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Surgical and Non-surgical Repair of Iatrogenic and Carious Perforation using Biodentine: A Case Report

Dr. Shikha Jaiswal[1], Dr. Sachin Gupta[2], Dr. Roshni Chandani[3]

[1,2,3]Department of Conservative Dentistry and Endodontics, Subharti Dental College and Hospital, Meerut, India.

Corresponding Author: Dr. Shikha Jaiswal

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ABSTRACT

Perforations during root canal treatment are unsolicited complications that occur due to various reasons and may affect the prognosis of the treatment. Amongst the plethora of materials available, Calcium Silicate cements have proven to be the material of choice for perforation repair with strong evidence of success in literature due to their osteogenic potential. This case report discusses surgical and non-surgical repair of carious and iatrogenic perforations using Biodentine as repair material.

Keywords: Perforations, root canal treatment, Biodentine, carious and iatrogenic perforations

INTRODUCTION

A root canal treatment is performed to resolve various pulpal and periapical diseases of the tooth. However, errors during root canal treatment may sometimes lead to endodontic mishaps and one such mishap is perforation which accounts for 29% of the verified injuries.[1] It has also been reported that perforation accounts for the second greatest cause of endodontic failure.[2] Various factors like the presence of pulp stone, calcification, resorptions, tooth malposition, extra coronal resorption, intracanal post, misdirected access cavity may predispose a tooth to perforation.[3] Prognosis of perforation depends on its location, size and the time of occurrence, and may be compromised by its delayed repair. Repair of perforation is necessary to prevent infection from communicating with the periradicular tissues and this communication also threatens the viability of the tooth.[4] Repair can be done surgically or non-surgically depending on factors like location, site, extension, accessibility and duration of exposure to contamination.[5] This case report will discuss both surgical and non-surgical management of an iatrogenic and carious perforation respectively.

CASE REPORT 1:

A 39-year-old male was referred for endodontic assessment with a chief complaint of pain in his lower left back region of the jaw since approximately a month. On further questioning, the patient revealed the pain to be dull and continuous in nature. Dental history revealed previous restoration of affected tooth. Upon clinical examination, it was observed that 36 had composite restoration, was tender on percussion and responded negatively to sensitivity testing. Radiographic examination revealed carious perforation at the furcation [Fig.1: A]. Thus, a diagnosis of symptomatic irreversible pulpitis with apical periodontitis was made. Root canal treatment with perforation repair was

planned and an informed consent was obtained from the patient.

Perforation Repair:

After administration of local anesthesia using 2% lignocaine with 1:100,000 epinephrine, 36 was isolated with rubber dam. The composite restoration was removed followed by access cavity preparation. After coronal pulp removal, bleeding was observed from carious perforation at the mesiolingual aspect of pulpal floor [Fig.1: B]. All root canal orifices were located and working length was determined with no. 10K file (Dentsply Maillefer, Ballaigues, Switzerland) using Propex Pixi^{TM} (Dentsply Maillefer, Ballaigues, Switzerland) and confirmed by radiograph [Fig.2: A]. Pulp extirpation and initial canal preparation till Protaper S1 was done, after which calcium hydroxide was placed in the canals as intracanal medicament and at the perforation site and the patient was recalled after a week. In the subsequent visit, biomechanical preparation was completed using Protaper Gold files (Dentsply Maillefer, Ballaigues, Switzerland). The mesiobuccal and mesiolingual canals were prepared till F1 and the distal canals were prepared till F2. The canals were then obturated with corresponding gutta percha cones [Fig.2: B]. To repair the furcal perforation, AB Gel (Healthium, Kandivali, Mumbai) was placed in the perforated area [Fig.3: A]. Then Biodentine (Septodont, Saint-Maur-des Fosses Cedex, France) was manipulated by mixing the 1 capsule of powder with 5 drops of liquid in the triturator for 30 seconds. The mix was then carried by using an amalgam carrier to the perforation site condensed passively with finger plugger (Dentslply Maillefer, Ballaigues, Switzerland) followed by radiographic verification [Fig 3: B]. After setting of biodentine, post endodontic composite restoration was done (Coltene Brilliant NG, Langenau, Germany) [Fig.3: C]. PFM crown was placed in the subsequent appointment.

Fig.1: A] Preoperative radiograph, B] After removal of restoration

Fig.2: A] Determination of Working Length, B] Obturation

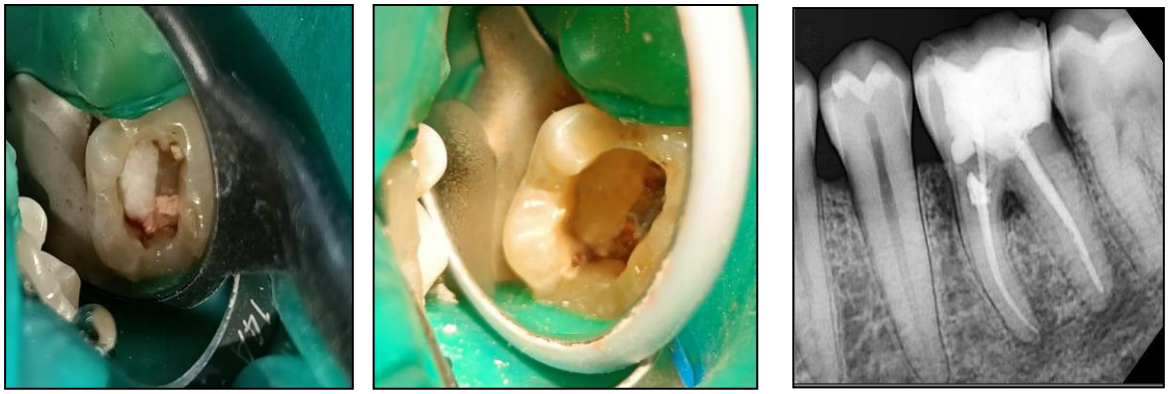

Fig.3: A] ABGel Placement, B] Repair with Biodentine, C] Post endodontic restoration

CASE REPORT 2:

A 20-year-old male reported with a chief complaint of mild pain in upper anterior tooth. The patient gave a history of root canal treatment done 1 year back however visited a dental practitioner for discolored upper anterior tooth a week back for which he got some treatment done; post which the patient developed mild pain. On clinical examination, it was found that 21 was discolored, temporarily restored and gingival inflammation at the cervical region was seen [Fig 5:A] The radiograph revealed obturation of root canal space with no significant apical pathosis [Fig 5:B]. On removal of temporary restoration, bleeding was observed in the access cavity and on further evaluation, perforation was seen in bucco-cervical region which was an apex locator. A CBCT was then advised to the patient, the axial and coronal sections revealed ma perforation of size 5X3mm in crestal region of tooth extending in bucco-lingual direction [Fig.6]. A surgical perforation repair was planned and an informed consent was taken from the patient.

Perforation repair:

After the area was anaesthetized with 2% lignocaine and 1:100,000 epinephrine, an envelope flap was raised to expose the perforation site. After isolating the perforation site, perforation repair was done using Biodentine (Septodont, Saint-Maur-des Fosses Cedex, France) which was manipulated as discussed in Case 1. The mix was then carried by using an amalgam carrier to the perforation site and finger plugger (Dentslply Maillefer, Ballaigues, Switzerland) was used to condense and fill the perforation canal with the mix [Fig.7: B] and the access cavity was sealed with RMGIC (GC Fuji li 2 LC, Tokyo, Japan). The raised flap was then sutured back with 5-0 silk sutures (Synthalin, Bangalore, India) [Fig.7: C] and post operative instructions were given to the patient. After a week, sutures were removed [Fig. 8] and 6 months follow up showed satisfactory healing.

Fig.5: A] Preoperative radiograph, B] Preoperative Clinical Picture

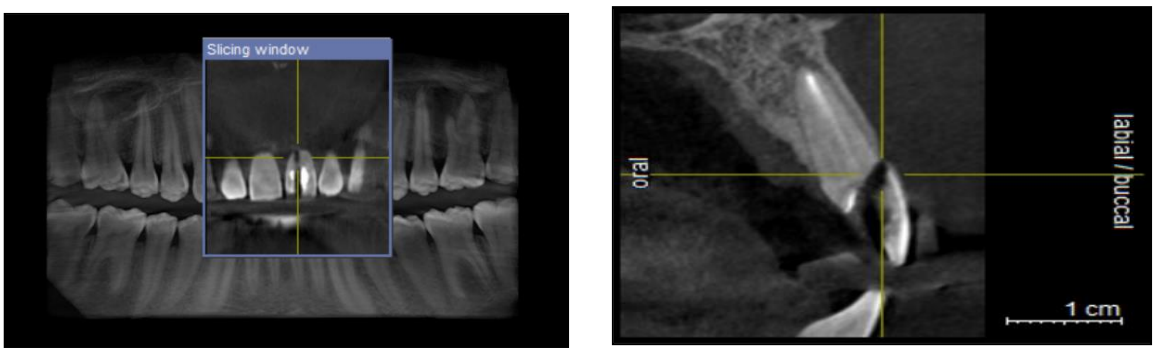

Fig.6: 3-D CBCT View A] Panoramic View, B] Axial View

Fig.7: A] Perforation site after raising the envelop flap, B] Repair with Biodentine, C] Suturing of the flap

Fig.8: After suture removal

DISCUSSION

According to the glossary of endodontic terms, root perforation is defined as the mechanical or pathological communication between the root canal system and the external tooth surface.[6] Accidental root perforations occur in approximately 2% - 12% of endodontically treated teeth[7] which may occur during access cavity opening, root canal preparation during post preparation, or during retreatment which was the major cause of iatrogenic perforation in the second case.

Diagnosis of root perforation can be through clinical and imaging examination. Some of the clinical signs that are suggestive of perforation includes persistent bleeding during coronal access or root canal preparation even after removal of pulp tissue, presence of blood on paper point

when inserted into the canal.[8] However, the clinical diagnosis of perforation is challenging. Apex locators serve as an adjunct diagnostic aid for location of perforation specially of it is in buccal or lingual region, however clinical diagnosis still remains challenging.[9] A radiolucency associated with a communication between the root canal walls and the periodontal space if seen in a radiograph constitutes an important vestige of this procedural accident.[4] Cone beam computed tomography plays an integral part in identifying the specific location and extent of buccolingual perforation as in Case 2.[10]

Knowledge of anatomy of the tooth can help in preventing perforation occurrence. The clinician should be cautious specially during access cavity preparation as an exaggerated or misdirected access is also conducive to root perforation.[11] Each clinical case must be analyzed carefully for the presence or absence of infection, the extent of perforation, the time elapsed before sealing, and the periodontal risk to the patient with respect to its association with the prognosis. Furcation perforation is amenable to non-surgical repair as in case report 1. A preliminary dressing of calcium hydroxide is important to prevent an ingrowth of the granulation tissue.[12] Barrier material which is placed in the perforation area provides for dry field or a back stop to condense the restorative materials against it. For controlled placement of restorative material, an internalized matrix (AB Gel) was used which is a resorbable matrix. Surgical management was decided in Case 2 as a more controlled repair with good accessibility was possible by a minimal flap design (envelop flap).

Various traditional materials used for perforation repair include resin modified GIC, Composites, Calcium hydroxide and Calcium silicate.[8] Since their introduction, Bioceramics have been a material of choice for perforation repair as it combats various disadvantages posed by traditional materials.[13] Aslan T *et al,* concluded that use of MTA and Biodentine may reduce the risk of potentially harmful stress in root perforation regions.[14] These 3rd generation bioceramic materials focus on the process of tissue regeneration including cell adhesion, proliferation, differentiation through the activation of specific genes. In both the cases, the perforation site was repaired with biodentine as it is highly bioactive and biocompatible.[15] Furthermore, biodentine possess a higher push out bond, compressive and flexural strength over MTA.[16]

CONCLUSION

Calcium silicate-based materials are the material of choice for repair of perforation as seen in both the cases.

Declaration by Authors

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