Scaphoidectomy and Capsulodesis for SNAC or SLAC Stage II

Thomas E. Trumble, MD¹ Gregory Rafijah, MD² Hayley Alexander¹ Thanapong Waitayawinyu, MD³

¹ Bellevue Hand Institute, Bellevue Bone and Joint Physicians, Bellevue, Washington

² Department of Orthopaedic Surgery, UC Irvine School of Medicine, Orange, California

³ Department of Orthopaedics, Thammasat University, Pathumthani, Thailand

Address for correspondence and reprint requests Thomas E. Trumble, MD, Bellevue Hand Institute, Bellevue Bone and Joint Physicians, 1632 #C 116th Ave NE, Bellevue, WA 98004 (e-mail: t.trumble@comcast.net).

J Wrist Surg 2012;1:129–134.

Abstract

Keywords

- scapholunate advanced collapse (SLAC) arthritis
- scaphoid nonunion advanced collapse (SNAC) arthritis
- wrist arthritis
- scaphoid nonunion
- capsulorrhaphy

Two common types of wrist arthritis are scapholunate advanced collapse (SLAC) and scaphoid nonunion advanced collapse (SNAC). In stage II SLAC or SNAC, there is arthritis between the scaphoid and the radius, sparing the cartilage between the capitate and the lunate and between the lunate and the radius. When nonsurgical treatment failed, scaphoidectomy plus capsulorrhaphy was used in 8 patients to provide pain relief without requiring an arthrodesis or compromising the radiolunate articulation. After surgery the pain scores improved from 8.5 preoperatively to 2.4 postoperatively. The Disabilities of the Arm, Shoulder, and Hand (DASH) score averaged 21, and the grip strength improved from 18 to 28 kg (81% of the contralateral side).

Although the initial pathology differs between the scapholunate advanced collapse (SLAC) and scaphoid nonunion advanced collapse (SNAC) patterns of arthritis, they both end up causing abnormal load transmission between the scaphoid and the radius, which leads to a fairly predictable pattern of wrist arthritis.^{1,2} In SLAC arthritis, the chronic disruption of the scapholunate interosseous ligament allows the capitate to migrate proximally. In SNAC arthritis, the chronic scaphoid nonunion disrupts the normal chain of connection between the scaphoid and the lunate.^{3,4} These conditions result in a progressive pattern of degenerative arthritis that first involves the radioscaphoid articulation with osteophytes forming near the radial styloid (Stage I), followed by arthritis throughout the radioscaphoid articulation (Stage II). As degeneration progresses, the midcarpal joint becomes involved at the capitulate joint. End stage SLAC or SNAC (Stage IV) results in arthrosis of the radiolunate articulation (►Fig. 1).

Patients with SLAC or SNAC wrist arthritis present with pain and suffer from decreased range of motion (ROM) in the wrist. In about 50% of cases there is a remote history of

trauma, often without any acute treatment. Upon clinical examination, dorsoradial swelling of the wrist with decreased wrist motion is common. Radiographs are useful to determine the stage of arthritis as just described (►Fig. 2).

Sometimes patients present with a ganglion but without significant pain. Efforts to excise the ganglion in these arthritic wrists will result in rapid recurrences of the cyst. The scaphoid shift test may produce pain or crepitus, which helps to differentiate an idiopathic ganglion cyst from one due to arthritis.^{5–8}

Computed tomography (CT) scans can be useful, especially in the evaluation of the capitate-lunate joint (►Fig. 3). Sagittal-plane CT scans with reconstructions in the plane of the scaphoid are very useful in determining the degree of involvement of the radioscaphoid and radiolunate articulation (►Fig. 4). When there is no significant involvement of the capitulate joint, the scaphoidectomy procedure can take advantage of the functioning articulation between both the capitulate and the radiolunate joints. When there is involvement of the radial styloid without degeneration of the

Fig. 1 Traumatic arthrosis of the wrist in either scapholunate advanced collapse (SLAC) or scaphoid nonunion advanced collapse (SNAC) follows a predictable pattern of involving the radial styloid (I), the radioscaphoid articulation (II), the capitate lunate articulation (III), and the entire wrist (IV).

radial-scaphoid articulation (Stage I), the patient may benefit from a radial styloidectomy alone. Although not routinely required to diagnose and develop treatment plans, magnetic resonance imaging (MRI) can help to identify early areas of arthritis with the marrow changes, especially on T2-weighted images (►Fig. 5).

Steroid injections are particularly successful in providing temporary pain relief for SLAC and SNAC arthritis. Splints and

Fig. 2 This radiograph demonstrates stage II SNAC of a 57-year-old carpenter.

nonsteroidal antiinflammatory drugs (NSAIDs) can also be effective.

Patients and Methods

Our experience includes a limited series of eight patients with 16 months follow-up; all but one of the patients was male,

Fig. 3 The coronal CT scan helps to confirm that the capitolunate articulation is spared, which indicates that scaphoidectomy and capsulodesis or proximal row carpectomy are treatment options.

Fig. 4 The sagittal CT scan demonstrates severe arthrosis between the scaphoid and radius. This indicates that isolated radial styloidectomy will not be effective in treating the patient.

Fig. 5 The T2-weighted image on MRI shows extensive marrow changes involving the midcarpal joint as well as the radioscaphoid articulation in a patient with minimal plain radiograph changes seen at the midcarpal joint. Based on this evidence, the hand surgeon should be prepared to perform an arthrodesis of the midcarpal joint (four-corner fusion) if this is confirmed at surgery.

and the average age in our series was 62 years of age. All patients had SLAC⁶ or SNAC² stage II. Grip strength was determined with a Jamar dynamometer before surgery and at final follow-up. A standard goniometer was used to measure wrist motion preoperatively and at final follow-up. The

Fig. 7 The postoperative posteroanterior radiograph demonstrates scaphoidectomy with the carpal alignment maintained.

Fig. 6 The carpus has been exposed through a dorsal approach using a capsular incision with an ulnar base to facilitate the reconstruction. The patient has SNAC arthritis, and a rongeur is used to excise the distal pole of the scaphoid.

patients completed a pain rating score from 1–10 pre- and postoperatively, with 1 being no pain and 10 being the worst pain. A Disability of the Arm, Shoulder, and Hand (DASH) questionnaire was completed at the final follow-up.

Surgical Technique

The scaphoid is approached through a dorsal midline incision. The sheath of the third dorsal compartment is released, the extensor pollicis longus (EPL) tendon is retracted radially, and the fourth dorsal compartment is sharply elevated from the capsule of the wrist and retracted ulnarwards. An ulnar-based curved capsular incision is made to create a capsular flap to wrap around the capitate and the lunate. This may help limit the radial subluxation of the capitate, which causes the wrist to collapse in radial deviation (► **Fig. 6**). One of the most challenging aspects of the procedure is removing the scaphoid tubercle, which is firmly fixed to the volar capsule (► **Fig. 7** and **8**). This is an area where it is difficult to control bleeding; therefore, a drain is recommended. #0 braided polyester sutures are placed in the volar capsule using remnants of the radioscapophcapitate ligament, passed through the radial edge of the capsule, and to secure them tightly into place. The flap wraps around the capitate and lunate to provide support against ulnar translation capitate. The retinaculum of the fourth dorsal compartment is sutured to the second dorsal extensor compartment, whereas the third dorsal compartment is not repaired to avoid adhesions forming around the EPL tendon. The wrist motion is now checked to ensure that the capsulodesis does not restrict the wrist ROM (► **Figs. 9, 10**). The tourniquet is then released and hemostasis is obtained before completing a layered wound closure. A volar splint is applied with the postoperative dressing.

The advantage of an isolated scaphoidectomy is that only limited immobilization is required postoperatively. Two weeks after surgery, the sutures are removed and a brace is fabricated. The patient begins gentle ROM exercises followed by strengthening exercises at 6 weeks.

Fig. 8 The lateral postoperative radiograph demonstrates scaphoidectomy with the alignment of the carpus maintained.

Fig. 10 Wrist flexion is preserved following scaphoidectomy and capsulodesis.

Fig. 9 Wrist extension is preserved following scaphoidectomy and capsulodesis.

Results

Follow-up averaged 24 months (range, 20 to 30 months). Pain scores improved from 8.5 preoperatively (range 6–10) to 2.4 postoperatively (range 1–5). Preoperatively, the grip strength was 18 kg. Postoperatively, the strength improved to 28 kg versus 34.6 on the contralateral side (81% of contralateral). Wrist flexion/extension was 110° preoperatively and decreased to 100° after surgery. The contralateral side averaged 132°. Radial/ulnar deviation averaged 40° prior to surgery, and this decreased to 38° after surgery. The DASH score averaged 21 (range 16 to 38) in these patients at final follow-up. The radiographs demonstrated stage II SLAC prior to surgery, and at final follow-up one patient had advanced to stage III. Youm's index averaged 0.48 prior to surgery and 0.46 at final followup. The index case in this series was an 82-year-old man, an avid golfer, who presented with severe radial-sided wrist pain due to a SLAC II wrist, which did not respond to splinting and steroid injections. The patient was able to return to playing golf at 4 weeks following a scaphoidectomy.

Discussion

We have not identified a similar series of an isolated scaphoidectomy without interposition in the literature. Scaphoidectomy and capsulorrhaphy offers the advantage of preserving the normal radiolunate articulation as compared with a proximal row carpectomy (PRC), in which a pseudo-joint is created between the capitate and lunate, and the load transmission between the triquetrum and the ulna via the triangular fibrocartilage complex (TFCC) is preserved as well. In our experience patients with a PRC continue to experience pain due to the abnormal articulation.

Swanson popularized the use of a silicone spacer following a scaphoidectomy.⁹ This procedure, however, fell out of favor because of progressive carpal collapse and wrist arthrosis as well as the high incidence of silicone synovitis.¹⁰ In an attempt to overcome these problems, Swanson et al¹¹ used a titanium scaphoid spacer, with good results. Spingardi and Rosello reported their results with 75 patients at a mean follow-up of 46 months (range, 6–152 months) following a

titanium scaphoid prosthetic replacement for a scaphoid nonunion with avascular necrosis (AVN) in 113 patients.¹² All patients had a scaphoid nonunion with necrosis and had failed conservative or surgical treatment, including screw fixation, Matti-Russe grafting, and vascular bone grafting. None of these patients had radiologic signs of radiocarpal arthritis or SNAC wrist. The average time between the initial injury or previous surgical treatment and diagnosis of scaphoid nonunion was 18 months (3 months–25 years). Twenty six percent of patients achieved full wrist ROM. The average grip strength test was 80% of the contralateral side (65–95%). Of these patients, 85% were pain-free, 8% had mild pain, and 7% had moderate pain with loading.

A scaphoidectomy is more commonly performed along with a midcarpal arthrodesis to prevent a gradual midcarpal collapse. Dacho et al examined 49 patients at an average follow-up of 47 months after midcarpal arthrodesis for SLAC and SNAC wrist arthritis.¹³ They reported a grip strength of 76% of the normal side, wrist range of motion of 56% of the unaffected side, and an average DASH score of 29. Sauerbier et al¹⁴ followed 31 patients at a mean of 15 months following a midcarpal arthrodesis for SLAC or SNAC wrist. They reported an average grip strength of 60%, average wrist motion of 50% of the opposite side, and a DASH score of 39. Four patients ultimately required a total wrist fusion. In a classic study comparing PRC (19 months follow-up) and four-corner fusion (28 months follow-up), Cohen and Kozin¹⁵ reported a grip strength of 71% and 79%, and a range of motion of 62% and 58%. Pain relief was equivalent in both groups.

This study is a preliminary report of a technique that provides pain relief with a procedure that is less invasive than complete excision of the proximal row or intercarpal arthrodesis and does not commit patients to prolonged immobilization. It is mostly indicated as a palliative procedure in elderly patients with posttraumatic SNAC or SLAC wrist with limited functional demands who do not want to undergo a more extensive salvage procedure. This may be an attractive alternative for elderly patients who need pain relief from wrist arthrosis and do not want to limit their lifestyle. The main concern with this technique is the progressive carpal collapse that is expected to occur and the uncertain long-term outcome. It should be used in select cases and does not supplant the more time-honored techniques of PRC or

scaphoidectomy and midcarpal fusion. A larger series and long-term follow-up are needed before this procedure can be advocated.

References

- 1 Watson HK, Ryu J. Evolution of arthritis of the wrist. *Clin Orthop Relat Res* 1986;(202):57–67
- 2 Watson HK, Weinzweig J, Zeppieri J. The natural progression of scaphoid instability. *Hand Clin* 1997;13(1):39–49
- 3 Krimmer H, Krapohl B, Sauerbier M, Hahn P. Posttraumatic carpal collapse (SLAC- and SNAC-wrist)—stage classification and therapeutic possibilities [in German]. *Handchir Mikrochir Plast Chir* 1997;29(5):228–233
- 4 Gohritz A, Gohla T, Stutz N, et al. Special aspects of wrist arthritis management for SLAC and SNAC wrists using midcarpal arthrodesis: results of bilateral operations and conversion to total arthrodesis. *Bull Hosp Jt Dis* 2005;63(1–2):41–48
- 5 Watson HK, Ballet FL. The SLAC wrist: scapholunate advanced collapse pattern of degenerative arthritis. *J Hand Surg Am* 1984;9(3):358–365
- 6 Resnick D. SLAC wrist. *J Hand Surg Am* 1985;10(1):154–155
- 7 Fassler PR, Stern PJ, Kiefhaber TR. Asymptomatic SLAC wrist: does it exist? *J Hand Surg Am* 1993;18(4):682–686
- 8 Watson HK, Weinzweig J. Physical examination of the wrist. *Hand Clin* 1997;13(1):17–34
- 9 Swanson AB, de Groot Swanson G, Maupin BK, et al. Scaphoid implant resection arthroplasty. Long-term results. *J Arthroplasty* 1986;1(1):47–62
- 10 Egloff DV, Varadi G, Narakas A, Simonetta C, Cantero C. Silastic implants of the scaphoid and lunate. A long-term clinical study with a mean follow-up of 13 years. *J Hand Surg [Br]* 1993;18(6):687–692
- 11 Swanson AB, de Groot Swanson G, DeHeer DH, et al. Carpal bone titanium implant arthroplasty. 10 years' experience. *Clin Orthop Relat Res* 1997;(342):46–58
- 12 Spingardi O, Rossello MI. The total scaphoid titanium arthroplasty: A 15-year experience. *Hand (NY)* 2011;6(2):179–184
- 13 Dacho A, Grundel J, Holle G, Germann G, Sauerbier M. Long-term results of midcarpal arthrodesis in the treatment of scaphoid nonunion advanced collapse (SNAC-wrist) and scapholunate advanced collapse (SLAC-wrist). *Ann Plast Surg* 2006;56(2):139–144
- 14 Sauerbier M, Bickert B, Tränkle M, Kluge S, Pelzer M, Germann G. Surgical treatment possibilities of advanced carpal collapse (SNAC/SLAC wrist) [in German]. *Unfallchirurg* 2000;103(7):564–571
- 15 Cohen MS, Kozin SH. Degenerative arthritis of the wrist: proximal row carpectomy versus scaphoid excision and four-corner arthrodesis. *J Hand Surg Am* 2001;26(1):94–104