

Bypassing separated files in the apical third: A case series using the same technique

Ricardo **MACHADO**¹

Eduardo Donato Eing Engelke **BACK**²

Luiz Fernando **TOMAZINHO**³

Emmanuel João Nogueira Leal **SILVA**⁴

Luiz Pascoal **VANSAN**⁵

doi: <http://dx.doi.org/10.1590/2178-3713.4.3.076-080.oar>

ABSTRACT

Introduction: The incidence of fractured files remains a frequent challenge in Endodontics. Regardless of the type of instrument, its complete removal would be ideal so as to perform better cleaning and shaping. As this is not always possible, bypassing procedures are good alternatives, especially when these files are located in the apical thirds. **Objective:** The aim of this paper is to report a series of cases detailing the process of bypassing fractured files. **Methods:** In three cases, a new safe

technique is presented for bypassing fractured files in the apical thirds. **Results:** The new technique was able to bypass the fragments without deviation, perforations or dentin damage. **Conclusion:** Based on the final results, the new technique proved to have potential to be used safely while avoiding the incidence of accidents during bypassing of fractured instruments in the apical thirds.

Keywords: Endodontics. Dental instruments. Techniques.

¹Professor, Postgraduate program in Endodontics, Hermann Institute. Professor of Multidisciplinary Clinics I (Endodontics), Paranaense University (UNIPAR).

²Professor, Postgraduate program in Endodontics, Hermann Institute.

³Professor of Multidisciplinary Clinics I and II and Integrated Internship II (Endodontics), UNIPAR.

⁴Professor of Endodontics, University of Grande Rio (UNIGRANRIO).

⁵Professor, Department of Restorative Dentistry, School of Dentistry — University of São Paulo/Ribeirão Preto.

How to cite this article: Machado R, Back EDEE, Tomazinho LF, Silva EJNL, Vansan LP. Bypassing separated files in the apical third: A case series using the same technique. *Dental Press Endod.* 2014 Sept-Dec;4(3):76-80. DOI: <http://dx.doi.org/10.1590/2178-3713.4.3.076-080.oar>

» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

Submitted: February 20, 2014. Revised and accepted: February 27, 2014.

Contact address: Ricardo Machado
Rua Anibal Gaya, 898 – Casa 14 – Centro,
CEP: 88.370-506 – Navegantes/SC – Brazil
E-mail: ricardo.machado.endo@gmail.com

Introduction

During endodontic treatment or retreatment, instruments might fracture within the root canal. Clinical studies have reported the incidence of this complication in a range that varies from 0.39% to 5%.^{2,7} In a systematic review, Panitvisai et al⁶ assessed the prognosis of teeth after instrument fracture during endodontic therapy and found no statistically significant difference in the healing rates of teeth with and without retained instrument fragments. However, the odds of treatment failure are higher when fragments prevent a thorough cleaning and shaping of the entire canal system.^{3,10,12}

Therefore, regardless of the type of fractured file, its complete removal would be ideal to perform better cleaning and shaping. As this is not always possible, bypassing procedures are good alternatives.^{1,5}

Thus, the aim of this paper is to report a series of cases detailing the process of bypassing fractured files in the apical third using a new technique.

Case I

A 37-year-old caucasian male patient was referred for endodontic treatment of tooth #27 after an episode of irreversible pulpitis and emergency intervention (Fig 1A).

He reported spontaneous acute pain before endodontic access performed by the referred professional. Clinical analysis revealed no periodontal involvement and thermal tests were not performed because access had already been carried out.

After nerve block with 4% articaine and epinephrine 1:100.000 (Articaine – DFL Indústria e Comércio Ltda., Rio de Janeiro, Brazil), the coronal seal was removed with 1016 HL spherical burs (KG Sorensen, Barueri, Brazil) and access was performed by means of Endo Z and 3083 burs (KG Sorensen, Barueri, Brazil) founding only three orifice canals. After rubber dam positioning and cleaning of the operative field with 2.5% sodium hypochlorite (Fórmula & Açã, São Paulo, Brazil), the cervical and middle thirds were prepared with SX, S1 and S2 files (Dentsply/Maillefer, Ballaigues, Switzerland). Subsequently, the working length of the distobuccal (DB) and palatal (P) canals was determined by using a 15 K-FlexoFile and a 20 K-FlexoFile (Dentsply/Maillefer, Ballaigues, Switzerland), respectively, mounted on an electronic apex locator (Diagnostic Elements Apex Locator — SybronEndo,

Orange County, USA). During this process, in the mesiobuccal (MB) canal, a 15 K-FlexoFile (Dentsply/Maillefer, Ballaigues, Switzerland) was fractured. This occurrence was confirmed radiographically (Fig 1B). Instrumentation of DB and P canals was performed following the principles of the crown-down technique using 2.5 ml of 2.5% sodium hypochlorite (Fórmula & Açã, São Paulo, Brazil) at each change of files up to files 35 and 40/04 (Dentsply/Maillefer, Ballaigues, Switzerland), respectively.

With the aim of bypassing the fractured instrument, a 15 K-File (Dentsply/Maillefer, Ballaigues, Switzerland) had its tip cut in an angle of approximately 45 degrees so as to make it active. Subsequently, a chelating solution of 17% EDTA (Fórmula & Açã, São Paulo, Brazil) was applied to the canal and maintained there for about three minutes. From this point on, a pre-curved sectioned instrument was introduced up to the cervical segment of the fractured file and introduced laterally by means of longitudinal and rotational movements. After the process of bypassing, the working length was determined and instrumentation was performed as described above.

After instrumentation, a chelating solution of 17% EDTA (Fórmula & Açã, São Paulo, Brazil) was applied for three minutes, followed by irrigation with 5 ml of saline solution (Fórmula & Açã, São Paulo, Brazil). The canals were then dried with sterile paper points (Tanari, São Paulo, Brazil). Filling was performed by means of the Tagger's hybrid technique and AH Plus sealer (Dentsply DeTrey, Konstanz, Germany). Temporary sealing was made with Cimpat (Septodont, São Paulo, Brazil).

In the following visit, after nerve block with 4% articaine and epinephrine 1:100.000 (Articaine – DFL Indústria e Comércio Ltda., Rio de Janeiro, Brazil), rubber dam positioning and cleaning of the operative field with 2.5% sodium hypochlorite (Fórmula & Açã, São Paulo, Brazil), the temporary restoration was removed with 1016 HL spherical burs (KG Sorensen, Barueri, Brazil), followed by removal of the partial filling from the palatal canal using Gates Glidden drills (Dentsply/Maillefer, Ballaigues, Switzerland), fiber glass post proof (Fiberpost - Angelus, Londrina, Brazil), cementation with resin cement – Rely X (3M Brazil Ltda., Sumaré, Brazil) and definitive restoration with Z250 composite resin (3M Brazil Ltda., Sumaré, Brazil) (Fig 1C).

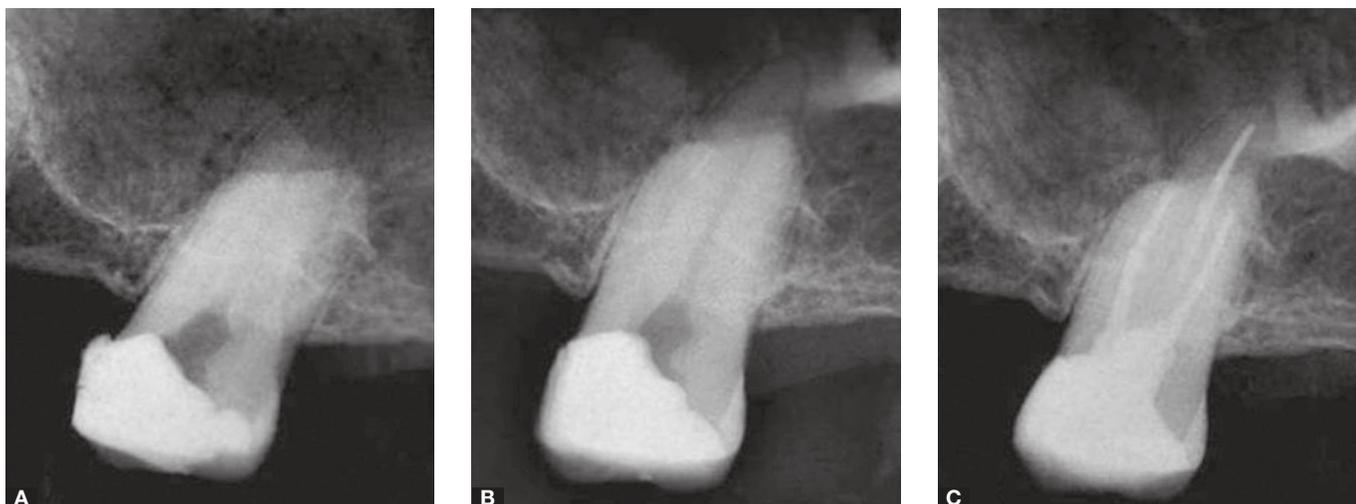


Figure 1. **A)** Initial radiograph; **B)** Fractured file in the mesiobuccal canal; **C)** Final radiograph.

Case II

A 57-year-old male caucasian patient was referred for an emergency procedure. The patient had spontaneous acute pain in the region of tooth #46 relieved with cold compression. Clinical analysis revealed extensive carious tissue without evident periodontal damage. Radiographic examination confirmed the proximity of the carious tissue to the coronal pulp. These features were sufficient to establish a diagnosis of irreversible pulpitis.

After nerve block with 4% articaine and epinephrine 1:100.000 (Articaine - DFL Indústria e Comércio Ltda., Rio de Janeiro, Brazil) the caries was removed and access to the pulp chamber was performed with 1016 HL spherical burs (KG Sorensen, Barueri, Brazil). Completion of access was performed with Endo Z and 3083 burs (KG Sorensen, Barueri, Brazil) and only three orifice canals were found. After rubber dam positioning and cleaning of the operative field with 2.5% sodium hypochlorite (Fórmula & Ação, São Paulo, Brazil), the cervical and middle thirds were prepared by means of SX, S1 and S2 files (Dentsply/Maillefer, Ballaigues, Switzerland). The working length was determined by using a 15 K-FlexoFile mounted on an electronic apex locator (Diagnostic Elements Apex Locator — SybronEndo, Orange County, USA). During this procedure, the instrument was fractured in the distal canal (Fig 2B). Instrumentation of mesial canals was performed by means of the crown-down

technique with 2.5 ml of 2.5% sodium hypochlorite (Fórmula & Ação, São Paulo, Brazil) at each change of instrument up to files 35 and 40/04 (Profile System - (Dentsply/Maillefer, Ballaigues, Switzerland), respectively).

With the aim of bypassing the fractured instrument, a 15 K-File had its tip cut in an angle of approximately 45 degrees so as to make it active. Subsequently, a chelating solution of 17% EDTA (Fórmula & Ação, São Paulo, Brazil) was applied to this canal and maintained there for about three minutes. From this point on, a pre-curved sectioned instrument was introduced up to the cervical segment of the fractured instrument and introduced laterally by means of longitudinal and rotational movements.

After bypassing, the working length was determined and instrumentation was performed as described above, up to file 45/04 (Profile System - (Dentsply/Maillefer, Ballaigues, Switzerland).

After instrumentation, a chelating solution of 17% EDTA (Fórmula & Ação, São Paulo, Brazil) was used for three minutes, followed by irrigation with 5 ml of saline solution (Fórmula & Ação, São Paulo, Brazil). All canals were dried with sterile paper points. Filling was performed by means of the Tagger's hybrid technique and AH Plus sealer (Dentsply DeTrey, Konstanz, Germany). Temporary sealing was performed with IRM (SS White, São Paulo, Brazil).



Figure 2. A) Initial radiograph; B) Fractured instrument in the distal canal; C) Final radiograph.

Case III

A 49-year-old caucasian female patient was referred for endodontic treatment of tooth #38 for prosthetic purposes. Clinical analysis revealed the presence of an adhesive prosthesis using the referred tooth as one of the pillars. Initial radiograph showed considerable infiltration and severe curvature in the mesial root (Fig 3A).

After nerve block with 4% articaine and epinephrine 1:100.000 (Articaine - DFL Indústria e Comércio Ltda., Rio de Janeiro, Brazil), access was performed using 1016 HL, 3083 and Endo Z burs (KG Sorensen, Barueri, Brazil), intervening as little as possible in the adhesive prosthesis and following the instructions of the professional who referred the patient for treatment.

After rubber dam positioning and cleaning of the operative field with 2.5% sodium hypochlorite (Fórmula & Ação, São Paulo, Brazil), access was completed and only two orifice canals were found. Subsequently, the cervical and middle thirds were prepared by means of SX, S1 and S2 files (Dentsply/Maillefer, Ballaigues, Switzerland).

The working length was determined by means of 10 K-File (mesial canal) and 20 K-FlexoFile (distal canal) mounted on an electronic apex locator (Diagnostic Elements Apex Locator — SybronEndo, Orange County, USA). Instrumentation of the distal canal was performed by means of the crown-down technique up to files 60/04 and using 2.5 ml of 2.5% sodium hypochlorite at each change of instruments. During instrumentation of the mesial canal, a fracture of an 30/04 file (Profile - Dentsply/Maillefer, Ballaigues, Switzerland) was found and confirmed radiographically after performing temporary sealing with Cimpat (Septodont, São Paulo, Brazil).

In the following visit, with the aim of bypassing the separated instrument, a 10 K-File had its tip cut in an angle of approximately 45 degrees so as to make it active. Subsequently, a chelating solution of 17% EDTA (Fórmula & Ação, São Paulo, Brazil) was applied to the canal and maintained there for about three minutes. From this point on, a pre-curved sectioned instrument was introduced up to the cervical segment of the fractured instrument and introduced laterally by means of longitudinal and rotational movements.

After bypassing, the working length was determined and instrumentation was performed as described above up to 35/04 file (Profile System – Dentsply/Maillefer, Ballaigues, Switzerland).

After instrumentation, a chelating solution of 17% EDTA (Fórmula & Ação, São Paulo, Brazil) was used for three minutes, followed by irrigation with 5 ml of saline solution (Fórmula & Ação, São Paulo, Brazil). All canals were dried with sterile paper points. Filling was performed by means of the Tagger's hybrid technique and AH Plus sealer (Dentsply DeTrey, Konstanz, Germany). Temporary sealing was made with Cimpat (Septodont, São Paulo, Brazil).

Discussion

The incidence of fracture of different types of instruments remains a major concern for clinicians and researchers.^{1,5}

Ungerechts et al¹² conducted a study to assess the incidence, location and impact of fractured instruments for treatments prognosis. In 3854 treated canals, 38 fractured instruments were observed in different tooth groups. A higher incidence of fractured instruments



Figure 3. A) Initial radiograph; B) Fractured instrument in the mesial canal; C) Final radiograph.

occurred in the apical thirds of molars with curved and/or constricted canals.

According to Madaratti et al,⁴ fractured instruments should be addressed on the basis of scientific evidence published on the subject; however, in this same study, the authors also acknowledge the lack of effective techniques for achieving this goal.

In the three cases presented herein, we used the chelating action of 17% EDTA associated with the action of a sectioned instrument in order to create an active tip for bypassing.^{9,12} At no time, the procedure aimed at removing the instrument fragments. In not doing so, the tooth structure would be preserved and major accidents, such as deviations and root perforations, would be avoided. The incidence of these events could significantly compromise the prognosis of the cases.^{8,11}

This clinical decision is in agreement with previous studies that found that, due to the impossibility of completely removing the fragments, especially those located in the apical thirds, bypassing constitutes an important alternative.^{1,5} The current presented a safe technique targeting this goal.

Nevertheless, the aim of this paper was only to present and signal the effectiveness of the proposed technique. Further clinical studies of prospective nature are needed in order to prove its effectiveness in a more robust and systematic manner.

Conclusion

Based on the final results obtained, the new technique proved to have the potential to be used safely, avoiding the incidence of accidents during bypassing of fractured instruments in the apical thirds.

References

1. Cujé J, Bargholz C, Hulsmann M. The outcome of retained instrument removal in a specialist practice. *Int Endod J.* 2010;43(7):545-54.
2. Di Fiore PM, Genov KA, Komaroff E, Li Y, Lin L. Nickel-titanium rotary instrument fracture: a clinical practice assessment. *Int Endod J.* 2006;39(9):700-8.
3. Kerekes K, Tronstad L. Long-term results of endodontic treatment performed with a standardized technique. *J Endod.* 1979;5(3):83-90.
4. Madaratti AA, Hunter MJ, Dummer PM. Management of intracanal separated instruments. *J Endod.* 2013;39(5):569-81.
5. Nevaes G, Cunha RS, Zuolo ML, Bueno CE. Success rates for removing or bypassing fractured instruments: a prospective clinical study. *J Endod.* 2012;38(4):442-4.
6. Panitvisai P, Parunnit P, Sathorn C, Messer HH. Impact of a retained instrument on treatment outcome: a systematic review and meta-analysis. *J Endod.* 2010;36(5):775-80.
7. Parashos P, Gordon I, Messer HH. Factors influencing defects of rotary nickel-titanium endodontic instruments after clinical use. *J Endod.* 2004;30(10):722-5.
8. Ree M, Schwartz R. Management of perforations: four cases from two private practices with medium- to long-term recalls. *J Endod.* 2012;38(10):1422-7.
9. Shen Y, Peng B, Cheung GS. Factors associated with the removal of fractured NiTi instruments from root canal systems. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2004;98(5):605-10.
10. Spili P, Parashos P, Messer HH. The impact of instrument fracture on outcome of endodontic treatment. *J Endod.* 2005;31(12):845-50.
11. Tsesis I, Rosenberg E, Faivishevsky V, Kfir A, Katz M, Rosen E. Prevalence and associated periodontal status of teeth with root perforation: a retrospective study of 2,002 patients' medical records. *J Endod.* 2010;36(5):797-800.
12. Ungerechts C, Bårdsen A, Fristad I. Instrument fracture in root canals: where, why, when and what? A study from a student clinic. *Int Endod J.* 2013;47(2):183-90.