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Practice Forum

Multimodal custom orthosis to promote hook fist

Nathan Short OTD, CHT *

Doctorate of Occupational Therapy Program, Huntington University, Fort Wayne, IN, USA

This author suggests a low profile orthosis design to improve intrinsic tightness to restore functional grasp. The therapist can use clinical judgment based on tissue extensibility to prescribe the device-wearing schedule. — *Kristin Valdes OTD, OT, CHT*, Editor Practice Forum, Journal of Hand Therapy.

Introduction

Generalized stiffness of the digits is common with many hand pathologies and postoperative conditions. The lack of ability to actively hook, flexing the proximal interphalangeal (PIP) joints and distal interphalangeal joints with the metacarpophalangeal (MCP) joints extended, may indicate shortening of the interossei, adhesion of the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) in zone II or impairment of joint arthrokinematics. Numerous methods have been utilized to address these common underlying restrictions, including static and mobilization orthotics, as well as casting techniques.[1] Blocking of the MCPs in extension or hyperextension with IP joint flexion is commonly advocated for maximal differential glide of the FDS and FDP, advancement of the dorsal hood distally, and stretch of the interossei to promote IP joint flexion and subsequent functional grasp.[2,3] Modifying the base of the MCP block exercise orthosis offers similar positioning with the addition of static or dynamic mobilization, which may prove to be beneficial for a wide variety of underlying limitations contributing to digit stiffness.

Materials

Materials recommended by the author are available through North Coast Medical, Inc. and may be modified based on clinician preference; however, material with moderate drape and rigidity is recommended (Fig. 1).

- Omega Max 1/8″ splint material
- VELCRO brand hook 1″
- VELCRO brand loop 1″
- VELCRO stretch loop 1″
- CushionStrap loop 1″
- Quick rivet 11/32″ (1)
- Splint scissors
- Revolving punch pliers

Procedure

1) Draw a hand-based orthosis pattern with distal edge extending just proximal to the PIP joint of each digit and thumb posts extending approximately 1.5″ beyond the web space and radial aspect of thumb (Fig. 2).
2) Heat, cut, and form orthosis to hand, positioning the MCPs in extension to slight hyperextension with thumb posts wrapping dorsally around metacarpal. Wrap the material around ulnar aspect of small and ring fingers and radial aspect of index finger to enhance stability and alignment (Fig. 3).
3) Roll edges of distal end of splint to allow full flexion of PIP joints of each digit. Roll edges of thumb opening but maintain firm contour to the thumb metacarpal to avoid distal migration of orthosis when in use (Fig. 3).
4) Once pleased with alignment, apply 1″ VELCRO brand hook on the ulnar and radial aspects of the orthosis at the level of the MCPs, proximal ulnar palm, and at the volar base of the thumb. Attach 1″ CushionStrap loop at the MCPs and proximal palm, bifurcating the loop at the dorsal thumb and wrapping volar (Fig. 4). The MCPs should be firmly held into the orthosis to prevent compensatory flexion when orthosis is in use.
5) Use revolving punch pliers to create a 1/8″ hole on the ulnar aspect of the orthosis at the level of the small finger first phalanx.
6) Using the quick rivet, attach 1″ VELCRO brand loop and 1″ VELCRO stretch loop at the opening created by the punch pliers.

* Corresponding author. Doctorate of Occupational Therapy Program, Huntington University, 1819 Carew St., Fort Wayne, IN 46804, USA. Tel.: (260) 702-9623.
E-mail address: nathan.short@huntington.edu.

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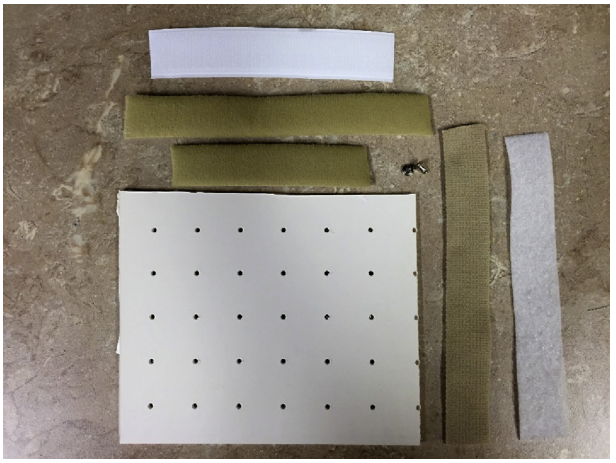

Fig. 1. Materials needed.

Lengths of material should be long enough to cross the palm and attach to the radial aspect of the orthosis (Fig. 5).

7) Apply 1″ VELCRO brand hook on the radial aspect of the orthosis at the level of the first phalanx of the index finger.
8) Fit orthosis to patient and ensure full available excursion for active hook fisting and appropriate alignment of static and dynamic straps for mobilization. Quick rivet should allow pivot of straps to cross distal phalanges of digits, and velcro hook should allow for increasing tension. Adjust as needed based on the clinical presentation and desired outcome (Fig. 6).

Prescribed use of orthosis

With the ability to provide dynamic mobilization, static progressive mobilization, and active hook fist (Figs. 6-8), prescribed use will vary depending on the diagnosis, clinical presentation, and desired outcome. Passive end feel may guide clinical reasoning regarding joint restrictions as opposed to soft tissue shortening which may suggest variable ratio of static progressive vs dynamic mobilization followed by active hook fist. Although prescribed use will vary, protocols for some diagnoses would suggest a period of mobilization followed by active hooking with the overall goal of increasing active digital motion to enhance grasp and function. The orthosis is beneficial for general intrinsic tightness found in a variety of conditions as well as limited differential gliding of the FDS/FDP in the late stages of rehabilitation after tendon repair. Furthermore, the orthosis design allows patients with significant restrictions of active hook, regardless of the underlying cause, to benefit from gradation of mobilization from light dynamic force to static progress force when appropriate. The orthosis has also served

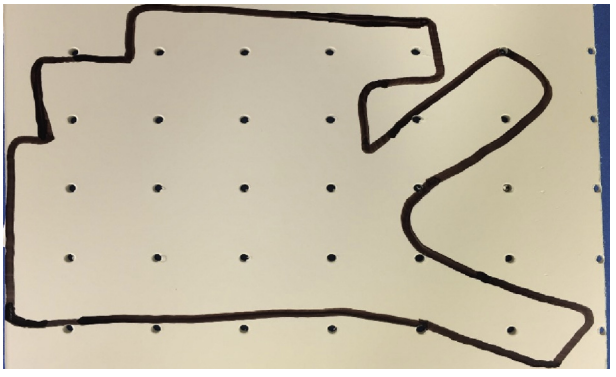

Fig. 2. Recommended orthosis pattern.

Fig. 3. Orthosis molded to hand.

Fig. 4. Recommended strap placement.

Fig. 5. Completed orthosis with mobilization straps added.

as a relatively low-cost solution for patients who have met overall therapy goals or exceeded visits approved by insurance but have residual intrinsic limitations and need a postdischarge solution to continue to address underlying limitations.

Limitations

Although principles utilized by the orthosis are supported by the literature, the specific design has not been empirically tested. Furthermore, the described use of the orthosis addresses global restrictions as opposed to individual digit restrictions, but simple design modifications may serve to focus benefits of the orthosis to address more specific restrictions of individual or adjacent digits.

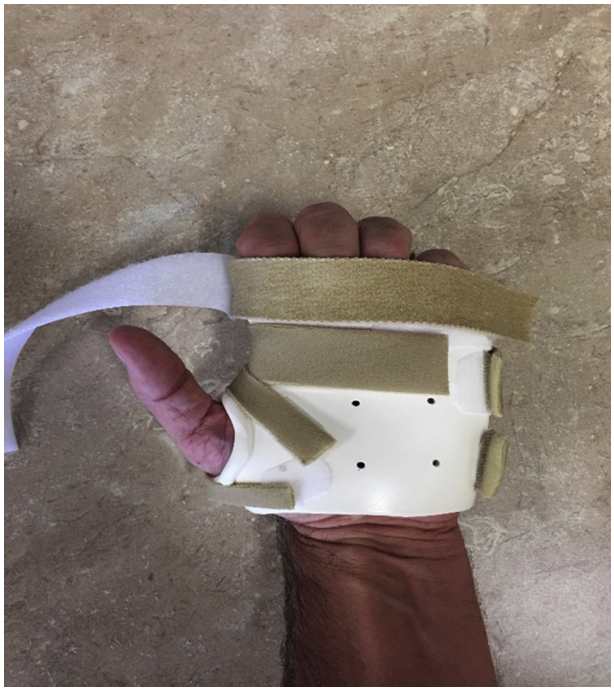

Fig. 6. Dynamic mobilization.

Fig. 7. Static-progressive mobilization.

Fig. 8. Active hook fist.

References

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1. The device is designed to
   a. have a standard 4 hour per day wearing schedule
   b. eliminate the need for any exercises
   c. reduce clawing
   d. improve intrinsic tightness
2. Ideally the MCP joints are held in _____ degrees of flexion
   a. 25
   b. 45
   c. 0
   d. -10
3. The IP joints are held in flexion
   a. actively by the patient
   b. with a Velcro strap
   c. with coban
   d. with Kinesiotape
4. The concept of differential gliding was originally put forth by
   a. Mackin and Bell
   b. Wehbe and Hunter
   c. Fess and Strickland
   d. Evans and Burkhalter
5. This specific design has been tested rigorously and reported previously in the literature
   a. true
   b. false

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