



Current concepts in replantation therapy

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INTRODUCTION

Persons who sustain facial injuries may receive their initial treatment from a wide range of medical, dental and paramedical personnel. A common facial injury which may confront any of these health workers and general dental practitioners in particular is the situation in which one or more anterior teeth have been fractured, loosened or completely avulsed from their sockets. In the latter case, attempts should be made to preserve the patient's anterior dentition by tooth replantations.

Although tooth replantation is practised by many dentists, there are equally many who do not do so. The public, as well as our medical colleagues, are becoming more and more aware that tooth replantation should be done wherever possible, so this short paper is to summarise, for the general practitioner, a reasonable approach to treatment based on current research in this field.

Factors affecting the prognosis: (a) **Extra Alveolar Period.** Andreasen (1972) has shown very clearly that the time that the tooth is out of its socket (the extra-alveolar period or EAP) is one of the most important factors influencing the prognosis after tooth replantation. The shorter the EAP the better will be the prognosis. The viability of the soft tissues, which is essential for successful periodontal fibre re-attachment to the tooth root is rapidly lost as the EAP is prolonged. For example, if the EAP is less than 30 minutes, there is a 90 per cent chance of long term success. Thereafter the success rate diminishes rapidly as the EAP increases so that if the EAP is 120 minutes or longer only 10 per cent of replanted teeth have been found to survive for a prolonged period of time.

Every effort must be made to minimise the EAP as much as possible. This can be accomplished in the following manner:

- (i) As soon as the dentist, or his staff, is notified of the accident he should request that the tooth or teeth be rinsed in water and for somebody, e.g. a parent, to attempt to replant the tooth or teeth immediately, before travelling to the surgery for treatment.
- (ii) If the patient presents at the surgery, the dentist should, after a rapid clinical assessment, replant the tooth immediately, without removing any blood clot from the socket. This can even be attempted without local anaesthesia. Minutes count at this stage so further clinical assessment, including radiographs, should be delayed until after replantation.

One must remember that it is not the onset of splinting that is vital but the period that the tooth is out of its natural environment, the socket.

(b) **Storage of the tooth.** The storage of the tooth during transportation to the dentist, should replantation at the site not be feasible, is another important factor. Dehydration of the root surface must be minimised in an attempt to preserve periodontal tissue viability. This is most easily achieved by keeping the tooth in the buccal sulcus of the patient. Normal saline is of course an ideal storage medium. If this is not readily available, as is usually the case, then simply wrapping the tooth in moistened cotton wool, gauze or a handkerchief will suffice. The important point is that the tooth must be kept moist.

(c) **Handling of the tooth.** Care should also be exercised in the handling of the tooth itself, in particular the handling of the root surface, a point often difficult for untrained personnel to grasp. Both they and the dentist should avoid touching the root surface with instruments or fingers and confine the handling of the tooth to the crown. Artery forceps or upper anterior extraction forceps are the most convenient instruments for this and help to avoid the all too common mishap of dropping the tooth onto the surgery floor. This precaution is aimed at preventing further damage to the traumatised periodontal ligament.

(d) **Splinting of the tooth.** Retention of the replanted tooth may be achieved using any one of many splinting methods. Splinting should stabilise the replanted tooth but should not immobilise it completely as less ankylosis is likely to occur under these conditions (Andreasen 1975). Of the many tooth splinting techniques available, the dentist should select the one he feels best able to use. We favour the construction of a self-cured acrylic splint to cover three or more teeth adjacent to the replanted tooth (Fig. 1). This splint can be made intra-orally after the replantation in the following manner. The crowns of the replanted teeth are covered with three or four layers of aluminium kitchen foil, suitably trimmed to size, and held in place with soft wax. Some self-curing acrylic is then mixed and, when pliable, is moulded, with the fingers, over the metal foil and the adjacent teeth. By continually removing and repositioning the curing acrylic splint undercut will be reduced. The cured acrylic splint is then suitably trimmed and polished and finally cemented to the adjacent teeth and the foil covering the replanted tooth using either carboxylate or oxyphosphate dental cement. Just prior to final cementation of the splint, an opening about 3 mm in diameter should be cut into the splint overlying the palatal area of the replanted tooth. This will facilitate root canal therapy, should it be necessary before splint removal, and will also allow excess cement to escape. The main disadvantage of the cemented acrylic splint is interference with normal bite and function, however, this disadvantage may be minimised by

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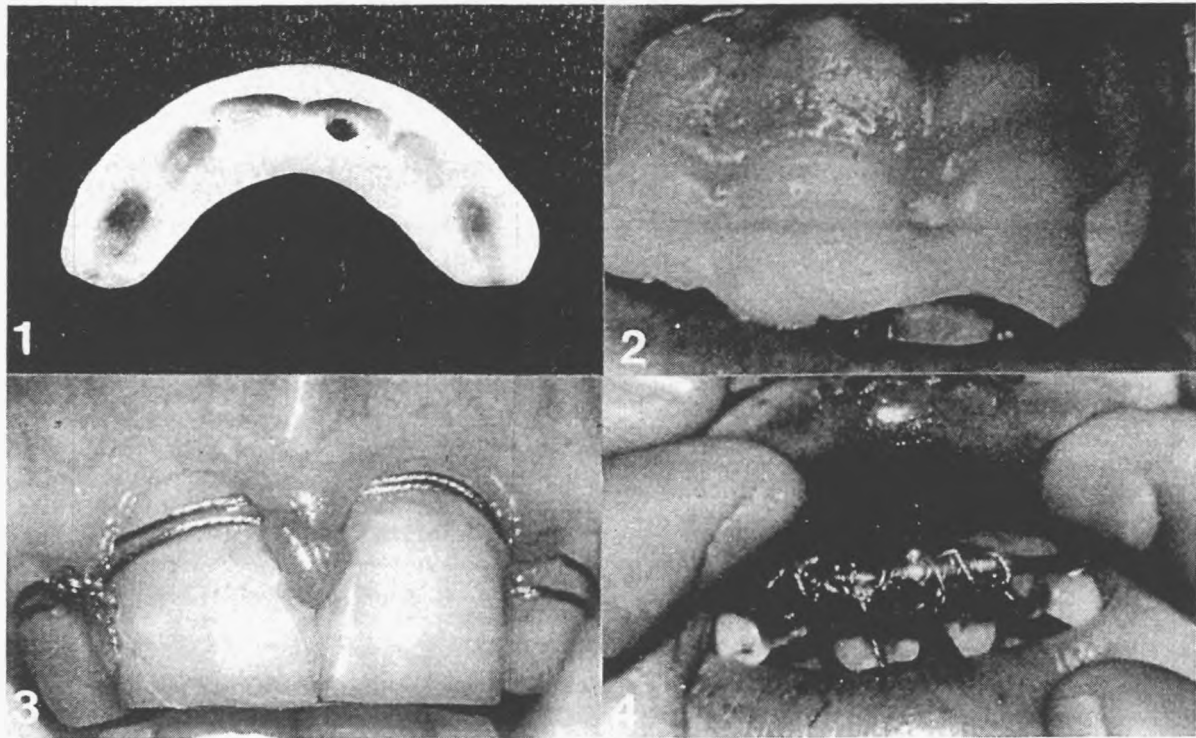


Fig. 1. Self-cured acrylic splint. Note the palatal opening to facilitate later pulp removal if necessary.

Fig. 3. Figure-of-eight interdental wiring of experimentally replanted central incisor teeth in a vervet monkey.

Fig. 2. Replanted upper right central incisor splinted to the adjacent teeth using the acid-etch technique (Restodent).

Fig. 4. Labial bars combined with a loop to support a replanted upper right central incisor (by kind permission of Dr. J. Lownie).

judicial grinding in and careful postoperative instruction to the patient.

The duration of the splinting period has been examined in detail by Andreasen (1975) who has clearly shown that this should optimally be between seven and ten days. Prolonged splinting may facilitate the development of ankylosis which in turn will be followed by resorption and eventual loss of the tooth. Early function seems to prevent this ankylosis or even encourage resorption of a small amount of ankylosis if this is already present.

After a suitable retention period, the cemented acrylic splint can be forcibly removed and the replanted tooth should not be dislodged because the foil protects the replanted tooth from the cement.

Other good techniques which may be employed include the use of the acid etch techniques (Fig. 2) to splint the replanted tooth to the firm adjacent teeth. This technique requires the maintenance of a dry operative field whilst the material is curing, which may not easily be achieved in the bloody, post-traumatic period.

Figure-of-eight interdental wiring (Fig. 3) may be employed, using thin stainless steel wires or even dental floss. This interdental wiring may be combined with labial or palatal bars. (Fig. 4).

(e) **Endodontic therapy.** Root canal therapy has been shown both clinically (Andreasen & Hjorting-Hansen 1966a, 1966b) and experimentally (Knight, Gans & Calandra 1964 and Barbakow, Austin & Cleaton-Jones 1977) to improve the prognosis after replantation. Toxic elements in the necrotic material in the root canal

may diffuse through the dentinal tubules of the root and initiate inflammatory resorption of the root surface (Andreasen 1966a, 1966b). This resorption is rapid and progressive if left untreated. It is important that the root canal therapy should not be carried out prior to replantation of the tooth as this procedure will unnecessarily prolong the length of the extra-alveolar period. Root canal therapy should preferably be performed after the replantation and, ideally, after the splinting period. It should only be done if there is radiographic evidence of apical pathology or inflammatory resorption.

(f) **Antibiotic therapy.** In all cases antibiotics should be administered as one is dealing with a contaminated wound. If soiling of the tooth is marked then the antibiotic therapy should be combined with 0.5 ml of tetanus toxoid administered by intra-muscular injection.

Summary of recommendations

1. Keep a kit of the necessary instruments for tooth replantation in a convenient place. This should include:
 - (i) Local anaesthetic and syringe
 - (ii) endodontic instruments
 - (iii) Forceps for holding tooth
 - (iv) physiologic saline (0.9%) and sterile petri dishes
 - (v) splinting materials, e.g. self-cure acrylic kit, aluminium foil and wax, thin ligature wire or acid etch material as the dentist prefers.
 - (vi) oxyphosphate or carboxylate cement
2. Always replant the tooth as soon as possible— anyone may do this.
3. Always keep the tooth moist before replantation.

4. "Always avoid handling the periodontal ligament surface.
5. "Always give antibiotics and, if necessary, tetanus toxoid as well.
6. Follow up adequately:
 - 1 week - remove splint if possible
 - 2 weeks - radiograph - check for pulpal necrosis
 - 3 weeks - radiograph - check for inflammatory resorption
 - 6 weeks - radiograph - check for replacement resorption
 If pulpal necrosis or inflammatory resorption is present, endodontic therapy must be carried out.
7. Give adequate analgesia after replantation.
8. Splint in as short a time as possible.
9. Always reassure the patient and the family. NOTE: We have copies of Dr. Andreasen's printed instructions to patients and parents, a copy of which we will gladly send to colleagues on request.

Remember that the prognosis is not predictable and tell the patient and parent this.

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