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The use of cone beam computed tomography in diagnosis and surgical management of a case of internal root resorption: A case report

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ABSTRACT

This study represents a case of extensive perforating internal root resorption in tooth 7 in 22-year-old female, with a history of trauma in the anterior segment of maxilla in childhood. Diagnosis was made by clinical manifestation, intraoral periapical radiograph and cone beam computed tomography (CBCT). CBCT has superior diagnostic accuracy that results in better management of complicated cases. Due to hemorrhage from the perforation site into the canal, and inability to dry the canal space surgical approach was employed to seal the resorptive defect. Clinical and radiographic examination revealed a successful outcome six months after treatment.

Key words: Internal Resorption, cone beam computed tomography, surgical management.

Introduction

Root resorption is dentin or cementum loss due to osteoclastic cell action.It can be classified into internal or external according to its location. Internal root resorption is a rare asymptomatic defect. It's a round to oval radiolucent enlargement of root canal space. The margin of the defect is smooth and well defined and distorts the root canal outline [1]. This phenomenon has been attributed to the infected coronal pulp and trauma. Most cases are seen in anterior teeth due to susceptibility to trauma [2]. The use of cone beam computed tomography (CBCT) has been suggested in diagnosis and management of resorptive defects. It provides a vast amount of information including size, shape and dimension of resorptive lesions. In particular, buccolingual extend of the lesion can be determined. Moreover, alveolar bone changes can be detected more precisely [3]. Management of internal root resorption is challenging. It's even more complicated if the resorption extends beyond confines of the root. In perforating internal root resorption after chemo mechanical preparation of root canal and interappointment calcium hydroxide dressing, the defect should be sealed with an appropriate material [4]. Mineral Trioxide Agreagate (MTA) is material of choice in management of root perforations due to its excellent biocompatibility and sealing ability. MTA may also promote regeneration of periodontal attachment including osteogenesis and cementogenesis [5]. Best results can be obtained through surgical management in these cases due to improved elimination of granulation

tissue, homeostasis and consequently much better access. This case report introduces diagnosis and surgical management of a perforating internal resorption by use of CBCT in a right maxillary lateral incisor (tooth # 7).

Case Report

A 22-year-old female patient was referred to the Department of Endodontics, Shiraz School of Dentistry for management of tooth 7 by a general dentist. Patient complained about a persistent sinus tract in gingival mucosa above tooth 7 for about two months and reported a history of trauma to the anterior part of maxilla in childhood (Figure 1.a). She was in a healthy condition and her medical status was noncontributory. Tooth 7 did not respond to thermal and electrical tests, while all adjacent teeth had normal response to these tests. There was no tenderness to percussion and palpation. Probing depths were within normal range (2-3 mm). Periapical radiographic examination using a parallel technique revealed a round radiolucency in the middle third of the root with radiolucency in the adjacent bone. This radiographic appearance was suggestive of a large internal root resorption (Figure 1.b).

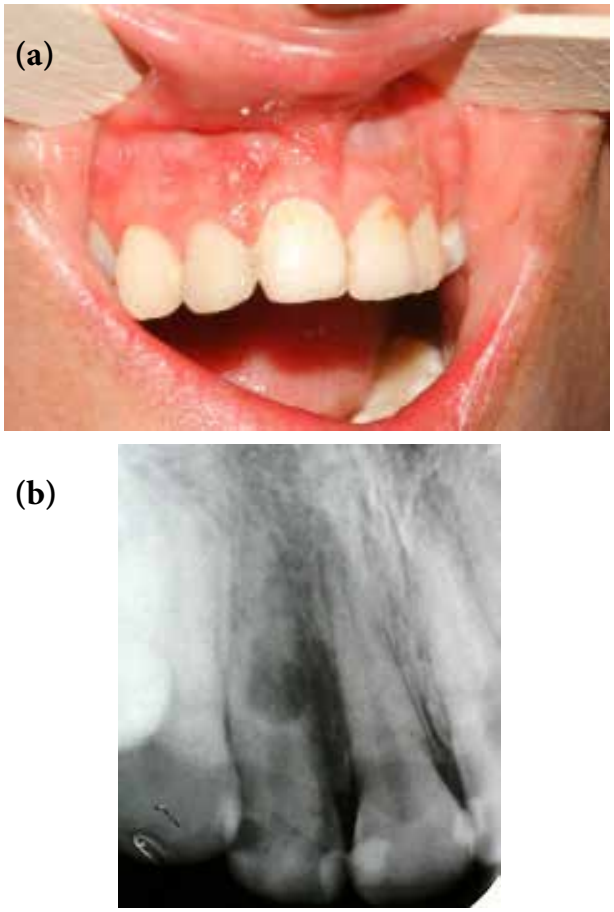

Figure 1. Preoperative images. (a) sinus tract as the clinical manifestation of the perforating resorption. (b) Periapical radiograph of tooth 7 demonstarting internal root resorption in the middle third of the canal, and adjuct bone radiolucency.

Due to better definition and visualization of the nature, size, location, severity of the resorptive defect, and presence of the perforation cone beam computed tomography (CBCT) was ordered. The CBCT images were obtained by a small volume scan (Kodak 9000, Carestream Health, Inc, Rochester, NY, USA) at 90 kVp, 6 mA, and 10 seconds. According to the axial and sagital views, there was obvious resorptive defect that had been perforated in the mesial wall of the canal in midroot region. Bone resorption adjacent to the perforation was more obvious in CBCT than conventional radiography (Figure 2).

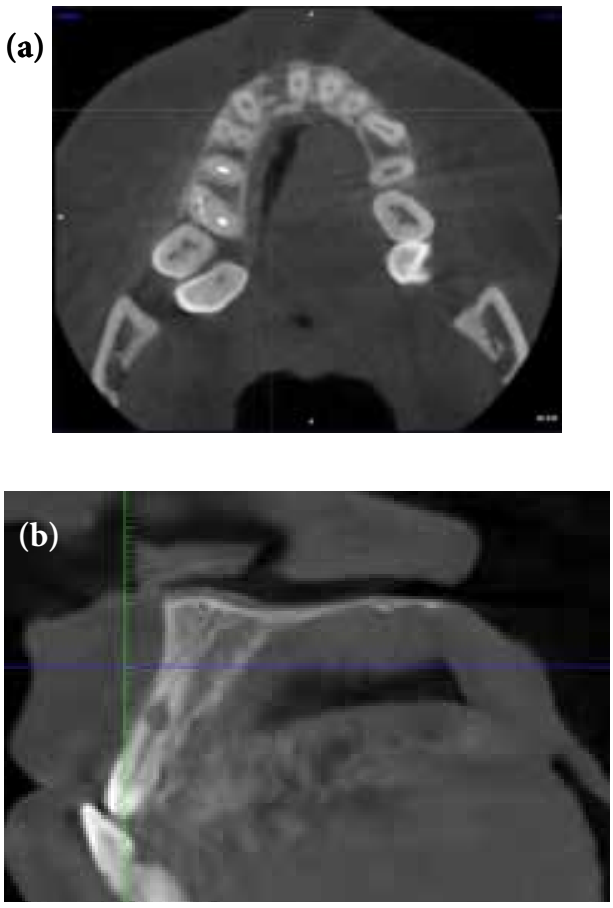

Figure 2. Selected cone beam computed tomography images of tooth 7. (a) the axial CBCT section shows mesial perforation and bone radiolucency. (b) the sagital section shows location and size of perforating resorptive defect.

Due to complications in disinfecting and sealing the resorptive defect, the patient was advised to have a combined non-surgical and surgical approach. During the first session, after the administration of local anesthesia, the tooth was isolated with rubber dam and the access cavity was prepared. An initial K file (MANI, Tochigi-Ken, Japan) size # 15 was introduced to the

canal and the working length was determined by periapical radiograph, which was 21 mm. working length determination with apex locator was impossible because of the perforation in midroot area.

The canal was instrumented using ProTaper rotary files (Dentsply Maillefer, Ballaigues, Switzerland). Copious irrigation with 2.5% sodium hypochlorite was done during the procedure. After preparation, the root canal was filled with calcium hydroxide paste in order to control bleeding of the perforation and the tooth was then temporarily restored. At the second visit which was 10 days later, access to the canal was reestablished and the root canal was copiously irrigated with 2.5% sodium hypochlorite to remove calcium hydroxide dressing. Due to continuous hemorrhage and exudation the canal could not be completely dried.

After flap elevation the perforated lesion with a bone dehiscence was observed which was filled with granulation tissue. The bleeding granulation tissue was removed, and the irregularities in the bone margin around the perforation site were smoothed by a surgical bur attached to a surgical handpiece. The canal was subsequently dried with paper points, and obturated with gutta-percha and AH-26 as sealer apical to the level of the resorptive defect. MTA (Angelus, Londrina, Brazil) was mixed according to the manufacturer's instruction and placed in the perforated site with an MTA carrier. MTA condensation was performed by using a Schilder hand pluggers (Dentsply Caulk, Milford, DE, USA) and a wet cotton pellet was placed within the coronal part of the canal in contact to MTA in order to maintain humidity for its setting, and the access cavity was temporarily restored (Figure 3). The flap was sutured, and the patient returned one week later for suture removal and obturation of the coronal third of the canal. She was without any clinical signs and symptoms and the sinus tract had been completely disappeared. The coronal third of the canal was obturated with gutta-percha with warm vertical obturation technique and the crown was restored with light-cured composite resin (Solitaire 2, HeraeusKulzer, Wehrheim, Germany). The patient was recalled 6 months later. The tooth was asymptomatic and bone repair was observed (Figure 4).

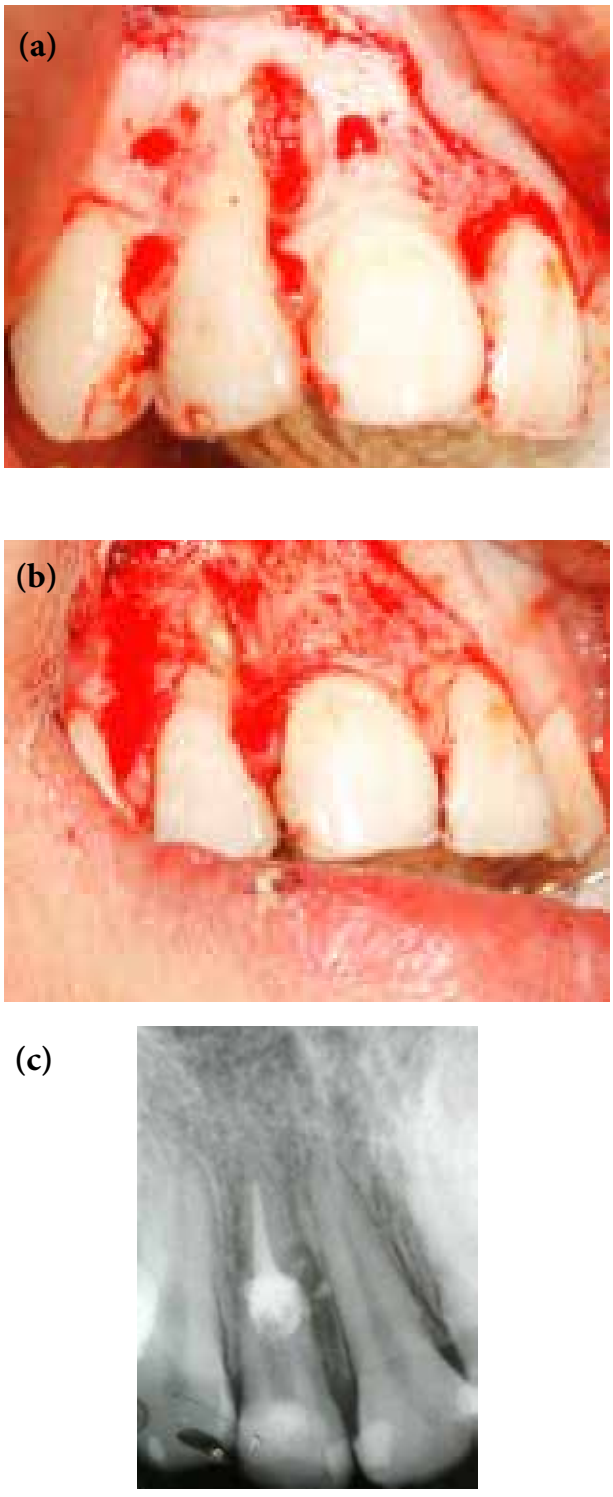

Figure 3. (a) flap elevation, bone deheicence and granulation tissue. (b) appearance of the perforation defect after granulation tissue removal and MTA placement. (c) peroapical radiograph after gutta-percha obturation of the canal apical third, and MTA placement in the resorption.

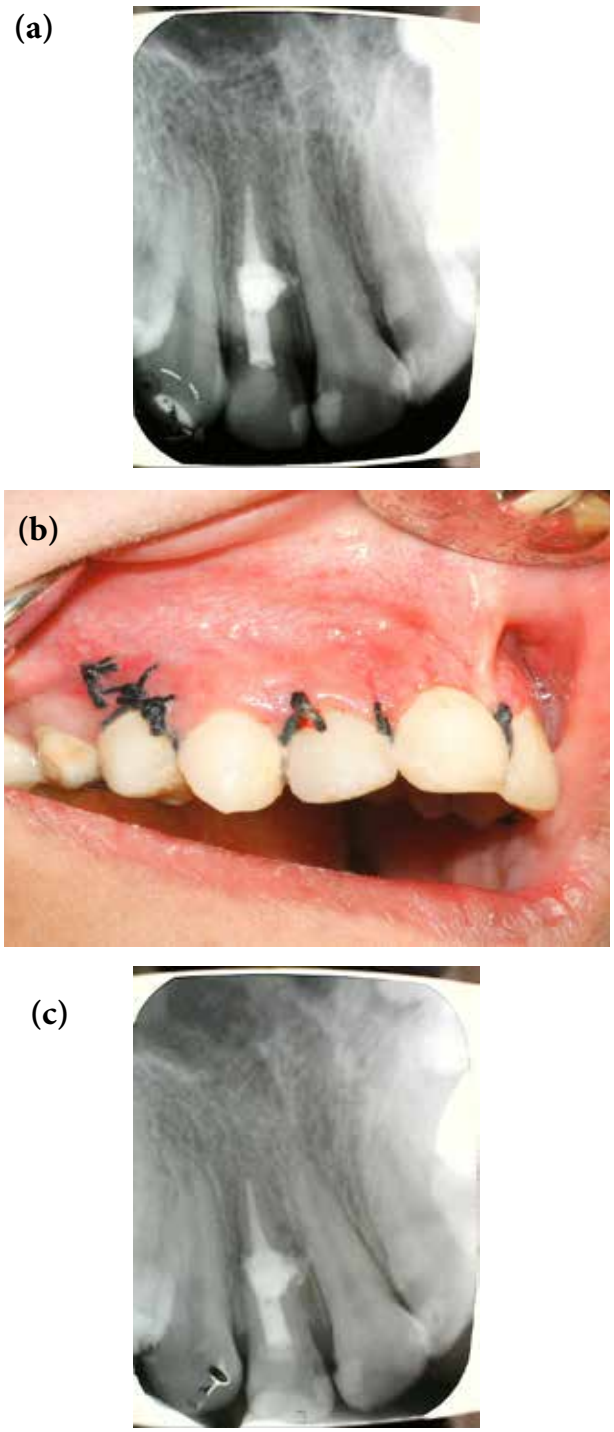

Figure 4. (a) postoperative final periapical radiograph. (b) 6 days after surgery the sinus tract was completely disappeared. (c) 6 month follow up periapical radiograph.

Discussion

Available evidence suggests dental trauma as one etiologic factor of internal root resorption. The present case is confirmative of this suggestion. Requisites of internal root resorption are loss or alteration of the protective layer and inflammation. Dental trauma may account for both of these two events [6].

tory internal root resorption with mineral trioxide ag

Cone beam computed tomography has been shown to be extremely advantageous in diagnosis and management of perforating internal root resorption, revealing superior accuracy in comparison with conventional intraoral radiographs [7]. In our case, by ordering CBCT before any treatment, it was possible to precisely identify the exact location, the extent of the internal resorptive lesion, and determining the perforation site. We believe in our case, it is unlikely that endodontic treatment and surgery could have been performed as accurately and safely as it was without the aid of the CBCT images. The use of CBCT is rational in managing complex endodontic problems such as resorptive defects or when surgical approach is necessary [8].

Managing a perforating internal root resorptive defect is based on the perforation size, including root canal debridement and placement of calcium hydroxide paste, followed by obturation with thermoplastisized gutta-perch in small defects, and placing restorative materials such as MTA by surgical approach in cases of large defects [9].

In the present case, the complete granulation tissue removal from the canal space was impossible, because the canal was perforated and the granulation tissue was extended out of the canal into the periodontium. Therefore, one session of placing calcium hydroxide in the canal space was followed by surgical removal of the granulation tissue in the next session.

MTA is the material of choice for root perforation treatment due to its satisfactory mechanical properties, biocompatibility, sealing ability and setting in the presence of blood and humidity [10]. For this case, according to the mentioned advantages, MTA was used to seal and repair the perforated area of the root. In the current case the usage of this material resulted in rapid resolution of clinical signs and symptoms and elimination of the sinus tract in the next session.

Conclusion

CBCT provides more details of the internal root resorption and is a useful adjunct in the endodontic and surgical treatment of perforating resorptive defects. The successful outcome in this case would be owing to the usage of CBCT in diagnosis, surgical approach for perforation closure, and MTA as a material of choice in root perforation closure.

Conflict of Interest

The authors declare no conflict of interest.

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