

Tips for splinting traumatised teeth

There are a lot of things to consider when splinting a tooth but when done right, it is a very useful and effective technique.

A splint is required when teeth are mobile or need to be repositioned following a traumatic injury. The aim of splinting is to stabilise the injured tooth and maintain its position throughout the splinting period, improve function and provide comfort. Current best practice guidelines from the International Association for Dental Traumatology (IADT) recommend splinting for luxated, avulsed, root fractured and traumatically loosened permanent teeth.^{1,2} Splinting of primary teeth is usually not feasible. In general, the prognosis of a traumatised tooth is determined by the type of injury rather than the type of splint.³ However, correct splinting is important to maximise healing of the soft and hard tissues, and prevent further injury.¹⁻⁶

An effective splint should be functional, meaning it incorporates at least one uninjured tooth on either side of the traumatised tooth or teeth. This can be difficult in mixed dentition, where there are mobile primary teeth, partially erupted teeth or no adjacent teeth. In such cases, a longer span may be required to achieve stability.

It is important that splints are flexible, allowing for physiological tooth movement. This is an important factor in healing within the periodontal ligament. IADT guidelines¹ recommend flexible splinting for all types of injury except alveolar fracture, where it is not specified (**Table 1**). Rigid splinting is associated with an increased prevalence of replacement root resorption and pulp canal obliteration during healing, especially when in situ for more than 14 days.^{4,6}

Table 1: IADT splinting recommendations

Injury type	Splint type	Splinting duration
Subluxation	Flexible	Two weeks (only if required for comfort)
Extrusive luxation	Flexible	Two weeks
Avulsion	Flexible	Two weeks (or four weeks if dry time >60 mins)
Intrusive luxation	Flexible	Four weeks
Lateral luxation	Flexible	Four weeks
Root fracture	Flexible	Four weeks (up to four months depending on fracture location)
Alveolar fracture	Not specified	Four weeks

Splints should be comfortable for the patient, allow adequate oral hygiene, and not irritate the soft tissues. A study subjectively comparing different splint types in 10 volunteers reported that composite wire splints and titanium trauma splints were the most acceptable. Bracket splints caused most interference with lips and speech.⁷

In addition, effective splints should:

- ▶ allow pulp sensibility testing and endodontic access;
- ▶ not interfere with the occlusion; therefore, a labially-placed splint is most common; and,
- ▶ be easy to apply and remove without causing iatrogenic damage to the tissues.

Splinting techniques

Wire secured to the teeth with composite (**Figure 1**) is the most favoured and widely-used splint, and can be used in almost all types of tooth injury. A clinical step-by-step technique is depicted in **Figures 5-5d**, and the Dental Trauma Guide also provides detailed instructions.² Always protect the airway. The stainless steel wire should be pre-contoured to conform to the teeth and the diameter must not exceed 0.4mm to remain flexible.⁴ The wire used should be passive in nature and not exert any unwanted orthodontic forces. Avoid excessive composite, which will limit the splint's flexibility.⁴ Composite should not encroach on the embrasure spaces or the gingival margin. Contrasting shades of composite should be used in order to facilitate removal.

Alternative splints include:

- ▶ fishing line nylon is used to replace the wire and offers an inexpensive and aesthetic alternative;
- ▶ orthodontic brackets and wire splints are useful if orthodontic alignment of the displaced tooth is desired in addition to splinting;
- ▶ composite resin splints are quick to apply but can lead to gingival irritation as they can be very difficult to clean⁷ and prone to fracture – composite splints are rigid and therefore not recommended;¹⁻⁴ however, a Protemp splint (**Figure 2**) can be useful as a temporary emergency measure;
- ▶ fibre splints (**Figure 3**) consist of weaved polyethylene fibres (Ribbon) or glass fibres in a polymer-resin gel matrix (EverStick) – they reportedly have



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FIGURE 1: Composite and wire splint.



FIGURE 2: Resin splint (Protemp 3M ESPE).



FIGURE 3: Fibre splint (Ribbond).



FIGURE 4: Titanium trauma splint (Medartis).



FIGURE 5: Step-by-step placement of a composite wire splint to stabilise a crown root fracture in tooth 11 and allow endodontic access.



FIGURE 5a: Clean and dry teeth and reposition fracture.



FIGURE 5b: Isolate the teeth, then etch and bond the mid-labial surface.



FIGURE 5c: Bond fracture together to stabilise and place base composite on labial surfaces.



FIGURE 5d: Stabilise pre-contoured wire and cure composite onto adjacent uninjured teeth first, then reposition traumatised tooth and add composite to secure. Ensure that there are no sharp edges.



FIGURE 6: Avulsion in tooth 21 and root fracture in tooth 11 in eight year old splinted for four months. Note that the splint extends posteriorly, and partially-erupted lateral incisors are not included to avoid interference with eruption.

high strength, are very easy to adapt and are aesthetic;

- ▶ titanium trauma splints (Figure 4) are flexible titanium splints with a rhomboid mesh structure – secured to teeth with flowable composite,^{4,5} they are easy to place and remove, but high cost is an issue;
- ▶ suture splints may be required if there are multiple missing teeth, or in the mixed dentition where conventional splinting is not possible; and,
- ▶ a removable Essix retainer splint can be of use where multiple teeth are involved.

Splinting duration

Shorter splinting durations appear favourable, as prolonged and rigid splinting is thought to promote replacement resorption.^{3,4,6} Current IADT guidelines¹

recommend different immobilisation times depending on the injury type and tissues involved in healing (Table 1). Only one week is required to obtain a strong gingival attachment following repositioning;^{3,4,6} however, where there is an associated bony fracture, such as in lateral luxation injuries or alveolar fracture, longer splinting times are recommended. When prolonged splinting is required, extra care is required that the wire is not impeding eruption in the mixed dentition (Figure 6). The importance of excellent oral hygiene following splint placement must be emphasised to the patient. IADT guidelines also recommend appropriate review intervals following dental injuries.^{1,2}

Splint removal

Correct splint removal is as important as placement. Aggressive removal can



FIGURE 7: Different composite removal techniques.



FIGURE 8: Top tip! When approaching the enamel–resin interface, rub articulating paper over the tooth surface and it will mark only the residual composite, guiding your final polishing.

damage the teeth but insufficient removal favours plaque retention and decalcification.^{5,8} There is no standard protocol for the removal of composite resin materials but commonly-used techniques, including pliers, hand scalers, burs and polishing disks (Sof-Lex, 3M ESPE), are shown in **Figure 7**. A study reported that composite removal with abrasive discs (using progressively finer discs) and tungsten carbide burs (in a slow hand piece) result in the smoothest enamel surface, but all techniques reportedly cause some iatrogenic damage.⁸ Hand scalers, ultrasonic scalers and diamond burs cause the most enamel surface roughness so are not recommended. Final polishing is facilitated by the use of magnification³ and articulating paper is useful to mark the residual composite once the operator approaches the resin–enamel interface to prevent iatrogenic damage to the enamel (**Figure 8**).

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