Blocking Splints to Assist Finger Exercise

To treat traumatically injured hands effectively, it is often necessary to isolate exercise or stretch to individual-affected joints by blocking out joint excursion in the unaffected joints. Isolated exercise and stretch are particularly important for patients with long-term stiffness or tendon adherences. Such exercise has traditionally been facilitated by manual blocking or by use of regular or adapted Bunnell blocks (1). However, both manual blocking and Bunnell blocks require the opposite hand to do the blocking (Figure 1) or to hold the Bunnell block (Figure 2). In addition, manual blocking can be fatiguing and stressful to a normal opposite hand, or difficult for and painful to a disabled opposite hand. To avoid these problems and to improve the effectiveness of the exercises, blocking splints can be constructed for one (Figure 3) or more fingers (Figure 4).

In addition to facilitating active exercise for individual joints, the blocking splint can be used, or adapted, for several other purposes. First, because it frees the opposite hand, the splint can be used when a patient performs a combination of active and passive exercises. Such exercise tends to increase exercise efficiency and promote more rapid gains in motion as well as maximum tendon glide. This exercise begins with the opposite hand passively flexing the joint for 5 seconds, followed by an active muscle contraction that attempts to hold the joint in the same position for an additional 5 seconds. A second adaptation involves constructing the blocking splint with a dorsal outrigger and finger cuff to give resistance to flexors and provide muscle re-education (Figure 5). If desired, a volar outrigger with cuff may be added to provide passive flexion and to strengthen the extensors (Figure 6). In both of these adaptations, traction should be light enough so that the patient can pull through the full available range of active motion. The third adaptation is used for a patient who wears a positioning splint all day. The

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block is built into the long splint so that the patient may exercise conveniently and frequently (Figure 7). Finally, the blocking splint can be used to stretch the intrinsics of a finger that has only minimal passive interphalangeal flexion. The traditional intrinsic stretch strap will not remain in place on such a finger, but the stiff finger can be positioned for stretch of the intrinsic muscles by a strap that fastens around the upright dorsal piece of the blocking splint (Figure 8).

Construction
Any thermoplastic material can be used such as K-splint, polyform, hexaplast or aquaplast materials together with Velcro strapping as needed.

Basic Splint. Wrap the thermoplastic material cylindrically around the impaired finger(s), bringing it just proximal to the joint that will be exercised. Position the joints proximal to the exercised joint in as much extension as possible in order to block their effect from the flexion exercises. Padding may be needed dorsally behind the metacarpophalangeal (MCP) or proximal interphalangeal (PIP) joints to reduce pressure on them during exercise. Flare the splint material very slightly under each impaired joint to be exercised by the splint, keeping the splint as close to the joint as possible for maximal blocking effect. As range of motion improves, make periodic adjustments by further flaring the distal end of the splint. For increased rigidity, a dorsal or volar spine may be added.

Variations:
1. Single Finger Splint (Figure 3).

Construct this splint to block proximal interphalangeal (PIP) or
distal interphalangeal (DIP) joints of the fingers, using the pattern in Figure 9 and drawing the extension that wraps around the finger under the DIP, as shown, or under the PIP.

a. With the patient's hand palm down on the paper, mark off 1 at both sides, just proximal to the joint to be exercised, and 2 just distal to the MCP joint.

b. Keeping the pen perpendicular to the paper, outline the length of the finger bilaterally, connecting 1 and 2.

c. At the ulnar border of the hand, mark off just proximal to the MCP joint of the little finger 3 and at the base of the metacarpal 1.

d. With the patient's hand off the paper, complete the pattern as follows:

   - Connect 1 with 2 as shown (dotted line #5), extending the projection 3.8 to 5 cm (1½ to 2 inches) ulnarily.

   - Connect ulnar 2 with 3, and radial 2 with 4, as illustrated.

   - Connect 3 and 4 in the manner shown on the diagram (dotted line), extending lines 5 cm ulnarily. The size of this volar projection can be adjusted according to which finger is being blocked. The projection is short for a little finger splint and long for a middle finger splint.

c. For the index finger, add a radial projection for the thumb web space.

2. Thumb Splint (Figure 10). This splint variation has been described by Fess (2).

   Construct this splint to block the DIP joint of the thumb or to stretch it into flexion dynamically.

   a. For a simple blocking splint, wrap a rectangular piece of splint material cylindrically around the base of the thumb, below the DIP joint.
b. Or, to fabricate a combination of a blocking splint and a dynamic DIP flexion splint, add a hypothenar projection to which a flexion outrigger is attached (Figure 6). The pattern is made by wrapping a paper towel around the thumb and palm and marking an outline similar to that in Figure 10.

3. Dorsal Outrigger (Figure 5).

Construct this splint to provide resisted finger or thumb flexion for muscle re-education. Construct an outrigger as desired and attach it to the dorsum of the blocking splint, where needed. Punch a hole at the distal end of the outrigger for attaching a rubberband with a finger cuff.

4. Multifinger Splint (Figure 4).

Construct this splint to block the PIP or DIP joints of multiple fingers. The pattern is made by wrapping a paper towel cylindrically around the hand and marking an outline similar to that in Figure 11.

Summary

The blocking splint and its variations have been used frequently and successfully in this hand surgery/therapy practice for 3 years to exercise most tendon repairs and chronically stiff joints, as well as to stretch some of the stiff joints. The basic blocking splint concept, which is not a new one, has been taught in hand therapy workshops and lectures but has never been published for the benefit of the general physical disabilities practitioner.

REFERENCES