



PERIODONTAL CONSEQUENCES FOLLOWING AVULSION THAT YOU SHOULD KNOW

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Introduction

Avulsion is defined as a complete displacement of a tooth from its socket and it is one of the most commonly encountered emergencies in the dental setting.¹ Unlike its management, periodontal complications following avulsion are rarely discussed in the literatures. An excellent dentist should not only focus on the tooth structure *per se*, but also on the related significant changes to the periodontium following the injury.

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The biological basis of periodontal healing

The anatomy of the periodontium consists of the gingiva, periodontal ligament, cementum and alveolar bone. Each anatomical structure has its own unique features and characteristics to maintain periodontal health.² Periodontal healing is a complex process as the nature of new periodontal attachment is determined by the types of cells repopulating the root surface. Gingival epithelium has the fastest rate of migration among all periodontal structures, thus healing is achieved mainly by the formation of long junctional epithelium. Meanwhile, even though periodontal ligament cells are the slowest cells to migrate and repopulate the root surface, they play an important role

in establishing new attachment to the root surface as they can also differentiate into cementoblasts and osteoblasts. However, healing processes that allows bone cells to come first into contact with root surface may cause ankylosis and root resorption.³

How does healing following avulsion occur?

1. Periodontal ligament or cemental healing:

This type of healing is more likely to occur if there is a minimal damage to periodontal ligaments and the avulsed tooth is stored in an appropriate storage medium prior to immediate dental emergency visit.⁴ Hydrated periodontal ligament cells are crucial for their viability and survivability in order to ensure an excellent healing process. This will allow

them to re-establish upon replantation with minimal inflammation and allow healing with new replacement cementum to take place after initial inflammation has subsided.⁵

2. Bony healing: Excessive drying of periodontal ligament cells caused by delayed replantation will affect the healing process and prognosis of the tooth as they will initiate inflammatory process along the root surface. This condition requires healing process by new tissue and promotes the adhesion of bone cells onto root surface as slower moving and migrating cementoblasts cannot cover the root surface in time. A process known as osseous replacement occurs through physiologic bone remodelling, resulting in ankylosis.⁶

What happens to the periodontium following avulsion?

Upon tooth avulsion, all periodontal structures including dental pulp are severed and damaged. This injury causes tearing and disruption of the gingival epithelium and periodontal ligaments, injury to the cementum and alveolar bone, and disturbance of the dental pulp nerve and vascular supply.⁵ Cemental damage occurs due to crushing of the tooth against the socket and viable periodontal ligaments are left on the avulsed tooth surface due to tearing of the attachment from bony socket.

In contrast to the more favourable functional healing or the ankylosis, replacement resorption and inflammatory resorption are the likely adverse outcomes that can result following a tooth avulsion. Anatomically, cementum is a mineralised calcified hard tissue that covers root surface. There are four main types of cementum that have been identified and they differ from each other according to their location, formation, structure and function (i.e. acellular afibrillar cementum, acellular extrinsic fibre cementum, cellular intrinsic fibre cementum, cellular mixed stratified cementum).⁷ Among these four types of cementum, cellular intrinsic fibre cementum which is mainly located at the furcation area and apex of the root is vital for tissue adaptation as it has great repair capacity following resorption. Due to this repair capacity, this type of cementum provides a protection to the tooth from unnecessary resorption.

As previously discussed, periodontal ligament cells are able to differentiate

into cementoblasts for new cementum deposition. However, the extent of traumatic dental injury and prolonged extraoral dry time following tooth avulsion may reduce the number of surviving periodontal ligament cells and as a result, impair the ability of cementum to regenerate and form a protective barrier between dental hard tissue and surrounding bone. Consequently, replacement resorption occurs due to physiologic bone remodelling. The progressive replacement resorption of the root with bone in a growing child is

Take home messages

1. A quick first aid management of the avulsed tooth as narrated by Crawford⁹ is mandatory for the survival of the tooth and its related periodontal structures. A good dentist should be able to give appropriate instructions on what to do in such cases prior to emergency arrival to dental setting.
2. Since most dental traumas occur outside clinic and hospital setting, knowledge and awareness among caregivers in managing such trauma is also crucial to ensure a good clinical outcome and prognosis of the tooth.

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often accompanied by infraocclusion and ultimately results in a complete loss of root structure and tooth loss.⁸

In addition to replacement resorption, pulp necrosis and inflammatory resorption are also among the most common consequences or complications that can be encountered on the avulsed tooth. Various factors including bacterial contamination and mechanical stress during the traumatic injury may aggravate the inflammatory resorption process. Similarly to replacement resorption, on-site and emergency management of the avulsed tooth influence the degree of the defect.

A study by Muller and colleagues revealed that tooth avulsion is a severe dental injury with an unpredictable prognosis as the survival rate of the replanted avulsed tooth complicated with inflammatory resorption and replacement resorption were at an average of 1.7 and 6.1 years respectively. From their observations, it can be concluded that the most common short term consequence following avulsion is the inflammatory resorption while replacement resorption is the long term consequence of avulsion.⁸

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