The Use of Hexcelite in Splinting the Thumb

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During the past decade, bioplastics have gained wide acceptance for use in splinting the hand. The material can be custom fitted, is removable, lightweight, and durable. The need to institute early motion of the hand, but still protect the thumb, prompted the design of the Hexcelite thumb splint. The material has an open weave that provides direct visualization of the skin during molding and thus allows precise fitting. The tape is easy to mold by expansion or compression of the interstices; also, the honeycomb pattern promotes skin hygiene by venting perspiration. The splint completely immobilizes the thumb metacarpal phalangeal and interphalangeal joints and permits full wrist motion. The design seems optimal for temporary or prolonged immobilization of the thumb joints with minimal inconvenience to the patient.

Materials and Methods

The material used for thumb splint construction is Hexcelite Orthopaedic Tape (Hexcel Co.), an open weave, cotton fabric coated with a high density resin. The tape is water resistant, nonabsorbant, and radiolucent; it is stronger and lighter than plaster and has an equivalent setting time. The material becomes highly flexible when placed in warm water. On cooling, the material is rigid and retains the desired contour. Reinforcement is achieved by layering the warm self-adherent material. Remodeling is accomplished by re-heating the splint.

To construct the splint, water is heated to 170°-200°F in an electric pan or hydrocollator containing a protective plastic net to prevent the material from sticking to the heating unit. Two strips of material, 15 x 7.5 cm, are sufficient for the average adult thumb. The strips are immersed in water approximately 1 minute until flexible and sticky, shaken to remove the water, then molded directly to the thumb, overlapping the material in the web space while keeping the thumb in a functional position (Figure 1). When the splint has cooled, the patient gently removes it, the therapist trims the excess, smooths the edges, and re-heats the splint for a final fitting. A dry heat blower can be used to assist the application of reinforcement strips to the splint. A wrist strap is secured by gluing a 2.5-cm patch of adhesive-backed, pressure-sensitive Velcro volarly and dorsally on the base of the splint (Figure 2). Patients are given adhesive padding when minor splint adjustment is required. The splint can be cleansed periodically by brushing with mild soap and cold water. A 5-cm elastic bandage can be worn over the splint for added protection and support.

Clinical Application

The splint was used in the treatment of 68 patients with thumb impairments (Table I); two thirds required a right thumb splint, one third a left thumb splint. The length of time the splint was worn ranged from 1 to 6 weeks and averaged 3 weeks. The time range excludes treatment of postural deformities and elective (PRN) use.

The splint was developed initially to improve rehabilitation of metacarpal phalangeal joint ligamentous injuries. Previously, plaster thumb spica immobilization had been used 4 to 6 weeks following collateral ligament injury or surgical repair. The Hexcelite splint permitted early removal of the thumb spica. Its light weight, durability, simple maintenance, and adjustability were positive features. Use of the splint was extended to other thumb rehabilitative conditions. Pre-operative splinting to maintain functional position, post-operative splinting to support surgical reconstruction, protective

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TABLE 1
Impairments of the Thumb Treated with Hexcelite Splint (N = 58)

<table>
<thead>
<tr>
<th>No.</th>
<th>Patients</th>
<th>Clinical Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td></td>
<td>MP ulnar collateral ligament injury</td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>Post-surgical (e.g., arthrodesis)</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Miscellaneous (e.g., tenosynovitis)</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Metacarpophalangeal fracture/dislocation</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Arthritis</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Interphalangeal fracture dislocation</td>
</tr>
</tbody>
</table>

Painful motion of the thumb basal joint was protected by proximal extension of the splint with an additional strip of material. The splint was also applicable to the maintenance of the first web space. By extending the splint over the dorsum of the hand and palmarward, a stable support of the hypothenar eminence was achieved. With hypothenar support, metacarpal phalangeal joint clawing could be controlled by extending the dorsal portion of the splint distally to the proximal interphalangeal level of the fingers.

There were virtually no complications associated with the splint. Pressure points or soft tissue impingements were easily corrected by reheating and remolding. Splint breakage or deterioration did not occur. Continued use and soiling occasionally warranted replacement of the Velcro wrist strap. Importantly, there were no disruptions of surgical repair, fracture displacement, or persistent painful joint motion because of inadequate splint immobilization. Refitting the splint was later required for two patients who had considerable thumb edema when the splint was first applied.

Discussion
The splint design does not impede wrist motion, thus extrinsic forces acting on the thumb are not effectively countered. Extrinsic thumb flexor and extensor repairs require splinting the wrist, in addition to the thumb, during healing. Since the splint is applied directly to the skin, it is unwise to place the material over fresh wounds in the early post-operative period. Use of plaster is recommended the first week following surgery. Thereafter, the risk of wound infection is reduced, wound pain is less, and edema is diminished to allow elective use of the splint.

Summary
Hexcelite Orthopaedic Tape can be used effectively for splinting thumb joints. The open weave material is easily molded, lightweight, and durable. It is useful in the rehabilitation management of a variety of thumb disorders and is well accepted by patients.