Preserving Pulp Vitality After Traumatic Dental Injury: A Case Report on Vital Pulp Therapy in a Young Child

Dr. Mariam Abdullah

Charity No: 1155781

Scottish Charity Number: SC045190

ABSTRACT

L.K., 8-year-old girl sustained a fall in the playground that resulted in a complicated crown fracture of the maxillary right central incisor. She was immediately managed at the Farwaniya Dental Casualty Clinic, where a composite splint was placed extending from the right primary canine to the left maxillary central incisor to stabilise the injured tooth, as well as two sutures intra-orally. Two days later, she presented to the paediatric dental clinic for definitive care.

Clinical and radiographic examinations revealed poor oral hygiene, generalized plaque-induced gingivitis with multiple carious lesions in the primary posterior teeth as well as a complicated crown fracture of the maxillary right central incisor and an uncomplicated crown fracture of the left central incisor, with subluxation injury and grade II mobility in both teeth.

The patient was initially anxious but was successfully managed through behaviour management techniques along with nitrous oxide conscious sedation.

Comprehensive care included removal of the initial composite splint and replacement with a nickel–titanium (NiTi) flexible splint extending from the upper right primary canine to the upper left primary canine for optimal stabilisation. A partial pulpotomy with bioceramic material was performed on the right central incisor to preserve pulp vitality, followed by composite restoration. The left central incisor and carious teeth were managed conservatively, and oral hygiene instructions were reinforced.

Follow-up clinical and radiographic evaluations demonstrated continued root development and dentin deposition, confirming successful pulpal healing. The patient remained asymptomatic and satisfied with the aesthetic outcome.

INTRODUCTION

Traumatic dental injuries (TDIs) are common in children and adolescents, often affecting the maxillary anterior teeth due to their exposed position in the dental arch. Management of such injuries in immature permanent teeth poses a particular challenge because root development is incomplete and maintaining pulp vitality is critical for continued root maturation. According to the International Association of Dental Traumatology (IADT) 2020 guidelines, conservative management with vital pulp therapy is recommended in cases of complicated crown fractures involving vital pulps, especially in teeth with open apices.

The purpose of this case report is to describe the comprehensive management of traumatic dental injuries in an 8-year-old girl, involving complicated and uncomplicated crown fractures with subluxation of immature maxillary central incisors, treated according to current IADT recommendations. This case highlights the value of early intervention, pulp vitality preservation, and flexible splinting in achieving favourable biological and aesthetic outcomes.

CASE DETAILS

History

An 8-year-old girl presented after a fall in the playground that resulted in dental trauma to the upper anterior teeth. The child was fit and well, with no relevant medical history or allergies. She had irregular dental attendance but had previously received dental treatment under local anesthesia without complications. On presentation, she was anxious yet responded well to behavior management and nitrous oxide sedation. She lived with both parents and three siblings, being the youngest child. The parents were cooperative and compliant, attending all follow-up visits after being educated about the importance of oral health and trauma management.

Examination

Extra-oral:

- Facial symmetry within normal limits.
- No temporomandibular joint (TMJ) pathology, deviation, or swelling.

Intra-oral:

- Poor oral hygiene with visible plaque accumulation.
- Mixed dentition with multiple carious lesions affecting primary and permanent teeth.
- 2 resorbable sutures in the anterior upper left mucosa.
- Notable findings include:
    - Carious lesion **#63, #83, #65, #75, #84, #85, #36**.
    - Amalgam restoration **#55, #54, #74**.
    - Remaining Root (RR) **#64**.
    - Central line shift 2 mm to the right.
    - Complicated crown fracture on **#11**.
    - Un-complicated crown fracture on **#21**.
- Basic periodontal examination (BPE) within normal limits.

Special investigations

Dental Injuries Assessment: (Fig 1., Fig 2., Fig 3.)

#11: Grade II mobility, Tender to percussion, negative to Endo ice and EPT.

#21: Grade II mobility, Minor tender to percussion, positive to EPT, negative to Endo ice.

Fig 1. Intra-oral Photographs (upper occlusal)

Fig 2. Intra-oral Photographs (frontal)

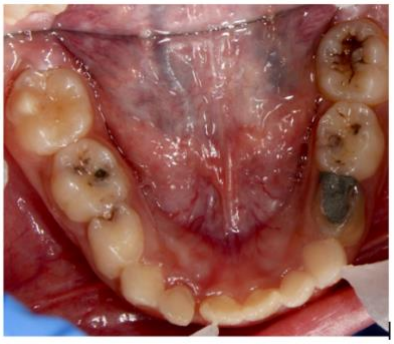

Fig 3. Intra-oral Photographs (upper occlusal)

Radiographic Examination: Main Dental Injury Findings: (Fig. 4,5)

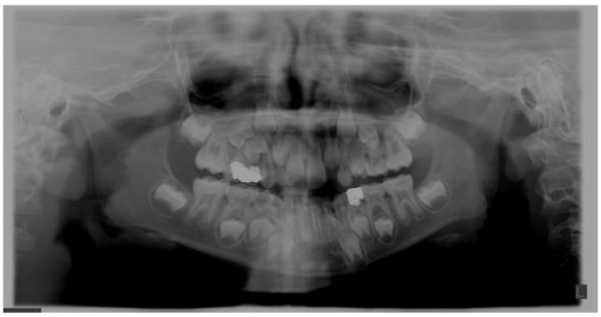

Fig 4. Orthopantomogram (Initial presentation)

Fig 5. Upper standard occlusal radiograph

- General: Normal bony outline, no alveolar/root fractures, no periapical pathology.
- **#11:** Incomplete root development with open apex, dentine-pulp fracture, widing of PDL.
- **#21:** Incomplete root development with open apex, dentine fracture, Widing of PDL.

Diagnoses

- Poor oral hygiene, generalized plaque-induced gingivitis, high caries risk with multiple carious lesions.
- **#63, #83:** Carious into enamel.
- **#65, #75, #84, #85, #36:** Carious into dentin.
- **#55:** Recurrent carious lesion.
- **#54, #74:** Internal root resorption.

- **#11**: Subluxation with complicated crown fracture.
- **#21:** Subluxation with un-complicated crown fracture.

Treatment

Initial:

- Oral hygiene instructions were given.
- Composite splint was removed.
- NiTi splint was applied from **#53 to #63**.
- **#11:** Canal was accessed, partial pulpotomy was performed, Bioceramic material was applied and tooth was restored with composite restoration.

Restorative: Carious and fractured teeth were restored; unrestorable teeth were extracted.

Follow-up:

3-Months Follow-Up: (Fig 6, Fig)

Fig 6. PA upper anterior radiograph

#11: Signs of root completion and dentin deposition, no sign of pathology

1-Year Follow-Up: (Fig 7)

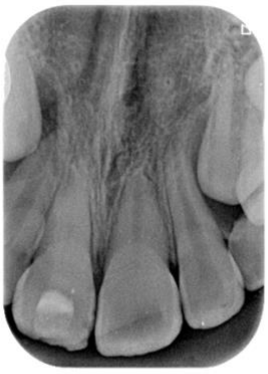

Fig 7. PA upper anterior radiograph

#11: complete root formation

DISCUSSION

TDIs are among the most common injuries in childhood and frequently affect the maxillary incisors due to their exposed position during play and sports. Crown fractures constitute the most prevalent form of TDI in permanent teeth and often involve the pulp, creating a risk for pulpal complications if not managed appropriately. Immature permanent teeth are particularly vulnerable because their open apices and thin dentinal walls make preservation of pulp vitality essential for continued root development.
Maintaining pulp vitality allows the tooth to complete apexogenesis, leading to increased root length and thickening of dentinal walls, which improves long-term prognosis.

In this case, an 8-year-old child presented with a complicated crown fracture and an immature root following a fall injury. Despite a 48-hour delay in managing exposed pulp, the tooth remained suitable for conservative vital pulp therapy.
The IADT Guidelines recommend partial pulpotomy as the treatment of choice for complicated crown fractures in immature teeth because young pulps possess strong regenerative potential even when treatment is delayed. In partial pulpotomy, the inflamed superficial pulp will be removed, while preserving the deeper, healthy tissue required for continued root development.

The positive outcome in this case corresponds with evidence from the systematic review by Cordeiro et al., which identified factors such as pulpal status, contamination control, and material selection as key determinants of pulp survival after trauma. Cordeiro and colleagues found that bioceramic materials significantly improve healing due to their biocompatibility, sealing ability, and capacity to stimulate mineralized tissue formation. The use of a bioceramic pulp covering material in this case therefore supported the biological environment needed for dentin bridge formation and root development.

The child's initial dental anxiety presented an additional challenge, as behavioural distress can complicate clinical management and compromise treatment quality. The combination of non-pharmacological behavioural techniques and nitrous oxide sedation provided the child with a safe and comfortable treatment experience.

CONCLUSION AND CLINICAL IMPLICATIONS

This case highlights that immature permanent teeth with complicated crown fractures can be successfully managed with partial pulpotomy, even when treatment is delayed. Preserving pulp vitality enabled continued root development and strengthened dentinal walls, supporting a favourable long-term prognosis. The use of a bioceramic material enhanced healing through biocompatibility and effective sealing. Clinical assessment of pulpal status, strict contamination control, and appropriate material selection remain essential for success. Additionally, employing behavioural guidance and nitrous oxide sedation helped manage dental anxiety and facilitated high-quality care. Early intervention and consistent follow-up are crucial to monitor apexogenesis and detect potential complications.

REFERENCES:

Andreasen, J.O., Andreasen, F.M. & Lauridsen, E. (2018) Textbook and Color Atlas of Traumatic Injuries to the Teeth.5th ed. Hoboken: Wiley-Blackwell.

Bourguignon, C. et al. (2021) 'International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2020 revision', Dental Traumatology, 1. Fractures and luxations. Dent Traumatol.2020 Aug;36(4):314-330.

Cordeiro, M.M., Santos, B., Louro, R. & Estrela, C. (2022) 'Factors influencing outcomes of vital pulp therapy in traumatised permanent teeth: a systematic review', International Endodontic Journal, 55(6), pp. 567–582.

Krastl G, Weiger R, Filippi A, Van Waes H, Ebeleseder K, Ree M, Connert T, Widbiller M, Tjäderhane L, Dummer PMH, Galler K. Endodontic management of traumatized permanent teeth: a comprehensive review. Int Endod J. 2021Aug;54(8):1221-1245.