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Case Report

Renovation of iatrogenic defect- A case report

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ABSTRACT

Management of endodontic mishaps is challenging for operator. Perforation of the root in the course of access cavity preparation is commonly encountered in modern practice. The prognosis of teeth with root perforations depends on several factors, including size, location, time since occurrence and rapidity of sealing the perforation area with biocompatible material. Root perforations are clinical situations that can be solved by either nonsurgical or surgical approaches using different biocompatible materials. The purpose of this case report is to describe a successful repair of a long-standing iatrogenic coronal root perforation in a maxillary right central incisor solved surgically using Biodentine™ (Septodont, Saint-Maur-des-Fossés, France) which was able to induce new bone formation and re-establish gingival and periodontal health status.

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1. Introduction

Endodontic procedural errors jeopardize the outcome of root canal treatment. Among them perforation, is one of the most common causes of endodontic treatment failure with the incidence rate ranging from 2.3% to 12%.¹

Perforation can be defined as pathological or mechanical communication between the root canal system and the peri-radicular tissues/oral cavity and its aetiology could be pathologic, restorative, or iatrogenic. All these procedural operative errors may lead to treatment failure. Aseptic management of perforation repair may lead to better outcome of treatment.²

Perforation causes injury to the periodontium, leading to inflammation, bacterial infection, alveolar bone destruction, formation of granulomatous tissue, epithelial proliferation, and eventually, the development of endo-perio lesion. Delay in perception and treatment of perforation can cause further complications leading to tooth loss.²

Root perforations can be repaired either nonsurgically or surgically. Biodentine™ is widely accepted as the preferred repair material for treating root perforations. This assertion is supported by various types of scientific research, such as case reports, preclinical studies, and clinical studies.

The purpose of this case report is to describe the surgical resolution of a long-standing iatrogenic root perforation in a maxillary central incisor.

2. Case Report

A 40-year-old male patient reported to the department of conservative dentistry and endodontics with chief complaint of discoloured tooth in upper front tooth region. The patient revealed history of Root Canal Treatment performed 8 years back by general dental practitioner. On Clinical examination maxillary right central incisor was discoloured with no associated signs of swelling, no tender on percussion and a probing depth of 8 mm was detected on labial surface. Radiographic examination (Figure 1a) revealed no periapical radiolucency, intact lamina dura and had a

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radiopaque restorative material inside the coronal portion of tooth with no radiopacity in the radicular canal suggestive of incomplete Root canal treatment done previously. Radiographically, radiolucency was detected in the junction between cervical and middle third of the root irt 11. The condition was suspected as iatrogenic mishaps which might have occurred during access cavity preparation or while canal negotiation by previous dental practitioner. The condition was diagnosed as primary endodontic-periodontal lesion. Non-surgical Retreatment followed by Surgical repair was planned considering the location of the perforation. Blood investigation was done to rule out any underlying systemic conditions and abnormalities prior to the treatment and no abnormalities detected.

Local anaesthesia was administered using 2% lignocaine with 1:80,000 adrenaline. Previous restorative material was removed irt 11 using no. 2 round bur (Mani, India) and access was gained followed by refinement of access cavity was performed using endo-Z bur (Dentsply Maillefer, North America) under isolation. During working length determination the file was deflecting away from the path of main canal which led to movement of attached gingiva present labial to 11. Immediate RVG was taken, which revealed perforation in the coronal 1/3rd of the radicular portion of the tooth (Figure 1b). Therefore, surgical approach was planned for perforation repair irt 11.

Prior to surgery, using shift technique, location of file was confirmed and the main canal was negotiated and working length determined using radiographic determination and apex locator(Figure 1c). Cleaning and shaping was carried out upto 25-2% K- files(Mani, India) under copious irrigation using normal saline and 2% NaOCl to disinfect radicular space following which intracanal dressing using Calcium hydroxide paste(RC Cal, Prime Dental, India) was placed and the tooth was sealed temporarily using CavitTM G (3M ESPE).

Patient was recalled after 2 days and 2% lignocaine containing 1:80,000 adrenaline was administered. Full thickness triangular flap was reflected and the perforation site was exposed(Figure 1d,e,f). After Complete debridement of the labial aspect of 11, perforation measuring of about 1×3mm in the coronal 1/3rd of the root along with the dehiscence defect was detected. The main canal was irrigated and prepared upto F2 using Protaper gold file (Dentsply Sirona, India) (Figure 2g) and corresponding Gutta percha was placed (Figure 2h) following which perforation sites was thoroughly cleaned to receive BiodentineTM(Septodont, Saint-Maur-des-Fossés,France) for the adequate sealing of perforation site (Figure 2i). After initial setting of BiodentineTM(Septodont, Saint-Maur-des-Fossés,France), GTR membrane(Fix GideTM GTR, Synerheal) was positioned over the surgical site(Figure 2 j,k), and the reflected tissue was re-approximated and stabilized by resorbable suture(Figure 2

l). The access cavity was sealed temporarily using CavitTM G (3M ESPE). Coe-PakTM Automix(GC, America) was applied on the surgically operated area(Figure 2m). The final radiographic examination revealed proper placement of BiodentineTM (Septodont, Saint-Maur-des-Fossés,France) in the defective area and also confirmed with different angulation, which was appreciated as a radiopacity in the coronal 1/3rd of the root.

One week following the surgical procedure, the surgically operated site was evaluated for any sign of rejection and inflammation, no complication was noted. The root canal was irrigated and obturation was carried out using lateral condensation technique followed by placement of post endodontic restorative material under proper isolation(Figure 2n,o,p).

The patient was recalled after 1 month, 3 months,6 months and 12 months intervals and post operative evaluation was done(Figure 3q,r). The tooth was asymptomatic at all the visits. Periodontium had regenerated with the average probing depth of 3 mm around the tooth (Figure 3s). Prosthesis was planned for discoloured tooth, but patient didn't turn up as he got transferred to other state.

3. Discussion

This case addresses the regenerative management of dehiscence defects developed around traumatized incisors having iatrogenic root canal perforation at the cervical-third of the root. Root canal perforation not only depicts direct damage to the root structure with mechanical weakening of the tooth but also induce insults to the periosteum, thereby potentiating entry of microorganism.¹

Successful repair of perforation depends on the ability to seal the perforation and to re-establish a healthy periodontal apparatus. The prognosis of teeth with root perforations depends on the severity of the initial damage to the periodontal tissues, the size of the perforation, the level of the perforation in relation to alveolar crest, the time lapse between perforation and repair, the adequacy of the perforation seal, the sterility of the perforation and the biocompatibility of the material used to repair at the site.^{3,4}

Surgical approach facilitates complete calculus removal, accessibility, and ease of placement of materials like BiodentineTM and GTR barriers. Therefore, in the present case report, the surgical repair of the endo-perio defect was preferred.²

To obtain success, the perforation material should ideally lead to osteoinduction, formation of periodontal ligament and cementum.

In the past, different types of materials were advocated for perforation repair; however, none of them have provided a favourable environment for re-establishing the normal architecture and predictable healing after treatment. The inadequacy of these materials can be attributed to



Fig. 1: **a:** Pre-operative Radiograph; **b:** K-File deflecting away from main canal suggesting perforation; **c:** WL determination; **d,e:** crevicular and vertical releasing incision; **f:** Flap raised and perforation site exposed; **k:** File showing root perforation at the labial aspect of the root.

their inability to seal the perforation site.⁴ MTA and Biodentine™ are capable of causing complete regeneration of adjacent dentoalveolar tissue and are hence used as perforation repair materials.

MTA is known to possess the most favourable properties for perforation repair, but it has certain drawbacks, including long setting time, high cost, difficult handling, and tooth discoloration of the tooth over a period of time.²

Tricalcium silicate-based cement, Biodentine™ is a new dentin substitute with excellent biocompatibility. Its biocompatibility is studied and reported in various in vitro and in vivo studies. Biodentine™ some superior properties over MTA such as short setting time, better handling characteristics, ease of manipulation etc. Therefore, in this case Biodentine™ (Septodont, Saint-Maur-des-Fossés, France) was choice of material for perforation repair.^{5,6}

The three-dimensional hermetic seal is one of the most important requirements during perforation repair. This seal is a complex outcome of marginal adaptation, adhesion and solubility of the material used. According to the study conducted by M. A. Alazrag et al Biodentine™ exhibited a better sealing ability than the MTA-Angelus. The good adaptation property of Biodentine™ may be attributed to the small size of Biodentine™ particles which may enhance

the adaptation at the cavity surface and filling interface.⁷

A study conducted by Kokate SR et al to compare the microleakage of GIC, MTA and Biodentine™ when used as retrograde filling material concluded that Biodentine™ exhibited least microleakage when compared to other materials.⁸

The major disadvantage of Biodentine™ is its radiopacity. The difference in radiopacity as compared to other materials is mainly explained on the basis of radiopacifiers used. Biodentine™ manufacturer uses zirconium oxide instead of bismuth oxide as radiopacifier. Considering the biocompatibility, zirconium oxide seems to be superior compared to bismuth oxide. In a study by Gunesser et al, Biodentine™ showed significantly better performance as a perforation repair material even after being exposed to various endodontic irrigants as compared to MTA and can also undergo setting reaction in the presence of moist environment.⁷

GTR, is an effective treatment modality for periodontal reconstructive surgery. GTR can improve the response of alveolar defects by the reduction in pocket depth, gain in clinical attachment levels, and filling of bone defect. Improvement in these clinical parameters and the potential for establishing new attachment has led to the consideration of GTR in the present reported case.²

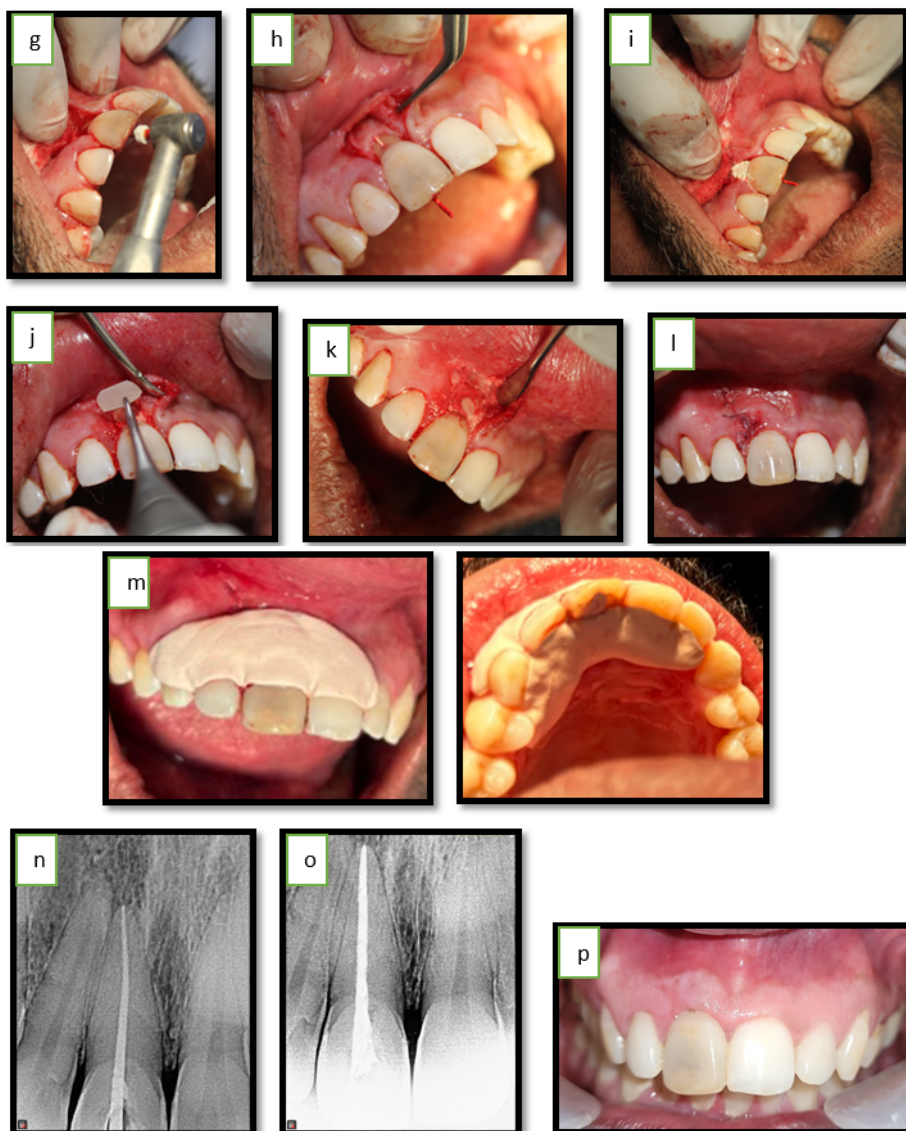


Fig. 2: **g:** BMP done; **h:** Placement of gutta-percha prior to perforation repair; **i:** perforation repair using Biodentine™ (Septodont, Saint-Maur-des-Fossés, France); **j&k:** placement of GTR; **l:** Re-approximation of flap and suture placed **m)** Coe-Pak applied **n)** Master-cone X-RAY; **o:** Obturation of root canal; **p:** Post-operative healing

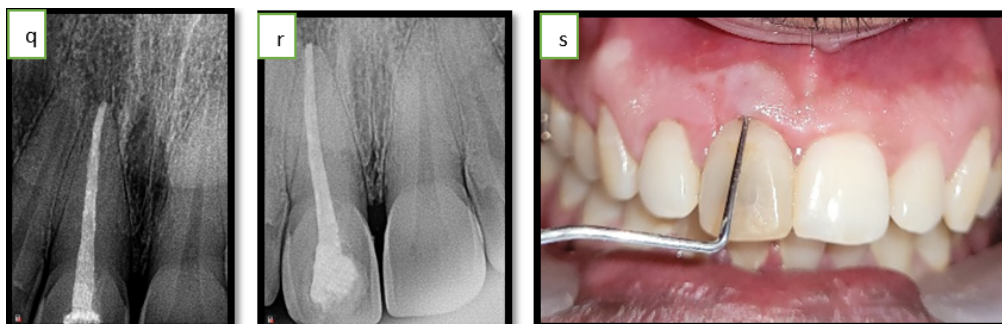


Fig. 3: **q:** 6 month follow-up; **r,s:** 12 month follow-up

Concurrent use of Biodentine™ and other calcium silicate-based cement along with placement of GTR for managing combined endodontic-periodontal lesions have been reported for orthograde and surgical repair of root perforations.⁹

4. Conclusion

Root perforations are complications which lowers the prognosis of endodontic procedures. Treatment can be challenging but with the advancement of new material, knowledge and techniques in dentistry, the quality of treatment rendered to the patient is vastly improved, thus enabling us to save such teeth which in past would require extraction and restoration with the prosthesis. The teeth affected with the root perforation can be saved with proper knowledge of the site, size, time of the perforation, and the choice of the material used. Biodentine™ seems to be promising choice as repair material in such cases.

5. Source of Funding

None.

6. Conflicts of interest

There are no conflicts of interest.

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