CASE REPORT

A Case of Periradicular Surgery: Apicoectomy and Obturation of the Apex

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ABSTRACT

Introduction: **The purpose of the current case is to give a detail description on an incidence of a traumatized upper left central incisor with symptomatic periapical periodontitis which was root treated.**

Descriptions: **The apical portion of the tooth had a large apical lesion with external root resorption that end up with an open apex due to the loss of tooth cementum, dentine and adjacent hard tissue. The tooth was endodontically retreated, and the apical region was treated surgically with apical curettage and retrograde Mineral Trioxide Aggregate filling (MTA).**

Results: **The affected tooth was considered successful both functionally and aesthetically during a 12-month follow-up.**

Conclusion: **Apicoectomy and retrograde filling with MTA is a viable option in case of treating traumatized tooth with large peri-apical lesion and open apex**

KEY WORDS

root canal retreatment, open apex, periradicular surgery

INTRODUCTION

A root-end surgery is an effective therapeutic option for teeth with peri radicular lesions that are not cured in the initial attempt of root canal therapy or when orthograde treatment is not an option[1)]. Overfilling and inadequate apical closure can also be caused by an immature tooth with an open apex. As a result, an apical barrier is critical. To make sure that the apical portion of the canal space is successfully filled and achieved a three-dimensional closure between the periodontium and root canal system, a retrograde filling is required.

The surgical treatment's goals are to eliminate the infected tissue, debride and clean the root canal system as much as possible, seal the cavity or defect to stop or slow the spread of bacteria and other microorganisms in the periradicular tissues, thereby creating a favourable environment for the healing and regrowth of a normal periodontal apparatus[2)]. Hassle-free application, non-moisture-dependent, superior sealing capability, biocompatible, radiologically confirmed seal, and non-absorbable are all properties of a suitable retrograde filling materials. MTA is preferred because of its high tolerance to moisture contamination, biocompatible, and sealing properties. MTA gives a better seal compared to Amalgam, IRM, and Super EBA, MTA[3)]. When compared to IRM and Super EBA, MTA's marginal adaption is better with or without completion[4)] MTA exhibited signs of tissue healing when used as a root-end filler material[5-7)].

Osseous restoration and re-establishment of an apical attachment apparatus is the best healing responses expected after a peri radicular surgery[8,9)]. Histopathological examination of specimens, on the other hand, indicate three types of tissue responses: healing with periodontal ligament reformation, fibrous tissue (scar) healing, and moderate-to-severe inflammation without scar tissue[10)]. The formation of cementum on the severed root surface is considered as the desirable healing reaction[8)].

The deposition of cementum begins at the root end's circumference and moves centrally toward the resected root canal. The cementum creates a 'double seal' by providing a 'biological seal' in addition to the 'physical seal' of the root-end filling[11)]. Various investigations have shown that MTA has a higher sealing ability while allowing cementoblast adhesion and development[12-17)]. MTA could be deemed cementoconductive based on the generation of mineralized matrix genes and protein expression[18)].

CASE REPORT

A 25-year-old Malay female came to the clinic with vague discomfort in her slightly discoloured upper front tooth. The patient had history of multiple treatments done on the affected tooth following a sports trauma at the age of 13. Subsequently a root canal treatment was done twelve years ago. Upon clinical examination, the upper left central incisor is tender to percussion, slightly darker than the adjacent teeth, and the tooth had a negative response to pulp sensibility tests. After radiographic examination, it is evident that the upper left central incisor had a root canal filling with a lack of both coronal and apical seal. There is also a considerably large periapical lesion of 12 mm in diameter, an open apex and external apical root resorption as shown in Figure 1. A 3D x-ray using CBCT was taken to examine the apical area and to facilitate the retreatment procedure if indicated, as shown in Figure 2.

A diagnosis of asymptomatic chronic apical periodontitis due to failure of root canal treatment was given. The treatment plan was to redo the root canal treatment and manage the apical lesion surgically by peri-radicular surgery involving apical curettage and direct retrograde filling.

During the endodontic re treatment, local anaesthesia infiltration with 1:100 000 adrenaline of 2.2 ml mepivacaine 3% was administered to buccal and palatal area of tooth 22 to establish anaesthesia. Moisture control and tooth isolation were achieved by rubber dam application. Endodontic access was made after the prior restoration was removed.

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Figure 1: periapical x-ray of maxillary left central incisor with poorly condensed root canal treatment and large periapical radiolucency.

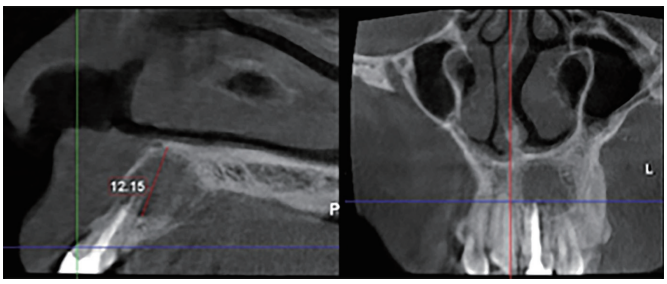

Figure 2: 3D x-ray for maxillary left central incisor showing 12.15mm apical radiolucency and root resorption.

Figure 3: Gutta percha was removed using K-files and working length determination.

Figure 4: Post obturation periapical radiograph.

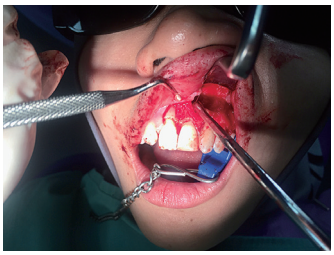

Figure 5: flap reflection to expose the periradicular area.

Composite was used to create a pre-endodontic build-up. Under a dental operating microscope, gutta-percha was removed with hand K-files starting at size 8 and progressing into bigger sizes.

The working length was confirmed for the canal using apex locator and radiographic examination as shown in Figure 3.

Step down technique was used to shape and clean the canal, with a master apical file of 80#. Irrigation with 5.2% sodium hypochlorite (NaOCl) was used extensively. Subsequently, non-setting calcium hydroxide (Ultracal XS, Ultradent, Utah, USA) was inserted intracanal and left for 14 days. Finally, Zinc oxide eugenol filling material was also used as a temporary filler.

No symptoms were reported after 14 days. both Zinc oxide eugenol filling material and intracanal medicament were removed from the tooth. A 5.2% NaOCL intracanal irrigation was used. Mineral Trioxide Aggregate (Pro-Root MTA, Dentsply, North Carolina, USA) was used for obturation as illustrated in Figure 4, and the patient was scheduled for peri-radicular surgery after one week.

On the day of surgery the patient was briefed about the surgical procedures and consent obtained. Patient was then draped with sterile linens and painted using chlorhexidine gluconate. 2 cartridges of 2% mepivastesin with 2.2 mL/cartridge containing 1:100,000 adrenaline were used for buccal and palatal infiltration, An envelope mucoperiosteal surgical flap was raised via a sulcular incision. Prior to the surgery, A radiographic examination of the tooth was performed to measure the length of the root and its axis, in order to facilitate the removal bone from the desired region. No-4 and 6 round carbide burs were utilised for osteotomy using an Impact Micro-motor handpiece, and a curette was used for periradicular curettage. A diamond fissure bur size 1mm was used for cutting the apical approximately 3 mm of the roots with continuous irrigation of normal saline to reduce heat generation as shown in Figure 5.

Flap was reapproximated and primarily closed with suture to allow optimal healing. Haemostasis was achieved. Following that, the patient was given post-operative instructions, including ice pack application at the extraoral region of the surgical site for the first 24 hours following surgery. Sutures were then removed at day 7 post operatively.

RESULTS

Due to travel restriction caused by COVID-19 pandemic, patient was reviewed via online and telephone consultation, the patient revealed that there were no abnormal signs and symptoms and the tooth is both functionally and aesthetically acceptable.

DISCUSSION

In most cases, non-surgical endodontic retreatment is the recommended approach once traditional root canal therapy (RCT) fails. Non-surgical retreatment may be hampered by several circumstances, such as a complicated anatomy of the root canal system or earlier operative errors. To save the tooth in these circumstances, periradicular surgery and apicoectomy would be the best options.

After resection of the last 3 mm of the root-end, a root canal filling material is applied into the created cavity to block the connection between the root canal and the periradicular tissues. The use of a high-quality root canal filling material has a big impact on the surgery's therapeutic outcome. Non-absorbable, non-corrosive, non-cytotoxic, moisture-resistant, dimensionally stable, biocompatible, antibacterial, radiopaque, cost-effective, easily manipulated, adherent to dentinal walls, form a tight seal, and induce cementogenesis are all desired characteristics in a material[19].

Many dental materials have been suggested for root-end obturation, and numerous researchers have sought to determine a perfect material; moreover, no such material has been discovered[20]. Mineral trioxide aggregate (MTA) and IRM are the most often used materials.

MTA can be recommended as a biocompatible retrograde filling

material based on multiple studies and clinical trials. Newly developed materials have also demonstrated comparable biocompatibility, as well as the capacity to provide a favourable environment for cell proliferation and osteogenic potential. Nowadays, endodontic microsurgical techniques accompanied by an operating endoscope are useful for a better outcome[21]. Microsurgery has various benefits, including easier identification of root apices, fewer osteotomies, and shorter resection angles that preserve cortical bone and root length. Furthermore, with extreme magnification and lighting, anatomical components like isthmuses, canal fins, microfractures, and lateral canals are easily visible on a resected root surface. Studies of the anatomy of the root apex revealed that at least 3 mm of the apical end of the root should be resected to reduce 98 percent of the apical ramifications and 93 percent of the lateral canals[22].; in the current situation, due to short root length and due to pathologically lost tooth apex, minimal removal up to a level of fresh root dentinal surface was performed.

CONCLUSIONS

As a result, after a previous endodontic treatment failure, we can consider Apicoectomy and retrograde filling with MTA as a viable therapeutic option. This is a risky procedure with a high success rate that the expert surgeon must consider in rare instances. This surgery was recommended to the patient as a pure preservation measure and to respect the tooth's anatomic-functional value.

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