Case Report

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Surgical Management of Iatrogenic Perforations of Maxillary Central Incisors with MTA

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ABSTRACT

Background: Perforations represent pathologic or iatrogenic communications between the root canal space and the attachment apparatus. Root perforations are significant complications to endodontic treatment and, if not detected and treated properly, the breakdown of the periodontium may ultimately lead to loss of the tooth. Iatrogenic root perforations are the second most common reason for endodontic failure. As a repair material for perforation, MTA is considered to be gold standard. Complete clinical and radiographic examination and adequate knowledge of the morphology of the teeth is necessary for successful clinical outcome.

Keywords: MTA, Perforations, Surgical procedure.

INTRODUCTION

A perforation is a communication between the root canal system and the supporting tissues of the tooth or oral cavity[1]. Perforation of root walls may be caused by iatrogenic causes, caries, or resorptive processes. Root perforations are significant complications to endodontic treatment and, if not detected and properly treated, the breakdown of the periodontium may ultimately lead to loss of the tooth[2]. Iatrogenic root perforations are the second most common reason for endodontic failure. The frequency of these perforations has been reported to range from 3% to 10%[3]. According to Kvinnsland et al, 53% of these perforations occur during insertion of posts (prosthodontic treatment); the remaining 47% are induced during routine endodontic treatment. In 73% of all cases, the complications occur in the maxilla and the remaining 27% occur in the mandibular arch[4]. Kvinnsland et al. found that in maxillary anterior teeth, all perforations were located at the labial root aspect due to the operator's underestimation of the palatal root inclination. The crowns of many teeth are frequently perforated when anatomical variations are not anticipated during access preparation as a result of misalignment of the bur with the long axis of the root[5]. Significant crown–root angulations, calcifications of the pulp chamber and orifices, anatomical variations, misidentification of canals, and excessive removal of coronal dentin are often the reason for perforations in the coronal part of the tooth. It has been held that the best way to manage perforations is to prevent them, but it is imperative to diagnose and treat a perforation if one has occurred[6].

Different materials have been used for repair of root perforations, including amalgam, IRM, ZOE, SuperEBA, Cavit, gutta-percha, glass ionomer, resin-ionomer, new generation dentin-enamel bonding systems, and composites; but none fulfill the criteria of an ideal repair material that includes ability to seal, biocompatibility, and ability to induce osteogenesis and cementogenesis[3].

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Fig 1: Showing fracture of 11 and 21.

Fig 2: Showing 11 and 21 has a large temporary restoration on the lingual surface.

Fig 3: Red arrow shows the site of perforation. Black arrow shows the guttapercha extruding into the periodontal tissues.

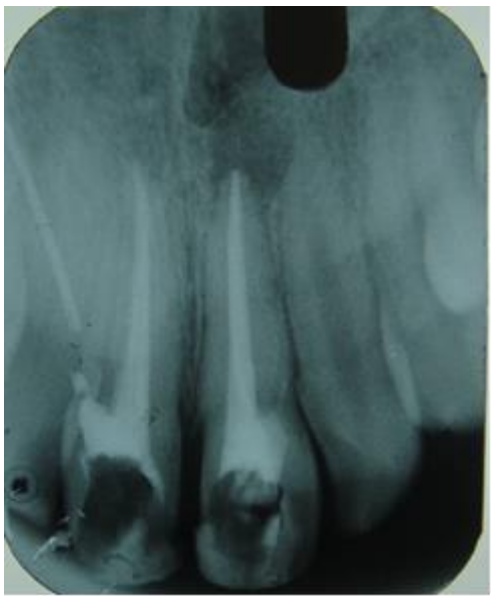

Fig 4: Obturation completed in relation to 11 and 21.

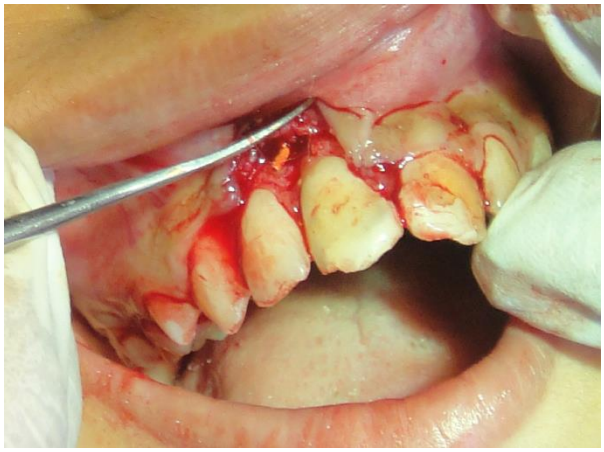

Fig 5: Elevated mucoperiosteal flap, arrow shows extruded gutta-percha.

Fig 6: Shows retrieved gutta-percha.

Fig 7a: Shows radiograph of 11 and 21 showing post space preparation.

Fig 7b: Shows placement of fibre post in relation to 11 and 21.

Fig 8: Shows restoration of 11 and 21 with acrylic crowns.

As a repair material for perforation, MTA has many favorable properties including a good sealing characteristic, biocompatibility, bactericidal effect, radiopacity, and ability to set up in the presence of blood. This paper reports a case of surgical repair of a maxillary incisor with lateral perforation at the coronal third of the root with MTA.

CASE REPORT

A 10 year old female patient was referred to the outpatient section of the Pedodontic Department, with chief complaint of pain in the maxillary anterior region, which was diagnosed as originating from the upper right central incisor. The medical history of the patient indicated that she was in good health and had no systemic diseases. There was a history of dental trauma with crown fracture of the maxillary right central incisor (Fig. 1), which took place about one year ago, and according to the parents, endodontic therapy was initiated at another dental clinic. The patient did not continue the treatment. Clinical examination revealed that the maxillary permanent right central incisor was sensitive to percussion and also showed mild mobility with normal probing depth. On clinical examination 11 and 21 had a large temporary restoration on the palatal surface (Fig. 2). On removal of the same, an ovoid shaped perforation was noticed in the distal wall extending subgingivally and communicating with canal. Intra oral periapical radiographic analysis of 11 and 21 showed a radiolucency extending obliquely, from the cervical 1/3rd of the crown to the coronal 1/3rd of the root (Fig. 3). Radio opacity was seen extending obliquely from distal part of cervical 1/3 rd of root of 11 to apical of the root of 12 confirming the extrusion of guttapercha into the periodontal tissues from the perforation site. As the perforation was extending subgingivally, a surgical method was opted to access the perforation and seal it, following obturation of the root canal. The root canal was negotiated, biomechanical preparation completed, calcium hydroxide saline paste was used as the intra canal medicament in between appointments and the root canal was obturated using a lateral condensation technique (Fig. 4). Following obturation, the patient was scheduled for surgery. A full thickness mucoperiosteal flap was raised buccally (Fig. 5). The extruded gutta-percha was removed (Fig.6). Degranulation and root debridement were done. The perforation site was subsequently sealed using white MTA. The flap was then repositioned and sutures were placed. Patient was recalled after one week for suture removal.

After a month 11 and 21 were treated with fibre post and core build up was done (Fig. 7 A, B). After 3 months, no pathological changes were observed on radiographs. The tooth was clinically and radiographically symptom free. 11 and 21 were restored with acrylic crowns (Fig. 8)

DISCUSSION

Root perforation may cause bone defects with varying degrees of periodontal tissue damage. The injury to the periodontium results in the development of inflammation, destruction of periodontal fibers, bone resorption, formation of granulomatous tissue, proliferation of epithelium, and ultimately will result in the development of a periodontal pocket. The more apical the perforation the more favorable will be 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 "Critical crestal Zone"[7]. Tooth perforations occurring below the crestal bone in the coronal 1/3rd of the root generally has the poorest prognosis[7].

In the present case, the perforation was present in the distolateral midroot area of the upper right central incisor, which might have been caused during access preparation. To avoid such an occurrence, preparation of the access cavity should be carried out with regard to the anatomy of the tooth, and help of microscope should be taken to locate the canal orifice. Close proximity of the perforation to the gingival sulcus can lead to the contamination of the perforation with bacteria from the oral cavity through gingival sulcus.

Furthermore, if the wound is large and not treated immediately, the proximity to the epithelial attachment is critical, and apical migration of epithelium to the perforation site will create a periodontal defect.

The aim of perforation management is to maintain healthy periodontal tissues against the perforation without persistent inflammation or loss of periodontal attachment. MTA promotes a favorable environment for regeneration and has been successfully used for perforation repair. A characteristic that differentiates MTA from other materials is its ability to promote regeneration of cementum, thus facilitating the regeneration of the periodontal apparatus[8]. MTA induces bone formation by stimulating osteogenic cell differentiation[9]. In a series of cases with perforations at various levels of the root, consistent healing with the use of MTA as a perforation repair material was demonstrated[10].

In the present case, it was decided to treat the root canal with calcium hydroxide between appointments to reduce exudation, excessive bleeding, and inflammation of the periradicular tissues, and also to reduce the resorption risk before the obturation of the root canal and the sealing of the perforation with MTA. It has been reported that calcium hydroxide has been used as a successful material to eliminate bacteria and bacterial toxins and to reduce excessive bleeding from the root canal. Application of calcium hydroxide for 1 month reduced the bleeding, but the canal could not be dried completely because of inflammation at the perforation site.

Sealers used for conventional root fillings require a good apical seal and dryness of the root canal. When treating a perforated root, intracanal dryness could be difficult to achieve, as there may be fluid flow into the root canal due to the large surface of periodontal granulation tissue. Success of a nonsurgical treatment depends on direct observation of the perforation site. In this case, a nonsurgical treatment modality was first attempted, but it was not possible to reach the perforation site through the access cavity due to excessive bleeding and the angulation. Therefore, the perforation was approached with surgical intervention and repaired with MTA.

CONCLUSION

Adequate knowledge is needed of the location and dimensions of the pulp chamber as well as the anatomical variations of the specific tooth treated in order to prevent complications. It is impossible to eliminate all iatrogenic errors in endodontics, but by focusing on key areas during the endodontic process, we can reduce the potential problems for ourselves and our patients.

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