www.HandLab.com
support@HandLab.com
2609 Atlantic Ave., Suite 213
Raleigh, NC 27604
USA

Complex made Simple...clinically relevant education by Judy C. Colditz, OT/L, CHT, FAOTA

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ClinicalPearls

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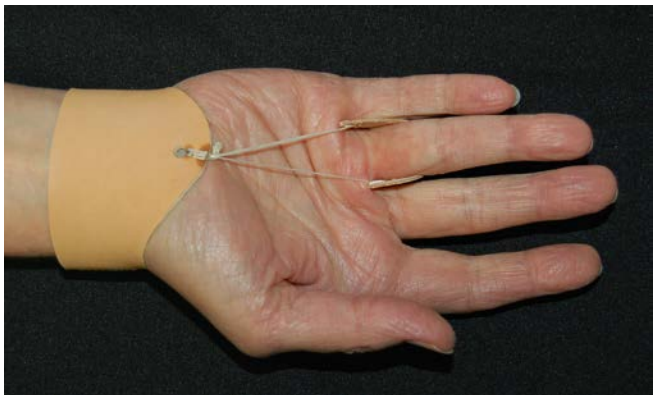
THE USE OF ORTHOSES TO GAIN PASSIVE JOINT MOTION

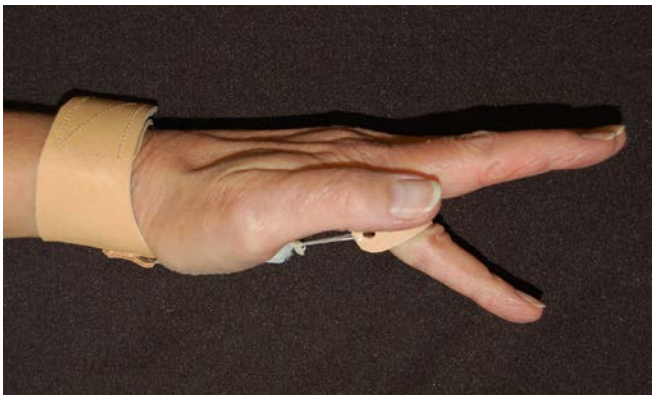
In our previous **Clinical Pearl** (No. 37), we discussed how manual passive range of motion (PROM) should be used very differently in early versus chronic joint stiffness in the hand. It now seems appropriate to consider the common practice of using serial static (including casts), dynamic, and/or static progressive orthoses to gain passive joint motion.

Therapists often reserve the use of orthoses until it is apparent that active motion and/or manual stretching is not successful. In the early stiff hand, when collagen is responsive, stress applied by an orthosis usually creates a rapid and effective response and the patient regains both passive and active motion. Gains made in passive joint motion in the chronically stiff hand, are however, often lost when the orthosis is discontinued.

In 1994, Flowers and LaStayo (1) compared gains in passive extension of twenty proximal interphalangeal (PIP) joint flexion contractures in those who wore a serial extension cast for three versus six days. Their purpose was "to test the hypothesis that the amount of improvement in passive range of motion (PROM) of a stiff joint is directly proportional to the amount of time the joint is positioned at its end range, or total end range time (TERT)." They concluded that the TERT theory was valid because those casted six days versus those casted three days had 1.77 greater gains in passive joint extension.

This validation of the use of TERT supports the use of orthoses for force application over longer periods of time. (HandLab's **Clinical Pearl** No.14 describes the rationale for increasing the time interval of serial cast changes for PIP joint flexion contractures.) As therapists, we often miss an opportunity for maximum results by assuming that it is only the application of TERT forces that is need-





This simple MP joint block orthosis is made of leather and is one of many different designs that can be used to encourage repeated full active PIP joint extension.

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THE USE OF ORTHOSES TO GAIN PASSIVE JOINT MOTION (continued)

ed to fully resolve flexion contractures. After all, we have no proof that gains in passive motion result in equal and/or permanent gains in active motion.

The PIP joint, our most frequent challenge, is the best example. With limited active and passive extension at the PIP joint, the patient customarily hyperextends the metacarpophalangeal (MP) joint when attempting active finger extension. During active MP joint hyperextension, the dorsal apparatus moves proximally over the MP joint, but does not achieve adequate proximal excursion over the PIP joint (PIP joint extension always lags if the MP is hyperextending).

Upon removal of a PIP joint extension orthosis/cast, resistance at the PIP joint is usually diminished. This may initially allow better active PIP joint extension, but patients often lose the full range of active PIP joint extension. A lingering active PIP extension lag develops because the patient has the habit of hyperextending the MP joint instead of driving the excursion across the PIP joint.

In early stiffness, brief use of an extension orthosis may be fully successful, but in the chronically stiff PIP joint, the use of a PIP joint extension orthosis should be considered only the first treatment step. Generally less severe joint contractures (fewer degrees of flexion), whether early or chronic, can be resolved by the use of active redirected motion alone (described in the article *Active Redirection Instead of Passive Motion for Joint Stiffness* by Judy Colditz). However, therapists more commonly use casts or orthoses to gain passive motion.

A comprehensive treatment approach when using an orthosis to treat a severe and/or chronic PIP joint flexion contracture should be:

- Use of a PIP extension cast or extension orthosis.
- When desirable passive PIP joint extension has been gained, an MP joint extension block orthosis should be worn full time during the day both 1) to assure excursion of the dorsal apparatus over the PIP joint and 2) to encourage repeated full PIP joint extension while also allowing full PIP joint flexion.
- Slow weaning from the orthosis is required to assure full active PIP joint extension is maintained.

The MP block orthosis is used for a longer period of time than one might assume necessary as the goal is to both allow enough repetitions of full joint extension over a long period of time to assure the resistance at the contracted joint does not recur and to provide enough repetitions of full PIP joint extension to erase the habit of hyperextending the MP joint instead of fully extending the PIP joint. In other words, the patient must have the opportunity to relearn how to extend the PIP joint.

1) Flowers KR, LaStayo P. Effect of total end range time on improving passive range of motion. Jour of Hand Ther 1994;7(3):150-157.

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