Titanium Trauma Splint: An Alternative Splinting Product

Aly Adatia, *BSc, DDS;* ***David J Kenny,*** *BSc, DDS, PhD, FRCD(C)*

"Clinical Showcase" is a series of pictorial essays that focus on the technical art of clinical dentistry. The section features step-by-step case demonstrations of clinical problems encountered in dental practice. If you would like to propose a case or recommend a clinician who could contribute to this section, contact editor-in-chief Dr. John O'Keefe at jokeefe@cda-adc.ca.

Dental injuries such as extrusion, severe intrusion, lateral luxation, severe subluxation and avulsion often require stabilization to facilitate repair or regeneration. Light wire and composite resin (**Fig. 1**), button-bracket orthodontic and resin bandage splinting techniques are time consuming and technique sensitive, and a dentist and an assistant are required for optimal results.[1] Once placed, these splints may be uncomfortable because of their bulk, they may hinder oral hygiene, and some splints may cause short-term speech impairment.[2] The titanium trauma splint (TTS) (Medartis AG, Basel, Switzerland; North American agents: Medartis Inc., Kennett Square, Penn.), which has recently been made available in Canada through Patterson Dental, offers solutions to many of these problems and has been in use at the Toronto Dental Trauma Research Unit since 2005. The TTS is just 0.2 mm thick and can therefore be readily adapted to the patient's dentition and is easily inserted and removed by a clinician working alone. This splint facilitates oral hygiene, limits tooth mobility because of its rhomboid mesh structure and is more comfortable than wire and composite resin splints.

Case Report

A 16-year-old male presented with avulsion of teeth 11 and 21. The incisors had been stored in water for 6 hours before presentation. The apices of both incisors were mature. After discussion with the patient and his parents, the decision was taken to perform extraoral root canal therapy and to replant the 2 incisors.

Endodontic therapy consisted of access, biomechanical preparation and obturation with gutta-percha and sealer. Coronal access was closed with a base of glass ionomer cement (Photac-Fil cement, 3M ESPE, Minneapolis, Minn.), and a final restoration of composite resin (Z100 resin, 3M ESPE) was placed. Finally, the root surfaces were debrided of adherent periodontal ligament[3] by polishing with flour of pumice in a rubber cup. The incisors were stored in normal saline before replantation.

Following provision of local anesthesia, the injury site was thoroughly

Figure 1: Wire and composite resin splint.

Figure 2: Titanium Trauma Splint (TTS) used as a template for placement of acid etch gel.

Figure 3: Acid etch gel in place.

Figure 4: Appearance after gel has been washed off and etched teeth have been dried.

Figure 5: Placement of bonding agent.

Figure 6: TTS being tacked in place and light cured.

Figure 7: Temporarily bonded TTS holding all teeth in place.

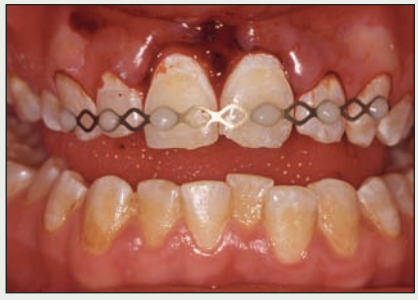

Figure 8: TTS finished and secured with flowable composite.

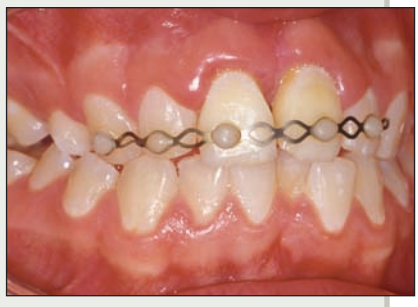

Figure 9: TTS at time of splint removal.

irrigated with normal saline and moistened gauze. Any clotted blood remaining in the sockets was gently curetted and the socket rinsed with normal saline. The incisors were then replanted with help from the patient and his parents to identify their original positions. Before splinting, occlusion was assessed to ensure that there were no interferences.

Splinting Procedure

A 52-mm TTS splint was adapted to match the patient's dentition and arch form. With the TTS held in the desired position, 37% phosphoric acid was applied to the rhomboid openings in the splint (**Figs. 2** and **3**); 30 seconds later, the splint was removed, the acid was rinsed off and the teeth were allowed to dry (**Fig. 4**). The splint was also rinsed to remove etchant. Bonding agent (Scotchbond, 3M ESPE) was then applied to the etched areas (**Fig. 5**) and the splint placed such that the openings matched the etched sites. The bonding agent was then light cured for 10 seconds with a LED light to tack the splint in place peripheral to the avulsed teeth (**Figs. 6** and **7**). Flowable composite resin (Filtek Supreme Plus resin, 3M ESPE) was then applied to the openings in the TTS mesh on the teeth adjacent to the injured teeth and light cured (**Fig. 8**). Only a thin layer of flowable composite is required to fill the openings, which minimizes the need for finishing and trimming. Once the adjacent, noninjured teeth were secured to the TTS, the 2 replanted incisors were secured to the TTS using the same technique. Final trimming of the splint to remove excess length and to smooth sharp edges was completed with a fine diamond bur. If necessary, the resin may be trimmed with a finishing bur to reduce bulk and ensure comfort.

A final check of occlusion was performed and the patient was given instructions for care. A radiograph was taken with the splint in place as a reference for re-assessment appointments.

After an appropriate interval, the radiographic examination was repeated and the splint removed (**Fig. 9**). The interval between examinations and the decision to remove the splint will vary with the particular injury. A carbide or diamond bur was used to separate the affected teeth from the remainder of the splint (**Figs. 10** and **11**), and a

Figure 10: TTS being cut to separate the replanted teeth from the rest of the arch.

Figure 11: Appearance after TTS has been peeled off all but the replanted teeth.

Figure 12: Composite reduced to the level of the TTS for easy removal by peeling back.

heatless green stone was used to reduce the composite resin to the level of the splint (**Fig. 12**). The TTS was then peeled off (this can be done by hand or with hemostats). Final polishing and removal of the residual composite was achieved with finishing disks to minimize enamel damage and reduce sensitivity.

Conclusions

The TTS can be applied in much less time than a custom light wire and composite splint, and removal and clean-up are much easier. The adaptability of the splint to adjacent teeth facilitates the etch-bond stage, as the splint can be easily tacked to adjacent teeth before application of flowable composite. These features make it much easier for a clinician working alone to stabilize the splint in the presence of oral injury and bleeding. The esthetics, ease of cleaning and comfort are apparent in the figures, and tooth mobility can be controlled by application of resin between the joints if more rigidity is desired. The costs for light wire splints are minimal, and the amount of composite resin used is approximately the same. The cost of the TTS is approximately Can$57, which is billed as a laboratory fee. Sports dentists or dental emergency clinicians who treat trauma would benefit most from the ease and time-saving features of this splint. Benefits to the patient are comfort, ability to keep the device clean and overall appearance.

THE AUTHORS

Dr. Adatia *is in private practice in Kitchener-Waterloo, Ontario.*

Dr. Kenny *is staff pediatric dentist and senior associate scientist, Research Institute, The Hospital for Sick Children. He is professor of dentistry, University of Toronto, and a member of the Toronto Dental Trauma Research Group.*

Correspondence to: *Dr. David J. Kenny, Department of Dentistry, The Hospital for Sick Children, Toronto, ON M5P 2C9. Email: david.kenny@sickkids.ca.*

The authors have no declared financial interests in any company manufacturing the types of products mentioned in this article.

References

1. von Arx T, Fillipi A, Lussi A. Comparison of a new dental trauma splint device (TTS) with three commonly used splinting techniques. *Dent Traumatol* 2001; 17(6):266–74.

2. Filippi A, von Arx T, Lussi A. Comfort and discomfort of dental trauma splints — a comparison of a new device (TTS) with three commonly used splinting techniques. *Dent Traumatol* 2002; 18(5):275–80.

3. Kenny DJ, Barrett EJ, Casas MJ. Avulsions and intrusions: the controversial displacement injuries. *J Can Dent Assoc* 2003; 69(5):308–13.