

Orthograde Endodontic Retreatment of a Tooth with Four Separated Instruments in One Root Canal - A Case Report

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Abstract

A case with four separated instruments in the MB-canal of tooth 27 was presented. The patient is a 45 years old female and was referred to us for orthograde endodontic retreatment. The Ni-Ti fragments were located beyond the root canal's curvature. First access and visibility of three of the fragments with a dental operating microscope (OPMI Pico, Carl Zeiss) was established by some straightening of the curvature. Then three fragments were successfully removed with ultrasonic K-files (EMS). Visibility of the fourth fragment could not be achieved, as it was located deep beyond the curvature of the root canal. Bypass with small sized K-files (VDW) was attempted, but was partially successful, as full working length could not be reached. Then the root canal was shaped with manual Pro-Taper Universal (Dentsply - Maillefer) and was obturated with zink-oxide eugenol sealer (Meta Biomed) and warm gutta-percha. The case will be followed up.

Keywords: Separated instruments; Dental operating microscope; Ultrasonic technique; Bypass of endodontic instruments

Abbreviations: Ni-Ti: Nickel-Titanium; ASR: Auto-stop reverse; MB: Mesio-buccal

Introduction

Separating an endodontic instrument in the root canal can influence the treatment outcome and may lead to the loss of the tooth [1]. In the past 15 years the incidence of separated instruments has raised, mainly because of the increased use of rotary nickel-titanium (Ni-Ti) instruments [2-5]. They have a lot of advantages, like maintaining the natural axis of the root canal during shaping, thus ensuring even removal of infected dentin from the root canal walls and good decontamination; reduced treatment time; reduced hand fatigue of the dentist and etc [6-8]. However, the lack of sufficient practical experience and knowledge has led to improper use of the rotary Ni-Ti instruments resulting in many procedural mishaps [4,9].

Introducing the operating microscope and new ultrasonic devices and instruments in endodontics has made treatment of hopeless teeth possible in many cases. Ultrasonic techniques uniquely allow working in the root canal under direct visibility [3, 5,10]. Thus these techniques aid to the so called "micro-tube techniques" and put them in the group of the micro-endodontic techniques [5]. Ultrasonics have good success rates in removal of fragments located in the straight portion of the root canal, but success rates drop when the fragment is inside or beyond the curvature [4,11,12]. Removing fragments from the curvature may lead to loss of considerable amount of root canal dentin and weakening or perforation of the root. That's why routine removal of fragments beyond the curvature is not advisable [4]. The following case report describes an example of several separated instruments in one and the same curved root canal.

Case Report

A 45 year old female patient was referred to the Department of Conservative Dentistry, Medical University of Sofia, Bulgaria, for endodontic retreatment of the maxillary left second molar (tooth 27). At the time of the examination, an access cavity had been prepared and

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the palatal and disto-buccal root canals had been shaped and obturated, because of irreversible pulpitis. The referring dentist had stated that he could not manage with the treatment of the mesio-buccal root canal because of some kind of obstruction in it.

The tooth was moderately sensitive to percussion and asymptomatic to palpation. The patient could not use the tooth normally, saying it had been “tender” since the beginning of the treatment. The radiograph showed no signs of periapical pathology, but there were four broken endodontic instruments in the apical portion of the mesio-buccal root canal (Figure 1).



Figure 1: Radiograph of tooth 27 - four or more fragments in MB-canal.

The microscopic examination (OPMI Pico, Carl Zeiss) at magnification 9x and 16x revealed one fragment only, that was barely visible at the side of the distal wall of the MB root canal (Figure 2). The rest of the fragments were hidden beyond the root canal’s curvature.

The treatment was initiated by modifying the access to the fragments using ultrasonic files ISO numbers 25 and 30 (Endosonores files, EMS, Switzerland). The files were used dry, and the operative field was kept clean by gently air-blowing away the dentin dust using a Stropko irrigator (Vista Dental, USA). After good access was established, three of the four fragments could be visualized (Figure 3).



Figure 2: A micro-photograph of a fragment in MB-canal of tooth 27 (Canon EOS 100D, OPMI Pico Carl Zeiss, magnification 16x).

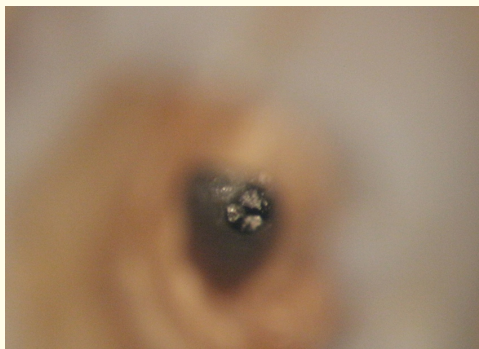


Figure 3: A micro-photograph of 3 fragments in MB-canal of tooth 27 (Canon EOS 100D, OPMI Pico Carl Zeiss, magnification 16x).

The ultrasonic files were then used to create a staging platform and remove dentin from the distal portion of the MB-canal, as it was considered to be the safest location. After some time one of the fragments, that was located most closely to the operator, became mobile and could be removed using the ultrasonic vibration. Subsequently the other two fragments could be removed using the same instruments and technique.

One more fragment was expected to be remaining in the root canal, but visible access to it seemed to be too risky. It was decided not to attempt to straighten the MB root canal more, so another radiograph was performed (Figure 4). It showed one more fragment, not very well visible, located at the apical end of the root canal.



Figure 4: Radiograph of tooth 27, showing a thin fragment remaining at the apical portion of MB root canal.

Bypass was attempted, using stainless steel hand K-files (VDW, Germany) with ISO numbers 08 and 10. EDTA cream was used during the bypass (MD-ChelCream, Meta Biomed, Korea). The procedure was partially successful and unfortunately full working length could not be reached. The root canal was shaped using the sequence of Pro-Taper Universal for hand use (Dentsply-Maillefer) and 5% NaOCl. The final shaping instrument was manual Pro-Taper Universal F3. The root canal was obturated with warm gutta-percha and ZOE-based sealer (ZOB-seal, Meta Biomed, Korea), Figure 5. The patient was then referred back to her dentist for follow up and final restoration.



Figure 5: Radiograph of tooth 27 - MB-root canal obturated.

Discussion

One important issue to be discussed is why four endodontic instruments (three of them Ni-Ti) were broken in one and the same root canal. What we suggest is that in the clinical case presented one of the instruments for glide-path broke first, without the operator noticing this. So, proper glide-path was not achieved, and the apical portion of the canal remained blocked by the fragment. That's how the tip of the first Ni-Ti rotary instrument, introduced to the full working length, was blocked and also broke-a torsional type of fracture. Unfortunately, this must have been unnoticed by the operator too, and led to the torsional fractures of two more Ni-Ti rotary instruments.

What's the conclusion - every Ni-Ti rotary instrument should be examined for a missing tip straight after use, before proceeding to the next instrument from the sequence. Also checking (verifying) the working length between the instruments can be very helpful. The torque-control system cannot prevent torsional fractures in every case [9, 13, 14, 15], so we shouldn't completely rely on it. Spanaki-Voreadi, *et al.* found that the most common mechanism of Ni-Ti rotary instruments fractures is not cyclic fatigue, but single overloading event of the instrument and momentary fracture in the root canal, even for single-use files [13].

Ultrasonic technique is revolutionary, but it only works when the fragment is visible in the root canal [4,11,12]. We think moderately curved canals can be straightened to some extent, taking the risk for perforation, but greater curvatures make ultrasonic removal of separated instruments inapplicable. Curvature straightening in general is not advocated (recommended) in literature [3-5,10,12,16].

Bypass seems to be the border line between orthograde micro-endodontics and retrograde surgical (micro-) endodontics. Being one of the oldest techniques described for management of fractured instruments, bypass is the only applicable orthograde option when the fractured segment is located beyond the root canal's curvature. Unfortunately success rates of bypass are significantly lower than success rates in cases when the fragment is visible in the root canal [17,18]. In the presented clinical case ledge is a probable reason for the impossibility to reach full working length with bypass.

It is recommended not to use rotary Ni-Ti files for canal shaping after bypass [19], because of the risk for instrument blockage and repeated fracture of torsional type. We decided to follow that advice and used the manual version of Pro-Taper Universal relying on better hand sensitivity than the endodontic motor could give us.

Conclusion

Ni-Ti rotary instruments are revolutionary but for their safe use the operator must be experienced and follow specific rules and recommendations. Even so, separating a Ni-Ti rotary instrument in the root canal may occur. The case prognosis is dependent mainly on the presence of infection in the root canal and periapical pathology, as well as on the degree of decontamination at the moment of

separation. Removing separated instruments usually requires dental operating microscope and ultrasonic devices and instruments. Even though this armamentarium gives the safest possibilities for management of separated instruments, fragments located beyond root canal's curvature are really risky to remove. Complications are connected with the necessity for straight line access to the fragment for visibility and the subsequent removal of great amount of dentin from the walls of the root canal. The only option for non-visible fragments is bypass, which gives lower success rates than ultrasonic techniques in cases of visible fragments. Prevention is the best way to manage cases with separated instruments.

Bibliography

1. Fors U and Berg J. "A method for the removal of separated endodontic instruments from root canals". *Journal of Endodontics* 9.4 (1983): 156-159.
2. Crump MC and Natkin E. "Relationship of broken root canal instruments to endodontic case prognosis: a clinical investigation". *Journal of American Dental Association* 80.6 (1970): 1341-1347.
3. Ruddle CJ. "Nonsurgical retreatment: post and broken instrument removal". *Journal of Endodontics* 30.12 (2004): 827-845.
4. Terauchi Y, et al. "Removal of separated files from root canals with a new file-removal system: Case reports". *Journal of Endodontics* 32.8 (2006): 789-797.
5. Ruddle CJ. "Broken instrument removal: the endodontic challenge". *Dentistry Today* 21 (2002): 70-72.
6. Perez F, et al. "Shaping ability of two rotary instruments in simulated canals: stainless steel ENDO flash and nickel-titanium HERO Shaper". *International Endodontic Journal* 38.9 (2005): 637-644.
7. Schäfer E, et al. "Comparison of hand stainless steel and nickel titanium rotary instrumentation: a clinical study". *Journal of Endodontics* 30.6 (2004): 432-435.
8. Shuping G, et al. "Reduction of intracanal bacteria using nickel-titanium rotary instrumentation and various medications". *Journal of Endodontics* 26.12 (2000): 751-755.
9. Pettiette MT, et al. "Procedural errors with the use of nickel-titanium rotary instruments in undergraduate endodontics". *Journal of Endodontics* 28 (2002): 259.
10. Ruddle CJ. "Nonsurgical retreatment". *Journal of Endodontics* 30.12 (2004): 827-845.
11. Shen Y, et al. "Factors associated with the removal of fractured NiTi instruments from root canal systems". *Oral Surgery Oral Medicine Oral Pathology Oral Radiology Endodontics* 98.5 (2004): 605-610.
12. Suter B, et al. "Probability of removing fractured instruments from root canals". *International Endodontic Journal* 38.2 (2005): 112-123.
13. Spanaki-Voreadi AP, et al. "Failure mechanism of ProTaper Ni-Ti rotary instruments during clinical use: factographic analysis". *International Endodontic Journal* 39 (2006): 171-178.
14. Tzanetakakis GN, et al. "Prevalence and management of instrument fracture in the postgraduate endodontic program at the Dental School of Athens: a five-year retrospective clinical study". *Journal of Endodontics* 34.6 (2008): 675-678.
15. Yared G and Sleiman P. "Failure of ProFile instruments used with air, high torque control, and low torque control motors". *Oral Surgery Oral Medicine Oral Pathology Oral Radiology Endodontics* 93.1 (2002): 92-96.
16. Ruddle CJ. "Nonsurgical retreatment". In: Cohen S, Burns RC, eds. *Pathways of the pulp*, 8th edn. St Louis: Mosby (2002): 875-930.
17. Nevares G, et al. "Success rates for removing or bypassing fractured instruments: a prospective clinical study". *Journal of Endodontics* 38.4 (2012): 442-444.
18. Li YG, et al. "Clinical evaluation on the root canal therapy bypassing intracanal separated instruments". *Hua Xi Kou Qiang Yi Xue Za Zhi* 26.6 (2008): 626-629.
19. Cohen S, et al. "Rips, Strips and Broken Tips: Handling the Endodontic Mishap". Part I: The separated instrument, *Oral Health* 5 (2005): 10-21.

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