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Surgical Endodontics to Manage a Separated Instrument: A Case Report

Abstract: Various iatrogenic mishaps can impede adequate biomechanical preparation of the root canal system. Instrument separation can be treated by orthograde retreatment, with or without instrument removal, endodontic surgery or extraction. The aim of this case report is to describe a minor surgical procedure to resect an infected root containing a separated instrument. A fractured instrument was detected in the mesiobuccal root of the maxillary first molar extending beyond the apex. This fractured instrument was serving as a niche for infection and formation of a sinus tract. The fractured instrument could not be retrieved through the root canal, hence the root canal was obturated up to the fractured instrument and the apical half of the mesiobuccal root was resected surgically. At the two years recall the clinical and radiographic outcome was considered favourable.

CPD/Clinical Relevance: Endodontic surgery, while classically being considered as the last resort, becomes important when orthograde retreatment fails to remove the cause of persisting infection.

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Adequate biomechanical preparation and obturation followed by a good coronal seal can result in long-term survival of endodontically treated teeth.¹ However, adequate cleaning and shaping can be impeded by various iatrogenic mishaps such as ledges, blocked canals and instrument separation.² Instrument separation prevents

complete debridement by blocking access to the apical portions of the root canals for irrigation and decontamination. Instrument separation can be treated by orthograde retreatment with or without instrument removal, endodontic surgery, further treatment or extraction. While broken instruments may be bypassed, removing them is imperative in most instances to ensure complete debridement and long-term success of endodontic treatment.³ Instrument separation is one of the most troublesome incidents, and when the separated instrument extends beyond the apex its retrieval becomes complicated.⁴ Moreover, those instruments extending beyond the apex can serve as a niche for biofilm accumulation and can eventually lead to formation of a periapical abscess, granuloma or cyst.⁵ Various methods have been described to remove fractured instruments using hand instruments, ultrasonic devices, an instrument removal system, loop device or surgical method.^{3,4,6,7} When orthograde retrieval

of a broken instrument, especially those extending beyond the apex, is not possible, minor surgical procedure to remove this source of infection becomes crucial.^{4,8} The aim of this case report is to describe a minor surgical procedure to resect an infected root containing a separated instrument.

Case presentation

A 51-year-old healthy female patient was referred to our department for consultation and treatment concerning tooth UL6. The patient's dental history revealed that endodontic treatment was started on this tooth, however, it was not completed. An iatrogenic mishap occurred during the treatment, hence the patient was referred for completion of the treatment. On presentation, the patient did not report any symptoms. Clinically, the patient's dentition was heavily restored. Most of her posterior teeth were restored with amalgam, which appeared normal clinically. A sinus tract was noticed

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on the buccal attached gingiva between tooth UL6 and UL4 (Figure 1). An intra-oral periapical radiograph taken with gutta-percha inserted into the sinus tract traced to the palatal root of tooth UL6 (Figure 2). The palatal and distobuccal canals appeared to be obturated. Furthermore, a broken instrument was noted in the mesiobuccal canal, extending beyond the apex. Based on the clinical and radiographic findings, the diagnosis was previously initiated therapy with chronic periapical abscess. Treatment options included:

1. Orthograde retreatment of UL6 (including an attempt to remove the fractured instrument);
2. Surgical root resection of the mesiobuccal root;



Figure 1. Pre-treatment clinical view showing a sinus tract on the buccal attached gingiva between UL6 and UL4.



Figure 2. Pre-treatment periapical radiograph showing gutta-percha cone tracing a sinus tract to the palatal root of tooth UL6. Note the fractured instrument in the mesiobuccal root extending beyond the apex.

3. Extraction of UL6.

The patient was keen to retain the tooth, hence, speculating on the persistence of intracanal infection, the first option was the preferred choice.

Clinical procedure and outcome

Tooth UL6 was isolated and accessed after all existing restoration was removed. Gutta-percha in the palatal and distobuccal canals were also removed. An attempt to retrieve the broken instrument through the mesiobuccal canal was made with the help of the *File Removal System Kit* (Dentsply Tulsa Dental, USA), but was unsuccessful. All canals were cleaned by copious irrigation with 5.25% sodium hypochlorite (HUSM Pharmacy, Malaysia) and 17% EDTA (Dentonic Inc, USA). The canals were medicated with calcium hydroxide (Paul Burns Chemische, Germany) and the patient was scheduled for another appointment. During that appointment another attempt was made to retrieve the instrument through the canal, however, it was also unsuccessful. Hence, all canals were obturated by a combination of warm vertical condensation technique and injectable gutta-percha backfill technique using *C-fill Obturation System* (Foshan Coxo Medical, China). AH plus® (Dentsply, Germany) resin-based root canal sealer was used in combination with gutta-percha (Figure 3). After obturation,

the tooth was permanently restored with posterior composite (*Filtek P60*, 3M ESPE, USA). The patient was then scheduled for surgical resection of the mesiobuccal root. On the day of surgery, informed consent was obtained from the patient. The surgical site was anesthetized by giving a buccal and palatal infiltration injection using 2% mepivacaine (Scandonest® 2% L, Septodont, USA) with epinephrine (1:100,000). A three-cornered, two-sided full thickness mucoperiosteal flap was raised exposing the buccal bone covering the mesio-buccal root. Following removal of the bone, the apical half of the mesio-buccal root was resected using a tapered fissure bur rotating in a high-speed handpiece (Figure 4). No retrograde preparation and obturation was carried out as the gutta-percha was found to be adequately sealing the root canal. The root amputation site and the surrounding area was curetted and irrigated using sterile saline solution to remove all the diseased tissue. The mucoperiosteal flap was repositioned and sutured with Dafilon 5-0® (Aesculap, USA) non-absorbable suture. Seven days following surgery, the patient was recalled and reviewed, and sutures were removed. Post-surgery, healing was uneventful and no complications were noted. At 3 months' review, the sinus tract had completely disappeared (Figure 5) and the radiolucency surrounding the roots of tooth UL6 had reduced in size (Figure 6). At 2 years' recall, the treatment outcome was satisfactory.

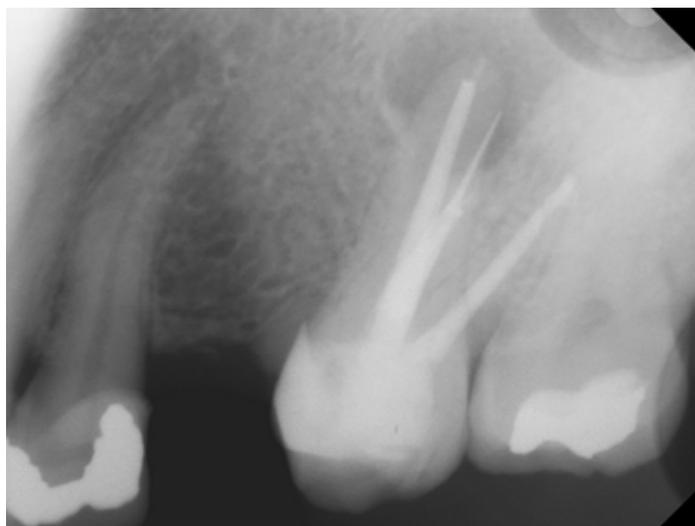


Figure 3. Periapical radiograph of tooth UL6 following obturation of all the canals. Note the fractured instrument in the mesiobuccal root extending beyond the apex.



Figure 4. Resected mesiobuccal root with the fractured instrument extending beyond the apex.



Figure 6. Periapical radiograph 3 months following root resection.

Clinically and radiographically there were no signs of failure. The radiolucency had almost completely healed radiographically (Figure 7). Tooth UL6 was not tender to percussion and tooth mobility was within normal limits. The patient was encouraged to come at regular intervals for long-term follow-up.

Discussion

Removal of fractured instruments from the root canal system is often difficult and, if not removed, it reduces the success in retreatment cases.³ Furthermore, the prognosis is determined by the position of the fractured instrument in the root canal, the stage of endodontic treatment during which the fracture occurs, and the presence of pre-operative periapical radiolucency.^{3,9,10} Indeed, the prognosis is poorest when the instrument fracture occurs near the apex in the early stages of endodontic treatment, particularly in



Figure 5. Clinical view 3 months after surgical root resection. Note that the sinus tract has completely healed.



Figure 7. Periapical radiograph 2 years following root resection. Note that the radiolucency around the apex has almost completely healed.

the presence of a peri-apical pathology.⁹⁻¹¹ In this report, the fractured instrument was not only near the apex, but it extended beyond the apex into the medullary bone. Besides, a chronic periapical pathosis, as depicted from the clinical and radiographic findings, was also present in this case. While instruments extending beyond the apex can protrude into the maxillary sinus, necessitating surgical intervention,¹¹ this was not so in this case, as observed from the pre-operative periapical radiograph (Figure 2). However, in this case, surgical intervention became imperative because the fractured instrument could not be retrieved through the root canal, preventing effective debridement of the apical portion of the mesio-buccal root.

Various surgical treatment options have been reported, which include, intentional replantation,¹² hemisection,¹¹ root resection¹³ or peri-apical surgery.⁴ Root resection refers to the removal of part of the root in single- or multi-rooted teeth, whereas root amputation refers to complete removal of one or more

roots of multi-rooted teeth.¹³ Indeed, root resection presented in this case does not realistically differ from apical root amputation carried out in conventional periapical surgery. In the present case, root resection was chosen over complete root amputation as a treatment modality because the fractured instrument was present in the apical portion of the mesiobuccal root. Furthermore, leaving a part of the mesiobuccal root will permit re-attachment of the periodontal tissues during healing.¹⁴ Besides, this will also preserve the integrity of the cervical outline of the tooth. However, patient selection is crucial for this type of treatment modality. It should only be undertaken when there is adequate periodontal attachment coronal to the point of resection.¹⁴

The short-term (2–4 years) success rate of endodontic surgery has been reported to be 77.8%, which is significantly higher than that of non-surgical endodontic retreatment (70.9%).¹⁵ However, the long-term (4–6 years) success rate of non-surgical endodontic retreatment is found to be 83%, which is significantly higher than the success rate of endodontic surgery (71.8%).¹⁵ This is probably attributed to the fact that pre-apical bone fill is more rapid following surgery, while non-surgically retreated teeth demonstrate slower healing dynamics.¹⁵ Thus, after longer follow-up periods, more teeth that are non-surgically retreated prove to be successful. In the present case, tooth UL6 was first retreated non-surgically, to ensure complete debridement and three-dimensional sealing of the root canal system. This was followed by surgical root resection to remove the extra-radicular source of infection. Therefore, the long-term prognosis of tooth UL6 is considered to be very good.

The placement of a root end filling material following root resection in endodontically treated teeth has always been in debate.^{16,17} While some authors state that root end filling should be placed routinely,¹⁶ others state that it is not necessary when the root end portion is not accessible to instrumentation and the source of infection has been removed, provided that the exposed root filling is of good quality.^{17,18} In the presented case, following resection of the root, the gutta-percha in the remaining portion of the mesiobuccal root was found to be adequately sealing the root canal, hence a retrograde filling was not done. Besides, a classical study showed that a root end

resection with a high-speed tapered fissure bur does not affect the sealing property of gutta-percha and sealer obturations.¹⁹

Conclusion

Endodontic surgery is classically considered as the last resort for treating endodontically involved teeth. However, when orthograde retreatment fails to remove the cause of persisting infection, endodontic surgery has to be performed. Furthermore, when clinical and biological principles are meticulously followed, endodontic surgery results in higher success rate and good long-term prognosis.

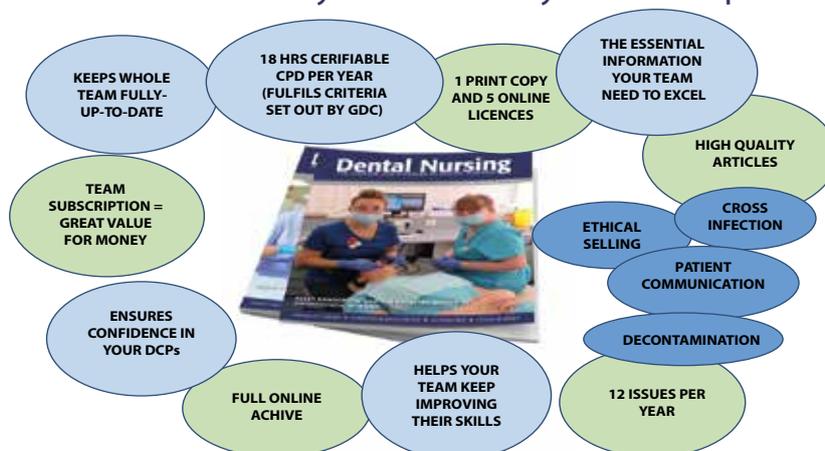
References

1. Ng YL, Mann V, Gulabivala K. A prospective study of the factors affecting outcomes of non-surgical root canal treatment: Part 2: Tooth survival. *Int Endod J* 2011; **44**: 610–625.
2. Siqueira JF. Aetiology of root canal treatment failure: why well-treated teeth can fail. *Int Endod J* 2001; **34**: 1–10.
3. Madarati AA, Hunter MJ, Dummer PMH. Management of intracanal separated instruments. *J Endod* 2013; **39**: 569–581.
4. Mohan S, Gurtu A, Singhal A, Guha C. Surgical endodontics – “an aid for the management of iatrogenesis”. *J Dent Sci* 2012; **37**: 37–39.
5. Nair PN. On the causes of persistent apical periodontitis: a review. *Int Endod J* 2006; **39**: 249–281.
6. D’Arcangelo C, Varvara G, De Fazio P. Broken instrument removal – two cases. *J Endod* 2000; **26**: 368–370.
7. Bahcall JK, Carp S, Miner M, Skidmore L. The causes, prevention, and clinical management of broken endodontic rotary files. *Dent Today* 2005; **24**: 74–80.
8. Carrotte P. Surgical endodontics. *Br Dent J* 2005; **198**: 71–79.
9. Panitvisai P, Parunnit P, Sathorn C, Messer HH. Impact of a retained instrument on treatment outcome: a systematic review and meta-analysis. *J Endod* 2010; **36**: 775–780.
10. Parashos P, Messer HH. Rotary niti instrument fracture and its consequences. *J Endod* 2006; **32**: 1031–1043.
11. Tsurumachi T, Honda K. A new cone beam computerized tomography system for use in endodontic surgery. *Int Endod J* 2007; **40**: 224–232.
12. Choi Y-H. Intentional replantation of the maxillary molar via partial osteotomy. *Asian J Oral Maxillofac Surg* 2011; **23**: 73–76.
13. Choudhary A, Choudhary E. Management of root amputated maxillary molar teeth: endodontic and prosthetic considerations – a case report. *J Oral Health Res* 2011; **2**: 42–44.
14. Floratos SG, Kratchman SI. Surgical management of vertical root fractures for posterior teeth: report of four cases. *J Endod* 2012; **38**: 550–555.
15. Torabinejad M, Corr R, Handysides R, Shabahang S. Outcomes of nonsurgical retreatment and endodontic surgery: a systematic review. *J Endod* 2009; **35**: 930–937.
16. Friedman S. Retrograde approaches in endodontic therapy. *Dent Traumatol* 1991; **7**: 97–107.
17. Johnson BR. Considerations in the selection of a root-end filling material. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1999; **87**: 398–404.
18. Chong BS, Pitt Ford TR. Root-end filling materials: rationale and tissue response. *Endod Topics* 2005; **11**: 114–130.
19. Harrison JW, Todd MJ. The effect of root resection on the sealing property of root canal obturations. *Oral Surg Oral Med Oral Pathol* 1980; **50**: 264–272.

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