



PERIODONTAL OUTCOMES OF REIMPLANTATION OF AVULSED TOOTH: A REVIEW

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ABSTRACT

Reimplantation refers to the insertion and temporary fixation of completely or partially avulsed teeth that have resulted from traumatic injury. Reimplantation of an avulsed tooth depends on clinical conditions like physiological status of periodontal ligament (PDL), the stage of root development and the length of extra oral time. The prognosis of avulsion cases is very poor and many factors have been thought to affect their success rate. Combined clinical, radiographic and mobility findings indicated that healing after replantation could be divided into the following modalities Normal healing, replacement resorption, inflammatory resorption, ankylosis and gingival health. This article gives us the review of periodontal outcomes in reimplanted tooth.

KEYWORDS : Healing, Pulpal Reaction, Resorption, Ankylosis

INTRODUCTION:

The outcomes of tooth replantation can be divided into pulpal and periodontal reactions. Both the pulp and the periodontal ligament suffer extensive damage during an extra alveolar period with healing reactions almost entirely dependent upon the extra alveolar period and extra alveolar handling.

Pulpal Reactions

Experimental studies have disclosed various distinct pulp-dentinal responses which can occur after immediate replantation. The parameters studied with respect to the *pulpal healing* included: the development of pulp necrosis (PN), pulp canal obliteration (PCO), the ingrowth of bone into the root canal (PB) and pulp survival without radiographic change (PS)⁽¹⁾.

Criteria for the diagnosis of **pulp necrosis PN** includes Grey color changes in the crown, periapical radiolucency or inflammatory resorption and no sensibility measured electrometrically. Pulp necrosis, as manifested by a periapical radiolucency or inflammatory resorption, could usually be demonstrated after 3 weeks. In the present investigation, pulps in teeth with completed root formation were extirpated one to two weeks after replantation in anticipation of pulpal healing complications (i.e. periapical radiolucency and/ or inflammatory resorption). In teeth with incomplete root formation, weekly radiographic controls were performed in the first month after injury in order to allow possible pulpal revascularization or immediate intervention in the event of pulpal healing complications.⁽¹⁾

· **Pulp Canal Obliteration (PCO)** was described as either partial PCO, where the coronal pulp chamber was no longer visible, or total PCO, where the entire pulp canal was barely or no longer visible.⁽²⁾

· **Pulp Bone (PB)** was diagnosed when alveolar bone invaded the root canal. This condition was distinguished radiographically from PCO by the presence of a lamina dura and periodontal ligament (PDL) space within the root canal, which were continuous with the same structures located around the external surface of the root.⁽³⁾

· **Internal Resorption** (root canal resorption) was diagnosed when transient or permanent enlargement of the root canal occurred.

Various Pulp Reactions Following Experimental Replantation Of Incisors.

- I. Regular tubular reparative dentin
- II. Irregular reparative dentin with diminished tubular structures
- III. Irregular reparative dentin with encapsulated cells (osteodentin)
- IV. Irregular immature bone
- V. Regular lamellated bone or cementum
- VI. Internal resorption

Extensive pulpal changes could be observed as early as 3 days after replantation. The most severe damage was usually observed in the coronal part of the pulp. Signs of healing were seen within 2 week after replantation. Damaged coronal pulp tissue was gradually replaced by proliferating mesenchymal cells and capillaries. In the border zone between vital and necrotic tissue, neutrophils and round cells were present in some cases. In the majority of cases with long observation periods, more advanced healing was found. This healing process led to the formation of a new cell layer along the dentinal wall in regions where the odontoblasts had been destroyed. The mesenchymal cells along the dentinal wall usually did not have processes extending into the dentinal tubules. New hard tissue formation along the dentinal walls was noted after 17 days; but in most cases matrix formation started somewhat later. In the early stages of healing, a tissue was formed without dentinal tubules but with cell inclusions. Gradually, the cells along the pulp walls began to show similarities to odontoblast with cytoplasmic processes within the newly formed matrix. This apparently corresponded to the degree of differentiation; however, in areas where new hard tissue formation indicated total primary destruction of the original odontoblasts, complete normal conditions were never found.

Periodontal Healing Reactions: Immediately after replantation, a coagulum is found between the two parts of the severed periodontal ligament. The line of separation is most often situated in middle of the periodontal ligament, although separation can occur at the insertion of Sharpey's fibers into cementum or alveolar bone.

Proliferation of connective tissue cells soon occurs and, after 3 to 4 days, the gap in the periodontal ligament is obliterated by young connective tissue. After 1 week, the epithelium is reattached at the cement enamel junction. This is of clinical importance because it may imply a reduced risk of gingival infection and reduced risk of bacterial invasion of either the root canal or periodontal ligament via the gingival pocket. Gingival collagen fibers are usually

spliced, while the infra bony fibers are united in only a few areas at this time.

After 2 weeks, the split line in the periodontal ligament is healed and collagen fibers are seen extending from the cementum surface to the alveolar bone.⁽⁴⁾

Combined clinical, radiographic and mobility findings revealed that periodontal healing after re-plantation could be divided into the following groups.

Normal Periodontal Healing- If the mobility of the replanted tooth was equal to that of the control tooth, and there was no radiographic sign of root resorption.

External Resorption(root surface resorption) was divided into the following groups:

· **Surface Resorption** - If there was a cavity on the root surface bordered by a normal PDL space and lamina dura, or a shortening of the root apex, again bordered by a normal PDL space and lamina dura.

· **Inflammatory Resorption**-If there was radiographic sign of external resorption cavities affecting both the root surface and adjacent bone. Mobility values were high until arrest of the inflammatory process by interceptive endodontic therapy.

Permanent Replacement Resorption (ankylosis)- If there were lowered mobility values and loss of the PDL space radiographically. Moreover, a high metallic percussion sound could be elicited as well as no or decreased mobility values.

TRANSIENT REPLACEMENT RESORPTION - If there were lowered mobility values which later became normal.

Gingival Healing And Loss Of Marginal Attachment – Were evaluated clinically by probing the gingival sulcus at the follow-up visits. Values greater than 3 mm were considered pathologic. The level of the alveolar crest was analyzed radiographically. Periodontal status was considered normal if the distance between the cemento-enamel junction and the alveolar crest was not greater than 2 mm on a bisecting angle exposure. A greater distance was registered as pathological and considered as loss of marginal attachment.

Root Development following replantation of teeth with incomplete root formation was classified as continued root development, if the root of the replanted tooth achieved the same length and form as the contralateral non-injured control tooth; disturbed root development, if a deformed and usually shorter root developed; arrested root development, if development stopped at the time of injury.

The Healing Can Occur In Four Different Types:

1. Healing With A Normal Periodontal Ligament: Histologically, this is characterized by complete regeneration of the periodontal ligament.⁽⁵⁾ which usually takes about 4 weeks to complete, including the nerve supply. This type of healing will only occur if the innermost cell layers along the root surface are vital.

Radiographically, there is a normal periodontal ligament space without sign of Resorption. This type of healing will probably never take place under clinical conditions (i.e. after tooth avulsion), as trauma will result in at least minimal injury to the innermost layer of the periodontal ligament, leading to surface resorption.

2. Healing With Surface Resorption (repair-related

resorption): Histological, this type of healing is characterized by localized areas along the root surface, which show superficial resorption lacunae repaired by new cementum. This condition has been termed surface resorption, presumably localized areas of damage to the periodontal ligament or cementum, which have been healed by periodontal ligament-derived cells.⁽⁴⁾ In contrast to other types of resorption, surface resorption is not progressive and self-limiting and shows repair with new cementum. Most resorption lacunae are superficial and confined to the cementum. In cases of deeper resorption cavities, however, healing occurs, but without restoration of the original outline of the root. It should be noted that resorption lacunae with similar morphology and location have been reported on non-traumatized root surfaces with a frequency as high as 90 % of all teeth examined.⁽⁶⁾

Healing With Ankylosis (replacement resorption): Histologically, ankylosis represents a fusion of the alveolar bone and the root surface and can be demonstrated 2 weeks after replantation. The etiology of replacement resorption appears to be related to the absence of a vital periodontal ligament cover on the root surface.^(7,8) Replacement resorption develops in two different directions, depending upon the extent of damage to the periodontal ligament over the root: either progressive replacement resorption, which gradually resorbs the entire root, or transient replacement resorption, in which a once-established ankylosis later disappears

Progressive Replacement Resorption: is always elicited when the entire periodontal ligament is removed before replantation. It is assumed that the damaged periodontal ligament is repopulated from adjacent bone marrow cells, which have osteogenic potential and will consequently form an ankylosis.⁽⁹⁾

Transient Replacement Resorption: is possibly related to areas of minor damage to the root surface. In these cases, the ankylosis is formed initially and later resorbed by adjacent areas of vital periodontal ligament. This can be due to the effect of limited drying or limited removal of the periodontal ligament upon periodontal healing after replantation.

The ankylosed root becomes part of the normal bone remodeling system and is gradually replaced by bone. After some time, little of the tooth substance remains. At this stage, the resorptive processes are usually intensified along the surface of the root canal filling, a phenomenon known as tunneling resorption. Radio graphically, ankylosis is characterized by disappearance of the normal periodontal space and continuous replacement of root substance with bone.

Replacement resorption can first be recognized radiographically 2 months after replantation; however, in most cases 6 months or 1-year elapses.⁽¹⁰⁾ The percussion tone is high differing clearly from adjacent non-injured teeth.

3. Healing With Inflammatory Resorption (infection related resorption): Histologically, inflammatory resorption is characterized by bowl shaped resorption cavities in cementum and dentin associated with inflammatory changes in the adjacent periodontal tissue. The inflammatory reaction in the periodontium consists of granulation tissue with numerous lymphocytes, plasma cells, and polymorphonuclear leukocytes. Adjacent to these areas, the root surface undergoes intense resorption with numerous Howship's lacunae and osteoclasts.

Radiographically, inflammatory resorption is characterized

by radiolucent bowl shaped cavitation along the root surface with corresponding excavations in the adjacent bone. The first radiographic sign of inflammatory resorption can be demonstrated as early as 2 weeks after replantation and is usually first recognized at the cervical third of the root. As in the case of ankylosis, this resorption type is usually evident within the first 2 years after replantation. Clinically, the replanted tooth is loose and extruded. Moreover, the tooth is sensitive to percussion and the percussion tone is dull (compared with ankylosis).

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