

Orthodontic splints in dental traumatology

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The pediatric dentist is often involved in the treatment of the maxillary anterior dentition following trauma.

Traumatic injuries have been classified in various ways, but the easiest and accepted classification system divides these conditions into:

- a) trauma affecting the tooth, **infractions** and **fracture of crown and root**,
- b) trauma affecting the periodontium: **concussion**, **subluxation**, **luxation**, and **avulsion**.

Except for concussion which is characterized by sensitivity without abnormal mobility, trauma affecting the periodontium is usually treated with splinting of dental elements to permit good stabilization during the healing period.

The **requirements** for an acceptable splint are:

- 1) easy and fast procedure
- 2) to allow endodontic and conservative therapy
- 3) to have an high degree of vertical elasticity (to prevent ankylosis)
- 4) to be esthetically acceptable
- 5) easy and safe debonding procedure
- 6) adaptable even in dentitions with partially erupted, missing, or widely spaced teeth
- 7) permit a good oral hygiene

Some authors propose a rigid bar fixation with adhesive bonding material (Kin 1977, Simonsen 1977) while others advocate the use of light round wire such as .018" Australian wire (Hagg, Rundquist 1983) with small round loops, both attached to the buccal surfaces of the teeth.

In our opinion, and according with Hovland, Gutman 1976, and Caprioglio, Lavagnoli 1982 the orthodontic splint is preferable.

In our experience the use of metal edgewise brackets with pre-coated and light cured adhesive speeds up the procedure. The correct amount of material, the fast and

controlled curing is very useful considering that in the traumatized patient there is usually profuse bleeding.

Metal brackets, although less aesthetic, are preferable to ceramic ones since the latter can traumatize the teeth during debonding.

Metal brackets should also have a thin base to allow easy debonding, by squeezing mesially and distally with a pair of pliers. This permits comfortable debonding, especially on traumatized teeth

Particular attention should be paid in positioning the brackets since a "super elastic" wire such as .014" Nickel Titanium wire is preferable to prevent ankylosis. The bracket slots should be lined up since NiTi wires cannot be easily bent.

The wire should passively engage the affected teeth. When a preformed Ni-Ti wire can't be used because of a severe malocclusion or missing teeth, a .014" Australian wire is in our opinion the second choice for its easy adaptability.

In the case of luxation or avulsion, a period of 3-4 weeks is usually sufficient for good healing. A longer stabilization period will expose the patient to a higher risk of ankylosis with root resorption.

In conclusion despite the fact that good research articles such as that of Anreassen J.O. Hjorting-Hansen (1996) involving a radiographic and clinical study of 110 human replanted teeth couldn't demonstrate a correlation between the type and length of fixation and the results of replantation, clinically we feel that this kind of splint should be better for the patient but we are also certain that this procedure can make our work easier and faster.

Case report 1

This case report was presented at: **VII World Congress of Dental Traumatology**
- Firenze 9-11 May 1996-

The patient, a 15 year old boy was the victim of a hit and run car accident while crossing the road at a pedestrian crosswalk.

His upper left central incisor was avulsed. Fortunately for the boy, the only serious damage was the tooth avulsion.

He was seen in the emergency room.



The boy's father had picked up the tooth and kept it dry in his pocket, and within 2 hours he called the specialist.

Instructions for the correct storage were given while the doctor and the young patient were going to the office. The tooth was immediately placed in physiological saline

solution with a fluoride rinse, and a control radiograph was taken to assure there was no fracture in the socket.



An orthodontic appliance with .022" x .028" Roth pre-coated brackets with light cured adhesive was bonded from upper cuspid to cuspid. An 0.014" Australian wire was used. This type of splint was preferred for the functional stimuli in preventing ankylosis and root resorption.

The pulp chamber of the tooth was open keeping it from the crown, and particular care was given to keeping the periodontal ligament moist during each step of treatment and to protect it from any accidental outside contamination. After removal of the pulp, the tooth was rinsed with chlorhexidine, the root canal was dried and filled with calcium hydroxide, then the canal was prepared again and filled with gutta percha.

A composite filling closed the tooth, and the reimplantation was complete. A suture was used on the gingiva.

Antibiotics (Penicillin) and anti-inflammatory (Nimesulide) drugs were administered immediately after replantation and prescribed for five days.

Clear instructions were given to the patient regarding proper chewing and rigid oral hygiene was recommended.

A week later a control radiograph was taken.



A month later the splint was removed.



After two months a new control radiograph was taken, and the incisal corner of the upper lateral left incisor was restored. Periodical check-ups were made every month and one year and half later a new radiograph was taken to evaluate the condition of the root.



Conclusion: Under certain conditions, a tooth can remain free of resorption after a replantation and maintain normal function. However, the length of time between avulsion and replantation is critical in determining the results. When this time exceeds 90 minutes, the frequency of healing is significantly lowered.

Now the question is..... how long does this tooth escape from resorption ?

Case report 2

This case report was presented at: **VII World Congress of Dental Traumatology**
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Preface:

The maxillary primary incisors are essential for aesthetics, mastication, speech development, the avoidance of deleterious habits, to maintain space for permanent teeth on the arch, and to limit the eruption of the opposing teeth.

Because trauma to primary incisors is most likely to occur between the ages of 1.5 and 2.5 years it is mandatory for the practitioner to recognize and treat the different types of trauma.

In this case the patient has been treated with a double replantation.

The patient, a boy aged 3 years and 10 months was referred by a general dentist. He presented with total avulsion of the maxillary primary central incisors. The trauma occurred while he was playing in kindergarten.



The child was in the office only 5 hours later because the emergency doctor had told the mother that nothing could be done for the teeth. The teeth were immediately immersed in

physiological saline solution with a fluoride rinse, and a psychological approach was taken by explaining every step of the procedure to the young child while allowing him to stay in his mother's arms.

Fortunately the child was very cooperative and it was quite simple to place the splint. An orthodontic splint was the splint of choice since according to the literature, it is preferable for the functional stimuli in preventing ankylosis.

Something similar occurs in insufficiently splinted bone fractures.

Considering the dry storage for 5 hours and the opportunity of a fast procedure without medicaments, the decision to postpone endodontic treatment was made.



An orthodontic appliance with .022" x .028" Roth pre-coated brackets with light cured adhesive was bonded from upper primary cuspid to cuspid.

An 0.014" Nickel Titanium wire was used because its high degree of elasticity is considered to be beneficial in preventing ankylosis.

Antibiotics (Penicillin) and anti-inflammatory (Nimesulide) drugs were administered immediately after the replantations and prescribed for five days.

Extreme care was suggested in the diet and a fluoride rinse was given to the mother recommending the best oral hygiene for the child. After 24 hours an intra-oral control radiograph was taken and endodontic treatment was initiated.



The pulp chamber was accessed and the necrotic tissue was gently removed.

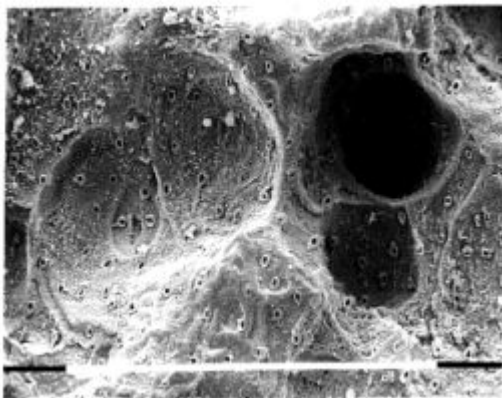
The tooth was washed with chlorhexidine and the root canals were filled with calcium hydroxide.

Two definitive composite fillings closed the teeth. After a week a checkup was done, and after 4 weeks the brackets were removed.

The mobility of the replanted teeth was normal and a small restoration was done on the mesial incisal edge of the upper left lateral incisor which was fractured during the trauma. Periodical checkups were done monthly and eleven months later the upper right central incisor exfoliated spontaneously and the root was almost completely resorbed.



The other replanted tooth is now nearing exfoliation. The exfoliated tooth, observed under S.E.M. (Philips 515 A-10 Kw) was previously prepared with NaCl, several washings with water, disidratation with alcohol higher step, acetone, critical point with CO₂, and metallized with gold 10 nm, has shown a normal root resorption pattern with the palatal wider surface as usual.



Conclusion:

This case report shows that deciduous teeth can be replanted and the ankylosis of the roots is not a strict rule even if the extra-oral time is high (5 hours).

Ours efforts are fully rewarded because we resolved aesthetics, phonetics and psychological barriers in addition to those related to the growth of the premaxilla and to the eruption.



References:

1. J.O. Andreasen
The effect of splinting upon periodontal healing after replantation of permanent incisors in monkeys. *Acta Odontol.Scand.* 1975;33:313-23
2. U.Hagg L. Rundquist.
A method for One-step Fixation of Traumatized and Transplanted Teeth. *J. Int. Ass.Dent.Child.* 1983 14:89-95
3. D.P.Durr, O.B.Sveen: Pulpal responses after the avulsion and replantation of permanent teeth. *The journal of pedodontics* 11:301,1987
4. J.O. Andreasen E. Hjorting-Hansen
Replantation of teeth: Radiographic and clinical study of 110 human teeth replanted after accidental loss. *Acta Scand.* 1996;24:263-86
5. Irwin Fried et al.
Subluxation injuries of maxillary primary anterior teeth: epidemiology and prognosis of 207 traumatized teeth. *Pediatr Dent* 1996;18:2:145-51

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