

Management of a Combination of Inflammatory Internal and External Resorption: Tooth Salvage.

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Citation of this Article: Dr. Bhavya Shetty, Dr.Disha Damodaran, Dr. Shruti Bhandary, Dr. Parimala Kumar, “Management of a Combination of Inflammatory Internal and External Resorption: Tooth Salvage”, IJDSIR- January - 2020, Vol. – 3, Issue -1, P. No. 85 – 93.

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Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

AIM: The aim of this case report is on the treatment of an extensive inflammatory internal and external resorption with combined use of Biodentin, bone graft (Bio-oss), Platelet rich fibrin and Amniotic membrane.

Case Description: A 38 year old male patient reported with discoloured tooth in the upper left anterior teeth region and was asymptomatic with a history of trauma twelve years back. IOPA in relation to 11 revealed radiolucency in the distal aspect of root (middle third region) and angular bone loss.

The CBCT was taken in order to estimate the extent of the defect which confirmed an extensive inflammatory combined internal and external resorption and including vertical bone defect of about 5mm.

Treatment: Multidisciplinary approach was planned in which the initiation of Root Canal Treatment with access cavity preparation, Biomechanical preparation and placement of intracanal medicament (Calcium hydroxide) was done. Surgical intervention with flap surgery was done. On flap elevation the diagnosis of extensive combined inflammatory internal and external resorption was clinically confirmed. Thus, the resorption site was treated with a combination of biodentin, bonegraft (Bio-Oss), injectable PRF and amniotic membrane. Later followed by completion of root canal treatment.

Conclusion: A 6 month follow up demonstrated clinically asymptomatic and adequately functional tooth, with radiographic signs of bone fill.

Clinical Significance: The use of Biodentin in conjunction with PRF, bonegraft and amniotic membrane

has accelerated the healing of the defect and induced rapid rate of bone formation.

Keywords: Internal resorption, External root resorption, Biodentin, PRF, Bio-Oss, Amniotic membrane.

Introduction

Resorption occurs when there is a loss of hard dental tissues occurring as a result of odontoclastic action.¹ It is defined as a condition which is associated with either physiologic or pathological process ultimately resulting in loss of dentin, cementum or bone.² Root resorption can be pathological or physiological. When it occurs in deciduous teeth it is a normal physiologic process. When resorption occurs in permanent teeth it is considered pathological.^{3,4} Pathologic resorption ultimately results in permanent loss of the affected tooth.⁵ The cell which causes resorption are called as odontoclast but since there is no biological difference between cells resorbing bone and dentine it can also be termed as osteoclasts.¹

Based on the location on root surface, root resorption can be classified as internal or external resorption. Internal root resorption can be mainly of two types inflammatory and replacement resorption. Whereas external resorption is further classified as external surface resorption, external inflammatory resorption, external replacement resorption, external cervical resorption and transient apical breakdown.^{2,6}

The occurrence of root resorption is prevented by unmineralized outermost precementum and innermost predentin layer. Whenever the mineralized cementum or dentin is exposed due to damage to precementum⁷ or predentine or odontoblast layer⁸ it results in root resorption.

External resorption may be mainly caused by local factors, but Becks et al reported that systemic disturbances, the chief among these being hypoparathyroidism may predispose to root resorption.⁹ local factors leading to

such resorptions include periapical inflammation, reimplantation of tooth, tumours and cysts, excessive mechanical or occlusal forces, teeth impaction,⁹ periodontal disease, and tooth bleaching. Other systematic factors found contributing to external resorption are Turner's syndrome, Gaucher's disease, and Paget's disease.¹⁰

The etiology of internal resorption in most cases is a result of inflammatory hyperplasia of pulp or trauma. The radiographic evaluation is the key for revelation of pulpal disease when patient appears for routine dental checkup,⁹ it exhibits as a round to ovoid area, well delineated, appears as ballooning out of pulp canal space.^{11, 12} The radiolucency is not associated with external tooth surface unless the condition is of such duration that leads to perforation. Complete perforation can occur if tooth is left untreated.⁹

Most of the time patient remains asymptomatic and such resorptive defects are detected on a routine dental checkup when radiographs are taken as a diagnostic aid. Radiographic diagnosis is of extreme importance in confirmed and definitive diagnosis.^{13,14}

The patient's history plays an important role in ruling out the cause for resorption as the patient remains asymptomatic and tooth resorption may be unnoticed clinically. The vitality of tissue determines the rate of resorption, resorption continues as the vitality of the tissue is maintained and may resorb the tooth root to reach the PDL.¹⁵

Internal resorption if detected radiographically and if it has not progressed into a large defect, the best treatment option is endodontic treatment.¹⁶ In case of external resorption treatment of etiology can be a turning point, in treatment of resorption. The treatment plan depends on the type of resorption as both involve different pathogenesis. Non-surgical and surgical therapy is the treatment options.

Andreasen recommended the use of intracanal medicament (Calcium hydroxide) in non-surgical root canal therapy because of its property of destroying bacteria.¹⁷ MTA, Biodentin, Calcium enriched materials are used as root repair materials, perforation sealing etc which aids in regeneration.¹⁸ Biodentin being the recently available one in the market with many favorable features one among them is that blood contamination has no effect on the push-out bond strength irrespective of the duration of the setting time.¹⁸ Demineralized freeze dried bone matrix (Bio-Oss) having both osteoinductive and osteoconductive property has resulted in periodontal regeneration. Platelet rich fibrin (PRF) has more suitable fibrin network for storage of cytokines and are rich in growth factors thus helping in cell migration.¹⁹

The aim of this case report is on the treatment of an extensive inflammatory combined internal and external resorption with use of Biodentin, bone graft (Bio-Oss), Platelet rich fibrin and amniotic membrane.

Case Report

A 31 year old male patient reported to the department of Conservative Dentistry and Endodontics with a chief complaint of discoloured tooth in the upper front teeth region since 1 year. Patient gave history of trauma 12 years back and was asymptomatic.

On clinical examination 11 was discoloured, non-tender on percussion, no mobility present, probing depth was within the normal range, no sinus opening or swelling was present. (Figure 1).



Figure: 1

Electric Pulp Testing was done irt 11 and showed no response (non-vital tooth)

IOPA in relation to 11 revealed radiolucency on the distal aspect of 11 (middle third portion of the root) extending to the interdental bone with periapical radiolucency and slight PDL widening. (Figure 2)



Figure : 2

CBCT revealed the measurement of 4.3 mm resorption extending from root to bone irt distal aspect of 11. (Figure 3).

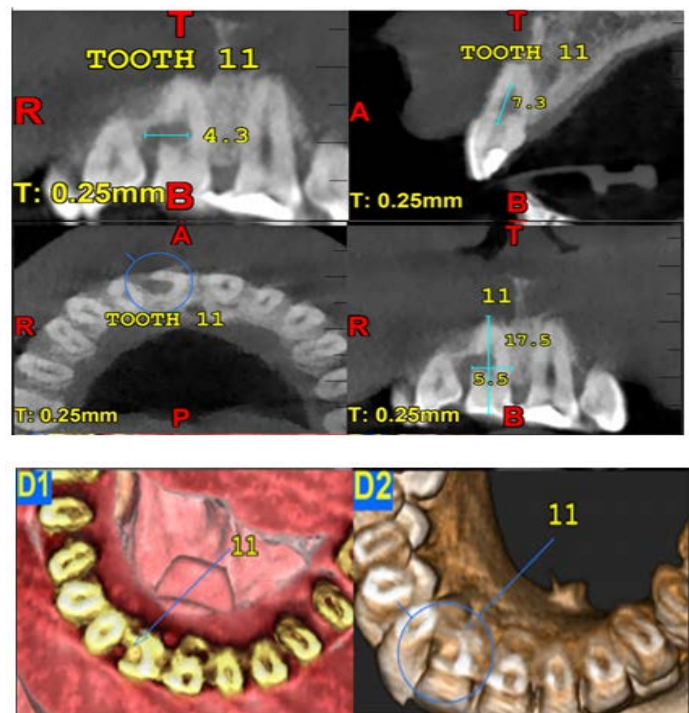


Figure: 3

After analyzing the case history, clinical examination and radiograph, treatment with initiation of Root canal therapy along with periodontal flap surgery was planned.

The patient was explained in detail about surgical treatment planning and regenerative modalities to be used and informed consent was taken. Before the surgical procedure patients platelet count, hemoglobin, bleeding time and clotting time were assessed and found to be within the normal range.

In the first appointment, using rubber dam isolation access cavity was prepared in relation to 11 from the palatal side using endoaccess bur. Thus a straight line access to the apical portion was achieved. The working length was determined with the help of apex locator and radiograph (21.05mm). During the instrumentation 1.5 % of dilute Sodium hypochlorite (NaOCl) and normal saline irrigation was done in a manual method .

The biomechanical preparation was done with K35 file and canal enlargement till F1. Brisk bleeding was seen from the canal during the cleaning and shaping. The prepared canal was completely dried with absorbent paper points and intracanal medicament (Calcium hydroxide) was filled within the canal to achieve proper disinfection. Access cavity was sealed completely with Cavit -G and patient was recalled after 2 weeks.

In the 2nd appointment tooth was symptomatic and it was tender on percussion. CaOH was removed with manual irrigation and again the medicament was placed in the canal.

During the third visit after a week later, patient was asymptomatic, CaOH was removed and gutta-percha (F 1 cones) was placed in the canal without sealant (in order to block the canal (Figure 4)) and meanwhile the patient was referred to department of Periodontics for surgical intervention.



Figure: 4

Oral prophylaxis was done. Under local anesthesia (2% Lidocaine) sulcular incision was given in relation to 11, 12, 13 and a full thickness mucoperiosteal flap (Kirklands Flap) was elevated . Upon flap reflection root resorption defect along with vertical bone defect was noted. Granulation tissue was present. Apical extent of the root resorption defect was not visible hence minimal amount of bone was removed using micromotor bur under copious irrigation. Degranulation of the defects was done using both Graceys curette and spoon excavator(Figure 5).

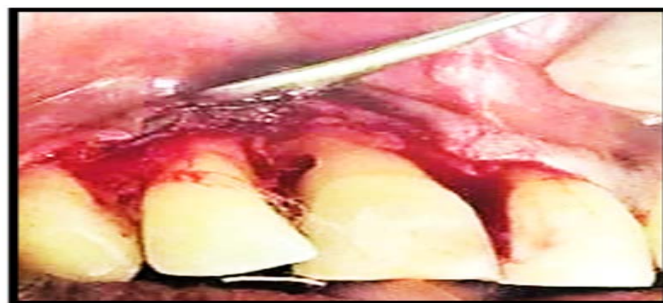


Figure: 5

Once complete homeostasis was achieved Biodentin (Gilles and Olivier in corporation with Septodont's, France) was used to seal the root resorption and was condensed thoroughly using a sterile condenser(Figure 6).

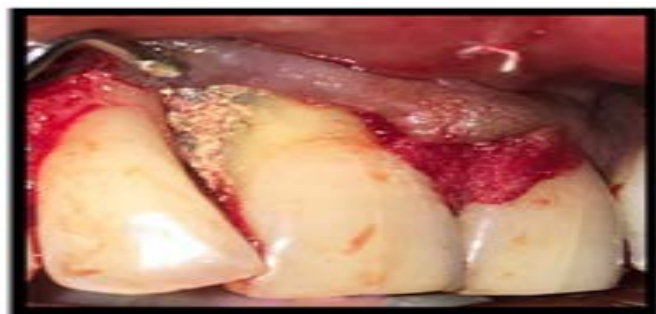


Figure: 6

Injectable PRF(i-PRF) was prepared drawing 10 ml of venous blood from the right antecubital fossa of the patient. It was centrifuged at 700rpm for 3min. i- PRF obtained was drawn in a syringe. Bone graft (Biooss) was taken in a metal bowl and i-PRF was slowly added to it and was closed for 10min for polymerization. 10 minutes later sticky bone was obtained. (Figure 7).



Figure: 7

The sticky bone was placed and condensed in the vertical bone defect, Irradiated Freeze Dried Amniotic membrane was placed over the sticky bone. Periodontal flap was positioned back and sutured (3-0, Silk Suture) using simple interrupted suturing technique. Periodontal pack (Coe-Pack) was placed (Figure 8).

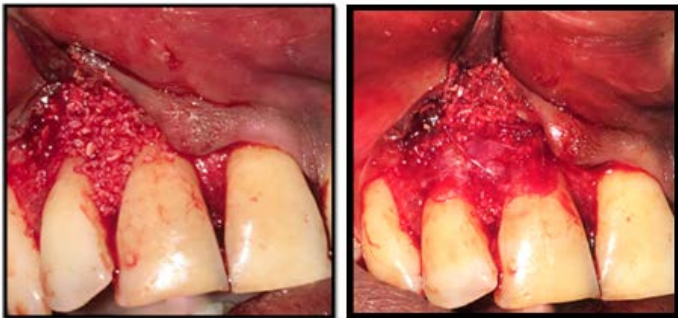


Figure: 8

Antibiotics (Cap Amoxicillin 500mg tid for 5 days) and analgesics (Tab Ibuprofen bd for 3 days) were prescribed postoperatively and 0.2% chlorhexidine gluconate solution (10 ml bd for 14 days) was prescribed as a mouthrinse. Patient was instructed to use the mouth rinse after 48hrs of the treatment.

Immediate post-operative IOPA was taken in order to confirm the complete sealing of the root resorption defect.

Periodontal pack and suture removal was done 1 week later, healing was uneventful (Figure 9).



Figure: 9

After two weeks patient was recalled, he was asymptomatic, healing was satisfactory, hence final obturation (using AH Plus sealer and lateral condensation technique) followed by permanent access restoration (Composite) was done. (Figure 10).

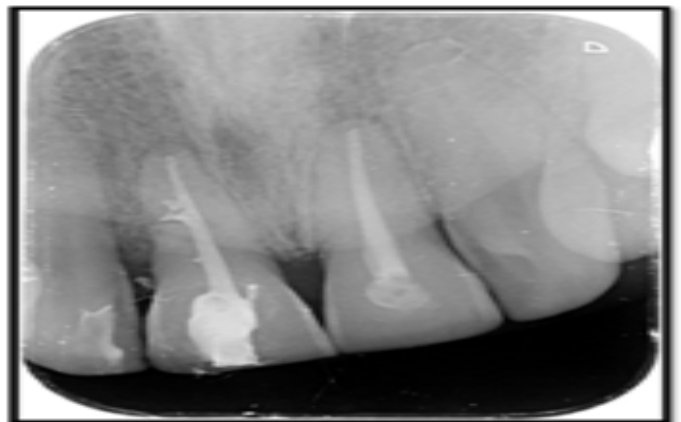


Figure: 10

Patient was kept on regular follow-up for 1st month, 3rd month and 6 month and healing was evaluated accordingly (Figure 11).



Figure: 11

Final assessment with CBCT was done after 6 months, and complete bone fill was seen in the vertical bone defect. (Figure 12) along with the root resorption surface without any communication between the root surface and the periodontal space.

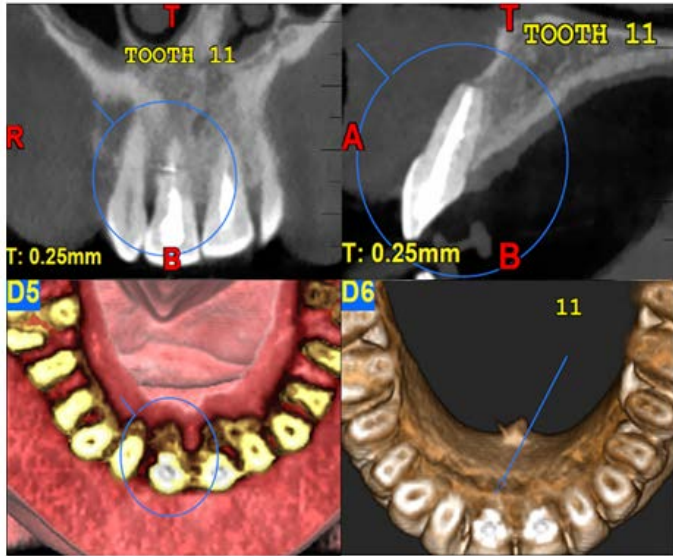


Figure 12

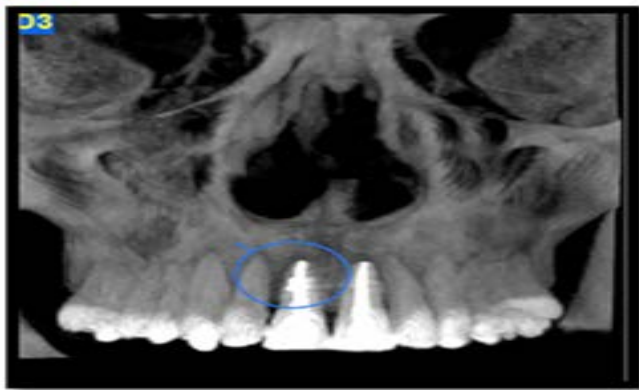


Figure 13

Discussion

Root resorption may be pathological process which can either be internal or external.⁵ Key factors in the successful treatment of root resorption are thorough cleaning of the resorptive lacuna and sealing of the defect with an appropriate biocompatible material.²⁰

When Root Resorption perforates root structure and forms a communication between the root canal space and the PDL, achieving the aforementioned goals of cleaning and

sealing off the defect becomes more difficult and is sometimes impossible.²⁰

Characteristic feature that gives an indication about the center of origin of resorption is the location of the spot. In inflammatory internal root resorption its seen typically in the middle of tooth in the mesiodistal direction (except in multirooted teeth) whereas in cervical resorption it is located either mesially, centrally or distally. Progressive resorption can lead result in extensive unrestorable tissue loss. At times an external resorption can develop between the root canal and periodontal ligament due to perforation of the tooth.²¹

Early diagnosis or detection of the resorption is essential in order to plan the proper treatment modalities and wise decision to choose the materials available for the best prognosis of the case.

Here in the present case the patient did not undergo any dental checkup after having trauma to the particular tooth until he reported to the department complaining of discoloured tooth. Due to the absence of early detection and intervention for a long period the internal resorption led to a perforating external resorption along with alveolar bone resorption. Hence, the management of such large defect was started immediately in order to cease the osteoclastic activity for further progression.

The endodontic treatment involved through chemomechanical preparation with gentle instrumentation, controlling the bleeding and placement of intracanal medicament to achieve proper disinfection in the canal. The most suitable concentration of NaOCl for endodontic irrigation may be 0.5 or 1% with the pH close to neutral, obtaining an optimal antimicrobial effect with minimal tissue irritating injury.²²

CAOH exerts an antimicrobial effect in root canal system as long as high pH is maintained. They attributed this to the fact that calcium hydroxide could be packed into root

canal allowing hydroxyl ions to be released over time. Shuping et al showed that placement of calcium hydroxide for at least one week rendered 92.5% of the canals bacteria free.²³

Treatment alternatives are case-dependent and depends on the etiology of resorption. The basic aim of treating is the complete removal of resorptive tissue and the restoration of the defect area.²⁴

The basic treatment modalities in external root resorption are flap reflection, complete removal of resorptive tissue, restoration of the cavity by appropriate restorative material like glass-ionomer cement, composite resin , calcium silicate-based cements such as mineral trioxide aggregate (MTA) ,Biodentine (Septodont, Saint-Maur-des-Fosses, France) , and calcium-enriched mixture (CEM) cement . Once the cavity is restored, the mucoperiosteal flap is replaced and secured in position .²¹

Biodentine is a new tricalcium silicate (Ca_3SiO_5) based inorganic restorative cement. Hydraulic calcium silicate cements are bioactive materials showing a dynamic interaction with dentin and pulp tissue interface and they can stimulate pulpal cell recruitment and differentiation. They also, up-regulate transformation factors and promote dentinogenesis.²²

Its property to release calcium ion and enhancing the alkaline environment makes Biodentine more conducive for osteoblastic activity.²² Biocompatibility and ability to induce calcium phosphate precipitation at the interphase to the periodontal tissue, calcium silicate cements play a major role in bone tissue repair.

Due to addition of setting accelerators which is Calcium chloride it results not only in fast setting of 9-12 min but also improves the handling properties and strength .According to Kokate and Pawar, that biodentin exhibited the least microleakage compared to MTA and GIC .²⁵Han and Okjii carried out a study and concluded that the

uptake of calcium and silicone ions by biodentin is more prominent than MTA.²⁴

PRF plays an important mechanical role in maintaining and serving the grafted materials. The fibrin network at the regenerative site facilitates cellular migration, vascularization, and survival of the graft. According to Simon pieri et al, use of PRF and bonegraft offers four advantages: The fibrin clot serves as a biological connector between the bone particles and enhances its stability. Secondly it facilitates cell migration, neoangiogenesis, vascularization and helps in the survival of the grafts. Third as the fibrin network are resorbed, the growth factors are released gradually and aids in the healing process.Finally,The leukocytes and cytokines present in the fibrin network helps in the self-regulation of inflammatory and infectious phenomena within the grafted material.²⁵

According to Inchingolo et al, the use of PRF and Bio-Oss proved significant increase in the bone density.²⁶

In the present study, periodontal condition was stable and bone regeneration was evident at the grafted site.

Amniotic membrane, a resorbable membrane, maintains the structural and anatomical configuration of regenerated tissues. It is a rich source of stem cells and also enhances gingival wound healing .Therefore, amniotic membrane is choice of material these days in augmenting various periodontal procedures. It has epithelisation, anti-inflammatory, antiscarring, angiogenesis, anti-viral, anti-microbial and immunomodulatory effect.²⁷

In the present case report it was observed that at 6 months follow up after the surgical treatment of the defect using biodentin, PRF, bonegraft, amniotic membrane resulted in significant progressive and predictable clinical and radiographic bone regeneration.

However, like other clinical studies, this case report also has few limitations like short follow up period of 6 months

and lack of histological evaluation to confirm regeneration.

Conclusion

Early diagnosis, correct case selection, an appropriate restorative/regenerative material and proper treatment plan are essential key factors for long-term retention of the tooth with root resorption and bony defect.

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