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Intractable treatment of inflammatory internal root resorption by fortifying with mineral trioxide aggregate and fibre post

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ABSTRACT

This article describes a case report where mineral trioxide aggregate (MTA) and fibre post were used for nonsurgical endodontic management of internal root resorption in a 53-year-old woman. Internal resorption is a relatively rare phenomenon leading to destruction of intraradicular dentine and dentinal tubules. Thorough cleaning and shaping of the root canal space and the resorptive defect was achieved by mechanical instrumentation, irrigation, and interim calcium hydroxide dressing. The root canal apical to resorptive defect was obturated with gutta percha, whereas resorptive defect was reinforced using MTA and fibre post. Follow-up intraoral periapical radiographs at 18 months showed adequate repair of the resorption and the tooth remained asymptomatic.

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1. Introduction

According to the Glossary of the American Association of Endodontists, resorption is defined as a condition associated with either a physiologic or a pathologic process resulting in loss of dentine, cementum or bone. Predisposing factors include trauma, chronic infections of pulp or periodontium and orthodontic forces.[1]

The ultimate goal of treatment is complete removal of the infective pulp and resorptive tissue from the root canal. If there is extensive loss of tooth structure, choosing apt restorative materials remain a challenge.

MTA is a competent material with its properties like sealing ability, strength, biocompatibility and tissue regeneration capability. These properties of MTA have been accredited to the production of hydroxyapatite when the calcium ions released by the MTA come into contact with tissue fluid.[2]

The present case report describes the 18-month follow-up of extensive internal inflammatory root resorption in a maxillary central incisor, where MTA and a fibre-glass post, were employed to restore function.

2. Case report

A 53-year-old female patient presented with a chief complaint of discoloration affecting maxillary central incisors. The medical history was non-contributory. Patient revealed history of trauma approximately 25 years earlier, involving a direct impact on maxillary anterior teeth.

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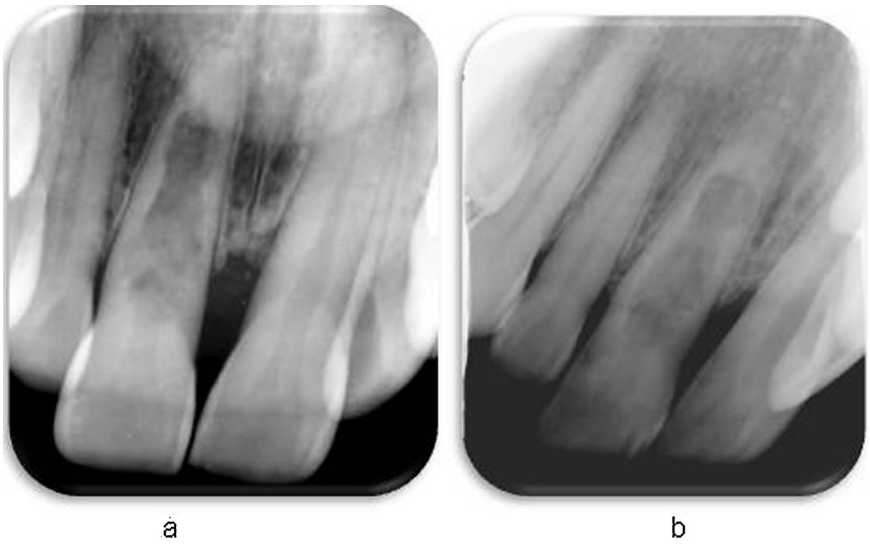


Fig. 1 – (a and b) Preoperative periapical angulation radiographs: extensive internal root resorption in maxillary right central incisor

No episode of pain was reported by the patient and on clinical examination, teeth number 11 and 21 showed discoloration. Thermal and electrical pulp testing with cold test (Endo-Frost, Roeko, Langenau, Germany), heated gutta-percha and electric pulp tester (Parkell, Edgewood, NY, USA), respectively, elicited a negative response.

A periapical radiograph revealed an apparent radiolucency in the middle and coronal third of the root canal which is ragged in outline in tooth number 11. Lesion appeared close to canal even if angulations of radiograph changes suggestive of extensive internal root resorption (Fig. 1a and b). The diagnosis was inflammatory non-perforating internal resorption in 11 and Ellis class IV fracture in 21.

The treatment plan was root canal treatment followed by reinforcing resorption area using MTA and fibre post in 11 and root canal treatment in 21. A full veneer crown was indicated as final postendodontic treatment plan.

Informed consent was obtained from the patient and access cavity preparation was done under rubber dam isolation. The canal was negotiated and as the resorption defect was in close proximity to external root canal wall, ultrasonic passive irrigation was done for gentle debridement. Working length was determined (Fig. 2) and biomechanical preparation was done using stainless steel K files to a master apical file size 35 (Dentsply Maillefer, Ballaigues, Switzerland) under 3% sodium hypochlorite irrigation. The canal was dried with paper points and calcium hydroxide was mixed with 2% chlorhexidine gluconate (Neelkanth Healthcare Pvt. Ltd, Safe Plus, Rajasthan, India) to form a paste and placed in the canal using a lentulo spiral to the working length. The access cavity was filled with a temporary restorative material, IRM (Dentsply, Caulk, USA).

In the next visit, calcium hydroxide dressing was flushed out using alternating irrigation with 5.25% NaOCl and 17% EDTA. The canal was irrigated with final rinse of 2% chlorhexidine gluconate and was dried using paper points. Platelet rich fibrin membrane was prepared using the procedure described by Dohan et al. The PRF membrane was cut into two halves and was introduced into the resorption defect and gently compacted using hand pluggers under an operating microscope (Carl Zeiss Inc, Oberkochen, Germany).

In the next visit, master cone was selected and sectional obturation was done using gutta-percha and AH-Plus sealer (Fig. 3). One gram of MTA powder (MTA-Angelus, Londrina, Brazil) and 0.33 g of distilled water were mixed, and the MTA slurry was introduced into internal portion of resorbed space. Then fibre post was inserted into the canal to preserve the original root canal space (Fig. 4) and temporarily restored.



Fig. 2 – Periapical radiograph showing working length determination.



Fig. 3 – Periapical radiograph showing sectional obturation.

Simultaneously tooth 21 was also root canal treated. At the fourth clinical session, successful hardening of the MTA was verified. The 'guide' fibre post was removed and again cemented using resin cement (Paracore, Coltene Whaledent) (Fig. 5). Finally, the coronal chamber was restored with nanohybrid composite Filtek Z 250XT (Universal restorative, A1 shade, 3M ESPE, St. Paul, MN, USA). An immediate postoperative radiograph was taken, confirming satisfactory filling of the root canal and resorptive defect. Clinical and radiographic follow-up was conducted for 18 months, demonstrating a functional tooth with no endodontic pathosis (Fig. 6).



Fig. 4 – Placement of MTA and guide fibre post in the resorptive area.



Fig. 5 – Immediate postoperative radiograph.



Fig. 6 – Eighteen-month postoperative radiograph.

3. Discussion

Treatment of internal resorption is a challenge when the resorptive area is extensive and perforating. It is frequently

seen as an oval shaped enlargement of the root canal space and is usually asymptomatic and detectable by radiographs.

Internal resorption is caused by activation of multinucleated giant cells adjacent to granulation tissue in the pulp, particularly when odontoblastic layer and predentin are lost or altered. Trauma has been regarded as a reason for loss of predentin layer in most cases.

Internal resorption of inflammatory type can be transient or progressive. Once initiated for internal resorption to progress, the dentinal tubules should have an unexpected course from necrotic tissue to an area of vital pulp tissue. This perhaps explains why it is reported as a rather rare occurrence as compared to external root resorption.[3]

Immediately after diagnosing, endodontic treatment should be initiated as removal of pulp tissue halts the resorptive process. The irregularities present in the root canal system, especially in internal root resorption defects, make it difficult to clean and fill the root canal. The removal of vital tissues from the resorption gaps is aided by irrigation with sodium hypochlorite and the use of calcium hydroxide paste. Because of its high pH, calcium hydroxide will neutralize the lactic acid released from macrophages and osteoclasts. It creates an environment which is unfavourable for collagenase cells and also arrests osteoclastic activity thereby stimulating repair.[4]

PRF placed at the internal resorption defect in this case might have acted as a healing enhancer. It is associated with slow and constant increase in cytokine levels. Leucocytes in PRF act as anti infectious agent and is crucial in immune regulation.

Various treatment modalities for management of internal resorption include root canal treatment, with three options i.e. complete root canal filling with gutta percha; combined gutta percha in the root canal and bioactive material for the resorptive defect; or complete filling with a bioactive material. In the present case, MTA and fibre posts were used in resorptive defect to reinforce the weakened tooth structure and guttapercha in apical root canal.

Maccari et al. advocated that fibre post enhances the fracture resistance of the tooth and strengthen compromised tooth by distributing functional forces through the tooth's long axis. According to Lui, when the weakened root is internally reinforced with fibre post having approximately the same modulus of elasticity as dentine, forces distribution in the root would be more even.[5]

MTA is a miracle material from the endodontic point of view. MTA sets in the presence of water, which results in the formation of a crystallized calcium silicate hydrate gel and calcium hydroxide. MTA releases calcium ions and promotes an alkaline pH in root canal.[2]

4. Conclusion

Mineral trioxide aggregate and a fibre-glass post were employed to restore a severely weakened, internally resorbed tooth, with satisfactory follow-up of 18 months.

However, use of CBCT might have resulted in an improved diagnosis and alternative materials such as calcium silicate cements offer new opportunities for the rehabilitation of resorbed teeth.

Conflict of interest

The authors have none to declare.

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