Case study

Conservative management of dentoalveolar trauma using conventional composite and wire splint: A Case Report

Running Title-Dentoalveolar trauma in children: A Report

Abstract:

Dentoalveolar trauma resulting from external or internal forces, causes major psychological effects on individuals, particularly in children. Optimal splinting is required to treat dentoalveolar traumatic injuries to stabilize and protect the teeth as well as for pulpal and periodontal healing. Luxation and pulpal necrosis of the affected teeth are the main consequences of dentoalveolar trauma. This case report demonstrates the successful management of a hopeless tooth demonstrating external root resorption and sinus formation, due to dentoalveolar trauma in the mandibular anterior region, in a 13-year-old male patient using the regular composite wire splinting method.

Keywords: dentoalveolar trauma, splinting, luxation, root resorption, sinus tract, composite wire, children.

Introduction:

Traumatic dental injuries are more commonly experienced in childhood and adolescents with global prevalence of 10% - 15%. Dental trauma in boys is more frequent than in girls in the same age group.[1] Dental trauma is associated with emotional and behavioral problems (depression, anxiety, post-traumatic stress disorder) in children and negative mental health outcomes. Hence, the timely management of dental trauma is required for a favourable prognosis.[2, 3]

Splinting has been recommended to securely support and hold teeth in position thereby enhancing the healing of periodontal tissues and stabilization of the teeth. Splint is defined as "an apparatus used to support, protect or immobilize teeth that have been loosened, replanted, fractured or subjected to certain endodontic surgical procedures"[4] According to the guidelines of the American Academy of Paediatric Dentistry, subluxed teeth should be splinted using a flexible splint for no more than 2 weeks. In contrast to rigid splint which immobilizes the tooth, the flexible splint allows functional tooth movement.[5] The present case report describes a case of successful management of a dentoalveolar fracture using the conventional composite wire splint.

Case report:

A 13-year-old male patient was reported to the department with chief complaint of loosening of lower front teeth in the last 10 days. History revealed that the patient had a fall while playing in his school, after which he noticed mild mobility in the lower front teeth (31, 32, 41, 42). The patient was conscious and apparently normal immediately after trauma. He noticed mild intra oral bleeding that was arrested in few minutes. Since no history of pain was present the patient did not consult a doctor/ dentist immediately after trauma. After 10 days of trauma, they noticed severe loosening of teeth with sinus tract formation in relation to the labial and the lingual aspect of 31 and 32. On clinical examination, no extra oral abnormalities were detected. Intraoral examination revealed permanent dentition with mobility in relation to 31 (grade III), 32 (grade II), 41 (grade II), and 42 (grade III) with clinical attachment loss of 6mm (between 31 and 32). An intraoral periapical radiograph was taken in relation to 31, 32, 41, 42. Radiographic examination revealed vertical bone loss extending beyond the middle third. No abnormalities were detected in temporomandibular joint. Based on the severity and extent of the bone loss the patient was categorized in stage III (American Academy of Periodontology). Composite wire splinting was planned and executed. The treatment procedure was explained to the parents and written informed consent was obtained.

Initially, the oral cavity of the patient was cleaned using the povidone-iodine solution to achieve asepsis. Local anaesthesia was not administered as pain was not reported by the patient. Then, the ligature round stainless-steel wire was taken and two strands of ligature wire were tightly twisted in the clockwise direction with a needle holder. The labial surfaces of the teeth were etched for 30 seconds using 37% phosphoric acid. The teeth were repositioned manually and the twisted wire strand was placed on labial surfaces of 31, 32, 33, 41, 42, 43 and secured with light-curing composite resin. The patient was advised to maintain good oral hygiene and to eat only soft food for 2 weeks. On one week follow-up, radiograph showed a negative outcome. External inflammatory root resorption in the middle third root in both mesial and distal surfaces of 31. The labial splint was dislodged so no improvement in mobility was noted. The vertical bone loss was extended 0.2 mm apically. Extraction of 31 was planned due to its poor prognosis. Since the patient was too young to extract anterior teeth (as it causes psychological trauma), we preferred an alternate treatment option, the conventional root canal treatment. Access cavity was prepared in 31 using the round bur (medium size) without local anaesthesia administration. The root canal was irrigated using 0.9% normal saline, chlorhexidine, and sodium hypochlorite. Considering the lack of alveolar support and prognosis of the teeth, canal instrumentation was limited to size 15 (21 mm) k file.

Calcium hydroxide with iodoform paste (Metapex) was placed in the root canal as intracanal medicament. The access cavity was restored with temporary cement. Further, composite wire splinting was done on the lingual surface from 33 to 43. Premature contact in the anterior region was relieved by raising the bite. Glass ionomer cement was placed on the occlusal surfaces of the permanent first molar and premolar on both sides. Again, the patient reported with dislodged splint in a week. Intra-oral periapical radiograph showed 1mm bone formation. At 1-month follow-up mobility the external root resorption was reversed with a reduction in mobility grade I. 1mm bone formation could be appreciated in the radiograph. To reduce the mobility and to bring back the tooth to normal composite resin splint was performed. The interdental surface was etched using 37% phosphoric acid for 30 seconds, composite was applied in the interdental area in relation to 31, 32, 41, 42 and light cured for 30 seconds. After 1-week the pathologic mobility diminished and the tooth returned to its physiologic tooth mobility was appreciated. 4 mm bone formation was evident in the third month follow-up. The patient is under follow-up. Complete bone formation is expected within 6 months period.

Discussion:

Dental trauma is one of the commonest injuries faced in growing children. The consequence of dental trauma often ends in pulp necrosis, a common complication. During dental trauma, due to the sudden impact on

teeth, the inflammatory process is triggered in dental pulp. Consequently, various chemical mediators are released directly from the dental pulp connective tissue as a process of inflammation. Subsequently, the pulp is necrosed, and the products of necrotic pulp spread through the apical foramen to periapical region, causing apical periodontitis.[6] As a consequence of the inflammatory process, osteoclasts (bone-resorbing cells) are activated thus causing bone resorption. Further, the bacterial toxins from the infected pulp spread along the dentinal tubules and activates the clastic cells with resultant damage to the periodontal ligament and resorption of the external root surface. The external inflammatory root resorption is particularly seen after luxation injury, followed by the combined injuries of dental pulp and cementum.[6] Root resorption is generally self-limiting and no treatment is required. [7]

The present case report described successful management of a case with of luxated mandibular anterior teeth with pathologic external root resorption using the conventional composite wire splinting and routine endodontic therapy.

In the present case, the patient reported luxated lower anterior tooth (grade III mobility) with sinus tract formation with external root resorption in relation to 31. Repositioning and stabilization of the teeth helps in periodontal healing. Time elapsed between the traumatic injury and the treatment initiation highly influences the treatment modalities. According to Andreasen et al[5] tooth repositioning within 48 hours yields superior treatment outcome. But, in this present case, the patient reported after 10 days of injury. Inspite of the fact that the tooth was repositioned and splinted on the 11th day from the dentoalveolar injury, excellent periodontal healing is appreciated in this case. Composite wire splinting is the widely used splint method in dental practice, accounting for its advantages such as easy accessibility, simple procedure, can be constructed using the materials available in regular dental practice. It is an inexpensive, flexible splint that allows the physiologic mobility of the teeth and do not require complicated steps to fabricate. Its disadvantage is that it requires an acid etching of the teeth to be splinted.[8]

In the second visit, endodontic therapy was performed to eliminate the foci of infection. Irrigation was done using 2% chlorhexidine and normal saline followed by the placement of intracanal medicament (calcium hydroxide). The 2% chlorhexidine is an effective irrigant against the chief root canal pathogen, *Enterococcus faecalis* and other persistent root canal infection-causing micro-organisms.[9] Calcium hydroxide is the most widely used intracanal medicament in dentistry due to its high anti-microbial effect. It is an effective anti-endotoxin agent. Calcium hydroxide kills the bacteria by the following three mechanisms. Calcium hydroxide releases highly oxidant free hydroxyl ions in aqueous environment. Hydroxyl ions have a bacteriostatic effect. It

penetrates into the bacterial cell membrane and destroys the cytoplasmic membrane of the bacteria. The higher pH of hydroxyl ions denatures the bacterial protein and damages the bacterial DNA.[10] An intraoral sinus is often characterized by a soft erythematous papule on the alveolar process associated with a non-vital tooth. The sinus tract is lined by the granulation tissue, not by epithelium. So, surgical intervention was unwarranted.[12] The conservative nonsurgical endodontic management was adequate to eradicate the sinus tract. The primary aim of treatment in these cases is mainly relieving the causative factor (occlusal trauma), followed by root canal treatment.The sinus healed in 2 weeks. The composite splinting was removed in 1 week. Excellent healing of the periodontal ligament was evident in 3 months without the aid of periodontal surgery or supportive measures such as platelet rich plasma, platelet rich fibrin or the placement of allogenic bone material. The success of the treatment can be explained by the age of the patient. Younger patients have faster wound healing. Composite wire splinting is the best rapid, economical, easily available and reliable technique, can be used in most of the dentoalveolar trauma in children.

Conclusion:

This case report provides an evidence for successful outcome of dento alveolar fracture of a hopeless tooth by composite splinting. Composite splinting is a simple and elegant method of treatment for dento alveolar trauma in children.

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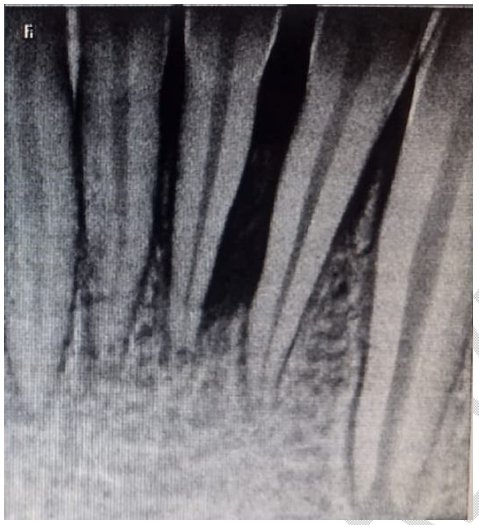

Fig 1: Pre operative radiograph

Fig 2: 1-week follow up showing negative outcome with external root resorption

Fig 3: 1 week after intra canal medicament (metapex) placement

Fig 4 : pre operative image showing intra oral sinus formation

Fig 5: Immediate post op (labial composite wire splint)

Fig 6: Interdental composite resin splint