Clinical Examination of the Wrist

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Evaluation of wrist pain can be challenging, because the anatomy of the wrist is complex and a variety of conditions can cause wrist pain. For example, ligament and cartilage tears, fractures, tendon problems, nerve involvement, vascular insufficiency, arthritis (either systemic or degenerative), and tumors may all cause wrist pain.

An effective wrist examination requires thorough knowledge of surface anatomy and the corresponding underlying structures. The key to assessing the wrist is to correlate the mechanism of injury with localized physical findings such as tenderness, abnormal motion, clicks, clunks, and snapping.

The components of the wrist evaluation include a thorough history, visual inspection, and a systematic topographic examination, including palpation and provocative testing.

HISTORY

A detailed history can provide clues to the nature of the wrist problem and can help focus the subsequent clinical examination. If the wrist problem resulted from a single incident or injury, the mechanism of injury should be thoroughly explored, including the position of the wrist at the time of injury and the subsequent degree and direction of stress. For example, an acute rotational injury to the forearm or a fall on the pronated outstretched upper extremity can result in a triangular fibrocartilage-complex injury.[1] Loading injuries to the wrist in extension, ulnar deviation, and carpal supination result in a pattern of injury to the carpal ligaments and a progression of perilunar instability, as described by Mayfield.[2] Weber and Chao found that load applied to the radial side of the palm with the wrist in extreme dorsiflexion produces scaphoid fracture.[3]

If the wrist condition developed over time, it is important to explore the potential causes. Job or activity analysis is helpful in determining the relationship between the patient's symptoms and daily activities.

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The location of the symptoms and their frequency, intensity, and duration should be reviewed. The activities, positions, or conditions that aggravate the symptoms and the measures taken to obtain relief are discussed. It is important to review previous treatment interventions and their efficacy. The impact that the wrist condition has had on the patient's ability to perform activities of daily living and work tasks must also be considered to determine the degree of disability.

INSPECTION OF THE WRIST

Inspection of the wrist and comparison with the uninvolved side can provide clues to the cause of the problem. The wrist is examined for swelling, and volumetric or circumferential measurements can be taken. Any masses, lacerations, and surgical scars are noted. The posture and alignment of the wrist and the prominence of the distal ulna, which can be suggestive of distal radioulnar joint (DRUJ) instability, are noted (Fig. 1). The active and passive ranges-of-motion of the wrist are measured in all planes, with comparison with the uninvolved side, and it should be determined whether any restrictions are the result of pain or mechanical blocking. Normal range-of-motion of the wrist as well as functional range-of-motion should be considered when evaluating wrist motion. Normal maximum

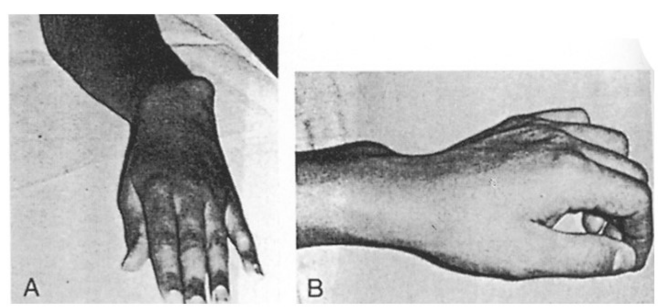

FIGURE 1. Posterior (A) and lateral (B) views of a patient with prominence of the distal ulna indicating DRUJ instability. From: Imbriglia J, Matthews D: The treatment of chronic traumatic subluxation of the distal ulna by hemiresection interposition arthroplasty. In Schnider L: Hand Clinics 7: 2. Philadelphia, W. B. Saunders, 1991, p. 330, with permission.

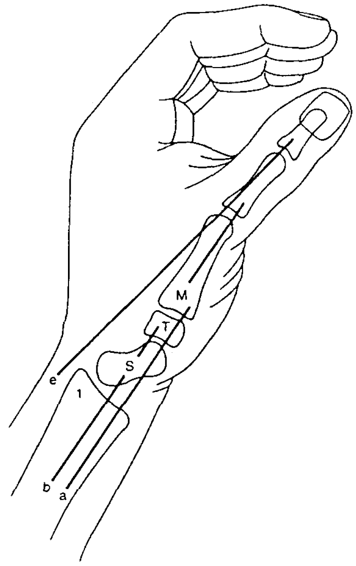

FIGURE 2. Radial dorsal zone: structures on the radial side of the wrist include the radial styloid (1), the scaphoid (S), the trapezium (T), the first metacarpal (M), the abductor pollicis longus (a), the extensor pollicis brevis (b), and the extensor pollicis longus tendon (e). Reprinted with permission from Brown DE, Lichtman DM: Physical examination of the wrist. In Lichtman DM: The Wrist and Its Disorders. Philadelphia, W. B. Saunders, 1988.

motion of the wrist has been documented with the use of goniometry.[4] Functional range-of-motion, i.e., the motion of the wrist required to perform most activities of daily living, has also been documented. Palmer et al. found that functional wrist motion is between 5° of flexion, 30° of extension, 10° of radial deviation, and 15° of ulnar deviation.[5] Ryu and colleagues found that 40° of wrist extension, 40° of wrist flexion, and a total of 40° of radial and ulnar deviation are needed to perform a majority of the activities of daily living.[6]

TOPOGRAPHIC EXAMINATION

Palpation and provocative testing are the heart of the examination. The goal is to define areas of tenderness by systematically palpating the bony and soft-tissue anatomy and to determine the area of maximum tenderness. The provocative tests are performed to identify carpal instabilities. Patients with carpal instabilities often complain of pain, decreased motion, and "clicks or clunks" with motion of the wrist. The provocative tests may reproduce these clicks and clunks, which are the result of abnormal carpal movements. A painless click or clunk can often be obtained in an asymptomatic individual with lax ligaments. The symptomatic wrist should always be compared with the contralateral wrist.[7]

Brown and Lichtman describe a systematic approach to wrist examination.[8] They divide the wrist into five zones: three dorsal and two volar. By methodically examining each structure in each zone, the examiner can most effectively localize the patient's symptoms and develop a differential diagnosis.

Radial Dorsal Zone

The structures to examine in the radial dorsal zone include the radial styloid, the scaphoid, the scaphotrapezial joint and trapezium, the base of the first metacarpal and the first carpometacarpal (CMC) joint, the tendons of the first and third extensor compartments, and the dorsal radial sensory nerve (DRSN) (Fig. 2).

The radial styloid is palpated on the radial aspect of the wrist proximal to the anatomic snuffbox with the wrist in ulnar deviation. Tenderness of the styloid may indicate contusion, fracture, or radioscaphoid arthritis.[9] The latter is common with longstanding scapholunate dissociation and scaphoid instability.[10] Tenderness may be accentuated by radial deviation.

The scaphoid is palpated just distal to the radial styloid in the snuffbox, which is formed by the tendons of the extensor pollicis longus (EPL) on the ulnar border and the extensor pollicis brevis (EPB) and abductor pollicis longus (APL) on the radial border. The scaphoid is most easily palpated when the wrist is in ulnar deviation, since the proximal carpal row slides radially and the scaphoid assumes an extended or vertical position when the wrist is in ulnar deviation[11] (Fig. 3). Tenderness of the scaphoid in the snuffbox may indicate scaphoid fracture, non-union, or scaphoid instability.[12]

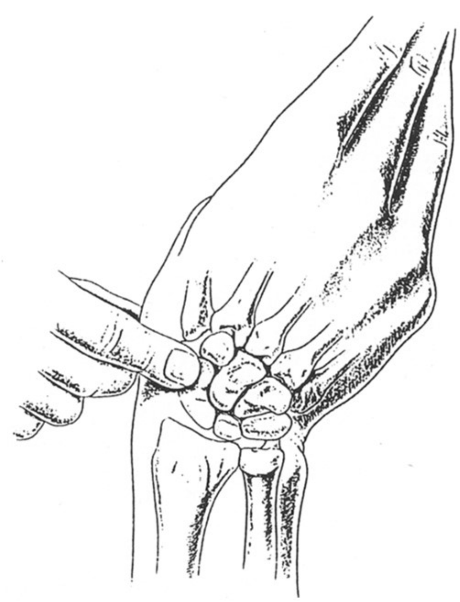

FIGURE 3. Palpation of the scaphoid with the wrist in ulnar deviation. From Whipple TL: Preoperative evaluation and imaging. In Whipple TL: Arthroscopic Surgery: The Wrist. Philadelphia: J. B. Lippincott, 1992, p. 16. Artist: Susan Brust, CMI; with permission.

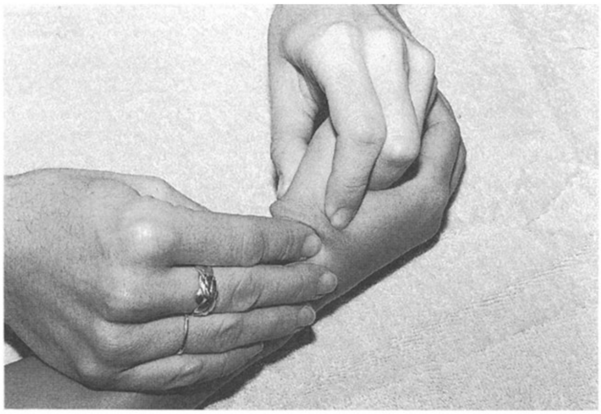

FIGURE 4. Grind test for CMC arthritis.

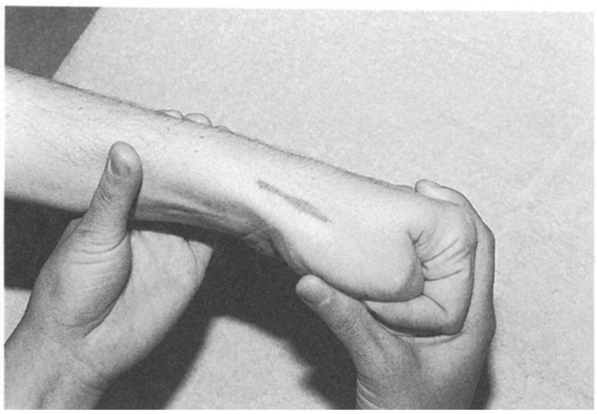

FIGURE 5. Finklestein's test to detect de Quervain's tenosynovitis.

The scaphotrapezial joint and trapezium are palpated just distal to the scaphoid. Opposing the thumb to the small finger and ulnarly deviating the wrist makes the trapezium more prominent. Tenderness in this region may indicate scaphotrapezial arthritis, which may result from scaphoid instability.[10]

The base of the first metacarpal and the first CMC joint are localized by palpating in a proximal direction along the dorsal aspect of the flexed first metacarpal until a small depression can be felt. This depression represents the first CMC joint. Tenderness here is frequently caused by degenerative arthritis. The **grind test** (Fig. 4) has been described for CMC arthritis[13] and involves axial compression of the first metacarpal combined with rotation. This clinical maneuver grinds the articular surfaces of the base of the metacarpal and the trapezium. A positive test elicits pain and crepitus may be felt.

The EPB and the APL tendons make up the first extensor compartment and form the radial border of the anatomic snuffbox. The thumb is extended and radially abducted to define and palpate these tendons. Fullness, nodularity, and tenderness may be indicative of de Quervain's tenosynovitis. **Finklestein's test** (Fig. 5) is used to detect de Quervain's tenosynovitis.[14] This test involves flexion of the thumb combined with ulnar deviation of the wrist. A positive test produces pain localized to the radial aspect of the wrist.

Intersection syndrome refers to friction at the point where the muscle bellies of the EPB and the APL cross over the radial wrist extensor tendons proximal to the wrist, resulting in an inflammatory

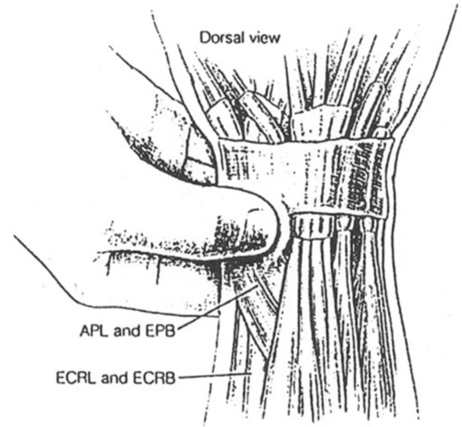

FIGURE 6. Intersection syndrome: friction at the point where the muscle bellies of the abductor pollicis longus and the extensor pollicis brevis cross the tendons of the extensor carpi radialis longus and the extensor carpi radialis brevis. From Whipple TL: Preoperative evaluation and imaging. In Whipple TL: Arthroscopic Surgery: The Wrist. Philadelphia: J. B. Lippincott, 1992, p. 17. Artist: Susan Brust, CMI; with permission.

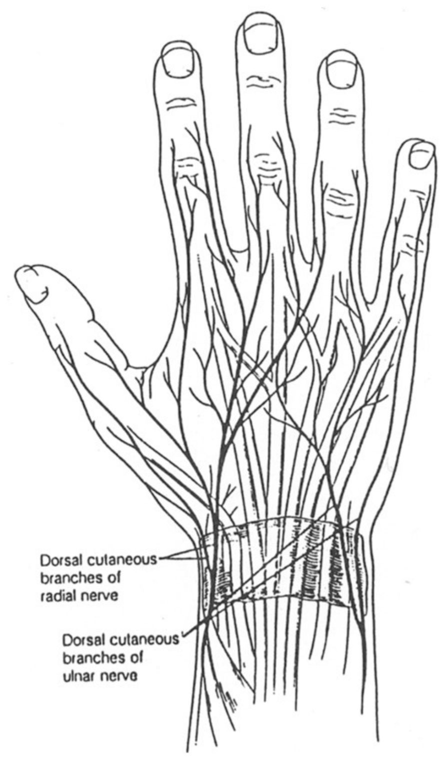

FIGURE 7. The course of the dorsal radial sensory nerve and an ulnar cutaneous nerve branch. From Whipple TL: Surical anatomy. In Whipple TL: Arthroscopic Surgery: The Wrist. Philadelphia: J. B. Lippincott, 1992, p. 60. Artist: Susan Brust, CMI; with permission.

peritendinitis[15] (Fig. 6). This condition may result from activities that involve a clenched fist with the thumb abducted, such as rowing. To assess for intersection syndrome, the EPB and the APL are palpated more proximally while the thumb is actively moving to identify tenderness and crepitus.

The DRSN (Fig. 7) travels along the dorsal radial aspect of the wrist and can become implicated in a variety of radial-sided injuries. Because of its superficial location, it is easily susceptible to any compressive force, such as tight externally applied wrist straps. Forearm position can accentuate DRSN compression. When the forearm is supinated, the DRSN lies between the tendons of the brachioradialis and the extensor carpi radialis longus (ECRL) without compression from these two tendons. When the forearm is pronated, however, the ECRL tendon crosses beneath the brachioradialis tendon and in a scissor-like fashion creates compression of the DRSN.[16] Palmar, ulnar flexion of the wrist puts the nerve on stretch. When irritated, the DRSN causes numbness, tingling, burning, and pain over the dorsal radial aspect of the hand. Percussion along the course of the nerve produces tingling and pain, and this may radiate distally. Sensibility over the dorsal web and dorsum of the thumb may be diminished and can be assessed with Semmes-Weinstein monofilaments.[17]

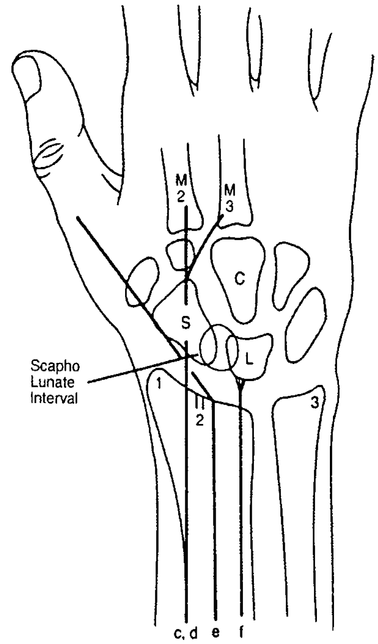

FIGURE 8. Central dorsal zone: structures in the central dorsal zone include Lister's tubercle (2), the lunate (L), the capitate (C), the scapholunate interval, the base of the second and third metacarpals (M2, M3), the extensor carpi radialis longus tendon (c), the extensor carpi radialis brevis (d), and the extensor digitorum communis tendons (f). From Brown DE, Lichtman DM: Physical examination of the wrist. In Lichtman DM: The Wrist and Its Disorders. Philadelphia, W. B. Saunders, 1988. Modified with permission.

Central Dorsal Zone

The structures of the central dorsal zone include Lister's tubercle, the lunate, the scapholunate interval, the capitate, and the base of the second and third metacarpals. The soft-tissue structures include the tendons of the second and fourth extensor compartments (Fig. 8).

Lister's tubercle forms a bony prominence over the dorsal and distal end of the radius and can be easily palpated. Lister's tubercle is helpful to use as a landmark when localizing other structures.

The lunate is found just distal and ulnar to Lister's tubercle with the wrist flexed. In this position the lunate forms a rounded prominence. Tenderness with palpation of the lunate can indicate Kienbock's disease or avascular necrosis of the lunate.[18]

The scapholunate interval is found just radial to the lunate between the third and fourth extensor compartments. Tenderness or fullness in this region may indicate scapholunate ligament injury or a dorsal wrist syndrome, described by Watson as localized scapholunate synovitis, that occurs secondary to overstress of ligaments in this area, or it may represent an occult ganglion.[19] The **finger-extension test** (Fig. 9), used to demonstrate dorsal wrist syndrome, involves resisted finger-extension with the wrist in flexion. The test is positive if pain is produced in the scapholunate region.[19]

Scapholunate ligament injury can lead to scaphoid instability and rotary subluxation of the scaphoid. This involves dissociation of the scaphoid and lunate and rotation of the scaphoid to a volar flexed position. Watson identifies five clinical signs for rotary subluxation of the scaphoid. These include tenderness over the scaphoid in the snuffbox; triscaphe joint synovitis and tenderness; dorsal scapholunate synovitis; a positive finger-extension test; and an abnormal scaphoid shift test.[19]

FIGURE 9. Resisted finger extension test used to detect dorsal wrist syndrome.

The **scaphoid shift test (SST)**, also referred to as the **Watson test** or the **radial stress test**, was

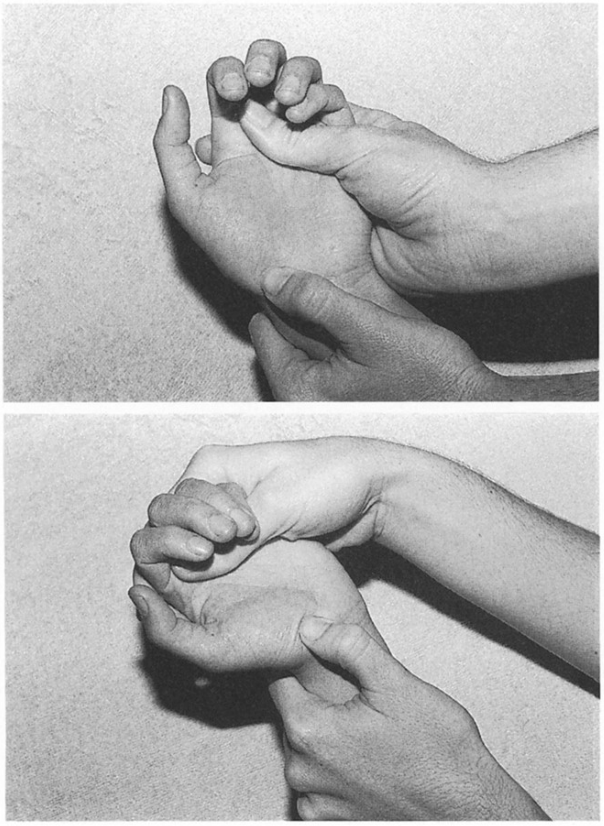

FIGURE 10. Scaphoid shift test used to assess scaphoid stability. (Top) Starting position is with the wrist in ulnar deviation. (Bottom) Wrist is moved into radial deviation with constant thumb pressure over the volar scaphoid.

described by Watson as a provocative maneuver to assess scaphoid stability[20] (Fig. 10). To perform the SST, pressure is applied over the volar prominence of the scaphoid, found at the base of the thenar crease, as the wrist is moved from ulnar deviation to radial deviation with slight flexion. Normally, with radial deviation, the scaphoid palmar flexes. With ligament laxity or disruption, and under pressure from the examiner's thumb, the proximal pole of the scaphoid shifts up onto the dorsal rim of the radius. When thumb pressure is withdrawn, the scaphoid returns with a clunk. A positive test is one that reproduces the patients' symptoms, usually a painful clunk.

The validity of the SST has been studied by LaStayo and Howell.[21] They found a 69% sensitivity and a 66% specificity, indicating that approximately one third of the scapholunate ligament injuries in their sample population were missed, and approximately one third of those individuals who did not have an injury tested positively.

The capitate is localized by palpating proximally over the dorsal surface of the third metacarpal until a small depression is felt. This represents the sulcus of the capitate. Tenderness here may be associated with scapholunate or lunotriquetral in-

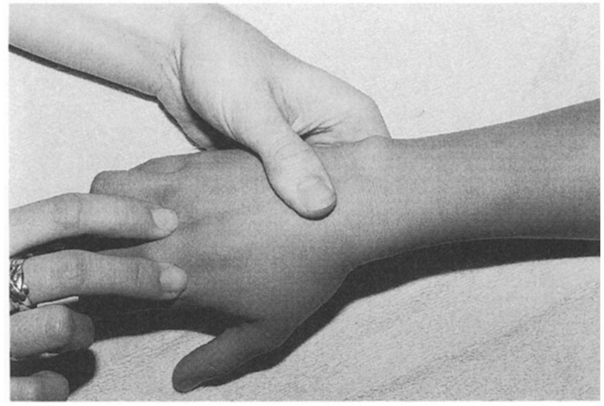

FIGURE 11. Linscheid test used to detect ligamentous injury and instability of the second and third CMC joints.

stability, or with capitolunate degenerative joint disease, which occurs with scapholunate advanced collapse or SLAC wrist. The SLAC wrist has undergone a pattern of degenerative changes that are based on and caused by articular alignment problems between the scaphoid, the lunate, and the radius.[22]

The base of the second and third metacarpals and the CMC joints are localized by palpating proximally along the dorsal surfaces of the index and long metacarpals to their respective bases. Tenderness may indicate injury to the CMC joints and ligaments, which can occur with forced palmar flexion of the wrist and hand.[23] A bony prominence found at the base of the second or third metacarpal may be a carpal boss. A carpal boss is not necessarily a pathologic process but a variation found in some individuals. It may represent hypertrophic changes of traumatic origin. These can occasionally cause pain and irritation of the local soft tissues.[24]

The **Linscheid test** (Fig. 11) is performed to detect ligamentous injury and instability of the second and third CMC joints. The test is performed by supporting the metacarpal shafts and pressing distally over the metacarpal heads in a palmar and dorsal direction. A positive test produces pain localized to the CMC joints.[25]

The extensor carpi radialis longus (ECRL) and the extensor carpi radialis brevis (ECRB) travel radial to Lister's tubercle, insert at the base of the second and third metacarpals, and act to extend and radially deviate the wrist. The extensor digitorum communis (EDC) travels ulnar to Lister's tubercle and acts to extend the MCP joints of the digits. Tenderness, nodularity, and fullness of these tendons and pain with resisted motion may indicate tendinitis.

Ulnar Dorsal Zone

The structures of the ulnar dorsal zone include the ulnar styloid and the ulnar head, the distal radioulnar joint (DRUJ), the triangular fibrocartilage complex (TFCC), the hamate, the triquetrum, the lunotriquetral interval, the fourth and fifth CMC joints, and the extensor carpi ulnaris (ECU) (Fig. 12).

The ulnar head forms a rounded prominence on the ulnar side of the wrist. It is easily palpated and most prominent with the forearm in pronation. The ulnar styloid is localized ulnar and slightly distal to the ulnar head. Tenderness in this region may be caused by an ulnar styloid fracture or non-union.

The DRUJ is formed by the sigmoid notch of the radius and the ulnar head and is palpated just radial to the ulnar head. Tenderness here may be caused by instability or incongruity with DRUJ arthritis. Prominence of the distal ulna and ulnar head is a sign of DRUJ instability and may be associated with a **piano-key sign** (Fig. 13). With gentle downward pressure applied to the distal end of the ulna, the head moves volarly but springs back when pressure is released, resembling the action of a piano key. When this maneuver causes pain, the subject may vocalize a "note" of discomfort.[26]

A variation of the piano-key sign is the **piano-key test** (Fig. 14), also used to assess DRUJ instability.[7] To perform this test, the distal ulna is grasped and moved passively in a volar and dorsal direction in various degrees of pronation and su-

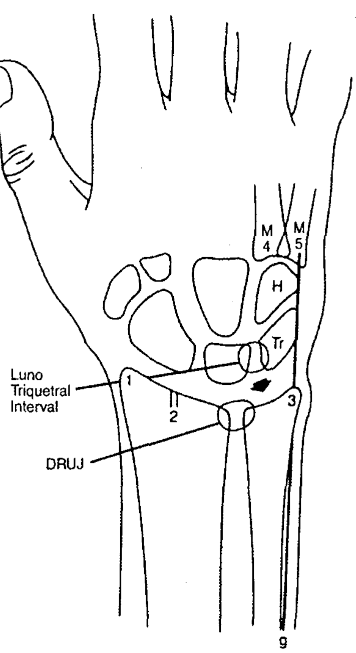

FIGURE 12. Ulnar dorsal zone: structures in the ulnar dorsal zone include the ulnar styloid (3), the distal radioulnar joint, the triangularfibrocartilage complex (arrow), the hamate (H), the triquetrum (Tr), the lunotriqutral interval, the base of the fourth (M4) and fifth (M5) metacarpals, and the extensor carpi ulnaris tendon (g). From Brown DE. Lichtman DM: Physical examination of the wrist. In Lichtman DM: The Wrist and Its Disorders. Philadelphia, W. B. Saunders, 1988. Modified with permission.

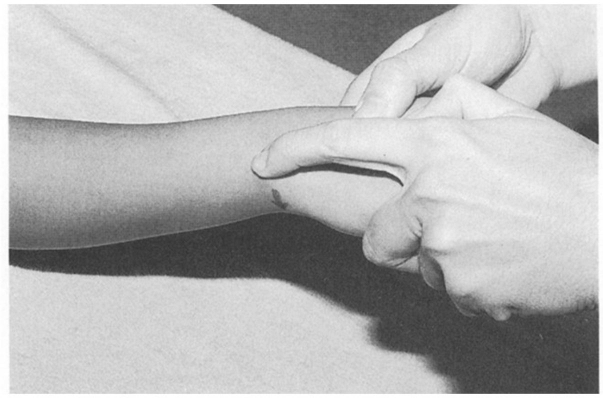

FIGURE 13. Piano-key sign for distal radioulnar joint instability.

FIGURE 14. Piano-key test used to assess DRUJ instability.

pination. Pain, tenderness, and increased mobility relative to the uninjured side suggest DRUJ instability.

The DRUJ can be compressed by pressure over the ulnar head into the sigmoid notch of the radius. When combined with pronation and supination, compression of the DRUJ will be painful in the presence of arthritis.[9]

The TFCC is the soft-tissue and ligamentous support for the DRUJ and ulnar carpus. The components of the TFCC include the triangular fibrocartilage (TFC) proper or articular disc, the volar and dorsal radioulnar ligaments, the ulnocarpal ligaments, the extensor carpi ulnaris sheath, and the lunotriquetral interosseous ligament.[27]

The TFCC is palpated between the head of the ulna and the triquetrum. Tenderness here may indicate a TFCC injury or ulnocarpal abutment, a condition involving abutment or impaction of the TFCC between the end of a long ulna (with positive variance) and the triquetrum.[28]

The **TFCC load test** (Fig. 15) is performed to detect ulnocarpal abutment or TFCC tears. It is performed by ulnarly deviating and axially loading the wrist and moving it volarly and dorsally or by rotating the forearm. A positive test elicits pain, click-

FIGURE 15. TFCC load test performed to detect TFCC tears or ulnocarpal abutment.

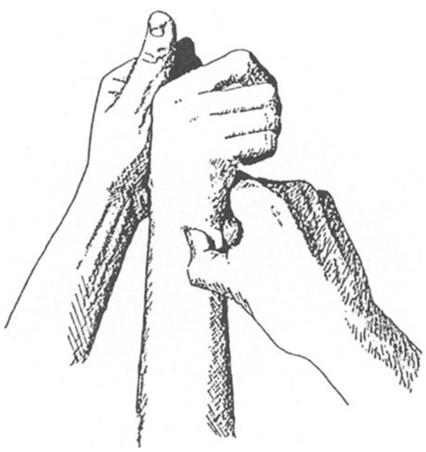

FIGURE 16. Ulnomeniscotriquetral dorsal glide test used to assess the TFCC. From Hertling D, Kessler RM: Management of Common Musculoskeletal Disorders: Physical Therapy Principles and Methods. Philadelphia, J. B. Lippincott, 1990; with permission.

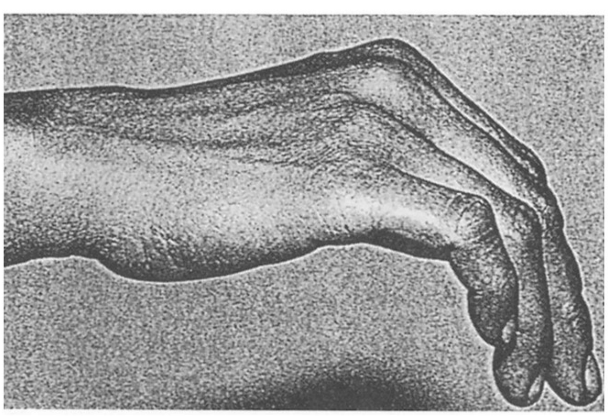

FIGURE 17. Ulnocarpal instability caused by disruption of the ulnocarpal ligaments and characterized by a volar sag and supination of the carpus. From Whipple TL: Preoperative evaluation and imaging. In Whipple TL: Arthroscopic Surgery: The Wrist. Philadelphia: J. B. Lippincott, 1992, p. 24. Artist: Susan Brust, CMI; with permission.

ing, or crepitus and reproduces the patient's symptoms.[7]

The **ulnomeniscotriquetral dorsal glide (UMTDG) test** is used to assess the TFCC and is based on a technique described by Hertling and Kessler as a joint mobilization procedure to increase the movement between the distal ulna bone, the meniscus, and the triquetrum (Fig. 16).[29] The test is carried out by the examiner, who positions his or her thumb dorsally over the ulna while placing the radial side of the index proximal interphalangeal joint over the pisotriquetral complex. The examiner then squeezes the thumb and the index finger together to produce a dorsal glide of the pisotriquetral complex on the ulna. A positive test result is indicated by reproduction of the patient's painful symptoms and/or excessive laxity in the ulnomeniscotriquetral region.

LaStayo and Howell studied the validity of the UMTDG test and found that approximately one third of TFCC injuries were missed with this test and approximately one third of those individuals who did not have an injury to the TFCC tested positively.[21]

Ulnocarpal instability is caused by disruption of the ulnocarpal ligaments and the TFCC and is characterized by a volar sag and supination of the ulnar carpus (Fig. 17). The **relocation test** (Fig. 18), which has been described by Prosser and colleagues, involves the combined movement of pronation and anterior-to-posterior glide of the carpus on the ulna, which relocates the carpus into normal alignment. The test is positive if the relocation of the subluxed ulnar carpus reduces the patient's wrist pain.[30]

The hamate is palpable proximal to the base of the fourth and fifth metacarpals. Dorsal tenderness of the hamate may indicate fracture.[31]

The triquetrum is palpated just distal to the ulnar styloid in the "ulnar snuffbox," a term utilized by Beckenbaugh to refer to the interval between the flexor carpi ulnaris (FCU) and the ECU tendons.[25] The wrist should be radially deviated to palpate the triquetrum, since the proximal carpal row slides ulnarly with wrist radial deviation. Tenderness may indicate triquetral fracture or instability. Tenderness and swelling in the triquetral hamate region are often present with midcarpal instability, which occurs when the volar triquetral–hamate–capitate ligament is ruptured or stretched.[32] Midcarpal instability is demonstrated clinically when the fingers are clenched in a tight fist and the wrist is ulnarly deviated, as in swinging a bat or in hammering. A palpable and visible clunk will be apparent as the wrist moves from neutral to ulnar deviation, and the wrist will appear to sag on the ulnar side or supinate.[33]

The lunotriquetral interval is palpated just ulnar to the lunate in line with the fourth ray between the EDC and the extensor digit quinti tendons. Tenderness and swelling in this region may be caused by lunotriquetral instability. The **ballottement test** (Fig. 19) for lunotriquetral stability is performed by stabilizing the lunate and attempting to displace the triquetrum volarly and dorsally with the other hand. A positive test elicits pain, clicking, or laxity.[34]

LaStayo and Howell found that the sensitivity of the ballottement test to discover a true injury was 64%, that is, approximately one third of lunotriquetral injuries were missed with this test. The specificity was 44%, suggesting that more than half of those who tested positively had no injury to the lunotriquetral ligament.[21]

Kleinman has described a **shear test** (Fig. 20) for lunotriquetral instability. The examiner's fingers are placed dorsal to the lunate and the thumb is placed on the pisotriquetral joint. With the lunate supported, the pisotriquetral joint is loaded in the anteroposterior plane, creating a shear force across the lunotriquetral joint. The wrist is then ulnarly and radially deviated. The test is positive if pain or clicking is produced.[35]

The **ulnar snuffbox test** (Fig. 21) involves lateral pressure on the triquetrum in the sulcus distal to the ulnar head formed by the ECU and the FCU tendons. A positive test reproduces the patients' pain, and lunotriquetral instability should be suspected.[36]

The fourth and fifth CMC joints are localized by palpating proximally along the dorsal surfaces of the fourth and fifth metacarpals to their base.

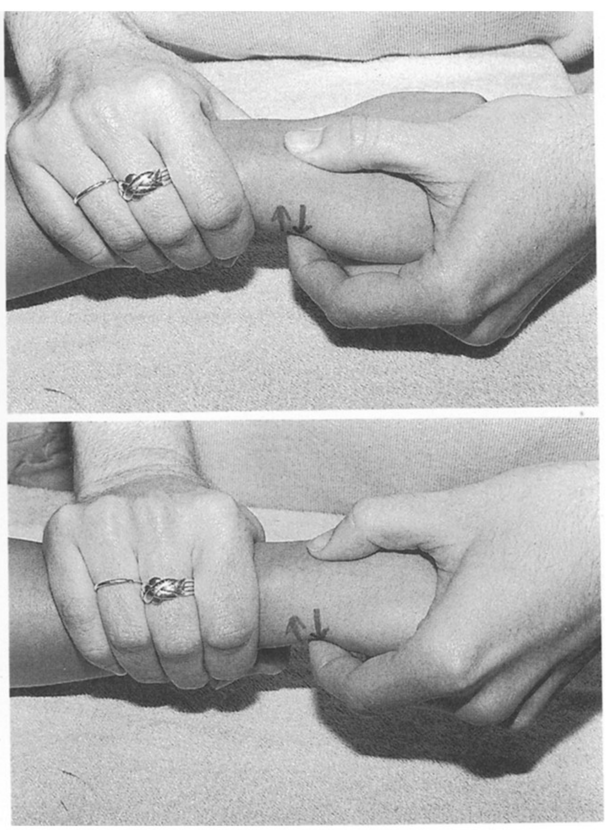

FIGURE 18. *Relocation test for ulnocarpal instability. (Top) Instability is characterized by volar sag and supination of the wrist. (Bottom) Relocation of the carpus is accomplished by volar-to-dorsal glide and pronation of the carpus.*

FIGURE 19. *Ballottement test for lunotriquetral instability.*

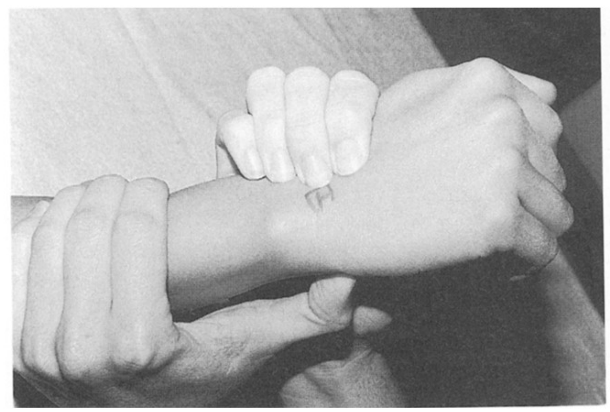

FIGURE 20. *Shear test for lunotriquetral instability.*

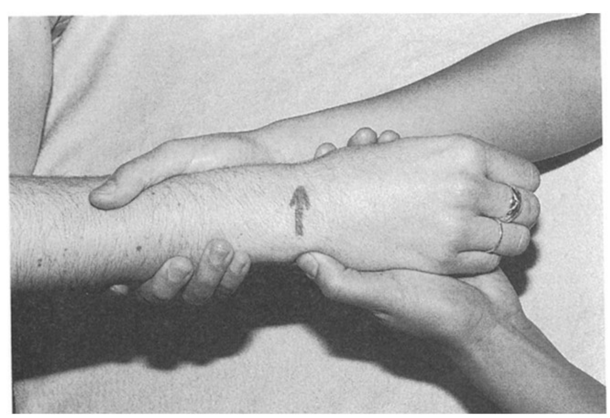

FIGURE 21. *Ulnar snuffbox test for lunotriquetral instability.*

Tenderness in this region may indicate ligament injury or fracture.

The ECU tendon is palpated in the gap between the ulnar styloid and the base of the fifth metacarpal with the forearm in pronation and during active ulnar deviation. Tenderness and pain with resisted motion may indicate tendinitis. Pain

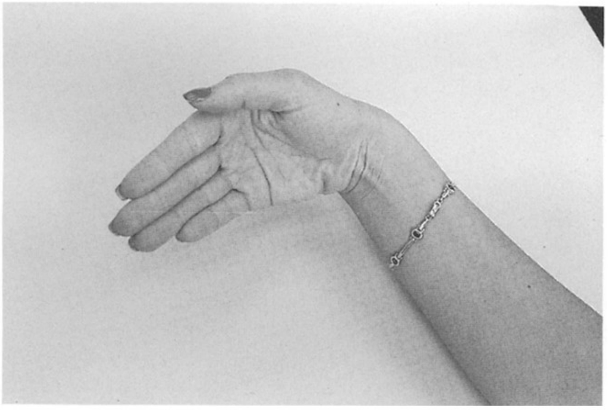

FIGURE 22. Test position for extensor carpi ulnaris subluxation involves forearm supination and ulnar deviation.

and snapping with forearm rotation may be caused by ECU subluxation. The ECU tendon is normally held securely in the ulnar groove of the distal ulna by the ECU sheath. With disruption of the sheath, the ECU tendon will sublux and snap during forearm rotation as it slides out of its groove and bowstrings ulnarly and volarly across the ulnar styloid.[37] To test for ECU subluxation, the forearm is supinated and the wrist is ulnarly deviated and the tendon is observed and palpated to assess for ulnar and volar subluxation[38] (Fig. 22).

Radial Volar Zone

Structures to assess in the radial volar zone include the scaphoid tuberosity, the palmaris longus, the flexor carpi radialis (FCR), the median nerve, and the radial artery (Fig. 23).

The scaphoid tuberosity can be found at the base of the thenar crease and is prominent with the wrist in radial deviation. Tenderness here may indicate scaphoid disease.[7]

The palmaris longus is present in 87% of upper extremities.[39] To define the palmaris longus, the thumb and the small finger should be opposed and the wrist slightly flexed.

Radial to the palmaris longus and ulnar to the scaphoid tuberosity is the FCR, which flexes and radially deviates the wrist. Tenderness and fullness of the tendon and pain with resisted movement are signs of tenosynovitis.

The median nerve is deep and ulnar to the palmaris longus. Median nerve compression can occur within the carpal canal. **Tinel's** and **Phalen's tests** are clinical tests used to identify median nerve compression at the level of the wrist. To perform Tinel's test, the median nerve is gently percussed at the wrist level (Fig. 24). A positive test produces pain and tingling that radiates to the fingers.[40] Phalen's test involves passive flexion of the wrist for 15–60 seconds (Fig. 25). A positive test produces numbness and tingling in the distribution of the median nerve.[41]

The validities of Phalen's test and Tinel's test have been studied by a number of investigators. Phalen's test appears to be the more sensitive, with a good specificity. Tinel's sign, although positive during some stages of carpal tunnel syndrome, is very useful due to its specificity.[42]

The radial artery lies radial to the flexor carpi radialis. **Allen's test** (Fig. 26) is used to assess the patency of the radial and ulnar arteries.[43] To perform this test, the subject makes a tight fist and the examiner occludes both the radial and the ulnar arteries. The subject opens and closes the hand until the skin is white and blanched. The radial artery is then released and the hand is observed for flushing,

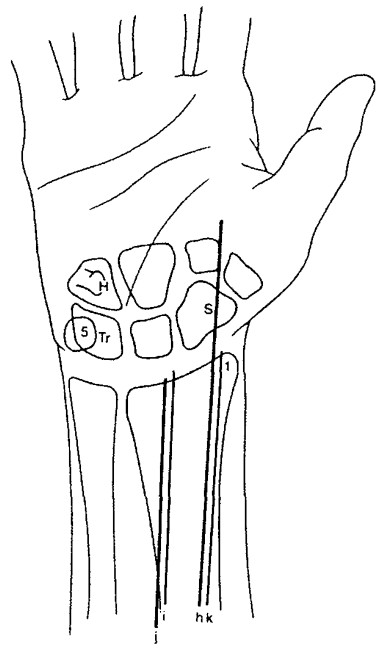

FIGURE 23. Radial volar zone: structures in the radial volar zone include the scaphoid tuberosity (S), palmaris longus (i), the flexor carpi radialis (h), the median nerve (j), and the radial artery (k). From Brown DE, Lichtman DM: Physical examination of the wrist. In Lichtman DM: The Wrist and Its Disorders. Philadelphia, W. B. Saunders, 1988. Modified with permission.

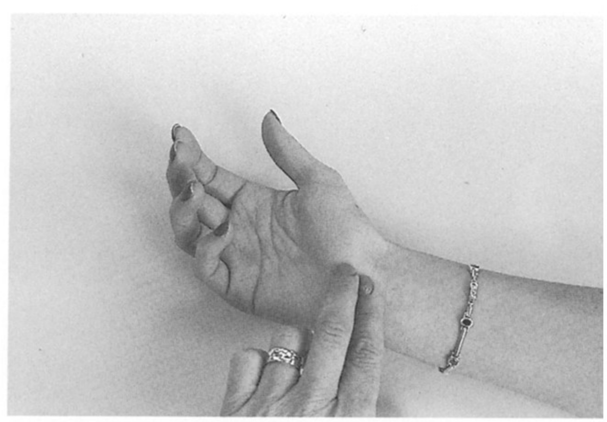

FIGURE 24. Tinel's sign for median nerve compression.

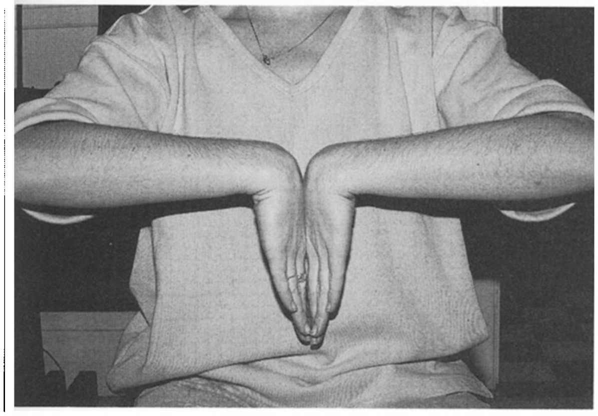

FIGURE 25. *Phalen's test for median nerve compression at the wrist.*

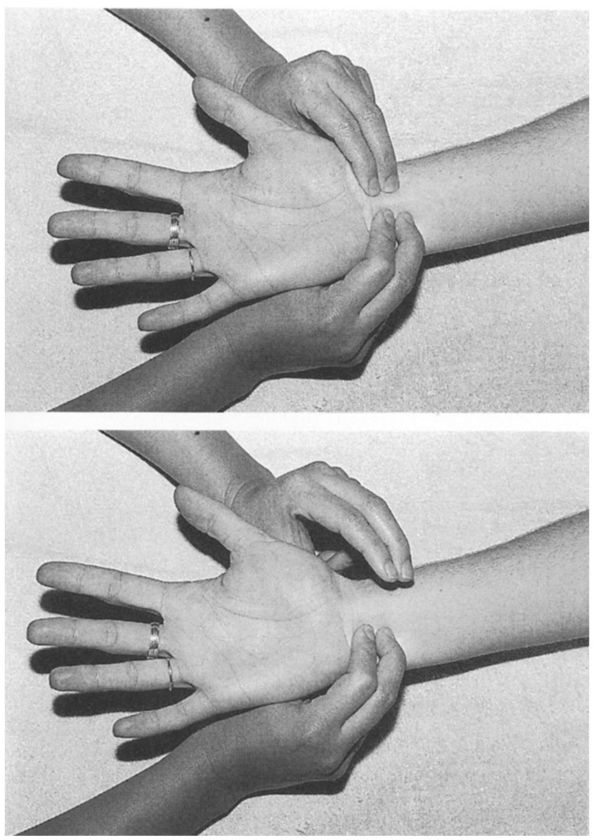

FIGURE 26. *Allen's test. (Top) Both radial and ulnar arteries are occluded, and the digits are flexed and extended several times to exsanguinate the hand. (Bottom) The radial artery is released and the palm is observed for flushing, indicating blood flow. The test is repeated to assess the ulnar artery.*

which indicates blood flow. If there is no flush or if flushing is delayed relative to the uninvolved side, occlusion may be present. The test is repeated to assess the ulnar artery.

Ulnar Volar Zone

The structures to assess in the ulnar volar zone include the pisiform, the hook of the hamate, the FCU, and the ulnar nerve and artery (Fig. 27).

The pisiform is located at the base of the hypothenar eminence at the flexion crease of the wrist. It is a carpal sesamoid bone that overlies the triquetrum and lies within the fibers of the FCU. Tenderness with palpation of the triquetrum may indicate fracture or pisotriquetral arthritis, which can occur with impact loading on the ulnar side of the wrist and proximal palm, resulting in impaction of the pisotriquetral articular surface.[44]

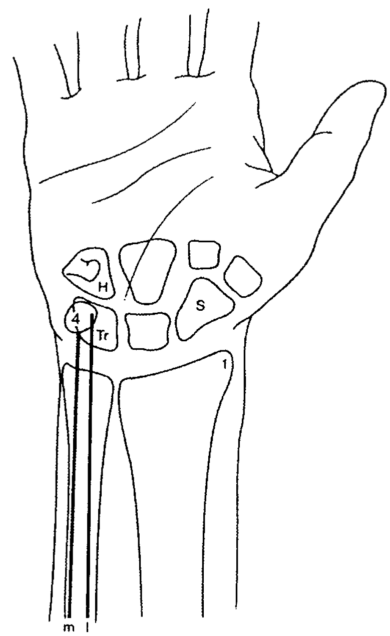

FIGURE 27. *Ulnar volar zone: structures in the ulnar volar zone include the pisiform (4), the hook of the hamate (H), the flexor carpi ulnaris (m), and the ulnar nerve and artery (l). From Brown DE, Lichtman DM: Physical examination of the wrist. In Lichtman DM: The Wrist and Its Disorders. Philadelphia, W. B. Saunders, 1988. Modified with permission.*

FIGURE 28. *Pisotriquetral shear test for pisotriquetral arthritis.*

The **shear test** (Fig. 28) for pisotriquetral arthritis involves pushing or rocking the pisiform into or across the triquetrum. A positive test elicits pain or crepitus.[7]

The hook of the hamate is found in the hypothenar eminence radial and 1–2 cm distal to the pisiform. Tenderness may indicate fracture of the hamate hook.[45]

The flexor carpi ulnaris is palpated on the ulnar volar side of the wrist. This tendon is defined with wrist flexion and ulnar deviation. Tenderness, fullness, and discomfort with resisted motion may indicate tenosynovitis.

General Tests

Additional general tests for the assessment of wrist pain include the **carpal shake test** and the **sitting hands test**.[7] The carpal shake test (Fig. 29) is performed by grasping the distal forearm and "shaking" or passively dorsiflexing and palmarflexing the wrist. This is painful in the presence of significant synovitis. The sitting hands test (Fig. 30) is used to gauge the severity of wrist involvement and is not used to make a differential diagnosis. The patient places both hands on the seat of the chair and pushes off, attempting to hold himself suspended using only hands. This maneuver produces great stresses in the wrist and is too difficult in the presence of significant synovitis.

Grip-strength testing is advocated by some as a reliable indicator of true impairment that deserves further investigation in cases of obscure wrist pain. Czitrom and Lister found a significant correlation between decreased grip strength and positive bone scans and confirmed pathology with chronic wrist complaints. Submaximal effort was ruled out with rapid-exchange grip testing and a bell curve with five-position grip testing using the Jamar dynomometer.[46]

SUMMARY

In summary, evaluation of the painful wrist is based upon a thorough knowledge of wrist anatomy. The key is to localize and identify the painful structures through systematic palpation of the wrist's bony and soft-tissue anatomy and to perform provocative tests to reproduce the patient's symptoms and identify instability. It is important to keep in mind that clinical findings must be interpreted with caution. North and Meyer correlated clinical and arthroscopic findings and concluded that it is possible to identify the region of wrist injury based on a clinical examination, but not the specific ligament.[47] Imaging and other diagnostic studies are needed to complete the evaluation of the wrist.

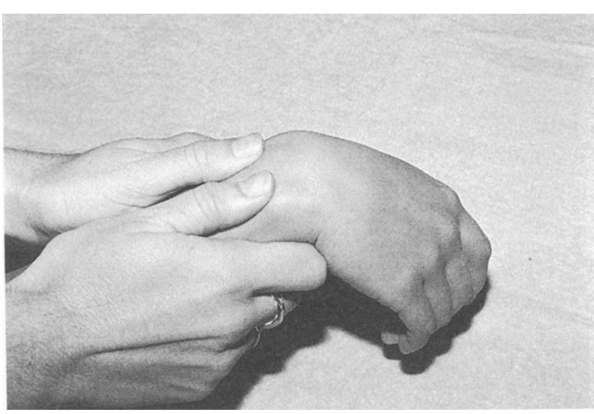

FIGURE 29. *Carpal shake test.*

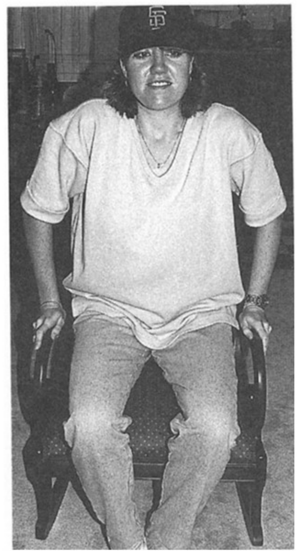

FIGURE 30. *Sitting hands test.*

Acknowledgment

The author thanks Ken Flowers, PT, CHT, of NovaCare, Phoenixville, PA, for reviewing this article and for supplying the photographs.

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