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Journal of Hand Therapy

journal homepage: www.jhandtherapy.org



Practice Forum

Wrist extension or flexion mobilization orthosis: The dinosaur design

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These authors describe how to fabricate an orthotic device to regain wrist range of motion flexion and extension deficits. Using 1 device can offer a more cost-effective solution than using 2 separate devices.
—KRISTIN VALDES, OTD, OT, CHT, Practice Forum Editor

Introduction

Passive limitation of wrist range of motion can be a common problem after trauma or surgical intervention (eg, distal radius fracture, dorsal carpal ganglionectomy). A wrist mobilization orthosis can be fabricated to recapture lost motion and improve overall function. The Hand to Shoulder Therapy Center developed an orthosis colloquially known as the dinosaur.¹

Materials

The following materials are required to fabricate the orthosis.

- 1/8" thermoplastic material:
 - Low conformable and uncoated (13" × 8") and
 - Moderate/high conformable (7" × 3");
- Nonslip material (4" × 2");
- Soft foam padding (4" × 2");
- Size #62 or #64 rubber bands;
- Velcro 2" width loop; and
- Velcro 1" width adhesive hook
 - Pieces A and D (outrigger) will need to provide sufficient length to attach the mobilization assist. Depending on the patient's range of motion limitations, this is typically 5–7". Piece A will need to be approximately 1" longer than piece D, as it will be attached directly to the base.
 - Piece B (base): the length should measure 1.5" distal to the elbow flexion crease and 1" proximal to the wrist flexion crease, with the width spanning half the width of the forearm.

- Piece C (connector tube): should be long enough to attach the base to the outrigger (~3–4").
- Piece E (mobilization assist): should measure the width of the metacarpals (index through small), with an additional 1.5" on each side; the length should measure from the metacarpal heads to the base of the metacarpals (Fig. 1).

Fabrication

Base

1. Fabricate the base (A) on the patient's forearm. This design is unique in that the same outrigger base may be used with patients who have bidirectional limitations in both flexion and extension. To fabricate the orthosis for wrist flexion, fit the base volarly and proximal to the wrist flexion crease (Fig. 2A). For wrist extension, fabricate the base dorsally and proximal to the ulnar head (Fig. 2B).
 - Flare the distal and proximal edges to avoid skin irritation.
 - To minimize distal migration, a nonslip material (eg, Dycem) may be applied to the inner surface of the orthosis.
 - Soft foam padding may be added to the inner distal end of the base for patient comfort.

Outrigger

1. Use a piece of low conformable material to fabricate the outrigger tube (B).
2. Fold the material to create a tube, maintaining a 1" diameter. Cut the edge to bond the seam, leaving 1 end of the tube open (Fig. 3A).
3. Widen the open end of the tube by cutting along the seam (Fig. 3B).

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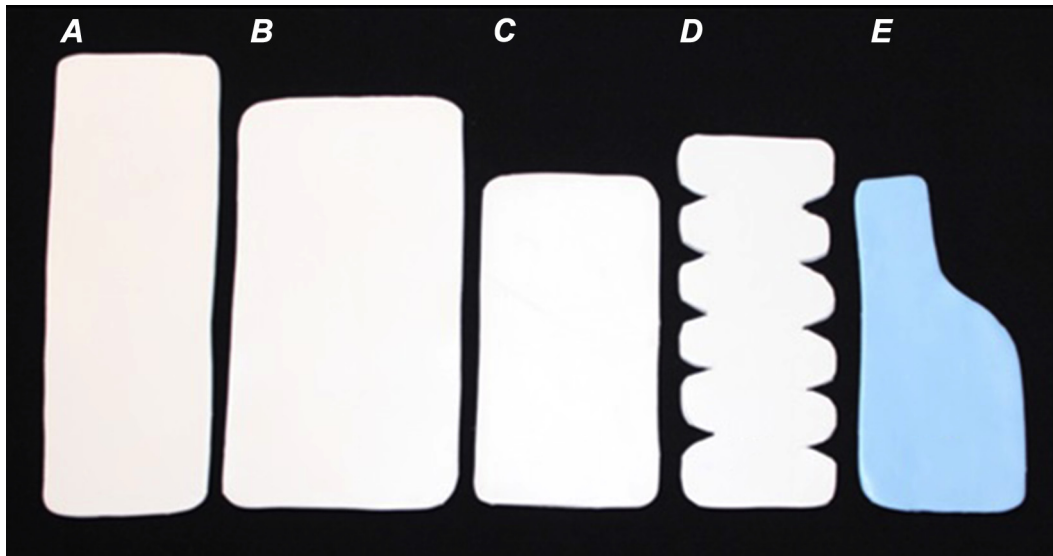


Fig. 1. Materials.

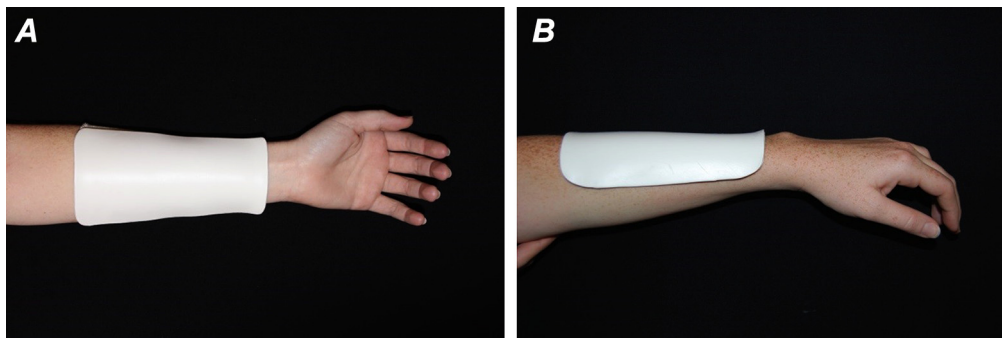


Fig. 2. (A) Base for wrist flexion. (B) Base for wrist extension.

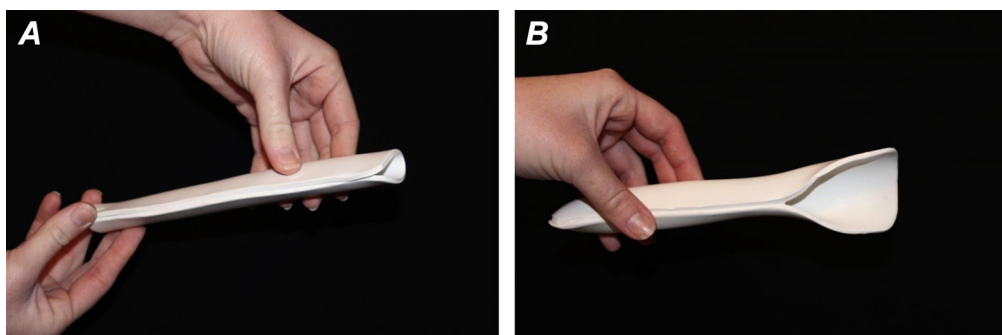


Fig. 3. (A) Form the connector tube. (B) Leave one end open.

4. Determine outrigger tube placement on the forearm base²:

- Align the outrigger with the joint angle of rotation to mobilize the wrist along the normal flexion/extension arc to avoid undesired radial or ulnar deviation (Fig. 4A).
- Position the wrist at its passive end range to determine the 90° bone angle of rotation from the metacarpals to the distal end of the outrigger (Fig. 4B).
- Ensure that the height of the outrigger will provide sufficient clearance for the hand as motion improves.

- Using a heat gun, heat both the proximal end of the outrigger and the forearm base. Then, securely bond the outrigger to the base.

Connector tube

1. Create a shorter tube, leaving both ends open. The connector tube (C) must have sufficient length to connect the outrigger to the forearm base.
2. Cut 2 slits at each end of the connector tube (Fig. 5A).

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