PART IX

Ligament Instability/Tears

10045-SLUTSKY-9781416056461

c0045 CHAPTER 45

Dorsal Wrist Syndrome and Rotatory Subluxation of the Scaphoid

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s0010 ## INTRODUCTION

p0010 Dorsal perilunate synovitis was the term that we used in the late 60s and early 70s for patients presenting with wrist pain who had clinical findings consistent with a syndrome that the senior author (HKW) now calls dorsal wrist syndrome (DWS). The patients with chronic and more severe wrist pain underwent surgical exploration. At the time of surgery, an abnormal ridging on the dorsum of the scaphoid and lunate was noted in all cases. The ridge occurred most prominently at the dorsal distal aspect of the proximal pole of the scaphoid. A lesser ridge was usually present on the dorsal, distal, and radial aspects of the lunate. The ridging bone was pink to purple, representing reactive fibrocartilage material and was always soft and easily removed with a dental rongeur. One could readily tell when the denser bone was in contact with the rongeur. As rotatory subluxation of the scaphoid became a clinically recognized entity in hand surgery, the senior author began to look more closely at the relationship of the ligamentous supports between the scaphoid and the lunate **(Fig. 45-1)**. Tears of the volar aspect of the scapholunate interosseous ligament (SLIL) were identified in the more symptomatic patients with dorsal wrist syndrome. Evaluation of the SLIL to look for tears became a standard part of the surgical procedure. It became evident that SLIL tears usually begin volarly and extend dorsally as the severity of the injury increases.

s0015 ## DIAGNOSIS OF DORSAL WRIST SYNDROME

s0020 ### Symptoms

p0015 The history of dorsal wrist syndrome varies significantly, but the constant features are wrist pain, limited activity, and post-activity ache. Localization of wrist pain is not as important historically. Dorsal wrist ganglions are commonly associated with dorsal wrist syndrome and are a signpost of underlying pathology. Patients who have received a cortisone injection typically experience some improvement for 2 months, and then the symptoms gradually recur. Many patients are seen having had arthroscopic repairs of the triangular fibrocartilage.

p0020 Post-activity ache is a useful clinical tool in that the duration of symptoms following any particular activity is indicative of the amount of synovitis that has been produced at the time of the activity. Post-activity ache lasting more than 24 hours after normal but strenuous activity is indicative of carpal displacement sufficient to produce edema and inflammation of the synovium. This is typical of a wrist with a displaceable scaphoid. Post-activity ache that lasts for 2 hours after chopping wood all day is a different situation from post-activity ache, which lasts for 3 days after an hour of tennis.

Physical Examination s0025

Physical examination first reveals a positive finger extension test[1] p0025 **(Fig. 45-2)**. This test is performed by passively flexing the wrist, [AQ1] then asking the patient to actively extend all four fingers against resistance. If the test is positive, the patient is unable to maintain extension because of pain in the wrist. The finger extension test is an extremely effective part of the evaluation. In the senior author's experience, a negative finger extension test all but excludes the possibility of any radial-sided wrist pathology such as rotatory subluxation of the scaphoid, dorsal wrist syndrome, Kienböck's disease, carpal boss, scaphoid fracture, scapholunate advanced collapse (SLAC) wrist, or any other abnormality in the load column of the index and middle finger metacarpals, capitate, scaphoid, lunate, and radius. A positive finger extension test is usually associated with a positive articular-nonarticular (ANA) test **(Fig. 45-3)**, which is synovitis and tenderness at the articular, nonarticular junction of the scaphoid. Scaphotrapeziotrapezoid (STT) joint synovitis is not usually present in dorsal wrist syndrome. A positive scaphoid shift **(Fig. 45-4)** may or may not be elicited, depending on the degree of synovitis at the time of the examination and the degree of instability or tearing of the SLIL tear.[1] There is tenderness over the scapholunate joint dorsally. Carpal boss testing is negative when forcibly malaligning the index and middle metacarpals; either depressing the one while extending the other or vice versa. There is no evidence of symptoms arising from tenosynovitis of the first or second extensor compartments. The patient may or may not have pain with forced wrist flexion or extension.

Imaging s0030

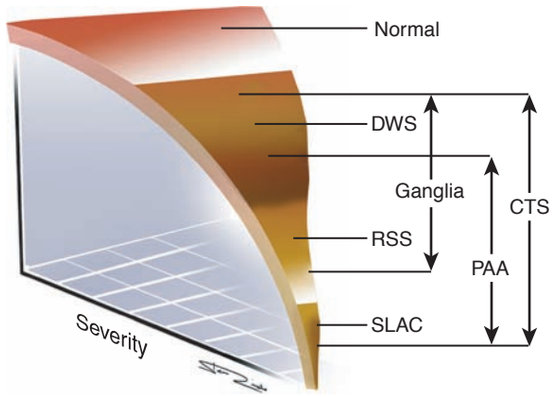
Radiographic examination of dorsal wrist syndrome is usually p0030 normal but may demonstrate osteophyte formation on the distal dorsal ridges of the scaphoid and lunate in the lateral projection with or without evidence of rotatory subluxation of the scaphoid **(Fig. 45-5)**. Contralateral wrist films may be useful in identifying inconsistencies for comparison.

Magnetic resonance imaging results are typically negative or p0035 may indicate minor abnormalities in other parts of the wrist. [AQ2]

Clinical Stages s0035

Three-day injury: A minimal sprain, such as falling from a chair u0010 on the dorsiflexed wrist, will produce pain from stretching of the synovium with or without minor tearing of synovium and joint edema. In this case, no significant tear of any major support ligaments occurs. The injury usually clears in about 3 days.

f0010 **FIGURE 45-1** Scaphoid instability produces a sequence of events that create a spectrum of disorders ranging from wrist sprain and dorsal wrist syndrome (DWS) to rotatory subluxation of the scaphoid (RSS) and a scapholunate advanced collapse (SLAC) wrist. The findings of carpal tunnel syndrome (CTS), ganglia, and post-activity ache (PAA) are often indicators of more severe underlying wrist pathology. Note that the development of ganglia seems to require a more intact joint; ganglia are absent with major joint displacement and destruction. (Illustration created by Steve Criado.)

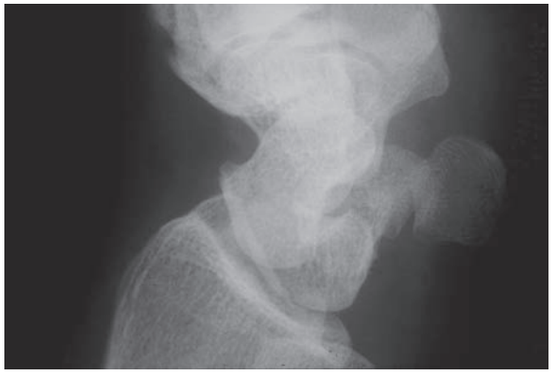


f0015 **FIGURE 45-2** **Finger extension test.** The patient's wrist is held passively in flexion; the examiner then resists active finger extension. Radial wrist disease causes pain and prevents powerful finger extension.

f0020 **FIGURE 45-3** **Articular-nonarticular test (ANA).** The articular-nonarticular junction of the scaphoid is acutely painful when palpated with the examiner's index finger firmly against the radial aspect of the patient's wrist just distal to the radial styloid with the wrist in ulnar deviation. Pressure in this area with the wrist in radial deviation is distal to the ANA and not symptomatic.

f0025 **FIGURE 45-4** **Scaphoid shift.**

f0030 **FIGURE 45-5** **Dorsal bony ridging.** An oblique x-ray of the wrist may demonstrate the ridging that occurs on the dorsum of the scaphoid and lunate.



u0015 **Three-week injury**: A more severe dorsiflexion injury ruptures blood vessels in the synovium and may cause a partial SLIL tear with or without injury to the volar radioscaphocapitate or long radiolunate ligaments or other volar extrinsic ligaments. The main ligamentous supports of the scapholunate joint remain intact, but hemarthrosis occurs. Clinically, this manifests as a wrist "sprain" that usually requires about 3 weeks to clear, but without any lasting sequelae. The repair activity in the tissues lasts a good deal longer than the symptoms. Because the ligament tears are partial—that is, incomplete—healing of each ligament is expected with or without treatment.

u0020 **Three-month injury:** A significant forced dorsiflexion injury ruptures. The SLIL with or without concomitant tears of extrinsic ligaments such as the radioscaphocapitate or long radiolunate ligaments and tear of synovium results in a hemarthrosis and soft tissue swelling. This is the injury described by Mayfield and Johnston,[2] which may result in different combinations of ligament tearing as the injury load pattern is dispersed through the wrist. The healing process is associated with a painful and unusable wrist joint for the first month. This is usually followed by significant residual symptoms for the second month and low-grade symptoms during the third month. Depending on the degree of tear and the type of immobilization, the patient's wrist may heal and become asymptomatic and fully usable. More commonly, there is some residual scapholunate instability of varying degrees, which in turn influences the incidence of recurrent wrist pain under loading. Twenty-five percent of normal adults demonstrate some tearing of the SLIL and clinical laxity of the scaphoid support. The wrists of 1000 people who were not patients were examined bilaterally by the same three hand surgeons.[3] Twenty-one percent demonstrated unequivocal unilateral positive scaphoid shift (Watson test). Thirty-seven percent of these "normal" people had some symptoms. Bilaterally positive scaphoid shift wrists were excluded. From this study, we have felt comfortable saying that nearly 35% of normal adults have sustained some permanent injury to the scaphoid support system.

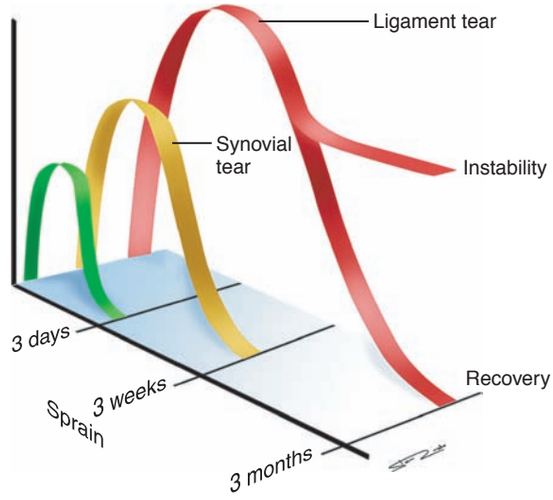
[AQ3]

s0040 ### Treatment Protocol

p0060 Our protocol for dorsal wrist syndrome has remained essentially unchanged **(Fig. 45-6)**.

[AQ4]

f0035 **FIGURE 45-6** Minor trauma results in soreness to the wrist joint that usually lasts for 3 days and is the result of synovial stretching without hemarthrosis. More severe injury will produce some synovial tearing, possibly some hemarthrosis, and is typically completely resolved in 3 weeks, leaving no residual sequelae. A more severe wrist injury results in some capsular tearing along with synovial rupture and hemarthrosis and a major clinical injury response in the wrist. These injuries usually take 3 months to resolve and may result in some permanent loss of ligament support, often undetectable except under heavy load. (Illustration created by Steve Criado.)



p0065 As always, the need for surgery is based primarily on the patient's level of symptoms and activity limitations. When there is a documented history of a recent injury, wrist immobilization and nonsteroidal anti-inflammatory medications and restricted activity are indicated for up to 3 weeks for symptomatic relief; however, cortisone injections are contraindicated. With more severe injuries, 6 weeks or more of casting are appropriate to allow time for ligamentous healing.

p0070 Treatment in the first 3 months after injury is primarily immobilization. This excludes the obvious major acute injury, which requires surgery. Between 3 and 6 months, patients are allowed to perform all normal daily activities including full stress as the tissues "hear" the activity input as a stimulus to ligament strengthening. If the patient remains symptomatic beyond 6 months, surgical treatment is considered.

SURGICAL TREATMENT

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Indications

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p0075 The following are indications to consider:

u0025 Interference with quality of life

u0030 Range of symptoms: An 18-year-old rated tennis professional with symptoms only during competition to a 65-year-old woman with constant ache and inability to garden for more than 20 minutes

Contraindications

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p0090 Surgery is contraindicated in anyone who is able to get along adequately with his or her particular symptom. The patient should be made aware of the possible progression to a SLAC wrist.

s0060 ### Surgical Management

p0095 Surgical management of dorsal wrist syndrome involves an exploration of the dorsal wrist, with removal of synovium and soft tissue between the third and fourth extensor compartments, evaluation of the SLIL, and excision of any bony ridging down to a cancellous surface. Our dorsal approach to the wrist involves a transverse incision, approximately 3 cm long, centered over the scapholunate joint at the level of the radial styloid.

p0100 The sheath of the extensor pollicis longus tendon is opened, and the tendon is retracted radially. A soft tissue mass, consisting of capsule (ligament)-thickened synovium and often containing ganglia, is invariably found between the third and fourth compartments and is excised to reveal the underlying scapholunate joint. An occult ganglion is often identified on the dorsal SLIL surface and excised. Traction on the hand permits visualization and evaluation of the proximal portion of the SLIL. Flexion of the distracted wrist and placement of a probe (joker) within the radiocarpal joint between the scaphoid and lunate permit evaluation of the volar portion of the SLIL. Repair tissue and a synovial layer that possesses negligible intrinsic strength often bridge the partially ruptured SLIL. The probe readily separates this layer, and the scapholunate joint space is entered volarly. The probe is swept proximally and then dorsally, tracing the curve of the scapholunate joint until intact ligamentous fibers are encountered. This process permits complete evaluation of the extent of ligamentous rupture. One of the benefits of operative management is also the ability to further diagnose the extent of SLIL injury. On the basis of intraoperative findings, we have classified SLIL rupture into four distinct types **(Table 45-1)**.

p0105 Bony ridging on the dorsum of the scaphoid and lunate, which is always present, is excised with a dental rongeur. This soft reactive bone is easily removed down to hard normal bone stock. A broad cancellous surface is thus created for capsular attachment on the dorsum of the scaphoid and lunate. If the surgeon wishes, elevation of the fourth dorsal compartment tendons allows identification and transection of the terminal branch of the posterior interosseous nerve. We have not been able to identify any difference in postoperative status between transected and preserved nerves; subsequently, we do not perform a posterior interosseous nerve neurectomy because we do not believe the nerve contributes significantly to the symptoms. The skin is then closed. The bulky dressing and splint are applied intraoperatively and removed on the third postoperative day at which time the wrist is fully mobilized.

s0065 ## RESULTS

p0110 In an early retrospective review of 102 patients with dorsal wrist syndrome who underwent surgical treatment by the senior author, 23% of patients were found to have a tear that involved 0% to 30% of the substance of the SLIL, 61% of the patients had an SLIL tear of 30% to 60%, and 16% had an SLIL tear of 60% to 100%. An occult ganglion was found in 40% of the patients. Eighty percent of the patients described improvement in pain and function. No surgical complications were reported. Nine patients with tears of50% to 100% went on to require STT fusions.[4]

p0115 Jansen and Adams[5] retrospectively reviewed similar patients treated conservatively and found the results to be inferior to our operated group. They did not differentiate between radial- and ulnar-sided wrist pain, and therefore their patient population may differ significantly from ours. Steinberg and Kleinman[6] described a very similar population treated with an almost identical type of surgery. Their population had a 50% incidence of a specific trauma before the appearance of symptoms. In one of our studies, only 22% of the patients described such an incident.[4] Eighty-one percent of their patients had excellent results, and 5% had good [AQ5] results.[6] Gunther and associates[7]also described a series of patients treated with dorsal wrist surgery with good results.

t0010 **TABLE 45.1**
Classification of Scapholunate Interosseous Ligament Rupture

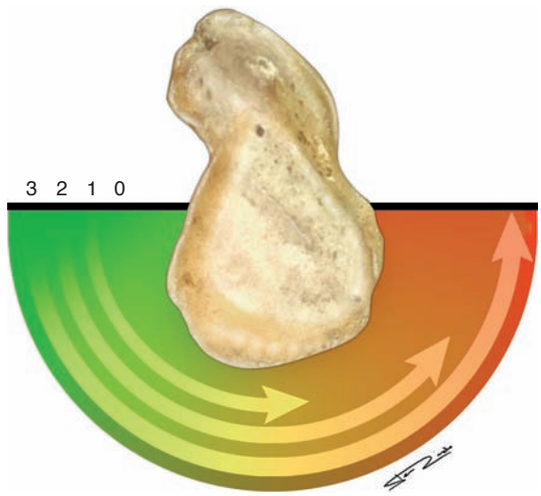
Type 0	Intact
Type I	<50% tear
Type II	50 – 99%tear
Type III	Complete tear

s0070 ## ROTATORY SUBLUXATION OF THE SCAPHOID

p0120 Rotatory subluxation of the scaphoidis classically described as a widening between the scaphoid and the lunate with dorsal displacement and rotation of the proximal pole of the scaphoid. This abnormal relationship between scaphoid and lunate, as a result of a more severe ligamentous injury, produces abnormal scaphoid motion. The altered joint biomechanics and incongruous alignment subjects the radioscaphoid joint to abnormal stress and subsequent arthritic changes in the evolution of a SLAC wrist.

p0125 The most common tear in a dorsiflexion injury is the rupture of the SLIL **(Fig. 45-7)**. This rarely occurs as a result of a single [AQ6] injury. The more common pattern is that of repetitive injuries that gradually increase the tear until, at some point, the scaphoid becomes unstable enough that it may escape from beneath the capitate under loading. When this happens, the wrist develops a symptomatic rotatory subluxation of the scaphoid—either dynamic or static. The ability of the scaphoid to displace from

f0040 **FIGURE 45-7 Schematic representation of scapholunate interosseous ligament rupture. (Illustration created by Steve Criado.)**



beneath the capitate makes the wrist susceptible to re-injury, which gradually advances the tear from volarly around dorsally until there is a static situation in which the scaphoid sits out of place and the wrist does not take the load. A common problem is the compensable injury, which is seen in the first week and demonstrates a static rotatory subluxation of the scaphoid on x-ray; yet the wrist has minimal swelling and does not demonstrate a recent major injury. The compensable injury may have ruptured the last of the SLIL, but the likelihood is that the injury produced symptoms in a wrist that already had significant rotatory subluxation of the scaphoid.

p0130 An acute complete rotatory subluxation occurring all at one injury manifests a major clinical response. The presentation mimics a major fracture of the wrist with hemarthrosis and swelling. It is only this picture that requires an early surgical approach in an attempt to repair the acutely ruptured ligaments. In the more typical situation, there is a terminal event for the interosseous ligament superimposed on a preexisting rotatory subluxation. At surgery, there is little or no ligament to repair because the accumulative injuries to the scapholunate interosseous ligament are old and the ligament attenuates and disappears.

p0135 Our current classification scheme describes five types of rotatory subluxation of the scaphoid: (I) predynamic, (II) dynamic, (III) static, (IV) degenerative, and (V) secondary. Predynamic instability is diagnosed when there are signs of scaphoid instability without radiographic abnormalities. A positive scaphoid shift, dorsal wrist pain, and limited range of motion, usually flexion, are typical findings at physical examination. Dynamic rotatory subluxation of the scaphoid is similar, but demonstrates radiographic findings when the scaphoid is stressed, such as with a clenched-fist view and radial or ulnar deviation x-rays. With static rotatory subluxation of the scaphoid, an increased scapholunate distance and an increased scapholunate angle, with or without a dorsal intercalated segmental instability (DISI) pattern, are observed radiographically without the need for joint stress.

p0140 The next phase in the pathologic evolution occurs when radiographic findings of degenerative changes at the radioscaphoid or STT joints (i.e., triscaphe arthritis) are present. Secondary rotatory subluxation of the scaphoid stems from carpal lesions other than SLIL tears, such as a collapsed wrist from Kienböck's disease or nonunion of the scaphoid. We differentiate rotatory subluxation of the scaphoid classifications because they can be used for treatment algorithms. Patients with predynamic or minimally symptomatic dynamic rotatory subluxation of the scaphoid are included in the dorsal wrist syndrome protocol. As soon as there is a significant symptomatic SLIL tear, our next phase of management is triscaphe (STT) arthrodesis.

p0145 Triscaphe arthrodesis has been our answer to the difficult problem of scaphoid stability after SLIL tears. It is extremely difficult to keep the scaphoid beneath the capitate under heavy loads. Rather than attempt ligamentous reconstruction, we feel that stability of the scaphoid can best be achieved by holding the scaphoid in position distally via the STT joint. Although we accept some degree of radial styloid beaking, advanced scapholunate degenerative arthritis is a contraindication to this surgery. STT fusion is a reliable procedure to return function to a young patient with high functional demands.

REFERENCES

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1. Watson KH, Weinzweig J (eds): The Wrist. Philadelphia: Lippincott Williams & Wilkins, 2001, pp. 484–485.
2. Mayfield JK, Johnson RP, Kilcoyne RK: Carpal dislocations: pathomechanics and progressive perilunar instability. J Hand Surg [Am] 1980;5:226–241.
3. Watson H, Ottoni L, Pitts EC, Handal AG: Rotary subluxation of the scaphoid: a spectrum of instability. J Hand Surg [Br] 1993;18(1):62–64.
4. Wollstein R, Watson HK: A surgical technique for the treatment of radial sided wrist sprain: the dorsal wrist procedure. Scand J Plast Reconstre Surg Hand Surg. [AQ7]
5. Jansen JC, Adams BD: Long-term outcome of nonsurgically treated patients with wrist pain and a normal arthrogram. J Hand Surg [Am] 2002;27:26–30.
6. Steinberg BD, Kleinman WB: Occult scapholunate ganglion: a cause of dorsal radial wrist pain. J Hand Surg [Am] 1999;24(2):225–231.
7. Gunther SF: Dorsal wrist pain and the occult scapholunate ganglion. J Hand Surg [Am] 1985;10(5):697–703.