

# Management Of Communicating Internal-External Inflammatory Root Resorption Conditioned By Orthodontic Treatment

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## Abstract :

Root resorption has been the subject of numerous studies and is recognised as a significant sequela observed after common dental trauma. One of the primary predisposing factors for root resorption is orthodontic treatment. The mechanical forces applied to teeth during orthodontics can lead to inflammation and subsequent resorptive processes. Careful monitoring and controlled force application during treatment are essential to minimise the risk. Early diagnosis through radiographs and clinical examination is crucial for effective management of root resorption. Cone Beam Computed Tomography (CBCT) offers a three-dimensional evaluation of these defects, enhancing diagnostic accuracy. Advances in dental materials, such as Biodentine and Guided Tissue Regeneration (GTR) membranes, have improved the survival rate of teeth affected by orthodontically induced root resorption.

**Keywords:** root resorption , external root resorption ,internal root resorption ,orthodontic ,biodentine ,GTR membrane

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## I. Introduction

Root resorption is a significant consequence observed following dental trauma, with implications for long-term dental health. Initially described by Bates in 1856, the term "root resorption" gained recognition in orthodontic literature by 1914. In orthodontics, the term "orthodontically induced inflammatory root resorption" is employed to differentiate this phenomenon from other causes in permanent teeth. The forces applied during orthodontic treatment, essential for tooth movement, provoke an inflammatory response and serve as the primary factor in root resorption.

Root resorption typically commences with damage to the precementum , predentine, or odontoblastic layer, and if dentine is resorbed, irreversible loss of tooth structure may occur. To mitigate the severity of tooth resorption, an optimal force ranging from 20 to 150g is recommended for tooth movement. Excessive force application, particularly in adults with thicker cementum layers, can result in periodontal schema, necessitating the use of intermittent rather than continuous force to prevent serious root resorption.

Certain teeth, such as maxillary central and lateral incisors, are more susceptible to orthodontically induced root resorption. Therefore, diligent follow-up through radiographic and clinical examinations of traumatised teeth is crucial for early defect detection. Cone beam computed tomography (CBCT) facilitates three-dimensional defect analysis, aiding in the assessment of communication between external root resorption and the root canal.

The emergence of novel restorative materials like Biodentine provides encouragement for clinicians to pursue endodontic treatment to restore such defects effectively. A comprehensive approach, incorporating advanced imaging techniques and a multidisciplinary team, is essential for managing complex cases of root resorption and preserving long-term dental health.

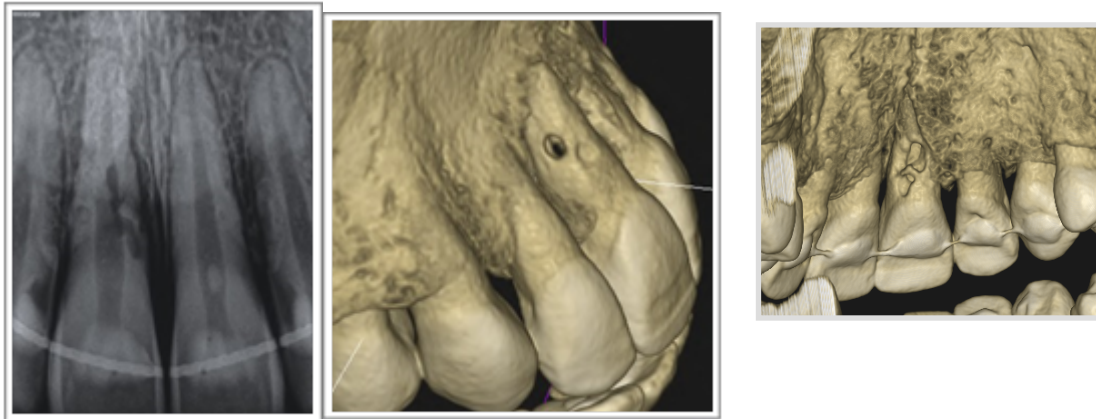
## II. Case Report:

A 24-year-old male patient reported to the Department of Conservative Dentistry and Endodontics at Rishiraj College of Dental Sciences in Bhopal, Madhya Pradesh, with the chief complaint of pain in tooth #11 (maxillary right central incisor) accompanied by pus discharge. The patient had a history of dental trauma prior to starting his orthodontic treatment. Clinical examination revealed that tooth #11 was discolored and had a

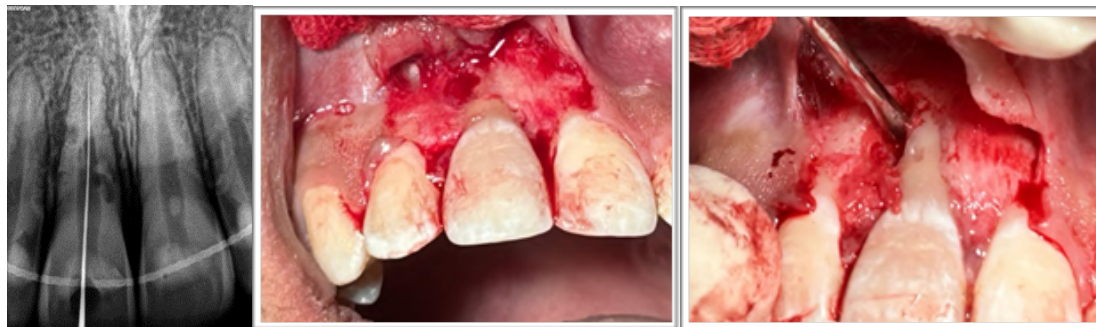
sinus opening at its apex. The tooth was tender to percussion. The patient's orthodontic treatment had terminated a year back and was currently wearing a palatal fixed splint.

Intra oral periapical radiographic examination showed a widened periodontal ligament space and apical radiolucency, with radiolucency extending along the coronal and middle third of the root. Radiographically it could not be confirmed whether it is an internal resorption or external as with different shifts the lesion was shifting but an overlapping of radiolucency was noticed hence CBCT was advised . CBCT imaging confirmed resorption in the middle third of the root on the distal side, as well as in the cervical region on the palatal side, with lacunae on the buccal surface of the root. Based on the clinical and CBCT examination, the confirmatory diagnosis was communicating internal-external inflammatory root resorption. Procedure was explained to the patient and patient concern was obtained, after proper isolation, access opening was performed on tooth #11. The working length was determined, and the root canal was instrumented up to a size 45 K-file. The canal was copiously irrigated with saline, followed by a final irrigation with chlorhexidine. The root canal was then dried, and calcium hydroxide was placed as an intracanal medicament.

After a week, surgery was performed. Upon elevation of the buccal flap, a large C-shaped bony defect was found associated with tooth #11, with the buccal plate completely denuded. On elevation of the palatal flap, a bone defect was observed on the mesial side, extending parallel to the root up to the middle third. After thorough curettage of the granulation tissue from the resorptive defect, a thick mix of Biodentine was placed on the external resorptive defect. A guided tissue regeneration (GTR) membrane was placed over both the buccal and palatal defects. The flaps were then sutured. One week later, the sutures were removed, and the canal was obturated using the single cone technique with bioceramic sealer. The tooth was subsequently restored with composite. Follow up after a week and month shows no symptoms



**FIG-1,2,3**



**FIG-,4,5,6**



FIG-7,8,9

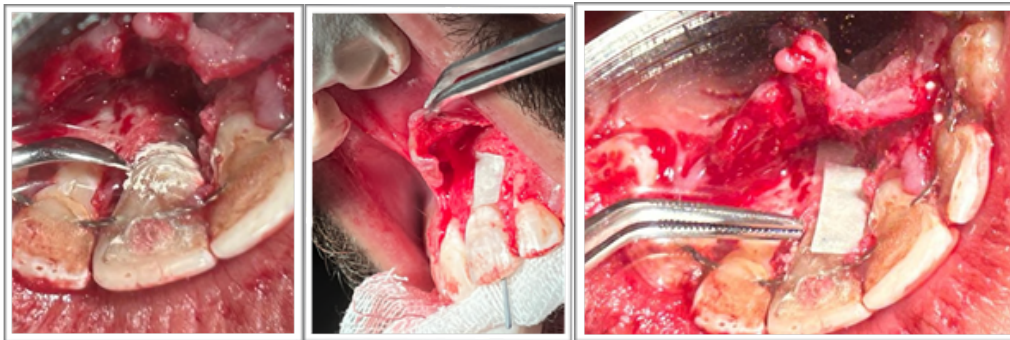


FIG-10,11,12



FIG-13,14,15



FIG-16,17,18

Fig-1 Preoperative Radiograph ; Fig-2 Buccal View On Cbct ; Fig-3 Palatal View On Cbct ; Fig-4 Working Length Radiograph ; Fig-5 C Shaped Resorptive Defect ; Fig-6 Curretarge Of Resorptive Lesion ; Fig-7 Resorptive Defect On Distal Side Of Root ; Fig-8 Resorptive Defect On Palatal Aspect ; Fig-9 & Fig-10 Biodentine Placement ; Fig-11 & Fig-12 Placement Of Gtr Membrane ; Fig-13 Radiograph After Biodentine And Gtr Membrane Placement ; Fig-14 & Fig-15 Flape Reposition And Suturing ; Fig-16 & Fig-17 Before And After Removal Of Stutures After A Week ; Fig-18 Radiograph After Obturation And Post-Op Restoration .

### III.

### Discussion:

Root resorption is the loss of hard dental tissue due to osteoclastic activities. In favorable conditions, resorption is followed by repair, whereas in unfavorable conditions, it becomes progressive<sup>1</sup>. In orthodontics, this process is referred to as induced inflammatory resorption, a form of pathological root resorption<sup>2</sup>. Orthodontically induced inflammatory root resorption is an unavoidable process; however, its progression in severe stages can be prevented through a thorough review of the patient's past dental history and regular radiographic assessments<sup>3</sup>.

Orthodontic treatment should be temporarily discontinued or postponed if resorption is detected. In the case of cervical root resorption, treatment should be halted immediately as the resorption process is invasive and directly related to the oral environment<sup>3</sup>. Cervical root resorption is particularly concerning because it can lead to significant structural damage to the tooth if not addressed promptly. Various factors, such as the presence of chronic inflammation, trauma, or infection, can exacerbate the condition. Furthermore, it is essential to consider systemic factors that may contribute to root resorption.

Studies have demonstrated that long-term and active orthodontic treatment, as well as the amount of force applied during treatment, are significantly associated with external root resorption<sup>4</sup>. Excessive force can lead to increased stress on the periodontal ligament and surrounding bone, triggering an inflammatory response that results in resorption.

Consequently, it is crucial to apply optimal force levels and monitor the patient's response to treatment to minimize the risk of severe resorption<sup>3</sup>.

Radiographic assessment plays a crucial role in determining the extent of root resorption. Periapical radiographs and cone-beam computed tomography (CBCT) provide insights into the extent and pattern of root resorption. CBCT, in particular, stands out for its capacity to offer accurate analysis without superimposition of overlying structures and geometric distortions<sup>5</sup>. This advanced imaging technology allows for a more precise diagnosis and aids in treatment planning by identifying the exact location and severity of resorption.

In this case report combined surgical and non surgical treatment was planned , after access opening biomechanical preparation was completed and calcium hydroxide dressing was placed to halt the resorption , but continuous seepage through the canal was noticed. So surgically buccal and palatal flap was raised to curettage the resorptive area ,choosing the right restorative material highly effect the healing of the resorptive area ,henceforth Biodentine (Septodont, Pomerode, Brazil) was used, due to its great biocompatibility, resistance, and the possibility of it being used as a restorative material in place of dentin<sup>6</sup>. Biodentine can help pause the invasion of resorption<sup>5</sup>. Biodentine has bioactive properties that promote the formation of reparative dentin and enhance the healing process. Other materials, such as mineral trioxide aggregate (MTA) and calcium hydroxide, are also used for their regenerative properties and ability to create a favorable environment for tissue repair<sup>4</sup>. Along with biodentine , GTR membrane was used. Recent studies have shown that this material has suitable mechanical properties and excellent dimensional stability after swelling and is proven to be safe and efficient for use as resorbable membranes for bone regeneration<sup>6</sup>. Flap was repositioned , sutures were placed and the flap was closed. A week after the removal of sutures the canal was obturated with bioceramic sealer .

#### IV.

#### Conclusion:

The etiology of root resorption associated with orthodontic treatment is complex. Root resorption during orthodontic treatment typically progresses smoothly and often halts when the orthodontic force is removed. This case highlights the importance of Biodentine and guided tissue regeneration (GTR), which not only helps to arrest the progression of resorption but also promotes the healing of bone defects adjacent to the area of resorption. Additionally, comprehensive diagnosis combining clinical evaluation and advanced imaging techniques like CBCT is crucial. A multidisciplinary approach is essential for effectively managing complex cases of root resorption.

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