CASE REPORT

The management of a traumatized central incisor after root canal treatment failure using mineral trioxide aggregate (MTA) – A case report with one year follow up


Abstract

Periapical surgery involves the surgical management of a tooth with periapical lesion which cannot be resolved by conventional endodontic treatment. Its objective is to promote tissue regeneration by removal of the periapical pathologic tissue and by exclusion of any irritants within the physical confines of the affected root. Mineral Trioxide Aggregate (MTA) has since long been successfully used by pediatric dentists in the management of non vital immature teeth. This article presents a clinical case report where an apicoectomy was successfully performed after failure of conventional endodontic treatment and retro grade filling was done using MTA followed by bone graft at the denuded buccal root surface of #21 in a 16 year old female patient in order to promote healing and regeneration of periodontal tissues.

Key words: Mineral Trioxide Aggregate, Root canal Treatment, Apicoectomy


Introduction

Traumatic injuries to the anterior teeth are one of the most common unanticipated events that cause pain, disfigurement and aesthetic problems. Periapical pathology could be the fate of untreated or unsatisfactorily treated traumatically injured teeth. Surgical endodontics is a reliable method for the treatment of teeth with periapical lesions which do not respond to conventional root canal treatment1. The indications for periapical surgery include - root canal obliteration impeding endodontic instrumentation access to the apical region, endodontic material apical extrusion, unsuccessful endodontic treatment and retreatment impossibility due to prosthesis and root perforations with radiological findings or...
clinical symptoms which cannot be treated from within the pulp cavity\textsuperscript{2,3}.

The goal of a periapical surgery is to gain access to the affected area, evaluate the root circumference and root canal anatomy, and place a biocompatible seal in the form of root end filling that stimulates the regeneration of periapical hard and soft tissues. Its success rate varies from 86 – 92\%\textsuperscript{4,5} while failure rate is 4.7\%\textsuperscript{5}. The prognosis depends on several factors such as: different surgical procedures and materials, clinical and radiographic evaluation, systemic conditions, local factors such as involved teeth and their anatomy, previous treatment and its quality\textsuperscript{5,6,7}.

Various studies have shown that MTA is an excellent material for use in apexification, as a root end filling material for immature permanent teeth, as a pulp capping and pulpotomy agent and for repair of perforations. Besides these uses, Mineral trioxide aggregate (MTA) has also emerged as a reliable bioactive material with extended applications in endodontics that include the obturation of the root canal space\textsuperscript{8,9,10}.

In the light of above facts, we present a case report demonstrating a successful surgical management of a large periapical lesion in a tooth (#21) with open apex, in a sixteen year old female patient followed by bone graft placement at the denuded buccal root surface intended for periodontal healing and regeneration, subsequent full coverage restoration by Porcelain Fused to Metal (PFM) crown for aesthetic rehabilitation.

**Case report**

A sixteen year old female patient reported to the Department of Pedodontics and Preventive Dentistry, Saraswati Dental College, Lucknow with the chief complaint of tooth discoloration and pus discharge through gums in front region of upper jaw since 15 days. The patient gave history of trauma to the upper front teeth 6-7 years ago. She underwent treatment for the same tooth two years back. The medical history was non-contributory. Clinical examination revealed fractured and discoloured #21 with bony defect at the labial cortical plate with sinus opening in the buccal vestibule (Fig 1). A thorough investigation demonstrated blackish hue on the labial aspect of the crown suggestive of gross caries reaching the pulp chamber.

Radiographic examination revealed incomplete root formation with wide open apex (approximately 3mm) and blunderbuss canal along with periapical radiolucency with respect to #21. Radiograph also demonstrated presence of radio opaque material in the pulp chamber and root canal (Fig 2). A provisional diagnosis of Ellis Class IV fracture with inadequately filled canals was made in relation to #21. The treatment plan included gross debridement and disinfection of root canal followed by apicectomy and subsequent sealing of the root end with MTA and placement of bone graft to treat the bone defect.
weakening of root. Copious irrigation was performed for complete removal of intracanal radio opaque filling material which was confirmed through radiograph. After thorough cleaning and drying, the canal was sealed with an intracanal medicament of Calcium hydroxide and Iodoform (Metapex, Biometamed) for disinfection of the root canal\textsuperscript{11}. The patient was recalled after 7 days for re-evaluation and complete blood investigation. In the next appointment, apicoectomy was performed in relation to 21. After administration of local anaesthesia, a full thickness mucoperiosteal flap was raised extending from distal aspect of 22 to distal aspect of 11 using Bard Parker (B.P) blade size #15 (BD, Sao Paulo, Brazil) and periosteal elevator (SS White, Lakewood New Jersey). Apical curettage was performed for the removal of granulation tissue. Apical resection of 2 mm at an angle of 45\degree to the long axis of the tooth was then carried out. Surgical site was irrigated using normal saline. After apical resection, the retrograde filling was done with MTA (Angelus, Londrina, PR Brazil). The bone graft (Biograft HA, IFGL Bioceramic Ltd, Kolkata) (Fig 3) was then placed over the bony defect in order to fill the defect and promote healing.

![Fig 3 – show operative site after placement of bone graft.](image)

The flap was then repositioned and approximated with moderated digital pressure and moist gauze and then sutured. Post-operatively antibiotics and analgesics were prescribed to the patient along with 0.12% chlorhexidine mouth rinse for maintenance of oral hygiene. The patient was recalled after 7 days for removal of sutures and treatment evaluation. As there were chances of perforation due to the caries removal on the labial aspect, fibre post placement in the next visit was planned in order to provide reinforcement to the weakened tooth structure. Radiographic evaluation on the recall visit, revealed continued healing of the periapical lesion with successful closure of the bony defect (Fig 4). Space was created for fibre post with the help of paeso reamer (Dentsply, USA) followed by luting of the post using flowable composite and core build up (Fig 5).

![Fig 4 – shows continued healing of the periapical lesion with successful closure of the bony defect](image)

Patient was then recalled after two days and prosthetic rehabilitation was done with Porcelain Fused to Metal (PFM) crown (Fig 6). On one year follow up, radiographic examination revealed periradicular bone formation (Fig 7).

![Fig 5 – shows tooth after placement of fibre post.](image)

![Fig 6 – shows the patient after delivery of Porcelain Fused to Metal (PFM) crown](image)
Discussion

Apicoectomy is a surgical procedure which involves the excision of pathological periapical tissue from root surface (including apical accessory canals) and sealing the canals against pathological agents thereby aiding in tissue regeneration and creation of new structural support to the tooth. It is the principal modality available to manage failure of conventional orthograde endodontic treatment of a large non healing periapical lesion. The reported success rate for periapical surgery varies between 44% and 90%. Harty et al. (1970) found that the success rate of 1016 cases of apicoectomy was 90%. Oginni and Olusile concluded that the success rate of apicoectomy of anterior teeth was 71.9%. Peterson and Gutmann reported a success rate of 64%. The reason for this great variation may be the lack of agreement on a definition of success and failure of surgery, the difference in the expertise of those who perform the operations, and the decision to operate or not to operate on teeth with unfavourable prognosis.

Various cements have been used as root end filling materials. The choice of material to be used is governed by handling properties, biocompatibility, apical seal and long term clinical success. MTA has been investigated and used as a root end filling material since its introduction. It appears to be equal or superior to other root end filling materials with respect to biocompatibility, microbial leakage, marginal adaptation, solubility and compressive strength. Interestingly this material also appears to induce cementogenesis with new cementum deposition on the surface of the retro filling material. MTA has been reported to be superior to other materials in cases with inadequate haemorrhage control. However the disadvantages of this material are its high cost and difficult handling as well as its prolonged setting time of 3 hours. Therefore care must be exercised not to wash off the material after placement. A recently published randomized clinical study comparing MTA and IRM with a 2-year follow up has reported success rates of 92% and 87%, respectively.

A challenging problem in periapical surgery remains the loss of buccal bone with partial or complete root exposure (apicomarginal lesions). It has been shown that healing outcome in periapical surgery is related to the condition of buccal bone plate. Epithelial down growth along the denuded buccal root surface is a major negative factor preventing successful healing in such cases. Hence, regenerative techniques such as placement of bone grafts can be used as an adjunct to the endodontic surgeries. Application of regenerative techniques in teeth with apicomarginal lesions might further expand the field of periradicular surgery.

In this case, we performed apicoectomy in maxillary left central incisor followed by MTA filling. In accordance with the results of the aforementioned studies, we obtained good results along with patient satisfaction. Post operatively, the tooth remained asymptomatic. Prosthetic rehabilitation and aesthetic correction are important to maintain the longevity of treated tooth in oral cavity and also to boost up the self-confidence of the patient by restoring the tooth in form as well as in function. To this effect, prosthetic rehabilitation of the tooth was performed using PFM crown.

Conclusion

This case report shows that the failure of routine endodontic therapy followed by surgical intervention with the placement of biocompatible root end filling material like MTA for management of chronic large periapical lesions could positively affect the treatment outcome. Moreover, the application of MTA as an obturating material introduces the practitioners to an alternative treatment strategy that might improve the healing.
outcomes in patients with complex endodontic conditions.

References


