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Separated Instrument Retrieval with Minimal Invasive Technique: A Case Report

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Abstract:
Background*: Separated instrument in endodontic is an endodontic accident. Broken instrument can affects treatment outcome when blocking the canals for cleaning and shaping procedures, which are important aspects for the successful of root canal treatment. Incidence of broken instrument is reported in 0,7-7% of cases.*
Objectives*: This article discusses endodontic management of separated instrument retrieval with modified Burrow technique in lower left mandibular molar.*
Case*: A 32 years old female patient was referred because of broken instrument inside the root canal. Clinical examination of teeth #36, temporary restoration was seen, teeth was responsive to percussion but nonresponsive to palpation. Pre-operative intraoral radiograph showed radio opacity in mesial canal, furcation lesion, and periapical radiolucency.*
Case Management*: Attempt to retrieve separated instrument with Burrow technique and root canal treatment was done. Staging platform in Burrow technique is done with angulated approach rather than a straight access, therefore minimized canal damage in slender roots. This technique is used to preserve more dentin structure; which differs in how radicular access is gained, avoiding usage of GG drills.*
Conclusion: *Dealing with separated instrument and doing retrieval attempts can be a stressful situation; by using the modified Burrow technique hopefully will preserve more dentin and minimize complications. However, there are still many factors affecting the successful retrieval of instrument such as tooth type, canal configurations and accessibility, fragment location and also visualization.*
Key Word*: broken instrument retrieval; Burrow technique; minimal invasive.*

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I. Introduction

Successful of root canal treatment depends on sequence of procedures; including cleaning and shaping of root canal.[1] However, broken instrument in endodontic is an endodontic accidents or mishap which can affects treatment outcome when blocking the canals for cleaning and shaping procedures.[1,2] Incidence of instrument fracture is reported in 0,7-7% of cases.[2]

Retrieval of fracture instrument is challenging for clinicians. [3] However, there are still many factors affecting the successful retrieval of instrument such as tooth type, canal configurations and accessibility, fragment location and also visualization.[2,3] Broken instrument may not caused failure ; but bacteria and dentin debris accompanied in the broken instrument is a foreign object and might cause inflammation. Fragment in the root canal can hinder proper cleaning shaping and obturation of root canal space.[4]

A broken file often occurs in the molar teeth, especially at the lower jaw because of poor access, small diameter, and sharp curvature of the root canal. Both hand instruments and rotary instruments have a potential to break.[5]

Clinical approach and management varies from retrieval, bypassing, or even surgery; despites inform consent of patient preoperatively of options and risks of treatment is important.[2] Furthermore, the case requires special attention, to minimize the risk of complication such as pushing the file apically, extruding fragments outside the apex, risk of tooth fracture due to dentin uptake excess, root perforation or ledge.[5]

Technological advancement has made it possible to manage broken instrument with tools such as ultrasonic. This case report discussed the management of broken file in mandibular molar by using ultrasonic device with modified Burrow technique while making the staging platform.

II. Case Report

A 31 years old female patient was referred from general dentist because of broken file inside the root canal. Clinical examination of mandibular lower molar showed temporary restoration in mesial, responsive to percussion but nonresponsive to palpation (Figure 1). A pre-operative intraoral periapical (IOPA) radiograph examination showed radio opacity in mesial canal, furcation lesion, and periapical radiolucency (Figure 2). The clinical diagnosis was previously initiated therapy with periodontitis apical asymptomatic; retrieval of broken instrument, root canal treatment and indirect onlay composite restoration was planned.

Figure 1. Preoperative intraoral

Figure 2. Periapical radiograph

Informed consent was done, and after administration of local anesthesia, tooth was isolated with rubber dam. Complete temporary restoration removal was done. It was seen that orifice of mesio buccal canal was wide and perforation at furcation of MB canal ; so perforation closure with MTA is planned. (Figure 3).

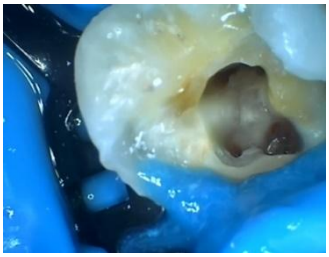

Figure 3. Perforation in mesio buccal canal

Attempts of instrument retrieval was done with "Burrow platform (BP) technique" (using an angulated approach to the staging platform rather than a straight access, allowing minimized canal damage in slender roots) : (Figure 4)

Step 1 : Radicular access : using thin, tapered and diamond-coated ultrasonic tip (ET18D) with piezoelectric unit (Satelec) at low power setting (3-5) without water coolant ; in internittent vertical motion less than 15 seconds until top of the fragment is visible.

Step 2 : partial platform preparation : about 180^{o} around fragment toward inner wall curvature.

Step 3 : exposure of the fragment and retrieval with smooth, tapered ultrasonic used for troughing along the partial platform and activated between fragment and inner wall, enabling instrument to loosen and disengage from the canal.

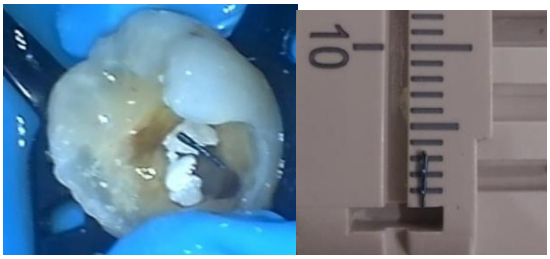

Figure 4. Retrieval of broken instrument

The working length was determined using an apex locator (Propex pixi, Dentsply Maillefer, Switzerland) with two # 10 K-files (M-access, Dentsply Maillefer, Switzerland) and confirmed radiographically (Figure 5). Cleaning and shaping were done with reciprocationg instruments (Reciproc Blue, VDW, Munich, Germany) and copious irrigation with 1% sodium hypochlorite solution, 17% EDTA and saline. Canals were dried with sterile paper points, closing perforation with MTA (Figure 6) and access cavity was sealed with temporary restoration.

Figure 5. Working length confirmation

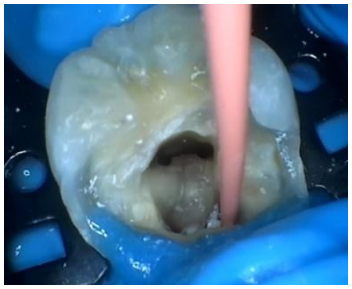

Figure 6. Closing perforation with MTA

At the second appointment as the tooth was asymptomatic, master cones were inserted with apical tug back sensation to the full working length in both canals and master cone radiograph was taken (Figure 7). Cleaning was done with copious irrigation of 5,25% sodium hypochlorite solution, saline, final irrigarion with 17% EDTA and saline. Canals were dried with paper points. Obturation was done with inserting the master cones and AH-plus sealer (Dentsply Maillefer, Ballaigues, Switzerland). Orifice barrier and core was filled with smart dentin replacement (SDR) (Dentsply Sirona, Belmont, Australia) (Figure 8).

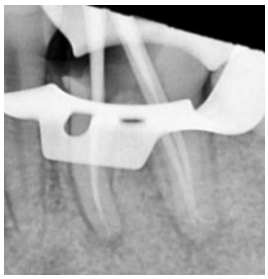

Figure 7. Master cone trial

Figure 8. Obturation

At the third appointment, final restoration preparation with indirect composite onlay was done ; after preparation retraction cord was inserted and impression taking was done (Figure 9).

Figure 9. onlay preparation

At the fourth appointment, the cementation final restoration of indirect composite onlay was done with try in, surface treatment and occlusion check before (Figure 10).

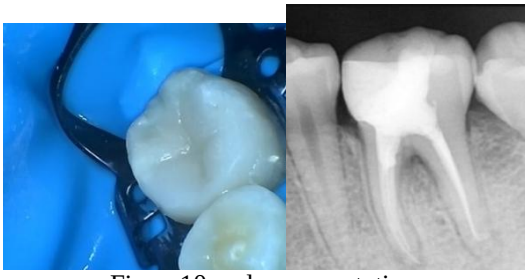

Figure10. onlay cementation

Follow up was done one month after and patient is asymptomatic and non responsive to percussion and palpation (Figure 11).

Figure 11. one month follow up

III. Discussion

One of many procedural accidents and difficulties that can occur in daily endodontic treatments is a fractured instrument. The development of NiTi rotary files did not decrease the incidence of broken instruments because fracture is caused mostly by incorrect used or overused of instrument.[6,7]

Clinical management of broken instrument varies; there are many techniques and devices.[2] Management varies from fragment removal, bypassing, and surgery.[8] Location of the broken file is one of factor that affects the success of instrument retrieval. Magnification was important to locate the fracture instrument, in controlling removal of dentin around the fragment, and preserving the original canal anatomy, allowing more light for clinician.[9]

Ultrasonic devices have proven to be an efficient system for loosening and removing various obstructions in root canals, due to the vibration capacity of the endodontic instrument. Ultrasonic tip is activated in low- power configurations, instrumenting the dentin around the fragment. Ultrasonic systems are recommended when fractured segments can be visualized, when the fragment is in the cervical third or when it is before the curvature of the root canal.[9] There are literature that said that broken instrument located coronal to the curvature with size <5 mm can be retrieved using ultrasonics.[2] Due to ultrasonic vibration, segment of fragment could fall into the adjacent canals, therefore other canal must be closed to prevent this from happening.[9]

Wire loop technique usage for broken instrument retrieval can also be done. This technique consists in making a loop by passing the 2 free ends of a 0.14 mm diameter steel ligature through a 25 gauge injection needle from the open end until it slides out. Using a small hemostatic mosquito forceps, the loop can be tightened around the free upper part of the broken instrument and then the entire instrument can be removed from the root canal.[9]

Staging platform technique is the most widely tried technique for orthograde instrument fragment removal. Burrow technique differs in how radicular access is gained, avoiding GG drills ; to preserve more dentin structure.[3] Burrow technique has 4 steps (Figure 12):[3]

Step 1: Coronal Access

Coronal access is prepared using high speed handpiece and fissure carbide or diamond bur with a safety tip to establish straight-line access to all canal orifices, similar to a conventional staging platform technique.

Step 2: Radicular Access

Burrow technique reach the fragment at slight angle by placing coronal aspect of the radicular access pathway into the outer curvature wall of the root canal and the apical aspect above the instrument fragment into the inner curvature wall; using thin-tapered and diamond-coated ultrasonic tip at low power setting (3-5) without water coolant with intermittent vertical motion, that not exceed 15 seconds to avoid heat accumulation.

Step 3 : Partial Platform Preparation

The technique only uses a partial platform of about 180^{o} around the instrument fragment, toward the inner wall of the curvature.

Step 4 : Exposure of the fragment and retrieval

Smooth, tapered ultrasonic tips are used for troughing along the partial platform to expose the coronal 2 – 3 mm of the fragment. Activated ultrasonic tips are placed between the fragment and the inner wall, enabling the instrument to loosen and disengage from the canal ; thin, noncoated ultrasonic tip is used.

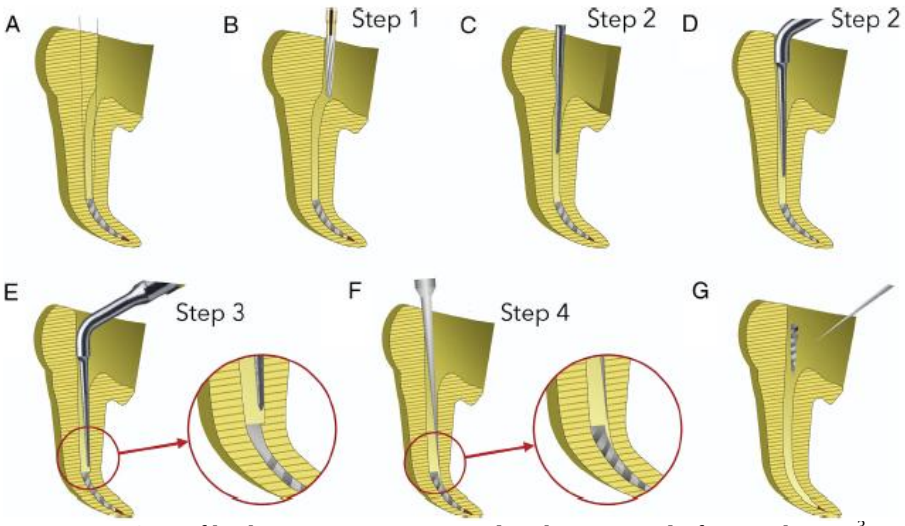

Figure 12. Step of broken instrument retrieval with Burrow Platform technique[3]

There is no standard method to follow when attempting to remove fractured instruments.[10] Separated instruments must always be attempted for retrieval and if retrieval is not possible bypass should be tried.[11] This case, the instrument retrieval was done with Burrow technique to minimize removing dentin structure. When clinician decides to remove the fracture instrument, patient compliance is necessary and conservative interventions are the best accepted.[8]

IV. Conclusion

Factors affecting the successful retrieval of instrument fragments are tooth type, canal configurations and accessibility, fragment location in relation to the curvature, patient's mouth opening, also visualization.

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