

Calcification and Discoloration Management of Mandibular Lateral Incisor: A Case Report

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Abstract

A significant cause of injuries that lead people to seek dental care is oral and maxillofacial trauma. Tooth trauma can result in pulpal injury, leading to various responses including pulp revascularization, chronic pulp inflammation, pulp canal calcification, internal root resorption, pulp necrosis, and discoloration. The aim of this case study was to outline the management of endodontic treatment in the presence of problems such as calcification, resorption, and discoloration resulting from trauma.

Keywords

- ▶ external apical inflammatory resorption
- ▶ pulp calcification
- ▶ tooth discoloration
- ▶ traumatic injuries

Introduction

Oral and maxillofacial trauma is a frequent event, representing 5% of all types of injuries that leads to people seeking dental treatment. Dental injuries, particularly teeth luxation and crown fractures, are the most frequent of all facial injuries. Tooth damage can result in pulp injury, with or without affecting the crown or root, or dislodgment of the tooth from the socket.¹ Traumatic dental injuries impact the health of the pulp, resulting in responses such tertiary dentine development, pulp revascularization, chronic pulp inflammation, pulp canal calcification, internal root resorption, root canal infection, and pulp necrosis.² Maxillary central incisors are frequently impacted by dental trauma, perhaps resulting in cosmetic concerns related to posttraumatic complications. Crown discoloration, with its negative impact on oral aesthetics, is a clinical issue that concerns both the patient and the doctor. Color change in the absence

of pulp necrosis indicates a potential modification in the pulpal tissue with uncertain prognosis, which could develop into necrosis.³

Dental traumas are common in society, accounting for 85% of patients with oral injuries. Oral injuries account for 5% of all body injuries across all age groups, with preschoolers having a proportion as high as 17%, even though the oral region only makes up 1% of the total body area.⁴

Tissue responses might be either favorable or unfavorable. The reactions of these tissues will dictate the necessary treatment and the result of the affected teeth. Thus, a comprehensive biological comprehension of potential tissue reactions and trauma mechanisms is essential for clinicians to confidently assess dental trauma severity accurately, enabling appropriate treatment and minimizing trauma consequences.² This case study aims to outline the management of endodontic treatment in the presence of problems such as calcification, resorption, and discoloration resulting from injury.

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Fig. 1 Clinical examination.

Case Report

A 31-year-old male patient reported at RSGM Universitas Sumatera Utara with the main concern of a lower front tooth being darker than the other adjacent teeth. The patient had a history of facial trauma 1 year back, resulting in prior tooth pain and mobility of teeth. There were no reported associated systemic diseases. Tooth #32 showed discoloration during the objective examination (►Figs. 1 and 2A), with no liveliness, palpation, or percussion sensitivity. The radiograph of the affected tooth showed calcified root canal system associated with external apical inflammatory resorption (►Fig. 2B). The tooth was diagnosed with pulp necrosis and asymptomatic apical periodontitis.

Case Management

Local infiltration anesthesia was applied to tooth 32 during the initial session, followed by rubber dam isolation. The access cavity was created with an endodontic access bur, followed by initial preparation with M-Access K-Files #6, #8, #10, and #15 under magnification. The working length determination was done using an apex locator (►Fig. 3A–D). The cleaning and shaping process involved utilizing a Protaper Gold rotary up to File F2 (#25.08) and irrigation using sodium hypochlorite (NaOCl) 2.5%, followed by ultrasonic activation. After irrigating with chitosan oligosaccharide 2% and applying nanochitosan 0.2% as intracanal medicament (►Fig. 3E), a follow-up appointment was scheduled in 2 weeks.

At the second appointment, following isolation with a rubber dam, the canal was flushed with NaOCl 2.5%, ethylenediaminetetraacetic acid 17%, and saline, and then dried. Master cone fit trial was taken and the tooth was obturated with a single-cone technique using a bioceramic sealer, and then resin-modified glass-ionomer cement was used as an orifice barrier (►Fig. 4A–C). The patient was recalled after 1 week of obturation.

At the third appointment, the patient exhibited no complaints. Tooth discoloration was corrected using the walking bleach procedure to restore the color (►Fig. 5A–C). During the fourth appointment, 2 weeks later, composite restoration was done (►Fig. 5D).

The follow-up sessions at 1, 3, and 6 months showed that the patient had no complaints and the color of the teeth looked the same as the other teeth. Radiographic evaluation showed healing of the lesion (►Fig. 6).

Discussion

Traumatic dental injuries may lead to variable degree of damage to the pulp, periradicular tissues, and adjacent soft tissues. The potential reactions of the dental tissues can be

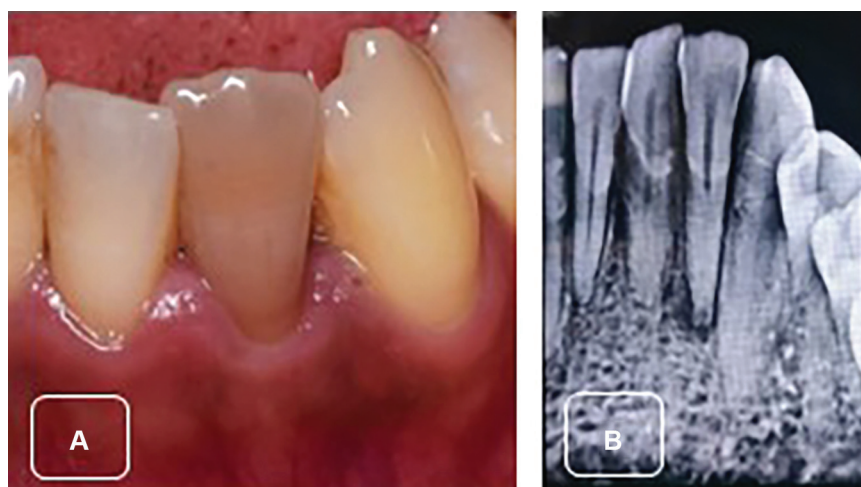


Fig. 2 (A) Clinical examination on tooth 32. (B) Preoperative radiograph on tooth 32.

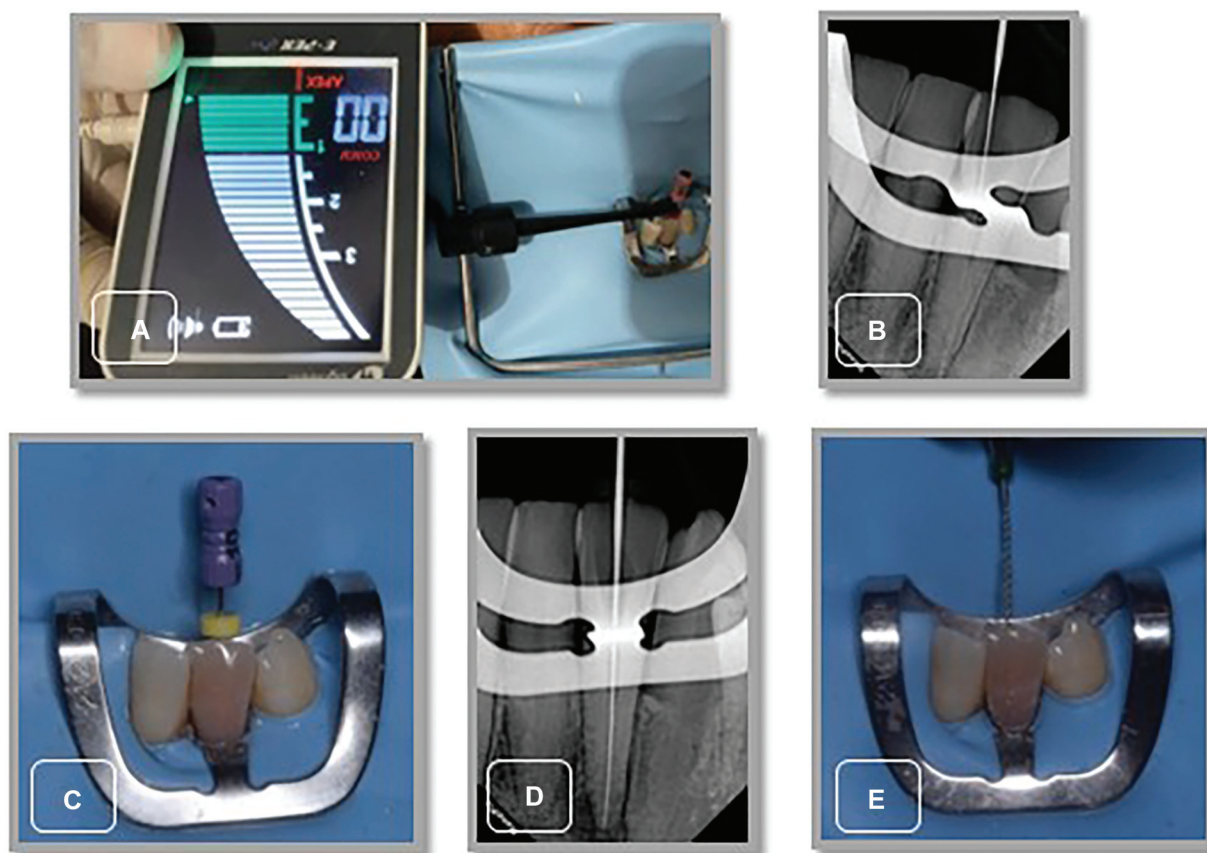


Fig. 3 (A–D) Root canal preparation and working length determination. (E) Application of nanochitosan 0.2%.

highly intricate because of the various sorts of injury and their combinations.² Traumatic injury causes injury to the pulpal blood vessels, resulting in blood entering the dentinal tubules. The teeth quickly develop a dark pinkish color after the accident and then undergo transition to a pinkish-brown hue subsequently. The discoloration remains even after the pulp is removed or if the pulp heals. In young individuals, the pigment formed from the destruction of red blood cells in the dentinal tubules remains, leading to darkening of the tooth's

crown. The pulp is usually harmed by trauma that results in the breakdown of hemoglobin and the formation of different pigment compounds such as heme, hematin, hematin, hemosiderin, and hematoporphyrin. Bacteria produce hydrogen sulfide that can interact with hemoglobin, leading to tooth discoloration.¹ Dental injuries may also lead to pulp canal obliteration. It is the uncontrolled growth of the hard tissue in the pulpal chamber and walls of the root canal. Over time, it might partially or fully erase the pulp canal gap. Calcifications

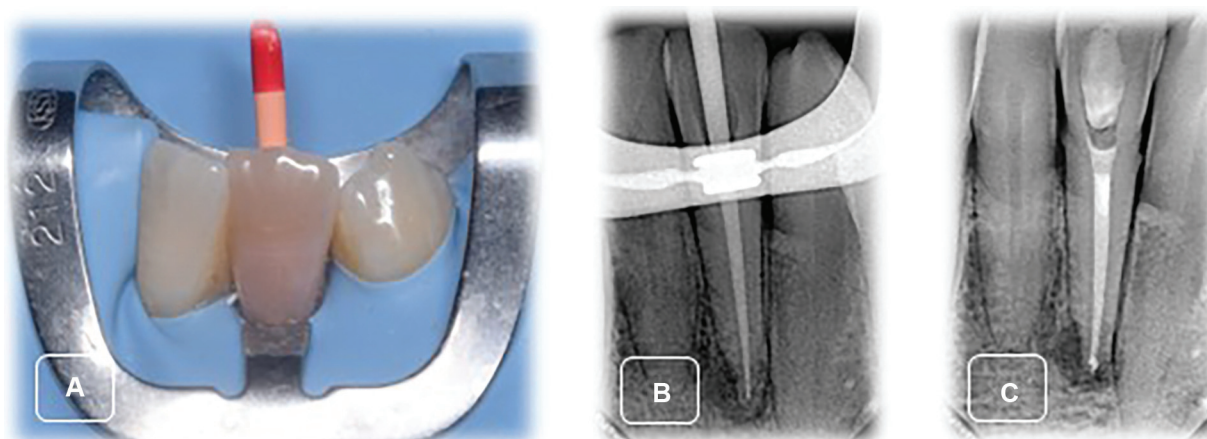


Fig. 4 (A, B) Master cone fit trials. (C) Obturation.

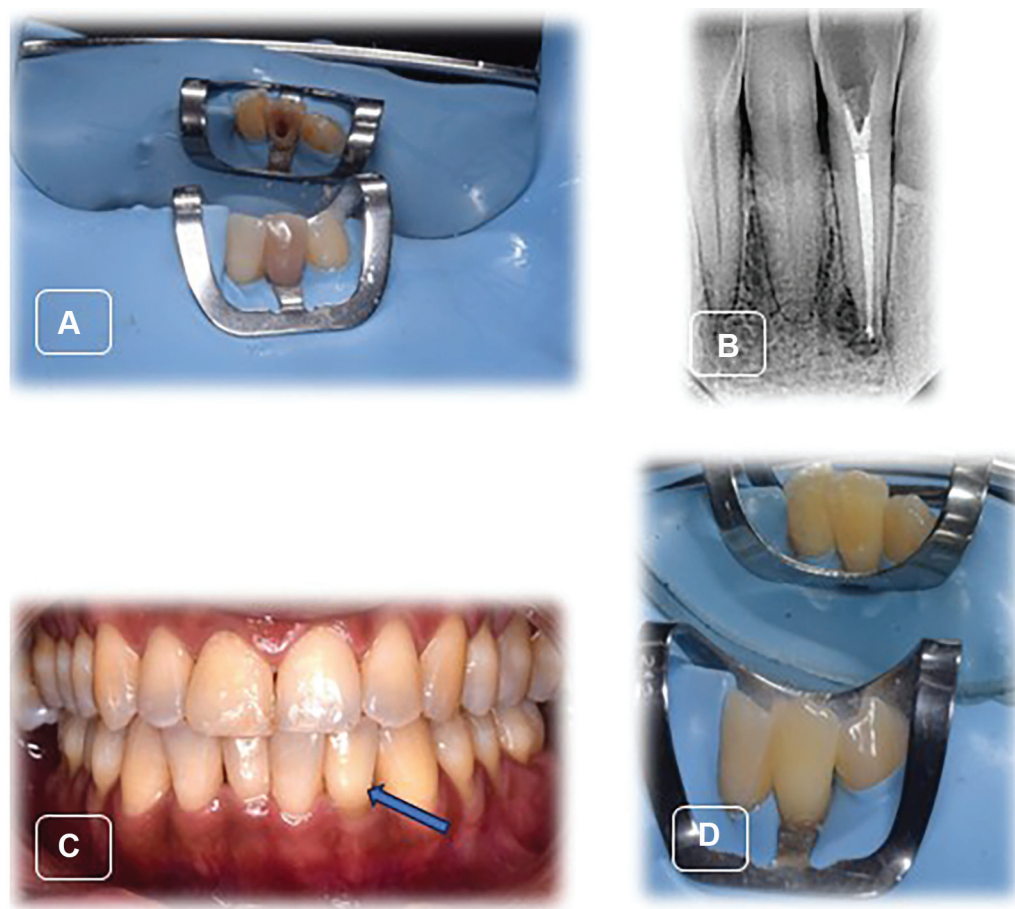


Fig. 5 (A–C) Bleaching procedure. (D) Final restoration.

occur as a result of uncontrolled mineralization caused by the malfunction of the enzyme pyrophosphatase, which in turn reduces capillary permeability and blood supply. The pulp's response to traumatic injuries is influenced by the level of damage to the neurovascular supply that enters through the apical foramen and bacterial contamination, both of which are critical factors in outcome determination.⁵

Utilizing a dental microscope is the most effective method for repairing calcified root canals. Calcified root canals are navigated with ultrasonic tips, while calcified canals are identified and troughs are created with burs with long shanks. Obtaining several angled radiographs is crucial when preparing deep access to verify central alignment and avoid excessive loss of dentin or any perforation. Dentists encounter challenges when negotiating a calcified and restricted canal. Typically, negotiating involves using K files #6, 8, and 10 in a sequential manner. However, files must be inspected prior to use and discarded upon detection of any kind of deformation.⁶ Use of C+ and C++ files (Dentsply) can also be done while working through narrow and partially calcified canals. The apical preparation can be made easier by using 2% chitosan oligosaccharide, which exhibits chelating properties without causing collagen denaturation.

Discoloration due to trauma to tooth impacts appearance and requires dental intervention to restore the natural tooth color, which can greatly influence psychosocial interaction and development by enhancing the patient's smile.⁷ Dentists must understand the causes and clinical signs of tooth discoloration to make an accurate diagnosis and select the most appropriate treatment for each case.⁸ Intracoronary bleaching is commonly done to treat discoloration in a front tooth resulting from trauma.²

Conclusion

The effectiveness of endodontic therapy relies on thoroughly disinfecting the entire root canal. Effectively managing calcified teeth and reaching the complete working length requires the use of various file system, irrigants, tailored burs, and a dental operating microscope. Dentists need to understand the reasons and visual characteristics of tooth discoloration to make an accurate diagnosis and formulate the best treatment approach.

Conflict of Interest
None declared.

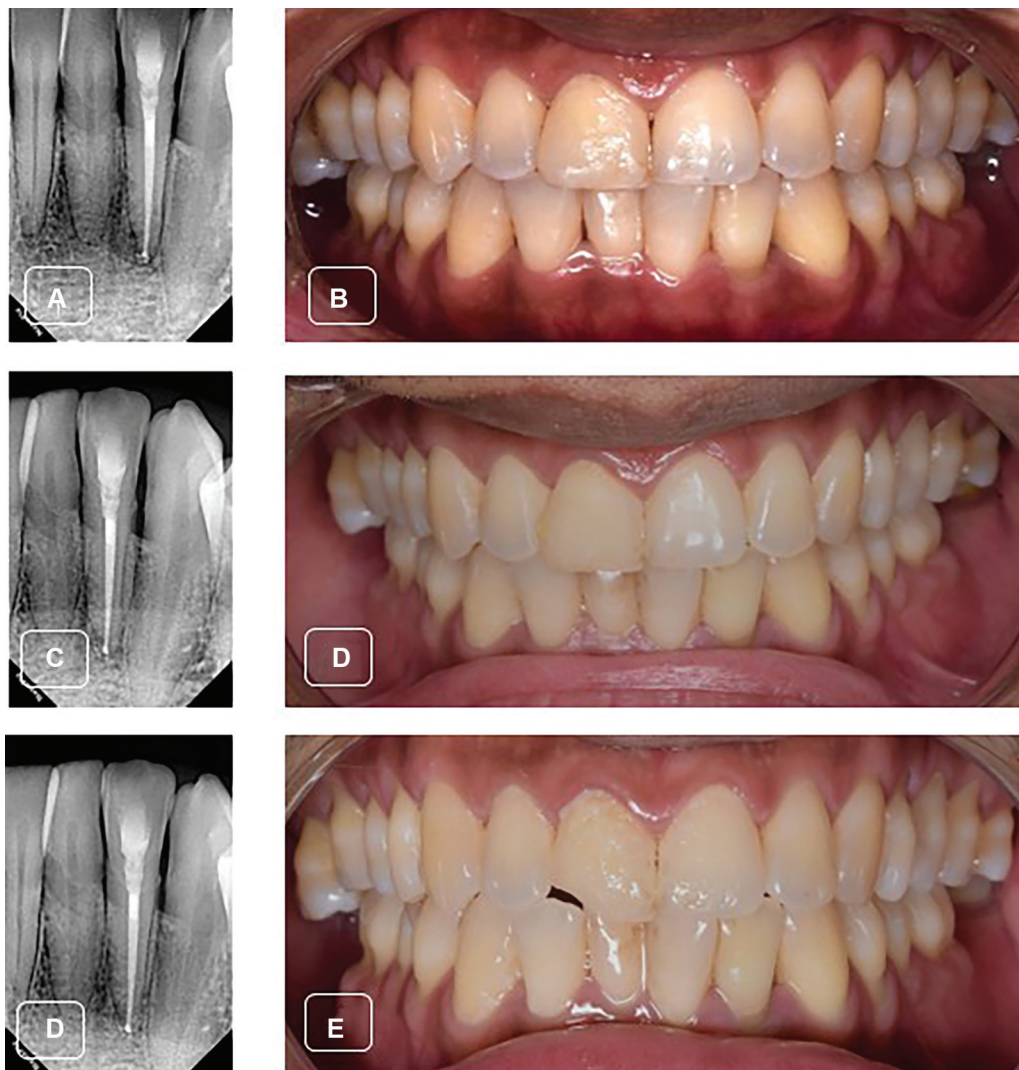


Fig. 6 (A, B) One-month follow-up. (C, D) Three-month follow-up. (E, F) Six-month follow-up.

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