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Practice Forum

Low profile radial nerve palsy orthosis with radial and ulnar deviation



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Individuals who sustain damage to the radial nerve experience a significant loss in functional use of the hand. Traditional orthoses have been effective in providing assistance with wrist stabilization and finger/thumb MP extension. These authors adapted a low profile orthosis to provide the necessary support while allowing radial and ulnar deviation of the wrist, thus increasing functional use of the hand. — VICTORIA PRIGANC, PhD, OTR, CHT, CLT, Practice Forum Editor

Rationale for orthosis

Radial nerve palsy and its associated wrist drop have been treated with a variety of orthoses over the years. The radial nerve is the most commonly injured nerve of the upper extremity¹ and orthotic fabrication for an individual with radial nerve palsy requires a balance between protecting tissues while trying to provide increased function for the affected hand. The primary purpose of the orthosis is to prevent over stretching of the denervated wrist extensors.^{2,3} Although the sensory loss has minimal functional implications,⁴ motor loss is far more detrimental. The lack of wrist extension greatly compromises grip strength due to the instability of the wrist while the long flexors are unable to adequately make a fist.⁵ Additionally, lack of MCP extension, thumb extension, and thumb abduction further limits the ability to use the hand for functional tasks.

Many orthoses have been proposed over the years varying from a static wrist support to dynamic orthoses with outriggers. Burkhalter observed when stabilizing the wrist with an orthosis that grip strength could be increased three to five times.¹ Although a simple wrist cock up may be appropriate for some individuals, it provides no increased finger/thumb function and also covers a large sensate portion of the palm.⁴ Orthoses that do not address wrist and finger extension require the assistance of the uninvolved hand for functional grasp and release activities.⁴ Dynamic extension and tenodesis orthoses have been beneficial in dramatically increasing functional grasp while providing support to healing structures.^{2,5} Orthoses with custom outriggers, however, can be difficult to make and the outrigger itself may impede function.

This orthosis developed for radial nerve palsy is an adaptation of the device first proposed by Sally Fistler DeSilva, OTR, CHT, presented as a poster in 1998 at a meeting of ASHT. The orthosis is economical, easy to fabricate, and has a lower profile than other radial nerve palsy orthotic devices. In addition to DeSilva's functional design, the option for ulnar and radial deviation have been added (Fig. 1). According to the individuals that have worn the orthosis, the ability to deviate at the wrist has a significant impact on the ability to perform many functional tasks. As radial nerve function returns and the individual regains active wrist extension, the forearm section can be removed. Thus the thumb and fingers can continue to receive necessary support while allowing full wrist movement.

Materials used

- 3 mm thermoplastic
- Adhesive hook
- Non-adhesive loop
- $\frac{3}{4}$ inch (1.9 cm) elastic band that is Velcro sensitive
- 3 mm elastic cord
- Screw rivet
- Theraputty for padding
- Stockinette sleeve

Fabrication

Patterns for the proximal and distal aspects of the orthosis are made with a section cut out of the palmar segment for the MP joints (Fig. 2). A piece of theraputty is placed over the dorsal aspect of the wrist in order to keep the hinge off of the skin surface. A stockinette sleeve is recommended for over the putty.

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Fig. 1. Radial nerve palsy orthosis.

1. With thumb in position between palmar and radial abduction and wrist in 20°–30° extension, mold hand section of orthosis. Be sure the open area of the orthosis aligns with the MP joint of the index through small fingers (Fig. 3).
2. Place a damp paper towel over the distal segment of the orthosis where the 2 pieces will overlap.
3. Form the proximal segment on the forearm, overlapping the distal segment by approximately 2 cm (Fig. 4).
4. After the 2 segments are formed, remove the sleeve and therapy.
5. With the palmar section removed, mark the forearm section of the orthosis for the pivot point directly over the capitate (This is easily palpated as the divot just proximal to the base of the middle metacarpal).

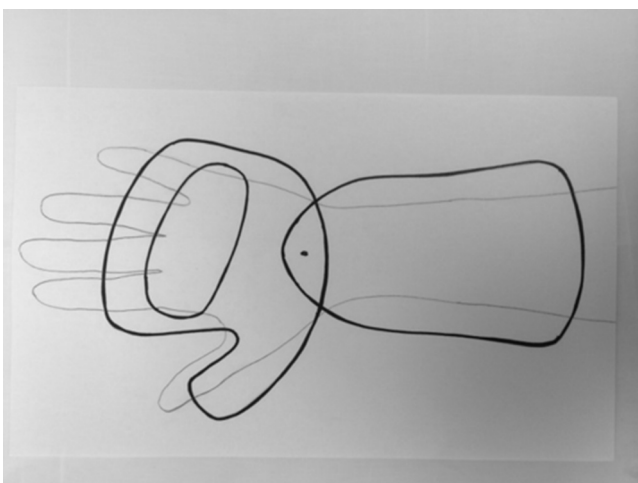


Fig. 2. Pattern layout.



Fig. 3. Hand section.

6. Punch a hole at this point large enough to accommodate your screw rivet.
7. Place the palmar section just under the forearm section and mark the associated pivot point and punch a second hole.
8. Place the orthosis on the patient to make sure the pivot point allows for ulnar and radial deviation.
9. On the palmar section, $\frac{3}{4}$ inch elastic band is placed under the proximal phalanges of index through middle fingers to maintain MP extension. A smaller piece of elastic band is used on the thumb proximal phalanx to maintain thumb in a functional position.
10. On dorsal aspect of the orthosis, mark the areas between the fingers. Punch 2 small holes at these areas, proximal and distal.
11. Use elastic thread to loop from distal hole, around elastic band and back through proximal hole. This will create a sling effect to help maintain MP extension (Fig. 5).
12. Place screw rivet in place between proximal and distal segments with distal segment on top. Do not over tighten screw in order to allow for free movement in ulnar and radial deviation (Fig. 6).
13. Two straps are placed on the forearm section.



Fig. 4. Molded forearm piece over formed hand section.

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