Splinting for Osteoarthritis of the Carpometacarpal Joint: A Review of the Evidence

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OBJECTIVE. Our objective was to review the evidence regarding the effectiveness of splinting for carpometacarpal osteoarthritis.

METHODS. A systematic review was conducted. Clinical considerations, occupational therapy exemplars, and further research questions were identified.

RESULTS. There was fair evidence for the effectiveness of splinting to relieve pain and improve function. There was no clear evidence of the superiority of one type of splint over another for pain relief, comfort, or function. Patient preference regarding type of splint varied.

CONCLUSIONS. Research to date indicates that splinting may help relieve pain in persons with carpometacarpal osteoarthritis. Further investigation is recommended using controlled methodology, more thorough reporting of outcomes, and tracking of analgesic use.


Occupational therapy intervention for persons with arthritis includes consideration of the use of orthoses (Yasuda, 2002). To assist patients to make informed decisions regarding the use of orthoses, occupational therapists must understand the theoretical and technical literature as well as the related research evidence. Although a number of excellent summaries of theoretical knowledge exist (Melvin, 2002; Moran, 2001; Poole & Pellegrini, 2000; Yasuda, 2002), to date there have been few systematic reviews of research on the effectiveness of splinting in arthritis. The purpose of this article is to report findings from a systematic review of the effectiveness of splinting in osteoarthritis of the thumb carpometacarpal (CMC) joint.

Osteoarthritis of the CMC joint is a common and troubling problem. Although the exact etiology is unknown, genetic, gender, environmental, and physiological factors all appear to play a role (Estes, Bochenek, & Fassler, 2000). The estimated prevalence of symptomatic CMC osteoarthritis increases with age and is especially prevalent among postmenopausal women. When the Framingham study participants (Dawber, Meadors, & Moore, 1951) were examined at ages 70 years and older, 3% of men experienced symptomatic CMC osteoarthritis in the left hand and 2.2% experienced it in the right hand. The figures for women were 5.0%, left hand, and 5.1%, right hand. Symptomatic osteoarthritis of the hands was related to difficulty carrying loads of 10 pounds or more and writing, handling, or manipulating small objects (Zhang et al., 2002).

One of the primary factors in CMC joint osteoarthritis is believed to be the inherent laxity of the volar oblique ligament. When this joint is repeatedly stressed (e.g., as in activities causing heavy loading on the joint), subluxation occurs, resulting in incongruity of opposing surfaces, inflammation, and eventual degeneration. These joint changes cause stiffness, which often is increased by the formation of osteophytes at the trapezium or metacarpal base. Movement can be further limited if the CMC joint becomes fixed in a dorsally subluxed position, limiting radial adduction. The thumb metacarpophalangeal (MCP) joint may become hyperextended to compensate (Glickel, 2001).
Carpometacarpal osteoarthritis is considered to have four stages that are discernible on X-ray. In Stage 1, there is a symptomatic increase in the trapeziometacarpal joint space, with subluxation and synovitis. In Stage 2, one observes a narrowed trapeziometacarpal joint space, with or without osteophytes of less than 5 mm and sclerosis. In Stage 3, a narrow or absent trapeziometacarpal joint space is seen, with sclerosis and osteophytes greater than 5 mm but a normal scaphotrapezial joint. Finally, in Stage 4, all of the same changes of Stage 3 are observed along with a narrowed scaphotrapezial joint (Eaton & Glickel, 1987). It is interesting to note that the degree of pain and associated functional problems varies considerably among patients with different stages of the disease; patients with minimal disease can experience severe pain, whereas those with advanced disease may be symptom free (Glickel, 2001).

Conservative treatment of CMC osteoarthritis includes analgesics, joint protection, strengthening exercises of the intrinsic and extrinsic muscles of the thumb, assistive devices, and splinting (Estes et al., 2000; Glickel, 2001). Surgical management may be recommended to relieve intractable pain. The procedure used varies according to disease stage (Glickel, 2001).

When splinting is carried out, the overall objective is to stabilize the CMC joint, providing pain control and preventing contracture, while maintaining hand function. The primary goal of stabilization of the base of the first metacarpal during pinch is to prevent dorsal subluxation (Poole & Pellegrini, 2000). Theoretically, then, splinting would not provide effective pain relief in the presence of a fixed CMC deformity.

Two types of splints are commonly used in the treatment of CMC osteoarthritis: the long opponens–type splint that includes the wrist and extends to the thumb interphalangeal joint and the short opponens–type that is based in the palm and extends only to or just past the first MCP joint (Shurr & Michael, 2002). Poole and Pellegrini (2000) recommended a short opponens–type splint with the thumb in palmar abduction and the MCP joint in 30° flexion. According to these authors, splinting the MCP joint in 30° of flexion reproduces the surgical unloading of the CMC joint of a metacarpal osteotomy. They professed good results of splint wear in patients with Stage 1 or Stage 2 of the disease. Chaisson and McAlindon (1997) stated that splinting the thumb in slight adduction, allowing for palmar pinch without movement at the joint, can provide good pain relief. Glickel (2001) reported radiographic evidence that the short opponens splint did stabilize a stressed trapeziometacarpal joint. He recommended use of a short opponens splint during the day and a long opponens splint at night for up to 1 month, in addition to a nonsteroidal anti-inflammatory drug (NSAID) analgesia, before considering surgery for pain relief. Colditz (2000) recommended a short opponens splint when osteoarthritis is limited to the CMC joint and a long opponens splint when the scaphotrapezial joint is involved or hyperextension at the MCP joint is beginning to develop. She described a volar hand-based splint that applies an extension force to the palmar and ulnar aspect of the distal metacarpal with counterpressure to the dorsoradial aspect of the metacarpal base.

Despite the enthusiasm for splinting evidenced by the authors cited previously, it is difficult to find an evidence-based guide for splinting for osteoarthritis of the CMC joint. Towheed (2005) carried out a systematic review of 34 randomized controlled trials (RCTs) of pharmacologic and nonpharmacologic treatments for CMC osteoarthritis, including three RCTs of splinting. Towheed concluded that, because of the methodological weaknesses of the studies, no recommendations could be made. The purpose of our study is to provide evidence-based recommendations for occupational therapists considering splinting as an intervention for CMC osteoarthritis by looking at a broader range of research on this subject.

Methods

Given an anticipated small number of studies in this area, we decided to include all studies, regardless of design. Inclusion criteria were that the study was experimental or observational and examined the effects of splinting for osteoarthritis of the CMC joint in adults. Studies were excluded if they reported on the effectiveness of postsurgical splinting or the effectiveness of splinting as an adjunct to a medical procedure (e.g., cortisone injection), or if the study was published in a language other than English or French.

Electronic searches were conducted up to June 2006 using the following well-recognized sources: MEDLINE from 1962, EMBASE from 1988, CINAHL from 1982, the Cochrane Controlled Trials Register, Healthstar from 1975, the database of the Cochrane Field of Rehabilitation and Related Therapies (based in Denmark), PEDro: Physiotherapy Evidence Database 2002 update, PsycINFO, REHABDATA, and Dissertation Abstracts International databases. Search terms were identified by a reference librarian with extensive experience in systematic reviews (search terms available on request).

Retrieved titles and abstracts were reviewed by the first author, who selected the studies that met the inclusion criteria. She then abstracted the methods and results and calculated effect sizes of the results for studies that included a control group and outcomes rated on a continuous scale. The first author then rated each study according to the
American Occupational Therapy Association’s Evidence-Based Practice Project schema (Trombly, Tickle-Degnen, Baker, Murphy, & Ma, 1999, as cited in Stoffel & Moyers, 2004) (Table 1). Based on a synthesis of this information, guidelines for occupational therapy intervention were developed.

**Results**

The search resulted in 16 articles, 7 of which were later identified as meeting the inclusion criteria. Of the 9 remaining articles, 5 were theoretical discussions, two were case reports, and 1 was a systematic review that contained three of the identified studies. The studies identified for this review included 1 RCT, 1 pretest–posttest, 1 retrospective cohort study and 1 posttest-only study that examined the effectiveness of splint use, and 3 randomized controlled crossover head-to-head trials that examined the relative effectiveness of different types of splints (Table 2).

**Splinting vs. No Treatment or Alternate Treatment**

Berggren and colleagues (Berggren, Joost-Davidsson, Lindstrand, Nylander, & Povlsen, 2001—Level IB1a) enrolled 33 female patients ranging from 46 to 80 years of age ($X = 63.7$). All of the women met the following criteria: isolated CMC joint arthritis on X-ray, absence of adduction contracture, and pain on movement with stress and pain at rest that interfered with activities. All of the women had been referred for consultation with a hand surgeon.

These participants were randomized to three groups: one that did not receive splinting (although they had access to many different types of adapted equipment) and two that received splints. One splint group received a semi-stable textile splint, which was fabricated at a Swedish factory and then custom-fitted by the occupational therapist. This splint was essentially a very short elastic gauntlet that extended down to just below the wrist crease and up to the interphalangeal joint of the thumb. A stabilizing plastic strip was attached to the thumb dorsally to lend support to the CMC and MCP joints. The other splint group received a leather splint custom-fabricated by the occupational therapist. It was wrapped around the thumb in a funnel shape that extended from just above the MCP joint, across the thenar eminence, and down to just below the CMC joint. Patients with splints were instructed to wear their splints as often as possible, especially during painful activities. Patient diaries compiled during the first 3 months of follow-up revealed that both groups wore their splints approximately 11 1/2 hours daily (Jane Lindstrand, personal communication, August 29, 2002). All of the women attended three occupational therapy appointments during which they were instructed in joint protection, adaptation of the work environment, and use of the equipment or splints.

### Table 1. Levels of Evidence and Classification Schema Used in Reviewing Studies

<table>
<thead>
<tr>
<th>Grade for Design</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Randomized controlled trials (RCTs) using experimental designs with randomization to groups and repeated measure designs with randomization to sequence of treatments. Also includes meta-analyses that analyze only RCTs.</td>
</tr>
<tr>
<td>II</td>
<td>Non–RCT-2 group. Two group (treatments) comparisons. Repeated measures but with two conditions. Also includes meta-analyses that analyze non–RCT studies.</td>
</tr>
<tr>
<td>III</td>
<td>Non–RCT-1 group. One group pretest and posttest. Cohort, case control, cross-sectional designs.</td>
</tr>
<tr>
<td>IV</td>
<td>Single-subject design.</td>
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<tr>
<td>V</td>
<td>Narratives, case studies, qualitative designs, expert opinions, retrospective reviews.</td>
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<tr>
<th>Grade for Sample Size</th>
<th>Definition</th>
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<tbody>
<tr>
<td>A</td>
<td>$n &gt; 20$ per condition.</td>
</tr>
<tr>
<td>B</td>
<td>$n &lt; 20$ per condition.</td>
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</tbody>
</table>

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<tr>
<th>Grade for Internal Validity</th>
<th>Definition</th>
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<tbody>
<tr>
<td>1</td>
<td>High internal validity: no alternate explanation for outcomes.</td>
</tr>
<tr>
<td>2</td>
<td>Moderate internal validity: attempt to control for lack of randomization.</td>
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<tr>
<td>3</td>
<td>Low internal validity: two or more serious alternative explanations for outcome.</td>
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</table>

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<tr>
<th>Grade for External Validity</th>
<th>Definition</th>
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<tbody>
<tr>
<td>A</td>
<td>High external validity: S's represent population—AND—treatments represent current practice.</td>
</tr>
<tr>
<td>B</td>
<td>Moderate external validity: between high and low.</td>
</tr>
<tr>
<td>C</td>
<td>Low external validity: heterogeneous sample without being able to understand whether effects were similar for all diagnoses—OR—treatment does not represent current practice.</td>
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</tbody>
</table>

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<thead>
<tr>
<th>Study</th>
<th>Level of Evidence</th>
<th>Sample</th>
<th>Treatment</th>
<th>Dosage</th>
<th>Outcome</th>
<th>Effect Size</th>
<th>Threats to Internal Validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berggren, Joost-Davidsson, Lindstrand, Nylander, &amp; Povlsen (2001)</td>
<td>IB1a</td>
<td>• N = 33</td>
<td>Group 1, no splinting (n = 11)</td>
<td>Patients instructed to wear their splints as much as possible, especially during painful activities</td>
<td>Desire for surgery at 7 months NS</td>
<td>NA</td>
<td>Substantial loss to follow-up due to death at 7 years in textile group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• All women</td>
<td>Group 2, semi-stable textile splint (n = 11)</td>
<td></td>
<td>Desire for surgery at 7 years NS</td>
<td>NA</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Mean age 63.7 (range 46–80 years)</td>
<td>Group 3, custom-made leather splint (n = 11)</td>
<td></td>
<td></td>
<td>NA</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Isolated CMC joint arthritis</td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
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<tr>
<td></td>
<td></td>
<td>• Referred for surgical consultation</td>
<td></td>
<td></td>
<td></td>
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<td>NA</td>
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</table>
| Bongi, Guidi, Cencetti, & Zoppi (1991)    | IIIC3a            | • N = 13                                    | Short opponens–type splint, custom made                                  | 5–6 hours per day and at night during the first month, then during heavy activities only | Pain on several common activities (10 cm VAS) 1 week, 1 month, and 1 year post-fitting was significantly reduced compared to pre-splint levels | NA          | No control group  
No indication that evaluator was masked |
|                                           |                   | • All women                                 |                                                                           |                                                                        |                                            | NA          |                                                                  |
|                                           |                   | • Mean age 57 (range 45–70 years)           |                                                                           |                                                                        |                                            | NA          |                                                                  |
|                                           |                   | • Isolated CMC arthritis 1–18 months’ duration |                                                                           |                                                                        |                                            | NA          |                                                                  |
| Buurke, Grady, de Vries, & Baten (1999)   | IB2a              | • N = 10                                    | 3 splints worn consecutively in random order: 
(a) semi-rigid thin orthosis that did not cross the wrist (Sporlastic 07051)  
(b) firm elastic splint with a semi-rigid strip along the dorsal side of the thumb (Gibortho 6302)  
(c) a supple elastic wrist gauntlet (Uriel 25). | Daily for 4 weeks                                                                              | Wearing comfort  
10-cm VAS  
\(p = 0.05\) | 1 vs. 2  
1 vs. 3  
2 vs. 3  
-0.16  
-0.95  
-1.21 | No indication that evaluator was masked |
|                                           |                   | • All women                                 |                                                                           |                                                                        |                                            | NA          |                                                                  |
|                                           |                   | • Mean age = 67.2 (range 39–91 years)       |                                                                           |                                                                        |                                            | NA          |                                                                  |
|                                           |                   | • CMC pain 1–14 years’ duration             |                                                                           |                                                                        |                                            | NA          |                                                                  |
| Melvin & Carlson-Rioux (1989)             | IIB3a             | • N = 37                                    | Custom-made thermoplastic splint                                          | Not specified                                                                 | Pain relief (VAS), reduction of NSAID use.  
(Significance testing not applicable.) | NA          | No control group  
No pretest  
Retrospective reporting |
|                                           |                   | • CMC osteoarthritis                        |                                                                           |                                                                        |                                            | NA          |                                                                  |
| Swigart, Eaton, Glickel, & Johnson (1999) | IIIA3a            | • 114 patients (130 thumbs) 93 women        | Long opponens–type splint                                               | Continuous wear for 3–4 weeks, with gradual decrease over 3–4 weeks’ period to wear only during heaviest activities and at night | Level of pain relief (25%, 50%, 75%, or 100%) immediately after splint initiation and 6 months later  
(Significance testing not applicable) | NA          | No control group  
Retrospective reporting |
|                                           |                   | • Mean age 53.8 (range 19–82 years)         |                                                                           |                                                                        |                                            | NA          |                                                                  |
|                                           |                   | • CMC osteoarthritis                        |                                                                           |                                                                        |                                            | NA          |                                                                  |
|                                           |                   | • Approximately 1/2 had Stage I or Stage II disease |                                                                           |                                                                        |                                            | NA          |                                                                  |

(continued)

The American Journal of Occupational Therapy

73

All patients were examined at 7 months and 7 years by a hand surgeon who was unaware of their group assignment. Approximately one-third of each group desired surgery at the 7-month follow-up, indicating that splinting did not have an effect on this outcome. After 7 years of follow-up, 1 additional patient in each of the splinting groups eventually had surgery. No additional patients in the group without splints had surgery.

Bongi and his colleagues (Bongi, Guidi, Cencetti, & Zoppi, 1991—Level IIIC3a) carried out a pretest–posttest study of a short opponens splint. Study participants were 13 women, ages 45–70 years (mean = 57 years), who had been diagnosed with CMC arthritis, without involvement of the other joints, during the previous 1–18 months. The thumb was splinted in “half opposition,” and participants were instructed to wear their splints 5–6 hours per day and at night during the first month, then during heavy activities only.

Pain on several activities (wringing out a rag, turning a doorknob, lifting a full teapot, cutting meat, driving a car) was measured using a visual analogue scale (VAS) 10 units in length, before splint fitting, and then 1 week and 1 month after initiation of splint wear. Substantial decreases in pain were observed after 1 week and 1 month of wear, and these decreases were stable over the next year.

Swigart and her colleagues (Swigart, Eaton, Glickel, & Johnson, 1999—Level IIIA3a) followed 125 patients with 141 thumbs affected by CMC osteoarthritis seen for surgical consultation. Eleven of these patients (11 thumbs) were referred directly to surgery, because these patients either did not wish to be splinted, were not able to be splinted, or already had unsuccessfully completed a trial of splinting. The remaining 114 patients (130 thumbs) consisted of 93 women and 21 men of ages ranging from 19 to 82 years (average 53.8). Approximately one half had Stage I or Stage II disease.

All patients received a long opponens splint that they wore continuously for 3–4 weeks and then gradually decreased wearing during a subsequent 3–4 week period, in which they wore it increasingly in only their heaviest activities and at night. In a postal questionnaire sent out approximately 6 months after treatment, patients were asked whether they experienced immediate pain relief and, if so, to rate their level of pain relief (25%, 50%, 75%, or 100%) immediately after splint initiation and 6 months later. Participants also were asked about their ability to comply with splint wear.

Results were analyzed by disease stage, either Stage I or Stage II (Group A), or Stage III or Stage IV (Group B). Seventy-four patients (with 85 involved thumbs) responded...
(67%). Of the 32 patients in Group A, 26 (76%) had at least some immediate pain relief; the average improvement immediately after splinting and at 6 months was 60%. Of the 42 patients in Group B, 27 (54%) experienced at least some immediate pain relief. Average pain relief was 61% immediately after splinting and 54% at 6 months. From Group A, 2 patients (2 thumbs) eventually had surgery. These patients had experienced no improvement with splinting. From Group B, patients representing 21 thumbs underwent surgery. Patients representing 17 of these thumbs had completed the questionnaire. Of this group, initial pain relief on splinting was experienced for only 3 of the thumbs, and among these patients the average amount of initial pain relief was only 25%. These individuals experienced no pain relief on splinting at 6 months.

The majority of patients (75% of Group A and 69% of Group B) reported that they were able to follow the splint-wearing schedule. Those who could not reported that the splint restricted their activities (especially driving, writing, and playing sports) or was painful to wear.

Melvin and Carlson-Riouix (1989—Level IIIB3a) sent a mail survey to 47 patients who had received an orthosis for CMC osteoarthritis. Thirty-seven (74.5%) of the patients replied and reported their pain levels and use of NSAID pain medication. Twenty-four patients reported at least some relief of pain (51.1% of the original patient group), and 6 reported complete pain relief (12.8% of the original group). Seven patients reported reduction of NSAID use (14.9% of original group). This figure is a conservative estimate of NSAID reduction because not all patients were using NSAIDs at the time of splinting.

Comparison of Different Types of Splints
In the first of two trials comparing different types of splints for CMC osteoarthritis without a no-splint control, Buurke, Grady, de Vries, and Baten (1999; Level II) enrolled 10 women, ages 39–91 years (mean = 67.2), who had experienced CMC pain for 1–14 years’ duration, in a crossover trial of 3 types of splints. Five of the women had worn a leather wrist gauntlet before participating in the study.

Each woman wore each of three different types of splints for 4 weeks each. The splints were presented in random order with no washout period between their use. The three splints were (1) a semi-rigid thin polyethylene orthosis that did not cross the wrist (Sporlastic 07051, available from Somas, T‘ Kempke 1, 5845GB St. Anthonis, The Netherlands), (2) a firm elastic splint with a semi-rigid strip along the dorsal side of the thumb (Gibortho 6302, available from Koha Medical BV, Sportlaan 3, 3299ZG, The Netherlands), and (3) a supple elastic wrist-gauntlet-type orthosis (Uriel 25, available from Bogaartz en Partners, Meierijlaan 48, 5628EA Eindhoven, The Netherlands).

Each day the women rated their pain, function, comfort, and splint cosmesis using a 10-cm VAS and were administered a test of hand function (the Green test) and pinch strength (both maximum pinch and pinch to pain threshold) at the end-of-wear period with the orthosis on. The women reported no difference in pain depending on the orthosis worn and no differences in pinch strength were found.

The women rated the Uriel splint as superior for wearing comfort. They also rated the Uriel as superior for function and tended to achieve better functional scores wearing this splint, but these differences did not attain statistical significance. They preferred the appearance of the Sporlastic. Problems with pressure were noted by 6 women during wear of the Gibortho and 6 women during wear of the Sporlastic. The participants noted as well that activities during which the splint could become wet or soiled could not be performed with the Gibortho or Uriel splints.

Weiss, LaStayo, Mills, and Bramlet (2000; Level IB1a) carried out a randomized crossover study of two types of splints. Their participants were 5 men and 21 women ranging from ages 36 to 88 years (mean = 57). Symptom duration ranged from less than a year (9 participants), 1–5 years (14 participants), and more than 5 years (3 participants). Both of the splints were custom-molded from low temperature thermoplastic. One was a short opponens splint ending below the thumb MCP joint; the other was a volar long opponens splint that included the thumb MCP joint.

Participants wore each splint for 1 week in random order, and there was no washout period between splint use. Participants rated their pain before splint application and after 1 week of splint wear. Compared to pre-splint levels, the participants reported substantial pain reduction with both splints (approximately 2–2.5 cm decrease on a VAS of 10 cm). Although Weiss and her colleagues (2000) reported no difference between the two splints with regard to pain relief, our calculations based on their graphs demonstrated the superiority of the short opponens splint. We also noted that pinch strength was somewhat better with the short opponens splint. No difference in pain on pinch was observed. When wearing the short splint, on average patients reported that 42% of daily activities were easier to perform, whereas 7% were more difficult. When wearing the long splint, on average they reported that 16% of activities were easier and 56% were more difficult.

Among participants with Grade 1 or Grade 2 CMC osteoarthritis, the percentage of CMC subluxation on pinch was decreased (from approximately slightly more than 30% to slightly less than 20% for participants with
Grade 1 osteoarthritis and from approximately 43% to slightly more than 30% for participants with Grade 2 osteoarthritis). These results did not seem to differ depending on the type of splint. No difference in subluxation on pinch was noted for participants with Grade 3 or Grade 4 osteoarthritis. As for patient preference, about half of the participants with Grade 1 or Grade 2 osteoarthritis preferred the short opponens splint, and half preferred the long opponens splint, whereas the majority of the participants with Grade 3 or Grade 4 preferred the short opponens splint.

These researchers also examined the relative effectiveness of a prefabricated neoprene splint and a custom-made splint based on Colditz’s (2000) model in a randomized crossover trial (Weiss, LaStayo, Mills, & Bramlet, 2004—Level IB1a). The participants, 4 men and 21 women, had Stage 1 or Stage 2 CMC osteoarthritis with symptoms lasting fewer than 6 months (12 patients), 6 months to 1 year (5 patients), or 1 to 5 years (8 patients).

Similarly to the previous study, participants wore each splint for 1 week in random order, and there was no washout period between splints. Participants rated their pain at rest before the splint application and after 1 week of splint wear. Compared to pre-splint levels, the participants reported substantial pain reduction with both splints (approximately 2–3 cm decrease on a VAS of 10 cm). Pinch strength was decreased with the custom-made splint (on average 0.3 kg) but increased with the prefabricated splint (on average 0.6 kg) compared with pre-splint levels. Pain during pinch was decreased with both splints, but most markedly with the prefabricated splint (average decrease of approximately half a centimeter on 10 cm VAS for the custom-made splint, and 1.5 cm for the prefabricated neoprene splint). Three-quarters of the sample preferred the prefabricated splint, whereas the remaining quarter preferred the custom-made splint.

### Applying the Evidence to the Practice of Occupational Therapy

Using the levels of evidence and classification schema introduced by Stoffel and Moyers (2004), we synthesized the preceding results in a guide to practice and research based on the current state of knowledge (Table 3). Essentially, we found evidence that, on average, patients who received a splint obtained some pain relief from it. This evidence came exclusively from pretest–posttest types of studies or from the pretest–posttest phase of RCTs examining the relative effectiveness of different types of splints. This type of evidence is open to threats to internal validity, particularly from the placebo effect but also from the effects of other treatments commenced when splinting was initiated (e.g., a change in analgesic medication). Therefore, this evidence could be considered limited (Ebell et al., 2004). We found no evidence that one type of splint was more effective at providing pain relief or enhancing function than another.

### Table 3. CMC Osteoarthritis Splinting Clinical Considerations, Occupational Therapy Application Exemplars, and Research Questions

#### CMC osteoarthritis splinting clinical considerations

- Splint wear does appear to decrease subluxation on pinch for individuals with Stage I and II CMC osteoarthritis (Weiss et al., 2000).
- Splint wear does not appear to decrease the eventual need for surgery (Berggren, Joost-Davidsson, Lindstrand, Nylander, & Povlsen, 2001; Swigart et al., 1999), particularly for persons with advanced disease or those who do not get at least some immediate relief from splinting (Swigart et al., 1999).
- There do not appear to be any clear indications for selecting a short opponens or long opponens design (Buurke, Grady, de Vries, & Baten, 1999; Weiss et al., 2000, 2004) other than patient preference.
- Different types of splints appear to have characteristics that would make them more or less attractive to patients depending on the types of activities they routinely perform (Buurke et al., 1999; Weiss et al., 2000).
- With the exception of one pretest–posttest study (Melvin & Carlson-Rioux, 1989), concomitant use of analgesics was not reported in any of the studies. It is unclear whether analgesia is required in addition to splinting to obtain the levels of pain relief reported in other studies.

#### CMC osteoarthritis splinting occupational therapy exemplars

- Patients should be offered a course of splinting for pain relief (Bongi et al., 1991; Swigart et al., 1999; Weiss et al., 2000, 2004).
- Patients should be instructed to wear their splint at least during heavy or painful activities and may wear them for longer periods during the day and at night for the first 3–4 weeks (Berggren et al., 2001; Bongi et al., 1991; Buurke et al., 1999; Melvin & Carlson-Rioux, 1989; Swigart et al., 1999; Weiss et al., 2000).
- Individuals with Stage I and II osteoarthritis should be encouraged to wear their splint during activities promoting CMC subluxation (Weiss et al., 2000, 2004).
- The characteristics of the different types of splints should be discussed with patients so that their preferences and needs can be taken into consideration when selecting a splint (Buurke et al., 1999; Weiss et al., 2000).

#### CMC osteoarthritis splinting occupational therapy questions

- What is the effect of a patient-centered program of splinting (i.e., splinting based on consideration of the individual’s activities and preferences) on pain and function of persons with CMC osteoarthritis?
- What is the effect of a patient-centered program of splinting on use of analgesics?

*Note: CMC = carpometacarpal.*
Discussion

As stated previously, the overall results of this review provide some evidence that splinting for CMC osteoarthritis may be effective for pain reduction. There was no evidence, however, that one type of splint was more effective than another, even in different stages of the disease. Given that patient preferences varied considerably, as did the suitability of different types of splints for different activities, we recommend that a patient-centered approach to splinting be used. Such an approach would require discussion of the different characteristics of each splinting option, during which the patient would be facilitated to select one (or more) splints based on his or her preferences and needs (McKee & Rivard, 2004). Such an approach has been reported as satisfactory in two case reports (Dunn, Pearce, & Khoo, 2002; McKee & Rivard, 2004), although in at least one of these cases the results were short-lasting (Dunn et al., 2002).

Although six studies of splinting in CMC osteoarthritis were located, none were carried out using a design that could lead to strong epidemiologic evidence of the effectiveness of this intervention. Therefore, the question of the overall effectiveness of splinting in providing pain relief remains unanswered. A high-quality RCT, perhaps using waiting list controls (because of the ethical difficulty of withholding a treatment for which fair evidence of effectiveness exists), is required to resolve this question. Such a study also could be used to examine the effectiveness of patient-centered splinting for CMC osteoarthritis; that is, splinting that is carried out not necessarily according to a rigid protocol, but one that allows for different types of splints to meet varying patient activity needs and preferences (McKee & Rivard, 2004).

The recommended study would include detailed information on the stage of the disease, as well as detailed diagnostic information (Towheed, 2005) and follow-up over at least several months. As well, within such a study, the effects of splinting on analgesic use should be examined. Morbidity related to chronic use of analgesics is a substantial problem for persons with arthritis (Blower, 1996). To help patients make informed decisions regarding splint use, occupational therapists must know whether splint wear allows patients to decrease their use of analgesics or whether the pain relief provided by splints is dependent on chronic analgesic use. The possible need for chronic analgesic use to supplement pain relief from splinting would be another important consideration for patients as they decide whether to wear a splint.

Summary

Although the evidence regarding the effectiveness of splinting for CMC osteoarthritis is underdeveloped, there is fair evidence to support the use of splinting in CMC osteoarthritis to provide pain relief. Given the conservative nature and relatively low cost of splinting, it is recommended that patients be given the opportunity to try a splint.

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References


Evidence-Based References


