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Practice Forum

Dynamic hinged orthosis following a surgical reattachment and therapy protocol of a distal triceps tendon avulsion



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Triceps avulsion injuries are not very common injuries. These authors describe an orthosis and protocol they utilized to successfully treat a client following a triceps avulsion injury. – VICTORIA PRIGANC, PhD., OTR, CHT, CLT, Practice Forum Editor

Triceps avulsion

Triceps avulsions are very uncommon injuries, occurring in less than 1% of upper extremity cases. Many of these avulsions take place at the distal insertion of the triceps.¹ Current literature includes reports of triceps rupture after a traumatic injury, surgical procedure, total elbow arthroplasty, or after spontaneous conditions such as endocrine disorders, steroid use, renal failure, and chronic olecranon bursitis.^{2–5} Some of the documented cases include traumatic injuries resulting from sports and manual labor.⁶ The mechanism of injury is usually an eccentric load placed on the elbow while falling on an outstretched hand, or a posterior blow to the elbow.⁷ While the current literature has certainly proven to be beneficial, there is little information on the postoperative management of these cases. The purpose of this article is to present the use of a dynamic hinged orthosis and treatment protocol following the surgical reattachment of a distal triceps tendon avulsion (Fig. 1). Two previously written articles that incorporated hinged elbow orthoses were reviewed and compared to analyze the outcomes.^{7,8} In our case, using the dynamic hinged orthosis and treatment protocol described below resulted in our patient returning to sports and normal daily activities 3 weeks earlier than the patients in the studies that were reviewed.

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Dynamic hinged orthosis

There are two types of orthoses involved in this treatment protocol: a hinged orthosis and a dynamic orthosis. The hinged orthosis format follows the short arc of motion rationale where the tendon can glide safely in a 60° range. The hinged orthosis protocol is based on the dynamic extension tendon protocol, which starts at 0° extension and advances flexion by 10° each week until near full flexion is achieved.⁹

Considering that the triceps is a three head, strong muscle with an origin and insertion beginning and ending at bony attachments, a strong elastic dynamic component was implemented to provide enough tendon excursion and stress without compromising the repair. The degree of force exerted by the elastic band was discussed with the surgeon. A medium resistance Theraband was chosen for the dynamic orthosis (approximately 1.7 kg of force when stretched 100%).¹⁰

Hinge covers were molded to provide more security and reinforcement to the metal stoppers after they were positioned on the hinge. The covers are easy to remold as the patient is allowed to increase flexion while wearing the hinged orthosis during the day. A second hinge cover was molded at full extension to be worn at night.

Materials (Fig. 2)

1. 2 inch straps
2. Adhesive Velcro hook
3. Approximately 1 yard level 2 Theraband
4. Large 6 inch hinge (Phoenix hinge by Patterson)
5. Thermoplastic material



Fig. 1. Dynamic hinged orthosis.

6. Molestick padding
7. Contour foam

Fabrication procedure

1. Heat a 17 cm × 17 cm and a 24 cm × 14 cm piece of thermoplastic material until soft and cut to form the arm and forearm cuffs.
2. Mold to patient's arm 2 cm below armpit and 2 cm proximal to elbow crease, and at the forearm 2 cm distal to elbow crease and 1 cm proximal to the ulnar styloid with the forearm in neutral. Flare the edges at the proximal arm and distal forearm to avoid indentation.
3. Pad the edges that are touching the skin area using the soft Molestick. This will help to prevent pressure sores and ensure skin integrity.
4. Install the hinge per manufacturer recommendations. The hinge is attached with the axis of rotation at the radial-humeral joint
5. Set the hinged orthosis at the appropriate degrees of flexion and secure with 2 stops (since the patient might overpower the

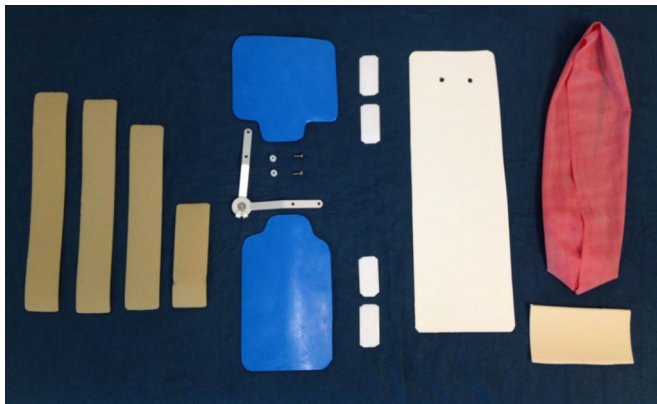


Fig. 2. Orthotic materials.

- position of the single stop). The hinge is locked to allow 0° extension and 60° flexion (Fig. 3).
6. One strap is used to secure the proximal arm cuff using two Velcro pieces on each side of the cuff. The other strap is used to secure the forearm cuff with two pieces of Velcro also on each side of the cuff.
7. In order to make the hinge covers, cut an 8 cm by 8 cm piece of thermoplastic material, and mold one piece on full hinge extension and one on the desired flexion. Cover the hinge's circumference to half its thickness to allow for it to be removed easily. Overlap both hinge arms by approximately 1 cm on each side to ensure the degree of motion. It is advisable to strap each hinge to cover the arms (Fig. 4).
8. Fabricate a 45 cm × 15 cm dynamic orthosis slab on full extension, drilling two holes at the distal edge parallel to the patient's distal forearm. Insert the Theraband and tie a knot on the posterior aspect of the slab. Soft padding can be used around the Theraband at the site surrounding the wrist. Attach two straps proximally using a single large Velcro piece in order to secure the hinged orthosis's arm cuff. A piece of contour foam can be placed on the slab at the position under the elbow to increase comfort. In some cases, it is recommended to mold an extra piece of orthotic material under the slab to provide more strength to the material so a strong individual will not bend the slab while flexing the elbow (Fig. 5).

Protocol

The patient is fitted for a hinged orthosis blocked at 60° flexion and 0° extension 3 days after surgery. The patient is instructed to use the hinged orthosis and flexion hinge cover at all times during the day, and use the extension hinge cover at night. It is recommended that the patient use a plastic bag over the hinged orthosis while showering.

The patient is instructed to perform active flexion until reaching the flexion block and allowing passive extension provided by the Theraband in the dynamic orthosis until the arm reaches the slab 6 times a day, completing 20 repetitions per set. This exercise must be performed while sitting with the shoulder resting on a table at 90° elevation. In the clinic, the patient can remove both orthoses under therapist supervision and perform active pronation and supination exercises, completing 10 repetitions of each exercise. Scar management with manual massage should be carried out twice a

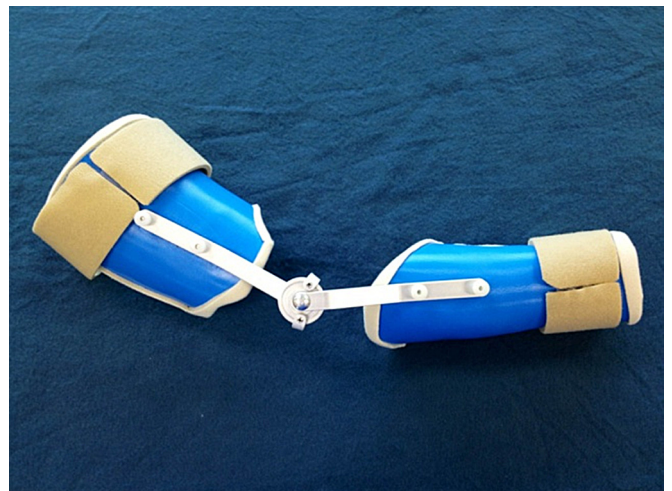


Fig. 3. Hinged orthosis with metal stops.

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