

# Management of fractured root canal treated mandibular molar with separated endodontic instrument extending in periapical region

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## Abstract

The aim of this article is to present a case which demonstrates that debriding and disinfecting the infected, under-obtured canal of a tooth using standardized orthograde technique along with surgical retrieval of separated periapical instrument, heals the lesion of endodontic origin. Restoring the tooth with a definitive restoration involving core and crown reinstates the fractured tooth as a functional member of dental arch.

## Keywords

Lesion of endodontic origin, separated instrument, fractured crown

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## Introduction

Periapical lesion of endodontic origin in a previously treated tooth persists because of inadequate treatment such as improper cleaning, shaping, disinfection and obturation. Procedural mishaps, such as root perforations, ledges and fractured instruments, are associated with increased risk of post-treatment disease due to inability to disinfect the infected canal.<sup>1</sup>

Persistent coronal leakage through a defective coronal seal increases the size of such a lesion. The absence of reinforcing coronal restoration after endodontic treatment often leads to fracture of the involved tooth. Apical periodontitis involves periradicular inflammation and destruction of the tissues caused by etiological agents of endodontic origin.<sup>2</sup>

Instrument separation is the bothersome occurrence in root canal treatment (RCT). The intra-operative breakage of the instrument, beyond the apex, complicates the situation. The separated segment of the instrument along with bacteria and dentine debris may act as foreign body deterring the post endodontic healing. Strindberg reported 19% higher failure frequency in cases with instrument breakage compared to case without breakage.<sup>3</sup>

The purpose of this article is to present a case which demonstrates that debriding and disinfecting the infected, under-obtured canal using standardized orthograde technique

along with surgical retrieval of separated periapical instrument heals the lesion of endodontic origin. Restoring the tooth with a definitive restoration involving core and crown reinstates the mutilated tooth as a functional member of dental arch.

## Case report

A male patient aged 38 years reported to the department with complaint of pain and purulent discharge from lower right first molar and wanted to save the tooth. The tooth was treated endodontically few years back. Clinical examination revealed broken lingual half of the crown of 46 and presence of buccal draining sinus. Tooth was firm and tender to percussion. Intra-oral Peri-apical radiograph (IOPA) showed periradicular radiolucency around a resorbed mesial root and presence of a periapical broken instrument. Under-obtured root canals of both the roots were evident.

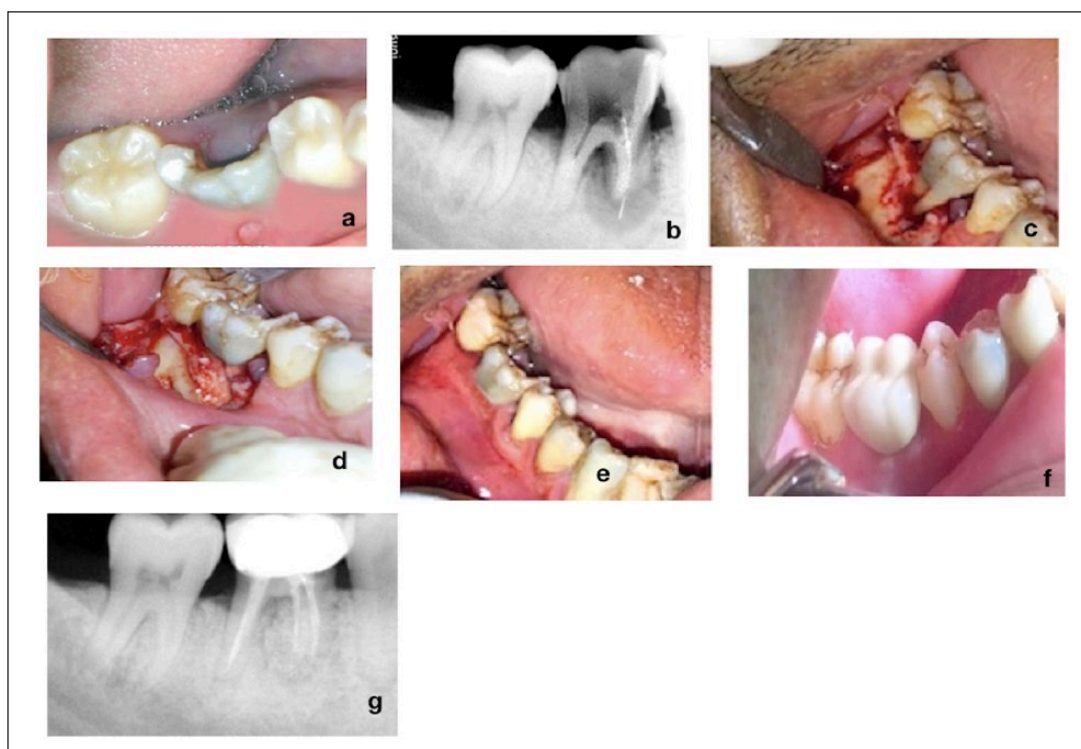
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**Figure 1.** (a) Preop photograph, (b) preop IOPA radiograph, (c) apical curettage after instrument retrieval, (d) bone graft, (e) post surgery follow-up, (f) PFM crown and (g) 1-year follow-up radiograph.

Treatment plan included root canal re-treatment, surgical removal of instrument and bone graft followed by Porcelain fused to metal (PFM) crown. Patient consent was obtained. Gutta-percha (GP) was removed using H files. Canals were instrumented using rotary K3 files and obturated by lateral compaction. After reflection of full-thickness mucoperiosteal flap, mesial root apical curettage was done. Broken instrument was removed with a mosquito forcep. Demineralized freeze-dried bone allograft was used to graft the surgical defect. Flap was re-approximated and sutured. Patient was prescribed amoxicillin 500mg/8h for 7 days, ibuprofen 600mg/8h for 3 days, and 0.12% chlorhexidine gluconate mouthwash thrice a day for 7 days. Sutures were removed after 7 days and the access-cavity was restored with composite resin. Temporary crown was placed and later replaced with PFM crown. One-year recall radiograph demonstrates uneventful healing (Figure 1).

## Discussion

Periradicular radiolucency involving root resorption of endodontic origin is a sequel of long-standing intracanal infection. Strindberg<sup>3</sup> concluded that while the presence of fractured files would always reduce the prognosis of RCT, the effect would be more profound if there was a preoperative lesion present. He surmised that prognosis would be poorer in the presence rather than in the absence of infection (i.e. a periapical radiolucency).

In a meta-analysis, Panitvisai et al.<sup>4</sup> found no significant difference in healing with or without the presence of a retained instrument, with a 95% confidence interval of  $-0.05$  to  $0.06$ . Ng et al.<sup>5</sup> in a prospective outcome study analysed the impact of fractured instruments on prognosis as an independent variable. They reported a significant difference in healing in the retreatment cases (50% healing vs 80% in primary treatment cases). Fu et al.<sup>6</sup> concluded that a failure to remove a fractured instrument reduced prognosis. Ungerechts et al.<sup>7</sup> found higher rates of success associated with teeth that had the fragments removed prior to obturation (71.4% vs 56.5%) as well as those teeth with preoperative diagnosis of vital pulps compared with those that were necrotic or previously treated (72.7% vs 58.3% vs 42.9%, respectively).

The overall level of evidence available concerning the impact of retained instrument fragments on endodontic prognosis is low. An instrument fragment, in itself, is rarely the direct cause of the problem; it does, however, limit access to the apical part of the canal, compromising disinfection and obturation.<sup>4</sup> Cujé et al.<sup>8</sup> observed that attempting to remove fractured instruments carries risks of root and root canal damage.

If bypass or removal of separated instrument will not structurally compromise the tooth, then it should be attempted because of unpredictability regarding intra-radicular infection. Otherwise, the root canal should be filled to the level of the fractured instrument and periodically reviewed to follow

progress. This conservative approach seems pragmatic due to the lack of cogent evidence to condemn the involved tooth; and obtaining higher-level evidence for, this complication, is unrealistic. Factors such as periapical lesion, canal infection, canal anatomy, fragment position and type of fractured instrument can significantly influence prognosis and the approach to management.<sup>9</sup>

In the present case, under-obtured canals and presence of separated instrument in apical area warrant orthograde retreatment and surgical intervention to retrieve instrument. Some practical problems, often encountered during periapical surgery in lower molar teeth, include proximity of the apices to the mandibular canal, difficult access to the roots due to their lingual inclination and type and thickness of the buccal plate.<sup>10,11</sup> Retrieval of separated instrument and placing bone graft in a large periradicular defect hastens the osseous healing.

Various factors influence the healing process of a periapical defect following endodontic surgery.<sup>12</sup> One of these is the presence of an intact periosteum which acts as a barrier against the infiltration of epithelial cells into the healing site. The inner layer of the periosteum is a source of osteo-competent cells. However, in large defects, the periosteum is often destroyed by the infective process.<sup>13</sup>

Healing can be appraised by various criteria to evaluate the success of the periapical surgery. The radiographic criteria of Rud et al.<sup>14</sup> include (1) complete healing: complete bone regeneration, normal or slightly increased periapical periodontal ligament (PDL) space. (2) Incomplete healing: reduced radiolucency, characterized by signs of bone healing around the periphery of the rarefaction. (3) Doubtful healing: reduced radiolucency. (4) Radiographic failure: there were no changes, or there was an increase in radiolucency.

The clinical and radiographic criteria of Von Arx and Kurt<sup>15</sup> to determine overall evolutions are (1) success: when bone regeneration was  $\geq 90\%$  and the pain and clinical scales were 0 (on a scale of 0–3); (2) improvement: when bone regeneration was between 50% and 90%, and the pain and clinical scales were 0 and (3) failure: when bone regeneration was less than 50% or there were symptoms.

In this case, according to Von Arx and Kurt's criteria, healing is successful. The tooth was rehabilitated with a definitive restoration, involving core and crown. Intact functional cusp with sound peri-cervical dentin augmented adhesive composite core and PFM crown.

### Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

### Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

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### Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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