

Management of broken instrument by file bypass technique

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Abstract

Different devices and techniques have been developed to retrieve fractured instruments during the endodontic procedures. This case report describes the management of a broken instrument, which was accidentally broken during cleaning and shaping of the root canal in right 2nd molar tooth. A # 25 stainless steel K-file was separated in mesiobuccal canal of the treated tooth. At first, 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 and then file bypass technique was performed. Calcium hydroxide dressing was given for 7 days followed by obturation with guttapercha cone and zinc oxide eugenol sealer in lateral condensation technique. It can be concluded that bypass technique can be considered as simple and effective technique for the management of broken instrument into the root canal.

Introduction

The separation of instruments during endodontic therapy is a troublesome incident. Its incidence range varied from 2 to 6% of the cases investigated.¹ A separated instrument within the root canal may block the access to the apical terminus, which may occur from some type of file or reamer, gates-glidden or passo-drills, lentulo spiral paste-fillers, thermo-mechanical gutta-percha compactors or the tips of hand instruments such as explorers or guttapercha spreaders.² However, the most common causes for file separation are improper use, limitations in physical properties, inadequate access, root canal anatomy, and possibly manufacturing defects.³ The separated fragment blocks the access to thorough root canal cleaning and shaping procedure apical to the level or separation of irritates the periapex when it just out of the root apex. This is significant in a tooth, as it affects the final outcome of endodontic therapy.^{4,5} Among the different technique used in dentistry, safe retrieval or bypass technique can be carried out.^{6,7}

An attempt to bypass or retrieve the instrument is necessary before leaving it and obturating to the level of separation or embarking upon surgery. Instrument separation commonly occurs at the middle or apical third of the mesial canals of mandibular molars, and at the same location in the mesiobuccal roots of maxillary molars due to their root curvatures. The roots not only characteristically curve distally (in the two dimensional view, on a periapical film) but often the mesiobuccal canal curves lingually

and the mesiolingual canal curves slightly to the buccal. Furthermore, lingual and buccal curves are not visible on the film and the first clue to treatment is to look at the location of the file segment and at that point, some force acted to cause fracture of the instrument. If the canal appears straight, assume there is a curve in the plane of the radiographic beam. If there is a visible curve in the canal, assume there is a second curve that is not visible. It is, therefore, considered that file separation usually occurs during its use as if a glide path is created with stainless still instruments prior to a crown down sequence of rotary niti file use, engagement of the file on the root canal wall be minimized, thereby, reducing stress and fatigue which allow the prevention of file fracture.

When an instrument fracture occurs, the clinician needs to evaluate the separated portion radiographically and clinically.⁸ Then find the treatment options with consideration for the pulp status, root canal infection, root canal anatomy, position, size and type of fractured instrument and the amount of damage that would be caused to the remaining tooth structure.² Treatment approaches are either non-surgical that includes attempting the instrument to bypass it and then preparation and obturation of the segment or surgical and extraction.

Case Report

A 46 year old man was referred to the Department with a dull pain in the right lower



back region for the last one month. Radiographic examination revealed dental caries in the right lower 2nd molar tooth. After elaborate history taking and through 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 mesiobuccal 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 remained 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 mesiobuccal canal at 16 mm. The remaining canals had no blockage. A radiograph was taken to confirm the position of separated file in canal and then bypass technique was applied as follows: With glide path the fragment was tried to loosen with # 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 (Figure 1). Once there was a catch feel, 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 at 18 mm

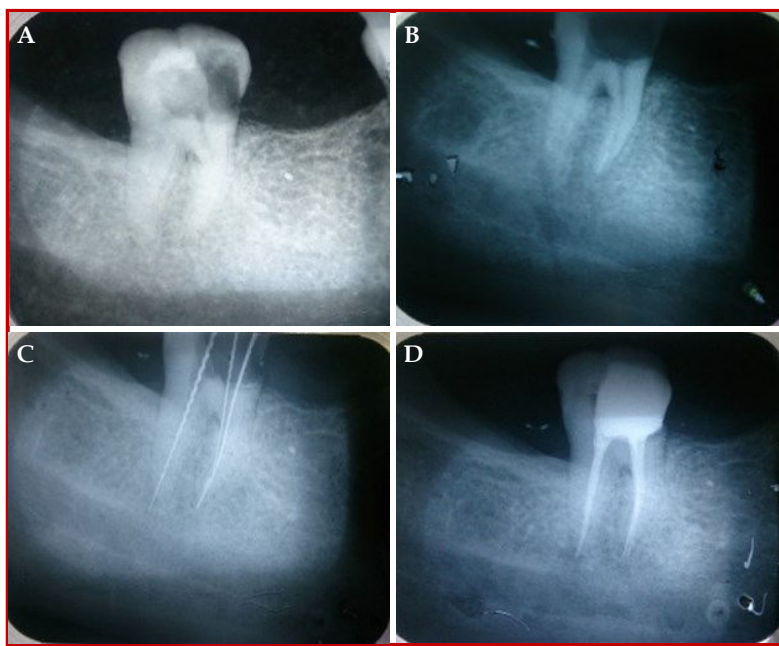


Figure 1: Radiological photographs of treatment with bypass technique followed by root canal obturation preoperative (A), broken instrument at mesiobuccal canal (B), diagnostic X-ray (C), following obturation of the canal (D)

in that position a working length measuring radiograph was taken. Chemomechanical preparation of the canal was done in standardized technique. In mesiobuccal canal, a place-pull, rotate, withdrawal movement rather than a filling motion was done. Calcium hydroxide dressing was given for 7 days. In the next visit, the canals were then filled with guttapercha cone and zinc oxide eugenol sealer in lateral condensation technique. Final radiograph was taken. Permanent restoration was done after 7 days. The patient was advised for follow-up at 1, 6 and 12 months.

Discussion

Intracanal separation of instruments usually compromise the outcome of endodontic treatment and reduce the chances of successful retreatment.^{10, 11} In such cases, prognosis is better when separation of a large instrument occurs in the later stages of preparation close to the working length. Prognosis is inferior for teeth with un-debrided canals in which a small instrument is separated short of the apex or beyond the apical foramen.^{10, 11} Although various techniques and devices for retrieving the fragment have been attempted, no standardized procedure for the successful removal of broken instrument in the root canal exists.^{12, 13}

Among the various methods used for broken instrument retrieval, a chemical method has been suggested.¹¹ In this technique, a chemical agents like iodine trichloride, nitric acid, hydrochloride acid and sulfuric acid were used to achieve intentional corrosion of the metal objects. But it may irritant to the periapical tissues when extruded through the apical foramen. Although chemical method has been used for over 30 years as a device for removing broken instruments, and a success rate of 73 and 44% has been reported regarding its use in anterior and posterior teeth respectively.¹¹ There is a high-risk of perforation in apical part of root canal.¹¹ Furthermore, they have limited application in teeth with thin roots, curved roots or in retrieving instruments which fractured apically. Moreover, the use of relatively large and rigid trephans leads to removal of considerable amount of root dentin thus weakening of the teeth or risk of perforation.⁴

In the present study, the performance of instrument fragment retrieval with bypass technique by using endodontic file along with copious irrigation was verified. It was found that this technique is simple and less invasive. Previous study has indicated that with bypass technique, there is a chance of the fragment to pushing out of the root apex that may causes periapical irritation and pathology.² However, in the present case, the fragment was bypassed and there was no apical pushing of the broken instrument and the treatment was performed with a

minimal damage to the tooth and supporting tissues. Furthermore, if the patient remains symptomatic or there is a subsequent failure, the tooth can be treated surgically. Therefore, despite the concern of both patient and dentist, the prognosis of broken instrument retrieval using bypass technique appears favorable.

Conclusion

Fracture instrument retrieval with bypass technique is an alternative method to chemical and surgical treatment.

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