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Case Report

Cvek technique in permanent upper right first incisor with traumatic pulp exposure: A case report

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ABSTRACT

Treatment of a traumatic tooth with pulp exposure is one of the most challenging. Nonetheless, advancements in adhesive dentistry and essential pulp therapy might enable professionals to handle these injuries conservatively. If the pulp gets exposed in the patient or if the condition is discovered after a long period of time, partial pulpotomy, i.e., Cvek pulpotomy, is recommended, having, 96% success rate. Calcium hydroxide, mineral trioxide aggregate, and biodentine have been used as medicaments for a long time. This case report concentrates on a naturally occurring and biocompatible alternative material, chitosan, thereby demonstrating the effective treatment of a complex crown fracture with partially exposed pulp, utilizing chitosan nanoparticles. The regeneration process was assessed clinically and radiographically. No relevant signs of failure were seen over 1 year.

Keywords: Chitosan, Complex crown fracture, Cvek technique, Partial pulpotomy, Pulpal vitality

INTRODUCTION

Dental trauma significantly impacted the social and psychological health of a patient. The anterior teeth, especially the maxillary upper incisors, are impacted during traumatic dental injuries. Complex crown fractures account for 8.5–34.5% of all severe dental trauma. Clinicians continue to face difficulties in treating this kind of traumatic fracture with pulp exposure. The traditional course of action for adult teeth had been root canal therapy. According to guidelines by the European Society of Endodontics and the International Association of Dental Traumatology (IADT), trauma to mature permanent teeth with pulp exposure should be managed with vital pulp therapy, which enhances pulp tissue healing, preserves pulp vitality, and stimulates hard tissue formation.[1] With a full pulpotomy procedure, the entire coronal pulp is removed, whereas in partial pulpotomy, only 2–3 mm of the inflamed pulp is removed. Conventionally, calcium hydroxide (CH) has been used as a medicament. Mineral trioxide aggregate (MTA) and biodentine have been recently used. Chitosan possesses antimicrobial properties, excellent hemostatic agent, is biocompatible, has no toxic effect, and increases the formation of reparative dentin.[2,3] Partial pulpotomy has advantages over complete pulpotomy: It preserves cell-rich coronal pulp tissue, which increases the likelihood of healing, and it keeps dentin deposition in the cervical zone, which may otherwise be much weaker and more brittle.[4]

The present case report follows CARE guidelines and demonstrates the pulpal response of a tooth with a complex crown fracture that underwent partial pulpotomy with chitosan as a medicament. The tooth was then observed clinically and radiographically for a maximum of 1 year.

CASE REPORT

A 22-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a complaint of traumatic injury to the upper front teeth after an accident. He reported after 12 h for treatment after the accident. Clinical examination revealed Ellis Class 2 fracture of tooth 13, Ellis Class 8 fracture of tooth 12, and Ellis Class 3 fracture of tooth 11 [Figures 1 and 2]. The patient was clinically asymptomatic and showed a normal response to the cold test, with the upper right first central incisor indicating pulp vitality. Exposed pulp can be seen with tooth 11, which is approximately 1 mm [Figure 3]. Before initiating treatment, informed consent, as per form number 527896/23, was obtained from the patient. Treatment was decided and explained to the patient. The sequential procedure followed was partial pulpotomy using chitosan, followed by glass ionomer cement (GIC) (GC Gold Label 2) and composite restoration (Ivoclar Vivadent Te-Econom Plus) with 11. Randomized controlled trial followed by post and core restoration with 12 and composite restoration with 13. After consent from the patient, tooth 11 was anesthetized using local anesthesia (Lignox 2% A). After isolation of the tooth with a rubber dam, visible pulp tissue of tooth 11 was removed using a spoon excavator [Figure 4]. Bleeding pulp was gently rinsed with saline (Biosynergy Lifecare (P) Ltd.), and a cotton moist pellet soaked with 5.25% NaOCl (HypoChlor forte) was placed to control bleeding. The cotton pellet was removed after 5–10 min. On examination, a healthy, bright-red pulp was observed without any bleeding. The exposed pulpal surface was covered with chitosan paste mixed with propylene glycol, which was gently packed using a ball burnisher [Figure 5] and covered with a layer of GIC [Figure 6]. After 1 week, the patient was recalled

Figure 1: Intraoral examination showing Ellis Class 3 fracture # 11.

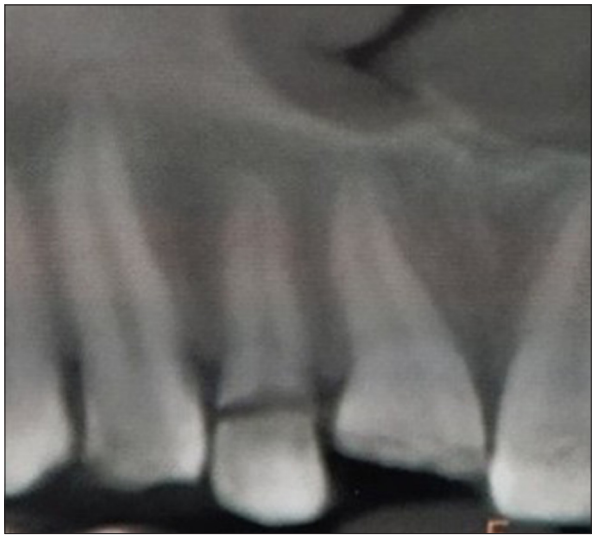

Figure 2: Radiograph showing Ellis Class 3 fracture # 11.

Figure 3: Intraoral examination showing exposed pulp #11.

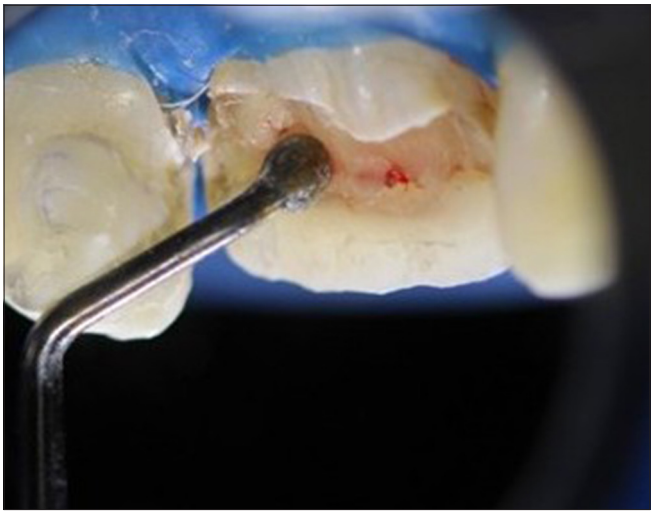

Figure 4: The exposed pulpal was removed using a spoon excavator.

for follow-up. The patient was asymptomatic to the electric pulp test. The GIC restoration was partially removed, and a composite restoration was done [Figures 7 and 8a].

The patient was recalled after 1 month [Figure 8b], 3 months [Figure 9a], 6 months [Figure 9b], and 12 months [Figure 10] to check pulpal vitality through heat and cold test and periodontal tissue health through radiograph. Radiographs showed normal peri-apical with no evidence of apical periodontitis.

DISCUSSION

About 80% of the maxillary central incisor and 16% of the lateral incisor are affected by dental trauma, which is a common incidence in dental practice.[1] According to newly revised guidelines released by the IADT, vital pulp therapy is the recommended treatment for traumatic dental injuries that must preserve remaining dental tissue and pulp vitality.[1,5] A vital pulpotomy technique is the preferred course of treatment when there is no radiographic evidence of bone degradation and no inflammatory response of radicular pulp tissue.[6] CH, MTA, and biodentine have been used in pulpotomy procedures. Evidence shows that CH leads to superficial necrosis of the pulp, degrades with time, and creates a tunnel defect beneath the dentinal bridge with poor sealing.[7] The disadvantages of MTA include tooth discoloration and a longer setting time. It also has difficulty in handling and a high cost. Biodentine has temporary post-operative sensitivity and pain, difficult handling, and limited radio-opacity.[8,9]

Chitosan is an alternative that does not cause the same local and systemic issues. For osteo-conductivity and reparative dentin, Chitosan, a naturally occurring nontoxic substance that is biocompatible, biodegradable, antimicrobial, and anti-inflammatory, can be mixed with other bioactive

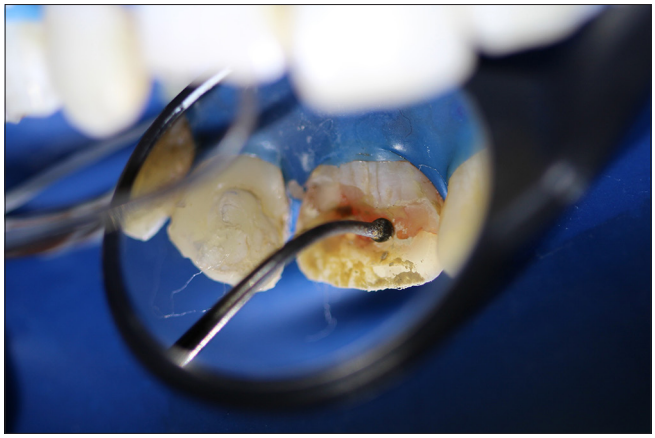

Figure 5: The exposed pulpal surface was covered with chitosan.

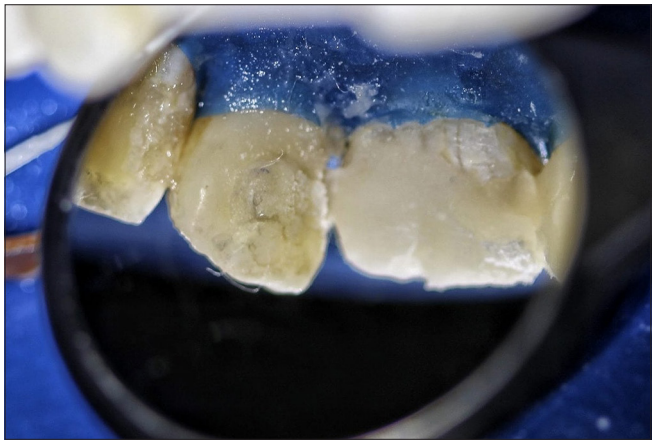

Figure 6: Chitosan was covered with a layer of glass ionomer cement.

Figure 7: Composite restoration done with # 11.

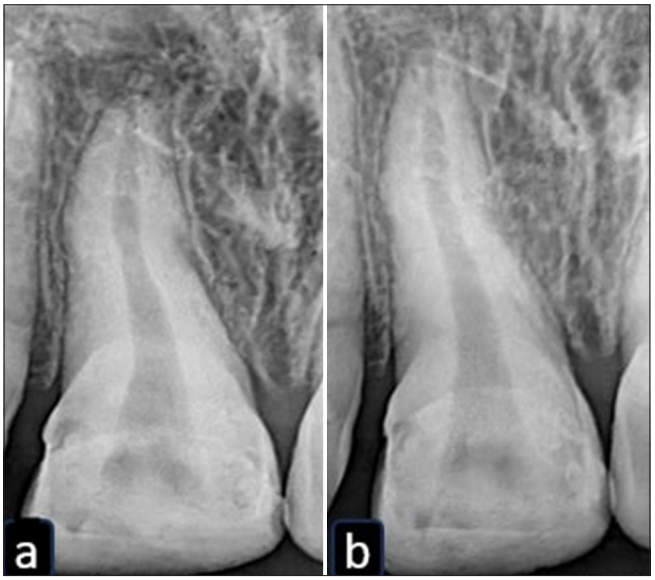

Figure 8: Radiograph showing no changes # 11 after (a) 1 week and (b) 1 month.

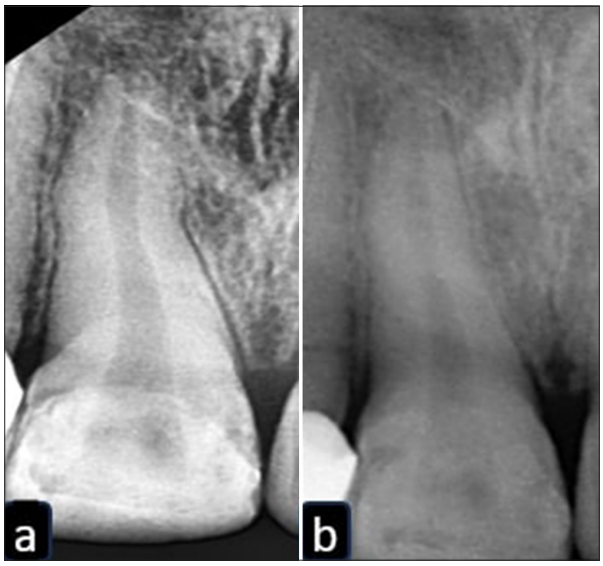

Figure 9: Radiograph showing no changes # 11 after (a) 3 months and (b) 6 months.

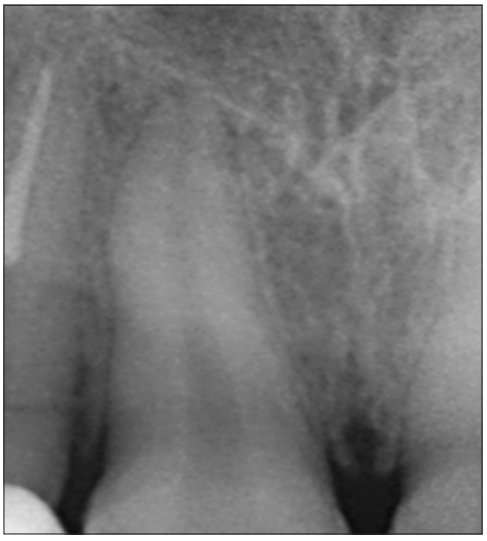

Figure 10: Radiograph showing no changes # 11 after 12 months.

substances.[10] Chitosan works better than CH and MTA, as this does not cause superficial necrosis and discoloration of the tooth.[11,12] Chitosan was chosen as the pulpotomy medicament due to the above-mentioned benefits over conventional medicaments.

Prognosis is good as the patient has not shown any clinical and radiographic symptoms for 1 year.

Clinical significance

It minimizes appointments, trauma response, and long-term costs. By focusing on conservative tissue preservation and reliable sealing, partial pulpotomy offers a high-value standard of care, facilitating ongoing patient-centered outcomes, long-term pulp vitality, function, and esthetics while decreasing the chances of complications such as pulp necrosis, infection, or structural failure. Partial pulpotomy combines biological soundness with practical efficiency, transforming traumatized immature and mature incisors into reliable candidates for conservative pulp therapy and long-term dental health.

CONCLUSION

For complicated crown fractures with vital pulps (≤4 mm exposure), partial pulpotomy provides an evidence-based, minimally invasive path to long-term pulp survival. Success depends on precise technique, prompt and adequate hemostasis, and a hermetic coronal seal. Chitosan-based nanoparticle dressings represent a promising frontier offering antimicrobial, regenerative, and aesthetic advantages that warrant further clinical investigation before widespread adoption.

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