



## Management of Internal and External Resorption with Open Apex: A Case Report

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### ABSTRACT

Tooth resorption refers to the progressive loss of dental hard tissue. The coexistence of internal resorption with communicating external resorption presents a significant clinical challenge. Prompt initiation of root canal therapy is crucial, followed by restoration of the defect to ensure favourable results. Accurate diagnosis, including detailed investigations and three-dimensional imaging, is essential for assessing the extent and location of resorption and for guiding appropriate treatment planning.

### I. INTRODUCTION

The American Association of Endodontists has defined tooth resorption as a condition associated with either physiological or pathological processes that result in the loss of hard dental tissues such as dentin, cementum, or alveolar bone (1,2). Resorption is classified as internal when the process originates in the pulp, and external when it begins in the periodontal ligament (3). The simultaneous occurrence of internal and external resorption accompanied by apical breakdown often resulting in an open apex is a rare clinical presentation and poses a significant challenge for diagnosis and management. In the present case report, we describe an unusual case involving the simultaneous, noncommunicating occurrence of internal and external resorption with an open apex, along with its clinical management.

### II. CASE REPORT

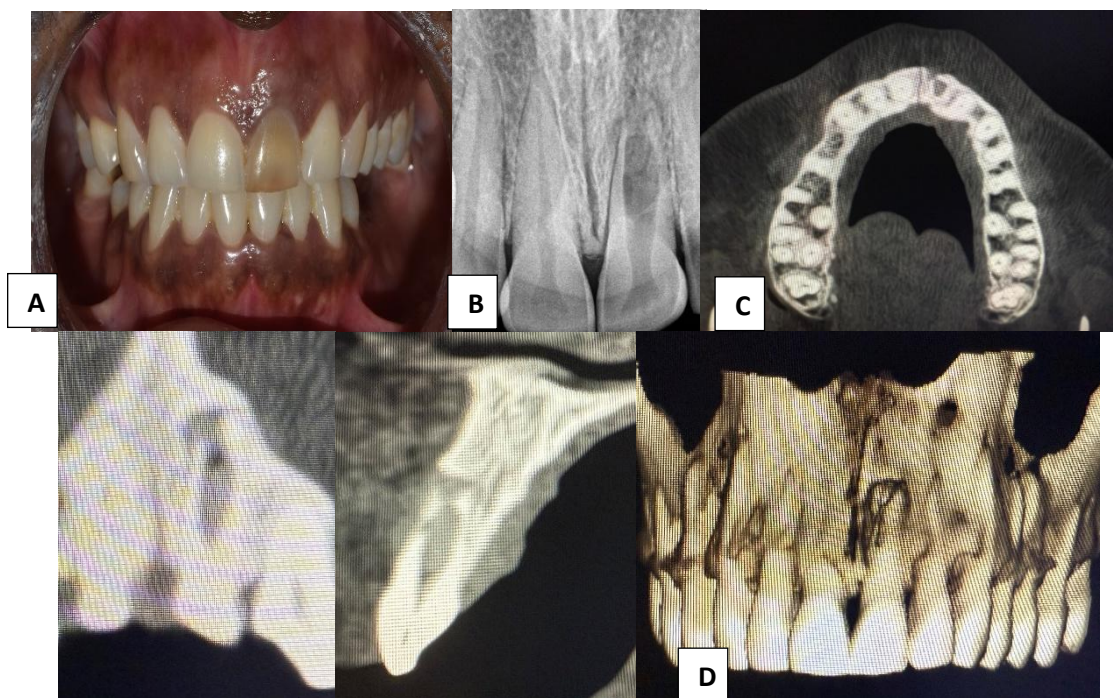
A 38-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of discoloration in the upper anterior region of the jaw. The discoloration had been present for an extended

period and was associated with a history of trauma sustained a few years earlier. According to the patient, the discoloration developed approximately one year following the traumatic incident and had gradually increased in intensity. She reported no aggravating factors and had not taken any medications related to the condition.

On clinical examination, tooth #21 exhibited visible discoloration (Figure 1a). There was no evidence of a sinus tract or crown fracture. The tooth was not tender to percussion, exhibited no periodontal pocketing, and remained non-mobile. Palpation revealed no soft or hard tissue swelling in the surrounding area. The tooth was found to be nonvital on electric pulp test (EPT) and thermal test, while teeth #11, 12, and 22 responded positively.

A conventional intraoral periapical radiograph was taken for radiographic assessment. The image revealed ballooning of the canal in the middle third of the root, loss of apical patency, discontinuity of the lamina dura, and an irregular periapical radiolucency, along with evidence of external root resorption associated with tooth #21 (Figure 1b). Further evaluation using cone-beam computed tomography (CBCT) showed labial cortical plate loss and an open apex due to apical seal loss, which was not clearly visible on the two-dimensional radiograph (Figure 1c and d).

Given these findings, the possibility of conserving tooth #21 was considered through a combination of root canal therapy using Biodentine for obturation, followed by sealing with glass ionomer cement and the placement of a composite veneer. The proposed treatment plan was explained to the patient, and informed consent was obtained.



**Figure 1: (a) Preoperative image showing discoloration, (b) Intraoral periapical in relation to 21 (c) Cone-beam computed tomography image – axial, coronal and sagittal sections(d) Cone-beam computed tomography three-dimensional reconstruction**

### III. TREATMENT

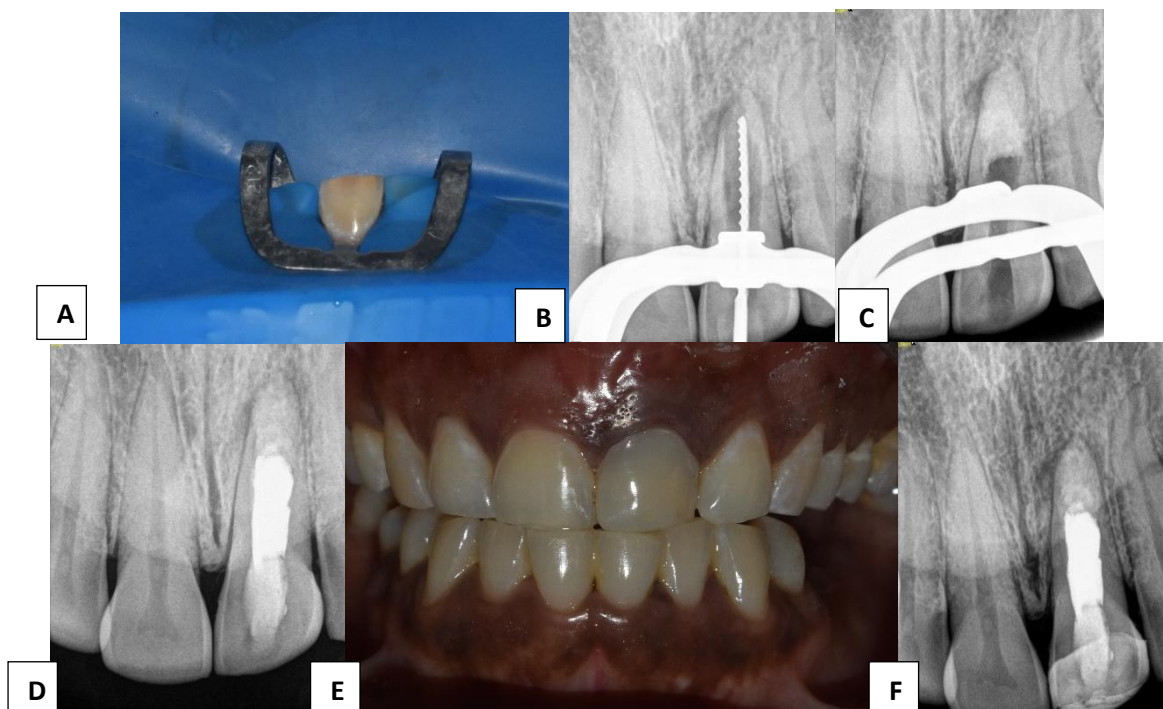
Tooth #21 was isolated using a rubber dam (Figure 2a), and access was gained from the palatal surface using a round bur (ISO #12, Mani), followed by refinement with a safe-end bur (ISO #24, Mani). Upon entry, a wet canal was observed. Working length was determined using a #25 K-file (Mani) (Figure 2b). Cleaning and shaping of the canal were performed using #50 K-file and #50 H-file (Mani). Intermittent irrigation was carried out using normal saline (Baxter), followed by 2% chlorhexidine solution (Ammdent). Calcium hydroxide [ $\text{Ca}(\text{OH})_2$ ] (Calcicure, Safe Endo) was placed as an intracanal medicament. The access cavity was then temporarily sealed with Cavit (3M ESPE) and the patient was recalled after one week.

At the second visit, the tooth was again isolated with a rubber dam. The interim restoration was removed, and the canal was found to be dry. The canal was irrigated with normal saline (Baxter) and dried with sterile paper points (Dentsply). Biodentine (Septodont) was manipulated as per the

manufacturer's instructions and placed into the canal to create a 4 mm apical plug (Figure 2c). An intraoral periapical radiograph was taken to confirm the placement of the root-end filling material.

Subsequently, the canal was coated with a bioceramic-based root canal sealer (Bioactive RCS, SafeEndo) and obturated using thermoplasticized gutta-percha (Gutta percha obturator, Woodpecker). A double seal was achieved at the cemento-enamel junction (CEJ) level—initially with resin-modified glass ionomer cement (Fusion I seal, Prevest), followed by a composite restoration (Figure 2d). (Tokuyama, Palfique). To restore esthetics, a composite veneer was placed as an interim restoration (Figures 2e).

At the 6 month follow-up, the patient remained asymptomatic and satisfied with the treatment outcome (Figure 2f). Despite being offered a ceramic crown, the patient declined further prosthetic intervention.



**Figure 2: (a) Isolation under rubber dam, (b) Working length, (c) Biodentine apical plug, (d) postobturation radiograph (e) Composite veneer placed (f) 6 months review**

#### IV. DISCUSSION

Inflammatory resorption is a pathological condition that occurs within the pulp chamber or root canal system and is characterized by the progressive loss of periradicular dentin and inflammation in the periapical region, ultimately leading to root resorption. Internal resorption typically appears as an oval-shaped radiolucency within the root canal space or as a loss of apical patency. It is often asymptomatic and usually detected incidentally during routine radiographic evaluation (3). Once diagnosed, the primary goal of treatment is to eliminate the etiological factor and arrest the activity of the resorptive cells responsible for tissue destruction (4).

In the present case, the patient reported to the dental outpatient department only after noticing discoloration of the affected tooth. Chronic inflammatory resorption of such long-standing duration presents a significant clinical challenge, with thorough canal disinfection being a key priority. Various treatment protocols were evaluated for managing this condition. As conventional intraoral periapical radiographs offer only a two-dimensional view, a three-dimensional evaluation was deemed necessary (5). Therefore, cone-beam computed tomography (CBCT) was advised. CBCT imaging revealed that tooth #21 exhibited apical resorption with the formation of an open apex. The chronic nature of the inflammatory

process had also caused a breach in the labial cortical plate and extensive internal resorption, resulting in ballooning of the canal space.

Achieving a reliable apical seal using gutta-percha and root canal sealer alone, without the support of an apical barrier, has been shown to yield poor long-term outcomes in cases involving open apices (6,7). Therefore, Biodentine was selected as the root-end filling material in this case. While mineral trioxide aggregate (MTA) is widely recognized for its biocompatibility and superior sealing ability, especially in dye penetration and bacterial leakage studies even under blood-contaminated conditions, Biodentine presents comparable clinical advantages, making it the material of choice in this instance (8).

To minimize microleakage and enhance the longevity of the coronal seal, a combination of restorative materials was employed to restore the access cavity. Specifically, resin-modified glass ionomer cement was used as a base layer, followed by composite resin restoration, a strategy that has demonstrated promising outcomes in sealing and durability.

With high-quality endodontic treatment and a functionally and esthetically stable post-endodontic restoration, this complex case involving both internal and external resorption with an open apex was managed successfully. Periodic follow-up revealed progressive healing, including evidence of



bone regeneration in the defect site. At the 6-month review, clinical examination showed healthy soft tissue healing, absence of pain, swelling, or mobility, and functional stability of tooth #21. Radiographic assessment confirmed healing of the periapical defect associated with the tooth.

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## V. CONCLUSION

A multidisciplinary approach is essential for achieving favourable clinical outcomes in complex cases involving both external and internal resorption associated with an open apex—conditions that would otherwise carry a poor prognosis. The use of advanced diagnostic tools, such as cone-beam computed tomography (CBCT), plays a critical role in such cases by enabling early detection of radiographic changes, accurate assessment of lesion extent, and facilitating timely intervention to prevent further deterioration or complications.

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