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Tackling Odontoclastic Activity in the Root Canal of a Molar Tooth: A Case Report

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Abstract:-

- ***Background:***

Internal root resorption is associated with progressive destruction of intraradicular dentin due to the activation of clastic cells. The treatment requires elimination of the causative factors and repair of the resorptive defect with biocompatible materials. Calcium hydroxide intracanal medicament, sodium hypochlorite irrigation and MTA are effective adjuvants in managing root resorptive defects. Endodontic management of resorption requires specific modifications in cleaning, shaping and obturation techniques.

- ***Case Description:***

This case report describes the management of an internal root resorption in the distal root canal of 46. Pulpectomy and chemomechanical preparation was done to prevent progression of lesion. 3% sodium hypochlorite irrigant was used to disinfect the root canal and resorptive defect and calcium hydroxide was placed as intracanal medicament. Obturation of the root canal was done with gutta percha by cold lateral condensation method. The lesion was repaired with MTA .

- ***Conclusion:***

Early diagnosis of the condition, proper disinfection of the resorption defect and root canal space along with adopting a proper obturation technique are the key factors in the successful management. The use of a biomimetic material like MTA to fill the defect shall elicit a positive biological response. The long term outcome cannot be predicted in the case of resorptive defects. But endodntic treatment will help to slow down the progression of resorption and repair the defect. Hence the patient can retain the tooth for esthetics, to maintain space by his natural dentition and for mastication.

Keywords:- *Internal Root Resorption, MTA, OPG/RANKL/RANK Transcription Factor, Clastic Cells.*

I. INTRODUCTION

Resorption is defined as the condition characterized by either a physiologic or pathologic process that will cause loss of dentin, cementum or bone. Root resorption is characterized by the loss of cementum and dentine due to osteoclastic cell activity [1]. Root resorption may occur as a consequence of damage to the root surface resulting in release of chemical mediators. It can also be stimulated by bacterial presence. Internal resorption occurance is more in anterior teeth and also rarely in molars. Root resorption that occurs prematurely in the deciduous teeth as part of the eruption process is a normal physiologic process. But root resorption in the permanent dentition is undesirable.

There are certain unmineralized surfaces in tooth that can prevent root resorption. These areas are the outermost precementum and innermost predentin surfaces[1]. Any damage to the unmineralized precementum and predentin causes exposure of mineralized cementum and dentin[2]. Osteoclasts will colonize on the exposed surface and will initiate resorption. The OPG/RANKL/RANK transcription factor system plays a key role in the differentiation of clastic cells from their precursors. It occurs by complex cellular interactions with osteoblastic stromal cells[3]. The human dental pulp has been shown to express osteoprotegerin (OPG) and receptor activator of NF-κb ligand (RANKL) messenger ribonucleic acids (mRNAs) [4]. Osteoprotegerin is a member of the tumor necrosis factor superfamily and can inhibit clastic functions. OPG will act as a decoy receptor and binds to RANKL and reduces its affinity for RANK receptors on the surface of clastic precursor cells. This results in inhibition of the regulation of clastic cell differentiation. Thus the OPG/RANKL/ RANK system may be actively involved in the differentiation of odontoclasts during root resorption. The key cells involved in tooth resorption are odontoclasts. Odontoclasts are multinucleated cells that produce resorption lacunae. They are are morphologically analogous to osteoclasts and have similar enzymatic properties and resorption patterns. The cell membrane of the odontoclast adjacent to the tissue surface has a series of finger-like projections called as the ruffled border. A microenvironment is created between the ruffled border of the odontoclast and the hard tissue in which resorption takes place. The resorption process will continue in the presence of stimulating factors like infection or pressure[5-7] . Internal root resorption and external inflammatory root resorption are stimulated by intrapulpal infection[5] . Endodontic therapy reduces intrapulpal bacterial load and arrest resorption process. Relief of pressure on the affected tooth also controls resorption [8].

According to Andreasen, tooth resorption can be Internal or External[7]. External resorption is always associated with bony resorption. Internal root resorption is characterized by progressive destruction of the dentin around the root canal space. It can occur due to traumatic injury, orthodontic treatment and infection. When the predentin of the canal wall is damaged, the underlying mineralized dentin layer will be exposed to odontoclasts.

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Odontoclasts will get attached to the mineralized dentin surface and brings about the resorption process. Endodontic treatment that effectively removes the blood supply to the resorbing cells is the treatment approach. Pericanalar Resorption Resistant Sheet (PRRS) is a resistant area that surrounds the pulp tissue with vital pulps. PRRS helps the pulp to retain its vitality by hindering the invasive actions of clastic cells. It has been reported that the existence of highly resistant PRRS is either linked to the vital pulp tissue or to the mineralization gradient distributed within this layer[9-10]. Lesions of less than 0.3 mm of depth and 0.6 mm of diameter could not be detected in conventional radiography [11]. It is difficult to detect the lesion if it is confined to the buccal, palatal, or lingual surfaces of the root. Only CBCT could accurately assess the position of the defects on the root surface and their relationship to the root canal.

Successful treatment requires early diagnosis, removal of cause and replacement of resorbed root structure. MTA is the most commonly used biomaterial to replace resorbed root structure. This case report discusses about the treatment of internal root resorption in a molar tooth. The defect was treated by conventional non surgical endodontic therapy with calcium hydroxide dressing, gutta percha obturation and Mineral trioxide aggregate (MTA) to restore the defect in the root.

II. CASE DESCRIPTION

A sixty six year old male reported the OP department with the complaint of severe, continuous pain in the right lower back tooth for the past 3 days. Pain aggravated on having hot and cold water, on chewing and in the night time. The patient had no relevant medical history. On clinical examination, 46 showed tenderness for both vertical and horizontal percussion. There was generalized attrition of all the teeth. A crack line was visible on the distal marginal ridge in a mesio-distal direction extending towards the center of 46.

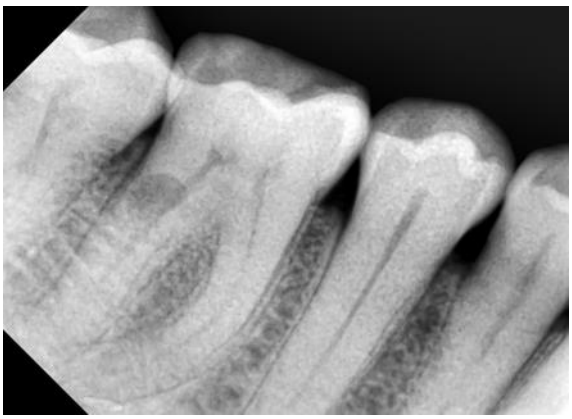

Fig 1: Pre-operative radiograph of 46 showing internal resorptive defect in the distal root canal

Electric Pulp Testing showed delayed response in 46 as compared to 36. Periapical radiograph showed radicular radiolucency in the coronal one third of distal root of 46 indicating the presence of resorption. This was a case of symptomatic apical periodontitis with internal resorption. Endodontic therapy was started and during removal of coronal pulp there was no bleeding while removal of radicular pulp caused little bleeding. The mesial root was long with a working length of 25mm and distal root had working length of 21mm. Chemomechanical preparation was done with hand instruments under profuse irrigation with 3% sodium hypochlorite. A close dressing was given with calcium hydroxide as intracanal medication. The patient was recalled after 2 weeks and the tooth was asymptomatic. The root canal was obturated with gutta percha by cold lateral condensation. Gutta percha was removed from distal root one mm below the resorptive lesion and the apical gutta percha was condensed with a hand plugger. The fragments of the gutta percha was removed from the resorptive defect using a K file with the tip of the instrument modified to a loop. MTA was mixed and carried to the defect and it was condensed with a small ball burnisher to completely fill the resorptive area. The remaining part of the distal root canal was filled with Glass Ionomer cement upto the orifice. Post - endodontic restoration with composite resin was given above the GIC base. Review was done after six months to evaluate the prognosis of the tooth.

Fig 2:- Ball burnisher and modified k file for cleaning the defect and root canal

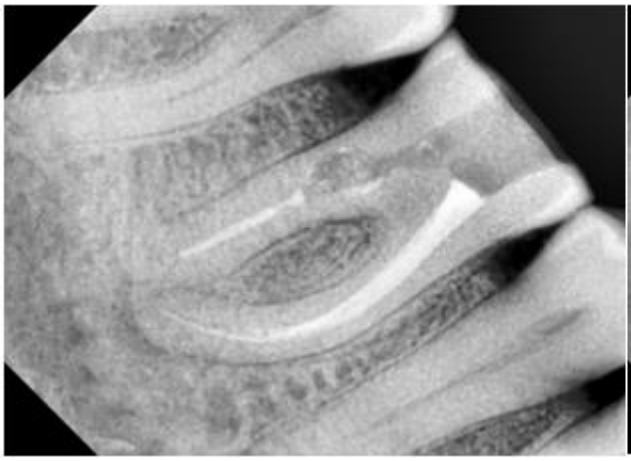

Fig 3:- After removal of gutta percha from lesion

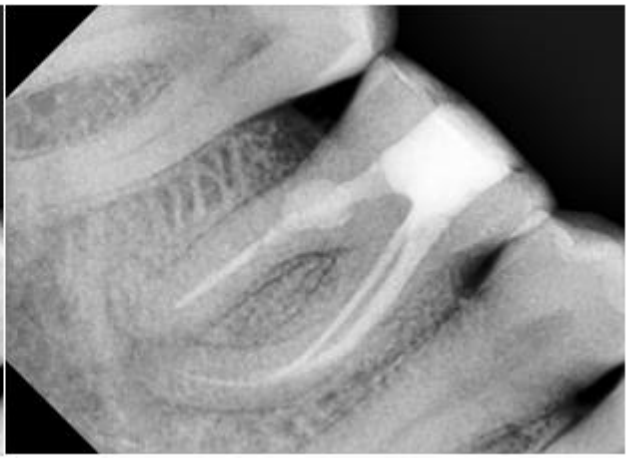

Fig 4:MTA placed in the resorptive defect

Fig 5:- Review after 6 months

III. DISCUSSION

Internal root resorption is the form of root resorption that originates in and affects the root canal walls. Internal root resorption is a rarely occurring defect as compared to external root resorption. First case of internal resorption was reported in 1830 by Bell[12]. It occurs due to damage of the outermost odontoblastic layer and predentin of canal wall. There have multifactorial etiology that include trauma, caries, restorative procedures and periodontal inflammation leading to chronic pulptitis, anachoresis, orthodontic treatment, cracked tooth or idiopathic dystrophic changes. The most common cause is chronic pulpal inflammation or after dental trauma. The lesion needs blood supply from the apical vital tissue for its progression[12]. The intracanal tissues coronal to the resorptive defect requires constant oxygenation to sustain its activity. As the demand is not met during the progress of the lesion the tissue will become infected and necrotic . Progression of internal resorption also depends on bacterial stimulation of clastic cells, which are recruited through blood vessel[12]. The defect is usually diagnosed by radiographs. In parallax radiograph technique the internal resorption defect will stay in the same position while

external resorption defect will move mesially or distally on different horizontally angulated X-rays. The tooth will appears to be discolored and will give negative response to sensitivity testing in advanced defects.

Management of resorptive defects is challenging. If left untreated pulpal tissue undergoes necrosis resulting in apical periodontitis. The tooth under treatment was tender on percussion with partial necrosis of the pulp. The treatment of internal resorption is by severing the blood supply to the resorbing precursor cells which is achieved by routine endodontic therapy. Hence the prognosis is predictable. Effective chemomechanical preparation is an essential requirement in root canal disinfection, even though it is difficult to achieve[13]. This needs elimination of intraradicular bacteria and pulpal tissue, disinfection of canal and sealing of the resorptive defect. Calcium hydroxide intracanal medicament helps eradication of persisting bacteria and potentiates the effect of sodium hypochlorite (NaOCl). Andreasen recommended non surgical therapy combined with calcium hydroxide dressing for managing internal root resorption[14]. MTA is a biocompatible material with superior sealing properties, biocompatibility and fibroblastic stimulation. MTA is used to restore the resorptive defect that can strengthen the remaining root structure. GIC seal in the orifice of distal root canal will provide a fluid tight seal due to its chemical bonding with tooth structure.

IV. CONCLUSION

Successful management of resorptive lesion requires early diagnosis. Timely intervention is important to arrest the resorptive process. After diagnosis of the resorptive defect, the causative factors has to be eliminated immediately and endodontic therapy has to be initiated to severe the nutrient supply to clastic cells. Calcium hydroxide intracanal medicament and sodium hypochlorite irrigation are effective adjuvants for eliminating bacteria and pulpal remnants from inaccessible regions in the lesion. The obturation of root canal needs special attention and filling the defect with a solid material may reinforce the tooth.

V. CLINICAL SIGNIFICANCE

Tooth resorption is a condition in which the structural integrity of the tooth is compromised. Early diagnosis and timely initiation of the treatment is crucial to arrest the progression of the lesion. Because of the abnormality in the root canal pattern, effective disinfection and well condensed obturation is a challenge. Post- operative follow-up is vital for evaluating the prognosis of the tooth.

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