A dynamic splint using thermoplastic materials was designed to increase elbow range of motion in patients with persistent soft tissue flexion contractures.

The orthosis consists of a forearm trough joined to a humeral trough via a hinge located at the axis of the elbow joint. Theraband is attached to the posterior portion of the splint, providing a gentle, controlled stretch (see Figure 1).

Construction
To construct the splint, any thermoplastic material can be used, such as Orthoplast, K-splint, or Polyform, together with Velcro strapping and Theraband.

The forearm trough and the humeral trough are constructed by wrapping the thermoplastic material cylindrically around the arm and forearm, allowing an anterior opening just large enough to permit the patient to comfortably don the splint. Velcro straps are used to hold these troughs snugly in place, and thin padding can be applied to the inside of these troughs if needed.

A hinge fabricated out of the same thermoplastic material or a prefabricated hinge can be used. The hinge is carefully applied to ensure that the axis of the splint corresponds to the anatomical axis of the elbow. This anatomical axis is determined by visually observing the axis around which flexion and extension of the elbow occur.

Thermoplastic hooks are fabricated and applied to the posterior portions of the humeral and forearm components at the proximal and distal borders, respectively. A length of Theraband is tied into a loop and stretched over the hooks, providing a continuous dynamic stretch. The Theraband should be tight enough to provide stretch of the soft tissue to the point where the patient first indicates pain; however, since excess force may result in edema which could

Figure 1
Splint Consisting of Forearm Trough Joined to Humeral Trough via a Hinge
Figure 2
Splint as Worn by Patient

Note. Thin adhesive padding and wide Velcro strapping are used for the patient's comfort.

slow or reverse progress, the therapist should be careful to limit the tension to the minimum needed to provide a gentle stretch.

A bridge may be necessary to prevent the Theraband from rubbing on the posterior portion of the elbow. This bridge, which can also be fashioned of the thermoplastic material, is placed on the posterior portions of the arm troughs (see Figure 2).

It is recommended that the splint be worn several hours daily. Measurements should be made on a regular basis; splint adjustments are made by gradually tightening the Theraband to increase or maintain tension as elbow extension improves.

Precautions

As with any splint, the patient's skin should be checked for signs of increased pressure from splint wear. The length of time the splint is to be worn in any 24-hour period should be increased gradually until the patient is wearing the splint for the prescribed time, and the patient should be able to don the splint independently before leaving the clinic.

History

This splint was designed primarily for patients who had sustained fractures of one or more bones of the elbow joint. Of the few prefabricated dynamic splints available for this purpose, none were tolerated well by patients in terms of skin breakdown and comfort: Tension was either hard to adjust or hard to maintain, and the forearm troughs, which need to conform to the patient's arm and forearm, were inadequate.

Similar designs have been published as early as 1959 (Blashy & Fuchs) and as recently as 1985 (American Academy of Orthopaedic Surgeons). However, the unique features of the splint described here, such as the use of Theraband to provide quick and easy tension adjustment, the use of articulated hinges, and the use of bridges for the Theraband have proved to be useful additions to previously published designs.

This splint has been used on nine patients over a period of 2 years in conjunction with a stretching and exercise program. The results gathered from these patients indicate a much higher degree of success than is attainable by using either a prefabricated splint alone, a prefabricated splint and a program of stretching and exercise, or simply stretching and exercise alone.

References