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Microsurgical removal of an invisible fractured endodontic instrument from a mandibular first molar

KEYWORDS

Endodontic
microsurgery;
Fractured instrument
removal;
Molar tooth

Root canal treatment is a dental procedure aimed at addressing severe inflammation or infection within a tooth, with the primary goal of relieving pain and preserving the tooth. However, complications can emerge during root canal treatment, one of which is instrument fracture, occurring at an incidence ranging from 0.25% to 10%.^{1–5} The removal of a fractured instrument that is visible under the operating microscope is generally considered manageable, while addressing non-visible fractured instruments presents more challenges with current techniques, often resulting in unpredictable outcomes.⁵ Here, we present a case involving successful removal of an invisible fractured instrument from a mandibular first molar.

A 24-year-old female patient presented with the chief complaint of spontaneous pain in tooth #36 for two weeks. The tooth exhibited heightened sensitivity when subjected to a cold pulp test and was accompanied by persistent, severe pain. Periapical radiograph displayed that tooth #36 had an amalgam restoration and a substantial caries lesion affecting the pulp chamber (Fig. 1A). Tooth #36 was diagnosed with symptomatic irreversible pulpitis. Root canal treatment was proposed, and the patient provided written informed consent. The procedure was undertaken by a resident student. Unfortunately, while conducting root canal preparation, there was an incident of fracture involving a nickel titanium rotary instrument in the apical region of the mesial root of tooth #36 (Fig. 1B). Attempts to remove the fractured instrument via nonsurgical means

proved unsuccessful. The patient was informed the occurrence of instrument fracture, and two options were presented for consideration: performing root canal obturation without removing the fractured instrument or undergoing surgical intervention. Opting for the former, the patient's choice prompted the completion of the root canal treatment, culminating in the restoration of the tooth with composite resin material (Fig. 1C).

During the 6-month follow-up examination, the patient reported chewing pain in tooth #36. The tooth had tenderness to percussion. Periapical radiograph exhibited a minor radiolucent area in the periapical region of the mesial root of tooth #36 (Fig. 1D). Tooth #36 was diagnosed with symptomatic apical periodontitis. Endodontic microsurgery was recommended, and the patient provided written informed consent. Under local infiltration anesthesia, a triangular mucoperiosteal flap was elevated. Subsequently, the apical part of the mesial root was exposed, and a diamond bur was employed to resect the apical root portion containing the fractured instrument. The resection surface was scrutinized using the operating microscope to confirm the complete removal of the fractured instrument (Fig. 1E). A 3-mm retrograde cavity was created using an ultrasonic tip and subsequently filled with bioceramic material. Following the closure of the surgical flap using sutures, a postoperative radiograph was obtained (Fig. 1F). After one week, the sutures were removed, and tooth #36 exhibited no symptom. At the 3-month follow-up, the tooth remained

<https://doi.org/10.1016/j.jds.2023.08.008>

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Figure 1 Microscopic photographs and radiological images of tooth #36. (A) Periapical radiograph exhibited that the tooth had an amalgam restoration, a substantial caries lesion affecting the pulp chamber and a slightly widened periodontal ligament space in the periapical area; (B) Periapical radiograph revealed that there was a fractured instrument in the apical part of the mesial root (yellow arrow); (C) Periapical radiograph showed that the tooth underwent root canal obturation followed by the restoration of the tooth using composite resin material; (D) Periapical radiograph exhibited a minor radiolucent area in the periapical region of the mesial root (yellow arrow); (E) Microscopic photograph showed that resection surface of the mesial root (yellow arrow); (F) Periapical radiograph revealed the complete removal of the fractured instrument (yellow arrow) and the obturation of the retrograde cavity with bioceramic material (red arrow); (G) Periapical radiograph at the 3-month follow-up revealed the reduction in the periapical lesion of the mesial root (yellow arrow); (H) Periapical radiograph at the 24-month follow-up displayed normal lamina in the periapical area of the mesial root (yellow arrow).

asymptomatic and there was evident reduction in the periapical lesion of the mesial root (Fig. 1G). The tooth was then restored with a ceramic crown. At the 24-month follow-up, tooth #36 remained asymptomatic, with normal lamina dura in the periapical area of the mesial root (Fig. 1H).

Declaration of competing interest

The authors have no conflicts of interest relevant to this article to declare.

Acknowledgments

None.

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Received 9 August 2023
Final revision received 9 August 2023
Available online 19 August 2023