Instrument retrieval from maxillary central incisor: A case report

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Abstract
Fracture of an instrument during endodontic treatment is a common procedural error which often hinders the root canal procedure and affects the outcome .The separated instrument, particularly a broken file leads to metallic obstruction in the root canal and prevents thorough cleaning and shaping procedures. There are several methods and techniques available to retrieve the separated instruments from the root canal. This article describes the successful removal of a broken instrument from the root canal of a maxillary central incisor using H-files and K-files and continuous irrigation.

Keyword: Central Incisor, Endodontic instrument, Retrieval, Cyclic Fatigue.

Introduction

A clinician may come across a variety of problems and procedural errors during the routine course of endodontic treatment, which has a direct outcome on the success of the treatment. Separation of endodontic instruments within the root canal is one of the most common occurrences that interferes with successful completion of root canal procedures and also affects the wanted outcome.[1] The rate of separation ranges from 2% to about 6% out of the reported cases.[2]

Most commonly the term broken instrument can be used for sectioned silver point, lentulo-spiral, gates Glidden drill, finger spreaders or paste fillers. These can be made of any material, most commonly being stainless steel or Nickel Titanium.

Improper use, inadequately extended access cavities, unpredictable root canal anatomy and very rarely manufacturing defects are the most common causes of instrument separation.[3] The separated fragment impedes access to thoroughly clean and shape the root canal apical to the level of separation or irritates the periapex when it juts out of the root apex. All this in turn affects the final outcome of the treatment and prognosis of the tooth.

The past decade has seen a significant rise in the incidence of separated instruments, mainly because of the increased use of nickel-titanium rotary instruments. Many factors can be attributed to the fracture of these instruments, which include operator experience, speed of rotation, degree of canal curvature, instrument design and technique, torque, manufacturing process, and most importantly absence of a well established glide path.[4] Separation rates of stainless steel (SS) instruments have been reported to be slightly less than the separation rate of NiTi rotary instruments as use of NiTi has increased steadily and mostly in untrained hands.[5]

Torsional fatigue and cyclic fatigue are the most common mechanisms involved in fracture of instruments.[6] When the instrument binds against the canal walls, torsional failure occurs and is usually associated with excessive apical force applied during instrumentation. Cyclic fatigue is more commonly caused by continuous stress applied to an instrument that has bee
n weakened by metal fatigue and when point of maximum flexure is reached, breakage occurs. This is commonly seen where the stress is greatest, most often in curved canals.

Once breakage of the instrument occurs there are 2 possible options left for treatment, either the instrument can be retrieved or it can be bypassed and make part of the obturation.

Technological advancements such as ultrasonic instrumentation, and micro tube delivery methods have not only made instrument retrival much easier but also more predictable .The use of dental operating microscope serves as a great advantage and contributes to the greater success of the treatment .At the present time, there is no standardized procedure for the removal of separated instruments. All the techniques have their own limitations and indication. The technique, which best suits the condition of the tooth and enables the best prognosis should be implemented. This paper describes a case report in which a separated file has been removed from the root canal of a maxillary central incisor using alternative H files and K files along with continuous irrigation.

Case Report

A 22 year old male patient referred to the Department of Conservative dentistry and Endodontics RDC Loni with a complain of pain in the upper front region since past 2 days. Patient gave a history of trauma 1 month ago, following an accident during which his maxillary anterior teeth were fractured.
Following the accident the patient visited a local dentist for treatment of the same. Patient was unable to complete treatment. Due to incomplete treatment patient experienced pain due to which he reported to the department.

A complete clinical investigation revealed Ellis class III fracture with 11 and 21.Access opening had been done and a temporary filling material was seen on both teeth. An IOPA was advised of the concerned region. Radiographic investigation revealed a filling material in the pulp chamber of both teeth (11 and 21). A broken instrument was seen in the apical region of 21. (Fig. 1)

Fig. 1: Preoperative IOPA

Periapical lesion was seen associated with both teeth. The patient was informed of the broken instrument and also regarding the prognosis of the tooth. Routine Root canal treatment was planned for the patient followed by crown prosthesis on the treated teeth.

After complete history taking, local anesthesia was administered to the patient. The concerned tooth (21) was isolated using rubber dam. The temporary filling material was removed. Working length was estimated on the diagnostic radiograph.

Starting with a no 6 K file an attempt was made to bypass the instrument at this working length. Progressively no 8, 10 and 15 K files were used. The files were used along with EDTA gel and copious irrigation of Sodium hypochlorite. At every step apex locator was used to check if the file had been bypassed and if the apex was reached. Once the file had been bypassed and apex was reached a confirmatory radiograph was taken.

Once the radiograph confirmed the bypass of the file uptill the apex, working length was measured (Fig. 2).

Fig. 2: Working length IOPA

Working length was measured to be 20mm.Subsequent biomechanical preparation was done using progressive files along with EDTA and Sodium hypochlorite for irrigation. When a no 40 K file was used the instrument loosened from the apex and was flushed out during irrigation. A radiograph was taken to confirm retrival of instrument. (Fig. 3)

Fig. 3: Confirmation IOPA

Complete biomechanical preparation was completed till no 70 K file followed by step back. Since the tooth was symptomatic the obturation was delayed until the next appointment. Last irrigant used was normal saline following which canal was dried with paper points. An intracanal Calcium Hydroxide medicament was placed in the canal and a closed dressing was given.

The patient reported after 8 days, he reported no history of pain. After clinical examination and absence of tenderness, obturation was completed with gutta-percha using cold lateral condensation. Obturation was carried out under rubber dam. Following obturation Glass ionomer cement was placed to seal of the access opening. Root canal treatment was completed with 11 and patient was advised to place crowns on both the anterior teeth (11and 21) (Fig. 4)

Fig. 4: Post Obturation IOPA

Discussion

Fracture of an endodontic instrument is a one of the most common procedural error, which may occur during the course of an endodontic treatment and may hinder with a successful predictable approach. The main cause of failure in these cases is that the broken instrument impedes access to the root apex, which in turn acts as a hurdle in the cleaning and shaping of the root canal.

Prognosis in such cases depends on the condition of the root canal (vital or non-vital), tooth (symptomatic or asymptomatic, with or without periapical pathology), level of cleaning and shaping at the time of separation, the level of separation in the canal; and is generally lower than that with normal endodontic treatment.[2]

Several options are available to deal with a case of instrument fracture. The instrument can be bypassed, retrieved or left in situ. In cases where the tooth continues to remain symptomatic and all the options fail extraction may be the only alternative.

By passing a fractured instrument is often considered an acceptable treatment option to achieve clinical success. However recent studies have shown that instruments that can be bypassed could easily be retrieved. Management of separated instruments includes various approaches. These include orthograde or surgical approaches. Orthograde approaches, which can be used, are removal of the fragment, bypassing the fragment, or cleaning/shaping and filling of the root canal to the level of the fragment.

Several techniques and methods are available for the retrieval of instruments. Prior to use of any of the techniques the clinician must assess the case thoroughly and should safely and effectively handle the instrument to prevent any further complications. Various techniques available include instrument removal systems and techniques such as the Masserann Kit, Endo Extractor, wire loop technique, the Canal Finder System, and ultrasonic devices. A number of limitations during the use of these devices included excessive removal of root canal dentin, ledging, perforation, limited application in narrow and curved roots, and extrusion of the fractured portion through the apex.

Newer methods have also been introduced for the process of instrument retrieval. The Nd: YAG laser has been tested for use in this procedure as well as Ormiga et al has checked the effectiveness of electrochemical-induced dissolution of metal.

All the devices, techniques, and methods described here vary in their effectiveness, cost, and mechanism of action. Hence, before a final treatment plan is designed it is advisable to weigh the advantages and disadvantages for the success of the treatment.

Conclusion

Prevention is the best antidote for a separated file in the canal. Clinician should be aware of techniques and various instruments. With the proper knowledge about root canal anatomy, root canal treatment, various accidents like instrument fracture can be reduced. However, on occasion, an instrument might break and in spite of the best existing technologies and techniques, the retrieval may not be successful. In these instances, and in the presence of clinical symptoms and/or radiographic pathology, surgery or extraction may be the best treatment option.

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