Journal of Dentistry and Oral Biology

Research Article
Published: 18 Feb, 2021

Nonsurgical Retreatment and Iatrogenic Perforation Repair Using Mineral Trioxide Aggregate-Two Year Follow Up - A Case Report

Savitha Adiga[1], Ida Ataide[2]*

[1]Department of Conservative and Endodontics, Sri Siddhartha Academy of Higher Education, SSAHE Sri Siddhartha Dental College and Hospital, Karnataka, India

[2]Department of Conservative and Endodontics, Goa Dental College and Hospital, India

Abstract

Introduction: Most root canals fail mainly due to micro leakage and bacterial infection. The presence of new or persistent periapical radiolucency adjacent to a root filled tooth is often used as a criterion for endodontic treatment failure. Most common causes of endodontic failure are incomplete obturation, inadequate coronal seal, missed canals, iatrogenic events like instrument separation, and lateral perforations. Perforations during endodontic procedures are cited as the second greatest cause of treatment failures. These perforations can be managed surgically or non-surgically depending on various factors such as accessibility and visibility, duration and size of perforation, periodontal status, and the quality of root canal treatment, the strategic importance of the tooth, the patient's oral hygiene, and the operator's experience.

Case Presentation: The purpose of this case report is to describe an endodontic retreatment and nonsurgical management of large periapical radiolucency in a maxillary central incisor with coronal third perforation managed successfully with MTA-Angelus without matrix. Esthetic was restored using all ceramic crowns in anterior teeth.

Conclusion: Six months, one and 2 year follow-up appointments showed no signs of infection and tooth remained asymptomatic. Radiograph showed evidence of osseous repair with resolution of periapical radiolucency, reparation of periradicular tissues, and deposition of cementum over MTA at the perforation site. Despite a perceived poor prognosis, present case report showed good clinical results, and therefore the technique appears promising.

Keywords: Mineral trioxide aggregate; Endodontic retreatment; Periapical radiolucency; Iatrogenic root perforation; Nonsurgical repair

OPEN ACCESS

Correspondence:
Savitha Adiga, Department of Conservative and Endodontics, Sri Siddhartha Academy of Higher Education, SSAHE Sri Siddhartha Dental College and Hospital, Tumakuru, Karnataka 572107, India, Tel: 91-9731131585; E-mail: drsavithab6@gmail.com

Received Date: *04 Jan 2021*
Accepted Date: *16 Feb 2021*
Published Date: *18 Feb 2021*

Citation:
Adiga S, Ataide I. Nonsurgical Retreatment and Iatrogenic Perforation Repair Using Mineral Trioxide Aggregate-Two Year Follow Up - A Case Report. J Dent Oral Biol. 2021; 6(1): 1177.
ISSN: 2475-5680

Introduction

Endodontic retreatment is a procedure performed on a tooth that diagnostically demonstrates incomplete treatment, yet the actual conditions require further endodontic treatment to achieve successful results [1]. Numerous factors associated with failing nonsurgical endodontic treatment are incomplete obturation, root perforation, external root resorption, coexistent periodontal-periradicular lesions, grossly overfilled or overextended canals, canals left unfilled, developing apical cysts, adjacent pulpless teeth, inadvertently removed silver points, broken instruments, unfilled accessory canals, constant trauma [2,3].

Perforations are cited as the 2nd greatest causes of treatment failure and have been reported to be a major factor in up to 9.6% of endodontic failures [4]. Root perforations can be pathological due to caries or root resorptive defects but most commonly occur iatrogenically due to the use of misaligned rotary burs during access preparation, inappropriate post space preparation, and while negotiating canals in the calcified tooth as well as in curved root [5,6].

Management of perforations will depend on a number of factors which includes time lapse since the creation of the perforation, diagnosis, etiology, location and size and shape of the perforation, access to the perforation site, visibility, adjacent anatomical structures (including adjacent roots), periodontal status, strategic importance of the tooth, and experience of the operator [7,8].

Immediate sealing of the perforation site with good biocompatible sealing material is a critical factor for the prognosis of the perforation repair [8]. A material with excellent sealing properties, Mineral Trioxide Aggregate (MTA) was introduced by Torabinejad et al. [9]. Gray or white powder consists of fine hydrophilic particles of tricalcium silicate, tricalcium aluminate, tricalcium oxide and other mineral oxides, which are responsible for its chemical and physical properties. Besides the retrograde filling application, it has also been regarded as an ideal material for perforation repair, pulp capping, pulpotomy and apexification [10,11]. Studies have shown that MTA present better features, such as: Alkaline pH (12.5) constant calcium release which inhibits bacterial activity [12]; efficient marginal adaptability and sealing ability [13,14], which avoid microbial infiltration [15]; and low toxicity to the periodontal tissues resulting in cementogenesis and osteogenesis [10,16], and gains the regeneration of periodontal attachment [17].

Majority of the data pertaining to MTA-Angelus are *in-vitro* animal studies. There are hardly any long term clinical studies; the purpose of this report was to present a case of contaminated one year old iatrogenic perforation with hopeless prognosis, managed successfully with MTA-Angelus. These cases illustrate the ease of use of MTA for management of perforations in retreated tooth with apical radiolucency.

Case Presentation

A 32 year old female patient reported to the department, with a chief complaint of discolored front tooth associated with mild pain on chewing/biting. The patient gave a history of trauma 5 years back and had undergone root canal treatment 3 years back. On intraoral examination, the tooth 11 and 21 was discolored and slight tender on percussion in 11 (Figure 1, 2). Intraoral periapical radiograph revealed that previous root canal treatment of 11 with incomplete obturation of the canal with periapical radiolucency (35 mm × 20 mm) at the apex of 11 extending to distal of 12, and coronal third perforation confirmed with file in place. Provisional diagnosis of failed root canal therapy with chronic periapical lesion and coronal third perforation in relation to 11 and necrotic pulp with 21 was arrived. Of the various treatment options explained to the patient, patient desired to retain the tooth. Treatment planning of retreatment of root canal combined with perforation repair with MTA-Angelus (Angelus, Londrina, PR, and Brazil) for 11 and RCT for 21 followed by all ceramic crowns was decided.

Standard isolation procedure with rubber dam was followed. Coronal access opening was refined and cleaned. Gutta-percha from the main canal was removed with H-file and solvent xylene (Figure 3). There was slight bleeding from the perforation site, which was controlled by irrigation with 1% sodium hypochlorite. Then the canal was prepared by step-back technique, accompanied by irrigation with 3% sodium hypochlorite and 3 mL of 15% trisodium EDTA along with manipulation of master apical file (#70) for 3 min, followed by irrigation with sodium hypochlorite, the root canal was filled with calcium hydroxide RC cal (Prime Dental) and introduced into the canal with a lentulo spiral. The calcium hydroxide dressing was changed twice at 3-week intervals and maintained for 2 months.

After 2 months, the dressing was removed by irrigation with 3% NaOCl and reaming motion with a K-type file, and then the root canals were obturated with seal apex sealer (Kerr manufactr Grp.) And gutta-percha (Hygenic, Akron, OH, USA) using a cold lateral condensation technique. At the same visit perforation site was packed using MTA-Angelus with pluggers, radiograph was taken to check for adequate condensation, and then the access was sealed with IRM (Figure 4). At the subsequent visit, 21 was cleaned, shaped

Figure 1: Preoperative labial view of 11 and 21.

Figure 2: Preoperative palatal view of 11 and 21.

Figure 3: IOPR after removal of GP.

Figure 4: Post-operative IOPR after obturation of 11.

and obturated with Gutta-percha points with AH-26 sealer (Figure 5). Then the access opening of both 11 and 21 was restored with composite resin. Acrylic crowns placed (Figure 6) until placement of final metal ceramic crowns (Figure 7).

Six months, one and 2 year follow-up appointments showed no signs of infection and tooth remained asymptomatic. Radiograph showed evidence of osseous repair with resolution of radiolucency, reparation of peri-radicular tissues, and deposition of cementum over MTA at the perforation site (Figures 8-10).

Discussion

Iatrogenic perforations impede proper endodontic therapy and

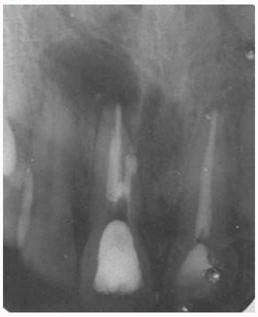

Figure 5: Post-obturation of 21.

Figure 6: Labial view of 11, 21 after acrylic crowns placement.

Figure 7: Labial view maxillary centrals with porcelain fused to metal crowns with GIC.

Figure 8: Six months postoperative IOPA radiograph.

Figure 9: One year postoperative IOPA radiograph.

Figure 10: Two year postoperative IOPA radiograph.

increase the risk of treatment failure; as a result, the prognosis is compromised, especially in non-vital teeth or teeth with periradicular lesions [18]. Perforations may lead to short-term or long-term complications such as infection, periapical cyst, or granuloma formation. Root perforation is followed by bacterial contamination, periradicular tissue injury, inflammation, bone resorption and further in furcation perforation there will be epithelial proliferation and periodontal pocket development [18,19].

As early as 1903, Peeso stated that successful management of root perforations is dependent on early diagnosis of the defect, choice of treatment, materials used, host response, and the experience of the practitioner [5]. These factors are valid even today. Ideally, to prevent bacterial contamination, perforations should be repaired as quickly as possible [17,18], for better post-treatment prognosis. In the cases presented, immediate repair of the perforation was not possible, because the patient presented to us one year after the defect.

In the present case, non-surgical approach was preferred due to accessibility and visibility of coronal third perforation. Major goals of nonsurgical retreatment of endodontically failed teeth with iatrogenic perforation include thorough debridement, disinfection and three dimensional obturation of previously treated canals to remove all etiological factors, without compromising on the root dentin [20]. Gaining access to prepare and seal the perforation with a biocompatible material and maintain an intact periodontal attachment apparatus [9].

Present case report showed failed root canal treatment with apical radiolucency, which could be due to incomplete obturation of the canal; the perforation was present in the mesio lateral midroot area of the upper right central incisor, which might have been caused during access preparation. To avoid such an occurrence, preparation of the access cavity should be carried out with regard to the anatomy of the tooth. Non surgical repair of perforation was considered in this case due to good visibility and accessibility to the cervical perforation. Matrix was not used while condensing MTA in the cervical third perforation; so there is slight extrusion of the material, which was later replaced by the cemental deposition (Figure 10). Previous studies by Pitt Ford et al. [10], Torabinejad et al. [9,16], Hashem and Hassanien [21] have shown that the superior sealing ability and biocompatibility of MTA causes cementum formation despite its extrusion into the periradicular tissues. In the present case white MTA-Angelus (Angelus, Londrina, PR, Brazil) was used which has good handling characteristics in addition to faster setting time [22]. Due to absence of calcium sulfate and lower percentage of bismuth oxide [23]. Setting time is 10 min since it does not contain calcium sulphate and it is cost effective when compared to Proroot MTA [23,24].

In addition MTA-Angelus has a high pH and greater calcium release in the first 24 h of activation possibly because of greater amount of Portland cement (80%) or other calcium releasing agents. MTA has demonstrated the ability to allow regeneration of these hard tissues [25]. The highly biocompatible nature of MTA and its tendency to induce osteogenesis and cementogenesis makes it a suitable candidate for root perforation repair and attains the regeneration of periodontal attachment [14,17,26]. It has been hypothesized that MTA may exhibit anti-recurrence properties against the pathological lesions [26].

Resolution in apical and lateral radiolucency attributed to appropriate cleaning, shaping, antisepsis and filling of the root canal. Intermittent calcium hydroxide paste dressing for 2 months was appropriate as it removes remaining microorganisms from the root canal system [27]. This procedure may promote periapical repair, by: (i) Controlling the inflammatory reaction (by hygroscopic action; calcium potentiate bridge formation and phospholipase inhibition); (ii) neutralizing osteoclast acid products (acid hydrolases and lactic acid); (iii) inducing cellular differentiation; (iv) inducing mineralization (alkaline phosphatase activation and calcium-dependent ATPases) and (v) neutralization of endotoxins [28].

Based on the outcome of the cases presented in this article, MTA seems to be an excellent material for the repair of perforations and there seems to be a marked improvement in the prognosis of teeth repaired with MTA. This may be due to superior sealing ability, cemento conductor, osteoinductor properties [29,26], biocompatibility, high pH of MTA, and absence of microleakage and infection at the site of perforations.

Conclusion

In the presence of old and contaminated perforations, without important endodontic-periodontal complications, the technique presented in this paper may be one solution. The materials are easy to use and are relatively inexpensive. In the present case 2 year follow-up appointments showed no signs of infection and tooth remained asymptomatic. Radiograph showed evidence of osseous repair with resolution of periapical radiolucency, reparation of peri-radicular tissues, and deposition of cementum over MTA at the perforation site. Despite a perceived poor prognosis, present case report showed good clinical results, and therefore the technique appears promising. However, further long term studies are needed to further evaluate the prognosis of MTA in retreatment cases with perforations.

References

1. Ruddle CJ. Nonsurgical endodontic retreatment. J Calif Dent Assoc. 1997;25(11):769-75.
2. Sjogren U, Hagglund B, Sundqvist G, Wing K. Factors affecting the long term results of endodontic treatment. J Endod. 1990;16(10):498-504.
3. Ingle JI, Simon JH, Machtou P, Bogaerts P. Outcome of endodontic treatment and retreatment. In: Ingle JI, Bakland LK, editors. Endodontics, 5th Ed. London: BC Decker Inc.; 2002:750-5.
4. Ford TR, Torabinejad M, McKendry DJ, Hong CU, Kariyawasam SP. Use of mineral trioxide aggregate for repair of furcal perforations. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1995;79(6):756-63.
5. Kvinnsland I, Oswald RJ, Halse A, Grønningsaeter AG. A clinical and roentgenological study of 55 cases of root perforation. Int Endod J. 1989;22(2):75-84.
6. Tsesis I, Fuss Z. Diagnosis and treatment of accidental root perforations. Endod Top. 2006;13(1):95-107.
7. Fuss Z, Trope M. Root perforations: classification and treatment choices based on prognostic factors. Endod Dent Traumatol. 1996;12(6):255-64.
8. Regan JD, Witherspoon DE, Foyle DM. Surgical repair of root and tooth perforations. Endod Top. 2005;11(1):152-78.
9. Torabinejad M, Hong CU, McDonald F, Pitt Ford TR. Physical and chemical properties of a new rootend filling material. J Endod. 1995;21(7):349-53.
10. Ford TR, Torabinejad M, McKEndry DJ, Hong CU, Kariyawasam SP. Use of mineral trioxide aggregate for repair of furcal perforations. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1995;79(6):756-63.
11. Torabinejad M, Watson TF, Pitt Ford TR. Sealing ability of mineral trioxide aggregate when used as root end filling material. J Endod. 1993:19(12):591-5.
12. Parirokh M, Torabinejad M. Mineral trioxide aggregate: A comprehensive literature review Part I: Chemical, physical, and antibacterial properties. J Endod. 2010;36(1):16-27.
13. Holland R, Filho JA, de Souza V, Nery MJ, Bernabé PF, Junior ED. Mineral trioxide aggregate repair of lateral root perforations. J Endod. 2001;27(4):281-4.
14. Gomes-Filho JE, Watanabe S, Bernabé PF, de Moraes Costa MT. A mineral trioxide aggregate sealer stimulated mineralization. J Endod. 2009;35(2):256-60.
15. Torabinejad M, Hong CU, Pitt Ford TR, Kettering JD. Antibacterial effects of some root end filling materials. J Endod. 1995;21(8):403-6.
16. Torabinejad M, Higa RK, McKendy DJ, Pitt Ford TR. Dye leakage of 4 root-end filling materials; effects of blood contamination. J Endod. 1994;20(4):159-63.
17. Ferris DM, Baumgartner JC. Perforation repair comparing two types of mineral trioxide aggregate. J Endod. 2004;30(6):422-4.
18. Motamedi MHK. Root perforations following endodontics: A case for surgical management. Gen Dent. 2007;55(1):19-21.
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. Ruddle CJ. Nonsurgical endodontic retreatment- chapter 25. In: Cohen S, Burns RC, editors. Pathways of the pulp. 8th Ed. US: Mosby, St. Louis; 2002. p. 875-929.
21. Hashem AAR, Hassanien EE. ProRoot MTA, MTA-Angelus and IRM Used to Repair Large Furcation Perforations: Sealability Study. J Endod. 2008;34(1):59-61.
22. Angelus. MTA Angelus: Cimento reparador. Londrina: Angelus.
23. 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.
24. Leder AJ, Simon BI, Deasy M, Fenesy KE, Dunn S. Histological, clinical, and digital subtraction radiographic evaluation of repair of periodontal defects resulting from mechanical perforation of the chamber floor using ePTFE membranes. Periodontal Clin Invest. 1997:19(2):9-15.
25. Main C, Mirzayan N, Shabahang S, Torabinejad M. Repair of root perforations using mineral trioxide aggregate: A long-term study. J Endod. 2004;30(2):80-3.
26. Duarte MAH, Dermarchi ACC, Yamashita JC, Kuga MC, Fraga S. 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.
27. Soares JA, Leonardo MR, da Silva LA, Filho MT, Ito IY. Effect of

biomechanical preparation and calcium hydroxide pastes on the antisepsis of root canal systems in dogs. J Appl Oral Sci. 2005;13(1):93-100.

28. Soares J, Santos S, Silveira F, Nunes E. Nonsurgical treatment of extensive cyst-like periapical lesion of endodontic origin. Int Endod J. 2006:39(7):566-75.