

CASE REPORT

Endodontic management of internal root resorption in a maxillary central incisor using Biodentine: A case report

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ABSTRACT

Internal root resorption (IRR) is a long-lasting inflammatory process that starts in the pulp area when dentin is lost. It is an unusual pathology of the permanent teeth that can be brought on by trauma, caries, restorative treatments, etc. Because of its subtle pathophysiology, it can develop before being identified and, if odontoclastic activity advances, may result in perforation of the external root surface. To diagnose the condition and prevent the resorptive events, an extensive understanding of the pathogenic process is necessary. This article discusses a case report of non-surgical management of IRR in maxillary central incisor, which was treated with conventional root canal treatment followed by repair of resorptive defect using Biodentine. Following one year, the tooth showed radiographic healing signs and was clinically asymptomatic and adequately functional. To preserve the integrity of the tooth structure and prevent further degradation of the already-damaged tooth, care was taken. In this case report, the use of Biodentine was beneficial for successfully managing IRR by reinforcing the weaker structures in the root.

Keywords: Biodentine, Calcium hydroxide, Endodontics, Internal root resorption

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INTRODUCTION

Internal root resorption (IRR) is defined by the American Association of Endodontists Glossary as a condition connected with a physiological or pathological process that results in the loss of dentin, cementum, and bone [1]. IRR occurs following odontoblast necrosis and is linked with prolonged partial pulp inflammation and partial pulp necrosis. In 1830, Bell reported the first incidence of IRR [2]. It is seen as a radiolucent region surrounding the pulpal cavity of the tooth.

Resorption happens in two stages: first, the organic matrix disintegrates, then the inorganic mineral structure deteriorates. While root canal replacement resorption results in the following deposition of hard tissue that mimics bone or cementum but is not dentin, internal inflammatory resorption entails the gradual loss of dentin. Perforating or non-perforating root resorption might result from internal inflammatory resorption [3].

IRR in teeth is typically asymptomatic and is first clinically identified using conventional radiography. The tooth is only partially vital when resorption is actively occurring, and it may exhibit typical signs of pulpitis [4].

Various materials such as MTA, Biodentine, glass ionomer cement, Super EBA, hydrophilic plastic polymer (2-hydroxyethyl methacrylate with barium salts), zinc oxide eugenol and zinc acetate cement, amalgam alloy, composite resin, and thermoplasticized gutta-percha that can be used to treat IRR. These materials can be injected into the affected area or condensed onto it [2].

In this case, IRR was successfully treated with Biodentine. In order to conceal resorptive defects, a novel calcium silicate-based material known as biodentine has been invented. In addition to being biocompatible, biodentine has a number of other advantageous characteristics over MTA, including

superior antimicrobial properties, bioactivity that promotes the development of hard tissues, good handling, self-adhesion to dentine, no shrinking, and a quicker setting time [5,6].

CASE REPORT

A 30-year-old female patient presented to the dental clinic complaining of pain while mastication in the maxillary right upper central incisor (number 11). Patient denied having experienced trauma recently or in the past. Upon clinical examination, anterior cross-bite was observed between teeth 11 and 41. Tooth 41 was inclined to the labial direction, but there was no swelling or discomfort to percussion. The periodontal tissue was healthy with normal probing depths. An intraoral periapical radiograph revealed an oval-shaped radiolucency within the root periphery of tooth number 11 (Fig.1) at the junction of coronal and middle one-third of the root, indicating internal root resorption, which was confirmed by multiple angulated radiographs. Pulp vitality tests with dry ice (Maquira, Parque Industrial Bandeirantes, Maringá – PR, Brazil) and electronic pulp stimulation (Parkel Electronics Division, Farmingdale, NY) on the affected tooth yielded a negative response. Based on clinical and radiological data, the lesion was diagnosed as pulpal necrosis due to trauma from occlusion with IRR in 11. The patient was given a treatment plan that included nonsurgical root canal therapy and IRR repair using Biodentine (Septodont, Saint-Maur-des-Foss'es, France). Informed consent was obtained from the patient before commencing treatment.

Following the isolation of the rubber dam, a conventional access cavity was performed. The canal was thoroughly irrigated with normal saline, followed by 3% sodium hypochlorite (NaOCl) (Prime dental products, India). The working length of the tooth was measured manually at first, and subsequently using a Root ZX apex locator (J. Morita Mfg. Corp., Kyoto, Japan), which was validated radiographically (Fig.2). ProTaper nickel-titanium rotary instruments (Dentsply Maillefer) were used in a crown-down technique till the F3 file for biomechanical preparation. To achieve thorough chemomechanical debridement, root canals were abundantly irrigated with 3% NaOCl solution and activated with an EndoActivator (Dentsply Sirona, USA). For two weeks, a dressing of calcium hydroxide (Ultracal™ XS, United States) (Fig.3) was given and the access cavity was temporarily sealed with Cavit (3M ESPE, Saint Paul, MN). After a period of two-week interval, the root canal was reopened, irrigated with normal saline and 3% NaOCl, and hand-filed to remove the calcium hydroxide medication. The choice of the master cone was determined and radiographically verified (Fig. 4). The warm vertical compaction technique was used to finish filling the apical and middle portions of the root canal using AH plus sealer (Dentsply, Tulsa Dental, Tulsa, OK, USA) and F3 size gutta-percha. According to manufacturer's instructions, Biodentine was mixed. Using a MTA carrier, biodentine was inserted into the resorption cavity and was condensed laterally against the walls of the resorption cavity. To ensure that the resorption defect and root canal were properly filled, postoperative radiographs were performed (Fig.5a, Fig.5b). The tooth was restored with composite resin after a week. For post-treatment observation, the patient was re-examined on a regular basis after one year. Intact dense obturation and stoppage of the resorptive process were seen on radiographic examination (Fig.6).



Figure 1: Preoperative radiograph of tooth 11

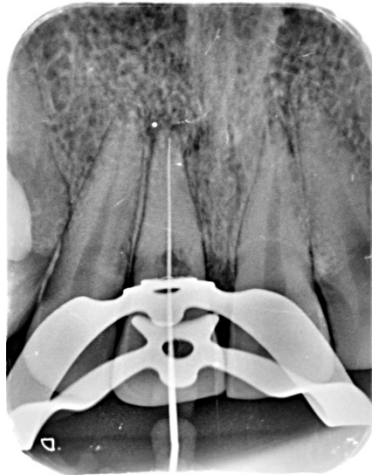


Figure 2: Working Length determination



Figure 3: Calcium hydroxide dressing



Figure 4: Mastercone

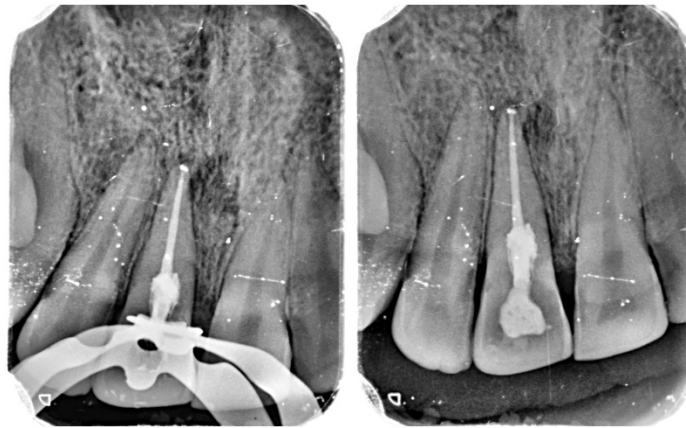


Figure 5: a) Confirmatory radiograph after placement of biodentine b) Immediate post-operative radiograph



Figure 6: One year follow up radiograph

DISCUSSION

There are numerous obstacles in the diagnosis and treatment of root resorption in the field of endodontics. Early and effective identification of root resorption determines the clinical outcome of such scenarios. For the clinician to manage the tooth and determine the appropriate course of therapy, it is essential to differentiate between IRR and other types of root resorptive defects [7]. A comprehensive clinical and radiographic examination is required to diagnose root resorption.

Treatment of IRR consists of root canal therapy followed by a final restoration. The presence of concavity defects and decreased dentin thickness in internal resorptive lesions complicates root canal instrumentation and restorative treatments. This type of defect also serves as a reservoir for granulation tissues and clastic cells, necessitating their full removal [8].

In this case, a thorough chemo-mechanical preparation and gentle instrumentation were used in the endodontic therapy of the resorptive defect in order to preserve the root dentin thickness. The root canal was gently irrigated with 3% NaOCl during root canal shaping. Because of its improved antibacterial activity and tendency to dissolve organic tissues, NaOCl is a commonly utilized irrigation solution for removing necrotic and granulation tissues from internal resorption cavities [9]. Calcium hydroxide intracanal medicament was placed within canal to ensure adequate disinfection and cessation of osteoclastic activity.

The resorptive process will be controlled by endodontic therapy, but if the defect is too severe, the tooth may mechanically fracture and fail. A bioactive material was required to fortify the tooth and improve its prognosis due to the thin and weakened tooth structure in the resorptive defect [10]. Biodentine was used in this case to reinforce the tooth and so enhance the prognosis. Biodentine was chosen as the material of choice for IRR due to its exceptional properties, including its appropriate consistency, one-step obturation, improved handling, and faster setting. As a result, Biodentine is an excellent choice for sealing the resorptive cavity. Sanaei-rad *et al* employed Biodentine to successfully treat IRR in the maxillary right

central incisor with horizontal root fracture and displaced apical segment [11]. Biodentine promotes osteoblastic activity by releasing calcium ions and increasing the alkaline environment. Furthermore, calcium and hydroxide ions induce the release of pyrophosphatase, alkaline phosphatase, and BMP-2, which promotes regeneration and mineralization [12].

CONCLUSION

Early diagnosis and treatment are critical for arresting the resorption process. Repair of IRR with Biodentine suppresses the resorptive process and is intended to enhance hard tissue synthesis. Biodentine reinforcement of weakened tooth structure is predicted to increase tooth longevity. Despite the fact that this case report shows a successful outcome, further research is encouraged to support the use of Biodentine to repair internal resorptive defects.

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