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Case Report

Internal root resorption management: Case series

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Abstract
Internal resorption is a rare resorption. It starts in the root canal and destroys the surrounding hard tissues. It is usually asymptomatic. Internal resorption is more common in anterior teeth due to trauma. However, it can be seen in posterior teeth due to the progression of deep caries lesions to the pulp. Early diagnosis of the defect improves the prognosis of such teeth. In this case series, three internal resorption cases treated with hot vertical compaction and mineral trioxide aggregate (MTA) are presented. Careful treatment planning and sensitive treatment prevented tooth loss.

Keywords: Root resorption; calcium hydroxide; mineral trioxide aggregate; endodontics

INTRODUCTION

Resorption is a condition associated with a physiological or pathological process that causes dentin, cementum and/or bone loss. Andreasen (1) has, over the past 40 years, made a unique contribution to the understanding of tooth resorption, and his original classification remains the most widely accepted. He classified tooth resorption into two different kinds: internal tooth resorption (inflammatory, replacement) and external tooth resorption (surface, inflammatory and replacement). Internal resorption is an inflammation process that involves the progressive destruction of intraradicular dentin and dentin tubules as a result of clastic activity (2). The etiology of resorption consists of various injuries to the tooth, including thermal, mechanical and chemical injuries (3). In a study of 27 patients, trauma was the most common etiologic factor for internal resorption (43%), followed by caries lesions (25%) (4). It has been reported that the prevalence of internal resorption varies between 0.01% and 1% (5). The most commonly affected teeth are reported as the maxillary incisors (4).

The pathology of internal root resorption is due to the transformation of normal pulp tissue into giant cell granulomatous tissue that resorbs dentin. The degradation of the inorganic mineral structure followed by the disintegration of the organic matrix takes place in two stages (6). Internal root resorption involves the progressive loss of dentin. It is mostly observed in the cervical region and is asymptomatic. The resorption defect may form a clinically prominent pinkish color in the crown because of excessive vascular resorptive tissue that becomes visible along the thin enamel (7).

If internal resorpsions are left untreated for a long time, internal root resorption may progress to external root perforation and cause tooth fracture (8). These lesions are difficult to diagnose because they cannot be detected at an early stage in radiography (3). On radiographic examination, the lesions are usually observed as uniform enlargements of the pulp cavity, in round or oval shapes. The outline of the root canal is mostly disrupted (9). The only treatment is to remove the pulp tissue of the vital tooth and then complete the root canal filling. Clastic precursor cells (monocytes) arrive at the site through blood vessels, so it is theoretically easy to control the progression of internal root resorption using conventional root canal treatment.

The success of endodontic treatment varies depending on many factors. The presence of organic debris and microorganisms in irregular resorptive areas may affect the prognosis. Another problem encountered in such cases is that the defect cannot be determined clinically or radiographically and, as a result, there are deficiencies

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in the root canal filling (10). Early detection of internal resorption is crucial to prevent further weakening of the remaining tooth structure and root perforations. In this case series, we describe the successful treatment of three internal root resorption defects with granulation tissue removal, root canal shaping and root canal filling using the heated gutta-percha technique or mineral trioxide aggregate (MTA).

CASE REPORT

Case 1

During the dental examination of a 25-year-old female patient, resorption was observed in the middle third of tooth #12. The patient did not have any systemic diseases. The clinical examination revealed that the tooth was asymptomatic and that there was a composite filling in the mesial area. The patient had a delayed positive response to the electrical and cold-pulp tests. Radiographic examination revealed suspicion of internal resorption in the middle third of the tooth (Figure 1a). This diagnosis was supported by conical beam computed tomography (CBCT) taken on the same day (Figure 1b).

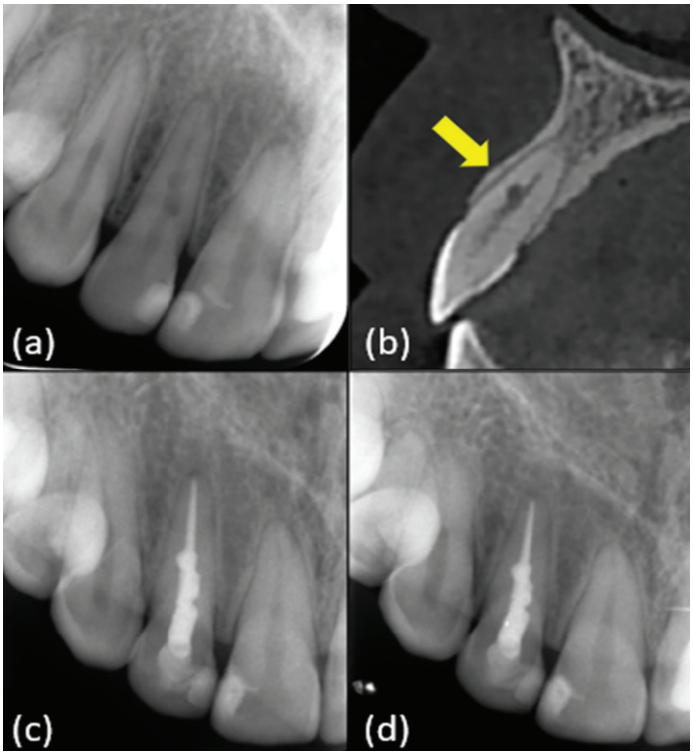

Figure 1. Case 1 (a) Diagnostic radiography of tooth #12 (b) CBCT image of tooth #12 (c) Post-treatment radiography of tooth #12 (d) 1 year follow-up radiograph of tooth #12

Case 2

During the dental examination of a 25-year-old female patient, resorption was observed in the middle third of tooth #22. The patient did not have any systemic diseases. The clinical examination revealed that the tooth was asymptomatic and that there was a composite filling in the distal area. The patient had a delayed positive response to the electrical and cold-pulp tests. Radiographic examination showed that the composite filling was deep in the distal part of the tooth, and internal resorption was detected in the middle third of the root (Figure 2a). On the same day, lesion size was determined using CBCT (Figure 2b).

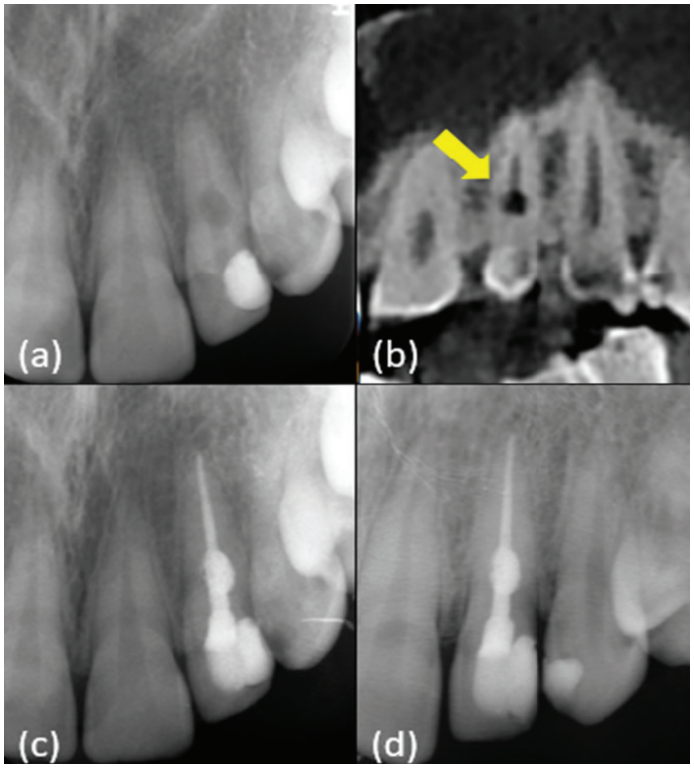

Figure 2. Case 2 (a) Diagnostic radiography of tooth #22 (b) CBCT image of tooth #22 (c) Post-treatment radiography of tooth #22 (d) 1 year follow-up radiograph of tooth #22

Case 3

A 54-year-old male patient presented to the Department of Endodontics in the Faculty of Dentistry at Inonu University with a complaint of pain against cold and heat on his tooth #45. The patient did not have any systemic diseases. In the clinical examination, it was observed that the tooth had large distal caries. The diagnosis of internal resorption (Figure 3a), which ranged from the coronal third to the middle third of the root, was suspected. At the same time, it was suspected that this resorption may have reached the periodontal tissues due to the patient's pain complaint. This diagnosis was supported by CBCT on the same day, and the dentin thickness remaining in the lingual of the tooth was very thin (Figure 3b).

Treatment of Cases

After the endodontic access cavity of the tooth was opened and the working length was determined, root canal shaping was completed with H-type and K-type hand files. Irrigation was performed with 2 ml/min 3% NaOCl after the use of each file. The final irrigation before calcium hydroxide treatment was performed by applying 2 ml/min 3% NaOCl, 2 ml/min 17% EDTA and 2 ml/min 3% NaOCl, and root canals were dried using paper cones. The patient was then treated with calcium hydroxide

for a week. A week later, the calcium hydroxide paste was removed from the root canals using H-type and K-type hand files and ultrasonic tips (DT-009 tip, EMS SA, Nyon, Switzerland) along with 2 ml/min 2.5% NaOCl irrigation. The final irrigation before the root canal filling was performed by applying 2 ml/min 3% NaOCl, 2 ml/min 17% EDTA and 2 ml/min 3% NaOCl, and the root canals were dried using paper cones. In Cases 1 and 2, the apical third of the root canal filling was completed using the cold lateral compaction technique, and the middle and coronal thirds were completed using the hot vertical compaction technique and a resin sealer (Dia-ProSeal, Diadent, Seoul, South Korea). In Case 3, the root canal filling was completed by filling the apical third of the canal with a resin sealer and the cold lateral compaction technique, and the middle and coronal thirds were filled using ProRoot MTA (ProRoot MTA, Dentsply, Tulsa, USA). Postoperative radiographs were taken to confirm that the root canal and resorption defect were satisfactorily filled. Restoration of the tooth with direct composite resin was completed (Figures 1c, 2c and 3c). After a follow-up appointment one year later, the teeth were functional and no pathology was observed in the periapical tissues during clinical and radiographic evaluations (Figures 1d, 2d and 3d).

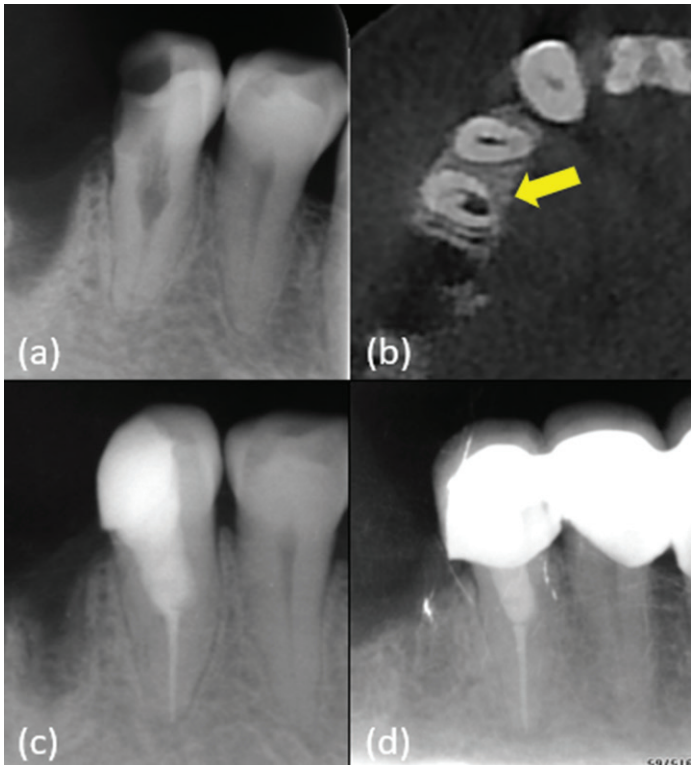

Figure 3. Case 3 (a) Diagnostic radiography of tooth #45 (b) CBCT image of tooth #45 (c) Post-treatment radiography of tooth #45 (d) 1 year follow-up radiograph of tooth #45

DISCUSSION

Internal resorption may be highly diffuse due to its insidious pathology. These lesions are usually asymptomatic and are often diagnosed incidentally on routine radiographic examinations. Angled radiographs and CBCT are highly beneficial in the early detection of internal resorption.

Endodontic treatment of internal resorption is very difficult, especially if the resorption area is large and the tooth has perforated (11). Once diagnosed, effective removal of granulation tissue and clastic cells should be considered (12). However, due to the complex nature of the root canal system and the difficulties of access to the internal resorption defect, thorough cleaning and obturation of the root canal becomes difficult. The persistence of organic debris and bacteria in these regions may jeopardize the long-term success of endodontic treatment (13). However, this residue can be resolved through the use of high concentrations of sodium hypochlorite, followed by intracanal calcium hydroxide treatment. Effective cleaning of the trough-shaped resorption area is only possible with chemicals capable of dissolving organic tissue. Endodontic instrumentation of this resorption area may result in perforations that can cause difficulties in prognosis (7). Due to its high alkalinity and its abilities to inhibit tooth resorption, dissolve tissue and induce remineralization of hard tissues, calcium hydroxide should be used as an intracanal medicament in addition to chemomechanical cleaning (14, 15). Additionally, the use of calcium hydroxide as an inter-appointment dressing maximizes the effect of disinfection procedures, helps to control bleeding and necrotizes residual pulp tissue (16, 17). Therefore, calcium hydroxide treatment was applied for a week in all cases.

Before the root canal is filled, the calcium hydroxide treatment applied to the root canal should be removed. However, it is rather difficult to remove calcium hydroxide residue from irregular canal walls (18). Various techniques have been suggested to remove calcium hydroxide from the root canal system, including endodontic hand files (19), sonic activation (20), passive ultrasonic irrigation (18) and nickel-titanium (NiTi) rotary files (21). However, none of these can completely remove calcium hydroxide from the root canals. Topcuoglu et al. found that passive ultrasonic irrigation was more successful in removing calcium hydroxide from artificial internal root resorption cavities (22). In a study in which calcium hydroxide applied between visits was removed by passive ultrasonic irrigation, it was found that the placement of a calcium hydroxide–based inter-appointment dressing did not influence the short- and long-term sealing abilities of the root canal filling. (23). In the current study, sodium hypochlorite agitation was performed using passive ultrasonic irrigation to remove calcium hydroxide applied to the root canals.

Another material with similar properties as calcium hydroxide is MTA. The excellent outcomes of studies primarily related to tissue response when employed for pulp capping, internal root resorption, endodontic treatment of teeth with incompletely formed roots and root canal filling (24). However, using orthograde MTA canal filling in perforating internal resorption cases can

have the disadvantages of coronal discoloration, extrusion from the perforation and inadequate marginal adaptation around the root defects (25). In a study comparing multi-visit calcium hydroxide dressing and single-visit MTA application in the treatment of inflammatory root resorption following immediate replantation (24), MTA provided similar results compared to calcium hydroxide paste.

The main purposes of root canal treatment are to disinfect the root canal system and obturating the canal with a suitable root canal filler to prevent re-infection. It is difficult to apply sufficient root canal filling to internal root resorption defects. Various treatment options may be considered depending on the size of the resorption cavity and the progression of the lesion (3):

1. Ortograde root canal treatment: there are three different treatment methods depending on the presence of perforation in the root canal walls:

•In cases without perforation, complete root canal filling with gutta-percha

•Combination of gutta-percha and MTA in root canal filling in the presence of perforation

•Completion of root canal filling with bioactive materials in short-rooted cases with apical perforation

2. Retrograde apical treatment

3. If the tooth is too weak to be treated, extraction and implant treatment

In order to obtain a sealed root canal filling in the presence of internal resorption, the filler must be flowable to completely cover the resorption defect. This can be achieved using hot vertical compaction of gutta-percha (2). Since there was no perforation in teeth #12 and #22, the root canal filling was completed using gutta-percha with the hot vertical compaction and cold lateral compaction methods together. However, because of the very low dentin thickness in the middle third of tooth #45, gutta-percha and MTA were used together in the root canal filling.

After endodontic treatment of the related teeth was completed, the patients were invited for follow-up appointments to prevent against the risk of recurrence of resorption. In the area of resorption, there may be a lateral canal that can allow the resorption process to be continuous and jeopardize the treatment process. Therefore, patients should be monitored for a long time to avoid the risk of defects. Prognosis depends on the location of the lesion (supraosseous or infraosseous), the time elapsed since the onset of the resorptive defect, contamination of the area, bone loss in the area and the sealing of the canal filler used (7).

CONCLUSION

In daily practice, internal resorption can be diagnosed during clinical and radiographic examination of the teeth. Modern endodontic techniques, including various chemomechanical- preparation tools and hot gutta-percha techniques, should be used during root canal treatment of teeth with internal resorption. As the use of bioactive materials has become more frequent, the survival rate of perforated teeth has increased. Clinicians should diagnose this condition correctly and complete endodontic treatment at an early stage to prevent further complications.

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