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Surgical Repositioning of a Severely Intruded Maxillary Permanent Central Incisor: A Case Report

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ABSTRACT:

Traumatic intrusion of permanent teeth is a serious dental injury that damages the tooth, periodontal ligament, and pulpal tissue. Treatment varies based on age, root development stage, and trauma severity. Approaches include observation for spontaneous re-eruption and surgical, or orthodontic repositioning.

This report presents a 25-year-old male with severe traumatic intrusion of the upper left central incisor and Ellis class II fractures of the upper right central and both lateral incisors. The intruded tooth was surgically repositioned within 4-5 hours of the injury, and a semi-rigid splint was placed from the right to left canine. Endodontic treatment of the repositioned left central incisor was completed after a month due to pulpal necrosis, while the upper right central and lateral incisors received treatment subsequently when found symptomatic.

The patient was evaluated every three months clinically and radiographically using intraoral periapical radiographs and cone-beam computed tomography. At the 12-month follow-up, the patient was asymptomatic with satisfactory periapical and periodontal healing.

1. Introduction

Dental trauma can result in various injuries to teeth and supporting structures. Intrusive luxation is a severe type of injury, characterized by the tooth being pushed into the socket, and is uncommon in permanent teeth, making up 0.5%-2% of all traumatic injuries, mostly affecting boys aged 6-12.[1] The upper central incisors are most frequently involved, followed by the upper lateral incisors.[2,3] Treatment options, including spontaneous re-eruption, surgical, or orthodontic repositioning, depend on age, root development, and trauma severity.[1,3] This report discusses the successful 12-month management of a severely intruded maxillary left central incisor in an adult male.

2. Case Report

A 25-year-old male reported to the Department of Conservative Dentistry & Endodontics for treatment of his upper front teeth, three hours after a bicycle fall. Referred by a primary health center and administered a tetanus shot, he had a history of oral bleeding that had ceased and no loss of consciousness or other symptoms.

Medical history was uneventful. Extraoral examination revealed no facial bone or mandibular fractures. Intraoral examination showed severe intrusion of the upper left central incisor (#21) with a gingival laceration and Ellis Class II fractures of the upper right central incisor (#11) and both lateral incisors (#12, #22) (Figure 1a). All teeth exhibited no mobility. Initial Intraoral Periapical Radiographs (IOPAR) revealed severe intrusion of #21 with obliterated periodontal ligament (PDL) space and no root or bone fractures (Figure 1b). #11 showed PDL space widening.

A Cone Beam Computed Tomography (CBCT) scan revealed that intruded #21 was displaced labially (Figure 1c-1e). Due to the severity and root development, immediate surgical repositioning of #21 was planned. Under local anesthesia using lignocaine with 1:80000 adrenaline (Lignox 2%A, Indoco Remedies Ltd.), the soft tissues were cleaned with saline and Betadine 2% (Microwin Labs). The intruded tooth was gently luxated with upper anterior extraction forceps (Figure 1d) to minimize cellular damage to PDL and cementum, repositioned, and stabilized using a semi-rigid splint from tooth #13 to #23) with 0.5mm stainless steel wire and

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composite resin (Tetric-N-Flow, Ivoclar Vivadent, Schaan, Liechtenstein) (Figure 1g-1h), which was confirmed by a radiograph (Figure 1i). The patient was prescribed antibiotics, analgesics, 0.2% chlorhexidine mouthwash, and advised to maintain oral hygiene and a soft diet.

Ten days post-surgical repositioning, the patient complained of pain in #21. Endodontic treatment was initiated for #21. The access cavity was prepared, and the root canal was irrigated with a 3% sodium hypochlorite solution (Prime Dental Products Pvt. Ltd.). The canal was filled with non-setting calcium hydroxide paste (Ultracal, Ultradent Inc., South Jordan) and temporized with zinc oxide-based temporary restorative material (Caviton, GC Corporation, Japan). The patient was advised to maintain good oral hygiene and recalled after 4 weeks.

Subsequently, after four weeks, tooth #21 was found completely asymptomatic and there were no signs of external root resorption of #21 confirmed radiographically so the tooth was obturated with gutta-percha applying cold lateral condensation technique and using a calcium silicate-based Bioceramic Root Canal sealer (Ceraseal, Meta Biomed, Korea). Additionally, the patient presented with pain in teeth #11 and #12 during the same follow-up. Clinical examination revealed tenderness to percussion, and radiographic assessment demonstrated widened PDL spaces. Pulp sensibility tests [cold test (Roeko Endo-Frost, Coltene Whaledent, USA) and electric pulp tests (Apex Industrial Electronics, Haryana, India)] indicated a non-vital pulp for #11 and #12. A diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis was made for both teeth. Endodontic treatment was initiated for both teeth, adhering to the same treatment protocol established for #21. When asymptomatic, both teeth were obturated with gutta-percha and a calcium silicate-based Bioceramic Root Canal sealer (Ceraseal, Meta Biomed, Korea), followed by sealing of the access cavities with a composite restoration (Beautifil II, Shofu, Japan). To restore the endodontically treated teeth, porcelain fused to metal crowns were fabricated for #21, #11, and #12. Due to significant coronal loss, #12 required additional reinforcement with a fiber post and core buildup prior to crown placement. #22 remained asymptomatic throughout, with normal pulp sensibility tests. It was restored with a composite restoration. The patient was recalled at regular intervals for clinical and radiographic evaluation.

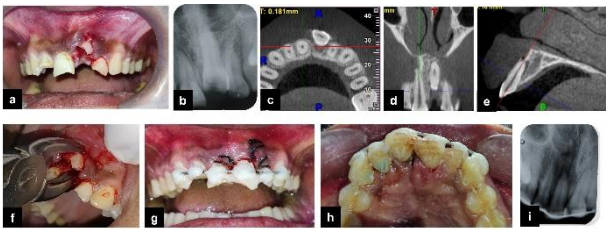

Figure 1: Steps in management of severe intrusion of the upper left central incisor: a) Pre-op clinical view, b) Pre-Operative Intra-Oral Periapical Radiograph (IOPAR), c) Pre-Operative Cone Beam Computed Tomography (CBCT) scan in axial view, d) Pre-Operative CBCT scan in coronal view, e) Pre-Operative CBCT scan in sagittal view, f)Surgical repositioning of intruded tooth using extraction forceps, g) semi-rigid splint with 0.5mm stainless steel wire and composite resin (labial view) from right maxillary canine to left maxillary canine, h) splinted teeth (occlusal view), and i)IOPAR showing splinted teeth.

A three-month follow-up assessment showed tooth #21 to be asymptomatic, with no signs of abnormal mobility. Percussion tests returned normal responses, and probing depths were within normal limits. Radiographic evaluations, including IOPAR and CBCT, confirmed the absence of any pathologic root resorption. (Figure 2i(a-d)).

A six-month and a 12-month follow-up evaluation revealed #21 to be asymptomatic, with no evidence of no evidence of external root resorption or periapical pathology, with no abnormal mobility; normal percussion responses, and probing depths. Radiographic assessment (IOPAR and CBCT) confirmed the absence of pathologic root resorption (Figure 2ii-2iii(a-d)).

Clinically, the tooth remained asymptomatic with no signs of gingival inflammation or mobility, indicating successful treatment outcomes. The patient expressed satisfaction with the aesthetic result and overall treatment.

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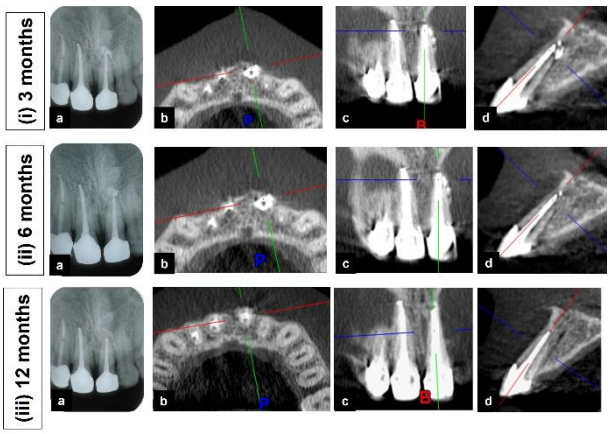

Figure 2: Follow-up radiographic evaluation at i) 3 months, ii) 6 months, and iii) 12 months as seen in a) Intra-Oral Periapical Radiograph, b) Pre-Operative Cone Beam Computed Tomography (CBCT) scan in axial view, c) Pre-Operative CBCT scan in coronal view, and d) Pre-Operative CBCT scan in sagittal view.

3. Discussion

Intrusion, a severe form of dental trauma, often leads to significant damage to the PDL, pulp, and alveolar bone, resulting in a poor prognosis. Treatment varies based on the severity of the intrusion and root development, including passive re-eruption, orthodontic repositioning, or immediate surgical repositioning.[4] For severe intrusions, especially with fully formed roots, spontaneous re-eruption is unlikely, making immediate orthodontic or surgical repositioning necessary. Delayed orthodontic treatment can lead to ankylosis if started later than 2-3 weeks post-trauma.[5] In our case, surgical repositioning of the intruded #21 was performed within hours of the injury. Research indicates that immediate surgical repositioning offers significant advantages, including a higher success rate and fewer complications.[6] It was reported that mild intrusions (<3 mm) can often be managed with passive repositioning, while moderate cases (3-6 mm) may require active repositioning.[1] Severe intrusions (>6 mm) benefit from surgical repositioning, which helps reduce compression and promotes healing by cemental deposition rather than ankylosis[7], and early endodontic access can prevent inflammatory root resorption[8], though repositioning might increase trauma to periodontal tissues.[7] Adjunctive treatments include splinting and antibiotics, with flexible, non-rigid splints recommended, typically covering two to three adjacent teeth for 4 weeks.[9] A four-week splinting period is recommended for post-surgical repositioning of intruded teeth to facilitate optimal healing.[10] In line with this, #21 was surgically repositioned and immobilized with a semi-rigid wire-composite splint spanning teeth #13 to #23, allowing for physiological tooth movement and providing a more aesthetic appearance compared to other splinting modalities. [11]

Endodontic treatment is crucial for severe intrusions to prevent pulpal necrosis and root resorption [12], with initiation within 2 weeks of trauma recommended to minimize resorption risk.[13] Calcium hydroxide (CH) paste is used for canal disinfection and resorption control due to its effectiveness in managing inflammatory resorption.[14] In our case, a water-based CH paste was applied. Advanced imaging like CBCT provides superior sensitivity in detecting apical changes and root resorption compared to periapical radiographs.[15] CBCT scans in our case confirmed no external root resorption or periapical radiolucency in #21 or adjacent teeth (#11, #12, #22) at the 12-month follow-up.

4. Conclusion

Surgical repositioning and timely endodontic treatment of the severely intruded maxillary central incisor led to a successful outcome. The 12-month follow-up revealed no resorption or periapical lesions, demonstrating the effectiveness of prompt and appropriate management in improving the prognosis for severe dental trauma.

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