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Clinical Management of Trauma Induced Inflammatory External Root Resorption in Maxillary Central Incisor

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Abstract

Root resorption is a pathological condition which might be an endodontic challenge if not diagnosed and treated properly. The recent advances in the imaging technologies and material science have enabled the clinician to visualize the structural changes accurately and repair them with materials providing favourable seal ability.

This case report gives a brief review on external root resorption and management of a traumatized tooth which was diagnosed with external root resorption.

Keywords: External root resorption, perforating resorption, invasive cervical resorption, cone beam computed tomography (CBCT).

Introduction

Dental resorption is the loss of dental hard tissues as a result of clastic activities. It can be physiologic or pathologic. In primary dentition root resorption is a normal physiologic process regulated by cytokines and transcription factors associated with bone remodelling. In permanent teeth, resorption is a pathologic process associated with highly structured interaction amongst inflammatory cells, resorbing cells (osteoclasts, odontoclasts or dentinoclasts) and hard tissues, initiated by injury to the non-mineralized tissues covering the external surface of root (precementum) or the internal surface of the root canal (predentin) and if left untreated can lead to premature loss of affected tooth. [1]

According to American Association of Endodontics, root resorption is defined as "A condition associated with either a physiologic or a pathologic process resulting in the loss of dentin, cementum or bone".

Resorption can broadly be classified as External resorption and Internal resorption. Internal root resorption (IRR) is a rare occurrence resulting in dystrophy of the pulp that leads to destruction of the hard tissues, leading to morphological changes. Its prevalence ranges between 0.1 and 1.6%. Majority of the cases remain asymptomatic and are often incidentally detected in radiographs. Once detected, it should be treated as soon as possible to limit its progression.[2]

External root resorption could be surface, inflammatory, replacement, and cervical resorption. External root resorption is more common than internal resorption and is frequently confused radiographically as internal resorption.[3]

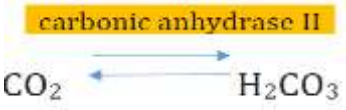
Management of resorption is often challenging in endodontics. Early diagnosis, removal of etiology and prompt treatment are mandatory for the successful treatment outcome.

Pathophysiology

Resorptive process is a bimodal process which involves 2 phases- dissolution of inorganic crystal structure and degradation of organic structure of collagen.

Dissolution of inorganic crystal structure

When the pH is less than 5 there will be rapid dissolution of hydroxyapatite crystals. There will be activation of polarized proton pump present along the ruffled border which provides steady source of H+ ions. Enzyme carbonic anhydrase II (CA II) catalyzes the conversion of CO2 and H2CO3 intracellularly to maintain an acidic environment. Acid phospatase also favours the resorptive process.



Degradation of organic structure of collagen (Mainly collagen type I&III):

Enzymes involved are collagenase, matrix metalloproteinase and cysteine proteinases. Collagenase and matrix metalloproteinase act at neutral pH and are found towards the resorbing bone surface whereas cysteine proteinases acts at acidic pH and are secreted directly by the osteoclasts into the clear zone via ruffled border.

Factors regulating tooth resorption

Systemic factors

Parathyroid hormone

1,25-dihyroxy vitamin D3

Calcitonin

Local factors

Noxious stimuli

Macrophage colony stimulating factor

Interleukin 1&6

TNF- alpha

Prostaglandin-PGE2

Bacteria & toxins

In endodontic practice, root resorption is one of the commonly encountered challenges. Early detection and accurate differential diagnosis are important factors that determine the successful clinical outcome of cases with resorption. This paper insight a case of external root resorption and its management and follow-up with satisfactory healing.

Case Report

A 19 year old male patient was reported to the Department of conservative dentistry and endodontics with a complaint of discoloured front tooth and forwardly placed upper front teeth. Patient had history of

trauma to the upper front tooth many years back and was asymptomatic. Patient noticed slight discolouration in the traumatized tooth recently. No associated pain or swelling was reported. On clinical examination, discoloured 21 was noted which was tender on percussion. There was no associated discharge or swelling .Vitality test (both EPT and thermal tests) gave negative response which revealed tooth to be non-vital. Cone beam computed tomography (CBCT) and radiovisuography (RVG) reports were analysed (Fig 1). Diagnosis was made as non vital tooth in relation to 21 with external root resorption and Endodontic therapy was planned in relation to 21.

An endodontic access cavity was established under rubber dam isolation and canal was located. Coronal enlargement was performed with a nickel-titanium (Ni-Ti) ProTaper (PT) series orifice shaper (Dentsply Maillefer, Ballaigues, Switzerland) to improve the straight-line access to canal. After working length determination (Fig 2), Cleaning and shaping were performed using Pro Taper Ni-Ti rotary instruments with a crown-down technique. Biomechanical preparation was done till F4 finishing file ProTaper (PT) series. Irrigation was performed using normal saline, 2.5% sodium hypochlorite solution, and 17% EDTA; 2% chlorhexidine di-gluconate was used as the final irrigant. An intra-canal dressing with calcium hydroxide paste (Calcicur; VOCO, Cuxhaven, Germany) was placed into the root canals using a Lentulo Spiral (Dentsply Maillefer). The access cavity was sealed temporarily with a cotton pellet and Cavit (3M ESPE AG, Seefeld, Germany).

The patient was recalled after 2 weeks for review (Fig 3). The intracanal dressing was changed, canal was irrigated and metapex dressing was given (Metapex plus calcium hydroxide temporary filling material; METABIOMED). The case was followed up every month for a period of 6 months(Fig 5). Follow up radiographs were taken on each visit. Positive signs of healing were noted in the external root surface in the follow up radiographs. At the 6th month of follow up, obturation was done using F4 gutta percha points(Dia-Pro T) and 2% accessory cones using cold lateral compaction of gutta-percha (Fig 6) and AH Plus resin sealer (Maillefer Dentsply, Konstanz, Germany). The tooth was then restored with capsulated GIC GC Fuji IX GP (GC Corp, Tokyo, Japan).The patient was advised a full-coverage porcelain crown later and was asymptomatic during the follow up period of 12 months (Fig 7).

Figure 1: Pre-op RVG-21

Figure 2: Working length

Figure 3: Review after 2 weeks

Figure 4: Review after 3 months -Metapex placed

Figure 5: Review after 6 months

Figure 6: Post obturation

Figure 7: Review after 1 year

Discussion

In endodontic practice, root resorption is one of the commonly encountered challenges. Early detection and accurate differential diagnosis are important factors that determine the successful clinical outcome of cases with resorption.

It is important for the diagnostician to differentiate internal resorption from external tooth resorption. Radiographs and knowledge of internal root anatomy help a lot in these matters. With the development of technology and CBCT as diagnostic aids the accurate diagnosis and predictable treatment and prognosis.[4]

If the tooth is restorable and has a reasonable prognosis, root canal is the treatment of choice. The aim of root canal treatment is to remove all vital and necrotic tissue, to ensure that the resorbing cells are lysed and to disinfect and obturate the root canal system.

The complexities of the root canal system and inaccessibility of the defect offer technical difficulties for thorough disinfection of the root canal, thus a chemo-mechanical approach along with an intracanal antibacterial medicament is advocated in such cases to render the canal bacteria free.[5]

In cases with perforating defects, the resorptive cavity is sealed with calcium silicate-based materials that form a hard tissue barrier against which the obturating material is condensed. In some cases where the defect is inaccessible a surgical approach is recommended and where there is extensive defect, extraction may be indicated.[3]

From a differential diagnosis perspective, the advent of cone beam computed tomography has considerably enhanced the clinician's capability of diagnosing internal root resorption from external root reorption. Nevertheless, root canal treatment remains the treatment of choice for this pathologic condition to date.

Conclusion

CBCT may be of great help in diagnosis and treatment planning of inflammatory root resorption. Thorough chemo-mechanical debridement of the root canal system

and use of biocompatible materials can significantly improve the healing outcomes in cases of infection related inflammatory external root resorption.

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