



Management of Separated Instruments in the Root Canal - Three Case Reports

KEYWORDS

Bypassing, separated instrument, small file, warm vertical compaction.

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ABSTRACT

With the introduction of rotary endodontics in recent years, separation of endodontic instrument in the root canal is a common mishap that may occur during treatment. It may have a potential impact on the outcome of the treatment as it hinders cleaning and shaping of the root canal. Although integration of modern techniques into endodontic practice has improved the clinician's ability to retrieve separated instrument but removal may not always be possible due to many factors like poor access, visibility, location of the instrument and the amount of dentin to be removed. While keeping these factors in mind, bypassing technique is more effective and conservative. This article describes the management of three patients with separated instrument in the root canal by successfully bypassing those separated instruments.

INTRODUCTION

The primary objectives of root canal treatment are thorough cleaning, shaping and three dimensional hermetic seal of the root canal system. These objectives will be made impossible if an instrument gets separated in the canal. The success of root canal treatment declines markedly if the clinician fails to achieve the above said primary objectives. Endodontics has developed over time with the introduction of CBCT in diagnosis, dental operating microscope, ultrasonics, surgical loupes etc. Even though root canal treatment is being done under much developed conditions, mishaps like instrument separation are inevitable. Evaluation of post endodontic radiographs shows that 2-6% of the cases have separated instruments¹.

The presence of a separated instrument in the root canal leads to failure of root canal treatment. The prognosis depends on the degree of contamination of canal at the moment of instrument separation. Proper assessment should be made whether the canal can be instrumented even in the presence of fractured instrument. If the canal cannot be instrumented, a decision should be made to remove the separated instrument²⁻⁴. The probability of removing a separated instrument is directly related to visibility, i.e. whether the fragment can be visualised or not. Visibility depends on the location of separated instrument. When the fragment is inside or beyond the curvature, visibility requires straightening of root canal that may lead to unnecessary removal of dentin and thereby weakening the root structure⁵⁻⁸.

An alternative technique that does not require direct visibility to the fragment is "bypass", where a fine file is inserted between the fragment and root canal wall and thereby negotiating the canal to full working length and enable thorough instrumentation and obturation with the fragment remaining in situ. Incorporating the fragment in the root canal obturation material considerably improves the case prognosis⁹. The purpose of this article is to report three case reports in which separated instruments were successfully bypassed.

Case reports

Case report 1

A 34 year old female patient reported to my clinic with the chief complaint of sensitivity and intermittent pain in the right upper back teeth region since last 2 to 3 months. Medical history was non-contributory. Clinical examination revealed a glass ionomer cement restoration on disto-occlusal side of maxillary first and second premolar. On vitality checking using heated gutta percha (Dentsply) and cold test (Endofrost, Roeko) an intense lingering pain was noticed on maxillary first premolar. A preoperative radiograph revealed restoration on disto-occlusal side of first premolar

approaching the pulp chamber. From clinical and radiographic findings, a diagnosis of symptomatic irreversible pulpitis was made. Treatment options were discussed with the patient and endodontic therapy was the treatment of choice. The tooth was anaesthetised with 1.8 ml 2% lignocaine containing 1:200,000 adrenaline followed by rubber dam isolation. An endodontic access cavity was established. While cleaning and shaping the canals, a 15 size K file was separated in the palatal canal of maxillary first premolar at apex.

Since the fractured segment could not be visualised and was below the root curvature, bypassing was preferred over retrieval. The access cavity was filled with chelating agent - 17% EDTA (Avuprep) and a no.6 K file was introduced into the canal for searching a way to bypass the instrument. After a few tries, it was able to get the 6K file past the instrument. Working length was confirmed radiographically. During the shaping of canals, copious irrigation with 5% sodium hypochlorite and saline was performed. Patency was kept with an 8 size K file between every instrument. Shaping of buccal and palatal canals were done up to 6% 25 hero shaper.

After shaping and cleaning, calcium hydroxide (Avucal) was placed in canals and the cavity was sealed with cotton pellet and a temporary restoration was given. After 2 weeks, patient reported for the second appointment. The tooth was again isolated and temporary restoration was removed. Calcium hydroxide was removed using sterile saline solution. Canals were dried using paper points. Obturation was done using warm vertical compaction technique. Post obturation radiograph was taken. Recall visits were uneventful and the patient is still under review.



Figure 1: Pre-operative radiograph



Figure 2: Radiograph of 14 showing fractured file in palatal canal.

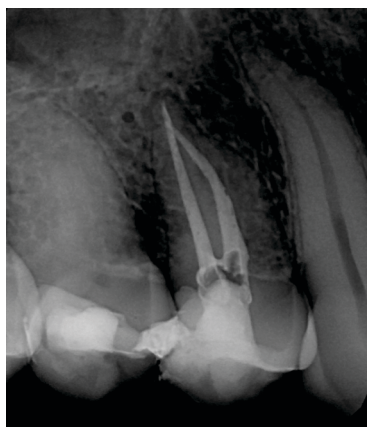


Figure 3: Post obturation radiograph after bypassing the fractured file

Case report 2

A 25-year old male patient was referred to my clinic for the treatment of left mandibular first molar. The referring dentist had already performed preliminary root canal treatment. Before starting the treatment, a new diagnostic radiograph was taken. It showed fractured instruments in the mesio-buccal and mesio-lingual canal. In the radiograph mesial root looks very thin and narrow, instrument removal would lead to unnecessary removal of dentin and thereby weakening the root structure. The decision was made to try to bypass the instrument rather than try to retrieve it. The tooth was anesthetised with 1.8 ml 2% lignocaine containing 1:200,000 adrenaline followed by rubber dam isolation. Similar procedure was followed as in case one to bypass the fractured instrument in mesio-buccal and mesio-lingual canal. Shaping of mesio-buccal and mesio-lingual canals were done upto 4%25 and distal canal upto 4% 35 Revo S rotary files (Micro Mega, France) followed by warm vertical compaction. Recall visits were uneventful and the patient is still under review.



Figure 4: Radiograph of 36 showing fractured instruments in mesio-buccal and mesio-lingual canal

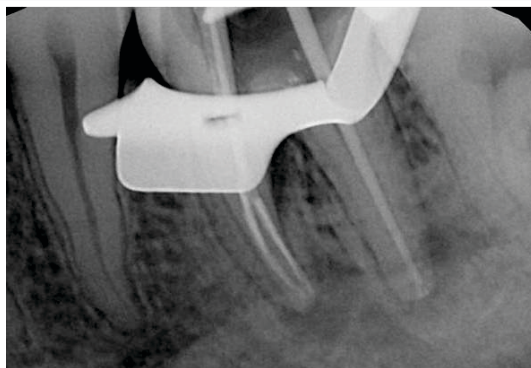


Figure 5: Master cone radiograph after bypassing the fractured instruments



Figure 6: Post obturation radiograph after bypassing the fractured instruments

Case report 3

A 25-year old male patient was referred to my clinic for the treatment of left maxillary second molar. The referring dentist had already performed preliminary root canal treatment. Before starting the treatment, a new diagnostic radiograph was taken. It showed fractured instrument in the curvature of disto-buccal root. In this case, the fractured instrument could not be visualised. The decision was made to try to bypass the instrument rather than try to retrieve it. The tooth was anesthetised with 1.8 ml 2% lignocaine containing 1:200,000 adrenaline followed by rubber dam isolation. Similar procedure was followed as in case one to bypass fractured instrument in disto-buccal root. Shaping of mesio-buccal and disto-buccal canals were done upto 4%25 and palatal canal upto 4% 35 Revo S rotary files (Micro Mega, France) followed by warm vertical compaction. Recall visits were uneventful and the patient is still under review.

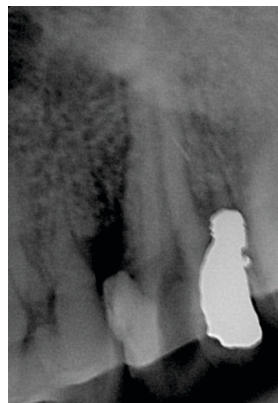


Figure 7: Radiograph of 27 showing fractured file in disto-buccal canal



Figure 8: Post obturation radiograph after bypassing the fractured file.

Discussion

The presence of a separated instrument in the root canal may lead to a failure of the treatment of the tooth. The prognosis depends on the degree of contamination of the canal at the moment of separation and the presence of apical pathology. The probability of removing a fractured instrument is directly connected to visibility – i.e. possibility to create straight line access to it. When the fragment is located inside or beyond the root canal's curvature, visibility requires straightening of the root canal to a different extent, which may lead to removing excessive amount of dentin and root weakening or even perforation⁵⁻⁸. Current information from scientific literature on the subject of broken instruments' retrieval is insufficient and mainly comprises clinical case presentations¹⁰⁻¹². In all three cases we have mentioned in this article, the separated instrument was located beyond the root curvature. Considering the relatively smaller size of the root, retrieving the fragment was not opted for treatment.

An alternative technique that does not require direct visibility to the fragment is the so called "bypass", where a fine file is inserted between the fragment and root canal wall and thereby negotiating the canal to full working length and enable thorough instrumentation and obturation with the fragment remaining in situ. Incorporating the fragment in the root canal obturation material considerably improves the case prognosis⁹.

Before bypassing a separated instrument, the clinician should examine different horizontally angulated radiographs¹³. Proper coronal access should be made before bypassing a separated instrument. Different techniques may be employed in flaring the canal coronal to an intra-canal obstruction. However, the predictable and safe way is sequential use of initially hand files, followed by Gates Glidden (GG) drills sizes 1 to 3. They should be used cautiously in approximation to the obstruction. Care should be ensured to use them away from furcation and to prevent transportation^{5,13}.

Flushing the canal system with irrigating solution facilitate flaring of the canal walls. The irrigation protocol, the delivery and sequence in which they are delivered is important to remove smear layer as well as debris¹⁴. The use of a chelating agent can facilitate removal of, or dissolve partially or totally, the debris stuck between the instrument spears and between the instrument itself and the dentinal wall.

Conclusion

The best method for managing separated instruments in the root canal is prevention of such incidences. Decision should be made whether to bypass it or to retrieve the separated instrument and it depends on various factors. Success of the treatment depends on the decision taken by the doctor. From the three cases mentioned in this article we were able to reach to a conclusion that if the separated instrument is able to be bypassed, it is more conservative than retrieving the separated instrument.

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