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CASE REPORT

PERFORATION REPAIR OF A PRIMARY TOOTH: A 1-YEAR FOLLOW-UP CASE REPORT

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Abstract. Aim and Background: *Primary teeth are more susceptible to perforation during endodontic treatment due to their anatomical features. Perforations, unintended communications between the root canal and external root surface, are a common procedural accident in endodontics, often leading to tooth loss. Managing these perforations in primary teeth is challenging, with prognosis dependent on factors such as location, size, and contamination. Traditional sealing materials have limitations like microleakage and toxicity. Mineral trioxide aggregate (MTA) is superior due to its sealing ability, biocompatibility, and promotion of hard tissue formation.* ***Case Presentation:*** *This case report describes a furcal perforation repair in a primary molar using MTA in a 5-year-old child. Repulpectomy with calcium hydroxide based obturating material was performed. Follow up was done at 3, 6 months and 1 year.* ***Conclusion:*** *With availability of bioactive materials like MTA, perforations in primary teeth can be repaired with good clinical and radiographic success.* ***Clinical significance:*** *As stated the best space maintainer is the primary tooth by itself. Therefore, perforation repair with MTA can be a viable alternative to extraction in young children thus the tooth can be preserved and meet the functional demands.*

Key words: *primary teeth, perforation, mineral trioxide aggregate, case report*

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INTRODUCTION

Anatomy of primary teeth exhibits a large and wider pulp chambers and thinner enamel and dentin compared to that of permanent teeth. These anatomical aspects increase the perforation risk during endodontic treatment. Pathological/mechanical perforation is defined as a “communication between the root canal and external root surface or periodontal ligament”. According to Ingle, it is the second most commonly occurring procedural accident in endodontics [1]. Furcal perforation causes breakdown in the periradicular region eventually leading to loss of periodontal attachment ultimately leading to tooth loss [2].

Management and clinical decision making of these procedural accidents pose a significant challenge, mainly when it occurs in primary teeth [3]. The prognosis depends on several factors such as location

and size of the perforation and also time of contamination of the lesion [4].

Various materials can be employed in order to seal the pathways of communication between the oral cavity and the root canal system along with the surrounding periradicular tissues. Amalgam, zinc oxide-eugenol-based cements, composite resins, and glass ionomer cements and gutta percha were used in permanent teeth. These materials pose several disadvantages such as microleakage, varying degrees of toxicity, and sensitivity to moisture making them a less reliable material for perforation repair [5]. They do not exhibit the property of resorption as well.

A potential dental material to seal the communication pathways between the tooth external surface and root canal is mineral trioxide aggregate (MTA). MTA consists of fine hydrophilic particles principally consisting of tricalcium silicate, tricalcium aluminate, tricalcium oxide, and other mineral oxides [6]. It posses the ability to set even in the presence of moisture. Various studies have shown that MTA is superior dental material in terms of its biocompatibility, sealing ability, low cytotoxicity and also promotion of odontoblasts to form a hard barrier making the material ideal for perforation repair [7].

Previous studies have shown that perforated roots treated with MTA showed no inflammatory tissue layer and root cementum attached to the MTA [8]. Therefore the purpose of this case report was to describe the repair of a furcal perforation, treated with MTA in a first mandibular primary molar tooth, in which underlying periodontal tissue healing could be observed radiographically after perforation repair.

CLINICAL CASE DESCRIPTION

A 5-year-old female patient presented to the department of pediatric and preventive dentistry with chief complaint of pain in the lower left back tooth region since 1 month. The patient's mother reported a history of spontaneous mild pain localized to lower left back tooth region only while having food which relieves on its own. The mother also reported that another dentist had treated the same tooth for carious lesion 1 year back.

Intraoral clinical examination showed a fractured restoration with secondary caries in relation to 74 (lower left first deciduous molar) with Grade 1 pathological mobility. No intraoral swelling or sinus tract was noted. Radiographic examination showed coronal radioopacity involving enamel, dentine and pulp chamber suggestive of fractured restoration. Radioopacity was noted in the coronal third of the root canal space suggestive of faulty root canal filling material (under obturated root canal). A circumscribed furcal, periapical radiolucency measuring 1x1 cm with discontinuity in the pulpal floor was noted. Considering all the above findings, we accepted the final diagnosis of previously endodontically treated teeth with apical periodontitis with respect to 74.

Considering age of the patient, development stage of permanent teeth and intact follicle surrounding the permanent teeth a clinical decision to save the tooth and attempt for repulpectomy with calcium hydroxide based obturating material was made.

Local anesthesia was administered – supraperiosteal injection with lignocaine hydrochloride was given. Repulpectomy was carried out under rubber dam isolation. Restoration was removed. Perforation on the pulpal floor was noted. The size of perforation was around 1x1 cm. Immediate decision to repair the perforation using MTA was taken. The parents' consent was obtained. Bleeding was controlled from the perforated area. Old obturating materials were removed using K hand files and canals were negotiated. Gutta-percha points were placed in the root canals to secure the patency of the canals. Fast setting MTA (e-MTA , Kids-e Dental, India) was placed on the perforated area following which metapex obturation was completed. GIC restoration was placed in the same visit. After 2 weeks, the patient was recalled and stainless steel crown was placed as the patient was asymptomatic and mobility of the tooth had reduced and tooth was firm (Fig. 1).

Clinical and radiographic follow-up was done at 1 and 6 months and 1 year (Fig. 2 and 3). There were no symptoms of pain reported by the patient and no signs of mobility and swelling were noted during follow up visits.

DISCUSSION

An inflammatory reaction that can result in fistulae and bone resorptive processes is triggered by a perforation, which serves as an open channel for germs to enter from either the periodontal or root canal tissues, or both [4]. The prognosis of the tooth is worse when a perforation happens laterally or in the furcation area because gingival epithelium may overgrow in that direction. Repair can be achieved by either surgical intervention or a conservative, non-surgical approach, depending on the location and size of the perforation. It is extremely important to seal these perforations in order to prevent the entry of noxious elements from within the tooth, which will cause complications [9].

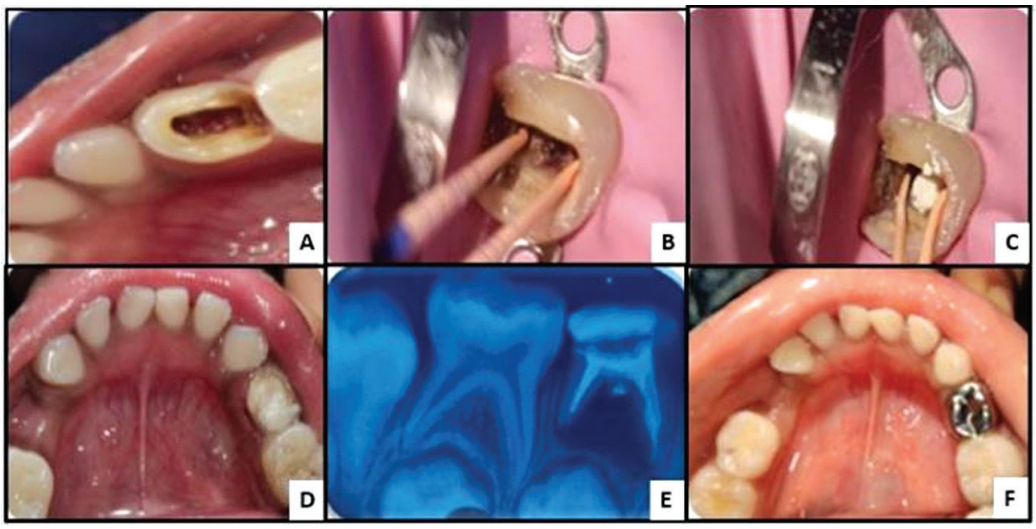

Fig. 1. Clinical steps: A) Perforation on the floor of pulp chamber. B) Placement of Gutta percha points to secure the canal patency. C) Placement of MTA. D) Obturation followed by GIC restoration. E) Post op radiograph. F) Placement of Stainless steel crown

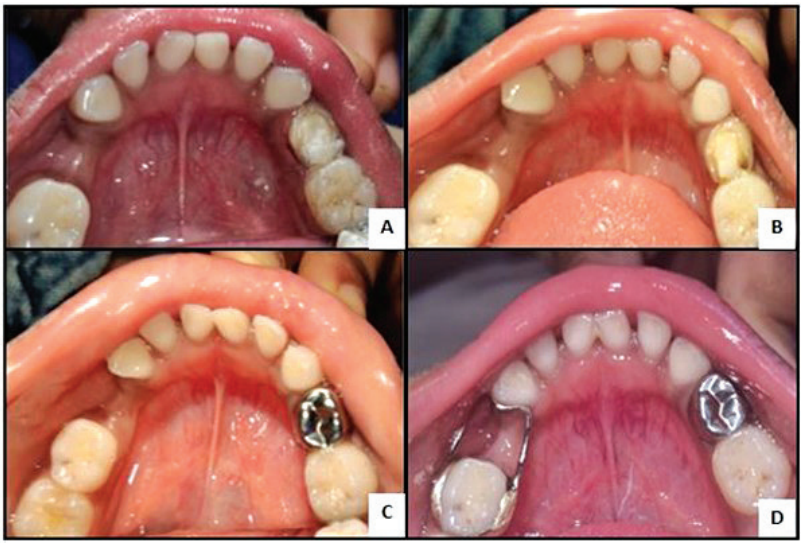

Fig. 2. Clinical follow-up: A) Immediate post-op. B) 1 week post-op. C) 6-month follow-up. D) 1-year follow-up

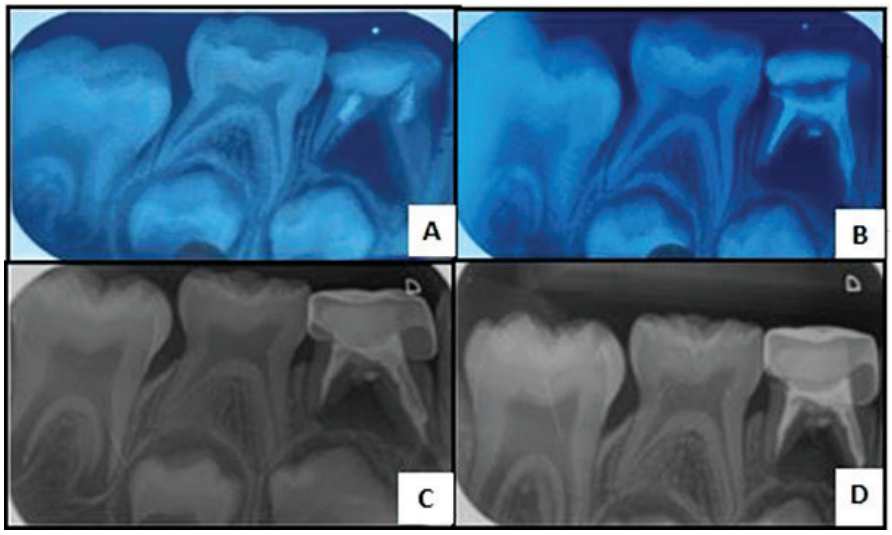

Fig. 3. Radiographic follow up: A) Pre-op. B) 3-month follow-up; C) 6-month follow-up; D) 1 year follow up

Numerous changes in the dental arches may be seen if the regular physiological process of a primary tooth's exfoliation and eruption of its successor is interfered and a space maintainer appliance is not employed. Reduced arch length, inclination of adjacent teeth, extrusion of an antagonist tooth, and early or late emergence of a subsequent permanent tooth are a few examples of these [10]. Consequently, it is imperative to keep the tooth till exfoliation instead of extracting primary teeth that have perforations.

The repair material should ideally be nontoxic, bacteriostatic, aid in the healing process, and offer the best possible hermetic seal [11-13]. Various materials such as, Super EBA, IRM (Intermediate Restorative Material), gutta percha, Cavit, glass ionomer cement, composite, dentin chips, decalcified freeze dried bone, calcium phosphate cement, tricalcium phosphate cement, hydroxyapatite, calcium hydroxide Portland cement, mineral trioxide aggregate, biodentine, bioaggregate, EndoSequence, calcium enriched mixture, etc., are used in literature to seal the perforation. Since the drawbacks of many of these materials outweigh the advantages, they are not currently in use. MTA is biocompatible material with minimal tissue toxicity, it has demonstrated favorable treatment results. The main benefit of using MTA as a furcation repair material is that it may offer a sufficient seal even in the presence of blood and moisture. MTA supports cementogenesis and periodontal ligament healing as it has an alkaline pH of 12.5. The use of MTA is influenced by its availability and desirable qualities [14].

Besides effective perforation sealing, various factors dictate the success rates of the treatment. They include exposure interval of the perforated site, location and size of perforation, pre-operative radiolucent signs adjacent to the perforation. In cases of large perforations, few authors advocate the use of a matrix to prevent the material extrusion due to a potential periradicular tissue inflammation. Late diagnosis and sealing treatment also seem to induce unfavorable prognosis [15]. Delay in perforation sealing impairs the repair by increasing the risk of contamination. Unal et al. also reported successful perforation cases treated between 10 and 15 days [16].

Hemostasis and the precise application of a restorative material are the two biggest problems a clinician must overcome when attempting to repair a perforation. Controlling hemostasis is crucial to create a tight seal since most repair materials are moisture-sensitive, which frequently compromises the material's seal and has adverse effects. Blood does not interfere with MTA's capacity to seal when it is present [17]. Additionally, the fact that the perforation permits the repair material to be extruded into neighboring structures complicates the repair of the defect. An acute lesion to the surrounding periodontal ligament may result from this, which typically happens when the size of the perforation is large and the filling material condenses into the perforation site. In smaller perforations, the rapid repair process is accelerated by the periodontal ligament and surrounding hard tissue, provided that it was not instrumented during the initial development of the defect [18]. Regardless of the material utilized, failure may result from the extrusion of material beyond the root's restriction. Internal matrices such as calcium sulphate were employed to prevent this extrusion [19]. Despite its intrusion into the periradicular tissues, MTA is known to be biocompatible and to induce the development of new cementum along with the regeneration of the complete periodontal apparatus [20].

In the present case the following factors are considered for choice of treatment. Previous studies in literature showed that the tooth survival rate was negatively correlated with the age. Younger children will have a strong repair ability which aids for success of the treatment [21]. Another factor that was considered is the stage of development of successor tooth. In the present case, development stage of the permanent tooth bud was observed to be Nolla's stage 5 where the crown of the developing teeth is almost complete. Thus space maintenance is indicated if extraction is chosen over saving the tooth [22], In this case, radiograph revealed healthy roots with no signs of internal resorption and also no breakage in the follicle lining of the permanent tooth bud indicating a better prognosis. In order to manage the of large periapical lesion Metapex as calcium hydroxide and iodoform based obturating material were used to obturate the tooth. Thus, considering all the above mentioned factors a clinical decision to save the tooth rather than extraction was decided.

A thorough clinical and radiographical follow-up was done at 1, 3 and 6 months and 1 year. During follow-up it was observed that the tooth was asymptomatic with no clinical signs of failure such as pain, mobility or swelling.

This case report adds evidence regarding consideration of perforation repair as treatment modality alternative to extraction in cases where pathological furcation is involved in disease process.

CONCLUSION

With availability of bioactive materials like MTA, perforation repair can be considered as an alternative to extraction in primary teeth.

CLINICAL SIGNIFICANCE

Compared to permanent teeth, primary teeth have thinner enamel and bigger pulp chambers. The risk of perforation is increased by these anatomical features. MTA may be regarded as the best choice for the immediate and intermediate treatments of furcal perforation in primary tooth. As stated the best space maintainer is the primary teeth by itself. Therefore, perforation repair with MTA can be a viable alternative to extraction in young children; thus, the tooth can be preserved and meet the functional demands.

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Ethical statement: *This study has been performed in accordance with the ethical standards as laid down in the Declaration of Helsinki.*

Consent for publication: *Consent form for publication was signed by the patient/parent and collected.*

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