

Case report**Retrieval of Separated Instruments: A Case Series Part I**

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Abstract: Separation of endodontic instrument within the canal is a challenge even for the most astute and experienced clinician. The first part of this paper series highlights the etiology of separated endodontic instruments with a case report illustrating one of the techniques for removal.

Keywords: Separated Instrument; Etiology; Retrieval Techniques; Endodontic; Therapy; Conservative.

INTRODUCTION

Separation of an endodontic instrument within the root canal is a frequent and potentially avoidable mishap that causes frustration to even the most experienced and astute clinician and can lead to failure of the endodontic treatment. It is mostly preventable by adhering to the basic principles of endodontic therapy and deviation from the standard procedures in an attempt to do a *short cut* treatment usually results in this mishap.¹

Many clinician associate “Broken instruments” with separated files, but the term could also apply to a sectioned silver point, a segment of lentulo, a Gates Glidden drill, a portion of carrier- based obturator, or any other dental material left inside a canal.

Case report:

A 24 year old female patient was referred to the department of Conservative dentistry and Endodontics with a complaint of pain in upper tooth following endodontic treatment. Clinical examination revealed access opening done elsewhere in maxillary left lateral incisor. IOPA X Ray showed separated instrument in 22 pushed beyond the apex with peri apical radiolucency (Fig 1).

The patient was informed about the situation and was given the choice for retrieval of the separated instrument or surgery or extraction.



Figure 1: Pre Op IOPA showing broken file

As it was a front tooth she first opted for retrieval. The instrument was visualized with the help of Operating Microscope (Fig. 2 and 3).



Figure 2: Operating Microscope

Retrieval was successfully accomplished with Pro Ultra ultrasonic endodontic tips (Fig 4) activated with EMS Piezo electric generator at medium power setting. (Fig 5). The canal was then prepared and obturated at a later appointment.



Figure 3: retrieved file



Figure 4: Pro Ultra Tips



Figure 5: post retrieveal IOPA

DISCUSSION:

Endodontic therapy is aimed at prevention and treatment of apical periodontitis. It consists of a triad of chemo mechanical preparation, disinfection and obturation of the entire canal system. However the later two procedures i.e. disinfection and obturation are highly dependent upon the first i.e. chemo mechanical preparation which in turn depends heavily upon the instruments used for shaping the canals.²

A recent study carried out on the practical experience of dental practitioners over a period of 13 years has revealed a risk of instrument fracture of 3.3%.⁽³⁾ Of those, 78.1% of the fractured instrument turned out to be rotary instruments made of nickel- titanium.

Instruments and instrumentation have evolved over the decades owing to the advancement in material science and manufacturing technology but still there are bottlenecks that prevent the production of an ideal instrument(s) for shaping the canal. Due to the imperfections in the material, design and usage of these instrument intra canal separation has been a bane of endodontics ever since.⁴

There are several factors that have been suggested as contributing to this problem like^{2,5}

1. **Improper diagnosis** of canal anatomy i.e. severe dilacerations and curvatures both visible and hidden. Dilacerations apply extreme stresses upon the file especially on those that are rotating. More the curvature more is the stress applied. Similarly hidden curvatures i.e. those in the Bucco-Lingual plane that are not seen on the radiographs reduce prudence on part of the clinician and can prove catastrophic.
2. **Improper access** opening i.e. disregard for the straight line access creates a situation that is similar to a dilacerations and its effects on the rotating file.
3. **Interferences** i.e. pulp stones, denticles and other calcifications if not taken into account and removed earlier on create undue stresses on the file and can lead to separation.
4. **Disregard of glide path** preparation can lead to ledging and early separation of the instrument as it encounters a lot of friction from the unexplored canal walls.
5. **Not using lubricants** and chelating agents creates a dry and rough environment for the file to work within and generates friction and stress.

6. **Disregard for proper irrigation** protocol allows debris to remain accumulated within the canal and these get loaded onto the flutes of the file and are regarded to have a potential to expand the existing micro cracks.

7. **Improper sequence** of instrument use generates undue stresses on the file as in such cases files tend to lock onto the canal walls.

8. **Disregard for the suggested speed and torque** values can cause separation because as the speed and torque increase stress levels on the file increase.

9. **Sudden movement** by the patient creates a condition similar to a severe dilaceration even in a relatively straight canal and all its above mentioned effects.

10. **Improper cleaning** of the instruments after use leads to debris accumulation onto the flutes of the file which is regarded to have a potential to expand the existing micro cracks.

11. **Over use** of instruments leads to fatigue of the metal and ultimately fracture.

12. **Operator inexperience** with the technique and instruments is a major factor and the learning curve has to be respected.

Two types of fracture patterns have been observed in broken instruments:^{1,6}

1. **Torsional fracture:** Torsional fracture occurs when the tip or any part of the instrument is locked in a canal while the shaft continues to rotate; the instrument exceeds the elastic limit of the metal and shows plastic deformation followed by fracture.

2. **Cyclic fatigue:** With this type of fracture, the instrument is freely rotated in a curved canal. At the point of curvature, the instrument flexes until fracture occurs at the point of maximum flexure.

Once any instrument has separated the clinician is faced with a challenge of not only managing a complicated case now but also the

patient in a whole new perspective. There are multiple techniques suggested to manage such cases and this part of the paper discusses retrieval techniques.³

The first and foremost is to inform the patient both verbally and in writing on the case sheet and obtain signature. This builds confidence with the patient, presents the doctor in an honest light and makes the patient more cooperative and is helpful in cases of future litigation.⁷

Now the case must be analyzed clinically in terms of accessibility and restorability, as these factors are of foremost importance in further management strategy.

Radiographs should be obtained from multiple angles to analyze the position of the instrument in the canal.

Now the clinician must evaluate his skill and experience in managing the case as well as the time and expenses that will be incurred in further treatment. If the operator lacks the necessary skill, experience and equipment required for such a case then expert help should be taken.

Armamentarium used for such cases includes:^{8,9}

- Magnification device like microscope or loupes.
- Piezo electric generator like EMS or Satelac.
- Commercial devices like Masseran Kit, IRS etc.
- Ultrasonic tips like Pro Ultra tips.
- Steiglitz forceps.
- Sectioned Gates Glidden drills.

Complications:^{10,11,12}

- Perforation due to improper use of ultrasonics, as these are aggressive instruments.
- Ledge formation due to improper use of ultrasonics by repeated gouging of the canal wall especially around a curvature.

- Refracture of the fractured segment which is common with NiTi instruments.
- Pushing of the segment into the peri apical area due to improper technique
- Fracture of the retrieving instrument as ultrasonic tips are thin and fragile.
- Root Fracture due to excessive dentin removal while using the ultrasonics.

CONCLUSION: The fracture of a root canal instrument during endodontic treatment is a surgical accident that every practitioner is likely to have encountered at some point during their careers. Curved and narrow canals have a higher risk for instrument fracture than straight and wide canals. In curved canals rotary instruments fractured more than other instruments. Since most stainless steel instruments fracture with excessive amount of torque, care has to be taken during negotiation and instrumentation of narrow, curved root canals. Other techniques and treatment modalities that are available for broken instrument management will be discussed in the subsequent parts of this paper.

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