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Case Report

SURGICAL REPAIR OF ROOT PERFORATION USING MINERAL TRIOXIDE AGGREGATE: A CASE REPORT

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ABSTRACT

Perforations are undesirable complications and unfortunate incidents that can occur during root canal therapy. Root perforation results in the loss of integrity of the root and further destruction of the adjacent periodontal tissues. Successful outcomes of perforation management influenced by various factors like early diagnosis, size, site, time and level of perforation. This report presents successful management of iatrogenic root perforation, treated and sealed with mineral trioxide aggregate.

INTRODUCTION

Perforations are regarded as serious complications in dental practice and pose a number of diagnostic and management problems. Perforation occurs primarily through three possible mechanisms: procedural errors, resorptive processes and caries. Most perforations result from procedural errors [1].However, when teeth are of strategic importance perforation repair is clearly indicated whenever possible. In recent times interest has centered on use of Mineral Trioxide Aggregate which has fulfilled the requirement of an ideal material such as biocompatibility and superior seal when compared to Amalgam, IRM, and Super EBA[2]. In addition, the setting expansion of MTA improves the sealing of perforation margins[3]. In several cases, the tooth crown is extensively destroyed, and the use of an intraradicular retainer is required. Fiber posts associated with composite resin are often used to restore endodontically treated teeth, which present long-term clinical success [3].

This case report explains the management of an iatrogenic perforation at junction of the coronal and middle third of the root, below the alveolar margin.

Case presentation

A 24 years old female patient was referred to the Department of Conservative dentistry and Endodontics with a chief complaintof exposure of metallic post through gingiva in relation to right maxillary central incisor which was giving unaesthetic appearance to patient. Through clinical examination revealed that metal post was perforated the labial cortical plate but the tooth was not mobile and the tooth was not sensitive to the percussion. The medical history of the patient indicated that she was in good health and had no systemic disease (figure 1).

Fig 1 clinical examination

Investigations

Periapical radiograph revealed a short filled root canal and metal post perforating the lateral wall of the canal (figure 2).

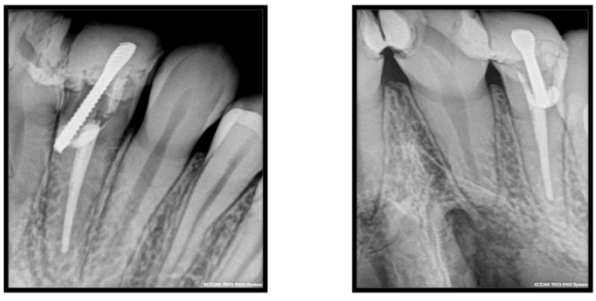

Fig 2 Radiographic examination

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Treatment

Metal post along with the guttapercha was removed from the root canal (figure 3). The root canal was negotiated and irrigated copiously with 2.5% sodium hypochlorite and normal saline. Then master cone was confirmed with radiographically and obturated with AH plus sealer and access cavity was temporised with cavit G. As the perforation was extending subgingivally, a surgical method was opted to access the perforation and seal it, following obturation of the root canal. With patient consent and desire to retain the tooth, patient was recalled next day for surgical procedure.

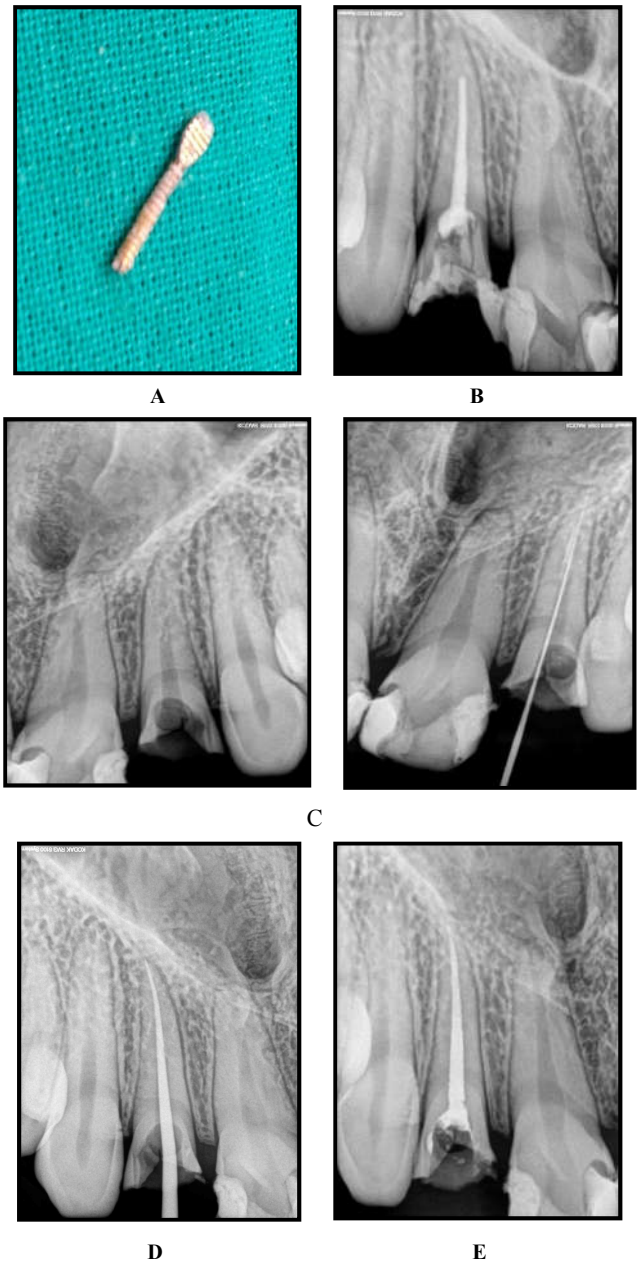

Fig 3 **A)** Post Removal Done
B) Gutta Percha Removal Done
C) Working Length Determination Done
D) Master Cone Selection Done
E) Obturation Done

Under LA (2% Lignocaine with 1:100000 epinephrine solution) buccal full thickness mucoperosteal flap was reflected and it was observed the root surface was devoid of labial cortical plate (figure 4). The perforation site was thoroughly debrided and cleaned.

Fig 4 Buccal full thickness mucoperosteal flap is reflected and perforation site was thoroughly debrided and cleaned.

After the surgical field was cleaned, the perforation site was subsequently sealed with Proroot MTA, which was mixed according to manufacturer instruction (figure 5). Flap was reposition and sutured carefully using 3-0 silk sutures. (figure 6)

Fig 5 Perforation site was subsequently sealed with Proroot MTA

Fig 6 Flap was reposition and sutured using 3-0 silk sutures

One week following the surgical procedure, the wound was healed satisfactory and no complications were observed. The sutures were then removed. Post space was created and fibre post was cemented. Core build-up was done with composite resin (figure 7). Patient was recalled every one month. The tooth was clinically and radiographically symptom free.

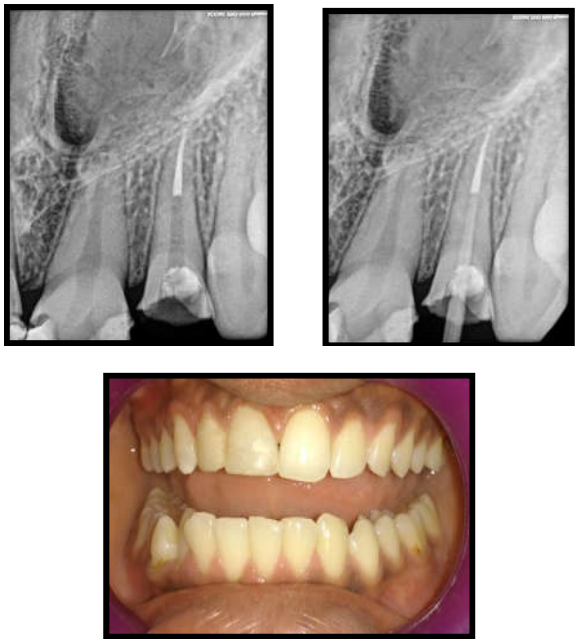

Fig 7 Post space was created and fibre post was cemented. Core build-up was done with composite resin

DISCUSSION

Maintaining the integrity of natural dentition is essential for the function and esthetics. Endodontic therapy plays a vital role in achieving the goal .Perforation during endodontic procedures is cited as the second greatest cause of treatment failure [4].Critical factors that are contributing to successful management of perforation are size, time of repair, level and location, periodontal status of the tooth, access and visibility of the perforation and biocompatibility of perforation repair material [4]. The more apical the perforation the more favourable is the prognosis. Perforation occurring relatively close to the crestal bone and the epithelial attachment is critical, as it may lead to bacterial contamination from the oral environment along the gingival sulcus. This location has been described as the " Criticalcrestal Zone"[5]. Tooth perforations occurring below the crestal bone in the coronal 1\3rd of the root generally has the poorest prognosis [5] In this case the size of perforation was large and as the extent could not reach from the access cavity thus surgical repair was undertaken.

In the past, many materials were advocated for perforation repair; such as tin foil, paraffin, Guttapercha, gold foil, zinc phosphate cement, formulations of calcium hydroxide, amalgam, iodoform, zinc oxide euzenol, cavit, dentin chips, indium foil, EBA cement and gel form however none provide a favourable environment for re-establishing the normal architecture and predictable healing after treatment [6]. Recently newer material like MTA, Biodentin, Endosequence, Bioaggregate, New endodontic cement has been tried for perforation repair[6].In this study we have used MTA as perforation repair material. MTA was initially introduced as root end filling material for surgical endodontic procedures [7,8]. Since then, its clinical applications have broadened to include perforation repair, pulp capping, pulpotomy, and apexification. During these procedures, the dental filling materials usually come into contact with the underlying tissues. The bond strength of most dental materials is significantly reduced by moisture contamination from the tissue, whereas MTA requires the presence of water for setting. Therefore, set MTA can aquire its optimal strength and produce excellent sealability in the presence of moisture [9] and also it promote regeneration of cementum, thus facilitating the regeneration of the periodontal apparatus [10].

Main *et al*[11] concluded that MTA provide an effective seal of root perforation and can be considered a potential repair material enhancing the prognosis of perforated teeth. Torabinejad *et al* [12] compared the sealing ability of MTA, amalgam and super EBA in root-end fillings and showed that MTA leaked significantly less than the other materials. According to Lee *et al* [13] MTA also had superior sealing ability compared with amalgam or IRM when used for perforation repair. The most critical property of any dental material that comes into contact with periapical pulpal or periodontal tissues is its biocompatibility. Several in vivo animal studies have reported that MTA is a biocompatible material with no adverse effect on the dental tissues [14,15].
In this case intraradicular retainer was required due to extensive crown loss. Hayashi *et al* indicated that, the best restorative methods needed to be identified for teeth with extensive loss of structure, and reinforcing pulpless teeth. However, when a tooth has more than 50% of its coronal structure missing, the use of a post and core foundation is recommended prior to restoration [16].The most common complication in post and core system is debonding. Restoration with cast metal posts can cause wedging forces coronally that may result in irreversible failure because of fracture of an already weakened root [17]. The fiber-reinforced posts can be used with minimal preparation because it uses the undercuts and surface irregularities to increase the surface area for bonding. Thus it reduces the possibility of tooth fracture during function or traumatic injury [18].

CONCLUSIONS

The complications like iatrogenic perforation may occur during root canal preparation. Even the tooth is in questionable prognosis; attempt shall be made to repair the tooth. Advances in technologies, like introduction of microscope, new instruments and materials like MTA and Biodentine have provided for more controllable and predictable treatment outcomes, either surgically or non-surgically.

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