

Iatrogenic perforation repaired – A case report

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ABSTRACT

Root perforations can be pathologic or iatrogenic communications between root canal anatomy and the surrounding attachment apparatus. Iatrogenic root perforations, may have serious ramification occurring in approximately 2–12% of endodontically treated teeth. Early diagnosis of the defect, location of the perforation, choice of treatment, materials used, host response, and the experience of the practitioner are among the important factors with regard to the profitable management of root perforations. This report introduces the effective management of multiple perforation with vertical bone loss using biodentine and xenograft in mandibular incisors with 1-year follow up. Advances in technologies such as the introduction of microscopes, new instruments, and materials like biodentine have provided for more controllable and predictable treatment outcomes, either surgically or nonsurgically.

Keywords: Biodentine, iatrogenic root perforation, xenograft

Introduction

Root perforation is pathologic or iatrogenic communication between root canal space and the attachment apparatus.^[1] Perforations can occur during access cavity preparation, postspace preparation or due to the extension of internal resorption into the periradicular tissues.^[2-4] The effect of perforation depends on the size of the perforation, time of repair, level, and location of the perforation.^[5]

Before, various materials have been used to seal perforations that include amalgam, intermediate restorative material, super EBA, cavit, glass ionomer, and composites. The ideal repair material for treatment of root canal perforation includes the ability to seal and biocompatibility which was not fulfilled by those materials.^[6] The most common mode of treatment for root canal perforation is using mineral trioxide aggregate (MTA). MTA has a good sealing ability, induces osteogenesis, and cementogenesis, and it is highly biocompatible.^[7-9]

Biodentine (Septodont, Saint-Maur des Fosses, France), a contemporary tricalcium silicate-based dentin replacement material like MTA, has been evaluated for various physical and biologic properties.^[10-13] It offers much more advantages than MTA like a faster setting time and higher push-out bond strength at 24 h.^[14]

Demineralized bone matrix (DBBM) xenograft is a bone inductive sterile bioresorbable material composed of Type I collagen. It is extracted from bovine cortical samples that results in nonimmunogenic flowable particles of approximately 250 μm that are completely replaced by host bone in 4–24 weeks. The xenograft combination for periodontal regeneration therapy results an interesting and effective clinically useful modality to the clinician in treating various periodontal osseous defect.^[15]

The following case report detail the management of a midroot perforation with vertical bone loss using biodentine and xenograft.

Case Report

A 32-year-old male patient was reported to the Department of Conservative Dentistry and Endodontics of Saveetha University, with chief complaint pain in the lower front region of mouth, after attempting of endodontic treatment by his dentist 1 day prior. On intraoral examination, the tooth was sealed coronally with temporary cement [Figure 1]. At the time of presentation, the tooth was sensitive to percussion and palpation; the mean probing

Access this article online

Website: www.japer.in

E-ISSN: 2249-3379

How to cite this article: Deepak S, Nivedhitha MS. Iatrogenic perforation repaired – A case report. J Adv Pharm Edu Res 2017;7(3):336-339.

Source of Support: Nil, **Conflict of Interest:** None declared.

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Figure 1: Pre-operative clinical photograph

pocket depth was 6 mm. There was a radiolucency in the midroot region of mandibular left lateral incisors and vertical bone loss on periradicular radiographic examination [Figure 2]. Extraction and surgical repair of the perforation were the suggested treatment options for the tooth. According to the patient preference, the option of saving the tooth by a surgical procedure that is midroot perforation with biodentine and vertical bone loss using osseograft was chosen.

Local anesthesia was administered using 2% lidocaine with 1:100,000 epinephrine and the tooth was isolated with a rubber dam. The temporary restorative material was removed, the access cavity was prepared, and the perforation area was clinically seen. Hemorrhage was controlled with copious irrigation with 1.5% sodium hypochlorite solution. The adjacent tooth had two canals so labial and lingual canals were located. The working length was then determined using an apex locator (Pixi 4th generation) [Figure 3a]. The cleaning and shaping of root canals were done using Mtwo rotary files in a crown-down technique. Each instrument's use was preceded by irrigation of the canal through making use of a syringe (27-gauge needle) which contains 1 mL of 2% chlorhexidine gel and then immediately rinsed with 3 mL of saline solution. After the root canals being dried with paper points, they were obturated. For obturation, gutta-percha points were used along with AH plus root canal sealer. The root canal sealer (AH plus) was mixed according to the manufacturer's instructions and applied by coating the root canal walls using the master cone itself. The root canals were then filled using lateral condensation technique [Figure 3b and c].

On the same day of appointment, full-thickness mucoperiosteal flap was raised, perforation identified just apical to the cemento-enamel junction of tooth 32 [Figure 4]. Perforation was sealed with biodentine (Septodont), on maintaining a hemostasis [Figure 5]. After the setting of biodentine, the defective areas were curetted and fresh bleeding was induced and xenograft was placed in the defective areas [Figure 6]. The flap was approximated with 3-0 silk sutures. The access preparation was restored with light-cured composite. (Tetric N Ceram, Ivoclar, Vivadent). The patient was put on periodic follow-up examinations. After 1 month recall visit [Figure 7], satisfactory periodontal healing was evident with return of probing depth to physiologic probing levels of 2 mm [Figure 8]. At 6-month follow-up visit, the patient was symptom-free with favorable healing of periradicular tissues.



Figure 2: Pre-operative radiograph

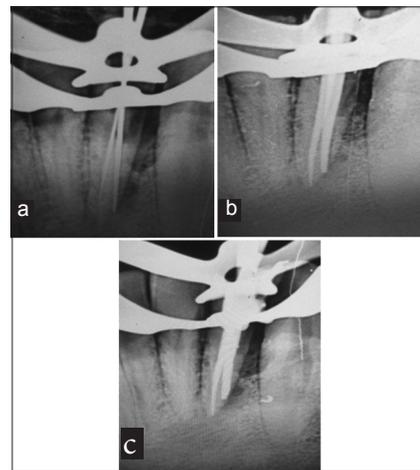


Figure 3: (a) Working length intraoral periapical (IOPA) radiograph, (b) master cone IOPA radiograph, (c) radiograph showing obturation

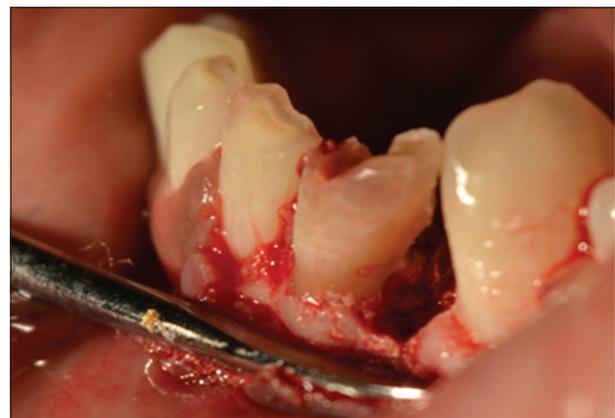


Figure 4: Perforation site

Discussion

Even though various factors affect the prognosis of teeth with iatrogenic perforations, it mainly depends on the timely intervention and the level of perforation (relative to crestal bone and epithelial attachment). The present case posed a challenge in treatment as the perforation was crestal in position.



Figure 5: Biodentine as perforation repair



Figure 6: Osseograft material



Figure 7: 1-month follow-up

^[16]A perforation which occurs near the crestal bone and the epithelial attachment is critical as it may lead to contamination of bacteria from the oral environment along the gingival sulcus. Furthermore, loss of epithelium apically to the perforation site can be expected, creating a periodontal defect. Such lesions which present with both endodontic and periodontal involvements are termed as endo-perio lesions. The present case is a primary endodontic lesion with secondary periodontal involvement (Simon's classification of endo-perio lesions).^[17]



Figure 8: 6-month follow-up

Once the periodontal pocket is formed, persistent inflammation of the perforation site is most likely maintained by continuous ingress of irritants from the pocket. In the present case also, both loss of attachment of periodontium and periodontal pocket (4 mm) were seen. Treatment of crestal perforation carries a guarded prognosis because of their close to the epithelial attachment.^[18] Hence, for sealing such perforations, a biocompatible material with a short setting time and good sealability should be selected. The biodentine (Septodont) was chosen as the material of choice due to its excellent biocompatibility, fast setting time of 10–12 min, and good sealability.

Osseograft primarily consists of Type I collagen and is prepared from bovine cortical bone samples of 250 μm. Sampath and Reddi^[19] reported that subcutaneous implantation of course powder (74–420 μm) of DMBM result in local differentiation of bone. Once the osseograft is used to seal the osseous defect, a sequential differentiation of mesenchymal type cell occurs to form cartilage and bone. There are four types of cell differentiation and bone formation.^[20] Stage 1 includes mesenchymal cell migration into vascular spaces of matrix within 2 days. In Stage 2, between 2nd and 18th day the mesenchymal cells differentiate into giant cells and chondrocytes. In Stage 3, the poorly vascularized areas of matrix show formation of cartilage at day 8 and 20, and from day 10 to 20 woven bone develops in the vascularized areas of matrix. Finally, Stage 4 formation of bone occurs between day 20 and 30.

It has been shown that periodontal healing with the formation of long junctional epithelium^[21] is more favorable in subgingival lesions restored with glass ionomer and resin composite material. A similar favorable periodontal response, which is signified by the return to physiologic probing depth (2 mm), can be attributed to the formation of long junctional epithelium. The favorable healing of the periodontal tissues can be resultant from high biocompatibility of biodentine and xenograft as important factors.

Conclusion

The prognosis of the affected teeth with crestal root perforation is compromised due to high probability of persistent periradicular inflammation even after perforation repair.

Having high sealability, fast setting time, and superior mechanical properties, makes Biodentine to be a good alternative to existing materials which are routinely used for managing such conditions. However, further studies need to be explored to establish its superiority and its beneficial effect over the currently used materials such as MTA and glass ionomer cement, since the lack of substantial supporting scientific literature is obvious.

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