Case Report

Internal root resorption in permanent mandibular molars – A rare entity: Report of two cases

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Abstract

The cases presented here aim to highlight the occurrence of a very rare internal root resorption (IRR) of inflammatory type among mandibular molars (prevalence 0.01%–1%). Patients reported in the outpatient department with a chief complaint of pain in the lower posterior region of the jaws, on thorough clinical and radiological examinations a diagnosis of irreversible pulpitis was made and nonsurgical root canal treatment was planned using thermoplastic obturation technique along with the use of magnification, cone-beam computed tomography, endosonics, and intracanal medicament to attain a successful outcome. Six-month follow-up showed arrest of IRR. This report of two cases with a literature review discusses the etiology, prevalence of IRR, the clinical decision, and the therapeutic management. Early detection of such resorption is the key to successful management and preserves the integrity of the tooth.

Keywords: Cone-beam computed tomography; internal root resorption; mandibular molar; root canal; root resorption; three-dimensional imaging

INTRODUCTION

Resorption is described as a condition linked with either a physiologic or a pathologic process that results in loss of dentin, cementum, or bone as per the American Association of Endodontists Glossary. Based on the site of its occurrence, root resorption can be categorized as internal or external. Internal root resorption (IRR) is characterized as a pathological process with loss of dental hard tissue caused by chronic pulpal inflammation. In intraradicular internal resorption, odontoclastic activities gradually destroy dentinal tubules from the pulpal canal surface toward the outer root surface. Haapasalo and Endal suggested a prevalence of between 0.01% and 1% for internal inflammatory root resorption.[1] The etiological factors which may be associated with internal resorption are acute or chronic tooth trauma,[2] autotransplantation,[3] crown preparation with inadequate cooling,[4] pulp amputation,[5] revitalization,[6] hyperthyroidism,[7] or orthodontic treatment.[8] In one instance, monozygotic twins raised the possibility of a genetic predisposition.[9] Asymptomatic at early stages, internal resorption can hardly be detected without radiological examinations, where it appears as a radiolucent lesion. However, clinical signs, such as pain and swelling, can be noticeable when internal resorption develops to advanced stages. In extreme cases, resorption perforates the root canal system, and the tooth becomes susceptible to fracture.[10] Based on the data gathered from the cone-beam computed tomography (CBCT) and clinical examination, the following therapeutic options could be taken into consideration: Therapeutic abstention and monitoring in the absence of infectious signs and symptoms, orthograde root canal therapy with three alternatives based on whether or not there is radicular wall perforation: Complete filling with thermoplastisized gutta-percha on nonperforated lesions, combined gutta-percha in the root canal and bioactive material for perforated area, complete

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filling with a bioactive material on apical perforated lesions located in a short root length. If the tooth is too weakened to be treated or restored, it will need to be extracted.[11]

CASE REPORTS

Case 1

A 32-year-old female patient reported with a chief complaint of dull pain in the lower right back tooth region for the past 3 months. Her medical history was noncontributory. She had no history of trauma. On clinical examination, caries was detected on the mesio-occlusal aspect of the right mandibular first molar along with mild tenderness to vertical percussion. There was no associated swelling and tooth mobility with respect to the tooth number 46. The vitality of the tooth was confirmed by electric pulp stimulation (Parkell D640 Digitest II, Parkell Inc., Edgewood, NY, USA) and cold test (Endo-Frost, Coltene Whaledent Inc., USA). Preoperative intraoral periapical radiograph revealed aberrant radiolucency with respect to the distal canal of tooth number 46 [Figure 1a]. Further evaluation was performed using a CBCT scan (Orthophos SL 3D, Dentsply Sirona, North Carolina, USA) to investigate the position and borders of the resorption area. Axial, sagittal, and coronal CBCT cross-sections approved the resorption area in the cervical and middle third of the distal root canal which did not perforate the root surface [Figure 1b and c]. A conservative orthograde treatment was planned that included root canal preparation, disinfection, and obturation of the root canal with gutta-percha using thermoplasticized technique as CBCT evaluation revealed a nonperforating IRR having good prognosis. Before

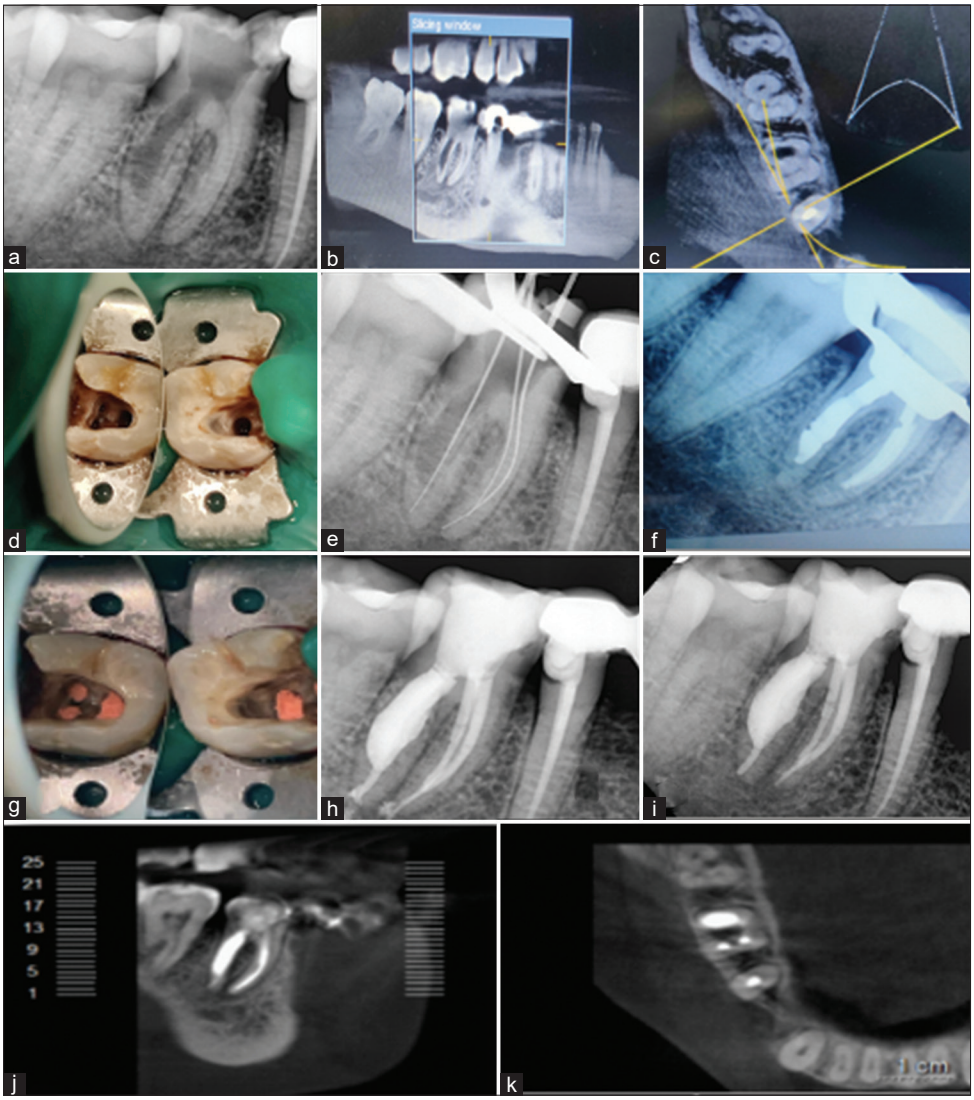

Figure 1: (a) Preoperative intraoral periapical (IOPA) radiograph w.r.t. 46, (b and c) Preoperative cone-beam computed tomography (CBCT) images w.r.t. 46, (d) Access cavity preparation, (e) working length determination, (f) Intracanal medicament placement, (g and h) immediate postobturation image and radiograph, (i) 6 months recall IOPA radiograph, (j and k) 6 months recall CBCT coronal and axial images

initiation of the treatment, the patient's informed consent was taken.

An inferior alveolar nerve block was given using 2% lignocaine with epinephrine 1:100,000 (Lignox, Indoco, India) to anesthetize tooth number 46. Following this, isolation was done using a rubber dam, caries was completely removed and the access cavity was prepared [Figure 1d]. Three root canal orifices were located (mesiobuccal, mesiolingual, and distal) and the working length was established using an electronic apex locator (Pixi Apex Locator, DENTSPLY Maillefer, Switzerland) with #10-K stainless steel file (DENTSPLY Maillefer, Switzerland). The working length was confirmed radiographically [Figure 1e]. Root canal preparation was performed and the distal root canal was enlarged up to 70-K stainless steel file (Dentsply Maillefer, Switzerland). Mesio-buccal and mesio-lingual canals were instrumented with rotary files HyFlex™ CM (Coltene Whaledent Inc., USA) up to 20/0.06 taper. During successive instrumentation, irrigation was performed with 2 mL of 5% NaOCl (PyraxPolymars, Uttarakhand, India). After completion of preparation, canals were flushed with 3 mL of 17% ethylenediaminetetraacetic acid (EDTA) (Waldent Innovations Pvt. Ltd., New Delhi, India) for 3 min. The irrigants were activated with sonic activation (Endo Activator, Dentsply Sirona, North Carolina, USA) and the final flush was done with 5 mL of normal saline. After chemo-mechanical preparation, the prepared canals were dried with absorbent paper points. Metapex (Meta Biomed Co., Seoul, Korea) an intracanal medicament was packed in the canals for 2 weeks [Figure 1f]. The access cavity was sealed temporarily with Cavit-G (3M ESPE, Germany) and the patient was recalled after 2 weeks. In the recall visit, the patient was asymptomatic, thus obturation using a thermoplastisized technique was planned. The metapex was removed with #50-H stainless steel file (DENTSPLY Maillefer, Switzerland) along with 17% EDTA irrigant using sonic activation (Endo Activator, Dentsply Sirona, North Carolina, USA). Obturation till the coronal end of the resorbed area was done with a down pack technique utilizing thermoplastisized gutta-percha (Calamus, DENTSPLY Sirona, North Carolina, USA) along with AH plus sealer (DENTSPLY Sirona, North Carolina, USA) [Figure 1g]. The remainder of the canal was backfilled using thermoplastic gutta-percha (Calamus, Dentsply Sirona, North Carolina, USA). After completion of root canal obturation, the tooth was restored using posterior resin composite (Brilliant NG, Dentin A2/B2, Coltene Whaledent Inc., USA) [Figure 1h]. Immediate postoperative intra-oral periapical radiograph revealed dense obturation in the resorptive defect. The patient was recalled after 6 months for follow-up. Intraoral periapical radiograph and CBCT scans were done to evaluate the outcomes [Figure 1i-k] showing good osseous healing and the resorption of the extruded sealer.

Case 2

A 58-year-old female patient reported with a chief complaint of pain in her lower left back region of the jaw for 1 week. Medical history was noncontributory. Dental history revealed fixed orthodontic treatment at the age of 13 years. History of the present illness dictated that a root canal treatment was initiated in the lower left second molar (tooth number 37) by a general dentist. The clinical examination and intraoral periapical radiograph revealed an initiation of root canal treatment with respect to 37 [Figure 2a]. On percussion, the tooth was mildly tender with no swelling or mobility associated. A radiographic examination also revealed the presence of radiolucency in the cervical third of the distal root. Further, angled radiographs showed that the radiolucency was contiguous with the root confirming a diagnosis of internal resorption. Radiolucency was also observed on mesio-cervical region of the crown with thinned-out dentin which indicated an error in previously initiated access cavity preparation (gouging) [Figure 2b]. The vitality of the tooth was confirmed with electric pulp stimulation (Parkell D640 Digitest II, Parkell Inc., Edgewood, NY) and cold test (Endo-Frost, Coltene Whaledent Inc., USA). The patient was advised a CBCT scan to know the exact location and extent of the defect. Axial, sagittal, and coronal sections revealed a well-contained radiolucency of approximately 3 mm × 5 mm × 3 mm in the coronal third of the distal root confirming the diagnosis of nonperforating internal resorption [Figure 2c and d]. A conservative treatment was planned that included filling of nonperforating internal resorption with thermoplasticized gutta-percha and mineral trioxide aggregate (MTA) placement in the area where dentin was thin. Before initiation of the treatment, patients' consent was obtained.

An inferior alveolar nerve block was given using 2% lignocaine with epinephrine 1:100,000 to anesthetize tooth number 37 and isolation with rubber dam was done. The access cavity was refined with Endo Z bur (Dentsply Maillefer, Ballaigues, Switzerland). Working length was determined with an apex locator and was confirmed by radiograph [Figure 2e]. The mesiobuccal and mesiolingual canals were prepared till the F2 and the distal canal was prepared till the F3 ProTaper Gold file (Dentsply Maillefer, Ballaigues, Switzerland). During successive instrumentation, irrigation was performed with 2 mL of 5% NaOCl. After the completion of preparation, canals were flushed with 3 ml of 17% EDTA for 3 min. The irrigants were activated with sonic activation (Endo Activator, DENTSPLY Sirona, North Carolina, USA) and the final flush was done with 5 mL of normal saline. The canals were then dried with absorbent paper points, after which calcium hydroxide was placed in the canals as an intracanal medicament. The access cavity was temporarily restored with Cavit-G. The patient was recalled after 2 weeks. In the subsequent visit, the calcium hydroxide dressing was removed using normal

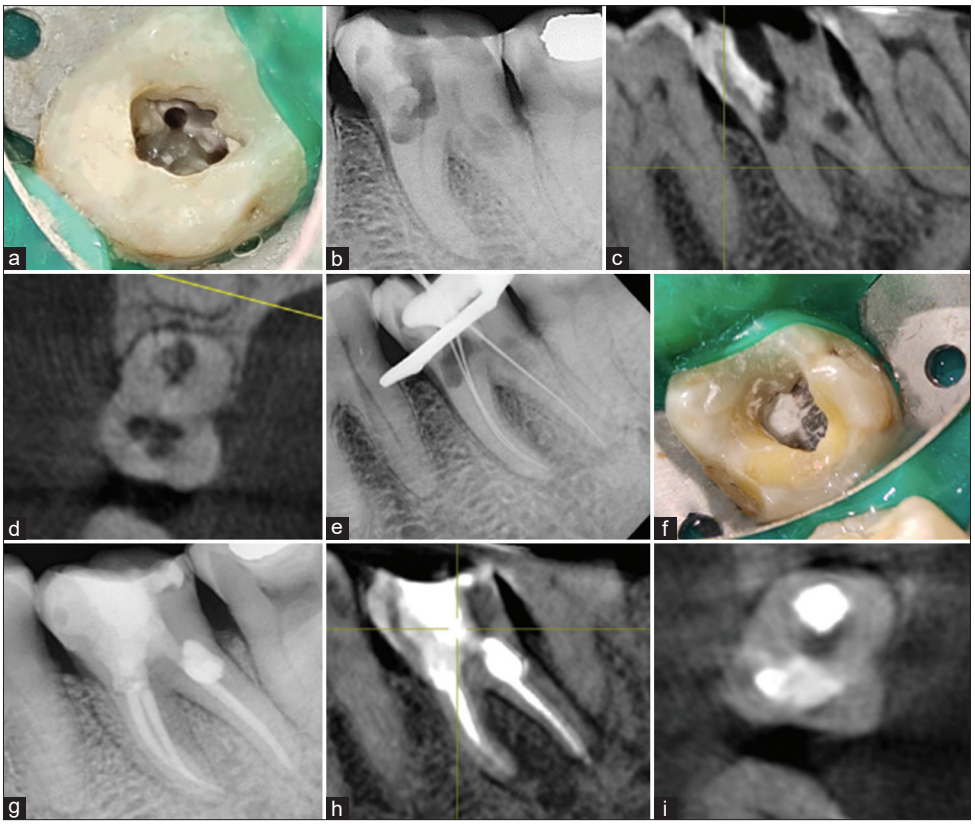

Figure 2: (a and b) Preoperative clinical view and intraoral periapical (IOPA) radiograph, (c and d) preoperative cone-beam computed tomography (CBCT) images, (e) working length determination, (f) mineral trioxide aggregate placement in the thinned area, (g) immediate postoperative IOPA radiograph, (h and i) 6 months recall CBCT images

saline in combination with Endo Activator. After drying with paper points, obturation of the distal canal was done with a down pack of gutta-percha using Calamus along with AH plus sealer. The remainder of the canal was backfilled using thermoplastic gutta-percha up to the orifice. The mesiobuccal and mesiolingual canals were obturated with a single cone obturation technique using the corresponding gutta-percha cone and AH plus sealer.

The mesio-cervical part of the coronal aspect of the crown indicating gouging with a dentinal wall <0.5 mm was restored with MTA (MTA Angelus® Reparative Cement, Brazil) following manufacturer directions [Figure 2f]. After the setting of MTA, the tooth was restored with RMGIC (GC Fuji II, St. Paul, USA) followed by composite (Brilliant NG, Coltene, Altstätten, Switzerland). Postoperative intraoral periapical radiograph revealed densely filled obturation in the resorptive defect [Figure 2g]. At 6 months, a postoperative CBCT scan was done showing perfect adaptation of the resorptive area and good osseous healing [Figure 2h and i].

DISCUSSION

IRR is characterized as an idiopathic, slowly progressing resorptive process. IRR finding is very unusual in clinical practice since they are typically asymptomatic and their finding is ascribed to serendipity during standard radiographic examinations. According to Dao *et al*.,[12] the prevalence of internal resorption was the highest for anterior teeth (15.6%), almost four times greater prevalence for molars (4%) and almost two times greater prevalence than for premolars (8.3%). Furthermore, the most prevalent resorption types were external (29.3%), cervical (22.5%), infection-induced apical resorption (13.7%), internal (9.6%), and impacted tooth induced (8.8%). It is more commonly observed in males than in females.[13] However, in this case, IRR was detected in a mandibular molar and a female in contrast to this information. In present times, the diagnosis of IRR has been significantly upgraded by the CBCT. In addition, the precise and accurate diagnosis using CBCT results in improved management of the defects and a prognosis of conservative therapy of teeth with IRR. In the present case, CBCT was performed for the detailed evaluation of the defect.[14] The superiority of CBCT is attributed to the three-dimensional nature of the images it obtains from the target region and is a suitable method for imaging the buccolingual view of teeth affected by IRR. A limited CBCT scan was carried out with exposure parameters of 80 kV, 3.0 mA and 17.5 s, following the analysis of the axial, sagittal and coronal slices, it was evident that there was a nonperforating, balloon-shaped

defect in the middle and coronal third of the distal root canal. One of the important goals of successful treatment in IRR cases is to completely fill the root canal system, although complex irregularities in the root canal especially IRR defects, create technical difficulties for root canal cleaning and filling.[15] The shape of the resorption defect usually renders it inaccessible to direct mechanical instrumentation. Therefore, the use of sonic instruments to agitate the irrigant was done to improve the removal of necrotic debris and biofilms from inaccessible areas of the root canal.[16] An antibacterial medicament Metapex was used to improve disinfection of the inaccessible root resorption defects. In the present case, the root canal wall was not perforated due to resorption, also constriction of the canal in the apical third region with respect to the distal root could be appreciated. About the root canal filling, the obturating material needs to be flowable to seal the resorptive defect.[17] The thermoplastic gutta-percha technique seems to give the best results when the canal walls are respected. Nilsson *et al*.[11] also utilized the warm gutta-percha technique successfully in molar with IRR with no perforation, similar to this case.

CONCLUSION

A successful treatment outcome requires early identification, eradication of the underlying cause, and appropriate management of the resorbed root. An unusual type of tooth resorption known as internal resorption occurs when the surrounding tooth structure is destroyed beginning in the root canal. Using standard root canal therapy, IRR can be regulated by obstructing the blood supply to the resorbing tissues. Frequent recall is crucial for the tooth's overall prognosis as well as to assess the state of recovery.

Patient perspective

The patients were happy and thankful after receiving the treatment and getting relieved from their pain and were convinced to maintain oral hygiene and regular oral check-ups.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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