



# Management of Bilateral Foreign Objects in Immature Permanent Maxillary Central Incisors: A Case Report

Hemant Ramesh Chourasia<sup>1</sup>

<sup>1</sup> Department of Restorative Dental Sciences, College of Dentistry, Jazan University, Jazan, Saudi Arabia

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**Address for correspondence** Hemant Ramesh Chourasia, BDS, MDS, Department of Restorative Dental Sciences, College of Dentistry, Jazan University, Jazan 45142, Saudi Arabia (e-mail: hchourasia@jazanu.edu.sa; drhemantrchourasia@gmail.com).

## Abstract

Traumatic dental injuries are more commonly seen in children and it often results in a complicated crown fracture. This case is unique as foreign objects in the form of hand-sewing needles were accidentally lodged bilaterally in both maxillary central incisors. A 13-year-old patient was referred to the Dental Clinics at the College of Dentistry, Jazan University with a complaint of broken needles in her front teeth and a history of trauma 3 years ago. Although the patient had the habit of using a hand-sewing needle to remove the lodged food particles from the open pulp chamber, she was not able to recollect the incidence of needle separations. Radiographic examination revealed radiopaque objects in the middle third of the right maxillary central incisor (#11) and in the apical third of the left maxillary central incisor (#21). Tooth #11 was clinically diagnosed as pulp necrosis with chronic apical abscess and tooth #21 as pulp necrosis with asymptomatic apical periodontitis. The micro tweezer from the broken instrument removal kit (Zumax Medical Co., Ltd., Jiangsu, China) was used to retrieve the separated needle pieces under the operating microscope. The open apices were managed by the formation of mineral trioxide aggregate apical plug, and the procedure of root reinforcement was achieved by bonded resin cement and fiber resin posts. Finally, teeth were restored with dual cure core build-up composite material and direct composite veneers. Recommendations are made to treat complicated crown fractures, especially in children on priority to minimize the risk of foreign object impaction.

## Keywords

- ▶ foreign object
- ▶ hand-sewing
- ▶ maxillary central incisors
- ▶ needle
- ▶ root canal

## Introduction

The objective of root canal treatment is to prevent and treat apical periodontitis.<sup>1</sup> The primary etiologic agents of apical periodontitis are microorganisms and their by-products that have invaded the root canal system.<sup>2</sup> Proper chemo-mechanical debridement of the infected root canal followed by obturation and coronal restoration provides a favorable

outcome of root canal treatment.<sup>3</sup> Dental trauma is a significant and common public health problem because of its frequency and socioeconomic impact. Epidemiological studies reported a 4.5% yearly incidence of dental trauma globally. Although traumatic injuries are more commonly seen in toddlers and children, approximately one-fifth of adolescents and adults are also affected. The maxillary central

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incisors are more commonly involved, mainly from falls at home or school and due to contact sports injuries in adolescents.<sup>4</sup>

In general, children are habitual to put foreign objects in the oral cavity. In the presence of a fractured crown with pulp exposure, these objects can get lodged in the pulp chamber or get pushed into the root canal or rarely into the periapical tissue of the tooth.<sup>5–10</sup> Often food gets impacted into the open pulp chamber, around the foreign object, and becomes a potent focus of infection.<sup>11</sup> The presence of foreign objects prevents the complete cleaning and shaping of the root canal system; thus, it is essential to put all possible attempts to retrieve the foreign object. It is important to have patience and apply appropriate techniques while retrieving foreign objects from the root canal and to avoid periapical surgery. To minimize the risk of foreign object impaction, complicated crown fractures should be managed as early as possible, especially in children.<sup>12</sup>

The following case report describes the successful removal of foreign objects from the root canals of maxillary central incisors by using a micro dental tweezer under the operating microscope and the subsequent management of immature young permanent teeth.

## Case Report

A 13-year-old girl accompanied by her mother was referred to the Dental Clinics at the College of Dentistry, Jazan University with a complaint of broken needles in her front teeth and a history of trauma 3 years ago. The patient admitted habitually using a sewing needle to remove the

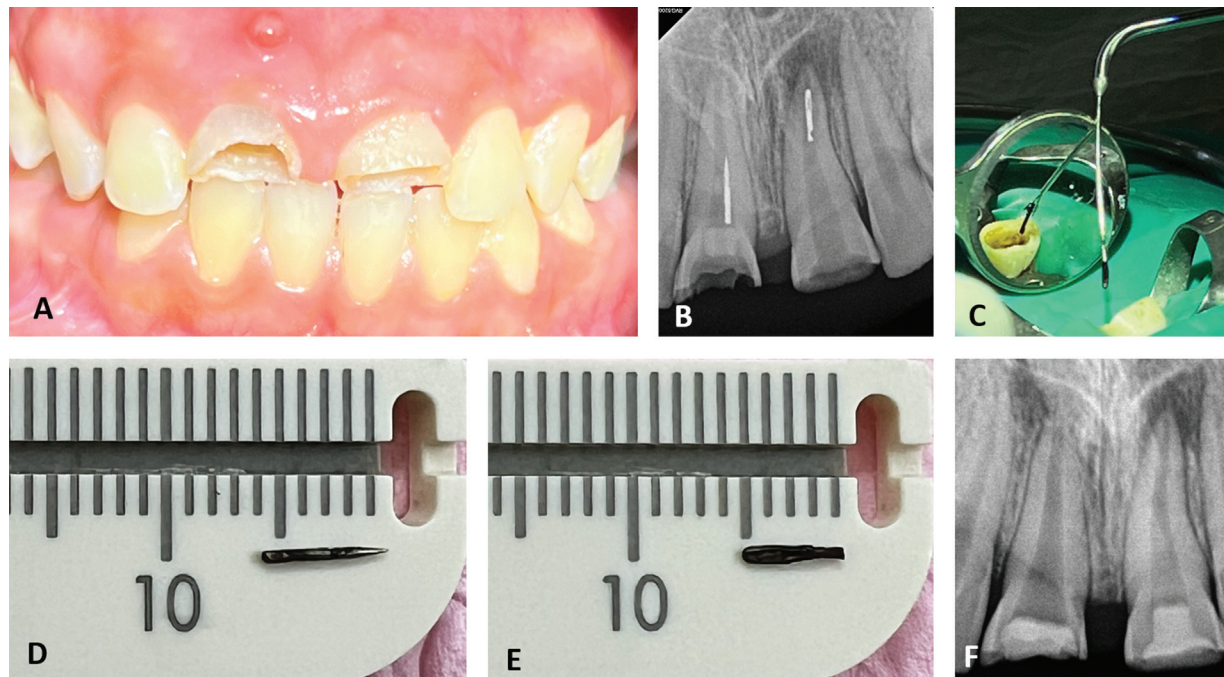
lodged food particles and relieve the discomfort. However, she was not able to recollect the incidence of needle separations. The patient had visited a private dental clinic where she had been informed about the foreign objects in the root canal of fractured maxillary incisors on radiographic examination.

Clinical examination showed complicated crown fractures on the maxillary right central incisor (#11) and left central incisor (#21). Intraoral examination revealed a sinus associated with tooth #11 (→Fig. 1A). Pulp sensibility tests showed negative responses and periodontal tests were within normal limits. An intraoral periapical radiograph showed radiopaque objects in the middle third of tooth #11 and in the apical third of tooth #21, open apices, and periapical radiolucency with both teeth (→Fig. 1B). Tooth #11 was diagnosed as pulp necrosis with chronic apical abscess, and tooth #21 as pulp necrosis with asymptomatic apical periodontitis.

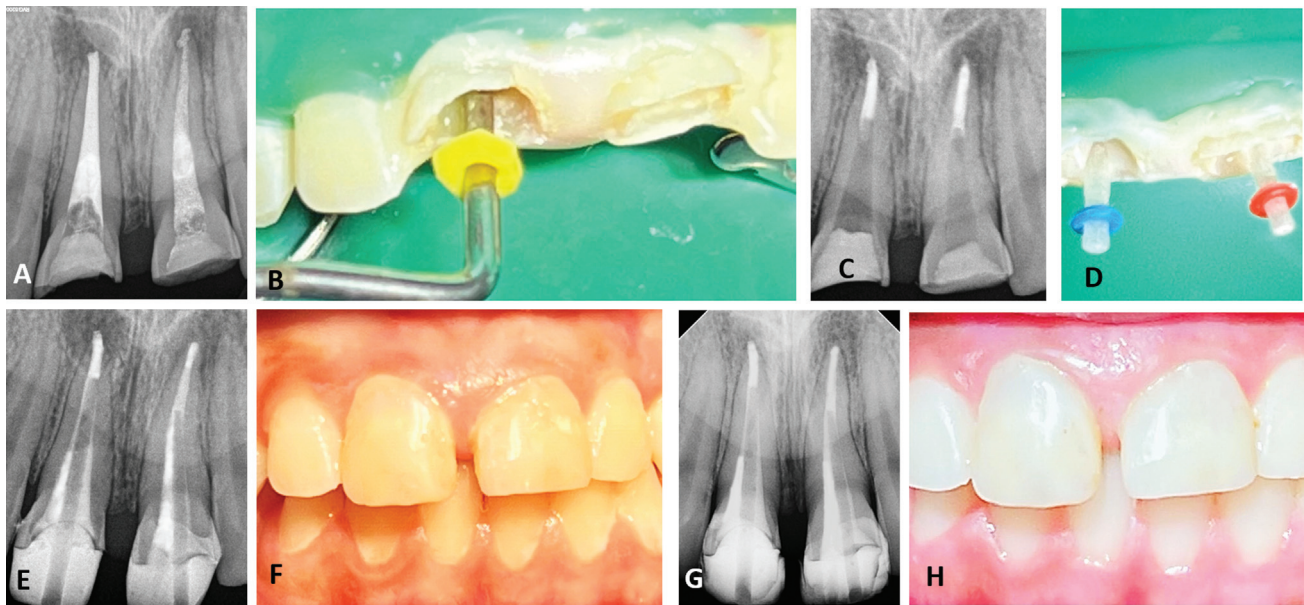
## Management

### Removal of Separated Needles

The procedure of separated needles removal was initiated for tooth #11 first followed by tooth #21. Medicaine 2% local anesthesia (LES laboratories, Medis S.A.) was administered and tooth #11 was isolated by a rubber dam. A large opened pulp chamber, filled with debris was noted. Following the complete removal of caries and loose debris, the canal was irrigated with 2.5% sodium hypochlorite. The access cavity was prepared with Endo-Z bur (Dentsply Maillefer, Ballaigues, Switzerland), and straight-line access was achieved.



**Fig. 1** (A) Preoperative intraoral image; (B) An intraoral periapical radiograph showing radiopaque objects in the middle third of tooth #11 and in the apical third of tooth #21, open apices, and periapical radiolucency with both teeth; (C) Removal of separated needle piece with the help of a micro tweezer; (D) The removed needle piece from tooth #11 (~6mm in length) identified as the tip of the hand-sewing needle; (E) The removed needle piece from #21 (~5mm in length) identified as the eye of the hand-sewing needle; (F) An intraoral periapical radiograph to confirm the removal of needle pieces.



**Fig. 2** (A) An intraoral periapical radiograph showing non-setting calcium hydroxide as an intracanal medicament; (B) Hand pluggers used to pack mineral trioxide aggregate in the apical third of the root canal; (C) An intraoral periapical radiograph showing apical plugs of approximately 5 mm thickness; (D) Cementation of fiber resin posts; (E) Postoperative intraoral periapical radiograph; (F) Postoperative intraoral image; (G) 6 months follow-up radiograph showing the formation of the trabecular pattern of bone at the apices of tooth #11 and #21; (H) 6 months follow-up image showing treated teeth maintained in normal functions in the oral cavity.

Under the operating microscope (Zeiss OPMI pico, Carl Zeiss Meditec AG, Germany) at magnification 8x, the separated needle piece was seen on the mesial wall of the root canal in tooth #11. The K- file number 15 (Dentsply Maillefer, Ballaigues, Switzerland) was used to lift the needle piece from the canal wall. The micro tweezer from the Broken instrument removal kit (Zumax Medical Co., LTD) was used to firmly grip the needle piece, and outward force was applied to remove it (► Fig. 1C). The removed needle piece from tooth #11 was approximately 6 mm in length and it was identified as the tip of the hand-sewing needle (► Fig. 1D). The canal was further irrigated with 2.5% sodium hypochlorite and the access cavity was closed with temporary filling material (MD-Temp Plus, Meta Biomed Co., LTD). Later, the procedure of separated needle removal for tooth #21 was initiated. The access cavity was prepared and straight-line access was achieved similarly to tooth #11. The tip of the separated needle piece was viewed under the operating microscope as located in a more apical position. The K- file number 15 was used around the needle piece to make it free from the canal wall. Finally, the needle piece was grasped with the help of a micro tweezer and pulled out from the root canal. The removed needle piece was approximately 5mm in length and it was identified as the eye of the hand-sewing needle (► Fig. 1E). The canal was further irrigated and closed with the temporary filling material. An intraoral periapical radiograph was taken to confirm the removal of needle pieces from both teeth #11 and #21 (► Fig. 1F).

#### Management of Open Apices

On the next visit, working lengths were determined with an electronic apex locator (Root ZX mini, J. Morita Corp., Kyoto,

Japan). Minimal instrumentation was done with K-file numbers 45 and 50 as the dentinal walls were thin. The canals were irrigated with 2.5% sodium hypochlorite and the closed-end side vent 27-gauge needles were used to prevent the extrusion of sodium hypochlorite beyond the apex. Root canals were medicated with non-setting calcium hydroxide (Metapaste, Meta Biomed Co., LTD), and the access cavities were closed with temporary filling material (► Fig. 2A). The patient was recalled after 7 days and the access cavities were re-established. Intracanal calcium hydroxide was removed with copious normal saline irrigation and canals were dried with paper points. ProRoot mineral trioxide aggregate (MTA; Dentsply/Tulsa Dental, Tulsa, Oklahoma, United States) was manipulated as per the manufacturer's instructions and carried to the apical third with the MTA carrier. Buchanan hand pluggers (Sybronendo) were used to pack MTA in the apical third of the root canal (► Fig. 2B) and apical plugs of approximately 5 mm thickness were formed. Moist cotton pellets were placed in the canal to allow the complete set of MTA and access cavities were closed with the temporary filling material. An intraoral periapical radiograph was taken to confirm the homogeneity of the apical plug (► Fig. 2C) and the patient was recalled after 24 hours to allow the complete setting reaction of MTA.

#### Root Reinforcement Procedure

Under the rubber dam isolation, access cavities were re-established and the complete set of MTA was verified with gutta-percha #80. The fiber resin posts (Mailyard fiber post, R K Enterprises, Delhi, India) of diameter 1.6 mm for tooth #11 and 1.2 mm for tooth #21 were selected. The self-adhesive universal resin cement (RelyX Unicem Aplicap,

3M) capsule was manipulated as per the manufacturer's instruction. First, the entire root canal space of tooth #11 was filled with resin cement and the selected post was cemented. A similar step of filling the canal and cementing the post was repeated for tooth #21 (→Fig. 2D). The dual cure core build-up composite material (Multicore Flow, Ivoclar Vivadent AG, Liechtenstein) was used to develop the core. Additional light curing cycles were given to allow complete curing of the dual cure composite and a postoperative radiograph was taken (→Fig. 2E). Finally, teeth were restored with direct composite veneers (→Fig. 2F).

The patient was advised to come at 6 monthly intervals as a long-term follow-up is essential to measure the treatment outcome. During the first 6 months recall visit, the radiographic examination revealed the formation of the trabecular pattern of bone at the apices of tooth #11 and #21 (→Fig. 2G); the patient had no complaints, and the treated teeth were maintained in normal functions in the oral cavity (→Fig. 2H).

## Discussion

Foreign object in the root canal hinders the cleaning and shaping of the root canal system. The literature search revealed different types of foreign objects embedded in the pulp chamber or root canal of deciduous teeth varying from metallic paper clips,<sup>5</sup> staple pins,<sup>6</sup> and in permanent teeth fractured sewing needle,<sup>7</sup> wooden incense sticks,<sup>8</sup> beads,<sup>9</sup> and stapler pin.<sup>10,11</sup> This case is unique as foreign objects in the form of hand-sewing needles were accidentally lodged bilaterally in both maxillary central incisors.

The dental operating microscope has become an integral part of modern endodontic practice.<sup>13</sup> Suter et al recommended an operating microscope as a prerequisite for the techniques used to remove the fractured instruments.<sup>14</sup> In this case, the high magnification allowed the clinician to visualize foreign objects without removing excessive tooth structure. Extensive data search revealed several approaches used by different clinicians to remove foreign objects that include the use of stainless-steel K/H files,<sup>11,15,16</sup> hollow tube-based extractor systems,<sup>17</sup> modified hollow tube-based extractor system,<sup>18</sup> Masserann technique,<sup>19</sup> modified 18-gauge needle, and cyanoacrylate glue.<sup>20</sup>

This case report utilized a novel approach to remove foreign objects without sacrificing dentin. The micro dental tweezer from Broken Instrument Removal Kit (Zumaz Medical Co., LTD.) was used to retrieve foreign objects. The microscopic tweezer has dimensions of 0.9mm × 20mm,<sup>21</sup> which was inserted into the root canal to firmly grip the foreign object and safely remove them. To preserve the available dentin, minimal instrumentation was performed and canals were irrigated using copious amounts of 2.5% sodium hypochlorite. The open apices were managed by the formation of the MTA apical plug. MTA is one of the most recommended calcium silicate-based cement for use as an apical barrier due to its biological and physicochemical properties.<sup>22,23</sup> A systematic review by Ravindran et al<sup>24</sup> reported a 100% success rate of MTA in apexification cases.

The most important factor determining the tooth's resistance to fracture is the amount of available dentin thickness.<sup>25</sup> The immature nonvital teeth are more prone to fracture than the mature teeth due to their thin dentin walls, especially in the cervical area. Carvalho et al<sup>26</sup> reported a significant increase in the structural resistance of immature teeth by the use of fiber post and composite resin and thus decreasing the risk of fracture. da Costa et al<sup>27</sup> used a customized glass fiber post instead of a conventional fiber post to restore severely damaged endodontically treated teeth and reported adequate clinical and radiographic success on a 3-year follow-up. Nikhil et al<sup>28</sup> reported a statistically better-reinforcing effect on simulated immature teeth when glass fiber post was used compared with teeth obturated with gutta-percha and sealer alone. Furthermore, Lawley et al<sup>29</sup> reported significantly greater resistance of root fracture after placement of MTA apical plug followed by an intracanal composite resin, compared with MTA apical plug followed by gutta-percha and sealer. In this, root reinforcement was achieved by filling the entire root canal space with self-adhesive universal resin cement and placing the fiber resin post. Nova et al<sup>30</sup> studied the pull-out bond strength of a fiber-reinforced composite post system luted with different self-adhesive resin cement and reported significantly higher pull-out bond strengths in the RelyX Unicem group. Furthermore, they found adequate retention of fiber-reinforced composite posts with self-adhesive resin cement even in case of its use with wider post space conditions.

The dual cure core build-up composite material was used to develop the core in this case. Rathke et al<sup>31</sup> studied six curing protocols for dual cure composite (MultiCore Flow), and recommended polymerization should always be the light initiated for adequate bonding to dentin. Although the study of Moosavi et al<sup>32</sup> reported lower bond strength of self and dual-cure composites compared with bulk-fill and conventional light-cure composites, in this case, additional light-curing cycles were given to allow the complete curing of the dual-cure composite and to improve the bond strength. Finally, the fractured crowns were esthetically restored with direct composite veneers, and the patient was kept on 6 months recall as a long-term follow-up is essential to measure the treatment outcome. During the 6 months recall visit, no abnormalities were detected and the treated teeth were maintained in normal functions in the oral cavity.

## Conclusion

This case described the successful removal of separated hand-sewing needles from maxillary central incisors by using modern instruments like a micro dental tweezer and a dental operating microscope. Open apices were managed by MTA apical plug formation, and root reinforcement was achieved by bonded resin cement and fiber resin posts. Further recommendations are made to treat complicated crown fractures in children as early as possible to minimize the risk of foreign object impaction.

## Conflict of Interests

None declared.

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