Case Report

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Dentistry Section

Surgical Repositioning and Adjunctive Injectable Platelet-rich Fibrin for Severe Intrusive Luxation of Permanent Maxillary Incisors: A One-year Follow-up Case Report

V JEEVITHA[1], S MANOJ[2], POOJA PRABHU[3], R VAISHNAVI[4], CHERRY BIYANI[5]

ABSTRACT

Intrusive Luxation (IL) is one of the most severe forms of traumatic dental injuries, causing extensive damage to the Periodontal Ligament (PDL), pulp, and supporting alveolar bone. Management of severe intrusion in mature permanent teeth remains challenging because of complications such as pulp necrosis, inflammatory root resorption, replacement resorption, and ankylosis. Injectable Platelet-Rich Fibrin (I-PRF), an autologous platelet concentrate, has gained attention because of its regenerative potential and ability to promote soft and hard-tissue healing. The present case report describes the multidisciplinary management of severe traumatic intrusion of the maxillary incisors in a 36-year-old male patient following an accidental fall. Clinical and radiographic examination revealed severe intrusion (>7 mm) of teeth 12 and 21, accompanied by uncomplicated crown fractures and subluxation of tooth 11. Owing to the severity of intrusion and complete root development, immediate surgical repositioning was performed and stabilised using a flexible fibre splint. Root canal treatment was initiated one week after surgical repositioning as a preventive (prophylactic) intervention in accordance with the International Association of Dental Traumatology (IADT) 2020 guidelines for mature intruded teeth, owing to the high-risk of pulp necrosis and inflammatory external root resorption. Calcium hydroxide was used as an intracanal medicament. To enhance periodontal healing and PDL regeneration, freshly prepared I-PRF was aspirated immediately after centrifugation into a sterile syringe and slowly administered through the gingival sulcus surrounding the affected teeth under aseptic conditions using 30 Gauge needle. The injections were performed once weekly for four consecutive weeks. At the one-year follow-up, clinical and radiographic evaluation demonstrated satisfactory periodontal and periapical healing without evidence of root resorption or ankylosis. The patient remained asymptomatic with satisfactory functional and aesthetic outcomes. This case highlights the potential role of I-PRF as an adjunctive regenerative therapy in the management of severe IL.

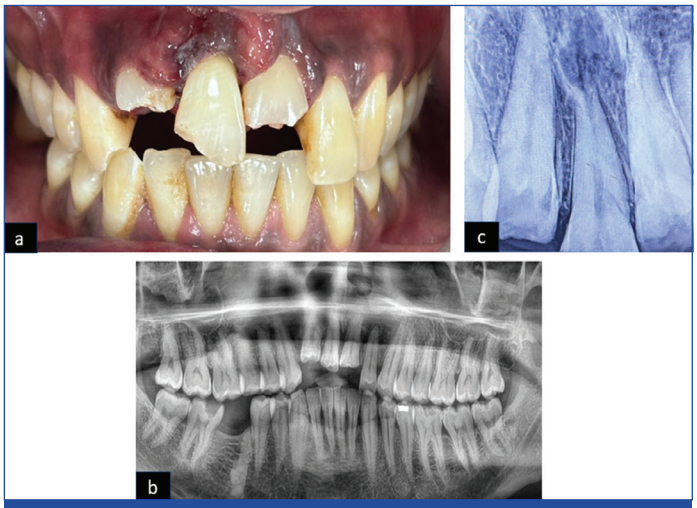
Keywords: Calcium hydroxide, Dental trauma, Periodontal ligament, Tooth injuries

CASE REPORT

A 36-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of trauma to the upper anterior teeth following an accidental fall from staircase one day before. The patient had received initial emergency medical care at a private hospital immediately after the incident, where intraoral bleeding was controlled with direct pressure using sterile gauze, and the injured area was irrigated with povidone iodine. The patient was subsequently referred to the study Institute for further management. There was no history of bleeding from the ears or nose, loss of consciousness, nausea, vomiting or any other associated systemic symptoms.

The patient's medical history was non contributory. The patient gave a history of uneventful extraction of tooth 46 three years back due to dental caries. Patient had no habit of smoking or alcohol consumption. The patient further gave no history of systemic illness, regular medication use, bleeding disorders, or known drug or food allergies.

Extraoral examination revealed facial symmetry with no evidence of swelling, upper lip abrasion, or laceration. No palpable submandibular lymphadenopathy was detected. Intraoral examination revealed Ellis class II fracture involving enamel and dentin in 12,21,11 and none of the teeth had direct pulpal exposure. Teeth 12 and 21 exhibited severe IL (>7 mm), while tooth 11 demonstrated Grade II mobility consistent with subluxation. No crown root fracture was observed and coronal fracture margins were supragingival. The marginal and attached gingiva associated with teeth 11, 12, and 21 appeared erythematous, with oedematous interdental papillae. Periodontal examination revealed a probing depth of 8 mm in teeth 12 and 21, and 3 mm in tooth 11 buccal and palatal aspect with bleeding on probing. No gingival recession was observed. Occlusal examination revealed a disruption of the normal occlusal relationship due to the severe intrusion of the affected teeth [Table/Fig-1].



[Table/Fig-1]: Preoperative pictures: a) Intraoral picture showing severely intruded 12, and 21; b) Orthopantomogram (OPG) showing the intruded upper incisors and abnormal relative Cementoenamel Junction (CEJ) position with other teeth; c) Intraoral Periapical Radiograph (IOPA) demonstrating extent of Intrusion and Periapical status.

Baseline pulp sensibility testing (cold test, heat test, and electric pulp test) was not performed because the patient presented during

the acute phase of trauma, in which transient neural damage may result in false-negative responses.

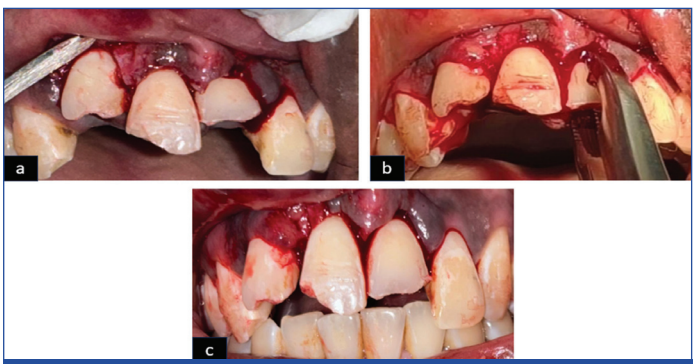
Radiographic examination with both orthopantamography and intraoral periapical radiograph confirmed the clinical findings and revealed complete root formation with no evidence of root fracture in the affected teeth. Intraoral periapical radiography revealed uncomplicated crown fractures involving enamel and dentin in teeth 11, 12, and 21, along with severe IL of 12, 21. No radiographic evidence of root fracture, alveolar socket fracture, or cortical plate fracture was observed on conventional radiographic examination. Although the affected teeth were displaced apically within the alveolar bone due to the intrusive injury, no distinct alveolar bone fracture was evident on the available radiographs.

The management of IL depends on the degree of intrusion, stage of root development, and time elapsed since injury. Available treatment options include spontaneous re-eruption, orthodontic repositioning, and surgical repositioning. Spontaneous re-eruption is generally recommended for immature teeth with open apices, whereas orthodontic repositioning may be considered for moderate intrusion (3-7 mm) [1]. In the present case, the affected teeth exhibited complete root development with severe intrusion (>7 mm) [1]. Therefore, immediate surgical repositioning of 12, and 21 was planned to achieve prompt repositioning of the teeth, facilitate early endodontic intervention, restore the occlusal relationship, and minimise the risk of complications, in accordance with the current International Association of Dental Traumatology (IADT) 2020 guidelines [1]. Further to enhance PDL healing and promote periodontal fibre reattachment, I-PRF was administered through the gingival sulcus into the PDL space once weekly for four consecutive weeks [2].

Case Management

Before the start of the treatment procedure, a written informed consent for publication of clinical information and photographs was obtained from the patient. Considering the severe IL (>7 mm) and complete root development of the affected teeth, prophylactic root canal treatment was initiated one week after surgical repositioning in accordance with the recommendations of the IADT, owing to the high risk of pulp necrosis and inflammatory root resorption [1].

With the administration of 2% lidocaine with epinephrine, infraorbital (right and left) and nasopalatine nerve block was performed and anaesthesia was attained locally. Following which the flap was carefully elevated using a periosteal elevator to gain access to the intruded teeth. Surgical repositioning was performed using maxillary anterior forceps, and the teeth were repositioned with controlled and atraumatic force. The teeth were restored to their normal anatomical position, with the CEJ aligned with the free gingival margin [Table/Fig-2].



[Table/Fig-2]: Surgical management of intruded incisors: a) Flap elevation exposing the intruded maxillary central incisors 12, and 21; b,c) Surgical repositioning of the intruded teeth to their normal anatomical position.

Following repositioning, the teeth were stabilised using an Interlig fibre splint with flowable composite extending from teeth 14 to 23. This provided adequate stabilisation while allowing physiological tooth movement during the healing period [Table/Fig-3,4]. Postoperatively, the patient was instructed to avoid biting hard with the anterior teeth.

[Table/Fig-3]: Adhesive protocol following surgical repositioning: a) Application of 37% phosphoric acid etchant on enamel surface prior to splinting; b) Application of bonding agent to conditioned enamel surfaces while preparation for fibre splint placement.

[Table/Fig-4]: Stabilisation of the teeth: a) Interlig fiber splint placement extending from 14 to 23 to stabilise surgically repositioned teeth; b) Immediate postoperative radiographic assessment following surgical repositioning.

One week after the procedure, root canal treatment was initiated for teeth 11, 12, and 21. Working lengths were determined using an electronic apex locator and confirmed radiographically. Biomechanical preparation was performed using the Hero Gold rotary file system (Micro-Mega, Besançon, France) up to size 25/.06. The canals were irrigated with 10 mL 3% sodium hypochlorite throughout instrumentation, followed by a final rinse with 5 mL 17% Ethylenediaminetetraacetic Acid (EDTA) and normal saline. Calcium hydroxide was placed as an intracanal medicament for two weeks to prevent or minimise inflammatory root resorption. At the subsequent appointment, the intracanal medicament was removed, the canals were irrigated, dried with sterile paper points, and obturated with gutta-percha and a bioceramic sealer using the single-cone technique.

For the preparation of I-PRF, the protocol was done as per Miron RJ et al., (2017) [3]. A 5 mL of the patient's blood was collected in an anticoagulant-free tube and immediately centrifuged in C-Paulo Labtech centrifuge machine (80-2B-1 Bench-top Centrifuge, rotor radius-13cm and relative centrifugal force-71g) at 700 Rotations Per Minute (RPM) for three minutes to obtain the injectable fibrin concentrate. The freshly prepared I-PRF was aspirated immediately after centrifugation from the upper plasma layer using a sterile large-bore needle (21-gauge) while still in its liquid phase. The aspiration needle was subsequently replaced with a sterile 30-gauge needle attached to the same 3-mL syringe for local administration. Approximately, 2 mL of I-PRF was obtained, and approximately 1 mL was injected circumferentially around each affected tooth (12,21) through the gingival sulcus into the PDL space using slow, controlled injection. Aspiration, needle replacement, and administration were completed immediately after centrifugation before fibrin polymerisation occurred, and no needle blockage or injection resistance was encountered.

This procedure was performed at weekly intervals for four consecutive weeks (without local anaesthesia). This adjunctive therapy was intended to enhance PDL healing and promote fibre reattachment [Table/Fig-5].

At the end of four weeks, obturation was completed, the fibre splint was removed, and definitive composite restorations were placed to restore function and aesthetics [Table/Fig-6]. The patient was followed up periodically for 12 months. At the 12-month follow-up,

[Table/Fig-5]: I-PRF therapy for periodontal regeneration: a) Centrifuge at 700 rpm for three minutes; b) Preparation of I-PRF; c) I-PRF injection administration in the first week around repositioned maxillary incisors; d) Second week I-PRF injection to enhance PDL healing; e) Clinical appearances showing improved gingival adaptation and soft-tissue healing at the end of 4 weeks.

[Table/Fig-6]: Third month postoperative follow-up evaluation: a) Clinical photograph demonstrating satisfactory alignment, stability and gingival healing of repositioned maxillary central incisors; b) IOPA showing satisfactory periapical healing.

the patient remained asymptomatic, with satisfactory aesthetic and functional outcomes. Clinical examination revealed physiologic tooth mobility (Grade I), a normal percussion sound without a metallic tone suggestive of ankylosis, and periodontal probing depths within normal limits (≤3 mm) without bleeding on probing or gingival recession. The patient exhibited satisfactory occlusion with no functional discomfort during mastication. Radiographic evaluation demonstrated normal periapical healing with preservation of the PDL space and lamina dura, without evidence of inflammatory root resorption, replacement resorption (ankylosis), or periapical pathology [Table/Fig-7].

[Table/Fig-7]: One year postoperative follow-up evaluation: a) Clinical photograph demonstrating satisfactory alignment, stability and gingival healing of repositioned maxillary central incisors; b) IOPA showing satisfactory periapical healing.

DISCUSSION

The IL is a severe form of Traumatic Dental Injury (TDI) and represents a relatively rare subtype, accounting for approximately 1.9% of all TDIs in the permanent dentition and 5-12% of luxation injuries [4,5]. It most commonly affects the maxillary central and lateral incisors, with falls being the primary cause and a higher incidence reported in boys aged 6-12 years [4,6].

Clinically, intruded teeth present with axial displacement into the alveolar bone, gingival lacerations, absence of mobility, and a characteristic metallic sound on percussion [7]. Current treatment options include spontaneous re-eruption, orthodontic repositioning, and surgical repositioning [7]. Despite treatment, complications such as pulp necrosis, pulp canal obliteration, inflammatory root resorption, ankylosis, marginal bone loss, disruption of root development, and gingival recession may occur [8].

The choice of treatment depends on the degree of intrusion and root development. In moderate intrusions (3-6 mm), orthodontic or surgical repositioning may be performed, whereas severe intrusions (>7 mm) generally require surgical repositioning [8]. Immediate surgical repositioning facilitates rapid realignment of the tooth, allows early endodontic intervention, and may reduce complications [6,8]. Root canal treatment initiated within 2-3 weeks is critical because of the increased risk of external inflammatory root resorption [9,10].

In the present case, teeth 12 and 21 exhibited severe intrusion (>7 mm), while tooth 11 showed Grade II mobility. Surgical repositioning was performed, followed by Interlig fibre splinting from teeth 14 to 23 for four weeks. Root canal treatment was initiated within two weeks following trauma. Similarly, Belevcikli M et al., reported successful management of an intruded maxillary incisor using surgical repositioning and fibre splinting for four weeks [8].

Splinting is an essential component of treatment following surgical repositioning. Various splinting methods have been described for the stabilisation of traumatically injured teeth, including rigid splints (arch bars, composite-wire splints with heavy orthodontic wire, and acrylic splints), semi-rigid splints, and flexible splints such as fibre-reinforced composite splints and composite splints with light orthodontic wire or nylon fishing line. Flexible splints provide adequate stabilisation while allowing physiological tooth movement, thereby promoting PDL healing and reducing the risk of ankylosis. In the present case, fibre-reinforced splinting was maintained for four weeks and provided satisfactory stabilisation [11,12].

To enhance PDL healing and reduce the risk of ankylosis and root resorption, I-PRF was used as an adjunctive therapy. I-PRF is a second generation autologous platelet concentrate obtained from the patient's own blood and contains growth factors such as epidermal growth factor, insulin-like growth factor-1, and fibroblast growth factor. These bioactive molecules promote angiogenesis, collagen synthesis, tissue regeneration, and PDL fibre reattachment. The fibrin matrix and fibronectin content of I-PRF further support cellular proliferation and periodontal healing [13-15].

Pullishery F et al., reported that the injectable consistency of I-PRF facilitates direct application and may enhance tissue regeneration and wound healing through sustained growth factor release [13]. In the present case, I-PRF was administered into the PDL space once weekly for four weeks. At the 12-month follow-up, the patient remained asymptomatic, with no clinical or radiographic evidence of periapical or periodontal pathology.

Similarly, Ragulakollu R et al., reported successful management of an intruded maxillary incisor using PRF as an adjunctive regenerative therapy [14]. In contrast, another case involving mature incisors demonstrated replacement resorption after 29 weeks of follow-up, highlighting the importance of timely diagnosis and appropriate management [6].

In literature, there are very limited reports describing the combined use of surgical repositioning with repeated I-PRF injections into the PDL space for severe intrusion of mature maxillary incisors. The present case provides insights on clinical observation of the possible role of this combined approach. However, the main limitation is that it is a single-case report without a control group and with only 12 months of follow-up, so firm conclusions cannot be drawn regarding the long-term effect of I-PRF on root resorption and ankylosis.

Overall, the current case emphasises the potential regenerative benefits of I-PRF in the management of severe IL. Favourable outcomes may be achieved through early intervention, timely endodontic treatment, flexible splinting, and adjunctive regenerative therapy. Nevertheless, long-term follow-up remains essential because complications such as pulp necrosis, ankylosis, and root resorption may occur even after initial healing.

CONCLUSION(S)

The present case demonstrates that surgical repositioning, early root canal treatment with calcium hydroxide, and adjunctive I-PRF therapy resulted in favourable periodontal and periapical healing at the 12-month follow-up, without ankylosis, root resorption, or other complications. While I-PRF may enhance PDL regeneration, long-term follow-up and further clinical studies are needed to validate its role in managing severe IL.

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PARTICULARS OF CONTRIBUTORS:

1. Postgraduate Student, Department of Conservative Dentistry and Endodontics, Vinayaka Mission's Sankarachariyar Dental College, Salem, Tamil Nadu, India.
2. Postgraduate Student, Department of Conservative Dentistry and Endodontics, Vinayaka Mission's Sankarachariyar Dental College, Salem, Tamil Nadu, India.
3. Postgraduate Student, Department of Conservative Dentistry and Endodontics, Vinayaka Mission's Sankarachariyar Dental College, Salem, Tamil Nadu, India.
4. Postgraduate Student, Department of Conservative Dentistry and Endodontics, Vinayaka Mission's Sankarachariyar Dental College, Salem, Tamil Nadu, India.
5. Postgraduate Student, Department of Conservative Dentistry and Endodontics, Vinayaka Mission's Sankarachariyar Dental College, Salem, Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. V. Jeevitha,
Postgraduate Student, Department of Conservative Dentistry and Endodontics,
Vinayaka Mission's Sankarachariyar Dental College, Salem-636308,
Tamil Nadu, India.
E-mail: jeevitha1999vm@gmail.com

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