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Surgical management of maxillary incisors with apicectomy and guided bone regeneration: A case report

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Abstract

Background: Apicectomy is the excision of the apical portion of tooth and the attached soft tissues during periapical surgery. It is most common surgical endodontic therapy. The main objective of apical surgery is to create an optimal environment for periradicular tissue healing.

Aim: The aim of this case report was to eliminate apical periodontitis by using apicectomy procedure along with retrograde filling in root canal treated tooth and using bone and a GTR membrane to enhance new bone formation at the site of defect.

Material and Methods: In this case, apicectomy (retrograde root canal treatment) of maxillary right incisors was done. The root end portions were resected and this was followed by retrograde filling with MTA paste. Since, the lesion was greater than 2 mm, there was a huge bony defect. So, bone graft was placed along with GTR membrane.

Results and Conclusions: The result of this case, reports complete healing and new bone formation after apicectomy. Hence, it is concluded from the following case report that the success rate of apicectomy with the use of regenerative material is high.

Keywords: Apical periodontitis,Endodontic Surgery, Apical surgery, Endodontic failure, Guided Bone Regenaration (GBR), Guided tissue regeneration (GTR)

Introduction

The term “endo-perio” lesion has been described as a destructive lesion of pulpal and periodontal origin resulting due to varying degrees of inflammatory products. The relationship between the periodontium and the pulp was first described by Simring and Goldberg in 1964. [1]

The effective way to preserve the tooth structure is by performing endodontic therapy. However, sometimes the endodontically treated teeth may fail mainly because of intra-radicular or extra-radicular infection.[2]

Intra-radicular infection is the most common cause for endodontic failure.[2] It can occur due to insufficient debridement of the root canal and persistence of viable bacteria at the time of root canal filling,[3]or due to re-infection caused by coronal leakage.[4] The most frequent microorganism, isolated in failed cases is *Enterococcus faecalis*, which is a species scarcely found in untreated root canals.[5] It is suggested that *E. faecalis* is inserted into the canal during root canal treatment.[3,6,7] In addition, *E. faecalis* can withstand intra-canal medication, even calcium hydroxide[8] and lack of symbiotic bacteria.[3,9] Therefore, it is difficult to be eradicated after its settlement in the canal.[2,3]

A low percentage of endodontic failures occur because of extra-radicular causes i.e periodontal infection.[2] Periodontal infection originates from bacteria that have entered periapical tissues and evaded host defence mechanisms.[2]The presence of these microorganisms cannot be detected clinically while treatment or eliminated by intra-canal medicaments, as they are situated away from the apex.[2]

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There are many possible methods to treat the primary endodontic and secondary periodontal lesion. One of such method is apicectomy.

Apparently, this controversy incited the clinicians to apply a new approach and to master a different perspective for the apicoectomy technique in which the ideal results were:

(1) covering of the resected surface of the root by a new layer of cementum;

(2) covering of the neoformed cementum by the periodontal membrane; and

(3) space formerly occupied by the resected root should be filled by bone.

In 1922, the first experimental study of root-resection was done by Bauler on cats in Germany. Bauler performed this procedure on six maxillary canines, and then after apicoectomy, histologic sections were obtained proving the growth of the periodontal membrane.[11] Several other studies in the subsequent 30 years were conducted on animals and humans. Some of these studies described the possibility of filling the resected root with wax, lead or gold.[12]Today, after previous endodontic failure, non-surgical revision of the root in cases of periapical infection, granuloma, or cyst is considered by many as the primary mode of case management. The decision to perform surgery is often open to deliberation and debate.[10] Apical surgery is often the last hope to save an endodontically treated tooth.

The main objective of apical surgery is to create an optimal environment for periradicular tissue healing. This is usually accomplished by removing pathology or

removing inaccessible parts of the root canal system, and by preventing reinfection from the root canal system. For this purpose, a retrograde cavity is prepared following root-end resection, and a filling material is placed into this cavity to completely seal the root canal system at the resection level.[15]

Therefore, the aim of this case report was to eliminate apical periodontitis by using apicectomy procedure along with retrograde filling in root canal treated tooth and using bone and a GTR membrane to enhance new bone formation at the site of defect.

Case Report

Case Presentation and Patient Information:

A 21 year old female patient reported to the Department of Conservative Dentistry and Endodontics at Late Shri. Yashwantrao Chavan Memorial Medical and Rural Development Foundation's Dental College and Hospital, Ahmednagar, with a chief complaint of pain and pus discharge from the upper front region of the jaw since 3-4 weeks. Medical history of the patient did not reveal any abnormalities. The patient also revealed about her past history of endodontic therapy in her maxillary right central and lateral incisors by another clinician 2 years ago. Nevertheless, episodic pain and intra-oral swelling in relation to 11 and 12 regions was the main reason of visit to this hospital a year later.

The patient was having pain in the upper anterior region which was of rapid onset, sharpshooting in nature, intermittent and prolonged for a short duration. The pain aggravated while chewing food and relieved on taking medications. The swelling was seen in relation to 11 and 12 regions since 3-4 weeks. The swelling was tender on palpation and was of pitting type.

Maxillary right central and lateral incisors were tender on vertical and lateral percussion as well as discolouration was seen i.r.t both the teeth when clinically examined. Extra-oral fistula corresponding to the apical areas of both the teeth was seen along with the presence of an intra-oral swelling. (figure 1)

Radiographic examination revealed overextended root canal filling with 11 and 12 with extrusion of the gutta percha into periapical tissues. There was periapical radiolucency about 2.5cm in diameter involving the root apices of 11 and 12 were revealed. So, the root canal retreatment was performed i.r.t both the teeth. But, the presence of poor endodontic retreatment led to the decision of performing an apicectomy. So, she was referred to the Department of Periodontology and Oral Implantology, Ahmednagar for performing the surgical procedure. (figure 12 A)

Firstly, the teeth were anesthetised using 2% lignocaine with adrenaline, infraorbital and nasopalatine nerve blocks were given. Crevicular incision extending from the distal portion of upper left central incisor upto the distal end of upper lateral incisor was made. Two vertical incisions were given extending from the marginal gingiva and beyond the mucogingival junction and full thickness rectangular mucoperiosteal flap was raised. (figure 2, 3)

A Bony window of 3 cm by 1cm was created just beneath the root of the central incisor (11) extending towards the root of lateral incisor (12) was made with the help of a contra-angled micromotor in order to expose the affected site. The granulation tissue was then debrided with the help of a Gracey curette and retrograde preparation was intitated. Bevel of 45 degree angle was given in the apical portions of the roots of both the teeth. (figure 4-6)

After the retrograde preparation of both the roots, the gutta percha was burnished and the roots were sealed with the help of Maarc MTA (Mineral Trioxide Aggregate) Repair Material. Then, the procedure of bone grafting (GBR) using Bio-Oss bone graft material was initiated and

Healiguide GTR membrane was placed which is a resorbable membrane. The bony window was then closed and flap was coapted and was sutured using a 5-0 vicryl suture. (figure 7-9)

After the procedure, the patient was recalled after 1 week for suture removal, after 1 month and after 6 months. The patient was happy and satisfied to have her tooth functional. Also, the X-ray evaluation reported clear and slow bone deposition in the cavity after apicoectomy, obturation, and cystic enucleation. (figure 12 A, B, C)

Discussion

Apicoectomy is the standard surgical procedure. This procedure allows minimal apical resection and enables the placement of material for retrograde sealing, which allows better waterproofing of the canal.[16]Apical surgery has 75-90% success rate and is evaluated through clinical exploration and radiographic controls after nearly half a year.[17]

In the present study, apicectomy was the treatment of choice because according to Wu et al. (2006) surgical intervention is warranted in cases with infection remaining in inaccessible apical areas, extraradicular infection including apically extruded dentin debris with bacteria present in dentinal tubules, true radicular cysts, and foreign body reactions.[18]

Immediately after flap reflection periapical curettage was done in the present study. Periapical curettage aims to remove pathological tissue in a lesion at the apical level of a tooth or foreign bodies at periapical region.[14]

In the present study, MTA was used to seal the root end. This is because MTA was researched as a potential root end filling material and showed promising results. MTA is more preferable because it is insensible to moisture, biocompatible and has the property of good seal. MTA provides superior seal when compared with Amalgam, IRM and Super EBA.[19] The marginal adaptation of MTA is better with or without finishing when compared to IRM and Super EBA.[20] As a root-end filling material, MTA showed evidence of healing of the surrounding tissues.[21,22]

Following the establishment of (guided) tissue regeneration techniques in periodontology and implant dentistry, there has been growing interest in using this treatment option as an adjunct in apical surgery. An increasing number of clinicians and researchers have advocated the use of regenerative techniques (RT) in apical surgery.[14]So, in the present study, bone graft was placed along with GTR membrane.

Bone graft of choice for the first regenerative procedure in our case was autogenous bone graft and e-PTFE membrane because this combination has been shown to result in the most favorable regenerative outcome.[23]

These criteria highlighted the success of the treatment after 6 months. Therefore, after the previous failure of the endodontic treatment, we can consider this a valid treatment. This result is in accordance with the study done by Lucurcio et al. [13]

Leonardi et al. stated that several factors can influence apicoectomy success, such as: the root region where the apicoectomy is done; the drill type employed or laser execution, as well as the cut angle. It is important to obtain the cut surface as regular as it can. The apical cut must involve anatomical variations such as the presence of isthmuses and accessory canals, because they act as a reservoir for bacteria and necrotic pulp tissue, which can lead to treatment failure. The apical cut performed at 3 mm leads to the reduction of the lateral canal in 93%, without the need of largest resections, such as 4 mm.[24]

After six months there was absence of fistula and there was periapical bone repair, confirms a successful procedure. Good post- operative oral hygiene is important,[27] especially in the area of root resection.[25]

Conclusion

Apical periodontitis due to a periapically infected cyst or a chronic abscess can be treated by conventional root canal therapy when the lesion is small. The result of this case, reports complete healing and new bone formation after apicoectomy. Although guided periapical surgery has the potential advantage of reducing the risk of iatrogenic injuries, additional research is needed to quantify the reduction in this risk with this method.

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Legend Figure

Figure 1: Pre-Operative Photograph

Figure 2: Incisions Were Given

Figure 3: Flap Reflection

Figure 4: Bony Window Was Created Using Micromotor

Figure 5: Image Depicting Overextended Gutta Percha From The Root Apices

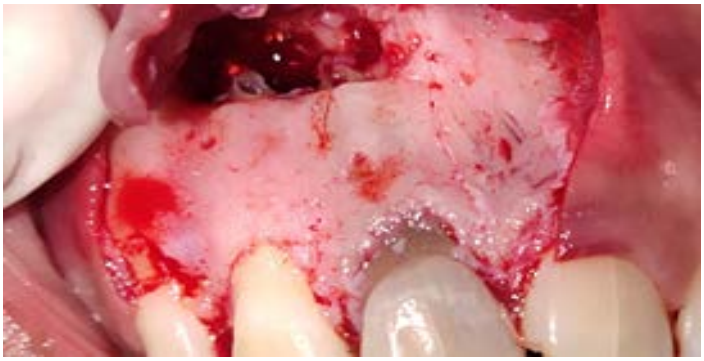

Figure 6: Root End Preparation Done

Figure 7: Mta Placed And The Root Apices Were Closed

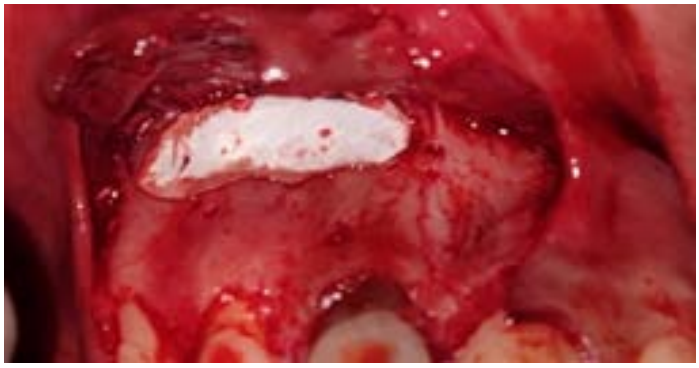

Figure 8: Bone Graft Was Placed Along With Gtr Membrane

Figure 9: Sutures Were Placed

Figure 10: Healing After 3 Months

Figure 11: Healing After 6 Months

Figure 12 A

Figure 12 B

Figure 12 C

Figure 12: Depicting Radiographs Of The Affected Teeth At Baseline (Before The Surgery), At 3 Months And At 6 Months