CASE REPORT / *CAS CLINIQUE*

Endodontics / *Endodontie*

MANAGEMENT OF PULPAL FLOOR PERFORATION USING BIODENTINETM: CASE REPORT

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Abstract: During endodontic treatment in multi-rooted teeth, furcation perforation refers to an opening in the pulpal floor, leading to a communication with the periodontal ligament space. A three-dimensional hermetic seal, with a biocompatible material, is a key point for the success of pulp floor perforation repair. MTA® has been considered, for a long time, as a gold standard in furcation perforation repair. Besides, BiodentineTM, when used for the same purpose, showed considerable performance and good results. The purpose of this paper was to report the management of an iatrogenic perforation of pulpal floor in the maxillary right first molar, using BiodentineTM.

Keywords: Furcation perforation, repair, MTA®, BiodentineTM, case report

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The authors declare that there is no conflict of interest regarding the publication of this article.

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PRISE EN CHARGE D'UNE PERFORATION DU PLANCHER PULPAIRE À L'AIDE DE LA BIODENTINETM: À PROPOS D'UN CAS CLINIQUE

Résumé: Lors d'un traitement endodontique sur des dents multiradiculaires, la perforation de la furcation désigne une ouverture dans le plancher pulpaire, conduisant à une communication avec l'espace ligamentaire parodontal. Un joint hermétique tridimensionnel, avec un matériau biocompatible, est un point clé pour le succès de la réparation des perforations du plancher pulpaire. Le MTA® a longtemps été considéré comme une référence dans la réparation des perforations de la furcation. En outre, la BiodentineTM, lorsqu'elle est utilisée pour le même but, a montré des performances considérables et de bons résultats. Le but de cet article était de rapporter la prise en charge d'une perforation iatrogène du plancher pulpaire de la première molaire maxillaire droite, à l'aide de BiodentineTM.

Mots clés: Perforation du plancher pulpaire, réparation, MTA®, BiodentineTM, cas clinique

Introduction

An endodontic perforation is a pathologic or iatrogenic communication between the root canal space and the surrounding structures of the tooth [1]. Accidental perforations have been reported to account for up to 29% of all iatrogenic errors [2]. Furcation perforations occur during an endodontic treatment in multi-rooted teeth, leading to a communication with the periodontal ligament space [3]. Bacterial contamination of the site of perforation can cause to an inflammation of the periodontal attachment, which can eventually lead to a tooth loss [3]. Treating furcation perforation remains challenging [4]. One of the most widely recommended treatments is to seal the pulp floor using biocompatible materials [1]. The present case report provides a description of a successful one-year treatment of an iatrogenic perforation of the pulpal floor in the maxillary right first molar, using BiodentineTM.

Case presentation

The study involved a 42-year-old female patient who came to the dental department in the Military Principal Hospital of Instruction of Tunis for root canal treatment of the tooth 16. The patient reported undergoing an incomplete root canal treatment.

During dental anamnesis, the patient did not report any subjective pain involving the tooth 16. The clinical examination revealed neither pathological tooth mobility nor pain reaction to horizontal percussion. Therefore, the tooth was slightly tender to vertical percussion. The mean probing pocket depth was within normal level.

The preoperative periapical radiograph showed the presence of a temporary restorative material with a normal apparatus of the periodontal structures (Fig. 1).

Fig. 1: Periapical radiograph showing the preoperative status of the tooth 16.

After administering of local anesthesia, the tooth was properly isolated with a rubber dam.

When the temporary restorative material was removed, a perforation in the pulp-chamber floor was clinically detected (Fig. 2).

The patient was informed about the situation, and a decision to repair the perforation and to save the tooth was made.

The access cavity was slightly modified. Three canal orifices were identified.

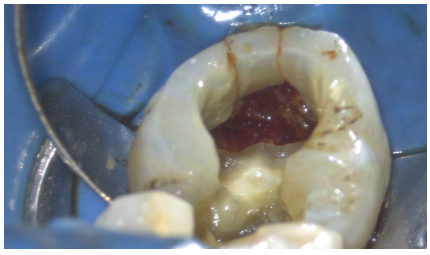

Fig. 2: Clinical view showing the perforation area at the furcation level.

The perforation contained a newly formed soft tissue. After initial hemostasis, the granulation tissue was removed with a sharp spoon excavator. The furcal perforation was irrigated with 2.5% sodium hypochlorite and then with normal saline (Fig. 3).

Fig. 3: Clinical view showing the pulp chamber just after the irrigation protocol.

The three canals were negotiated with K-files, and the coronal enlargement of the canal orifices was conducted with OneFlare (MicroMéga). Gutta-percha points were placed in the canals during the application of the repair material (BiodentineTM) to avoid their obstruction (Fig. 4).

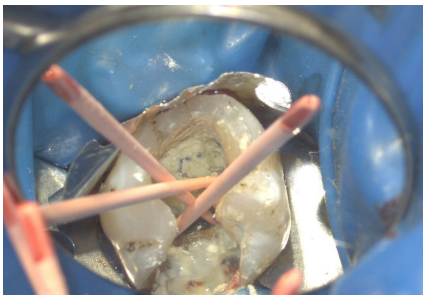

Fig. 4: Clinical view under the dental operating microscope (Leica M320) of the furcal perforation repair of the tooth 16 using BiodentineTM.

BiodentineTM was prepared following the manufacturer's instructions and was applied using MTA gun and Machtou plugger (Dentsply Maillefer).

After that, BiodentineTM was covered with CavitTM, a temporary restoration material (3M ESPE) (Fig. 5).

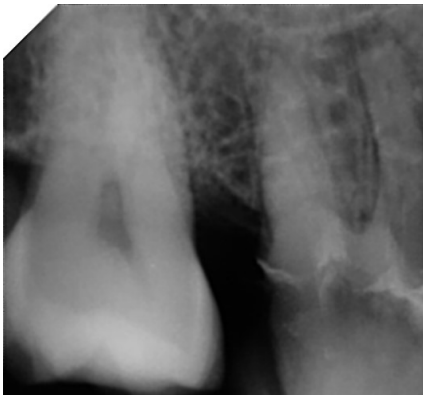

Fig. 5: Immediate radiographic image after perforation sealing using BiodentineTM.

During the patient's second appointment, the temporary coronal temporary restoration was removed. The working length was determined radiographically (Fig. 6).

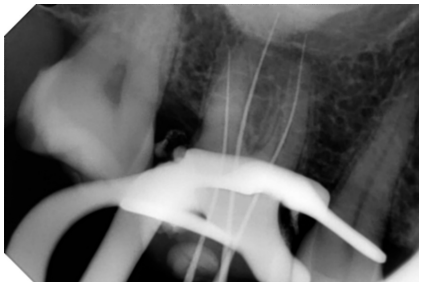

Fig. 6: Radiographic working length determination.

The root canals were cleaned with 3.25% sodium hypochlorite and shaped in a crown-down technique, using rotary files (NiTi Rotate, VDW, Germany). Next, they were dried with paper points and filled using the lateral condensation technique (Fig. 7) (Fig. 8).

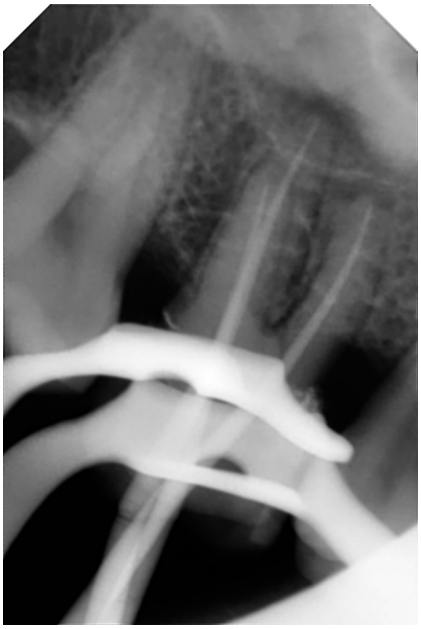

Fig. 7: Radiograph showing master cone verification after chemo-mechanical preparation of root canals.

Fig. 8: Post-operative periapical radiograph showing the filled root canals and the BiodentineTM repair material placed over the furcation perforation.

The post-endodontic coronal restoration was performed using BiodentineTM followed by composite restoration (Fig. 9).

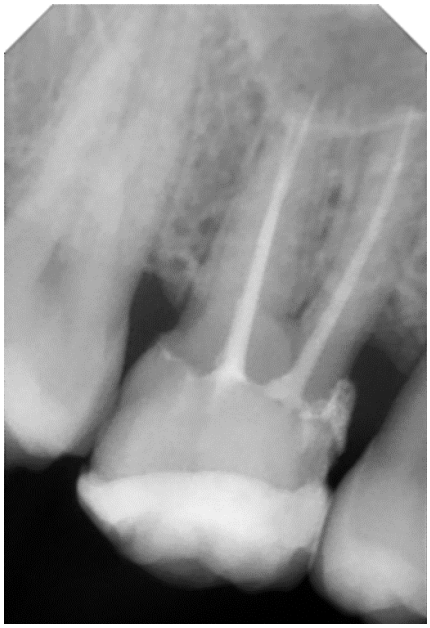

Fig. 9: Post-operative periapical radiograph of the tooth 16.

After this treatment, the patient was asked to return for a check 4 months later (Fig. 10) and for another one 12 months later (Fig. 11). The re-examinations showed that the tooth was asymptomatic. No tenderness to percussion was detected. The tooth was functional and the sulcus probing revealed normal values (1-3 mm). In addition, the radiographic examination showed adequate root canal filling and an adequate repair of the perforation site. Finally, no enlargement of the periodontal space was detected.

Fig. 10: Post-operative radiograph at 4 months follow-up.

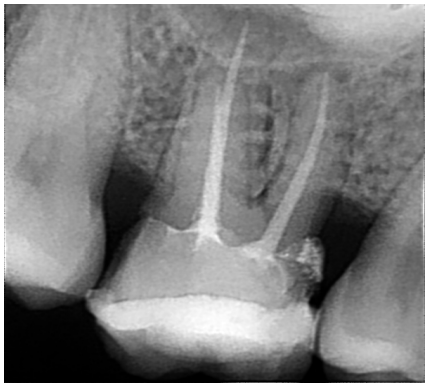

Fig. 11: Post-operative radiograph at 12 months follow-up.

Discussion

Iatrogenic perforation of the pulp-chamber floor complicates the endodontic procedure and ultimately can lead to the loss of the tooth. Moreover, studies report a 10 to 12% increase in the failure rate of endodontic procedures with perforated teeth [5]. However, the non-surgical treatment of perforations has a success rate of more than 70%, and thus can be the preferred approach [2].

Furcal perforations may occur during access cavity preparation, canal orifices location and postspace preparation [6]. This accident can be identified by the sudden pain and immediate bleeding of the defected area. A periapical radiograph may reveal the pathway made in the pulp chamber floor. After haemostasis, the dental operating microscope can help detect perforations. [6] Probing the gingival sulcus to detect possible communication with the oral cavity is recommended in such teeth. [6]. An early diagnosis with an immediate repair of such perforations can lead to a long-term survival of the tooth.

Different factors affect the outcome of the treatment such as the size and the location of the perforation, the time lapse between the occurrence of the perforation and its repair, the severity of the initial damage of the periodontal tissue and the filling material [7]. In the present case, the perforation was treated only four weeks after it had occurred.

The most important thing that should be taken into account when managing perforations is to reduce the bacterial contamination and to stop the inflammatory process in the damaged area. With chronic inflammatory reaction, it is necessary to disrupt the newly formed granulation tissue because it may obstruct the good adaptation of the repair material. [5] In the present case, we used a sharp spoon excavator to remove the granulation tissue. However, burs or ultrasonic tips may also be used for the same purpose. [7] Before applying of the repair material, the bleeding of the perforation site should be controlled so as to achieve a fluid-tight seal [7] [8].

It is also recommended, before repairing the defected area, to cover the canal orifices with gutta percha points, paper points, cotton pellets or an easily removable material such as CavitTM, in order to avoid the blockage of the canals with the repair material [7]. In the present case, we used gutta percha points.

For many years, several materials have been used for the nonsurgical management of furcation perforation, such as Amalgam, Super-EBA, Calcium phosphate and CavitTM [9]. More recently, calcium silicate cements, such as mineral trioxide aggregate MTA® and BiodentineTM, have been described as the most adequate materials for the treatment of furcation perforation thanks to their appropriate biocompatibility and their ability to induce the formation of mineralized tissue [1] [10].

MTA® was the first calcium silicate cement used for perforation repair. It has many advantages such as good sealing ability, appropriate biocompatibility, marginal adaptation, less bacterial leakage, bacteriostatic effect, and an ability to set with the presence of moisture (e.g. blood, tissue fluids). It has been then considered a gold standard in furcation perforation repair [2] [10] [11]. However, MTA® has some clinical limitations such as long setting time, manipulation difficulties, applicability, and tooth discoloration caused by the reaction of bismuth oxide and sodium hypochlorite [12].

On the other hand, BiodentineTM is regarded as an efficient alternative to MTA®, with better handling properties and faster setting time [6]. Indeed, some studies showed that BiodentineTM provides good biocompatibility, good bioactivity, shorter setting time, and a higher compressive strength [11] Besides, BiodentineTM showed a more significant performance as a perforation repair material even after being exposed to different endodontic irrigants compared to MTA® [9].

The selected material in this clinical case was the BiodentineTM which led to good results when repairing the perforation site. In addition, the use of the operating dental microscope was helpful for BiodentineTM application.

Conclusion

The use of bioactive materials and higher magnification is extremely valuable for the furcation perforation management. Results obtained from the present case study showed that BiodentineTM can be a suitable material for furcation perforation repair.

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