Treatment of Static Scapholunate Instability With Modified Brunelli Tenodesis: Results Over 10 Years

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Purpose To examine the long-term results of the modified Brunelli tenodesis using a strip of the flexor carpi radialis tendon as a ligament substitute to maintain reduced rotatory subluxation of the scaphoid for scapholunate instability.

Methods Between 1995 and 1998, 10 patients with scapholunate instability underwent the modified Brunelli procedure. We reviewed 8 patients with static instability with a mean follow-up of 13.8 years (range, 12–15 y). The mean age of patients was 40 years at the time of surgery. The mean period from the injury to surgical treatment was 4 months.

Results The functional outcome according to Green and O'Brien was excellent or good in 7 of 8 patients. Postoperative Disabilities of the Arm, Shoulder, and Hand and modified Mayo scores averaged 9 and 83, respectively. At final follow-up, average total wrist motion and grip strength were 85% of the opposite normal side. Of the 8 patients, 6 were pain free; 1 patient had slight and occasional pain, and another had chronic pain. On radiographs, the average preoperative scapholunate gap was 5.1 mm. It was corrected to 2.4 mm at surgery and was 2.8 mm at final follow-up. The average scapholunate angle was 72° preoperatively, 46° postoperatively, and 63° at final follow-up. We observed degenerative osteoarthritis in 1 case.

Conclusions Because the number of cases is small, only a few conclusions can be made. At final follow-up there was a certain loss of scapholunate reduction. The fact that we observed arthritic changes in only 1 of 8 cases suggests that carpal stability obtained by this procedure is probably sufficient to obtain good functional long-term results. Long-term studies with more cases are required to evaluate this method, which has shown encouraging results in the present study. *(J Hand Surg 2013;38A:887–892. Copyright © 2013 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Rotatory subluxation scaphoid, scapholunate instability, tenodesis, wrist instability.

THE MOST COMMON FORM of symptomatic carpal instability is scapholunate (SL) dissociation. Garcia-Elias et al[1] have pointed out that treatment options depend on the integrity of the dorsal portion of the SL ligament, the healing potential of the disrupted ligaments, the status of the secondary scaphoid stabilizers, the reducibility of the carpal malalignment, and the degree of cartilage lesions. Most authors agree that soft tissue stabilization techniques such as capsulodesis or tenodesis operations are indicated in cases of SL dissociation where the SL ligament is not repairable but the carpal malalignment is easily reducible and the cartilage is acceptably preserved.[1–3] I studied my results in a series of patients treated with the tenodesis technique described first by Brunelli and Brunelli[4] and then modified by Van den Abbeele et al.[5] In the original technique, a tendon strip of the flexor

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carpi radialis (FCR) tendon is passed through a tunnel in the distal part of the scaphoid parallel to the distal joint surface, pulled dorsally to reduce rotatory subluxation of the scaphoid, and then fixed to the lunate and the radius. To avoid excessive loss of flexion in the radiocarpal joint, Van den Abbeele et al[5] modified the technique so that the FCR tendon slip is inserted into the lunate or tunneled under the radiolunotriquetral ligament, not crossing the radiocarpal joint.

Independently of that publication, in 1995 the author started with the technique described by Van den Abbeele et al.[5] In 2006, Garcia-Elias et al[1] introduced another modification of the original Brunelli technique, the 3LT procedure, in which the FCR tendon strip is passed obliquely from the palmar scaphoid tuberosity to the dorsal ridge of the scaphoid, where the dorsal SL ligament normally inserts. Then it is fixed on the lunate, passed through the radiolunotriquetral ligament, and sutured onto itself. The aims of this technique are to augment the palmar distal ligaments of the scaphoid, reconstruct the dorsal portion of the SL ligament, and reduce ulnar translation of the scaphoid.

The purpose of this study was to present the long-term results of the modified Brunelli technique as described by Van den Abbeele et al,[5] fixing the FCR tendon strip to the lunate.

MATERIALS AND METHODS

Patients

Between 1995 and 1998, the author treated 10 patients with SL instability with the modified Brunelli procedure. Two of these patients had dynamic SL instability and were excluded from this study to make it more homogeneous. Thus, in a retrospective follow-up analysis, 8 patients (7 men and 1 woman) with static SL instability were reviewed with a mean follow-up of 13.8 years (range, 12–15 y). The mean age of the patients was 40 years (range, 28–54 y) at surgery. In 3 patients, the trauma occurred during sport activities, and in 1 patient, during work as a mechanic. In 2 cases, the trauma was caused by a fall, and in 2 other cases, by traffic accidents. In 2 patients, SL dissociation was associated with distal radius fractures, which had been treated without making the diagnosis of SL ligament dissociation. Before surgery, all patients reported wrist pain and weakness. The mean period from the injury to surgical treatment was 4 months (range, 1.5–12.0 mo). The local ethics committee approved the study.

Surgical procedure

A longitudinal skin incision was centered over the Lister tubercle. The dorsal sensory branches of the radial and ulnar nerves were identified and protected. The extensor retinaculum was divided along the third compartment, and the extensor pollicis longus tendon was retracted radially. The approach to the wrist capsule was performed between the third and fourth extensor compartment, reflecting the compartments subperiosteally. The posterior interosseous nerve was identified and resected. A transverse capsulotomy was performed and the SL space identified. Scar tissue was removed, and the SL dissociation was reduced using K-wires as joysticks. The reduction was stabilized in 7 of 8 cases with 3 K-wires placed under fluoroscopic control across the capitolunate, scaphocapitate, and scapholunate joints. A curved skin incision was centered over the palmar tuberosity of the scaphoid and the distal part of the FCR tendon, and its tendon sheath was opened. A 3.5-mm drill hole was made through the distal pole of the scaphoid parallel to its distal articular surface from palmar to dorsal. Two transverse incisions were centered over the proximal part of the FCR tendon, and a distally based 8-cm tendon strip using half the width of the FCR was prepared, passed through the scaphoid tunnel, and fixed to the dorsal part of the lunate by a bone anchor. After closure, a short thumb spica cast in a wrist neutral position was maintained for 6 weeks. At this time K-wires were removed and active assisted motion exercises were started. Patients were not allowed to return to sport activities and heavy work before 3 months after the operation.

RESULTS

All 8 patients were evaluated at an average follow-up period of 13.8 years (range, 12–15 y). Six patients were pain free, 1 had mild occasional pain, and 1 had pain at rest.

The functional outcome according to Green and O'Brien[6] was excellent in 2 patients, good in 5, and poor in 1. The Mayo wrist score[7] modified by Krimmer et al[8] averaged 83 out of 100 points (range, 35–100 points). At final follow-up, average total wrist motion was 85% (range, 66% to 99%) and grip strength was 85% (range, 22% to 100%) of the uninjured contralateral extremity. The average Disabilities of the Arm, Shoulder, and Hand score[9] was 9 on a scale of 100 (range, 2–38) (Tables 1 and 2). Seven of 8 patients were satisfied with the result and would have the operation again. All patients but 1 returned to former activities. The patient who did not return to work was receiving workers' compensation. He had a poor functional result as the consequence of a complex regional pain syndrome. Apart from this case, there were no other com-