splints are found to be more irritating to the lips compared to the wire and composite, composite or titanium trauma splints. Care should be taken to avoid the application of orthodontic forces on the teeth. Orthodontic wires are never passive and generate forces that range up to 27.33 x 10^2 N, which may result in tipping of the incisors. The advantage of an orthodontic splint is that simultaneous tooth movement and tooth repositioning is possible when desired. It should also be noted that rectangular wires or wires made of nickel titanium are not recommended, since the force developed by these wires is higher than when round/square stainless steel or cobalt-chrome wires are used. This may be due to the higher elasticity of the nickel titanium wires.

Wire and composite splints

This was introduced by O'Riordan et al. who used a thin flexible wire of diameter 0.3–0.4 mm as a splint. It is a semi-rigid splint secured by light cured composite resin (Figure 7). The wire and composite splint is the most favoured and routinely used splint for immobilizing a traumatized tooth, as it meets most of the demands of modern tooth fixation. This splint can be used in almost all types of tooth injuries. The composite material is placed over the wire on the labial portion without extending into the interdental area. The amount of composite that covers the wire will influence the rigidity of the splint, since it reduces the free and deformable section of the wire. The diameter of the wire used also determines the rigidity of the splint. The less the diameter of the wire used, the more flexible the splint. Thus a wire of diameter 0.3 or 0.4 mm was found to be more flexible than a 0.5 mm wire. The only situation where wire and composite splints cannot be used are on teeth with artificial crowns, large fillings where etching of the surface is not possible, teeth restored with porcelain veneer, or where the adjacent teeth are absent. It may be difficult but not impossible to place this splint on teeth with smaller crowns.

Bonding between the wire and the composite was a concern. In a study conducted by Jacob and Nandlal, to evaluate the optimal method of enhancing the wire-composite bond strength of dental splints, they found the bond between the stainless steel wire and the composite could be improved by sandblasting the wire.

Fibre splints

This was introduced by Smith in the 1960s and popularized by Andersson et al. in 1983. The main advantage of the fibre splint is that it does not require any laboratory assistance and is bonded directly onto the teeth (Figure 8). It has good strength, less volume and is aesthetic and repairable. Fibre-reinforced composites are resin-based materials containing fibres aimed at enhancing their physical properties. The fibres used are heterogeneous and varied, depending on the nature of the fibre, the geometrical arrangement of the fibres and the overlying resin material. The fibres commonly used are glass, ultra-high strength polyethylene fibre and Kevlar fibres. The properties of the splint depend on the pattern of arrangement of the fibres (unidirectional, meshwork design or woven arrangement). Key factors which influence the physical properties of fibre-reinforced structures are:

- Fibre loading within the restoration;
- Effectiveness of the bond between the fibre resin interface;
- Fibre orientation and fibre position in the restoration.

The commonly used bondable reinforced fibres in clinical practice are:

- Ultrahigh molecular weight polyethylene fibres – Ribbond (Ribbond), Connect (Kerr);
- Glass fibres – GlasSpan (GlasSpan) and Fibre Splint ML (Polydentia);
- Fibres pre-impregnated with resin – Vectris (Vivadent), StickNet (StickTech) and FibreKor (Jeneric/Pentron).

Ribbond is a biocompatible, aesthetic material made from polyethylene fibre, which was in use until recently. The present day splints utilize siliconated E-type glass fibres (EverStick, Stick Tech Ltd, Turku, Finland) embedded in a BISGMA matrix and surrounded by PMMA interpenetrating Polymer Network with good flexural strength of 1280 Mpa.

Titanium trauma splints (TTS)

The TTS is a new device developed by von Arx et al. It is made of pure titanium and is 0.2 mm thick and 2.8 mm in width (Medartis AG, Basel, Switzerland) (Figure 9). It has a rhomboid mesh structure, making it flexible, to allow for physiologic tooth movement. It can easily be adapted to the contour of the dental arch with fingers without the need for additional pliers. It is easy to cut with any cutting instrument. A TTS splint of about 52 mm is required to extend the splint from canine to canine. As it is thin and flexible it can be easily adapted to the desired position. A thin layer of flowable composite is placed into the rhomboid opening of the splint after the application of etch and bonding agent.

The splint placement comparison study by von Arx et al. demonstrated that titanium trauma splints are the easiest and least time consuming to apply (8.5 ± 0.76 min) compared to the wire and composite splint (10.1 ± 1.29 min) or the bracket splint (13.1 ± 0.94 min). The amount of composite used to bond the splint to the tooth is small, within the rhomboid opening, making it easier to remove the splint after its use. It was also observed that TTS was comfortable for the patient because it was less bulky and did not hinder speech or oral hygiene practice.