ISSN: 2754-4893

Journal of Dental Science Research Reviews & Reports

SCIENTIFIC Research and Community

Case Report

Open Access

Iatrogenic Root Perforations: Case Report

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ABSTRACT

Root perforation, a connection between the root canal system and tooth surface, is a common cause of endodontic therapy failures. Caused by pathological conditions or operative errors, it can occur during access cavities, root canal preparation, or post-preparation. A 28-year-old patient was diagnosed with a vestibular medium-sized infra-osseous perforation during root post realization. Despite no systemic disorders, the patient showed physiologic movement and was slightly sensitive to pressure. A flap surgical treatment was chosen to remove excess material and enable tissue regeneration. Biodentine® was used to prevent future discolorations. The patient underwent an intrasulcular incision, flap raised, cavity cleaned, disinfected, revised, and sealed using an anterior Schilder plugger. Root perforations are common errors caused by factors like anatomy, caries, pulp calcifications, and intracanal posts. Diagnosis is based on clinical signs, radiographic examinations, and imaging techniques. The prognosis depends on preventing bacterial infection. The ideal reparation material should stimulate bone formation, be biocompatible, maintain sealing, and not disintegrate in tissue fluid. Equivalent materials like Biodentine® offer advantages in protocol, antibacterial power, and bioactive properties. Radicular perforations, a significant dental issue, can be prevented through early management using modern techniques and clinical training, ensuring long-term success in endodontic treatments.

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Received: June 22, 2024; **Accepted:** June 28, 2024; **Published:** July 05, 2024

Introduction

Root perforation leads to a connection between the root canal system and the external tooth surface. They represent the second most frequent reason leading to endodontic therapy fails [1]. The scenario may be caused by a pathological condition (dental caries, root resorption), or an operative procedural accident. Procedural operation errors may happen at any point during root canal therapy and lead the treatment to fail [2]. Routine clinical examinations reveal pathological perforations, however iatrogenic root perforations might develop during the elaboration of access cavities, root canal preparation, or post-preparation.

Case Report

We received in consultation a young 28-year-old patient addressed by the prosthetic department for the management of a perforation occurred during the realization of the root post. The patient's medical history revealed that he had no systemic disorders and was in good condition. Dental examination revealed the presence of vestibular medium size infra-osseous perforation with visual access perforation. The tooth showed physiologic movement, was not swollen, and was just slightly sensitive to pressure. Radiological examination supports the clinical examination.

We opt for a flap surgical treatment in order to remove the excess of material beyond the perforation and to enable any potential guided tissue regeneration. Regarding obturation materials, we had the option of using either MTA or Biodentine®; nonetheless, we chose the latter to prevent future discolorations.

Initially, we started with the realization of an intrasulcular incision without relieving incisions, then a flap was raised and we located the infra-osseous perforation. Following that, we cleaned the cavity and disinfected it with 2% chlorhexidine as final irrigation in the canal. Then the access cavity was revised and dried. Biodentine® was mixed and placed in the access cavity, which was carried out using an anterior Schilder plugger. Finally, the cavity had been properly sealed.

Figure 1: Intraoral Photographs of the Initial Clinical Situation

Figure 2: Pre-Operative Radiography

Figure 3: Intraoral Palatal View of the Initial Clinical Situation

Figure 4: Intrasulcular Incision was applied and a Flap was raised and the Infra-Osseous Perforation was Located

Figure 5: Placement of Biodentine® using an Anterior Schilder Plugger

Figure 6: Sealing of the Perforation using HCS Material (Biodentine®)

Figure 7: Follow up after 3 months with Proper Coronal Obturation

Figure 8: Post-Operative Radiography

Discussion

Iatrogenic perforations in the great majority of instances are considered as operative errors, which may be attributed to a variety of causes including inexperience, anatomy and dental position, severe caries, pulp calcifications, and intracanal posts [3].

Several clinical signs may be useful to identify root perforations. The clinical and radiographic examinations offer an overview of root perforation diagnosis [2]. Iatrogenic perforations are always detected by the copious bleeding that occurs after the lesion. When a perforation occurs near the coronal area of the tooth, bleeding may be seen directly. However, if the perforation occurs farther within the canal, a paper point can expose the bleeding. If no local anesthetic is used, severe and unexpected discomfort after treatment could point to a perforation [4]. Also, imaging techniques and clinical examinations are commonly used to diagnose perforation. Cone Beam Computed Tomography (CBCT) enabled volumetric studies to clearly depict and quantify structural alterations and diseased states that were not detectable by standard radiographic examinations.

The size, location and the perforation's age determine whether it may be repaired conservatively or surgically. The prognosis depends on keeping the perforation site free from bacterial infection. One of the most important variables for success is the interval time between a perforation and its repair [5]. Also the perforation extent; a small perforation causes less tissue destruction and inflammatory response. In addition, the severity of tissue injury and its location relative to the crestal bone are essential factors affecting treatment prognosis [2].

The clinical approach to a confirmed radicular perforation might be a non-surgical or a surgical treatment. In a systematic manner, non-surgical treatment will be initially preferred. Nevertheless, the surgical intervention may be considered if

- The defect's shape or nature is unknown, or if it is sub-crestal and causes pathology or symptoms.
- Extensive intracoronal/extracoronal restoration blocks internal access.
- A large defect prevents material control.
- An apical third perforation with persistent disease is difficult to clean and repair.
- External cervical resorption cannot be repaired internally.

The ideal reparation material should have the potential to stimulate bone formation, be biocompatible with the periradicular tissues, maintain sealing in the perforation site, be nonresorbable, and not disintegrate in the tissue fluid.

Various materials serve for perforation healing: Amalgam, Zinc Oxide Eugenol, Super EBA, IRM (Intermediate Restorative Material), Gutta Percha, Glass Ionomer Cement, Metal-Modified Glass Ionomer Cement, Composite, Calcium Phosphate Cement, Tricalcium Phosphate Cement, Hydroxyapatite, Calcium hydroxide

However, there are certain downsides for choosing MTA: it is difficult to manage, and handling needs time and experience. Additionally, both grey and white MTA can discolor the tooth, compromising aesthetics. This requires to be reviewed particularly in the anterior areas. Equivalent materials, such Biodentine®, which is a calcium silicate with calcium chloride added to speed up the setting time, may be able to solve these handling issues. It could become ready, set, and installed in about 12 minutes [6]. Its high alkaline pH and biocompatibility make it an ideal material for perforation healing. Guneser et al. found that biodentine® outperformed MTA as a perforation repair material, even after exposure to several endodontic irrigants [7].

It is also noted that Hydraulique Calcium Silicate (HCS) endodontic cements serve as obturation materials and offer advantages in terms of protocol. Unlike traditional cements, they are considered obturation materials rather than simple sealing materials, due to their sealing ability. This is why they are the material of choice in treating a case of zipping, for example. HCS cements are biocompatible, non-cytotoxic, and non-genotoxic. The main advantages described currently include ease of use, antibacterial power, and bioactive properties that stimulate the formation of hard tissues [8].

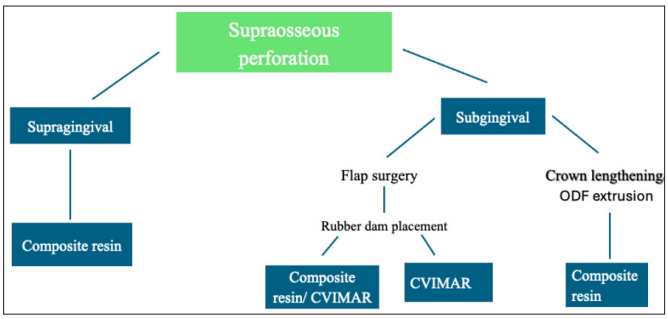

Figure 9: Therapeutic Decision-Making Tree in the Case of a Supra-Osseous Perforation with Visual Access

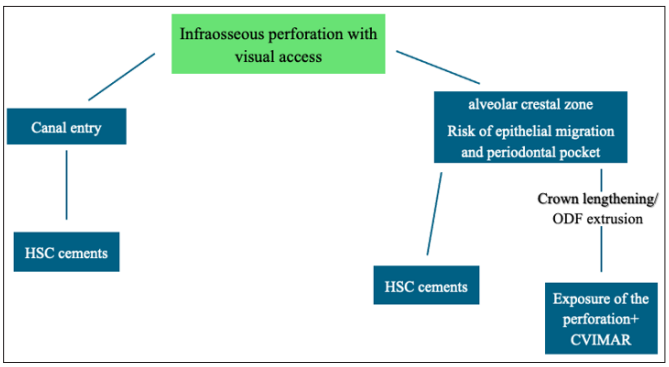

Figure 10: Therapeutic Decision Tree in the Case of an Infra-Osseous Perforation with Visual Access.

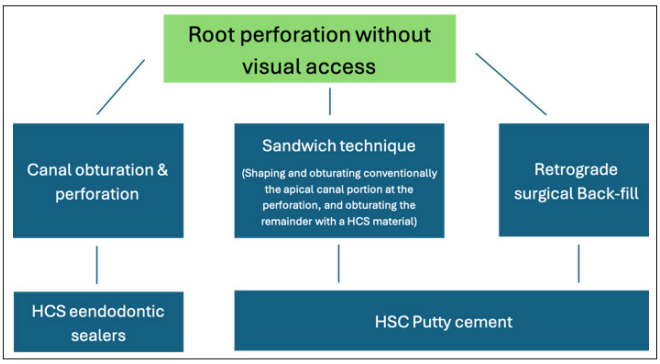

Figure 11: Therapeutic Decision Tree in the Case of an Infra-Osseous Perforation without Visual Access.

Conclusion

Radicular perforations are serious complications in dentistry, but their prevention and early treatment can prevent more severe problems. Proper management, based on modern techniques and good clinical training, is essential to ensure long-term success in endodontic treatments.

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