

CASE REPORT

Separated Instruments - Smart Management

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ABSTRACT

When a file fractures during root canal treatment there are several treatment options available to the clinician. When an instrument fractures in the root canal system a decision have to be made to bypass or remove the fragment, the choice being based on an assessment of the potential benefit of removal compared with the risk of complication. The factor taken into consideration was to use radiographs to define the location of the fragment in accordance to the curvature. Since radiographs give us a two-dimensional picture, we have also considered the idea of Nevares *et al.*,^[12] to do this clinically rather than radiographically. According to this idea, fragments, which can be visualized under magnification without the necessity of root canal straightening, are located before the curve. All the rest are inside/beyond the curve. The main purpose of the clinical work was to treat the patient successfully, and treatment has not been modified to suit the aim of the article.

Keywords: Endodontic mishap, Procedural accident, Retrieval, Separated instrument.

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INTRODUCTION

Early morning, started with a routine endo case. You are feeling pretty good about the end you're doing. You found all the canals, the cleaning and shaping are going well, and all of a sudden you feel a bind, slight snap, and your rotary file continues to spin effortlessly. You get a sinking feeling in your stomach, stop, pull the file out, and notice that your 25 mm file is now measuring 20 mm. Verification through radiograph confirms the inevitable, and now you have to tell the patient that he has a separated file in his tooth [Figure 1]. Now what?

The separation of an endodontic instrument instantly transforms a case, from whatever level of difficulty it

was preoperatively, to a new level of severity by altering the outcome of cleaning, shaping, and filling of the canal.^[1-3] The aim of the article is to evaluate some of the factors that cause files to break, how can separation be prevented, and what are the options post-file separation?

The consequences of file separation are significant because separation prevents access to the apex, accompanying uncleaned and unfilled spaces within the root canal system^[4,5] as well as unnecessary removal of excess dentin during removal procedures, which otherwise would not be required had separation not occurred in the first place. This removal of dentin can predispose a clinical case to perforation, root fracture, and difficulty in locating canals even if the file fragment is removed. In such cases, prognosis following an endodontic therapy depends on the condition of the root canal (vital or non-vital), tooth (symptomatic or asymptomatic and with or without periapical pathology), level of cleaning and shaping at the time of separation, and the level of separation in the canal; affecting the final outcome of the endodontic therapy^[6] and is generally lower than with normal endodontic treatment.^[7]

There are two possible outcomes that may be encountered when treating such cases:

1. Retrieval of the separated fragment
2. Bypass and sealing the fragment within the root canal space.

Over the period of time, we encountered such cases and did the following case studies:

CASE REPORT 1

Retrieval

Success of retrieval depends on the canal anatomy, what type of metal the piece is made out of, the location in the canal of the fragment, the plane in which the canal curves, the length of the separated fragment, and the diameter of the canal.

A 36-year-old female reported with a chief complaint of pain in left lower back tooth region for last 2 days. Pain was sharp, severe, and aggravated on taking hot and cold foodstuffs. Clinical examination revealed carious lesion on the distal aspect of mandibular first molar, a decision to do root canal treatment was taken. Root canal treatment was initiated under rubber dam isolation. Three canals were located and negotiated with

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size 8, 10, and 15 stainless steel K-file. Working length was determined using apex locator (Raypex 5, VDW). Cleaning and shaping were initiated with Rotary NiTi Revo S files (Micromega, France) under copious irrigation with 5.25% sodium hypochlorite. During preparation of the distal canal, approximately 2 mm of #15 K file fractured which was located in the apical third region. A radiograph was taken to confirm the instrument separation. Following this event, the patient was informed about the fractured instrument, and the preparation of the rest of the canals was continued. Mesiolingual and mesiobuccal canals were prepared with SC2 Revo S file (MicroMega, France). The separated instrument in the distal canal was bypassed successfully with a #10 K file. During subsequent preparation, the instrument was retrieved with the SC2 file. The preparation was continued up to SU Revo S file. All the three canals were then dried with paper points and obturated with corresponding Gutta-Percha and sealer using warm vertical compaction, and a post obturation restoration was done with composite. The patient was recalled for follow-up at 1, 6, and 12 months [Figure 2].

CASE REPORT 2

Bypassing a File

Inserting a fine file between the fragment and root canal wall may lead to negotiating the canal to full working length and enable thorough instrumentation, and root canal obturation with the fragment remaining *in situ* is known as file bypassing.

Incorporating the fragment in the root canal obturation material considerably improves the case prognosis.^[8]

A 28-year-old female patient visited with a dull pain in the right lower back region for the past 1 month. Radiographic examination revealed dental caries in the right lower 1st molar tooth. After elaborate history taking and thorough clinical examination, it was diagnosed that tooth had dental caries with chronic irreversible pulpitis. Root canal treatment was performed as follows: Access opening was done, and working length was determined. During cleaning and shaping, a #25 stainless steel K-file was separated in the distolingual canal of the treated tooth. A radiograph was taken to confirm the level of separation of the instrument. The instrument was found to be separated at the apical 3rd of the mesial canal. On clinical examination, there was no tenderness, mobility, or swelling. However, as the broken file was there within the canal and there was no periapical pathology, a nonsurgical file bypass technique was selected for this case. During canal preparation, a block was found in a distolingual canal. The

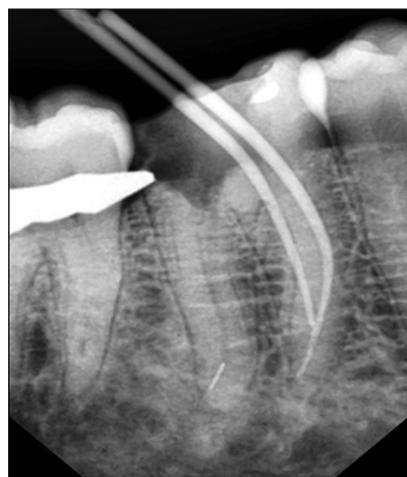


Figure 1: Separated instrument in the distal root



Figure 2: Case report 1 - Retrieval of the broken file



Figure 3: Case report 2 - Bypassing the broken file

remaining canals had no blockage. With glide path, the fragment was tried to loosen with pre-curved #8 file and then inserted the file slowly and carefully into the canal and tried to negotiate past the fragment in between dentinal wall and broken instrument thus avoiding placing the instrument directly on top of the broken file. Once

there was a feeling of a sticky spot, the file was not removed at that point. A small in and out movement along with copious irrigation of the root canal was done. The patency of the canal was found with #10, and at that position, a working length measuring radiograph was taken. Chemomechanical preparation of all canals was done using 2 shape rotary files (Micromega, France). The canals were then filled with gutta-percha cone and sealer with warm vertical compaction technique. Final radiograph was taken. The patient was advised for follow-up at 1, 6, and 12 months [Figure 3].

DISCUSSION

The aim of the article is to demonstrate as to when an ultrasonic technique should be used for retrieval and when should a bypass be done for managing separated instruments located beyond the root canal curvature.

First, we would like to discuss the definition "fragments, located inside the root canals' curvature." Hülsmann and Schinkel,^[9] as well as Shen *et al.*,^[10] and Ward *et al.*^[11] used radiographs to define the location of the fragment in accordance to the curvature. In the present study, we have accepted the idea of Nevares *et al.*^[12] To do this clinically rather than radiographically. According to this idea, fragments, which can be visualized under magnification without necessity of root canal straightening, are located before the curve. All the rest are inside/beyond the curve. Although it was suggested that the retention of the fractured instrument did not affect prognosis, it is logical to assume that the fragment will compromise chemomechanical cleansing, working length control, and root canal filling.^[13-15] Conversely, it can be argued that retaining the fragment where appropriate is a less destructive option, conserving tooth substance, time, and money.

CONCLUSION

When an instrument fractures in the root canal system a decision has to be made to leave or bypass the fragment, the choice being based on an assessment of the potential benefit of removal compared with the risk of complication. The interests of the patient are paramount in this decision as they may opt to have the tooth extracted for reasons such as anxiety, time, and finance.

- As removal of a fractured file is associated with considerable risk, bypassing the fragment should be considered, bypass shows significantly lower success rates than ultrasonics, but in cases of lack of visibility to the fragment, it is the only alternative.

- The removal of files can be expensive in terms of time and equipment, and therefore a cost-benefit analysis of the treatment should be considered before selecting a definitive treatment for the patient.
- True blockage also does not mean automatic failure. If the bulk of the canal space has been soaking in full strength sodium hypochlorite, and the critical concentration of bacterial contaminants within the canal is sufficiently reduced, the body may heal around this root as well.

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