Extensive internal root resorption

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Internal root resorption (IRR) is a structural loss of dentine as a consequence of dentinoclastic activity starting at the inner surfaces of the root canal or the pulp chamber walls (Gartner et al, 1976; Al-Momani and Nixon, 2013).

IRR might occur as a physiologic or pathologic phenomenon, is normally asymptomatic and is frequently detected during routine radiographic examination (Patel et al, 2010).

IRR may be caused by:

- Recurrent caries
- Pulp infection
- Trauma
- Overheating during cavity or crown preparation
- Orthodontic treatment
- Cracks (Silveira et al, 2009; Al-Momani and Nixon, 2013; Ramazani et al, 2016).

IRR is an irreversible and pathological defect, which occurred when the odontoblastic palisade and the non-mineralised predentine are damaged or irritated by the presence of a noxious agent.

Dentinoclasts are then recruited to the injured site via release of pro-inflammatory cytokines.

In an acidic environment, these cells participate in the development of resorptive depressions (the so-called Howship Lacunae) on the surface of calcified tissues. If IRR is not treated, it may continue to spread until the tooth becomes untreatable.

Basically, the pulp may present an inflamed granulomatous tissue in which the clastic cells are stimulated by bacterial penetration and the blood supply from the root canal. If IRR progresses, it may result in a root perforation and subsequent periodontal lesion (Caliskan and Türkün, 1997; Deep et al, 2021; Riyahi, 2022).

The normal radiographic presentation is a radiolucent and well-defined area of enlargement of the root canal or the pulp chamber (Gartner et al, 1976).

The clinical characteristics of IRR are dependent of the stage of the resorptive process. Although most teeth with IRR are symptom-free, during active progression of the process, the pulp is at least partially vital, and on occasions may show acute exacerbations, causing severe discomfort episodes (Patel et al, 2010).

There are many publications on IRR. However, cases with extensive areas of internal resorption are scarce (Rossi-Fedele et al, 2010).

This article describes the management of a case with a large and extensive area of IRR, which required a different approach to treatment.

Case study

Presentation

A 41-year-old female complaining of intermittent pain was referred for endodontic treatment of her mandibular left first molar.

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Fig 1A: Preoperative clinical view of the mandibular left first molar showing an old amalgam restoration and a deep carious lesion on the occlusal surface

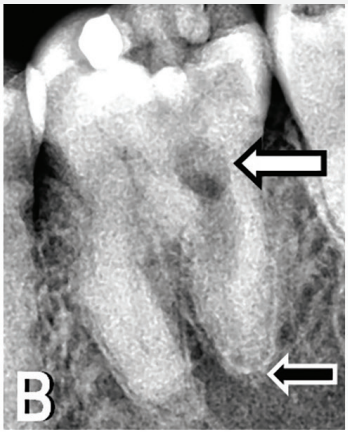

Fig 1B: Preoperative radiograph – a large IRR lesion extended from the pulp chamber (white arrow) to the middle third of the distal canal. The cortical bone and the periapical tissues are within normal limits (black arrow)

Fig 1C: Preoperative axial CBCT image showing the size of the IRR at the level of the pulp chamber (arrow)

Fig 1D: Preoperative axial CBCT showing the size of the IRR at the level of the middle third of the distal canal (arrow)

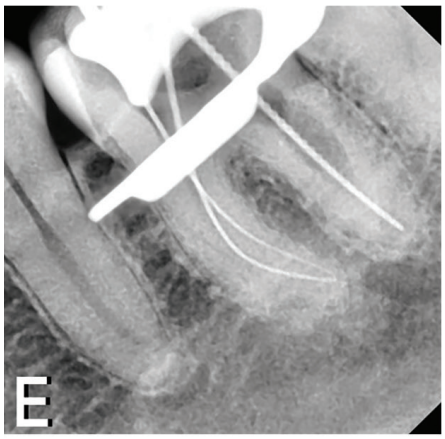

Fig 1E: Intraoperative radiograph showing instrumentation of the root canals

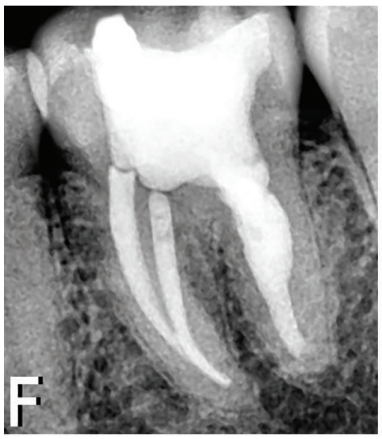

Fig 1F: Immediate postoperative radiograph showing the obturated root canals. Note volume of the root canal filling material

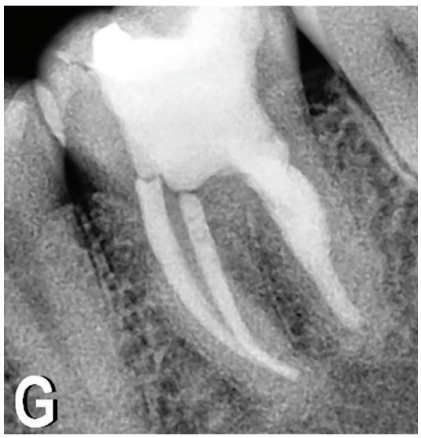

Fig 1G: After six months, the evolution of the treatment was uneventful

Her medical history was non-contributory. The patient provided a dental history of having had orthodontic treatment when she was 28 years old.

Clinical examination revealed tenderness to palpation and percussion of the tooth. Periodontal probing and tooth mobility were within normal limits.

Recurrent caries was observed around an old amalgam restoration located on the buccal aspect of the crown (Figure 1a), while a deep caries lesion was detected on the coronal surface.

The molar was sensitive to thermal and electric pulp tests, while the adjacent teeth responded normally.

Radiographic examination revealed that there were no signs of periapical pathology, but there was a wide and large radiolucent area that extended from the pulp chamber to the middle third of the distal root (Figure 1b).

Cone-beam computed tomography (CBCT) images were illustrative of the extensive size of resorption at the level of the pulp chamber and the root canal (Figures 1c and 1d).

From the combined clinical, radiographic and CBCT examination, a diagnosis of irreversible pulpitis associated with a severe IRR process was arrived at.

Regarding treatment, a non-surgical endodontic therapy was proposed, which was accepted by the patient.

After the risks and benefits were explained, the patient signed an informed consent form.

The root canal therapy was subsequently performed and completed in a single session.

Root canal treatment

Following mandibular anaesthesia with 1.7ml of articaine, 4% L-adrenaline 1:100,000 (Totalcaina Forte), the tooth was isolated with rubber dam and the operative field disinfected with 2% chlorhexidine.

After a wide coronal access was established, the pulp chamber was accessed. The coronal pulp was removed, and the pulp chamber cleaned by profusely irrigating with 5.25% NaOCl followed by rinsing with saline.

After drying, three canal orifices were detected with the aid of an endodontic explorer. The canals were negotiated with size #10 and #15 K-files (Dentsply) and the working lengths were determined with the aid of an electronic apex locator, which was further confirmed with a periapical radiograph (Figure 1e).

The canals were prepared with Reciproc Blue nickel titanium instruments (VDW Dental) up to a size 35/.06.

During preparation, the canals were irrigated with 5.25% NaOCl. Final irrigation of the canals was performed with 17% EDTA (one minute) followed by rinsing with saline.

The canals were once again irrigated with 5.25% NaOCl and the irrigant solution agitated for a minute with the XP-Endo Finisher instrument (FKG Dentaire) to improve the flow of the irrigant through the canals and into the resorptive defect.

After preparation, the canals were dried with sterile paper points. The mesial canals were filled with the single cone technique using 30/06 taper gutta percha cones and Bio-C sealer, while the distal canal was filled with warm vertical compaction of gutta percha and Bio-C sealer.

The access opening was sealed with a dual curing resin composite (Rebilda, Voco) and a postoperative radiograph was taken to establish a baseline for further follow-up evaluation (Figure 1f).

The patient was then referred back to her general dentist for completion of the restorative treatment.

During the following six months, the patient was asymptomatic, and the postoperative experience of the treatment was uneventful (Figure 1g). There was no response to further recall notifications.

Discussion

In the case of IRR presented here, the diagnosis was based on radiographic and CBCT examination.

Although most IRR cases are asymptomatic, the patient reported repeated episodes of

pain attributed to the first lower molar. This was probably due to acute exacerbations of a chronically inflamed pulp.

The most remarkable aspect of this case is the presence of a wide and large resorptive area, which extended from the pulp chamber to the middle third of the distal root canal.

Considering this scenario, we may hypothesise that the resorptive defect was initiated in the pulp chamber due to the presence of a deep caries lesion and subsequent bacterial invasion though dentinal tubules.

Then, as the infected pulp advanced in profundity, the resorptive defect progressed apically.

When the IRR is not compromised by a root perforation, orthograde endodontic therapy is indicated as the treatment of choice (European Society of Endodontology, 2006).

However, debridement and disinfection of the resorptive defect can be extremely challenging. Because of the irregular contour of the resorptive areas, a chemo-mechanical preparation, disinfection and obturation may not be sufficient enough to completely remove the infected tissues and the bacterial contamination.

For this reason, complementary methods for irrigant activation/agitation are needed in most of the IRR cases. In the present case, we used the XP-Endo Finisher instrument to aid the flow and penetration of the irrigant through the canals and inside of the resorptive defects.

The XP-Endo Finisher is a non-tapered, flexible rotary nickel titanium instrument specially designed to agitate the irrigants in the final step of irrigation/disinfection of the root canals.

In this respect, previous investigations revealed that the instrument was quite effective to remove smear layer remnants and the bacterial load from infected root canals (Azim et al, 2016; Bao et al, 2017).

As suggested by Al-Momani and colleagues (2013), the warm vertical compaction of gutta percha technique was used to obtain a tight adaptation of the material to the

irregular canal anatomy of the distal root.

Bio-C sealer, which is a bioceramic material, was also used to provide the seal between gutta percha and dentine. This material has proven to have antibacterial activity, is biocompatible and safe in contact with periapical tissues, while contributing to the mineralisation process (Okamura et al, 2020).

Despite the fact that the tooth presented here showed an extensive IRR, we anticipate that the treatment provided will result in retention of the involved molar.

Conclusion

We may conclude that, independent of the extension of a resorptive defect, a non-perforated IRR can successfully be treated provided a timely diagnosis is made and appropriate clinical treatment is rendered.

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