Favorable outcomes include tooth in place, erupting, intact lamina dura, no signs of resorption and continuing root development in immature teeth. Also, severe complications may be seen especially pulp necrosis, external root resorption, and mar of the range of clinical outcomes associated with intrusive luxation.20 Some preinjury and injury factors have significant influence on the healing outcome. The most prominent factor considered is the stage of root development as less risk of complications are associated with immature root formation possibly because of softer bone surrounding teeth with immature root development, which may allow intrusion with less trauma to the periodontal ligament. Also, the extent of intrusion has been found to have strong influence as more complications have been associated with intrusion more than 7 mm.2,11

Treatment of the complications of luxation injuries is often complex, time-consuming, expensive, and unpredictable. These late healing complications
highlight the need for regular long-term follow-up to aid in their detection and treatment in all cases of luxation.

CONCLUSION
This clinical case report served to demonstrate that careful and continual assessment was necessary to follow the progress and determine the prognosis for a favorable healing outcome of traumatically luxated intrusion permanent maxillary incisors. The treatment has to be adaptable according to complications. Further surgical repositioning in the presented case with one month follows up proved to be a viable treatment method for intruded teeth without any additional risk of resorption. The occurrence of such complications seems to be related to the degree of severity of the original injury. Further interpretation of results requires continued long-term follow up of the case.

REFERENCES
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