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**MAJOR CONTRIBUTORY FACTORS IN THE INITIATION OF ROOT
 RESORPTION**
 (Review article)

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ABSTRACT

Background: Root resorption is one of the complications that often occur as a result of trauma in the permanent dentition. Resorption may be frequently observed unexpectedly because asymptomatic. The anterior teeth are more affected by root resorption and therefore it is utmost importance for the patient from socio-economic and psychological standpoint, various treatments can be perform to avoid severe damage to the teeth. **Purpose:** to know the management trauma of the permanent teeth so as to prevent the occurrence of resorption. **Case:** This report of seven case; 2 cases resorption due to avulsion injury without endodontic treatment, 2 cases resorption due to inadequate endodontic treatment, 2 cases post traumatic injury treated by splint and endodontic treatment, and 1 case resorption due to inadequate final restoration and preformed splint and endodontic treatment. **Discussion:** Tooth resorption results from injuries to or irritation of the periodontal ligament and / or tooth pulp and the treatment goal is to remove or eliminate bacteria to allow healing in the periradicular space. **Conclusion:** Treatment is based on removal or reduction of the source of infection.

Keywords: dental trauma, infection, resorption,

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INTRODUCTION

Trauma to the oral region occurs frequently and comprises 5% of all injuries for which people seek dental treatment.^{1,2} Longitudinal studies show that the prevalence of root resorption as a result of dental trauma is very high 8-50% .¹ Beside root resorption, root canal obliteration, interruption in root formation, periapical lesion, and damages to permanent tooth buds may occur after dental trauma.¹ This condition is usually found suddenly or unintentionally because it is

asymptomatic.^{1,3} Tooth mobility, crown discoloration, and sensitivity to percussion may also be reported as clinical sequelae of traumatized teeth.¹ Therefore, follow up radiographic examination of traumatized teeth plays an important role in the early diagnosis and adequate treatment.^{1,4}

Tooth resorption results from injuries to or irritation of the periodontal ligament and/ or tooth pulp.^{5,6} It may arise as sequelae of traumatic luxation and avulsion injuries, orthodontic tooth movement, or chronic

infections of pulp or periodontal structures, neoplastic process, associated with systemic disease and lesions of idiopathic origin.^{5,7} The anterior teeth are more affected by root resorption, probably because they are single-rooted with tapered roots. Moreover, they are more exposed to external factors such as trauma and most play a role in the orthodontic movement process.³ Since anterior tooth is of utmost importance for the patient from socio-economic and psychological standpoint, various treatments can be performed to avoid severe damage to the teeth.⁸

The resorption classifications play an important role for clinician in the process of diagnosis and treatment planning.^{1,5} Adresen classifies resorption into internal and external.^{5,9-11} The resorption treatment depends on severity, location, whether the defect has perforated the root canal system, and the restorability of the tooth. Essentially, treatment involves complete removal or stop the resorptive tissue and restoring the resulting defect with a tooth-colored restoration.⁴

When discussing treatment options with patients, it is important to advise patients that the final decision on treatment (surgical repair, endodontic treatment or extraction) can only be objectively made.⁴

CASE 1

A 25 years old female patient, reported with the chief complaints of gingival swelling in upper anterior region. The tooth had suffered avulsion injury one year ago. The patient mentioned that the tooth had been replanted immediately in a private dental clinic and no symptoms had been noted since then. Her medical history was noncontributory.

Clinical examination revealed no mobility and percussions test induced discomfort of the upper right central incisor. The periapical radiographic showed several resorpted lesions around the root apex (Figure 1).



Figure 1. Periapical radiographic of the upper right central incisor.

CASE 2

A 13-year-old male patient referred to endodontic team in one of private dental clinic. He complained of gingival swelling in the upper anterior region. During anamnesis, he was reported that his tooth had been avulsed, replanted, and fixed using orthodontic appliance. Clinical examination revealed orthodontic appliance of the upper teeth, sinus tracts were found in the apical areas of upper right and left central incisor. On radiographic examination root resorption was seen in both teeth (Figure 2).

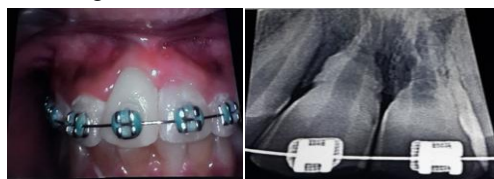


Figure 2. Clinical condition and periapical radiographic of upper right and left central incisor.

CASE 3

A 39 year old female patient attended the dental clinic, complaining of discoloration in the upper right central incisor. The tooth had been traumatized 2 years ago, which was followed by root canal treatment. Radiographic examination revealed faulty endodontic treatment, with inadequate shaping and filling. The presence of a radiolucent image was also noted in the middle third of the root (Figure 3).

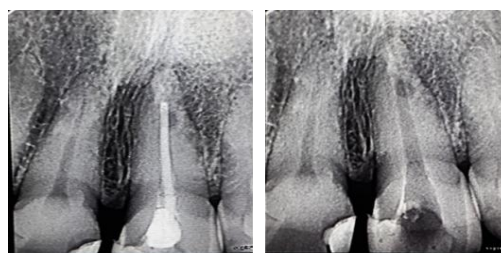


Figure 3. Periapical radiography of upper right central incisor

CASE 4

A 25 year old male patient attended the dental clinic complaining of mobile in upper left lateral incisor. The tooth had been traumatized in a bicycle accident about 2 years ago, which was followed root canal treatment. Radiographic examination revealed faulty endodontic treatment, no apical teeth and only gutta serena retained in alveolar bone. Radiolucent was noted in the apical of upper right central and in the middle third of the root externally. The presence of a radiolucent

image was also noted in the apical region of upper right lateral incisor and obliterated from middle third of root canal to apical, indicated external and internal resorption (Figures 4a and 4b).



Figure 4. a. periapical radiography of upper right central and lateral incisor; b. periapical radiography of upper left lateral incisor

CASE 5

A 27 year old female patient attended the Dental Clinic complaining of mobile in upper front region. The tooth was traumatized in a bicycle accident 2 hours ago, which was followed by splinted with Interdental Wiring (IDW) under local anesthesia. Clinical and radiographic examination revealed an anterior dentoalveolar maxilla fracture, the upper right and left central incisor avulsed and retained in socket only with wiring orthodontic appliance, extrusive luxation also noted in upper right and left lateral incisor (Figure 5).



Figure 5. Radiography of post traumatic injury and after inserted The IDW

After two weeks, endodontic treatment was performed on avulsion and luxation teeth (Figure 6).



Figure 6. Periapical radiography after endodontic treatment of all upper incisors

The results of treatment after 4 weeks revealed avulsion and luxation teeth were well fixed. (picture 7)



Picture 7. Clinical feature 4 weeks after IDW

CASE 6

A 20 year old female attended the Dental Clinic complaining of fracture and mobile in upper right and left central incisor and upper right lateral incisor. Clinical and radiographic revealed fracture of bilateral condylus and symphysis. Fractures two third of crowns in upper right and left central incisor and upper right lateral incisor. Open reduction internal fixation (ORIF) and IDW were placed under general anesthesia (Figure 8).



Figure 8. Radiography after ORIF and IDW placement

After 3 months, the IDW was removed and endodontic treatment was performed on upper right, left central and upper right lateral incisor (Figure 9).



Figure 9. Periapical radiography after endodontic treatment

After endodontic treatment, patients were referred to the prosthodontist for the construction of crown bridge (Figure 10).



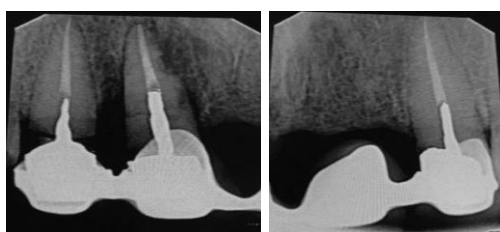
Figure 10. Clinical feature after insertion of bridge dentures

CASE 7

A 54 year old male patient attended the dental clinic complaining of pain and gingival swelling in the upper anterior region. The tooth was traumatized in a bicycle accident 3 years ago, fractured 3 of his upper anterior teeth and avulsed of upper left central incisor (Figure 11), which was followed by endodontic treatment and final restoration using a crown bridge (Figure 12).



Picture 11. Initial Radiographic



Picture 12. Periapical radiography after endodontic treatment and final restoration

Clinical examination revealed sinus tract in upper right central incisor (figure 13).



Figure 13. Clinical feature of upper anterior incisor

DISCUSSION

The 1st and the 2nd case is avulsion injury and had been replanted without endodontic treatment. One of the most common sequelae resulting from tooth avulsion is external root resorption, which can be inflammatory or substitutive (ankylosis).⁷ Inflammatory external resorption is directly associated with endodontics because of the ensuing pulp necrosis and subsequent presence of microorganisms in the root canal system and dentinal tubules. The process through which an inflammatory external root resorption occurs has not been explained completely; however, it is known that destruction of the precementum layer and necrosis of cementoblasts result in a denuded root surface that, together with a necrotic pulp and bacteria inside the dentinal tubules, is the essential factor leading to resorption. This denuded root surface allows irritants inside the root canal to come into contact with the periodontium, not only through the apical foramen or lateral canals, but also through dentinal tubules, particularly in young patients, whose dentinal tubules are wider.^{1,7,10} The treatment of avulsion teeth is complex, not only treated with splint, but also with endodontic treatment. Pulpal tissue of teeth cannot survive an avulsion injury and must be removed. Endodontic treatment for avulsed teeth should be initiated at 7-10 days after splint removed. In the case presented here, lack of treatment by the patient resulted in pulp necrosis, which, combined with the destruction of the precementum layer, led to an inflammatory external root resorption and more perforation around the apex causing poor prognosis to maintain it in oral cavity.^{6,7} The 2nd patient, an orthodontic appliance was used to fix the tooth that had been avulsed. Pressure due to the use of orthodontic appliance can also cause external resorption.¹² Therefore high pressure should not be applied to injured teeth.

The 3rd and the 4th case also showed resorption. This cases previously treated with endodontic treatment, but the treatment was not adequate, the obturation was not hermetic and underfill, it can allowed bacteria increase in the root canal and caused root resorption. Based on histological examination, the site of resorption were correlated to remnants of pulp tissues within the root canal.¹¹ Therefore the root canal filling must not only afford a tight seal at the apex but along whole root length.

The 4th showed the upper right central incisor with external root resorption and upper right lateral incisor with external and internal resorption (replacement type). Internal resorption in this case is very rare.¹³⁻¹⁵ As a response of dentinal tubular anatomy to resorption, they have a variety of special grooves. The tubules have to be open to an area of the root canal where the tissue is necrotic and infected so that microorganisms may enter the tubules, and then lead to an area of the canal with vital pulp tissue. This event may explain why the occurrence of internal resorption is rare.¹⁶

A replacement type of internal resorption cause defects in the dentin adjacent to the root canal, with concomitant deposition of bone like tissue in some regions of the defect. It result in an irregular enlargement of the pulp space with partially or fully obliterated area of the pulp chamber. The etiology of internal resorption is not clearly known. In a study of 27 patients, trauma is the most common etiological factor (43%), followed by carious lesions (25%). Persistent infection of the pulp by bacteria causes the colonization of the walls of the pulp chamber by macrophage-like cells. The attachment and spreading of such cells is the primary prerequisite for initiation of resorption.¹⁷ It can be concluded that trauma and pulpal inflammation / infection are the major contributory factors in the initiation of root resorption, although the complete etiologic factors as well as the pathogenesis have not yet been completely elucidated.¹⁷⁻²¹

The 5th dan 6th case, the predisposing factor for resorption has been reduced so that it is expected that the tooth will not occurred resorption as a result of complications from the injury. Splinted and endodontic treatment was preformed. Adequate endodontic may stop pregression of this complication.

The 7th case, endodontic treatment was preformed to reduce bacteria and remove necrotic tissue, but in this case, external resorption still occurred. This is likely due to a leak from the edge of the restoration. In addition, there is a widening of the periodontal ligament, and alveolar bone damage which is a factor that influences the process of resorption.

Root canal treatment and restoration must be a single unit to prevent secondary

infection.¹¹ The tooth was definitively restored immediately afterward to minimize the risk of coronal microleakage and fracture. The presence of widening of the periodontal ligament is the cause of bacterial entry into the sulcus. Because the source of stimulation (infection) originates from the sulcus, it can be postulated that bacteria in the tooth sulcus will stimulate and cause an inflammatory response in the periodontium in relation to the degree of attachment to the root.

Treatment for resorption is very complex. But in principle the cause of inflammation must be eliminated, for example sulcus bacteria. However, this resorption is not the same as resorption produced by pulp infection that occurs in a closed environment, tooth sulcus is very difficult to be disinfected even in a very long time. Therefore, in this case, it is expected that damage and root surfaces that are susceptible to exposure will become resistant to resorption after treatment. The resorption defect is the focus of the treatment strategy that will be performed.¹² Various treatments can be done to prevent the occurrence of resorption, but the treatment is based on the reduction or elimination of sources of infection.

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