International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2020): 7.803

Management of Furcal Perforation with Mineral Trioxide Aggregate - Case Reports

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Abstract: ***Perforation is a pathologic or iatrogenic communication between root canal system and supporting tissues of teeth or oral cavity. Teeth with furcal perforation present difficult outcome and dubious prognosis. Iatrogenic root perforations occur in approximately 2.12% of endodontically treated teeth. Several materials have been proposed in case of perforation repair and calcium silicate based cements like mineral trioxide aggregate (MTA) are the most recommended one. The present study reports clinical cases of furcal perforation repair using MTA in rotated maxillary premolar with deep buccal cervical abrasions and another one in mandibular molar.***

Keywords: Furcal perforation, Root perforation, Perforation repair, Mineral trioxide aggregate

1. Introduction

Procedural operative errors may occur at any time during root canal treatment and may cause treatment to fail. Several predisposing factors causing procedural errors include – pulp stones, calcifications, misplaced tooth (incorrect inclination in the arch, tipping or rotation), intensive caries, internal root resorptions, etc[1].

Furcal perforation is one of the most unpleasant and frequent accidents that occur during endodontic treatment [2]. Causes of furcal perforations include – burs with inappropriate dimensions and/or inadequate direction during the pulp chamber ceiling removal and root canal location, also in combination with pathological factors causing weakening of pulpal floor [3].

However, large furcal perforations do not respond well to calcium hydroxide, probably due to its restricted physical and chemical properties[4]. Thus, newer materials like biodentine and MTA are now in use to overcome these restrictions of calcium hydroxide. MTA was introduced in 1993 by Torabinejad at Loma Linda University, California, USA, which is now in extensive use for perforation repairs, apexifications, regenerative procedures, apexogenesis, pulpotomies and pulp capping [5]

2. Case Report - 1

A 64 year old male patient reported to the Department of Conservative Dentistry and Endodontics in GDC&H Aurangabad with a chief complaint of pain in upper left back region of jaw, since one week. Clinical examination revealed 90^0 degree rotated maxillary left first premolar (buccal cusp placed distally and palatal cusp placed mesially) with deep buccal cervical abrasion (figure 1). The concerned tooth was tender to percussion. Also, patient gave history of swelling with 24 one month ago. Based on clinical and radiographical examination and history given by the patient, provisional diagnosis established was acute exacerbation of chronic lesion with 24.

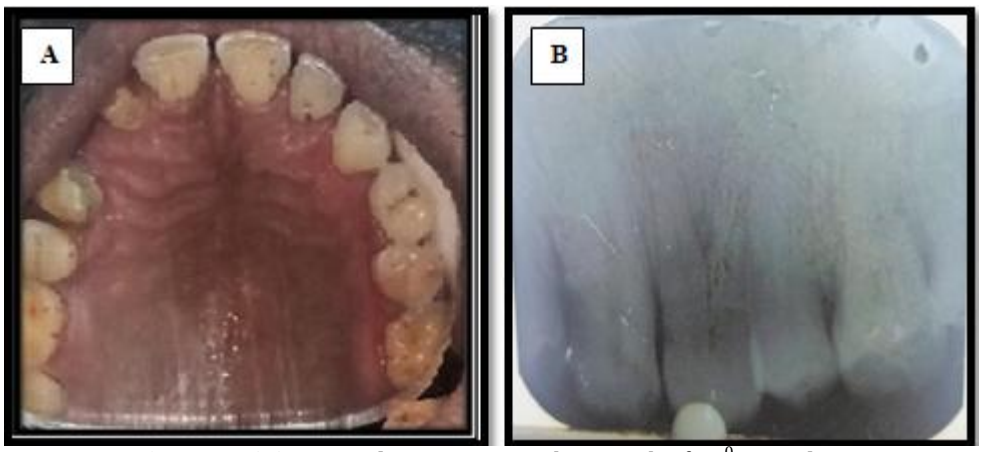

Figure 1: (A) Intraoral pre-operative photograph of 90^0 rotated 24
(B) IOPA X-Ray with 24 (pre-operative) showing cervical and furcal radiolucency

Analgesic and antibiotic were prescribed and patient was recalled after 3 days. Local anaesthesia was administered and access opening was started using an endo access bur. In an attempt to locate root canal orifices with DG 16 endo explorer, because of weakened pulpal floor (due to deep buccal cervical abrasion) pulpal floor was perforated centrally (Figure 2). Bleeding was controlled by placing a small cotton pellet dipped in a haemostatic agent.

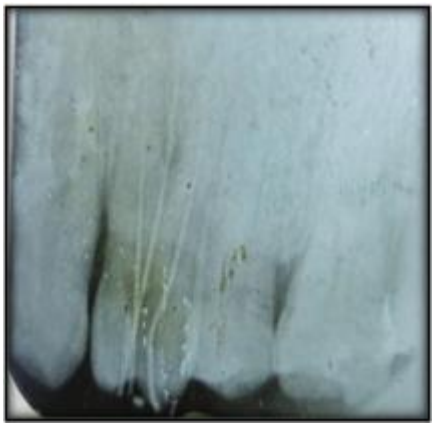

Figure 2: IOPA X-Ray with 24 showing furcal perforation

After complete control of bleeding, mesial and distal root canal orifices were located (as the tooth was rotated, buccal and palatal orifices became distal and mesial orifices respectively) and biomechanical preparation started. Root cervical preparation was performed using ProTaper Sx instrument. After obtaining glide path with a #10 K file, tooth length was obtained using an electronic apex locator (SybronEndo) and apical patency was performed with a pathfile instrument (19/0.02). the root canal was instrumented upto F1 instrument (20/0.06). The root canals were irrigated using 2.5 % sodium hypochlorite solution between instrumentation. Final irrigation was performed using normal saline for 1 minute. Root canals were aspirated and dried with absorbent paper points, master cone evaluation done and obturation performed using F1 gutta percha points and epoxy resin based sealer, using a single cone technique. Endodontic sealer residues were cleaned and MTA in the ratio 1:1 (powder and liquid) was placed on pulpal floor (perforation site). Wet cotton was kept over MTA and cavity sealed with temporary restorative material (cavit). Patient was recalled after 24 hours and the setting of MTA was evaluated. Then the cavity was sealed using glass ionomer cement.

Figure 3: Master cone IOPA X-Ray with 24

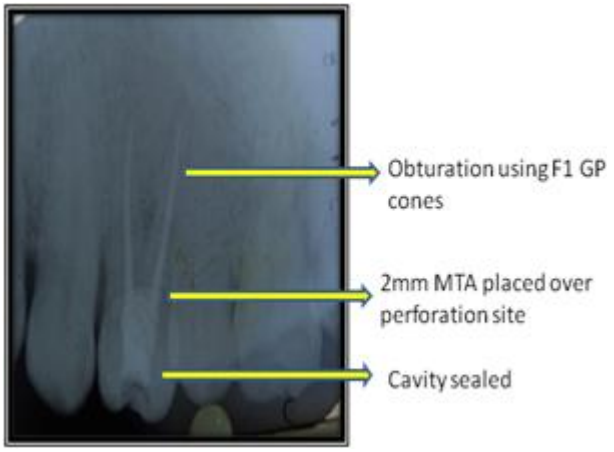

Figure 4: Post operative IOPA X-ray with 24

Patient was recalled after 7 days to evaluate any sign or symptoms of pain or discomfort. Follow up was done till 12 months and the tooth was clinically asympotomatic.

3. Case Report - 2

A 35 year old female patient was referred to the Department of Conservative Dentistry and Endodontics in GDC & H, Aurangabad with a chief complaint of pain in lower right back region of jaw, since one week. She gave a history of incomplete root canal treatment one week ago. On intraoral examination, the concerned tooth (46) was sealed coronally with temporary cement. At the time of examination, the tooth was sensitive to percussion and palpation. Pre operative radiographic examination revealed furcal radiolucency and periodontal ligament widening with right mandibular first molar (figure 5). Treatment options indicated for the tooth were extraction and non surgical repair of the perforation. As per patient's choice, the option of saving the tooth via non surgical procedure, i.e. furcal perforation repair with MTA was chosen.

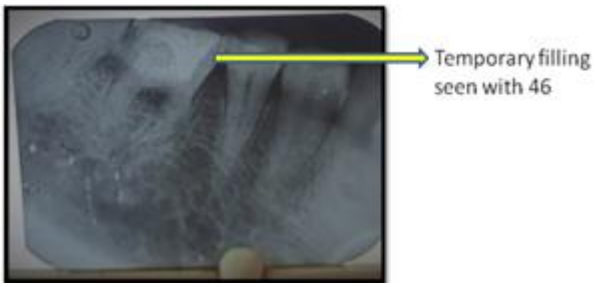

Figure 5: Pre operative IOPA X-ray with 46

After administration of local anaesthesia, 2% lidocaine with 1:100000 epinephrine, temporary filling was removed. After removal of dressing, perforation area could be seen clinically (figure 6-A). Haemorrhage was controlled with copious irrigation with 0.9% normal saline solution. A cotton pellet dipped in haemostat was placed at perforation site for 1 min which completely arrested furcal bleeding. The canals were located using Endo Z bur and working length determined using electronic apex locator (SybronEndo). The root canals were cleaned and shaped using rotary files (SuperEndo Gold Flex Niti files) in a crown down technique. In between instrumentation, canals were irrigated using 27 guage needle syringe with 1 ml of

2.5% sodium hypochlorite solution and immediately rinsed afterwards with 3ml of normal saline solution. The canals were dried with paper points and obturated using F1 gutta percha points. Endoseal was used as a root canal sealer.

After the obturation of the root canals, the perforation site was copiously irrigated with normal saline for 1 minute. MTA (Pro Root MTA) was mixed with distilled water as per manufacturer's instructions and placed at perforation site using an amalgam carrier. It was gently packed with a wet cotton pellet to obtain good adaptability. The cavity was sealed with temporary restorative material (cavit) and patient was recalled after 24 hours. The setting of MTA was evaluated and the cavity was restored using a permanent restorative material.

Patient was recalled after 2 months. At the time of follow up, the patient was completely asymptomatic and RVG with 46 showed initial trabecular bone formation in furcal area. Further, 3 months of follow up showed complete loss of radiolucency and a dense bony formation in furcal area with completely asymptomatic 46. The clinical examination revealed that the tooth had no pain, no response to percussion, palpation and there was no attachment loss or periodontal problems, as indicated by normal probing depths and the tooth was completely in function.

Figure 6: (A) Clinical photograph with 46 after removal of temporary restoration, (B) RVG showing Master cone with 46 after biomechanical preparation and (C) Post obturation IOPA X-Ray with 46 after sealing furcal perforation with MTA.

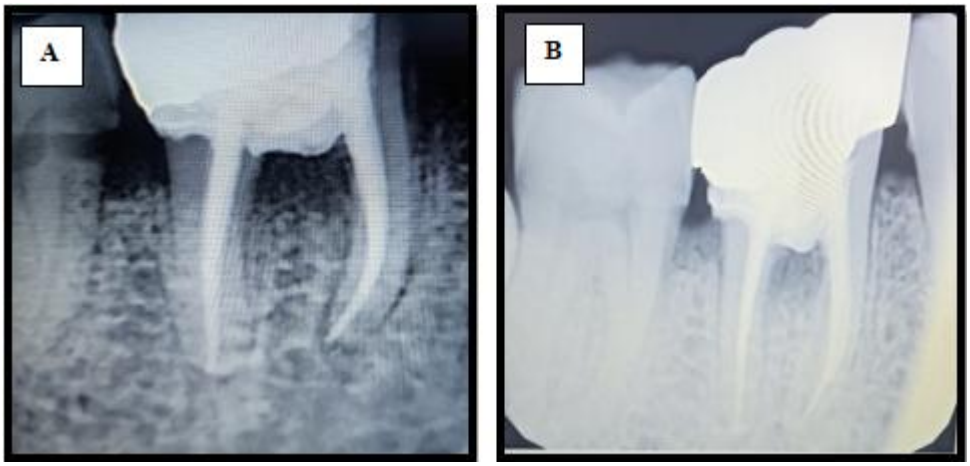

Figure 7: (A) RVG with 46 after 2 months of follow up, (B) RVG with 46 after 3 months of follow up showing complete loss of furcal radiolucency and decrease PDL widening

4. Discussion

Many authors reported that the prognosis of a tooth with perforation depends on the size and location of the defect, the time period for which the opening is exposed to contamination, the material used for repair, the sealing possibility of the perforation and accessibility to the main canal[6]. MTA has wide range of applications including endodontic repair (root perforation repair, apexifications, resorptive lesions, retrograde filling material in endodontic surgeries), for pulp capping, etc[7]. The cementogenic activity of MTA is because of its release of an abundance of calcium ions, which interacts with phosphate ions in the surrounding tissue fluid to form hydroxyapatite on its surface[8]. Thus MTA appears to provide a biocompatible and long term effective seal for root perforation with higher success rate[9].

5. Conclusion

Root perforation during an operative procedure shoud always be prevented. Diagnosis and immediate sealing, intensity of aggression, control of contamination, relationship to crestal bone and epithelial attachment are factors that have an impact on the prognosis. Physiochemical, histological and clinical studies have indicated MTA as a good sealing material in such circumstances. Biodentine and EndoSequence are other alternatives to MTA for repairing furcal perforations.

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