International Journal of Enhanced Research in Medicines & Dental Care, ISSN: 2349-1590
Vol. 3 Issue 3, March-2016, Impact Factor: 1.102

Furcation Perforation Repair- A case report

Dr. Shashank Saurav[1], Dr. Ankita Agarwal[2], Dr Neal Bharat Kedia[3],
Dr Sumit Kumar Yadav[4], Dr Achla Bharti Yadav[5]

[1]Post graduate student Dept. of conservative dentistry and endodontics Buddha institute of dental sciences and hospital, Patna, India
[2]Senior lecturer, Dept. of conservative dentistry and endodontics Buddha institute of dental sciences and hospital, Patna, India
[3]Reader, Department of Orthodontics & Dentofacial Orthopedics, Buddha Institute of Dental Sciences & Research, Patna, Bihar, India
[4]Reader, Department of Orthodontics & Dentofacial Orthopedics, Mithila Minority Dental College & Hospital, Darbhanga, Bihar, India
[5]Demonstrator, Department of Oral Pathology, Post Graduate Institute of Dental Sciences, Rohtak, Haryana, India

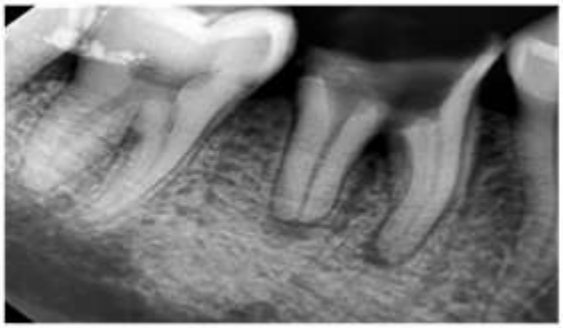
INTRODUCTION

Perforations can be defined as mechanical or pathological communications between the root canal system and external tooth surface (1).Several materials have been used to repair perforations like amalgam, zinc oxide-eugenol cements (IRM and Super-EBA), glass ionomer cement, composite resins, resin-glass ionomer hybrids (2).In recent times interest has centered on use of Mineral Trioxide Aggregate which has fulfilled the requirement of an ideal material such as biocompatibility and superior seal when compared to Amalgam, IRM and Super EBA.MTA has been used successfully in several clinical applications such as Root end filling material, Pulp capping and as well as Pulpotomy (3) (4). The Mineral Trioxide Aggregate was developed by Dr. Torbinejad at Loma Linda University in the year 1993. The chemical composition of MTA was determined by Torabinejad et al, which consisted of fine hydrophilic particles, and the main components were tricalcium silicate, tricalcium aluminate, tricalcium oxide, and silicate oxide. Bismuth oxide acted as a radioopacifier. They declared that calcium and phosphorus were the main ions in MTA. Microscopic examinations of periodontal tissues after perforations in the furcal area and subsequent sealing with MTA demonstrated repair of the periodontium and new cementum formation over the material(5) (6).

This article presents 2 case reports of supracrestal and furcation perforation repaired by MTA anglus MTA anglus has excellent sealing ability and can be used with or without matrix in repair of large furcation perforations(7).No statistically significant difference in leakage was found between gray and white MTA when used as a furcation perforation repair material (9).

CASE 1

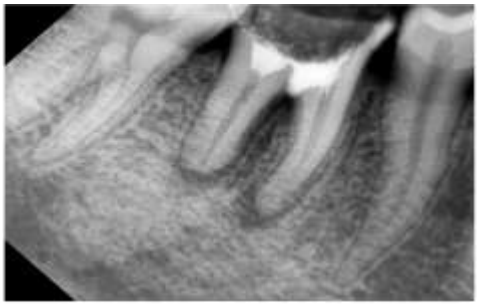
A 24-year-old man presented with accidental furcal perforation, which had occurred during access preparation for root canal treatment of tooth 46 in ug section of dept of conservative dentistry and endodontics Buddha institute of dental sciences and hospital. Several treatment options like extraction, bicuspidization and nonsurgical repair of the perforation with MTA was discussed with the patient, who opted for root canal treatment along with repair of the perforation with MTA. The furcal perforation was confirmed by periapical radiography of tooth 46, which revealed osseous breakdown at the furcation. A rubber dam was used for isolation, the caries was removed, and the perforation site was irrigated with 1% sodium hypo chloride to control hemorrhage and allow visualization of the perforation. Cotton pellets moistened in saline were placed in the root canals, and the perforation was sealed with white MTA (Angelus, Londrina, Brazil) mixed with liquid supplied by the manufacturer. The MTA was covered with a cotton pellet moistened with distilled water and Cavit temporary restoration material (3M ESPE, St. Paul, Minn.) (Fig. 1b). Two days after repair of the perforation, the patient underwent nonsurgical root canal treatment without complications. At the 15-day follow-up, the patient was asymptomatic. Three months after the treatment, there was radiographic evidence of bone formation adjacent to the MTA; there was slight extrusion of the material along with the seal of the defect.



Pre operative radiograph

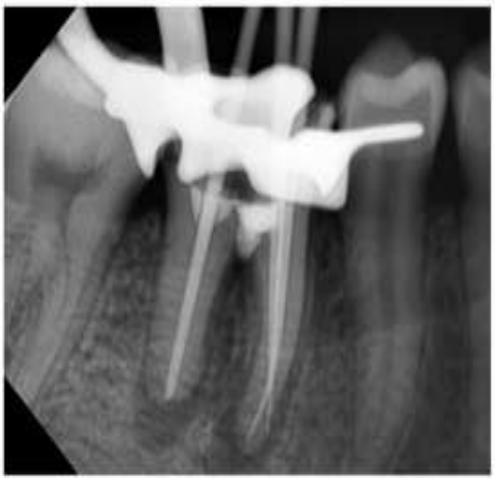
Pre operative photograph

MTA Placement photograph



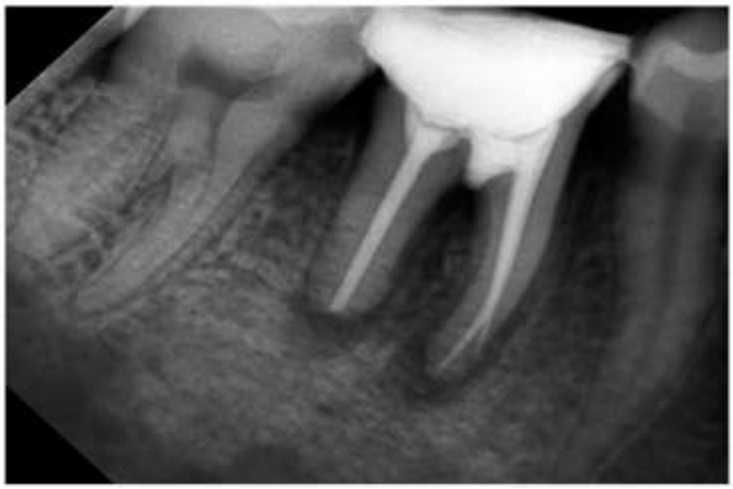
MTA placement radiograph

Working length determination



Mater cone radiograph

obturation radiograph



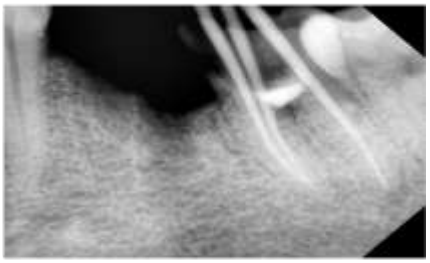
3 months follow up radiograph

CASE 2

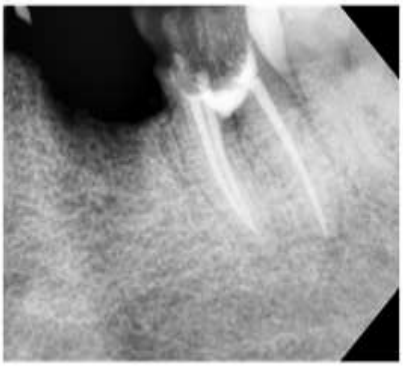
A 30-year-old woman presented with accidental furcal perforation, which had occurred during access preparation for root canal treatment of tooth 37 in ug section of dept of conservative dentistry and endodontics Buddha institute of dental sciences and hospital. Several treatment options like extraction, bicuspidization and nonsurgical repair of the perforation with MTA was discussed with the patient, who opted for root canal treatment along with repair of the perforation with MTA. The furcal perforation was confirmed by periapical radiography of tooth 37, which revealed osseous breakdown at the furcation. A rubber dam was not applied as patient was very apprehensive and non cooperative so we used cotton roll for isolation, the caries was removed, and the perforation site was irrigated with 1% sodium hypo chloride to control hemorrhage and allow visualization of the perforation. Cotton pellets moistened in saline were placed in the root canals, and the perforation was sealed with white MTA (Angelus, Londrina, Brazil) mixed with liquid supplied by the manufacturer. The MTA was covered with a cotton pellet moistened with distilled water and Cavit temporary restoration material (3M ESPE, St. Paul, Minn.) (Fig.1 b). Two days after repair of the perforation, the patient underwent nonsurgical root canal treatment without complications. At the 15-day follow-up, the patient was asymptomatic. Six months after the treatment, there was radiographic evidence of bone formation adjacent to the MTA; there was slight extrusion of the material along with the seal of the defect.

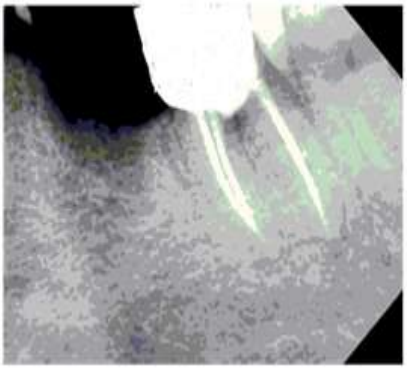
Pre operative radiograph

Mta placement radiograph



Master cone radiograph





Obturation Radiograph

6 months follow up radiograph

DISCUSSION

Perforation is an artificial communication between the root canal system to the supporting tissues of teeth or to the oral cavity. Causes :-Iatrogenic As a result of misaligned use of rotary burs during endodontic access preparation and search for root canal orifices or Inappropriate post space preparation for permanent restoration of endodontic ally treated teeth. Non-iatrogenic: Root Resorption & Caries. Factors of Significance To Prognosis For Treatment are Time, Size & Location. Classification of Perforations by Fuss & Trope is Fresh perforation – treated immediately or shortly after occurrence under aseptic conditions, Good Prognosis. Old perforation – previously not treated with likely bacterial infection, Questionable Prognosis. Small perforation - (smaller than #20 endodontic instrument) – mechanical damage to tissue is minimal with easy sealing opportunity, Good Prognosis. Large perforation – done during post preparation, with significant tissue damage and obvious difficulty in providing an adequate seal, salivary contamination, or coronal leakage along temporary restoration, Questionable Prognosis. Coronal perforation – coronal to the level of crestal bone and epithelial attachment with minimal damage to the supporting tissues and easy access, Good Prognosis. Crestal perforation – at the level of the epithelial attachment into the crestal bone, Questionable Prognosis.Apical perforation – apical to the crestal bone and the epithelial attachment, Good Prognosis.

Furcal perforation is an undesirable problem that may occur during root canal treatment or post preparation. Similarly, a risk of perforation may arise during removal of affected tissue in a patient with caries involving the pulpal chamber. In either case, the situation can be quickly addressed, which is important, as immediate treatment will help ensure a positive prognosis.4 In the 2 cases presented here, the problem was resolved promptly by application of MTA. Two major brands of MTA are available on the market: MTA-Angelus (used in the cases described here) and Pro-Root MTA (Maillefer, Dentsply, Switzerland). Both products are available in grey or white. According to the manufacturer's material safety data sheet, Pro Root MTA is composed of 75% Portland cement, 20% bismuth oxide and 5% dehydrated calcium sulfate. MTA Angelus is composed of 80% Portland cement and 20% bismuth oxide, with no calcium sulfate.8 The dominant compounds in both types of Pro-Root MTA are calcium oxide, silica and bismuth. However, the grey version has greater concentrations of aluminum oxide (122% higher), magnesium (130% higher) and iron (1000% increase).9 Although both the grey and the white versions of Pro Root MTA perform similarly in terms of furcal sealing10 and antimicrobial effectiveness,11 the grey version has a more favourable behaviour in vitro in terms of development of odontoblasts,12 whereas the white version is associated with development of cement oblasts and keratinocytes.

13 The white version gives a better final appearance than the original grey MTA, which can create a shadow under thin tissue.10 Both the grey and the white versions of MTA-Angelus and Pro-Root MTA have numerous similarities: pH 9 after 168 hours,14 success in dog pulpotomy,15 minimal concentration of arsenic (0.0002 ppm),16 overall composition,8 biocompatibility,17 inflammatory response,18 sealant ability,5 in vitro fibroblastic stimulation19 and antimicrobial activity.20 However, MTA-Angelus has greater release of calcium in the first 24 hours of activation14 and a lower concentration of bismuth (grey version only).21 In the current report, white MTA-Angelus was used in one case and grey in the other, with similar results.MTA is difficult to manipulate because of its granular consistency, slow setting time and looseness.22 Pro-Root MTA contains fewer large particles and fewer small particles than MTA-Angelus. Generally speaking, white MTA contains smaller particles than grey MTA, with a narrower distribution of sizes. MTA-Angelus particles have relatively low sphericity and a wide size distribution, and they are less homogeneous than Pro-Root MTA.23 The main disadvantage of Pro-Root MTA may be its long setting time.

MTA-Angelus contains no calcium sulphate, which reduces its setting time to 10 minutes.8 Contamination of the blood should be avoided when using this type of material, as such contamination can reduce the retention capacity of the MTA.24 Previous authors have stated that contact with adjacent tissues may increase the sealant capacity of MTA, since an acidic environment (such as tissue) may increase this property.25 In the cases presented here, sealing of the lesions could be observed, with some extrusion of the material. To prevent overfilling or under filling, a resorbable collagen matrix can be applied before placing the MTA,24 but use of a matrix depends on the size of the lesion. Success has been reported both with26 and without27 the matrix. At present, there is no size classification for furcal lesions to determine appropriate treatment and prognosis; therefore, all options are considered to have a guarded prognosis.1,7 In the 2 cases presented here, the lesions were of different sizes. In case 2, the lesion was larger, with irregular limits, characteristic of a V-shaped caries. As shown in case 2 the lesion affected almost the complete dimension of the furcal region, but did not affect the internal walls of the roots; this limited the lesion overall and indicated a lateral boundary against which to place the material.

If the lesion had been larger, it would have been necessary to apply a matrix base before placing the MTA. As shown in case 2 mild extrusion of the MTA adjacent to the newly formed osseous crest. In case 2, the lesion was more circumscribed and had a vertical entrance, characteristic of accidental perforation with a diamond bur osseous destruction was also greater . Nevertheless, the use of white MTA in case 1 yielded results similar to those achieved with grey MTA in case 2. Although use of MTA has been reported for several different endodontic treatments, the literature on its success in cases of furcal perforation is limited. Two common clinical presentations of furcal perforation (related to caries and to accidental drilling) have been described here. Although the prognosis is typically better for smaller lesions (as in case 2), and although the location of these perforations at the level of the epithelial attachment and crestal bone suggested a guarded prognosis,1,4 .

CONCLUSION

Advances in technologies, like the introduction of microscopes ,new instruments and materials like MTA have provided for more controllable and predictable treatment outcomes ,either surgically or non surgically .Nevertheless an excellent initial radiographic examination ,careful consideration of the anatomy and position of the tooth should be the first factor to be considered before endodontic therapy to avoid procedural accidents.

REFERENCES

[1] American Association of Endodontists glossary of endodontic terms, 7th ed. Chicago, IL: American Association of Endodontics, 2003.
[2] Ruddle JC. Nonsurgical endodontic retreatment. In: Cohen S, Burns RC, eds. Pathwaysof the pulp, 8th ed. St Louis: Mosby Inc, 2002:919.
[3] J. Camilleri & T.R Pittford Mineral trioxide aggregate :a review of the constituents and biological properties of the material International endodontic journal 39, 747-754,2006.
[4] Howard W. Roberts ,Jeffrey M. Toth, Mineral trioxide aggregate material use in endodontic treatment :A review of the literature Dental materials 24 (2008) 149-164.
[5] Torabinejad M, Hong CU, McDonald F, Pitt Ford TR. Physical and chemical properties of a new root-end filling material. J Endod 1995; 21:349 –53.
[6] Pitt ford TR, Torbanijed M, Mc Kendry DJ, Hong CU, Kariyawasam SP. Use of mineral trioxide aggregate for repair of furcal perforations. oral surg O ral med Opathol Oral radiol Endod 1995;79:756-63
[7] Ahmed Abdel Rahman Hashem, Ehab E Hassanien. Pro Root MTA, MTA-Angelus and IRM Used to Repair Large Furcation Perforations: Sealability Study *JOE* — Volume 34, Number 1, January 2008
[8] Main C, Mirzayan N, Shabhahang S, Torabinejad M. Repair of root perforations using Mineral Trioxide Aggregate: Along term study. J Endod 2004;30:80-3.
[9] Hatim A Hamad, Patricia A Tordik, Scott B McClanahan Furcation Perforation repair comparing Gray and white MTA: A Dye extraction study.
[10] Tsesis I, Fuss Z. Diagnosis and treatment of accidental root perforations. Endod Top 2006; 13:95–107.
[11] Al-Daafas A, Al-Nazhan S. Histological evaluation of contaminated furcal perforation in dogs' teeth repaired by MTA with or without internal matrix. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007; 103(3):e92–9.
[12] Roda RS. Root perforation repair: surgical and nonsurgical management. Pract Proced Aesthet Dent 2001; 13(6):467–72.
[13] Fuss Z, Trope M. Root perforations: classification and treatment choices based on prognostic factors. Endod Dent Traumatol 1996; 12(6):255–64.
[14] De-Deus G, Reis C, Brandão C, Fidel S, Fidel RA. The ability of Portland cement, MTA, and MTA Bio to prevent through-and-through fluid movement in repaired furcal perforations. J Endod 2007; 33(11):1374–7.
[15] Torabinejad M, Chivian N. Clinical application of mineral trioxide aggregate. J Endod 1999; 25(3):197–205.
[16] Roberts HW, Toth JM, Berzins DW, Charlton DG. Mineral trioxide aggregate material use in endodontic treatment: a review of the literature. Dent Mater 2008; 24(2):149–64.
[17] Oliveira MG, Xavier CB, Demarco FF, Pinheiro AL, Costa AT, Pozza DH. Comparative chemical study of MTA and Portland cements. Braz Dent J 2007; 18(1):3–7.

[18] Asgary S, Parirokh M, Eghbal MJ, Brink F. Chemical differences between white and gray mineral trioxide aggregate. J Endod 2005; 31(2):101–3.
[19] Hamad HA, Tordik PA, McClanahan SB. Furcation perforation repair comparing gray and white MTA: a dye extraction study. J Endod 2006; 32(4):337–40.
[20] Ribeiro CS, Kuteken FA, Hirata Junior R, Scelza MFZ. Comparative evaluation of antimicrobial action of MTA, calcium hydroxide and portland cement. J Appl Oral Sci 2006; 14(5):330–3.
[21] Perez AL, Spears R, Gutmann JL, Opperman LA. Osteoblasts and MG-63 osteosarcoma cells behave differently when in contact with Pro Root MTA and White MTA. Int Endod J 2003; 36(8):564–70.
[22] Oviir T, Pagoria D, Ibarra G, Geurtsen W. Effects of gray and white mineral trioxide aggregate on the proliferation of oral keratinocytes and cementoblasts. J Endod 2006; 32(3):210–3.
[23] Duarte MA, Demarchi AC, Yamashita JC, Kuga MC, Fraga Sde C. pH and calcium ion release of 2 root-end filling materials. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2003; 95(3):345–7.
[24] Menezes R, Bramante CM, Letra A, Carvalho VG, Garcia RB. Histologic evaluation of pulpotomies in dog using two types of mineral trioxide aggregate and regular and white Portland cements as wound dressings. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004; 98(3):376–9.
[25] Duarte MA, De Oliveira Demarchi AC, Yamashita JC, Kuga MC, De Campos Fraga S. Arsenic release provided by MTA and Portland cement. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2005; 99(5):648–50.
[26] De Deus G, Ximenes R, Gurgel-Filho ED, Plotkowski MC, Coutinho-Filho T. Cytotoxicity of MTA and Portland cement on human ECV 304 endothelial cells. Int Endod J 2005; 38(9):604–9. 27) Rezende TM, Vargas DL, Cardoso FP, Sobrinho AP, Vieira LQ. Effect of mineral trioxide aggregate on cytokine production by peritoneal macrophages. Int Endod J 2005; 38(12):896–903.
[27] Guven G, Cehreli ZC, Ural A, Serdar MA, Basak F. Effect of mineral trioxide aggregate cements on transforming growth factor beta1 and bone morphogenetic protein production by human fibroblasts in vitro. J Endod 2007; 33(4):447–50.
[28] Tanomaru-Filho M, Tanomaru JM, Barros DB, Watanabe E, Ito IY. In vitro antimicrobial activity of endodontic sealers, MTA-based cements and Portland cement. J Oral Sci 2007; 49(1):41–5.
[29] Song JS, Mante FK, Romanow WJ, Kim S. Chemical analysis of powder and set forms of Portland cement, gray ProRoot MTA, white ProRoot MTA, and gray MTA-Angelus. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006; 102(6):809–15.
[30] Ber BS, Hatton JF, Stewart GP. Chemical modification of ProRoot MTA to improve handling characteristics and decrease setting time. J Endod 2007; 33(10):1231–4.
[31] Komabayashi T, Spångberg LS. Comparative analysis of the particle size and shape of commercially available mineral trioxide aggregates and Portland cement: a study with a flow particle image analyzer. J Endod 2008; 34(1):94–8.
[32] Vanderweele RA, Schwartz SA, Beeson TJ. Effect of blood contamination on retention characteristics of MTA when mixed with different liquids. J Endod 2006; 32(5):421–4.