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Repair of iatrogenic perforation in central incisor with glass ionomer cement- a case report with 1 year follow up.

Dr. Prinaxy Byxyx[1,4], Dr. Sumedha Sharma[1,5], Dr. Ajay Kumar Nagpal[2,4], Dr. Hasti Kankariya[2,5], Dr Shreya Srivastava[3,5]

[1]*Post Graduate Student, K.D. Dental College and Hospital, Mathura, Uttar Pradesh, India*
[2]*Head of Department, K.D. Dental College and Hospital,Mathura, Uttar Pradesh, India*
[3]*Senior Lecturer, K.D. Dental College and Hospital,Mathura, Uttar Pradesh, India*
[4]*Department of conservative dentistry and endodontics*
[5]*Department of Oral and Maxillofacial Surgery*

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ABSTRACT: Even with the advancements in endodontic therapy, treatment-related problems such as root perforation might occur and cause concerns about the outcome. Different root perforations along the root canal have been attributed to errors caused by the practitioner during the endodontic treatment's operative phases, particularly when it comes to overlooking the anatomic uniqueness of various tooth kinds. Numerous materials, such as calcium hydroxide, silver amalgam, mineral trioxide aggregate (MTA), hydroxyapatite, and glass ionomer cement, have been developed and employed for the purpose of root canal perforation repair. The dental treatment of a maxillary central incisor with a cervical level lateral root perforation and pathology revealed by periapical radiography is described in this report. After nonsurgical root canal therapy and glass ionomer cement sealing of the perforated area, periapical surgery and perforation repair were the next steps in the treatment plan. At the one-year follow-up, there was positive clinical and radiological progression. Therefore, we draw the conclusion that tooth longevity can be increased even when a root hole is present.

KEYWORDS: Endodontics, Root Canal, Dental Materials, Root perforation.

I. INTRODUCTION

Complications from endodontic therapy may arise, including mistakes made by the physicians. These may involve perforations in the pulp chamber floor or canal walls allowing for association with the adjacent periodontium. The location of the perforation is a critical aspect that influences the outcome of endodontic treatment in this type of situation. [1,2]

Perforations have been sealed using a variety of materials. The ideal materials for this purpose are those that are radiopaque, nontoxic, non-absorbable, have a quick preparation time, exhibit good sealability and antibacterial effects, and can stimulate bone growth.[3,4]For this, several materials have been used, including amalgam, zinc-engenol oxide-based compounds, calcium hydroxide, glass-ionomer cement (GIC), mineral trioxide aggregate (MTA), super-ethoxy benzoic acid (EBA), and others.[4,5]Since GIC adheres to dentin well and has high sealing ability compared to other materials, it has been utilized for the repair of perforations during endodontic therapy.[1,2]

Developed initially in the late 1960s, GIC is a biointeractive adhesive hybrid restorative material with therapeutic purpose. It attaches to dentin and releases fluoride, which promotes biocompatibility and remineralization.[6] The adhesive qualities of GIC are derived from the glass ionomer's capacity to chemically chelate calcium and establish a chemical connection with dentin and enamel when it is in its acidic phase.[7] However, its high retention rate, low microleakage, and strong marginal sealing are due to its fluidity and greater coefficient of thermal expansion.[8]

A clinical case with a lateral root perforation in the maxillary central incisor mesiocervical region is presented in this study. The decision was taken to use glass ionomer cement for sealing the perforation.

II. CASE REPORT

A 17-year-old systemically healthy, nonsmoking male patient was referred from a local dentist for pain in the anterior region of the upper right central incisor to the Department of conservative dentistry and Endodontics of K. D. Dental College, Mathura.

The patient complained of pain and discoloration of the teeth. Patient gave a history of

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RCT initiation by local doctor 2 days back. Clinical examination showed yellowish discoloration along with pain during percussion and grade 1 mobility in 11 (Figure1a and b). Radiographic examination revealed perforation in the cervical third and calcification in the middle third of 11 along with radiolucency in the apical third in both the teeth 11 and 12 (Figure 1b). The patient was informed about the prognosis and consent for the treatment was taken.

FIGURE 1 Preoperative images. (a) Discolouration of 11. (b) access opening initiation by local dentist. (c) preoperative radiograph showing perforation in 11 and perapical radiolucency in 11 and 12.

Local anasthesia was given and access opening was done in 11 and 12. Canal negotiation using a small round bur was done. Bleeding was seen from the perforation site of 11. After bleeding was stopped with cotton pack, working length was determined with 10 k file using digital radiograph. Working length was 23 mm in 11 and 21.5 mm in 12 (Figure 2a and b). Biomechanical tooth preparation was done using crown down technique upto 80 and 55 k-file with copious irrigation with 3% sodium hypochloride (chemident^{tm}, India) and 17% EDTA liquid (NeoEDTA, India) in 11 and 12 respectively. Calcium Hydroxide dressing was given for 10 days.

In the next appointment, calcium hydroxide dressing was removed and irrigation was done with saline and 3% sodium hydroxide. Re-application of calcium hydroxide medication was given into the canal due to presence of pain on percussion for 10 days in 11.

Pain was not subsided even after 20 days so periapical surgery was planned and the patient was informed. Due to patients' economic condition, the patient could not effort CBCT scan before the surgery.

The canals were obturated with lateral compaction technique and post endo was done 1 day before the surgery (Figure 2c and d)

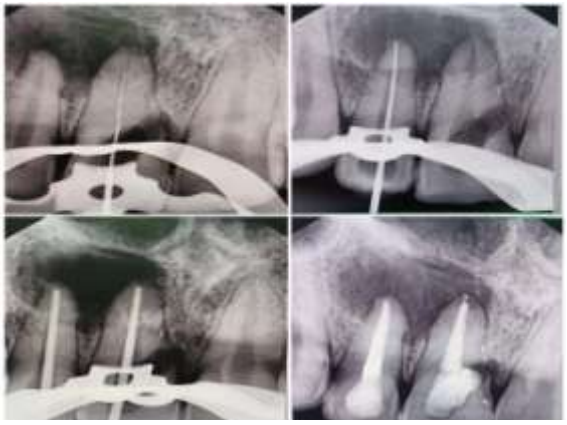

FIGURE 2 (a,b) Working length determination. (c) Master cone (d) Obturation with post endo using GIC

On the day of the surgery, full thickness flap was raised and cyst enucleation was done with respect to 11 and 12. Apicetomy with retrograde filling was done with Glass ionomar cement (3M KetacMolar, USA). Perforation repair in the mesial side was done with GIC (3M Ketac Molar, USA). Suture was done and haemostasis was achieved (Figure 3)

FIGURE 3 (a) Full thickness flap (b) Enucleation of the cyst and apicetomy of 11 and 12 (c) Exposure of the perforation (d)Repair of perforation with GIC (d) suturing of the flap

The patient received written postoperative instructions, a postoperative radiograph (Figure 4a), and a prescription for an analgesic (ibuprofen 400 mg, three times a day) for three days. The patient was prescribed an antibiotic for five days (500 mg of amoxycillin and 400 mg of metronidazole, three times a day), and they were

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also instructed to rinse their mouths with 0.2% chlorhexidine for ten days.

Sutures were removed 10 days after the surgical procedure. The patient was instructed to maintain meticulous oral hygiene and was recalled after 1 month.

After 6 month tooth preparation was done and zirconia crown was given.6 months follow up showed healing of the periapical area with no TOP positive. (Figure 4b)

12 months follow up showed healing of the periapical region with no TOP present and no mobility. The patient is kept under observation. (Figure 4c)

FIGURE 4 (a) Immediate radiograph after surgery (b) At 6 months follow up (c) At 1 year follow up

III. DISCUSSION

Accidental root perforations which occur during root canal therapy can cause the periodontium to produce granulation tissue as a chronic inflammatory response, and this can result in irreversible loss of the tooth or attachment.[7] Positive prognoses are associated with fresh, tiny, coronal, and apical holes. The cervical part of the root has the poorest prognosis for untreated root perforations.

The prognosis of a perforation is dependent upon the chosen repair material's capacity to seal it, as well as the perforation's size, location, duration since it occurred, existence of microbial agents, viability of sealing, and accessibility to the main canal.[8]

In addition to having antibacterial activity, the perfect material for hole sealing should encourage the regeneration of periradicular tissues. It ought to stop bacteria and their byproducts from leaching. Along with being radiopaque, insensitive to moisture, sticky to dentin, nontoxic, nonirritating, non-carcinogenic, and biocompatible, it should also be dimensionally stable and encourage cementogenesis and osteogenesis.[9] Particular emphasis has been paid to GICs as a material for perforation repair. It is a hybrid bioactive adhesive restorative material that promotes biocompatibility and remineralization by bonding to dentin and releasing fluoride.[2]

GIC was selected for the current clinical instance because to a number of benefits, including its strong chemical adherence to tooth structure, superior biocompatibility, and anticariogenic properties. It has also proven to have strong sealing capabilities.[1] Prior research on perforation repair shown that GIC was better to composite resin, amalgam, and a temporary dental restorative material.

In a particular study, there was no statistically significant difference in the results between MTA cement and GICs. MTA shows potential in enhancing the prognosis of teeth with holes that would otherwise be impaired by providing an efficient closure of the root perforations. Although MTA did not increase microhardness or sealing, the data also suggested that the material may have had an antibacterial impact, potentially eliminating germs that were entering the material and providing surface protection.[10]

The removal of the tooth's apical part is known as an apicoectomy. It may be appropriate in the following clinical circumstances: periapical lesions that are ongoing toconventional treatment, holes, broken tools, removal of the apical delta, and the existence of external absorption.[11]

In this clinical case, the chosen treatment was apicoectomy with curettage and planing, because Periapical lesions are mostly caused by a leaky apical seal that permits the outflow of microorganisms and their byproducts. Periradicular curettage of the injured periapical tissue eliminates just the leak's impact. Thus, even if the periradicular lesion is excised, it could reappear if the root end is not resected.

IV. CONCLUSION

In cases where conventional endodontic therapy proves to be unproductive, the dentist must consider other options.As seen in the current clinical instance, perforation repair ought to produce new bone and cementum based on the achieved clinical success. In order to prevent iatrogenic perforations, practitioners must implement preventative management measures. Consequently, in order to evaluate the root and pulp chamber volume, the tooth's longitudinal axis, the root's orientation and curvature with respect to adjacent teeth, etc., a comprehensive study of

radiographs should always be carried out. Nevertheless, understanding dental morphology—that is, the relationships between the exterior (surface) and internal anatomy—can be crucial for obtaining endodontic access. Practitioners can significantly lower the requirement for follow-up interventions that could result in an uncertain prognosis by using this advice.

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