Management of Overextended Root Canal Filling of an Immature Maxillary Central Incisor – Case Report

Abstract
Overextension refers to inadequate and poor root canal obturation that extends beyond the periapical region of the tooth. Root canal overextension is often associated with a wide range of local complications and results in sustained periapical infection and inflammation. Long term periapical infection delays definitive prosthetic management of the involved tooth. The condition of blunderbuss root canal can be associated with various factors that can render pulp tissue non-vital during apexogenesis. An immature tooth often presents as an endodontic challenge due to the need for meticulous precautions that are required during its management. In the presented case report, the overextended contents of the immature tooth were removed by periapical surgery and the contents within the root canal system were removed using an orthograde manner. The main canal was obturated with mineral trioxide aggregate. Eight month follow-up showed complete healing clinically and the radiograph showed successful periapical healing (Dent. Med. Probl. 2014, 51, 3, 397–401).

Key words: biofilm, apexogenesis, mineral trioxide aggregate.

Streszczenie

Słowa kluczowe: biofilm, apexogenesis, mineral trioxide aggregate.

Overextension refers to poor filling of the root canal system with obturating materials that extend beyond the root apex, reaching the periapical space [1]. Such overextended root canal materials might act as a foreign body, causing mechanical or chemical irritation of periradicular tissues, leading to treatment failure [2].

Open apex or blunderbuss root canal could occur as a consequence of pulpal necrosis following trauma or dental caries compromising the vitality of the tooth during the early stages of apexogenesis. When endodontic treatment is carried out in blunderbuss canals, the apexification process would confine the endodontic instruments, medications and obturating materials within the canal to prevent endodontic complications [3].
Contemporary Mineral Trioxide Aggregate (MTA) forecast conventional calcium hydroxide as the material of choice for apexification by its widely proved property of biocompatibility without having any detrimental effect on the fracture strength of blunderbuss root canal dentin. When used as an obturating material, MTA establish superior seal, preventing the passage of bacterial infection to the periapical region [4].

This case report presents successful management of an overextended maxillary central incisor by periapical surgery followed by MTA obturation of the canal and the significance of bacterial biofilm in persistent apical periodontitis.

Case Report

A 20 year old, male patient reported to the dental clinic with pain and swelling in his upper front tooth region for the past 2 months. The medical history of the patient was noncontributory. Dental history revealed that the patient had undergone endodontic treatment for his upper front tooth 3 years before. Oral examination revealed a discolored maxillary right central incisor (11) with poor coronal restoration and with a localized swelling in the alveolar mucosa (Fig. 1a). Percussion of the tooth presented with a dull pain. Radiograph revealed an overextended root canal with periapical radiolucency along with root canal filling materials extending approximately 5 mm beyond radiographic apex (Fig. 1b).

Based on the clinical and radiographic findings, a diagnosis of apical periodontitis involving tooth 11 following an inadequate endodontic treatment was proposed. A treatment plan involving endodontic surgery to remove the overextended material followed by MTA obturation of 11 was planned.

Informed consent of the patient was obtained. After administration of local anesthetic (Lignocaine 2% with 1:80,000 adrenaline), a full thickness mucoperiosteal flap was raised. Using a No. 4 round bur, a bony window was created to gain access to the overfilled gutta-percha (GP) points (Fig. 1c). The GP points inside the root canal were retrieved in an orthograde manner using a no. 60 H file (Mani inc, Tochigi, Japan) and those outside the root canal filling materials was associated with a wide range of local complications, some of them include orbital pain, headache, aspergillosus sinusitis and anesthesia of the inferior alveolar nerve [5–7]. Histologically, extruded GP are slowly eliminated by macrophages thereby delaying the periapical healing process [8].

Biofilms are surface attached microbial communities formed by many organisms [9, 10]. Biomaterial centered infections (BCIs) refers to the ability of bacteria to colonize biomaterials in the form of
biofilms and subsequently infect the adjacent tissues [11]. Extruded GP points form a favorable substrate for bacterial colonization and houses a wide range of bacterial species on their surfaces. Biofilms formed over extruded GP are capable of sustaining periapical inflammatory processes and persist as long-standing periapical infection [12–14]. In the presented case report, lack of a proper coronal seal could have opened the pathway for oral microflora to permeate through the poorly-filled root canal and subsequently colonize the periapical space and persist as bacterial biofilms. More-
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ration using commonly-used obturation material like GP. In conditions of poor coronal seal, in vitro microleakage studies using dye penetration, fluid filtration and bacterial leakage models had shown the presence of a weak interface between root canal dentin and GP irrespective of cold or warm compaction techniques [9]. In the presented case report, obturation of the entire root canal system with MTa was preferred against the MTa apical plug, as the former showed superior sealing ability subsequent to formation of the mineralized interface with the root dentin as discussed in the study by Bogen et al. [9].

Biphasic calcium phosphate ceramic was used in the presented case. It consists of 60% hydroxyapatite and 40% beta tricalcium phosphate, having a mineral composition close to that of bone. It’s a bioactive, osteo-conductive, resorbable material which acts as scaffold for new tissue to develop. Reconstruction of natural tissue occurs simultaneously with resorption of these ceramic materials during the repair process [15].

over, inadequate debridement of the root canal and lack of a fluid impervious seal could have been additional contributory factors to the long-term periapical infection.

A case series study by Bogen et al. [9] documents the advantages of using MTA as an obturating material especially in retreatment of failed endodontically-treated teeth with persistent refractory apical periodontitis. According to their study, formation of a mineralized interstitial layer between root dentin and MTA during the setting process of MTA entombs and inhibits the microorganism within the root canal system, preventing its pathway to the periapical region. According to Witherspoon et al. [4], MTA obturated blunderbuss canals showed a high percentage of healing in their follow up visits irrespective of single or multiple visit treatment. Their study also highlights the superiority of MTA over calcium hydroxide in the management of an open-apex tooth.

Apexification with a MTA apical plug of 4–5 mm had to be subsequently followed by obturation using commonly-used obturation material like GP. In conditions of poor coronal seal, in vitro microleakage studies using dye penetration, fluid filtration and bacterial leakage models had shown the presence of a weak interface between root canal dentin and GP irrespective of cold or warm compaction techniques [9]. In the presented case report, obturation of the entire root canal system with MTA was preferred against the MTA apical plug, as the former showed superior sealing ability subsequent to formation of the mineralized interface with the root dentin as discussed in the study by Bogen et al. [9].

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Fig. 2. a – PFM crown luted with resin cement; b – 2 month follow-up of MTA obturation and healing periapical lesion; c – 8 month follow-up showing healed periapical lesion and normal bony trabeculae

Ryc. 2. a – korona protetyczna osadzona na cemencie; b – dwa miesiące po wypełnieniu kanału MTA, gojenie tkanek okołowierzchołkowych; c – kontrola radiologiczna 8 miesięcy po leczeniu pokazuje wygojenie tkanek okołowierzchołkowych oraz prawidłowe beleczkowanie kostne
Conclusions

The eight month follow-up radiograph of the discussed case report showed an absence of periapical radiolucency and the presence of a normal trabecular pattern of the periapical bone. This strongly emphasizes the physiochemical and bioactive properties of MTA when used as obturation material in retreatment of long-term apical periodontitis.

References


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Conflict of interest: None declared

Received: 20.04.2014
Revised: 18.05.2014
Accepted: 23.05.2014

Praca wpłynęła do Redakcji: 20.04.2014 r.
Po recenzji: 18.05.2014 r.
Zaakceptowano do druku: 23.05.2014 r.