EAS Journal of Dentistry and Oral Medicine
Abbreviated Key Title: EAS J Dent Oral Med
ISSN: 2663-1849 (Print) & ISSN: 2663-7324 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-4 | Issue-1 | Jan-Feb-2022 | DOI:10.36349/easjdom.2022.v04i01.006

Case Report

Conservative Approach for Management of Separated Endodontic Instruments: Case Reports

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Article History
Received: 19.12.2021
Accepted: 31.01.2022
Published: 27.02.2022

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: The fracture of endodontic instruments is an unpleasant occurrence that may hinder the endodontic therapy with an impact on the prognosis of the treatment. Therefore, an attempt to remove the broken file should be considered in most cases. Various techniques and modalities have been developed to facilitate the removal of the separated fragment. The orthograde method and by-pass technique are two recommended approaches with a successful outcome when managed properly. Several factors have to be considered before choosing to remove a fractured instrument. The chances of success have to overweigh the possible complications. The purpose of this article was to describe through clinical cases, the management of separated endodontic instruments with orthograde method and non-invasive technique.

Keywords: Fractured instrument, by-pass technique, ultrasonic, removal.

INTRODUCTION

Endodontic instrument separation is a frequent and potentially avoidable mishap. It's a frustrating incident for both clinician and patient. The presence of a foreign instrument in the root canal system blocks the access to the root apical third and thus compromises the effectiveness of cleaning and shaping procedures, which could impair the success of the endodontic treatment [1, 2]. As a consequence, the level of difficulty of such cases increases, while the tooth healing is challenged [3, 4].

The composition and design of endodontic instruments have been modified, with the aim of achieving a better performance and fewer undesirable complications including instrument separation. However, the advent of nickel-titanium (NiTi) alloys has not resulted in a lower incidence of instrument fracture [5, 6]. The prevalence of retained endodontic stainless steel (SS) hand instruments has been reported to range between 0.25% and 6%. While the separation rate of NiTi rotary instruments varied between 1.3% and 10.0% [4, 7]. The management strategy of broken files includes abstention, conservative approach or orthograde method, surgical management and tooth extraction. Although a variety of techniques and devices have been described and used, there is no standardized safe procedure and consistently successful for separated instrument retrieval. The selection of the management approach depends on the case selection, success -risk assessment, prognosis of the treated teeth, clinician experience and patient consent [8-10].

This paper aim's was to illustrate the conservative approach of the management of several separated endodontic instruments basing on two clinical cases.

CASE PRESENTATION

Case report 1

A 24 year old man was referred to the Department of Dental Medicine and Endodontics of Charles Nicolle Hospital of Tunis for multiple endodontic retreatments. The patient's medical history

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was non-relevant. Clinical examination revealed the presence of a temporary restoration on mandibular second left premolar tooth #35 and first mandibular left molar tooth # 36. Teeth were asymptomatic upon percussion and palpation. The preoperative radiograph showed three separated NiTi instruments in the cervical third, median third and the entrance respectively, of the mesio-buccal, the disto-buccal and distal roots of the first left mandibular molar #36 (Figure 1, a). All broken files were fortunately on a straight part of the root canal system. The diagnosis of asymptomatic apical periodontitis was retained. The following treatment plan was proposed to the patient and approved: non-surgical root canal retreatment with the attempt to remove the separated files with a conservative approach.

First, the temporary restoration was removed to gain access to the canal entrance of the mesio-buccal canal. The coronal cavity walls were finished with an Endo-Z bur (Dentsply Maillefer, Ballaigues, Switzerland) and straight line access to the instrument fragment was achieved with Endoflare ® (Micro-Mega ® Besançon, Cedex).

The access cavity was irrigated with 2.5% sodium hypochlorite solution NaOCl and the by- pass technique of the broken-file was by initiated with a hand K-file # 15 (Micro-Mega ® Besançon, Cedex) which was inserted in the root canal as far as the coronal extremity of the broken file.

A little space was created between the broken fragment and the root canal wall and then enlarged with the use of hand K-file #20 and #25. During this procedure, periapical radiograph was taken to control the progress of the instrument and prevent a possible perforation. A copious irrigation with a 2.5 % hypochlorite solution was applied during this procedure. The NaOCl was neutralized with saline solution and the access cavity was irrigated with a 17 % EDTA chelating solution. After a few trials of by-pass and alternative irrigation, the broken instrument was completely by-passed and its apical point was reached (Figure 1, b). So the apical third of the root canal system was shaped and cleaned to the full working length. Next, an ultrasonic hand piece with a K-file #15 (Figure 1, c) was introduced into the space created between the broken-file and the root canal wall and it was activated, frequently irrigated with 2.5% sodium hypochlorite solution. The procedure was carefully repeated with a minor push up and down of one mm. The fragment was then detached in the access cavity within the irrigant solution. For the broken file localized in the disto-buccal root, the same procedure was applied. However, the separated instrument was longer than the first one. After by-passing technique and ultrasonic vibration, the file was discharged from the root canal dentin wall by not completely separated outside. For that, a hand file Hedstrom # 20 was introduced in the space created by the by-pass technique alongside the instrument, which was finally retrieved by a push-up action. Finally, the third broken file within the distal root canal system was removed by a simple by-pass technique associated with the use of the ultrasonic vibration as its access was coronal (Figure 1, d).The radiographic showed complete removal of the three broken instruments. The complete shaping and cleaning of the root canal system was then achieved followed by vertical condensation obturation of warm gutta percha (Figure 1, e, f).

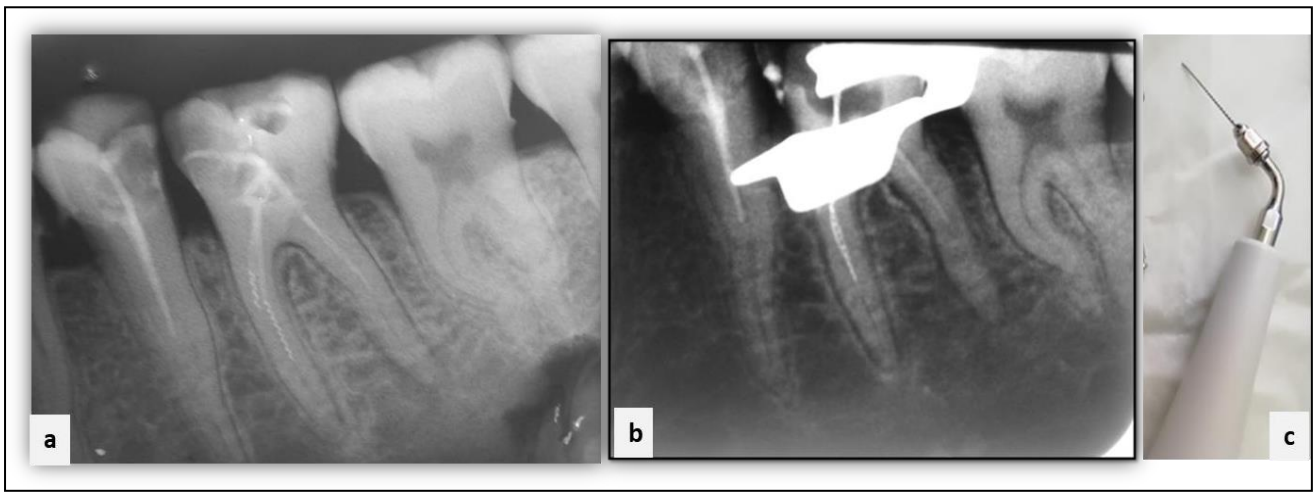

Figure 1, a: Pre-operative radiograph showing several separated instrument in tooth # 36.
Figure 1, b: Per-operative radiograph showing by-pass technique.
Figure 1, c: Ultrasonic endodontic K-file #15.

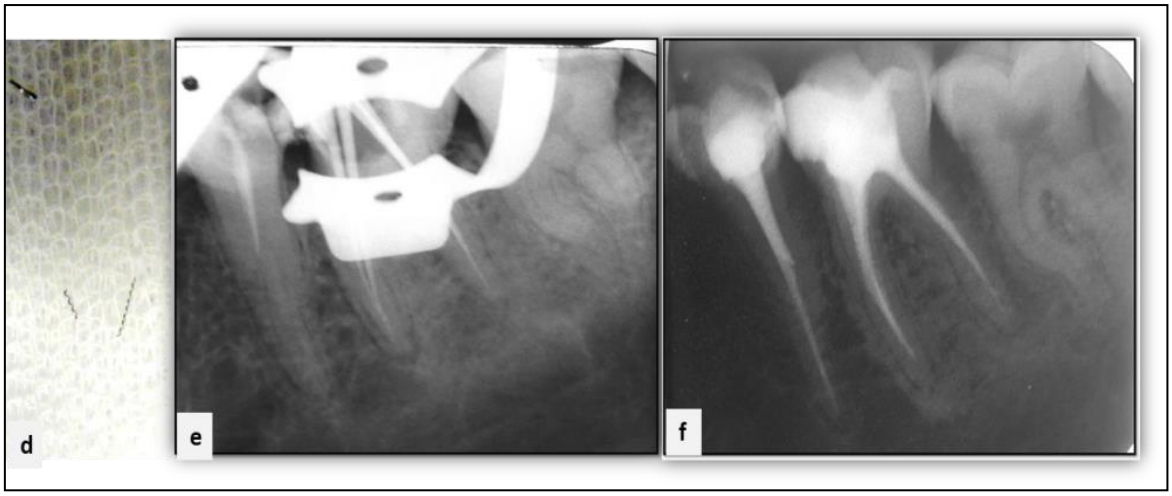

Figure 1, d: Removed separated instruments.
Figure 1, e: Working length radiographic view.
Figure 1, f: Post-operative radiographic view after root canal sealing.

CASE REPORT 2

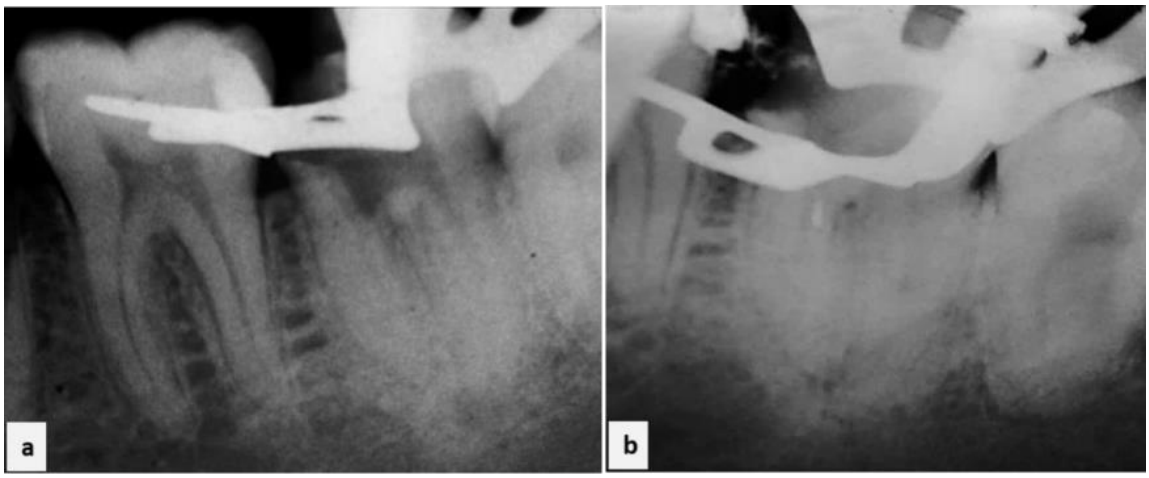

Figure 2, a: Pre-operative radiograph tooth #37.
Figure 2, b: Per-operative radiographic view: the apical part of the endodontic needle was broken in the canal.

A 40 year old female patient was reported to the Department of Dental Medicine and Endodontics of Charles Nicolle Hospital of Tunis with the chief complaint of pain in the mandibular left region. On clinical examination, we noticed the presence of a deep carious lesion on the second left mandibular molar. Basing on the clinical and radiographic findings, the diagnosis of symptomatic irreversible pulpitis on tooth #37 was retained. Conventional root canal therapy was planned. Access cavity preparation was done under local anesthesia (Figure 2, a). During the procedure of irrigation and creating the glide path, the extremity of the endodontic irrigation needle (30 GA) was separated in the coronal third of the mesio- buccal root canal. The radiographic examination confirmed the presence of the separated instrument in the mesio-buccal canal entrance (Figure 2, b). The patient was informed about the incident, the possible management strategies and complications. The mesio-buccal canal orifice was enlarged using a Gates Glidden drill up to #3. The access cavity was protected with cotton wool plug to prevent the removed segment lodging in another canal. A modified Gates-Glidden drill #3 (Dentsply Maillefer) was used to create a staging platform in order to expose 2-3 mm of the coronal most part of the broken instrument (Figure 2, c). Then, an ultrasonic insert tip (ET40, Satelec®) was placed against the head of the instrument, and activated in a counterclockwise (CCW) direction. Following the ultrasonic activation and continuous copious irrigation with a 2.5% sodium hypochlorite, the needle fragment floated on the access cavity (Figure 2, d). Chemo-mechanical debridement was then achieved followed by vertical thermo-compacting obturation technique and coronal restoration (Figure 2, e).

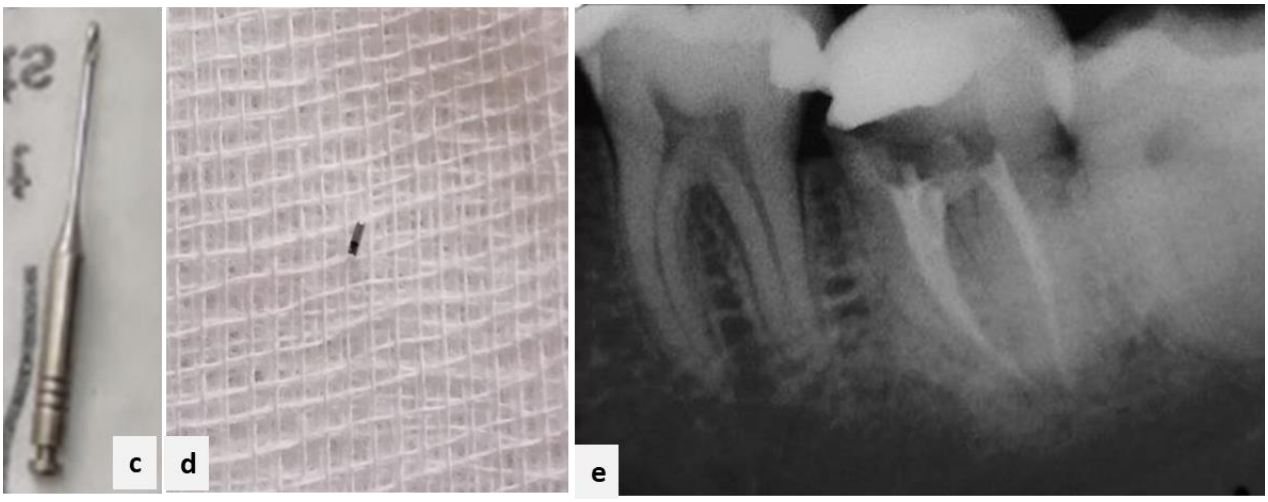

Figure 2, c: Gates-Glidden drill # 3.
Figure 2, d: Removed endodontic needle tip.
Figure 2, e: Post-operative radiographic view after root canal sealing

DISCUSSION

Separation of endodontic files during root canal treatment is a frustrating and challenging incident. The optimum management option is retrieval in order to enable sufficient cleaning and shaping of the root canal system. Several methods were described to remove broken instruments or objects within root canals. However, no gold standardized safe procedure and consistently successful instrument fracture management was reported [1, 2, 4].

The selection of the management approach depends on the case selection, success - risk assessment, prognosis of the treated teeth, clinician experience and patient consent. Management of separated instruments includes orthograde and surgical approaches.

The Orthograde or conservative approach includes removal of fractured instruments from canal space, bypass of the fractured file and if above two were not possible, then prepare and obturate the accessible part of the canal [3, 4].

Bypassing the separated endodontic instrument is a recommended technique. It is considered to be the first step towards the removal of the separated instrument fragment from the root canal as it reduces the contact between the instrument and the root dentin walls and creates a space for inserting other instruments. However, it is a very demanding technique where success depends on the clinician's sense of touch and perseverance. In addition, the success of this procedure depends on the ISO size and taper of the separated instrument and the section of the root canal system [1, 2, 6, 11].

The clinical application of the ultrasonic method allows detaching the file from the surrounding dentin wall. In the first present case, the separated instruments were successfully removed using the association of the two described techniques. The second case was well managed using the Ruddle technique, during which a modified Gates Glidden drill was used to create a flat platform in the dentin that surrounds the coronal edge of the separated instrument, before the use ultrasonic insert [1, 3, 8, 10].

The success of the removal depends on several factors: the tooth position and the root canal with the instrument; the root canal shape, diameter and curvature; the thickness of the dentin wall; the type, length and location of the fragment within the canal; the status of the periapical and periodontal tissues. Favorable factors are straight canals, incisors and canines; localization before the curvature; length of fragment of more than 5 mm; localization in the coronal or mesial third of the root canal; reamer or lentulo spirals; and hand NiTi K-files [3, 6, 8].

The prognosis of a tooth with a separated file depends on the moment of separation, the status of the periapical and periodontal tissue and the prognosis of the treated teeth. The removal of a broken instrument from the root canal must be performed with a minimum of damage to the tooth and the surrounding tissues. The patient needs to be informed of the associated risks and the appropriate referral made.

If the separated file is retained, a periodic radiographic and clinical follow up is necessary to prevent further complications [1, 3, 6]. Surgical management could be indicated in case of failure of conservative technique.

CONCLUSION

Various techniques of management of separated instruments are available. Conservative procedure should be the first attempt. As removal of a fractured file is associated with considerable risk, the selection of the technique should be discussed basing on the case selection and the patient consent.

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Cite This Article: Souha yahia, Rym Mabrouk, Jihène Ghabri, Afef Oueslati, Nadia Frih (2022). Conservative Approach for Management of Separated Endodontic Instruments: Case Reports. *EAS J Dent Oral Med*, *4*(1), 36-40.