# Biodentine™ in the management of complex root perforations

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## Introduction

**Endodontic therapy seeks to conserve natural teeth. Accidents during this procedure are quite common, which affects the prognosis of root canal therapy.**

Iatrogenic perforations occur during the formation of the root canal, but are more common during access and apical shaping, particularly in curved canals (2). Likewise, they can occur when creating the space for the placement of an intraradicular post.

The communication between the root canal system and the supporting tissue reduces the prognosis of endodontic treatment, and often leads to the loss of the tooth. Ingle et al found that the second most common reason for failure associated with endodontic therapy is root perforation (2).

Several clinical findings may be determining factors in the diagnosis of root perforations. Clinical examinations and radiographs are the basis for the diagnosis of these perforations (2,3).

During the preparation of the root canal, the root pulp can be extracted by pulpectomy. After removing the pulp tissue, persistent bleeding during access to the crown or the preparation of the root canal can be a sign of perforation. A paper point with blood can also suggest perforation. Clinically, the diagnosis is challenging (3), but an apex locator can help in the diagnosis of root perforation.

Periapical radiographs are often indicated for endodontic diagnosis, the treatment plan and follow-up (5). Radiolucency associated with communication between the dentinal root canal walls and the periodontal space is a major sign of this accident during the procedure.

The prognosis of perforation depends on the size of the defect, the time, the duration of exposure to contamination, the material used to repair it, the possibility of sealing the perforation, and access to the main canal (4).

To minimize contamination in the area of the perforation, it is important to apply suitable sealing immediately (2). The success of the repair always depends on an effective seal between the root canal and the periodontal ligament. This can be achieved using suitable material, which should stop microfiltration and the communication between the tooth and the periodontal ligament. The ideal material for use in root perforations should be biocompatible, capable of a good seal, not resorbable, radiopaque, induce bone formation and healing, induce mineralization and the formation of cementum, and facilitate ease of placement (11).

# Case report

Sixty-year-old male patient referred to the endodontist for a periodontal abscess in the vestibular mucosa of the lower left first molar.

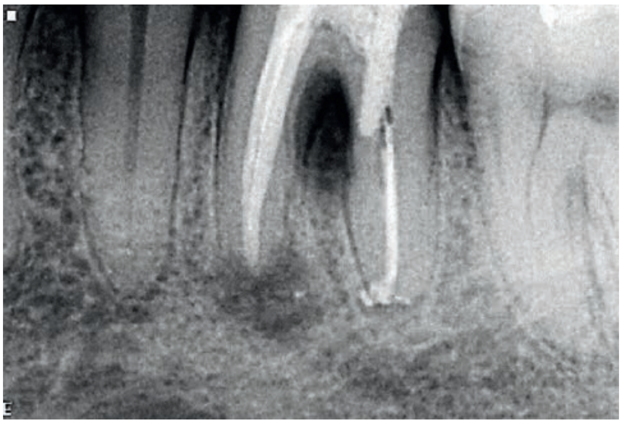
Radiographically, the patient presents a radiolucent zone at the level of the furcation, and a tooth skewed towards the internal wall of the distal root, apparently producing a perforation in the cervical third of the distal root towards the zone of the interradicular furcation.

Local anesthesia is injected into the lower dental nerve and the mental nerve. Removal of provisional crown. Removal of titanium post with No. 3 Start-X Denstply ultrasonic tips.

Once the provisional crown is removed, it is observed under the microscope that purulent material spontaneously seeps out of the perforation site.

We are faced with a perforation of poor prognosis, due to its size comparable with the diameter of the tip of the post, with a width of 2 mm and a long period of contamination equivalent to 3 years, the time since the cementation of the tooth.

The presence of a bone defect adjacent to the site of the perforation and leakage of purulent material indicates a chronic infection with a poor prognosis. The perforation is located in the cervical third of the root, where it can only be observed under magnification. Irrigation is done with 2% hypochlorite, initially only introducing the needle into the entrance of the canal to avoid accidents. The real entrance of the canal was located under microscope, to eliminate guttapercha, xylol was used.



Thanks to help of the microscope, we place the rotary file in the distal canal, taking care not to touch the perforation site. Instrumentation was done with Protaper Next Dentsply files. Disinfection was done with 2% hypochlorite using an Endoactivator. The calcium hydroxide matrix was placed in the perforation site. In a second visit, we sealed the perforation with Biodentine™ using micro condensers of Marthe's instrumental, while we leave some taperized guttapercha cones No. 25 cut into canals to prevent the entry of Biodentine™ into the canals. Perforations caused by wear and tear are characterized by the need to place the sealing material directly on the periodontal tissue and extend the obturation 1 to 2 mm from the edges of the perforation on the dentin. When a clinical microscope cannot provide sufficient visibility there is a risk of not applying the material correctly (8).

The initial setting time is 6 minutes and the final time between 10 and 12 minutes, followed by 2% hypochlorite as an irrigant and sealing the canals by lateral condensation ***(Fig. 1)***.

The patient is then referred to the rehabilitation specialist for the placement of the core and provisional crown, and a period of 3 months is established to evaluate the evolution and be able to recommend the placement of a porcelain crown.

In the follow-up radiograph at 3 months, 80% bone formation is found at the site of the lesion at the furcation, and in the apical zone of the two roots ***(Fig. 2)***.

The patient is absent for a period of 5 years. when he returns for his dental control, radiographically he presents a complete healing of the bone defects caused by the perforation and the apical lesions ***(Fig. 3)***.

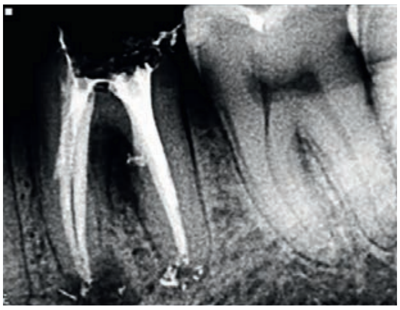


*Fig. 1*

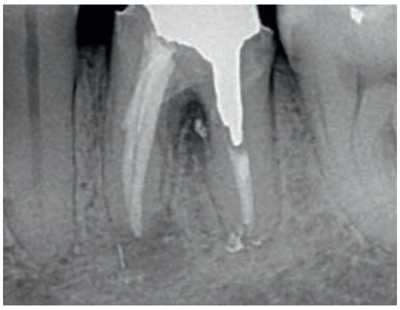


*Fig. 2*

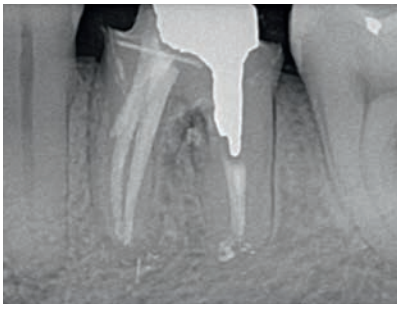


*Fig. 3*

# Discussion

A microscope is essential to try and treat procedural errors in the best possible manner. We need to see what we are going to seal (9).

A range of materials such as composite resin, 4-ethoxybenzoic acid, resin-reinforced glass ionomer cement, calcium hydroxide, gutta-percha, MTA and Biodentine™ are the most commonly used repair materials(1).

When the use of MTA was introduced as an alternative for perforation repair it offered very favourable properties compared with previous materials. Its ability to induce the formation of cement to regenerate periodontal tissue was also a step forward (2).

Advances in bioceramic technology have improved the science of endodontic materials. Biodentine™ is used in dentistry as an alternative to MTA to try and offset the latter's deficiencies. Biodentine™ is a bioactive material that can be used for different purposes, and represents an improvement on the characteristics of MTA in terms of compatibility, manipulation and hardening (11, 12). It also offers better bone regeneration properties than MTA, as it releases more calcium ions(12). This material creates a bond with root dentin that is significantly stronger than that achieved with MTA (14).

At sites that are difficult to access we need to compensate by using easy-to-handle material with good osteo-inductive properties, to be able to apply it at the perforation site.

Specifically at the perforation site, where contamination with tissue fluids is present, Biodentine™ is a good choice because the blood contamination that can occur when placing it in the site does not affect its adhesive strength, whereas MTA is affected by blood contamination (13).

Furthermore, in this type of perforation, located in roots that will receive a core, the material used for sealing should be of high compressive strength. Biodentine™ has greater compressive strength than other materials as a result of the low level of water used in it. It also performs well as a perforation repair material, even after exposure to different irrigants used in endodontics.

# Conclusion

- The use of magnification in endodontic therapy has proved very useful for an operator to develop his/her skills to the maximum and offer higher quality and greater precision in treatments. If we add the use of bioceramics such as Biodentine™ in the sealing of perforations, the operator can turn a poor prognosis into a good one.

- Bioceramics have osteo-inductive properties (10) that older materials did not offer, and Biodentine™ has better physical and biological properties in comparison with MTA, which makes it more useful in handling root perforations than other cements. As well as having very good biological properties, placement at the perforation site is very simple, which reduces operative time.

- An old and large perforation, with the associated destruction of bone and purulent infection -variables that produce a poor prognosis- can be solved by using a material that performs well in the presence of blood contamination, has good compressive strength and resistance to leakage, is osteo-inductive and offers good adhesion to the dentin in a single cement: Biodentine™.

- Thanks to advances in contemporary endodontics, we can now save teeth that previously had poor prognosis and could not be saved.

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## Biodentine™

Biodentine can be used both in the crown and in the root:

**In the crown**: temporary enamel restoration, permanent dentin restoration, deep or large carious lesions, deep cervical or radicular lesions, pulp capping, pulpotomy (reversible and irreversible pulpitis).

**In the root**: root and furcation perforations, internal/external resorptions, apexification, retrograde surgical filling.