

CASE REPORT

Healing of Large Periapical with Tricalcium Silicate-based Root End Filling Material

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ABSTRACT

Periradicular disease is mainly caused by varied microflora present in the root canal system. These microorganisms are removed to some extent with the help of various steps in root canal treatment. The infected teeth are treated nonsurgically rather than treating directly by surgical root canal treatment. For the successful surgical treatment, root end filling material is placed at the root end. This case report describes a case which is prior to nonsurgical method; however, because of complications these teeth are treated surgically. Biodentine being a biocompatible material can be used as a root end filling material, according to the manufacturer's instructions. The patient was recalled at a regular interval and it was found that periradicular tissue responded well to the restorative material. However, the long-term success rate for this material is yet to be evaluated, so for evaluation this case is followed up.

Keywords: Apicoectomy, Biodentine™, Endodontic microsurgery, Periradicular pathology, Periradicular surgery.

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INTRODUCTION

Nonsurgical root canal treatment (NSRCT) is often opted over surgical root canal treatment (SRCT). However, SRCT is indicated when there is persistent periradicular disease and when nonsurgical retreatment is impractical or unlikely to improve the previous results.¹ This persistent root canal infection is because of varied microflora present within the root canal system. For

healing of any periradicular disease bioactive repair materials have been used as a root end filling material. The various bioactive materials are calcium hydroxide introduced by Hermann in 1952,² mineral trioxide aggregate (MTA) introduced by Torabinejad et al,^{3,4} Biodentine™ introduced by Septodont (Septodont, St. Maurdes Fossés, France),⁵ bioactive glass developed by Larry Hench,⁶ Diadent BioAggregate introduced by Diadent (DiaRoot, Diadent, Burnaby, Canada).^{7,8} These bioactive materials are used as a root end filling materials after root end cavity preparation and are considered as root end repair material against persistent periapical diseases. The other materials that have been used over ages are silver amalgam, intermediate restorative material (IRM), glass ionomer, etc.

Biodentine™ was launched in the year 2009 and has some similar properties to that of MTA. It is a tricalcium silicate-based material and has been used in restorative dentistry (pulp capping and dentin substitute) as well as in endodontics (root perforation, apexification, resorptions, and root end filling material). It has been proven as a biocompatible material according to various researchers.^{5,9-14}

It has been proved that Biodentine™ has good healing capacity. It acts by proliferation, migration, and adhesion of human dental pulp stem cells, which in turn are activated by growth factors.¹⁰ It was also found that Biodentine™ showed good marginal integrity and has ability to form hydroxyapatite crystals at the surface, thus increases the sealing ability.^{11,15,16} Biodentine™ enhances vascular endothelial growth factor (VEGF) and fibroblast growth factor (FGF-2), thus stimulating angiogenesis for healing pulpal fibroblasts.¹⁷

Thus considering the bioactivity, biocompatibility, and angiogenic properties of Biodentine™ it has been successfully used in the following case report.

CASE REPORT

A 25-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of discolored anterior tooth and palatal swelling. The patient gave a history of intermittent swelling in the palatal region, which lasted for about 4 to 6 days, with no history of pain during the duration

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of swelling or prior to swelling. A detailed medical and dental history was taken. The patient told the history of trauma since 10 years and the discoloration since 3 years.

On clinical examination discoloration was seen with right maxillary central incisor with no history of tooth fracture. Intraoral palatal swelling was seen with overall dimension of about 2×2.5 cm. It was soft, fluctuant, and distended. Anteroposteriorly, the swelling was situated between the line passing through distal margins of right and left maxillary canine (anteriorly) and the line from distal margin of maxillary right second premolar to distal margin of maxillary left first premolar (posteriorly). Mesiodistally, the swelling was situated from the mid-palatine fissure centrally and laterally by line passing through the distal margin of maxillary right lateral incisor (Fig. 1A). There was no mobility present with the affected tooth with sound periodontium. Vitality test gave nonvital results with 11 to 13 when compared to other teeth. Intraoral periapical radiograph showed large periapical radiolucency with 11, 12 extending lateral to 13, and then occlusal radiograph was taken so as to evaluate the extent of radiolucency (Figs 1B and C). The provisional diagnosis of palatal abscess was given. The treatment plan was root canal treatment with 11 to 13.

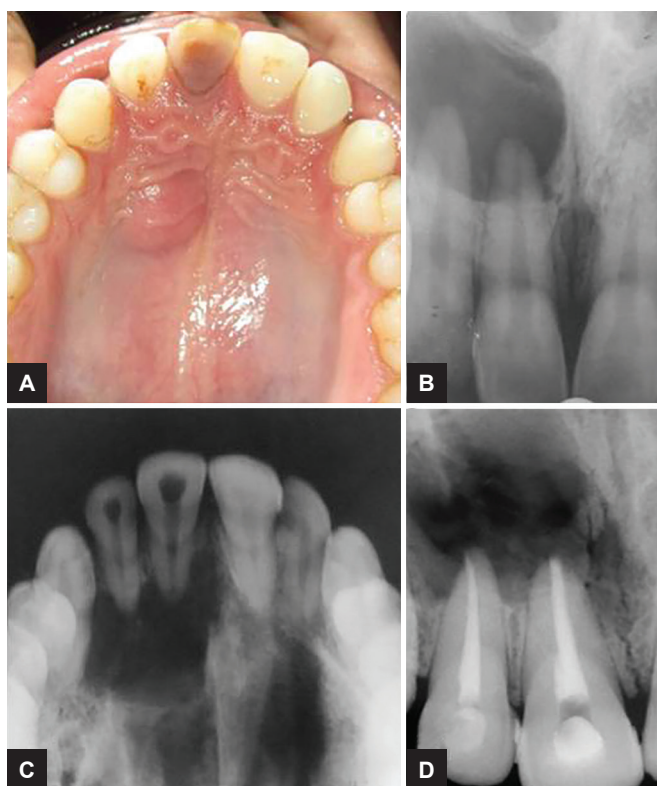
The treatment plan was explained to patient, and patient's consent was taken. The patient was also explained about the surgical part.

Local anesthesia (lignocaine hydrochloride with adrenaline) was given and isolation was done with rubber dam (Hygienic Rubber Dam Kit, Coltene Whaledent, USA). Access opening was done with the help of large round bur and nonend cutting bur EX 24 (MANI, Inc., Dental products, Japan) and just after opening purulent drainage was seen through the canal. This purulent discharge was collected with the help of a sterile syringe (2 mL) and sent for histopathological investigation.

The swelling was compressed and complete drainage was done. After complete evacuation canal was irrigated with 10 mL of normal saline (Baxter, Baxter India Pvt. Ltd., Aurangabad, India) till there was no discharge from the canal. The canal was dried with the help of paper points (Pearl Endopia, India) and was left opened for 6 hours. The patient was recalled and intracanal medicament (calcium hydroxide powder mixed with normal saline) was given. However, it was seen that after 30 minutes the swelling reappeared, so intracanal dressing was removed and open dressing was given. The swelling did not resolve, even after repeated open dressing and intracanal medicament. So as to overcome the problem, surgical treatment was planned. After complete cleaning and shaping, obturation was done just prior to surgery (Fig. 1D).

Histopathological Report

A smear layer for the purulent discharge was prepared on the slide and was stained with hematoxylin and eosin stain. In $100\times$ magnification, chains in cocci were seen. Histopathologically, it was stated that the present organisms were Streptococci (Fig. 2). Hence, the final diagnosis of chronic alveolar abscess was given.



Figs 1A to D: Preoperative analysis: (A) Maxillary intraoral photograph showing palatal swelling; (B) intraoral periapical radiograph showing periradicular radiolucency with 11, 12; (C) maxillary occlusal radiograph showing periradicular radiolucency with 11, 12; and (D) Post Obturation radiograph with 11, 12

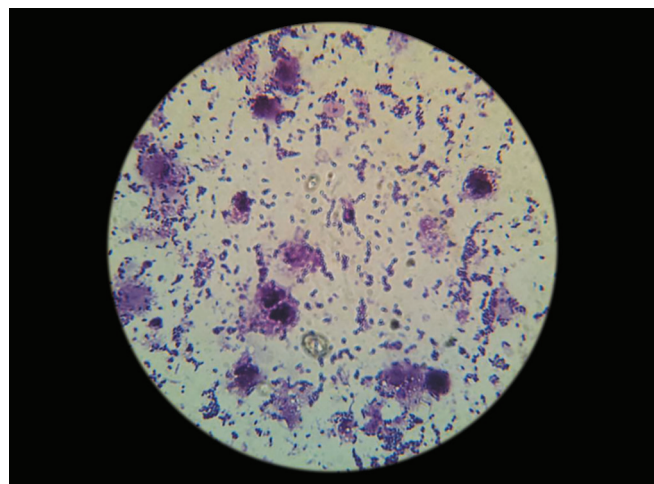


Fig. 2: Histopathological report showing cocci in chains

Surgical

Surgical part was done under dental operating microscope (Seiler iQ 100-180, Seiler Precision Microscopes, St. Louis, USA) at 10× magnification. Local anesthesia (lignocaine hydrochloride and adrenaline in the ratio 1:50000) was given to maximize postoperative analgesia and minimize intraoperative bleeding. The patient was asked for signs and symptoms of anesthesia after 10 to 15 minutes.

An incision was given perpendicular to gingival margin with the help of microsurgical blade. The extent of incision was from distal of left central incisor and mesial of right first premolar (Fig. 3A). Then with the help of blunt instrument, a mucoperiosteal flap was raised. The defect was located and granulation tissue was completely excavated with the help of different types of excavators (CK Dental Specialties, Microsurgical Instruments, USA). The defect was excavated carefully as there might be chance of palatal perforation. To prevent this during curettage, the palate was supported by index

finger (Fig. 3B). After complete excavation of granulation tissue, the defect was seen from mesial of canine laterally to mesial of left central incisor and was rinsed with the help of normal saline.

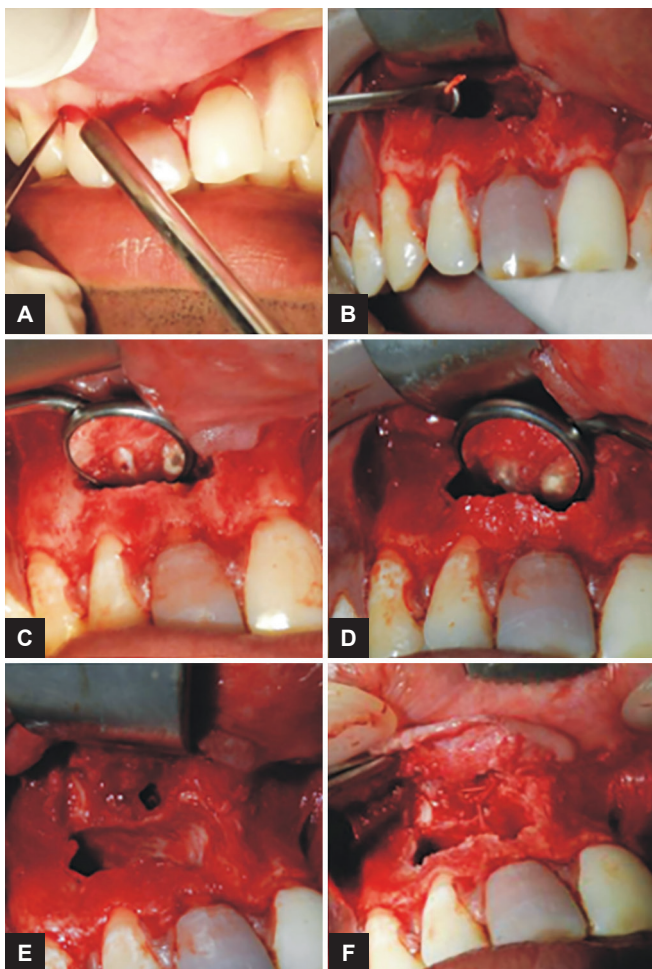
Then with the help of high-speed contra-angled handpiece apical 3 mm of tooth structure was removed, such that the resected surface is at right angle to the long axis of tooth for 11 and 12.¹⁸ Then with the help of root end cavity preparation tips root end cavity preparation was done and gutta-percha was compacted so that there is no gutta-percha on the walls (Fig. 3C). The borders of the defect were sharp, so they were rounded off with the help of a slow-speed micromotor. The osseous defect was washed thoroughly with normal saline and was inspected for any debris. Then, Biodentine™ was mixed according to the manufacturer's instruction and was placed in the root end cavity (Fig. 3D).

A nasal perforation was seen above the defect, so it was closed with the help of absorbable suture [VICRYL RAPIDE™ (polyglactin 910), Ethicon, Figs 3E and F]. The defect was again analyzed, flap was approximated, and sutured with the help of vicryl suture. Postoperative instructions were given to the patient. Then the patient was recalled and sutures were removed. The tooth was discolored, so nonvital bleaching was performed with the help of sodium perborate and hydrogen peroxide. Then the patient was recalled bimonthly for evaluating the healing of defect. The periradicular healing for the case was shown in Figures 4A to C.

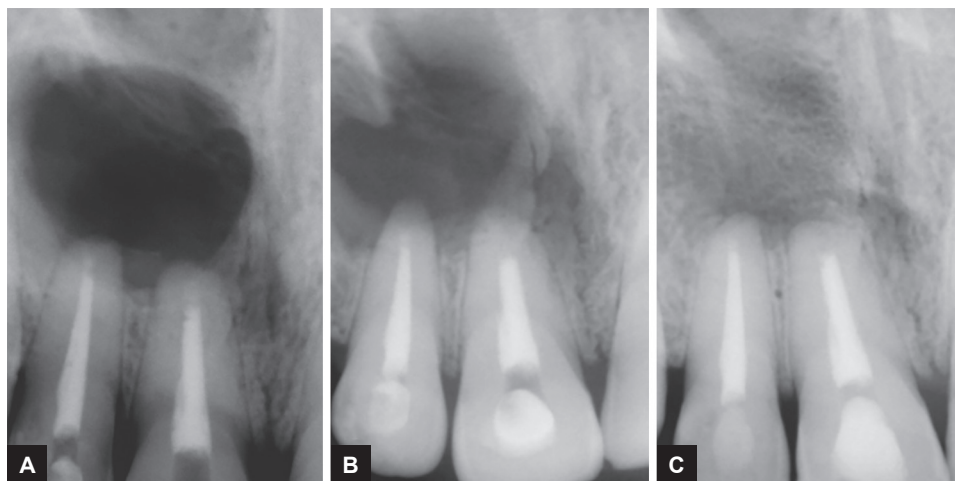
DISCUSSION

Nonsurgical root canal treatment is usually opted; however, in some cases SRCT is done, and is a challenge to endodontist. Surgical root canal treatment is a treatment option when the teeth are affected by biofilms known as extraradicular microbial biofilms.¹⁹ Nevertheless, for successful SRCT each and every step must be done carefully, thoroughly, and uneventfully. The teeth 11 to 13 were nonvital and patient did not experience any pain; however, palatal swelling reappeared, was distended when closed dressing was given and after placing intracanal medicament. The conservative treatment option would have been drainage by using drain tube or needle tip used in impression material.²⁰ However, the patient insisted for immediate treatment as he experienced discomfort because of swelling.

A Cochrane Collaboration Review stated that the healing rate could be higher when the cases are treated surgically than cases treated nonsurgically.²¹ Elemam and Pretty²² found that the success rate of SRCT was 27.84 to 80%. In SRCT, root end cavity preparation is done and restored with root end filling material. These root end filling materials are usually bioactive and are



Figs 3A to F: Surgical procedure (Apicoectomy) with 11 and 12: (A) Incision given with the microsurgical blades, (B) reflection of flap, curettage, and supporting palate with the help of index finger, (C) preparation of root end cavity with the help of ultra, (D) retrograde restoration with tricalcium Silicate based (Biodentine™) material, (E) nasal perforation seen above the defect, and (F) nasal perforation sutured with absorbable sutures



Figs 4A to C: Radiographs at different interval: (A) Immediate radiograph after surgery; (B) recall after 6 months; and (C) recall after 24 months

biocompatible, angiogenic, thus helps in uneventful healing of periradicular region.

The most commonly used material for restoring root end cavity is MTA. Biodentine™, being a bioactive material, has been used in the present case. It is dentin replacement material according to the manufacturer's instruction and can be used as root end filling material. Mineral trioxide aggregate has been used since decades as a root end filling material but the setting time of MTA is about 165 ± 5 minutes.²³ However, Biodentine™ has very less setting time of about 8 to 10 minutes. The main drawbacks of MTA are its difficulty in handling, discoloration potential, toxic components in the material, high material cost, an absence of a known solvent for this material, and the difficulty of its removal after curing.²⁴ It was also found that, if MTA is brought into contact with acidic primer or with excessive blood, it adversely affects the hydration reaction of MTA.²⁵ However, Biodentine™ has all these advantages. It was also studied that microleakage of Biodentine™ is less than glass ionomer and MTA when used as a root end filling material. Thus, because of all these advantages, Biodentine™ was used in the present case.

It was found that there is reduction in size of the periradicular lesion (Fig. 4). This can be attributed to cytotoxic and angiogenic property of this root end filling material. The findings of this case report were in accordance with Pawar et al²⁶ where they found reduction in size of periradicular pathology.

In the present case it was found that there was resolution of radiolucency in the periapical region when the patient was recalled after 24 months. These findings can be related to an *in vitro* study in which they found that Biodentine™ showed better marginal adaptation than other materials.²⁷ However, this result was in contrast to other study, which stated that the marginal adaptation of Biodentine™ is less when compared to MTA and IRM.²⁸

CONCLUSION

This case report has shown that the routine endodontic therapy followed by surgical intervention with a placement of biocompatible retrograde filling like Biodentine™ showed resolution of periapical radiolucency, and a good clinical result; therefore considered as a positive treatment outcome.

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