

Replantation of avulsed teeth: considerations and complications

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Summary

Avulsion of teeth is a traumatic dental injury which can be managed by replantation. Important considerations for successful replantations are highlighted. Several sequelae to replantation are discussed in relation to the clinical features observed in a patient seen 6 years after replantation of two avulsed upper incisors. Many of these complications might have been avoided if the patient had returned to the clinic for root canal therapy shortly after the teeth was replanted.

Keywords: *Tooth replantation, consideration and complication*

Résumé

L'avulsion des dents est un accident dentaire qui peut être traité par la replantation. Des considérations importantes qui doivent être prises en compte pour des replantations positives sont ici présentées. Plusieurs séquelles dues à la replantation sont discutées en relation aux observations cliniques chez un patient rencontré 6 ans après une replantation de deux incisives supérieures avulsées. Plusieurs de ces complications pourraient être évitées si le patient était rentré à la clinique pour un traitement de la racine peu après que les dents avaient été replantées.

Introduction

Traumatic injuries of teeth are a common reason for patient attendance at dental clinics. Studies have shown that such injuries occur most frequently in the 7 to 15 year age group [1]. Because of their position and prominence in the mouth, the anterior teeth are commonly traumatised particularly where they are proclined. The prevalence of traumatic anterior dental injuries varies between 10 and 22 per cent [12].

Avulsion is a type of dental injury that may result from trauma to teeth. It is described as complete displacement of a tooth from its alveolar socket [3]. It is usually the result of sudden impact such as a blow or hitting a hard object during a fall. If the avulsed tooth is replanted, it has a good chance of survival. Two factors are crucial in the prognosis of replanted avulsed teeth;

- the time period between avulsion and replantation and
- preservation of periodontal ligament cells and fibres attached to the root surface.

Time is the most critical factor in successful replantation. The sooner the avulsed tooth is replanted, the better. The prognosis of replantation is greatly improved if it can be carried out immediately after avulsion [4]. However, avulsion does not often occur where replantation by dental personnel can be carried out immediately. It is for this reason that parents, physical education instructors, teachers and everyone should be aware of this emergency procedure and should be able to carry out replantation at the site of the accident. In one study [5], no relationship was demonstrated between the place or personnel who replanted

the teeth and a successful outcome. The avulsed tooth should be retrieved quickly. It is important to preserve the periodontal ligament cells and fibres attached to the root surface by keeping the tooth moist and avoiding unnecessary handling of the root surface. If the root surface is dirty, the patient may lick it clean or it may be wiped gently with a handkerchief moistened with the patients' saliva, milk or cold water [5]. The tooth is gently repositioned as close as possible to its original position and the patients made to bite down on a handkerchief. The patient must attend the dental surgery as soon as possible.

Where it is impossible to replace the avulsed tooth into its socket at the site of the injury, it must be taken to the dental surgery quickly as the tooth must be replanted within 2 hours of its avulsion for it to have a good chance of survival. During transportation to the surgery, it is important to keep the tooth moist to enhance the success of the planned replantation. Studies have shown that the best transport medium is saline [7]. Where this is not immediately available, the tooth may be kept in the patients' buccal sulcus or in the parent's buccal sulcus when a child is unable to do so. It may also be stored in saliva or milk. Storing it in water is quite as good as these other media because the vitality of the periodontal ligament cells is not well maintained in water [8].

At the dental surgery, the tooth is placed in normal saline while X-ray of the socket and adjacent teeth are taken to check the extent of the injury [9]. The socket may be irrigated with saline to remove blood clots [10] but it is not necessary to curette the socket walls [11]. The tooth is replaced into its socket and splinted in position for 1 to 2 weeks [12]. It may be necessary to splint for 3 to 4 weeks where there is socket injury. However, prolonged and rigid splinting could lead to ankylosis [6]. The patient should receive a tetanus booster injection if the last one was administered more than 5 years before the planned surgery. Antibiotics should be prescribed in the same dosage as indicated for mild to moderate oral infections [13].

Once the tooth is firm, the root canal therapy is indicated in teeth with complete root formation and closed apices [14]. In teeth with incompletely formed roots and where the apices are still open, the tooth is allowed to develop fully by apexification procedures before root canal therapy is commenced [16]. However the pulpal status should be monitored by pulp testing and clinical observations for possible crown colour changes as well as by radiographic evaluation.

This report is about a patient whose avulsed teeth were replanted and splinted. However after the removal of the splint, she did not attend the clinic until 6 years later when she developed pain in one of the teeth. Further investigations revealed that the teeth displayed many of the complications of replantation, which could have been avoided if pulp canal therapy had been carried out shortly after the replantation.

The aim of this report are two-fold:

1. To contribute to the literature on replantation of teeth by documenting the long-term complications that could arise when matured avulsed teeth are replanted but not endodontically treated. It has been advised

that reporting of long-term documented cases be encouraged to aid evaluation of replantation techniques [15].

- To emphasize to practitioners that timing and sequencing of endodontic therapy as well as patient compliance and regular recalls are critical in the prevention and treatment of root resorption in replanted teeth.

Case report

A 19-year-old female patient reported in the clinic complaining of severe pain from her tooth. The pain started the day before and was related to a slightly discoloured tooth in front of her mouth. The past dental history revealed that she fell and traumatised her upper teeth 6 years before she presented for treatment. As a result, the painful tooth and the one adjacent to it fell out and were replanted at a dental clinic within 45 minutes of the injury. The teeth were splinted for 2 weeks and by the time the splint was removed, they were quite firm. They had remained firm and were asymptomatic except that she noticed a gradual darkening of the upper right central incisor over the past 2 years. The pain she was experiencing was the only episode of discomfort or pain she had since the replantation.

Examination revealed a young lady with a bimaxillary protrusion. There was a discoloured upper right central incisor (Fig. 1) which was slightly more proclined than the upper left central incisor. It was tender to percussion. The upper right lateral incisor, which had also been replanted, did not have any discolouration. They were both firm, exhibiting similar degrees of physiological mobility as other opposing and adjacent teeth. When percussed, the sound produced was similar to that produced when other teeth in the mouth were percussed. There were generalised stains and calculus with mild inflammation of the marginal gingivae.



Fig. 1. The patient's upper right incisors. There is darkening of the maxillary right central incisor.

Pulp vitality tests were negative for both upper right central and lateral incisors. Periapical X rays showed a periapically radiolucency encompassing the roots of the 2 upper right incisors. There were irregular widening of the pulp canals along the lengths of the incisors (Fig. 2)

The outline of the mesial surface of the apical half of the root of the upper right lateral incisor appeared irregular in structure. Similar radiographic findings occurred on the distal surface of the right central incisor. There was also a pulp stone in the pulp chamber of the upper right lateral incisor.

A diagnosis of an apical lesion in relation to replanted 21 was made. They both displayed internal and external resorptions and a pulp stone was observed in 2.



Fig. 2. Periapical X-rays of 21 showing resorption along the pulp canals and on the cementum. There is also bluntness of the apex of 2 as well as the pulp stone in the canal. Periapical radiolucency surrounds the teeth.

Discussion

A frequent sequela to replantation is resorption of the root. There are three types:

- surface resorption
- inflammatory resorption
- replacement resorption

Surface resorption results in superficial lacunae of erosion in cementum [9]. It occurs in response to local trauma and injury to the cementum and periodontal ligament. It is self-limiting as the missing tissue is replaced by deposition of new cementum. It is not visible on X rays [15].

Inflammatory resorption is characterised by loss of tooth structure and peri-radical bone in areas adjacent to the pulp [9]. The main sites affected are the areas around the apical foramen and lateral canal openings [16]. The traumatised pulp tissues become highly vascularised with dentinoclastic activity. This erodes the dentinal walls of the root canal and the periapical bone. It is seen as radiolucency on X-rays. Resorption observed in this case is consistent with inflammatory resorption as described earlier. After replantation, root canal therapy is indicated and should optimally be carried out during the second or third week [14] particularly in teeth with closed apices. Unfortunately, this procedure was not followed in this case. It is only when the teeth are immature that incomplete root development and wide-open apices that may revascularize and root canal therapy may not be indicated immediately. They must however be monitored clinically and radiographically at regular intervals so that

if pulpal necrosis occurs, root canal therapy can be performed [5,17].

Replacement resorption occurs when there is substitution of resorbed tooth structure by bony tissue causing ankylosis and direct fusion of bone with adjacent dentine. Radiologically, the periodontal ligament space disappears [16]. Such teeth lack physiological mobility and produce a "solid" sound when percussed. They cannot be moved orthodontically like normal teeth and they fail to erupt along with adjacent teeth leading to infraocclusion. Immersing the tooth in fluoride prior to replantation [6] can slow this type of resorptive process.

Injury to pulps may also cause abnormal calcification. Pulp calcification is a pathological condition that occurs as a response to trauma, dental caries or periodontal disease [18]. These cause injury to the pulp and lead to abnormal calcification around necrotic cells, thrombi in blood vessel and collagen sheaths around vessel walls which are the possible *nidi* for these calcifications. The pathological process so far described may explain the pulp stone seen in the root canal of the upper right lateral incisor.

A force which causes teeth to avulse results in severance of their periapical vessels and exposure of the pulps to the organisms in the environment and the oral cavity. The pulp systems of the teeth will therefore harbour bacterial and their by-products. Replantation may allow reestablishment of the periapical circulation, particularly in young teeth with open apices, but the pulp may not have the capability to get rid of these damaging bacteria. The defences may slow their spread, but sooner or later, the bacterial infection will be extensive and spread throughout the canal leading to pulp autolysis, necrosis and gangrene. The bacteria, their by-products and other irritants from the necrotic pulp tissue will diffuse from the root canal into the periapical tissue with resulting development of a periapical inflammatory lesion. The tooth could get progressively darker with time as the products of necrosis and gangrene penetrate the dentinal tubules. It could be argued that the pathological process described may explain the discolouration observed in the maxillary central incisor presented in this case report.

In conclusion, endodontic considerations are important in the management of avulsed teeth. All the complications of replantation observed in the case being reported might have been avoided if root canal treatment had been instituted shortly after replantation.

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