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CASE REPORT

ENDODONTIC PERFORATION REPAIR WITH LIGHT CURE GIC - A CASE REPORT

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ABSTRACT

Despite the development of endodontic therapy, adverse complications can arise during treatment resulting in a questionable prognosis. Perforation is one such complication associated during the operative stages of endodontic treatment, particularly with failure to observe the anatomic variations of different tooth types. Various materials have been suggested and used to repair root canal perforations, including calcium hydroxide, silver amalgam, mineral trioxide aggregate (MTA), and glass ionomer cement. This report describes the clinical management of a mandibular molar in which periapical radiography showed satisfactory canal obturation, but with a lateral perforation present at the floor level. Initial treatment involved sealing of the perforated area with resin-modified glass ionomer cement, followed by completion of root canal retreatment and canal sealing with composite-resin followed by reconstruction with metal ceramic crown. There was favourable clinical and radiographic progression at 3months and 6 year follow-up. We thus conclude that tooth longevity can be prolonged even in the presence of a perforation.

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INTRODUCTION

Recent developments in endodontic therapy and adhesive restoration techniques have substantially increased the rate of conservation of teeth with endodontic involvement and significant coronal damage. The aim of endodontic therapy is for complete debridement of pulpal tissues, thorough cleaning and shaping, and total obturation of the root canal space, which will subsequently provide an effective barrier to prevent passage of micro-organisms and their byproducts into periodontal spaces and periapical tissues (Gutmann, 2002; Ingle and Bakland, 2002). An endodontic perforation is defined as an artificial passage created within a tooth or its root, whether iatrogenic or due to pathological resorption, which produces a communication between the pulp cavity and the periodontal tissues (Mente and Hage). Perforations may be caused by iatrogenic dentistry, resorptive processes, or caries and can be diagnosed through direct observation of bleeding, indirect bleeding assessment by means of a paper point, radiographs, and an apex locator. The prognosis depends on the extent and location of the perforation, as well as on the time elapsed between perforation and repair (Alhadainy, 1994). Perforation may occur in the cervical, middle, or apical thirds of the root, as well as in the furcation; it constitutes a clinical challenge in conventional endodontic practice Depending on the location, different treatment techniques are available to address this event (Tsesis I,). Iatrogenic perforations may be caused by several reasons, including aberrant canal morphology, practitioner error while gaining access to the pulp chamber, failure during chemical and mechanical preparation due to inadequate canal wall wear, calcifications, or preparation for intracanal post placement. Therefore, several authors have sought to study alternatives that increase the safety of instrumentation so as to minimize rates of iatrogenic perforation (Juarez Broon). When located in the furcation or cervical third of the root, perforations have a negative impact on the prognosis of endodontic treatment, as they trigger an inflammatory reaction in the periodontal region that may lead to attachment loss and, occasionally, tooth loss

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as well. Depending on the crestal bone level and the degree of its destruction in the region of the perforation, a periodontal pocket may form. Once the alveolar bone is destroyed, granulation tissue is likely to form and may invaginate into the tooth through the perforation tract (Krupalini). Adequate repair of a perforation requires sealing of the tract. The material used for this purpose will be effective if it provides excellent sealing, is biocompatible and easy to compound, and is able to promote osteogenesis and cementogenesis (Menezes R). Perforation defects may be repaired by non-surgical or surgical techniques. Surgical repair is indicated when access through the canal is impossible (Stock, 2004). Various materials have been utilized for perforation repairs, such as zinc oxide and eugenol-based cements (IRM and EBA), mineral trioxide aggregate (MTA), A wide range of materials has been used to seal endodontic perforations. Differences in outcome show that no optimal material is available; rather, there is a broad selection to choose from depending on the factors involved in each case (size, location, contamination, time elapsed between perforation and repair) and, of course, on which material is available at the time the perforation is detected (Melo PAV). Silver amalgam is not advised for this purpose, due to its poor retention and high marginal leakage rate. Glass ionomer cement, which is commonly used for retrograde obturation, is also an alternative for sealing of perforations, especially those located in the cervical third, where use of adhesive restorative materials has been recommended. Glass ionomer cement is classified as such, and has been used to treat resorption defects and iatrogenic perforations (Behnia A).

The properties of glass ionomer cement are adequate for repair of subgingival lesions: it is biocompatible, bonds to dentin and to cementum, releases fluoride, and has a low thermal expansion coefficient (Behnia A). Gomes *et al.* studied the periodontal response to resin-modified glass ionomer cement (RMGIC) and in some sites restored with RMGIC, the author found evidence of bone repair and a connective tissue lining. MTA has been the first-line material of choice for perforation repair due to its compatibility with periapical tissues, its sealing ability, its behaviour in the presence of moisture, and its ability to induce cementogenesis and it does not affect the healing process (Pfefferle T, Camilleri J,). MTA is reportedly able to stimulate mineral deposition at the material-dentin interface and within the dentinal tubules (Juarez Broon).

CASE REPORT

A 23-year-old male was referred to the our hospital for the management of an endodontic perforation of his lower molar. At the initial visit he complained about swelling, mobility and moderate to severe pain. He stated that the endodontic treatment had been completed. His medical history was unremarkable. Extra-oral examination revealed no abnormalities. Intra-orally, tooth 36 presented with improper root canal treatment with lingual swelling and an abscess. Periodontal probing showed 5mm pockets on the lingual opposite bifurcation area. The tooth was also tender to vertical percussion and apical palpation. Vitality testing was omitted as the tooth already had undergone initial endodontic treatment. An intra-oral periapical radiograph revealed areas of radiolucencies associated with the furcation and distal root (Figure 1). A diagnosis of post treatment periapical periodontitis and abscess formation with a possible lingual furcation perforation was made. All possible treatment options were presented to the patient and he was advised of the condition and poor prognosis of the tooth.

Figure 1.

However, he insisted that attempts be made to save the tooth and agreed to the perforation repair with a light-cured glass ionomer followed by definitive endodontic and restorative treatment. The patient was also informed about the treatment protocols and informed consent was obtained from the patient Upon establishing access and removal of all existing restorative material and caries, a round perforation defect measuring about 2mm in diameter was detected on the pulpal floor towards the lingual aspect of the tooth The perforation showed minor haemorrhage (Figure 2) one percent NaOCl irrigation followed by pressure packing with sterile gauze as described in case report one was used to achieve haemostasis.

Figure 2.

After rinsing with distilled water and drying, the perforation site was etched with a dentin conditioner (GC Corporation, Tokyo, Japan), which was applied to the surrounding dentin for 10 seconds, followed by rinsing with distilled water for five seconds and light air drying (Figure 3 and Figure4).

Figure 3.

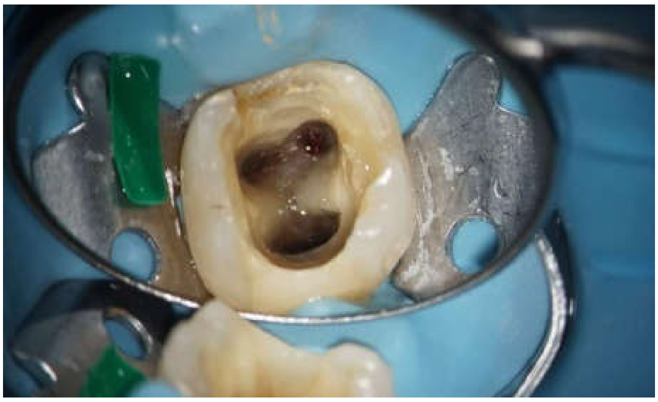

Figure 4.

Subsequently, the perforation site was repaired with a light-cured glass ionomer (GC, Tokyo, Japan). Mixing and application was done according to the manufactures instruction and Care was taken not to occlude the orifices of the root canals and the canal orifice was sealed with IRM material to establish in maintaining the canal patency. The perforation site was gradually filled up with the material covering about 2-3mm of the surrounding dentin and then light-cured (Bludent LED, Plovdiv, Bulgaria). (Figure5) Final thickness of the material was about 2mm.

Figure 5.

Subsequently, conventional endodontic treatment was performed consisting of cleaning and irrigating with 1% sodium hypochlorite and drying with paper points (Kerr Absorbent Points, USA). Calcium hydroxide (PD, Washington, USA) was placed as intra-canal medication followed by a sterile cotton pellet, Caviton (GC, Japan) and a light-cured glass ionomer restoration (Fuji II, GC, Japan). The tooth was adjusted for minimal occlusal contact. At the three-month recall the patient was asymptomatic. Intra-oral examination showed that the tooth was no longer tender to percussion and palpation. Buccal and lingual swelling had subsided. After removal of the restoration under rubber dam,examination of the perforation site (visual and tactile) showed an intact repaired perforation with no clinical signs of leakage (foul odor). Conventional endodontic treatment was then continued with mechanical preparation of the canal using a rotary crown-down technique (ProTaper, Dentsply Maillefer). Canal preparation was completed with up to a F3 bur. Calcium hydroxide was used as intra-canal medication. Obturation was completed one month later with AH 26 (Dentsply De Trey GmbH) (figure6) and cold lateral condensation of gutta percha (Dentsply Maillefer, Ballaigues, Switzerland).

Figure 6.

Regular recalls were carried out at three and six-month intervals (Figure 7 and Figure 8) and after treatment, the patient presented with a normal functioning tooth.

Figure 7

Figure 8

DISCUSSION

Maintaining the integrity of the natural dentition is essential for function and esthetics. Endodontic therapy can play a vital role in achieving this goal. Occasionally technical problems do occur during endodontic treatment i.e. perforating a wall or floor of the pulp chamber or root canal during caries removal, during access cavity preparation, locating of canals and mechanical debridement. This can significantly impair the long-term prognosis of a tooth (Breault *et al.,* 2000). Perforations located in the furcation region or cervical third of the root have a negative impact on the prognosis of endodontic treatment, as they trigger an inflammatory reaction in the periodontal region that may lead to loss of attachment and, occasionally, of the affected tooth. Depending on the crestal bone level and the degree of its destruction in the region of the perforation, a periodontal pocket may form. Once the alveolar bone is destroyed, granulation tissue is likely to form and may invaginate into the tooth through the perforation tract (Juarez Broon). No single optimal method for perforation repair exists. A wide range of materialsand treatment strategies is available to conserve the affected tooth and return it to normalfunction. Bernardes *et al*. suggests that measures be taken to improve the outcomes of perforation repair, such as recognition, correction, assessment of results, and avoidance of file contact with bone and surrounding tissues during instrumentation. A small perforation will cause minor bleeding, while an extensive perforation will cause much heavier bleeding, which can prevent treatment from continuing. According to chevigny etal the prognosis of a perforation is highly dependent on the sealing ability of the chosen repair material and is related to the size and site of the perforation, the time since perforation, and the presence of microbial agents, as well as on the feasibility of sealing and the accessibility of the main canal. According to Gomes etal glass ionomer cement bonds well to dentin, which may be explained by the formation of chemical bonds between the glass ionomer and the calcium ions of dentin. The high fluidity of light-cured glass ionomer cement promotes better flow and, consequently, better filling of the perforation cavity, thus providing improved sealing It is thus a good material for repair of perforations, especially those located in the cervical region, where use of restorative materials is indicated. Different materials have been used for endodontic perforation repair and the search for an ideal perforation repair material is a challenge.

A repair material has to be placed in intimate contact with hard tissues of the tooth and soft tissues of the periodontium. These materials may pose a threat to endodontic treatment outcome by causing local or systemic adverse effects, either through direct contact with or leaching of chemical components into the periodontal tissues and alveolar bone (Breault *et al.,* 2000). In this case report, a light-cured glass ionomer was chosen as an alternative to MTA. Light-cured glass ionomer is a small particle, hydrophilic, non-aqueous resin combined with a photo initiator and glass powder formulation. The advantages of this material are its insolubility in oral fluids, reasonable adhesion to tooth structure, high strength, and dual cure properties. Lightcured glass ionomers also offer the following attributes: low cure shrinkage, low thermal expansion, and extended fluoride release as found in traditional glass ionomers (Scherer, Dragoo, 1995; Dragoo, 1997). Traditional clinical applications for light-cured glass ionomer include: erosive lesions in geriatric patients, fixed prosthetics and resin bonded retainer cementation, porcelain repair, bonded amalgam restorations, core material, and pediatric restorations (Scherer, Dragoo, 1995; Dragoo, 1997). Dragoo (1997) demonstrated clinically and histologically the biocompatibility of this restorative material. The formation of an epithelial and connective tissue adherence to light-cured glass ionomer represents a significant advancement in the ability to restore previously considered hopeless teeth (Dragoo, 1997;Stock, NG, 2004). Dragoo's (1997) clinical and histological investigation of light-cured glass ionomer demonstrates a biocompatibility to both soft and hard tissues. As an additional benefit, fluoride release from light-cured glass ionomer may positively affect bacterial plaque biochemistry through an alteration of carbohydrate metabolism (Scherer, Dragoo, 1995). As the material polymerizes with visible light, its setting is fast and controllable, thus improving performance and reducing messy handling. This is in contrast to MTA, which has an extended setting time and requires careful handling. Based on the above, even an inexperienced operator will appreciate the handling of a light-cured glass ionomer as being less demanding. In addition, sealing and resistance to microleakage are predictable as the material through chelation, chemically bonds to both enamel and dentin (Mount, Hume, 1998), while the material has been proven to be biocompatible (Human, Love, 2003). Glass ionomer, as a restorative dental material, has been successfully utilized for treatments of tooth abfractions, external root resorption, and root perforation repair (Shuman, 1999, Silveira, Sachez-Ayala, 2008). The present case report have demonstrated an additional application.

Conclusion

With good diagnosis, thorough treatment planning, and selection of appropriate procedures and restorative materials, good clinical outcomes can be obtained even in endodontic ally treated teeth with perforations Based on its biologic compatibility, lightcured glass ionomer material may be considered to be part of the clinician's armamentarium for the treatment of endodontic perforations and it should, therefore, be of interest to many practitioners. However, more evidence from randomized controlled clinical trials needs to be generated to assess whether a more conclusive valid recommendation can be made about the performance of light-cured glass ionomers for the repair of endodontic perforations.

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