Joint stiffness and soft tissue contractures of the fingers are common problems treated by the occupational therapist specializing in hand therapy. It is widely accepted that dynamic splinting in combination with range-of-motion exercises is the most effective way of managing these problems. The rationale, principles, and objectives of dynamic splinting or range of motion are presented in the numerous texts and articles written about these subjects (Brand, 1984; Colditz, 1984; Fess, 1984; Malick, 1982; McEntee, 1984). The purpose of this article is to describe an effective dynamic splint for the management of joint stiffness and soft tissue contractures of both the proximal and distal interphalangeal joints of digits 2–5.

The finger flexion loop is unique when compared with similar splints documented in the literature (Colditz, 1984, English, Rehm, & Petzoldt, 1982; Enos, Lane, & MacDougal, 1984; McEntee, 1984) in that the flexion loop is fabricated with a separate elastic traction system that allows for controlled and directed tension (see Figure 1). The traction system of the loop lies perpendicular to the skeletal axis of the distal interphalangeal (DIP) joint. As maximum flexion is attained at the DIP joint, the force of the pull is directed to and acts on the proximal interphalangeal (PIP) joint. The combination of these forces maximizes passive range of motion of both the DIP and PIP joints. Additionally, by positioning the traction at the distal end of the distal phalanx, the length of the lever arm is increased, thus providing a greater mechanical advantage for the application of force (Brand, 1984; Malick, 1982).

The loop is fabricated from a padded nonstretch strapping material available through most splint products catalogs. During our 2 years of clinical experience with the splint, we noted that this material is...
more durable and more comfortable than material in other documented loops. We found that unlike rubber band or latex, soft strapping material does not produce skin irritation, sweating, or skin maceration of the finger secondary to splint wear. This splint was also aesthetically pleasing to patients and more functional than forearm-based dynamic finger flexion splints. This seemed to increase the patients' compliance with the prescribed use of the splint.

The loop has been fabricated for over 100 patients with soft tissue contractures and joint stiffness associated with flexor tendon repair and grafts, Dupuytren's contracture release, hand infections, digital replantation, or soft tissue trauma of the fingers. This splint has been effective in fingers with more than 50% total active and/or passive range of motion. Increases in motion related to splint wear varied depending on the patient's compliance with the splinting regimen. The length of time a patient was required to incorporate this splint into the rehabilitation regimen was directly proportional to the extent of the stiffness. Patients with less stiffness required from several days to weeks of splint wear whereas patients with extreme tightness needed from several weeks to months of splint wear. Patients were instructed to wear the splint beginning with 5- to 10-minute applications once every hour during the day. Each day, they increased the wearing time by 2 to 3 minutes with each application as tolerated to a maximum of 20-minute intervals. A supplemental program of active and passive range of motion exercises and functional hand activities was prescribed for each patient. Sometimes, to maintain gains made with the splint during the day, night splinting was warranted. The type of splint used at night varied depending on the extent of the stiffness and the discretion of the therapist. If patients did not require the simultaneous use of the loop on all four digits, they were able to use the splinted hand for functional activities. All patients were able to independently apply the loop using the uninjured hand (see Figure 2).

Materials and Construction

The following items are used in constructing this splint: Padded, nonstretch strapping material 1 in. (2.54 cm) wide, scissors, hole punch, eyelets 1/8 in. (0.48 cm) in diameter, eyelet fastener, 2 to 3 rubber bands.

The finger flexion loop is constructed in 3 steps. First, the length and width of the strap are determined. The length of the digit, in full extension, is measured from the web space to the finger tip, and 2½ in. (6.35 cm) is added. For example, a digit of 3½ in. (8.26 cm) plus 2½ in. (6.35 cm) would need a total strap length of 5½ in. (14.61 cm). The width of the strap should equal the broadest portion of the involved digit.

Second, the rubber band traction is attached to the strap. With the length of the strapping material oriented vertically, a ½ in. (1.91 cm) fold is made at the proximal end of the strap. A 1/16 in. (0.48 cm) hole is punched in the center of the folded material. Then, 2 or 3 rubber bands are placed in the pocket formed by the folded portion of the strap. The eyelet is then fastened into the hole of the strap. (The smooth, finished edge of the eyelet should face the surface of the strap that does not have the fold seam.)

The third step is to repeat steps 1 and 2 on the opposite end of the strap.

To apply the loop, one must position the loop with the fold seam facing outward so that it does not interface with the skin during splint wear. Then, both
ends of the loop are spread apart and the loop is placed over the dorsum of the involved finger. The tension of the loop is adjusted for the patient’s tolerance by cutting and removing the excess rubber bands one at a time until adequate tension is achieved (see Figure 3).

Discussion

The finger flexion loop can be fabricated for digits 2–5 of the hand. A separate loop can be worn on all of these digits at the same time as warranted. The loop is easily to apply and remove and small enough to be conveniently carried in the patient’s pocket during “off-intervals.” The loop allows the wearer maximum functional use of the involved hand during routine activities of daily living. This dynamic splint has been an effective and inexpensive device for the management of soft tissue contractures and joint stiffness of the interphalangeal joints of digits 2–5 in the more than 2 years that we have used it, especially in fingers with more than 50% of the total active and/or passive motion.

References


