CASE REPORT

SINGLE-VISIT ENDODONTIC TREATMENT WITH IATROGENIC CERVICAL ROOT PERFORATION REPAIR ON MAXILLARY RIGHT CENTRAL INCISOR BY GUTTAFLOW BIOSEAL : A CASE REPORT

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ABSTRACT

Perforations represent pathologic or iatrogenic communications between the root canal space and the attachment apparatus. The causes of perforations are resorptive defects, caries, or iatrogenic events that occur during and after endodontic treatment. Case report: A 27-year-old male patient reported to the Department. Clinical examination revealed that access preparation had been attempted in the grossly carious maxillary right central incisor the access opening was carefully examined and no bleeding was present. An intraoral periapical radiograph was taken with a #25 size K file placed in the perforation, The lateral walls of the perforation were refined and cleaned. A #25 size K file was used to establish the length from the incisal reference point up to the perforation site inside the root canal. Working length was established. GuttaFlow Bioseal was mixed and carried to the perforation site with the help of lentulo spiral and packed with an appropriately fitted plugger. Repair of the perforation was carried out by placement of the sealer. Cleaning and shaping was done upto file size F5. Canal was irrigated with 1.5 mL of 2.5% NaOCl. The root canal was obturated with the same sealer such that the sealer was allowed to flow out of the access cavity. Conclusion: advances in technologies have also provided for more controllable and better treatment outcomes, either surgically or nonsurgically.

KEY WORDS

Root perforations, Mineral Trioxide Aggregate, GuttaFlow, Bioseal

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INTRODUCTION

Perforations represent pathologic or iatrogenic communications between the root canal space and the attachment apparatus. The causes of perforations are resorptive defects, caries, or iatrogenic events that occur during and after endodontic treatment.[1] Regardless of etiology, a perforation is an invasion into the supporting structures that initially incites inflammation and loss of attachment and ultimately may compromise the prognosis of the tooth and thus they are the undesired complications of endodontic treatment. Once a perforation has been diagnosed, treatment must be rendered to seal the perforation site effectively to minimize injury and prevent contamination of the surrounding periodontal attachment apparatus. Although successful treatment and prognosis depend on many factors, the location of the perforation and the time lapse between exposure and repair are the two most important factors for determining the treatment and prognosis of the tooth.[2] Iatrogenic root perforation is usually an undesired complication that can occur during the preparation of endodontic access cavities or overzealous instrumentation in a tooth that has thin and slender roots.[3] Such perforations are managed surgically or non-surgically.[4] Cases where the perforation occurs supra-gingivally can be managed by non surgical procedure but lesions sub gingivally present, have to be treated surgically. Various materials have been used in repairing perforations, including zinc oxide-eugenol, amalgam, calcium hydroxide and composite resin glass ionomer.[5] These materials either show inadequate sealing ability or have no biomimetic action and hence contribute to a poor outcome. Mineral trioxide aggregate (MTA) has been regarded as an ideal material for perforation repair.[6] The chemical composition of MTA was determined by Torabinejad et al.[7] The material consists of fine hydrophilic particles, and the main components are tricalcium silicate, tricalcium aluminate, tricalcium oxide and silicate oxide and bismuth oxide. Plethora of studies has demonstrated its excellent sealing ability and biocompatibility.[8] It is an ideal material for treating root perforation as it is non-toxic, non-absorbable, radiopaque and has antimicrobial properties.[9] MTA is also a periodontal friendly material which can be used in moisture. The repair capacity of MTA can in turn be attributed to its antimicrobial properties due to high pH (12.5). These characteristics of MTA promote the growth of cementum and formation of new bone.[10] GUTTA-FLOW bioseal (MTA BASED SEALER) was used in this case for iatrogenic perforation repair.

Figure 1 : Pre-operative photograph of tooth number 11

Figure 2 : IOPA radiograph of tooth 11 with 25 k file placed through the perforation

Figure 3: IOPA radiograph of tooth 11 with 25k file to determine the working length

Figure 4 : Canal preparation upto file F3

Figure 5 : Irrigation of the prepared canal

Figure 6: IOPA of master cone selection

Figure 7 : Post operative IOPA

CASE REPORT

A 27-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, Guru Nanak Institute of Dental Sciences & Research, Kolkata, with pain in the maxillary right central incisor tooth. He gave a history of root canal treatment (RCT) been attempted on that tooth, elsewhere about a month ago.

Clinical examination revealed that access preparation had been attempted in the grossly carious maxillary right central incisor. Under proper isolation, the access opening was carefully examined and no bleeding was present.

An intraoral periapical radiograph was taken with a #25 size K file placed in the perforation, which aided in further localizing the site of the perforation (Figure 2). A slight periodontal ligament (PDL) widening was seen in the periapical region with the associated tooth.

The decision to nonsurgically manage the perforation using Mineral Trioxide Aggregate based sealer (GuttaFlow Bioseal), was taken with the patient's consent.

The lateral walls of the perforation were refined and cleaned. A #25 size K file was used to establish the length from the incisal reference point up to the perforation site inside the root canal. Working length was established with a #25 size K file. (Figure 3).

Cleaning and shaping was done using the ProTaper file system upto file size F5 (Figure 4).

Canal was irrigated with 1.5 mL of 2.5% NaOCl. After each instrumentation, in order to remove the smear layer, 3.0 mL of 17% EDTA was introduced and allowed to remain in the canals for 3 minutes and then a final flush with 1.5 mL of 2% CHX was performed. (Figure 5)

Master cone selection was done by intra-oral periapical radiograph (Figure 6). The access cavity and perforation defect were dried. GuttaFlow Bioseal was mixed and carried to the perforation site with the help of lentulo spiral and packed with an appropriately fitted plugger. Repair of the perforation was carried out by progressive placement and packing of small increments of the sealer. The root canal was obturated with the same sealer such that the sealer was allowed to flow out of the access cavity (Figure 7). The Mineral Trioxide Aggregate was allowed to set for approximately four hours.

DISCUSSION

A perforation is defined as the pathological or iatrogenic communication between the root canal space and the periodontal tissue.[11] Successful outcome of perforation treatment depends upon the whether bacterial contamination at the site of perforation can be prevented or eliminated.[12] Various factors that include time from the perforation to detection, size, and shape of the perforation and also its location have a great importance to control infection at the perforation site.

Lantz and Persson conducted a study by making root perforations in dogs and treatment was initiated as soon as detected or after a small delay and on observation healing response were more clear when perforations were repaired immediately.[12] Healing response is clearer when the perforation repair is done as soon as possible.

Small perforations are easier to seal and thus it has good healing.

Location along the root surface is the most important parameter in the prognosis of root perforation. A perforation that appears nearer to the crestal bone and to the epithelial attachment is very crucial as there is more chance of contamination from the oral environment through the gingival sulcus.[13] Perforations, that are coronal to the crestal bone, are easier to access and repair, and teeth may be restored without periodontal involvement. Sufficient sound tooth structure for an adequate restoration is needed for good prognosis. Perforations that are apical to the crestal bone and epithelial attachment are observed to have a good prognosis however prognosis depends upon cleaning, shaping and obturation procedures. Seltzer et al. conducted an in vitro study and found that furcal areas in molars are more troublesome as there is increased chance of periodontal involvement and tissue destruction.[12]

In the present study, the perforation was seen on the distolateral cervical third area of the upper right central incisor, which might have been caused during access preparation.

Radicular perforations, either iatrogenic or pathological, may make it impossible to keep the tooth in the oral cavity. Other than the factors mentioned above, the material used to seal the perforation in itself plays a very important role. Therefore, the sealing of the perforation should be performed with biocompatible material, in order to provide a favorable environment for repair, and with characteristics similar to those of the dental hard tissue after setting. And thus in the present case, the immediate treatment of the perforation with MTA based sealer, a regenerative material, was used. The main purpose of the therapeutic of perforations is to control and heal the inflammatory process.[14] Materials as amalgam, composite resin and glass ionomer cement were widely used in cases of perforations in the past; nowadays, MTA and BiodentineTM® have been used for this purpose.[15,16] Studies have shown that MTA present better features, such as: alkaline pH, which inhibits bacterial activity; sealing ability, which avoid microbial infiltration; and low toxicity to the periodontal tissues.[17,18,19] Due to its hydrophilic feature, moist environment provides adequate condition to activate the chemical reaction of MTA, which is of great importance mainly for surgical procedures, since moisture is always present is such cases.[20,21] Additionally, biocompatibility was tested in perforations of dog's teeth, and the ability to induce the formation of hard tissue at the site of perforation was detected.[22] MTA is mostly composed of calcium and phosphate ions, which are also present in the tooth structure.[23] Due to its similarity of composition with dental hard tissues, it is believed that MTA is able to form hydroxyapatite when releasing calcium ions, thus allowing the sealing of perforated cavities. Besides, it has osteogenic and cementogenic potential, thus making it an excellent choice in cases of radicular perforation.[24] Several studies are in accordance to this, for example, Main et al. noticed that MTA provides an optimum repair of tooth perforations and enhanced the prognosis of perforated teeth.[25] Economides et al.[26] conducted an in vitro study on dog's teeth and showed that MTA can be used in root end cavites, being a biocompatible material, MTA stimulated reparation of periradicular tissues, showed no inflammation.[22] It also had the ability to induce hard tissue formation.[27]

As the perforation was in the coronal third of the mesial root and sufficient access was available through the pulp chamber, the perforation was repaired nonsurgically. The perforation site was cleaned and ensure an environment free of microbial contamination and necrotic tissue. As mentioned earlier, the location of the perforation is an important factor for its successful repair. More apical the perforation, the better the prognosis. In the present case the perforation was in the coronal third of the root, but yet prognosis was favorable.

CONCLUSION

An excellent initial clinical and radiographical examination, careful consideration of size, level and the time of perforation provides a better prediction of prognosis of perforation repair. Nevertheless, advances in technologies have also provided for more controllable and better treatment outcomes, either surgically or nonsurgically.

REFERENCES

1. Naresh Sharma, Binita Srivastava, Hind P Bhatia, Archana Aggarwal. A Comparative evaluation of Mineral Trioxide Aggregate (MTA) & Calcium Hydroxide / Iodoform paste as reparative agent in Furcation involvement in deciduous teeth: A Clinical & Radiographic Study. Indian Journal of Dental Sciences. 2015; 3: 40-42

2. Dr.Pradnya V. Bansode, Dr. Seema D.Pathak, Dr.M.B Wavdhane, Dr.Shirish Khedgikar, Dr.Shraddha Gite. Non-Surgical Repair of A Perforation Defect-A Case Report. Journal of Medical and Dental Science Research. 2017; 4: 32-35

3. Narang I, Mishra N, Singh K. Single-visit endodontic management of iatrogenic supracrestal root perforation associated with dual sinus using MTA and collagen. Int J Oral Health Sci 2013;3:105-8.

4. Roda RS Root perforation repair: surgical and nonsurgical management. Pract Proced Aesthet Dent 2001;13:467-472.

5. Fuss Z, Trope M. Root perforations: classification and treatment choices based on prognostic factors. Endod Dent Traumatol 1996;12:255-264.

6. Lee SJ, Monsef M, Torabinejad M. Sealing ability of a mineral trioxide aggregate for repair of lateral root perforations. J Endod 1993;19:541-4.

7. Osorio RM, Hefti A, Vertucci FJ, Shawley AL. Cytotoxicity of endodontic materials. J Endod 1998;24:91-6.

8. Hashem AA, Hassanien EE. ProRoot MTA, MTA-Angelus and IRM used to repair large furcation perforations: Sealability study. J Endod 2008;34:59-61.

9. 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;33:1374-7.

10. Roberts HW, Toth JM, Berzins DW, Charlton DG. Mineral trioxide aggregate material use in endodontic treatment: A review of the literature. Dent Mater 2008;24:149-64.

11. Mousumi Biswas, Dibyendu Mazumdar, Abhijit Neyogi. Non surgical perforation repair by mineral trioxide aggregate under dental operating microscope. J Conserv Dent. 2011 Jan-Mar; 14(1): 83–85. doi: 10.4103/0972-0707.80729

12. Hegde, Mithra & Varghese, Litty & malhotra, Sakshi. (2017). Tooth Root Perforation Repair-A Review. Oral health and dental management. 16. 1-4.

13. Igor Tsesis & Zvi Fuss. Diagnosis and treatment of accidental root perforations. Endodontic Topics. 2006; 13: 95–107

14. Mente J, Hage N, Pfefferle T, et al. Treatment outcome of mineral trioxide aggregate: repair of root perforations. J Endod 2010; 36(2): 208-13.

15. El-Khodary HM, Farsi DJ, Farsi NM, Zidan AZ. Sealing ability of four calcium containing cements used for repairing furcal perforations in primary molars: an in vitro study. J Contemp Dent Pract 2015; 16(9): 733-9.

16. Alsubait SA, Hashem Q, AlHargan N, AlMohimeed K, Alkahtani A. Comparative evaluation of push-out bond strength of ProRoot MTA, bioaggregate and biodentine. J Contemp Dent Pract 2014; 15(3): 336-40.

17. Silveira CM, Sánchez-Ayala A, Lagravère MO, Pilatti GL, Gomes OM. Repair of furcal perforation with mineral trioxide aggregate: longterm follow-up of 2 cases. J Can Dent Assoc 2008; 74(8): 729-33.

18. Torabinejad M, Pitt Ford TR. Root end filling materials: a review. Endod Dent Traumatol 1996; 12(4): 161-78.

19. Keiser K, Johnson C, Tipton DA. Cytotoxicity of MTA using human periodontal ligament fibroblasts. J Endod 2000; 26: 288-91.

20. DeAngelis L, Chockalingam R, Hamidi-Ravari A, et al. In vitro assessment of mineral trioxide aggregate setting in the presence of interstitial fluid alone. J Endod 2013; 39(3): 402-5.

21. Sluyk SR, Moon PC, Hartwell GR. Evaluation of setting properties and retention characteristics of mineral trioxide aggregate when used as a furcation perforation repair material. J Endod 1998; 24(11): 768-71.

22. 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.

23. Unal GC, Maden M, Isidan T. Repair of furcal iatrogenic perforation with Mineral Trioxide Aggregate: two years follow-up of two cases. Eur J Dent 2010; 4(4): 475-81.

24. 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.

25. Main C, Mirzayan N, Shabahang S, Torabinejad M. Repair of root perforations using mineral trioxide aggregate: A long-term study. Journal of Endodontics. 2004; 30: 80-83.

26. Economides N, Pantelidou O, Kokkas A, Tziafas D. Shortterm periradicular tissue response to mineral trioxide aggregate (MTA) as root end filling material. International Endodontic Journal. 2003; 36: 44-48.

27. Yaltirik M, Ozbas H, Bilgic B, Issever H. Reactions of connective tissue to mineral trioxide aggregate and amalgam. Journal of Endodontics. 2004; 30: 95-99