

# Scapholunate Interosseous Ligament Reconstruction: Results With a Modified Brunelli Technique Versus Four-Bone Weave

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**Purpose** To compare clinical and radiographic outcomes in patients with chronic scapholunate dissociation treated with a modified Brunelli technique versus a 4-bone tendon weave.

**Methods** A retrospective cohort study was performed. Twenty-three patients presented with chronic scapholunate dissociation and were treated with the 4-bone tendon weave technique as described by Almquist and colleagues. A separate group of 21 patients were subsequently treated with a modified Brunelli plus reduction-assisted scapholunate ligament technique. All patients had preoperative radiographs demonstrating scapholunate ligament disruption and positive magnetic resonance arthrograms. All were treated by the senior surgeon (T.E.T.), who initially performed the 4-bone tendon weave and later the modified Brunelli procedure plus temporary screw fixation. Evaluation included radiographic changes, pain and Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire scores, grip strength, and range of motion. Data were analyzed using the Wilcoxon signed rank test for preoperative-to-postoperative comparisons and the Wilcoxon-Mann-Whitney test for comparison between the 2 treatment groups.

**Results** The scapholunate angle decreased in both groups (mean  $15^\circ \pm 5$  decrease for the Brunelli group;  $10^\circ \pm 4$  decrease in the 4-bone tendon weave group). Mean pain and DASH scores preoperatively and postoperatively demonstrated greater improvement for the modified Brunelli group (pain scores rated on a visual analog scale of 1 to 10: mean difference Brunelli group = 4.8 cm; 4-bone tendon weave group = 3.2 cm; mean difference 1.6 cm; DASH scores: mean difference Brunelli group = 31.5 points; 4-bone tendon weave group = 14.2 points). The Brunelli group also experienced greater postoperative motion as a percentage of preoperative motion (mean  $86\% \pm 7$  vs  $60\% \pm 12$ ) and significant increases in postoperative versus preoperative grip strength (mean 2 kg vs 1 kg; increase of 1 kg).

**Conclusions** The modified Brunelli technique for scapholunate interosseous ligament reconstruction compared with the 4-bone tendon weave technique has improved outcomes in pain relief, DASH scores, range of motion, and grip strength at 2.5 years follow-up. (*J Hand Surg* 2008;33A:850–856. Copyright © 2008 by the American Society for Surgery of the Hand. All rights reserved.)

**Type of study/level of evidence** Therapeutic III.

**Key words:** Brunelli technique, 4-bone ligamentous weave, scapholunate dissociation, scapholunate instability, reconstruction.

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**S**CAPHOLUNATE INSTABILITY IS THE most common form of carpal instability and arises from injury to the scapholunate ligament and the dorsal ligamentous complex.<sup>1,2</sup> Untreated, it can lead to scapholunate advanced collapse, degenerative osteoarthritis, and considerable disability, including pain and decreased grip strength.<sup>3-5</sup> Treatment of scapholunate instability is directed toward reestablishing normal carpal kinematics and is guided by the clinical stage of the disease.<sup>1</sup> Chronic static scapholunate instability is characterized by radiographs with a scapholunate interval of 4 mm or greater on the posteroanterior view, a ring sign of the scaphoid, and a dorsal intercalated segment instability deformity. It is diagnosed by these radiologic findings, arthroscopic confirmation of scapholunate ligament injury, and a positive Watson's scaphoid shift test. These injuries are difficult to correct because of secondary ligament degeneration, making it challenging to maintain the scaphoid in its position next to the lunate.

In 1978, Linscheid et al. recommended ligament reconstruction for chronic scapholunate dissociation based on a retrospective review of 55 patients. They characterized ligament repair results as only "good or fair."<sup>6</sup> In 1992, Lavernia et al. recommended direct scapholunate ligamentous repair with a radioscapoid capsulodesis in patients without degenerative osteoarthritic changes.<sup>7</sup> Previously, in 1991, Almquist et al. reported a 4-bone ligamentous weave reconstructive technique, using a strip of the extensor carpi radialis brevis tendon woven through the carpus, and reinforced

with a wire loop through the scaphoid and lunate.<sup>8</sup> They noted that 31 of 36 patients returned to work and demonstrated no progression of arthritic changes at their 5-year follow-up. In 1998, Van den Abbeele et al. reported their modification of the Brunelli technique for chronic scapholunate dissociation.<sup>9-11</sup> The authors passed a strip of the flexor carpi radialis (FCR) tendon through the distal pole of the scaphoid, anchored it to the lunate, and then reinforced the carpal capsule by looping the tendon around the radiolunotriquetral ligament and tightening the repair. They found that 17 of 22 patients treated with this repair had marked reduction of pain, and 13 of the 14 non-workers' compensation patients returned to work at an average of 10 months follow-up. Other methods of acute and chronic scapholunate injury treatment include percutaneous pinning, primary repair with capsulodesis, wrist arthrodesis, and composite grafts such as the bone-tissue-bone graft described by Harvey and Hanel.<sup>12</sup>

Surgical procedures that attempt to reconstruct anatomy and avoid marked alteration of carpal mechanics are, in theory, preferable to non-anatomic reconstructions and procedures, which notably alter carpal mechanics (ie, intercarpal arthrodesis). Two tendon-weave procedures that have been described include the modified Brunelli and the 4-bone tendon weave as described by Almquist et al. The former technique has been modified by us and combined with a variation of the reduction and association of the scaphoid and lunate (RASL) technique described by Rosenwasser.<sup>13</sup> The purpose of this study was to compare the short-term



**FIGURE 1:** Patient with scapholunate dissociation (preoperative anteroposterior and lateral radiographs). Lateral radiograph shows the longitudinal axis of the scaphoid forming an angle of 95° (scapholunate angle) with the longitudinal axis of the lunate.

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