Journal of Hand Therapy 29 (2016) 339–347

Contents lists available at ScienceDirect

Journal of Hand Therapy

journal homepage: www.jhandtherapy.org

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Practice Forum

An alternative fabrication method of the dart thrower's motion orthosis (also known as the dart orthosis)

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To allow safe early wrist motion after wrist injury, this author has modified an earlier version of a dart thrower's motion orthotic device using material that is currently available on the market and an inexpensive paper fastener as the rivet. — Kristin Valdes, OTD, OT, CHT, Practice Forum Editor.

Introduction

The dart thrower's motion as described in the current literature[1–5] is wrist movement from radial deviation and extension toward ulnar deviation and flexion. Most activities of daily living are performed using this oblique wrist motion.[1–5] This motion occurs at the midcarpal wrist joint with the axis of motion occurring from the radiopalmar aspect of the scaphoid tuberosity to the ulnar-dorsal aspect of the hamate bone.[1] During this motion, there is minimal movement of the radiocarpal joint, and the lunate position remains virtually unchanged.[1–3]

Wrist motion in the dart throwing plane minimally affects the scapholunate and radiocarpal joints.[1,2,4,5] After injury or surgical repair to the proximal row of carpal bones, movement in the dart thrower's plane of motion would not disturb the healing structures. A hinged wrist orthosis offers patients a method of early wrist rehabilitation after scapholunate repairs, carpal fractures, and other wrist injuries. Patients can perform functional, yet protected, wrist motion while healing takes place.[1,2,4,5] A hinged orthosis that permits selective midcarpal mobilization along the plane of the dart throwing motion has been modified because one of the materials described in the original practice forum article is no longer available for purchase.[1] The fabrication of this modified orthosis is relatively easy and less expensive to complete. This revised method of orthotic fabrication allows for movement in the radial deviation/extension to ulnar deviation/flexion plane using a simple paper fastener as the guiding rivet.

Materials

8″ × 10″ rectangle of elastic thermoplastic material 1/12″ thick, preferably coated for ease of fabrication.

2 (½″ × 3″) rectangles of the same material as mentioned previously (use the scraps and double the thickness if necessary).

Velcro loop (with adhesive back).

Velcro hook (with adhesive back).

Velcro loop.

Two paper fasteners.

See Figure 1: Materials for the dart thrower's orthosis.

Method of fabrication

1. The orthosis is molded on the client in 1 piece as a circumferential wrist orthosis, then cut into the hand-based and forearm-based portions at the wrist [See Figure 2: Mark the wrist crease on the circumferential orthosis; See Figure 3: Cut into separate hand and forearm pieces; See also Multimedia Component 2 (http://s3.amazonaws.com/pclive-elsevier/proofs/elsevier/HANTHE/953/images/mmc2.mp4)]. About ½″ is trimmed from each of the cut edges (see Figure 4: Trim material from the cut edges to allow free wrist motion), leaving a gap of about 1″ at the level of the wrist crease.
2. As described in the previous article, the scaphoid tubercle is identified on the client and then on the hand-based portion of the orthosis (See Figure 5: Mark the scaphoid tubercle on the client's hand). A hole punch is used to create a hole (See Figure 6: Mark the scaphoid tubercle on the hand piece, and punch it out) at this marking, and another hole (See Figure 7: Mark the base of the fourth metacarpal bone, and punch it out) is made on the dorsal surface at the level of the base of the fourth metacarpal.

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http://dx.doi.org/10.1016/j.jht.2015.12.008

Fig. 1. Materials for the dart thrower's orthosis. See also Multimedia Component 1 (http://s3.amazonaws.com/pclive-elsevier/proofs/elsevier/HANTHE/953/images/mmc1.mp4)

3. The 2 rectangular strips of material can be folded in half for extra rigidity. A hole is also punched into 1 end of each.
4. One of the rectangular strips of material is heated (See Figure 8: Fold the strips of material in half, and punch a hole in one end) and molded to the volar orthosis, aligning the holes, and the other rectangular strip is heated and molded to the dorsum of the hand and wrist also aligning the holes (See Figure 9: Heat the strips of the material, and mold them in their positions: 1 volar and 1 dorsal). By molding these pieces, forward wrist flexion and backward wrist extension are effectively blocked.

Fig. 2. Mark the wrist crease on the circumferential orthosis.

5. Using the paper fastener, 1 rectangular strip is attached on top of the volar orthosis and 1 is attached on the dorsal orthosis through the punched holes (See Figure 10: Attach the volar strip to the hand piece using the paper fastener). This allows for motion in the specified plane. The paper fasteners are then opened on the interior surface of the orthosis and covered with the Velcro loop with adhesive backing (See Figure 11: Open the fastener wings and cover with adhesive loop). This keeps the paper fasteners in place (See Figure 12: Repeat for the strip on the dorsal side of the hand piece) and offers padded pressure on 2 key areas of the wrist for stabilization.
6. The forearm portion is bonded to the free ends of the rectangular strips by directing dry heat to both parts (and removal of any coating by scraping or sanding) See Figure 13: Mark the forearm piece for attachments. Make sure these parts are well secured with firm pressure (See Figure 14: Use dry heat, and bond the strips to the forearm piece.).

The opening of the orthosis is on the ulnar border (See also Multimedia Component 3 http://s3.amazonaws.com/pclive-elsevier/proofs/elsevier/HANTHE/953/images/mmc3.mp4), and 3 straps can be used to secure the orthosis to the client. See Figure 15: Volar view make sure there is no rubbing or interference of the orthosis on the wrist as the client moves in the directed plane of motion, from radial deviation/extension to ulnar deviation/flexion See Figure 16: Side View. See Figure 17: Dorsal View.

By molding the orthosis in 1 piece, cutting into the distal hand and proximal forearm pieces, and using inexpensive paper fasteners as the hinges, the fabrication process is made relatively easy and inexpensively (See also Multimedia Component 4 http://s3.amazonaws.com/pclive-elsevier/proofs/elsevier/HANTHE/953/images/mmc4.mp4).

Wearing schedule

All functional orthoses are designed to be worn during functional activities. When treating patients with carpal bone injuries and/or proximal carpal row instabilities, consider this orthosis as an option. Always verify the appropriateness of this orthosis with the referring doctor/surgeon and discuss the optimal wearing schedule for each individual patient.

Recommendation

It is highly recommended to practice fabrication of this orthosis on other clinicians to understand the intricacies of the wrist anatomy and the specific movement pattern of the Dart throwing motion.

Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jht.2015.12.008.

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