CASE REPORT

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Treatment of maxillary central incisors with internal resorption: Two case reports

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Internal root resorption is a rare condition, but it may require complex treatment protocols, depending on the progression. The aim of this case report is to present the treatment protocol and the follow-up results for 2 cases of a right upper central incisor with internal root resorption. A 15-year-old female patient presented with the chief complaint of dental caries. The radiological examination revealed that tooth #21 had internal resorption (IR) in the middle third of the root. The warm vertical condensation technique was applied using a warm obturation system. At 3 years, the tooth was asymptomatic and no lesions were observed. A 48-year-old female patient was referred to the clinic for a routine control. The radiological examination revealed IR in the middle third of tooth #21. As the resorption area was quite wide, cone beam computed tomography was used. The results indicated that there was also external resorption in the buccal part of the root. Therefore, the treatment protocol was changed and the IR area was sealed with mineral trioxide aggregate. At 1 year, the tooth was asymptomatic and no lesions were observed.

Keywords: Cone beam computed tomography; internal root resorption; mineral trioxide aggregate; root perforation; trauma.

Dental roots are surrounded by presementum on the outer surface and predentine on the inner surface. Dentine tissue begins to resorb with cellular activity when these structures are damaged by infections, mechanical or chemical factors.[1] If resorption occurs on the external root surface, it is called external root resorption (ER). If it develops within the root canal due to pulpal origin, it is called internal root resorption (IR) which can be progressive or temporary.[2]

IR is characterized by resorption on the inner surface of the dentine adjacent to the granulation tissue produced in the pulp. Although there are several theories of the origin of IR-associated pulpal granulation tissue, the most consistent explanation is inflammation or trauma of the pulp tissue caused by the infected coronal pulp cavity.[3] It has been reported that traumas, infections and restorative procedures may also be factors in the formation of IR.[4,5] IR can develop in a short time such as a few months, but it can continue to develop slowly for many years.[6]

Destruction of dental hard tissues in IR occurs with odontoclastic activity.[7,8] IR can be seen in every third of the root canal, most often occurring in the middle third of the root.[9] When the internal root resorption is localized in the middle and apical third, the patient usually does not have any complaints due to the chronic inflammatory character of the resorption process and the lesion is detected during routine radiological examination. However, if the resorption area is in the cervical third and the dam-

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age is advanced, the pink reflection from the granulation tissue facilitates the diagnosis. Also, pain or discomfort may be the chief complaint if the granulation tissue has been exposed to oral fluids.[7]

The progression of internal root resorption depends on the presence of vital tissue in the root canal.[10] Therefore, when the diagnosis of IR is made, the root canal treatment should be started as soon as possible to prevent further hard tissue loss and root perforation.[7] If the lesion is not detected or remains untreated, it grows and perforates the root surface from the inside. When detected early, treatment and long-term prognosis of the tooth is good. If significant destruction of tooth tissue or resorption approaches the marginal bone, it weakens the tooth and adversely affects the prognosis of treatment.[11]

In cases without a perforation, root canal treatment should be sufficient. However, root canal treatment should be followed by repair of the perforation site with a proper sealing material in cases where the resorption is perforated.[12]

MTA with its superior sealing ability[13] antimicrobial activity[14] and fibroblastic stimulation[15] can be used in such cases. This case reports describe three years and one-year follow-ups of two different central incisors which were diagnosed as IR. Besides IR one of the incisors also had perforation, thus MTA were used as sealing material.

Case report

Case 1 – A 15-year-old female patient referred to our clinic with the chief complaint of dental caries. On the clinical and radiological examination, tooth #21 had deep caries reaching the pulp chamber and internal resorption in the middle third of the root (Fig. 1a). On clinical examination, there were no symptoms other than mild sensitivity on percussion test. The history revealed that the patient had trauma to the tooth about a year ago and that the tooth was fractured horizontally. The patient stated that she did not come for the treatment because she had no complaints those days other than caries. When history and examination were combined, it was thought that IR was triggered by trauma, and root canal treatment was performed immediately.

Caries in the coronal part was completely cleaned and the access cavity was opened. The cervical section of the canal was enlarged with Gates-Glidden drills to provide easy access to the resorption area. ISO #20 K type canal file and x-ray images were used to determine the canal length. The root canal was instrumented with stainless steel hand files under the NaOCl and EDTA irrigation until an apical stop of ISO #40 was established. After the root canal was dried with sterile paper cones, calcium hydroxide dressing was applied and the access cavity was temporarily restored. One week later in the second visit, the tooth was asymptomatic. After the removal of temporary restoration and cotton pellet, calcium hydroxide dressing was also removed using a 40 K file and 5.25% NaOCl. After the final irrigation using NaOCl and EDTA, the root canal was dried with sterile paper cones and obturated with warm vertical condensation technique using Elements Free (SybronEndo/ Kerr Endodontics, Orange, CA) warm obturation system using a resin-based root canal sealer (Fig. 1b).

No clinical and radiographic findings were found after the 1 years follow-up examination (Fig. 1c). Also there were no clinical and radiographic findings at the 3 years follow-up examination but the temporary filling material was missing, thus the patient was directed to restorative dentistry department immediately (Fig. 1d).

Case 2 – A 48-year-old female patient was referred to our clinic for routine control. Radiological examination revealed IR in the middle third of the tooth #21 (Fig. 2a). On clinical examination, the tooth was asymptomatic. As the resorption area was quite wide, the patient was guided for CBCT imaging. As a result of the CBCT also an external resorption was detected in the buccal part of the root (Fig. 2b–e). Therefore, the treatment protocol was changed and the IR area was decided to be sealed with MTA (Pro Root Maillefer, Ballaigues, Switzerland).

The existing prosthesis of the patient was removed, the access cavity was opened, and ISO #25 K type canal file

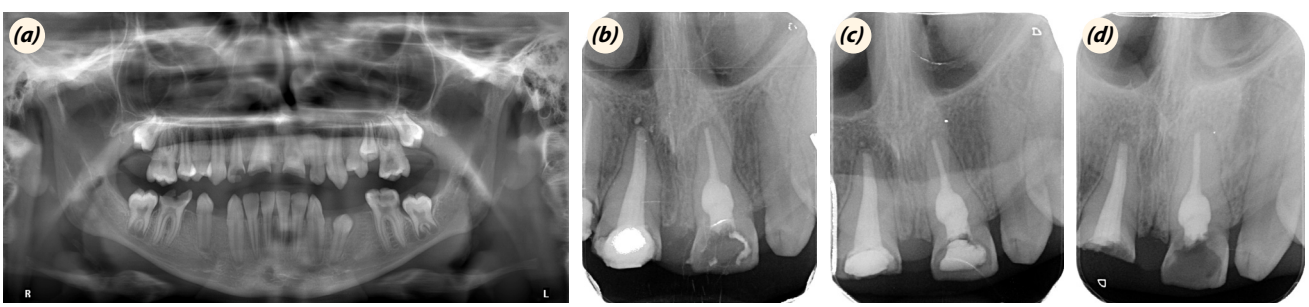

Fig. 1. Case 1, **(a)** initial, **(b)** post-treatment radiograph, **(c)** 1 year follow-up, **(d)** 3 year follow-up.

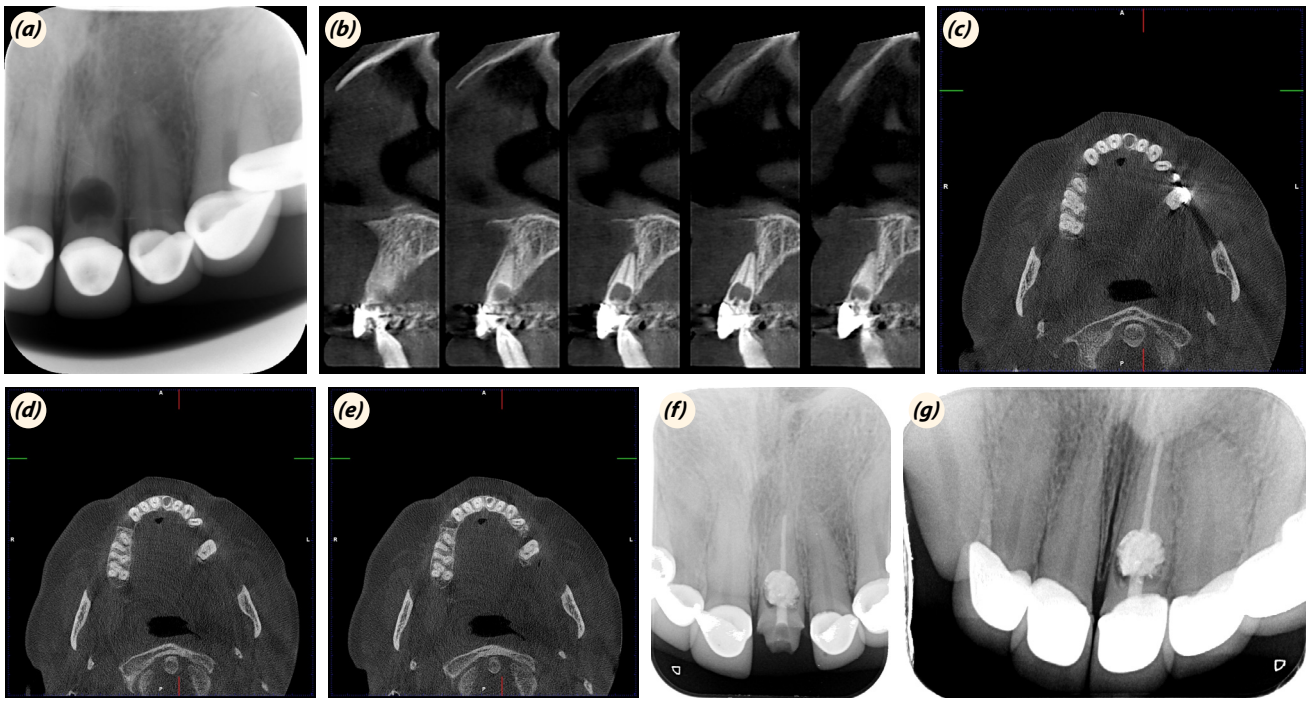

Fig. 2. Case 2, **(a)** initial, **(b)** CBCT sagital view, **(c)** axial view 1, **(d)** axial view 2, **(e)** axial view 3, **(f)** post-treatment radiograph, **(g)** 1 year follow-up.

and x-ray images were used to determine the canal length. The root canal was instrumented with stainless steel hand files under the NaOCl and EDTA irrigation until an apical stop of ISO #40 was established. After the root canal was dried with sterile paper cones, calcium hydroxide dressing was applied, the access cavity was temporarily restored and the prosthesis of the patient was temporarily cemented.

One week later in the second visit, the tooth was asymptomatic. After the denture and the temporary restoration removal, cotton pellet and calcium hydroxide was also removed with a 40 K file and 5.25% NaOCl. NaOCl and EDTA were used for the final irrigation procedure. After the root canal was dried with sterile paper cones, the part of the root up to the resorption area was filled by lateral condensation technique and the gutta perchas in the resorption area were cut off. The resorption area was then filled with MTA (Fig. 2f).

No clinical and radiographic findings were found after the 1 year follow-up examination (Fig. 2g).

Discussion

IR is a complex interaction of resorbing and inflammatory cells in permanent teeth, resulting in the resorption of dental hard tissues.[2] IR is usually asymptomatic and shows clinical findings in only about 2% of cases.[16] Our cases were also asymptomatic. It has been reported that the IR is more common in males than females.[17] Both of our patients were female in contrast to this information.

A traumatic injury can be the initiating factor for IR.[3,5,18] Our first case may have been triggered by trauma. Another possible cause is high heat build-up during tooth preparation without adequate water cooling or orthodontic treatment.[3,19] Our second case may have been triggered by restorative procedures.

Today, the diagnosis of IR is significantly improved by the CBCTs. Additionally, the CBCT's superior diagnosis correctness resulted in an improved management of the defects and a prognosis of conservative therapy of teeth with IR.[20] In our first case, it was not necessary to apply to CBCT in order to protect the patient from radiation because the limits were specific and the resorption area was smaller and surrounded by dentine wall. However, if CBCT was taken in the first case, a more detailed evaluation of the case could have been achieved. In the second case, we referred to CBCT foreseeing a possible perforation due to irregular and wide possible resorption area.

It is known that if there is no perforation in internal resorption cases, successful results can be achieved with root canal treatment only.[21] Complex irregularities in the root canal system, especially IR defects, create technical difficulties for root canal cleaning and filling. The retention of organic debris and bacteria in these disorders may affect the long-term success of endodontic treatment.[22] One of the important goals of successful treatment in IR cases was to completely fill the root canal cavity. Therefore, complete filling of the root canal cavity has been in-

dicated in IR cases.[23] The filling material must be fluid to fully fill the resorbed area. Gutta-percha is the most commonly used filling material in endodontics and there are warm gutta-percha techniques in which this material is softened with heat and used in a fluid consistency. It is recommended to utilize warm vertical compaction and heated gutta-percha methods during filling of the resorption area.[22,24–26] In our first case, cause there was no perforation, we completed the treatment only with root canal treatment without applying bioactive material like MTA or Biodentine. However, in order to fill the irregularities in the canal completely, we applied warm gutta-percha technique as recommended in the literature.[24] Nilsson et al.[20] also used the warm gutta-percha technique successfully in the lower molar with internal resorption which has no perforation, similar to our case. It has also been reported that warm gutta-percha techniques can be used to backfill the resorption area after MTA or Biodentine application.[27,28]

In cases where the resorption causes perforation and the pulp tissue is related to the oral or periradicular tissues, the treatment process is difficult and endodontic surgery may be needed in these cases besides canal treatment.[29] Bioactive materials provide successful results in the treatment of the areas where the pulp tissue is covered or associated with periodontal and bone tissue.[30] MTA is one of the most preferred materials among these materials. MTA is used as vital pulp therapies such as pulp capping, pulpotomy, amputation, and retragrat filler in endodontic surgical procedures; also can be used successfully in the treatment of open apex teeth and perforation repair applications.[31] In addition, MTA is a suitable material for the treatment of root perforations by regenerating periodontal attachment and inducing osteogenesis and cementogenesis.[32,33] However, the disadvantages of this material, such as prolonged freezing time (3–4 hours) and tooth discoloration, must be considered.[34,35] The application of MTA for treatment of root perforation originating from IR/ER is supported by evidence of a long-term positive outcome.[19,36] Furthermore, the use of MTA in situations where exessive dental destruction is found may lead to an increase in resistance.[37] MTA was applied to most of the internal resorption cases as a bioactive material, but there was also a case of Biodentine.[27,28,38,39]

In our second case, we decided to use bioactive material in IR area in addition to root canal treatment because of perforation detection with CBCT. We have used MTA as bioactive material because of its many advantages. The tooth discoloration did not cause any disadvantage in this case due to the presence of tooth under the prosthesis. Since the perforation area and bone loss were limited and the case healed with canal treatment only, surgical procedure was not applied. In the literature, it has been reported that MTA can be used in teeth with perforated internal resorption successfully without surgery, similar to our case.[38,39] However, it has also been reported that in some cases additional surgical treatment may be required.[40–42]

Conclusion

As a consequence, internal resorptions are generally rare and asymptomatic cases, but they may require different treatment protocols depending on their progress. In addition, the application of CBCT according to the progress of the case is a great advantage. It is important to determine the required treatment protocol by assessing the amount of destruction in the case (perforation, bone loss, etc.). Such an accurate evaluation is an important key to the success of the treatment.

Conflict of interest: None declared.

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