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Management of Iatrogenic Lateral Root Perforation with Mineral Trioxide Aggregate: A Case Report

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ABSTRACT: Iatrogenic perforation is a common example of procedural mishap which may happen when looking for the canal orifice. Such incidents severely affect the prognosis of the teeth by establishing a communication between the canal space and the surrounding periodontal tissues. Mineral Trioxide Aggregate (MTA) is a calcium silicate based cement that was developed as an ideal repair and medicament material. This case report addresses the re-repairof an iatrogenic lateral root perforation with Angelus MTA after its failure post the first attempt. Following the repair, the tooth was anchored with a fiber post and a porcelain fused to metal (PFM) crown. The tooth showed complete healing in the following months. However, the adjacent root canal treated tooth fractured and was restored with a custom cast post followed by a PFM crown.

Keywords: Lateral Perforation, Mineral Trioxide Aggregate, Root Perforation, Tooth Perforation, Re-Repair, Bioceramic material

I. INTRODUCTION:

Iatrogenic perforation is an undesirable incident that occurs in approximately 2%-12% of endodontically treated teeth.[1]Over time, many materials have been tested for the purpose of sealing this communication between the root canal space and the surrounding periodontium like amalgam and glass ionomer cement. Recent literature shows the use of calcium silicate based cememts like Mineral Trioxide Aggregate (MTA) for various endodontic procedures like pulp capping, retrograde filling, apexification and perforation repair. MTA has shown to provide good seal as shown in a dye leakage study by Lee et al wherein it performed better than amalgam and IRM.[4]Greater biocompatibility, capability to induce regeneration of periradicular tissue and workability in a moist environment make MTA as the material of choice for perforation repairs.

In the case of iatrogenic errors, even if the material used has excellent properties, the results equally depend on the efficacy of the clinician to satisfactorily execute the procedure.

II. CASE DESCRIPTION AND RESULTS:

A50 year oldfemale patient was referred from a private clinic to the Department of Endodontics of the institution with an iatrogenic perforation that occurred during the access opening of tooth no 13 (maxillary right canine). The medical history of the patient revealed that the patient is hypertensive and under medication for the same.

On presentation, the patient was asymptomatic with no extra oral clinical findings.An intraoral radiograph was taken to determine the location of the perforation (Fig 5. a&b). The tooth was isolated and on the removal of the temporary restoration, the canal space was found filled with blood. Canal was irrigated with saline solution and hemostasis was achieved.MTA (Angelus, Londrina, Brazil) was dispensed and mixed as per the manufacturer's instructions and condensed into the perforation site using an endodontic condenser. Type II glass ionomer cement (GC Fuji II, United Kingdom) was placed to seal the MTA into the defect.

Patient was recalled after 5 days. A #20 K-file (ManiInc,Tochigi, Japan) was used to determine the working length of the tooth with the help of an electronic apex locator (Root ZX; J Morita, Kyoto, Japan). It was also confirmed radiologically. Cleaning and shaping was done manually using K-files upto the size of #50 K-file (Mani Inc, Tochigi, Japan) with copious irrigation using 3% sodium hypochlorite and saline solution. The canal was dried using paper points and obturation was done by lateral condensation using zinc oxide sealer (Fig.5 c). The tooth was then restored with composite resin (Filtek Z250, 3M ESPE, Minnesota, USA). Post endodontic restoration was not advised as there was enough remaining tooth structure.

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Patient reported back to the department 5 months later with the complain of pain and purulent discharge with respect to the same tooth (Fig.5 d).Presence of a sinus tract was seen clinically in the buccal vestibule corresponding to 13. Radiographic examination revealed radiolucency in the periapical region of 13 with minimal trace of MTA at the site of repair. The permanent restoration was removed followed by guttapercha removal. The canal was flushed with saline solution and calcium hydroxide was placed in the canal as the interappointmentintracanal medicament followed by restoration with a temporary restorative material. Intracanal medicament was replaced every week for upto 3 weeksuntil the purulent discharge subsided and the sinus tract healed.

In the fourth week, perforation site was visualized under a dental operating microscope (Prima DNT, Labomed, Labo America Inc, Fremont, California) and repaired using MTA (Angelus, Londrina, Brazil). MTA was dispensed and mixed as per manufacturer's instructions and placed at the site of perforation followed by condensation. A moist cotton pellet was placed in the canal and a temporary restoration was given. After a 14-day break, patient was recalled for obturation followed by placement and cementation of #1 glass fiber post (Reforpost, Angelus, Londrina, Brazil) (Fig.4 f). Core build up was done using composite resin (Filtek Z250, 3M ESPE, Minnesota, USA) and tooth preparation was done to place a PFM crown. Patient was recalled periodically for over a year to check for clinical and radiographic healing.

During the recall phase, patient reported with the crown fracture of the adjacent tooth, 12, which was also root canal treated (Fig.5 g). Insufficient tooth structure was available to do conventional core build up followed by crown placement. Hence,surgical crown lengthening was planned and executed with2mm gingivectomy and 1.5mm of osteotomy on both buccal and palatal aspect of the tooth (Fig.1).Patient was recalled after a week for the removal of Perio pack and sutures.

Fig.1. 12 – After gingivectomy

Fig.2. 12 – Wax pattern for the cast post and core

Fig.3. 12 – After cast post cementation and tooth preparation

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Fig.4. 12 and 13 – Post crown cementation

After satisfactory healing, post space was prepared in 12 using hand reamers until #120(Mani Inc, Tochigi, Japan). An impression was made of the prepared canal space along with the core build up was done using inlay wax after coating the prepared space with a lubricant (Fig.2).The prepared pattern was casted into a metal custom made cast post. The fit of the cast post was checked radiographically before cementation using Type I GIC (GC America) (Fig.5 h). Gingival retraction cord was used for gingival displacement that would help record the prepared margins (Fig.3). An elastomeric impression was made to record the margins of the prepared tooth. The rehabilitation was completed with a PFM crown over the cemented cast post.

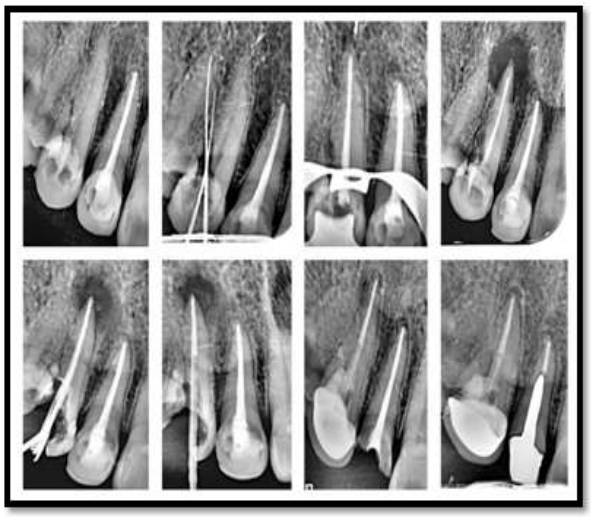

Fig. 5. a-d (top row) ; e-h (bottom row)

Fig.5. a & b – Perforation location wrt 13;

c – Obturation done wrt 12 & 13;

d - Periapical lesion wrt 13 after 5 months of treatment;

e – Re-rct wrt 13;

f – #1 fiber post placement wrt 13;

g – Coronally fractured 12;

h – 12 after cementation of cast post

III. DISCUSSION:

Root perforation is the formation of a channel between the root canal space and the surrounding periodontium which adversely affects the prognosis of the tooth. It could result from the hunt for canal orifice, during post space preparation or as a result of internal or external root resorption. There are several factors that determine the prognosis of a perforated tooth. First and foremost is the time lapse since the perforation until it is repaired. Longer the time taken for repair, worse is the prognosis of the tooth. The location and size also play a major role.[2]Perforations occurring close to the 'critical crestal zone' may be complicated by

periodontal breakdown, with connection between the perforation defect and the oral cavity via a periodontal pocket.[5]Cervical perforations usually bear poor prognosis due to contamination of the site from the gingival fluids. In the present case, the perforation site was radiographically located just below the cementoenamel junction making it easy to access for repair.

In this case, calcium hydroxide was used as an intracanal medicament in between the appointments to reduce the periradicular infection and disinfect the canal before it could be repaired and obturated. 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.[3]However, completely dry canal could not be obtained due to bleeding from the perforation site.

Mineral Trioxide Aggregate (MTA) is a calcium silicate based cement that was developed as an ideal repair material and medicament for such mishaps. It is preferred for several procedures such as pulp capping, apexification and perforation repair due its excellent biocompatibility and ability to induce cementum formation.MTA has also shown to have antibacterial effects on clinical strains of E. faecalis along with other oral bacteria namely S. aureus and P. aeruginosa. Its consistency also makes it easy to be packed efficiently against a barrier.Main et al did a study on 16 patients with root perforations that were not associated with periodontal pockets and were repaired with MTA.[6]All patients showed complete healing at a one year follow up. In this case, MTA was placed with a moist cotton pellet to allow the setting and hardening to seal the perforation before the canal could be obturated with guttapercha. On the second attempt, the repair was performed under 1x magnification of a dental operating microscope to visualize the site and ensure complete packing of the material into the perforated area.

Grossly mutilated teeth pose a challenge for the clinician to esthetically and functionally restore the tooth. The factors that influence the post endodontic restoration are the remaining tooth structure, functional load on the tooth, position and esthetic requirements of the patient.[7]As per Ingle 6th edition, cast post is indicated when both the proximal walls are missing in an anterior tooth.[8]Since, in the present case, the remaining tooth structure of the lateral incisor was minimal with no proximal walls, a customized cast post was planned. Post and core function together as a unit. The lost tooth structure is replaced by the core and post provides retention for the core and protects the tooth from any further fracture causing trauma. Here, surgical crown lengthening was performed to place ferrule margins on sound tooth structure. A prefabricated fiber post was opted for the canine due to the presence of enough tooth structure. The dual cure luting cement also helped ensure the seal of the repaired perforation. Both the teeth were given PFM crowns as the final prostheses due to the aesthetic concerns.

IV. CONCLUSION:

Thorough knowledge is necessary to correctly diagnose and plan the treatment of grossly mutilated teeth with questionable prognosis. Placement of ferrule on sound tooth structure plays the most important role in determining the success of the rehabilitation of teeth with a custom cast post. The time elapsed before the perforation is repaired is a crucial factor in determining the success of the treatment. Use of magnification to visualize the defect and right material to repair the perforations can help improve the outcome of the treatment and prolong the longevity of the tooth.

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