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Editor

Wrist Arthroscopy

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Clinical Approach to the Painful Wrist

Andrea Atzei and Riccardo Luchetti

Pain localization of the wrist is the most common cause of referral to consultation in the office of many hand and wrist surgeons. In many cases, a patient's complaints are readily recognized as typical symptoms and the history pathognomonic of defined disorders. Accurate physical examination, supplemented by standard x-rays, often yields a prompt diagnosis during the first patient visit.

However, cases of chronic wrist pain, in which exact diagnosis is difficult even after several consultations, are not infrequent. This is not surprising if one considers the anatomic and biomechanical complexity of the wrist joint. Within that small area, there is a concentration of intimately related structures, including more than 20 radiocarpal, intercarpal, and carpometacarpal joints, as well as the distal radioulnar joint (DRUJ), 26 carpal ligaments and the triangular fibrocartilage complex (TFCC), each of which can be source of intra-articular pathology. In addition, the 24 tendons, 2 main vascular trunks, and 6 nerves crossing the joint are all sources of extra-articular pathology.

Thorough clinical evaluation of the painful wrist should include routine steps of taking the patient's history and performing a physical examination, followed by appropriate imaging studies. During the last decade, arthroscopy has confirmed its role as a valuable tool in helping the clinician in the diagnosis of wrist disorders.[1–4]

Direct visualization of intra-articular structures allows early diagnosis and treatment of selected cases. However, limitations of arthroscopy include the fact that only intra-articular pathology can be assessed, and not all abnormalities identified by arthroscopy are necessarily responsible for the patient's complaints. Therefore, diagnostic arthroscopy is indicated only following a thorough clinical examination, during which the anatomic structures responsible for the patient's symptoms should be located with the greatest accuracy and all extra-articular causes of pain excluded. A systematic approach is suggested for the diagnosis and management of the conditions or disorders that cause wrist pain.

CLINICAL EVALUATION

History

The steps in taking a patient's history are well defined (Table 24.1). The patient's general history should be collected first; age and sex are important as they correlate with joint wear.[5,6] Special attention should be paid to occupational and avocational activities involving the wrist; previous injuries or surgery, and other systemic illnesses and/or rheumatologic diseases. Details of wrist complaints, whether they follow injuries considered trivial and therefore initially underestimated, or result from slow progression of nontraumatic conditions, must be obtained by specific questioning during a thorough clinical history. T1

The most common causes of acute or chronic wrist pain[7–9] can be divided into 7 main categories (Table 24.2): traumatic injuries (including acute injuries and posttraumatic conditions), degenerative and inflammatory disorders (local or systemic conditions and repetitive trauma disorders), infections, tumors, congenital and developmental disorders, neurological disorders, and vascular disorders. Categorizing the patient's wrist complaints according to these 7 general causes is an important step to identify a specific disorder or to formulate a differential diagnosis to guide physical examination and further investigation. T2

Physical Examination

Continuous advances in our understanding of wrist anatomy and kinematics have increased the importance of physical examination as the basic diagnostic tool, over imaging techniques, whose most valuable contribution is in differential diagnosis in selected cases.[10] Examination should be extended to the entire upper extremity, including the cervical spine and all other joints or areas of symptomatology.

Evaluation of the painful wrist begins with an accurate inspection for specific areas of swelling or obvious deformities, erythema, warmth, nodules or skin lesions, and prior surgical scars. Assessment of pas-

TABLE 24.1. Steps in Taking a Patient History.

Patient's general history	*Wrist complaint history*
1. Age	1. Classification of chief complaint
2. Handedness	2. Onset, location, and nature of symptoms
3. Occupation	3. Symptom's relation to specific activities
4. Avocational activities	4. Factors exacerbating or improving symptoms
5. Previous wrist injuries	5. Frequency and duration of post-activity ache
6. Previous wrist surgery	6. Subjective loss of wrist motion
7. Other orthopedic/ rheumatologic disorders	7. Abnormal sounds or sensations with wrist motion
8. Other medical/ dismetabolic disorders	8. Efficacy of prior treatments
	9. Current work status
	10. Involvement of worker's compensation claim

sive and active range of motion of both wrists usually follows. A loss of motion is consistently associated with a disorder primarily affecting the wrist joint, either posttraumatic or degenerative. Measurement of grip strength has proved to be a reliable index of wrist impairment,[11] especially when the rapid exchange grip technique is used to detect submaximal effort.[12]

Palpation is the next step of physical examination. Diagnostic ability depends essentially on a thorough knowledge of both soft tissue and bony topographic anatomy of the wrist: recognition of underlying soft tissue and bone structures as sources of pain is a fundamental step towards diagnosis, as it allows correlation of clinical complaints with anatomical damage.[13] A systematic approach to correlating the pain symptom to topographic anatomy of the wrist can be achieved by dividing the dorsal and palmar aspect of the wrist surface into 3 areas: radial, central, and ulnar (Fig. 24.1). A total of 6 areas are defined by using prominent bony landmarks and easily palpable tendons as reference points. F1

Proceeding from radial to ulnar on the dorsal surface of the wrist, the following landmarks are located (Figure 24.1A): the dorsoradial border of the compartment for the abductor pollicis longus (APL) and the extensor pollicis brevis (EPB) tendons—i.e., the first extensor compartment of the wrist, a longitudinal line

TABLE 24.2. Most Common Causes of Wrist Pain.

Traumatic Disorders	**Fracture and Malunion** Radius—ulna Scaphoid Other carpal bones	**Nonunion** Scaphoid Capitate Hamate	**Chondritis/Osteochondritis/ Post-traumatic arthritis** SNAC SLAC Piso-triquetral arthrosis Hamate-triquetral arthrosis Hyperextension Radioscaphoid impingement *(Gymnast's wrist)* Ulno-carpal impingement	
	Ligamentous Injuries and Instability Perilunate *(scapholunate, lunotriquetral)* Midcarpal *(intrinsic, extrinsic)* Radiocarpal *(ventral or dorsal subluxation, ulnar translocation)* Dorsal wrist syndrome Distal radio-ulnar joint *(luxation, subluxation, TFCC injury)* Carpo-metacarpal J *(1st CMC; 2nd–3rd CMC, carpal boss; 4th–5th CMC)*		**Extensor Carpi Ulnaris Tendon Subluxation**	
Degenerative Inflammatory Disease	**Connective Tissue Diseases** Rheumatoid arthritis Systemic erythematous lupus	**Metabolic Diseases** Gout/pseudogout Hyperparathyroidism Chondrocalcinosis	**Tendonitis, Tenosynovitis, Repetitive Strain Injury**	**Chondritis/ Primary Arthrosis**
Infective Disorders	**Common Bacterial/Atypical Agent**		**Specific Granulomatous Disease**	
Neoplastic Disorders	**Ganglia** (extra-osseous/ intra-osseous/occult) **Tendon Cysts**	**Bone Tumors** Enchondroma, osteoid osteoma, chondromatosis, etc.	**Soft Tissue Tumors** Pigmented villonodular synovitis, Giant cell tumor, etc.	**Malignant Tumors** **Metastasis**
Congenital and Developmental Disorders	**Simple Osseous Cyst**	**Madelung's deformity**	**Muscular Anomalies** Extensor brevis manus	**Carpal Coalition** Scapholunate Scaphotrapezial Lunotriquetral
Neurological Disorders	**Traumatic** Palmar branch median n. *(from section)* Sens. branch radial n. *(from injection)* Dorsal sens. branch ulnar n. *(direct contusion)* Distal post. interosseous n. *(recurrent ganglion)*		**Compressive** Carpal tunnel syndrome (CTS) Wartemberg's syndrome Guyon's syndrome T.O.S. Radicular compression	
Vascular Disorders	Aneurysm/thrombosis of the Ulnar Artery Avascular necrosis of the lunate *(Kienboeck's disease)*; of the scaphoid *(Preiser's disease)*; of the capitate; of the triquetrum			

1 line long

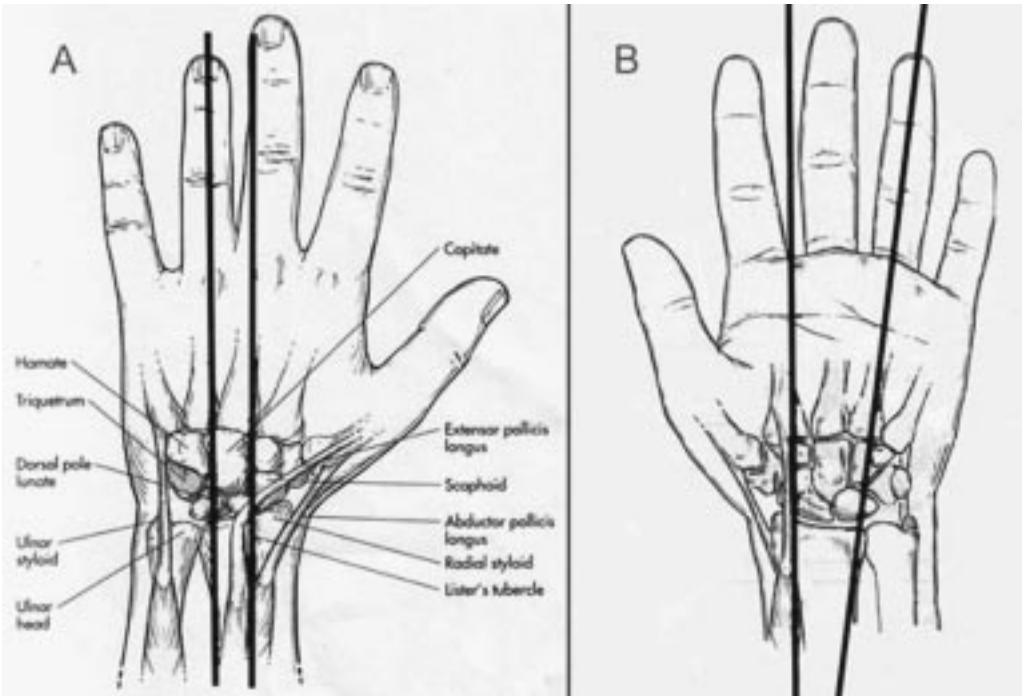

FIGURE 24.1. *TOPOGRAPHIC ANATOMY OF THE WRIST.* **A)** Dorsal surface of the wrist. Landmarks for reference are the dorsoradial border of the first extensor compartment, a longitudinal line passing over Lister's tubercle, a line continuing proximally from the middle axis of the ring finger and passing between the fourth and fifth extensor compartment, and the ulnar border of the sixth extensor compartment. Three areas are defined between these landmarks: radial dorsal area corresponding to the "anatomical snuffbox," central dorsal area, and ulnar dorsal area. **B)** Palmar surface of the wrist. Landmarks for reference are the dorsoradial border of the first extensor compartment, the ulnar border of the FCR, a line continuing proximally from the middle axis of the ring finger and passing just radial to the volar aspect of the distal radioulnar joint, and the ulnar border of the sixth extensor compartment. Three areas are defined between these landmarks: radial palmar area, central palmar area and ulnar palmar area.

passing over Lister's tubercle, and a line that extends along the middle axis of the ring finger proximally—this line usually passes between the fourth and fifth extensor compartment of the wrist—and the ulnar border of the flexor carpi ulnaris (FCU) tendon.

Consequently, 3 dorsal areas are defined as follows: the radial dorsal area between the dorsoradial border of the first extensor compartment of the wrist and the longitudinal line passing over Lister's tubercle, including the area of the "anatomical snuffbox"; the central dorsal area between the longitudinal line passing over Lister's tubercle and the line continuing the middle axis of the ring finger; and the ulnar dorsal area between the line continuing the middle axis of the ring finger and the ulnar border of the FCU tendon.

On the palmar surface of the wrist the following landmarks are located (Figure 24.1B): the dorso-radial border of the first extensor compartment, the ulnar border of the flexor carpi radialis (FCR) tendon, a line continuing proximally along the middle axis of the ring finger (this line usually passes just radial to the volar aspect of the DRUJ), and the ulnar border of the FCU tendon. Consequently, the palmar surface of the wrist is divided in 3 areas between these landmarks: the radial palmar area between the dorsoradial border of the first extensor compartment and the ulnar border of the FCR tendon; the central palmar area between the ulnar border of the FCR tendon and the line continuing proximally along the middle axis of the ring finger; and the ulnar palmar area between the line continuing proximally along the middle axis of the ring finger and the ulnar border of the FCU tendon.

A comprehensive and careful examination of the diffusely painful wrist will enable the surgeon to elicit patient's symptoms by palpating specific spots. Palpation of an osseous prominence may evoke pain in the case of fracture or nonunion or avulsion of the ligaments inserting on it. A joint rim is usually felt as a small depression between 2 bony ends. Gentle palpation may show swelling, in the case of synovitis, or in the presence of small ganglia, direct pressure over the capsule may exacerbate pain. Firm palpation of the joint surface may provoke pain in the case of osteochondritis or avascular necrosis.

A series of maneuvers exerting axial load on the different joints are utilized to elicit pain and/or crepitation in degenerative joint diseases. In these cases, joint compression or, when possible, palpation of the degenerated articular surfaces increases pain, while axial distraction maneuvers usually relieve it. Pain is also present following those maneuvers that stress the joint ligaments in an attempt to sublux the joint itself, as well as following direct pressure over the torn ligament. In the presence of complete ligament disruption, malalignment of the bony ends and widening of the joint space are common findings.

1 line long

Pain, swelling, and tenderness are present along a tendon's course in tenosynovitis. Crepitation and pain are reproduced by palpation and exacerbated when the patient is asked to actively pull the tendon against resistance. Pain is also reproduced by passive tendon stretching.

A complaint of painful paresthesias and/or dysesthesias is associated with either a peripheral nerve injury or compression; paresthesia elicited by digital nerve percussion (Tinel's sign) is present just at the level of nerve compression. In the case of mixed nerves, early signs of muscular dysfunction must be sought.

Disorders of the vascular tree, such as arterial thrombosis or aneurysms, must not be overlooked, as they may be responsible for a deep, dull wrist ache radiating to the palm and fingers that is difficult to diagnose except by a clinical and/or ultrasonographic vascular assessment of the hand. Information obtained from the clinical history and from joint palpation according to the suggested topographic approach, allows the clinician to focus on the most common causes of wrist pain for the symptomatic area (Table 24.3). ← T3

TABLE 24.3. Common Causes of Wrist Pain According to Topographic Areas.

	Ventral areas			*Dorsal areas*		
	Radial	***Central***	***Ulnar***	***Radial***	***Central***	***Ulnar***
Traumatic Disorders	**Fractures:** Scaphoid* Radial styloid* Trapezium Base 1st MC* Trapezoid **Nonunion:** Scaphoid **Post-trauma Arthrosis:** SNAC;* SLAC*	**Fractures:** Lunate hamate	**Fractures:** Pisiform Hook of the hamate **Arthrosis Post-traumatic:** Piso-triquetral* **Lig. Injuries:** TFCC injuries (*type 1B and C*)* DRUJ.Inst.*	**Fractures:** Radial Styloid* Scaphoid* Trapezium* Trapezoid* Base 1st MC* **Inst./Lig. Injury:** 1 CMC **Nonunion:** Scaphoid **Post-tr. Athro.:** SNAC;* SLAC* R-S impingement*	**Fractures:** Lunate Capitate Radius (dye punch) **Inst./Leg Injury** Scapholunate Inst.* 2nd –3rd C-MC inst. (Carpal-boss) Midcarpal inst.	**Fractures:** Treiquetrum Base 4th–5th MC **Nonunion:** Ulnar styloid **Post-Tr. Arthrosis:** Triq-hamate* Ulno-carp. imping.* **Inst./Lig. Inj.:** TFCC injuries (*type 1B–D* and 2)* DRUJ. Inst.* Lunotriq. inst.* Midcarpal inst. 4th–5th CMC inst.
Degenerative Inflammatory Disorders	**Tendonitis:** FCR **Prim. Arthrosis:** Basal thumb* Triscaphe*	**Tendonitis:** Trigger Finger	**Tendonitis:** FCU **Prim. arthrosis:** Piso-triquetral	**Tendonitis:** de Quervain Intersection s.	**Tendonitis:** EPL EIP	**Tendonitis:** ECU (Subluxation) **Prim. Arthrosis:** Triq-hamate*
Infective Disorders	**No specific location**					
Neoplastic Disorders	**Cysts:** Articular;* Tendinous	**Cysts:** Articular;* Osseous		**Cysts:** Articular;* Osseous	**Cysts:** Articular;* Osseous	
Congenital and Developmental Disorders	**Skeletal anomalies** Scaphotrapezial synostosis	**Skeletal anomalies** Scapholunate synostosis	**Skeletal anomalies** Luno-triquetral synostosis	**Skeletal anomalies** Scaphotrapezial synostosis	**Extensor manus brevis** **Madelung's disease**	**Madelung's disease**
Neurological Disorders	**Traumatic:** Cut. palm. br. Median nerve	**Compressive:** CTS	**Compressive:** **Guyon's syndrome**	**Traumatic:** Sens. br. rad. n. **Compressive:** Wartemberg's syndrome	**Traumatic:** Post. inteross. n.	**Traumatic:** Dorsal br. Ulnar nerve
Vascular Disorders	**Preiser's disease**	**Avascular necrosis of the capitate**	**Ulnar artery aneurysm-thrombosis**	**Preiser's disease**	**M. di Kienboeck's disease**	**Avascular necrosis of pisoform**

SNAC = scaphoid nonunion advanced collapse; SLAC = scapholunate advanced collapse

CMC = carpometacarpal joint; ECV = extensor carpi ulnaris; CTS = carpal tunnel syndrome

*Indicates disorders for which diagnostic or therapeutic arthroscopy is indicated.

Provocative Maneuvers

Differential diagnosis and/or confirmation of the suspected diagnosis is achieved by means of special provocative maneuvers and diagnostic tests. Not only ligaments and osteoarticular structures should be tested but also the numerous tendons, vessels, and nerves crossing the wrist. Table 24.4 summarizes the tests and maneuvers most commonly used in clinical practice categorized by the 6 topographic areas in which the patient's major complaint is localized.

T4 ➟

Taken by itself, information from each of these tests may not yield an exact diagnosis. To reach a presumptive diagnosis, results from each test should be compared with those from other tests, with the patient's clinical history, and with the pathomechanics of known wrist trauma.

Anesthetic Examination

As a part of the clinical evaluation of wrist pain, an injection of a small amount of local anesthetic (0.5 to 0.8 mL of lidocaine) is essential to determine whether there is a multiplicity of causes to confirm the clinical diagnosis. In addition, an anesthetic injection may be of help in demonstrating to the patient the degree of pain relief that might be obtained with surgery.

IMAGING INVESTIGATIONS

In those complicated cases in which history and clinical examination are insufficient to formulate an exact diagnosis, the clinician should plan further evaluations. The introduction of many new imaging modalities has expanded the use of diagnostic imaging to be frequently abused or overused without a clear understanding of the indications for specific pathologic conditions. As a general rule, imaging techniques should be used to confirm or exclude a clinically presumptive diagnosis or to improve definition of a treatment plan.

Unless otherwise indicated by clinical findings, the initial radiographic examination should consist of 3 views:[14,15] standard posteroanterior (PA), oblique (PA oblique or AP oblique), and lateral views. The conventional radiographs are examined for bony abnormalities (fractures, cortical interruption, degree and pattern of mineralization) and the width and symmetry of joint spaces. The ligamentous architecture is assessed by determining whether the 3 carpal arcs of the wrist and parallelism of the joints are maintained.[14] Any arc interruption usually indicates disruption of joint integrity at that site. The lateral view is extremely important for evaluation of radiolunocapitate alignment and assessment of radioscaphoid, scapho-

TABLE 24.4. Common Diagnostic Tests and Provocative Maneuvers According to Topographic Areas*.

Area	*Radial*	*Central*	*Ulnar*
Dorsal	1 CMC Grind Test 2–3 CMC Shear Test Palpation of Anatomic snuffbox/Articular-Nonarticular Junction of Scaphoid (ANAJ) Intersection Syndrome Tinel's sign over the sensory branch of Radial Nerve (Wartenberg's Neuralgia)	Finger Extension Test (FET) Scaphoid shift (Watson's) Maneuver SL Shear Test "Catch-up clunk" (Lichtman's) Test EPL Test EIP Test Radio-Carpal Subluxation Test Palpation of Extensor Digitorum Brevis Manus	LT Shear Test Derby's Method for LT dissociation Ballottement Test Triquetral Impingement Ligament Tear (TILT) Test Ulnar Snuff Box Compression test Piano Key Test Press Test Ulno-Carpal impaction test Ulnar styloid impaction test EDM test EUC Palpation Test EUC Subluxation Provoc Test Tinel's sign over the Dorsal Branch of Ulnar Nerve
Volar	1 CMC Grind Test Palpation of STT joint Finkelstein's Test FRC Palpation Test Tinel's sign over the Palmar Cutaneous Branch of Median Nerve	FDC Palpation Test Phalen's Test Tinel's sign over the Median Nerve	Palpation of the Hook of the Hamate Piso-Triquetral Grind Test FUC Palpation Test Tinel's sign over the Ulnar Nerve

*See Suggested Readings for literature about various tests.

lunate, and scaphocapitate angles. Additional views of the wrist should be dictated by the findings of the clinical examination, such as the carpal tunnel view to evaluate the bony tubercles of the carpal tunnel, "clenched-fist" radiographs for enhancing detection of scapholunate dissociations, and spot films or tangential films of the painful region for patients with pain isolated at one site.

When clinical examination suggests superficial involvement, and extra-articular pathology is suspected, an ultrasound examination should be the next step. Musculoskeletal ultrasound is a quick and easy method of excluding soft tissue abnormalities, particularly tendon damage, ganglia, and synovial cysts. Although it allows for dynamic studies and bilateral comparisons with low patient discomfort, the quality and interpretation of ultrasound findings are operator-dependent, and therefore its use is limited.

If the history and physical examination (clicking or snapping) suggest that the patient's problems arise from interosseous ligamentous or TFCC injuries, cineradiography or an arthrogram under fluoroscopic control may be done. In cineradiography the wrist is moved through full range of motion, with specific attempts to re-create stresses and positions known by the patient in order to reproduce that altered movement between the carpal bones responsible for the painful click.[16]

Subsequent examination is arthrography, which serves to establish the integrity of the capsular structures and intrasynovial interosseous ligaments, especially the scapholunate and lunotriquetral ligaments and the triangular fibrocartilage.[17] It may also show abnormal infolding of the synovium or the corrugated appearance consistent with localized synovitis. Arthrograms are diagnostic when they show an abnormal leak of opaque material between the radiocarpal and midcarpal or distal radioulnar spaces. To confirm the diagnosis, the flow of dye across these articulations is viewed directly by fluoroscopy. This finding must be

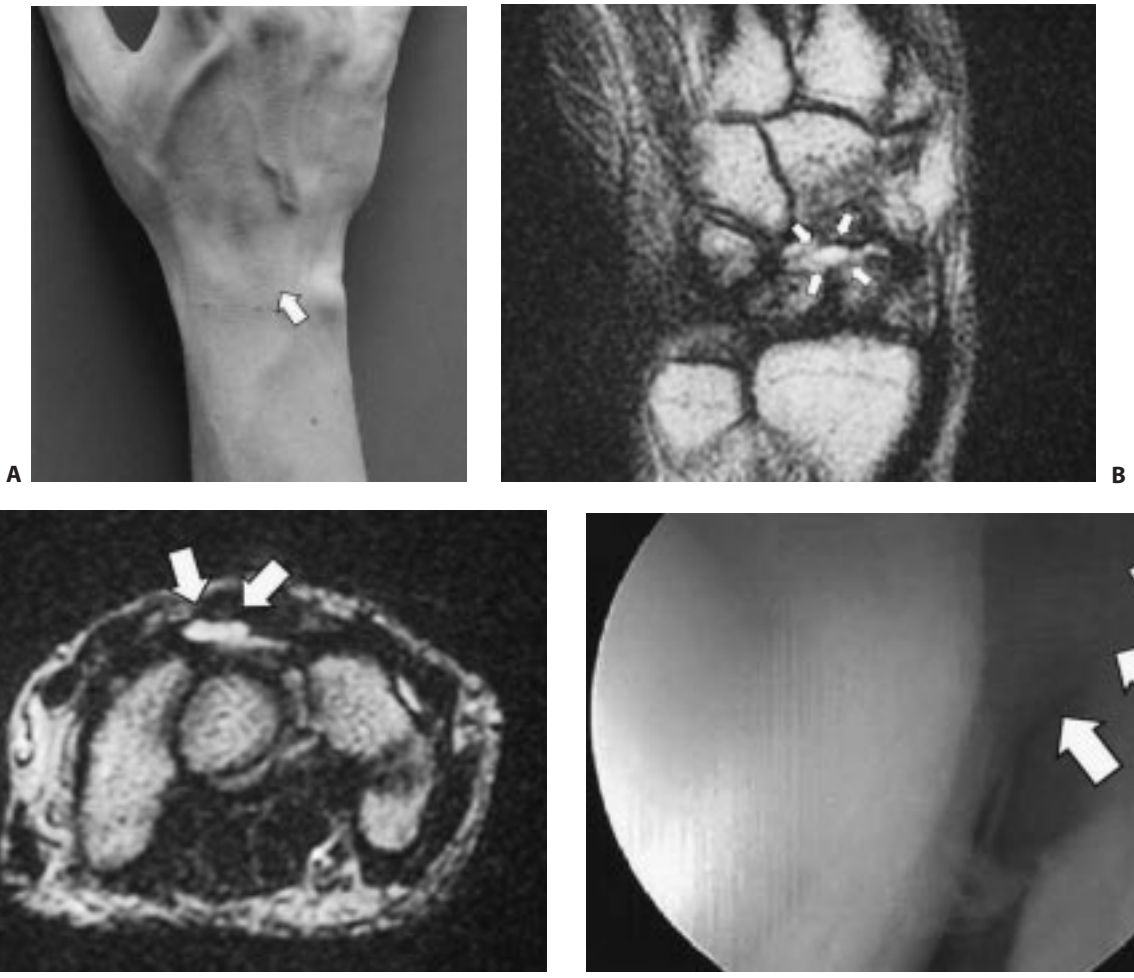

FIGURE 24.2. A 30-year-old male with right hand dominance, complained of pain in the dorsal central area of the wrist without previous trauma. No swelling of the dorsal wrist was evident at clinical evaluation **(A)** Pain was exacerbated by palpation of the dorsal aspect of SL ligament. Positive a FET confirmed pathology of the SL ligament. X-ray films were negative, but MR images **(B, C)** showed an occult ganglion at the level of the SL ligament. Arthroscopy of the radio carpal joint allowed visualization of the ganglion stalk, arising from the distal part of the dorsal aspect of the SL ligament **(D)**.

evaluated carefully, however, in relation to the patient's age, complaints, and clinical findings. As reported by several authors, communication between the different compartments of the wrist is not necessarily the result of trauma or disease.[15,18]

The computed axial tomography (CAT) scan has been used in the diagnosis of carpal pathology, but its only advantage is a better definition of the static alterations of the relationships between the carpal bones and the distal extremities of the radius and the ulna.

The MRI has recently been introduced for studying wrist anatomy and various other pathological conditions, such as avascular necrosis, tumors of the soft tissues, and carpal tunnel syndrome. Good-quality MRI can occasionally visualize the ligamentous and cartilaginous structures of the wrist, particularly the triangular fibrocartilage complex, and can reveal the presence or absence of occult ganglia and tendinitis.[19,20] Even though the application possibilities for studying injuries to the intercarpal ligaments are still being studied, this exam has shown a fair degree of accuracy in identifying TFCC injuries and intercarpal ligaments disorders when its results are compared to arthroscopy.[21–23]

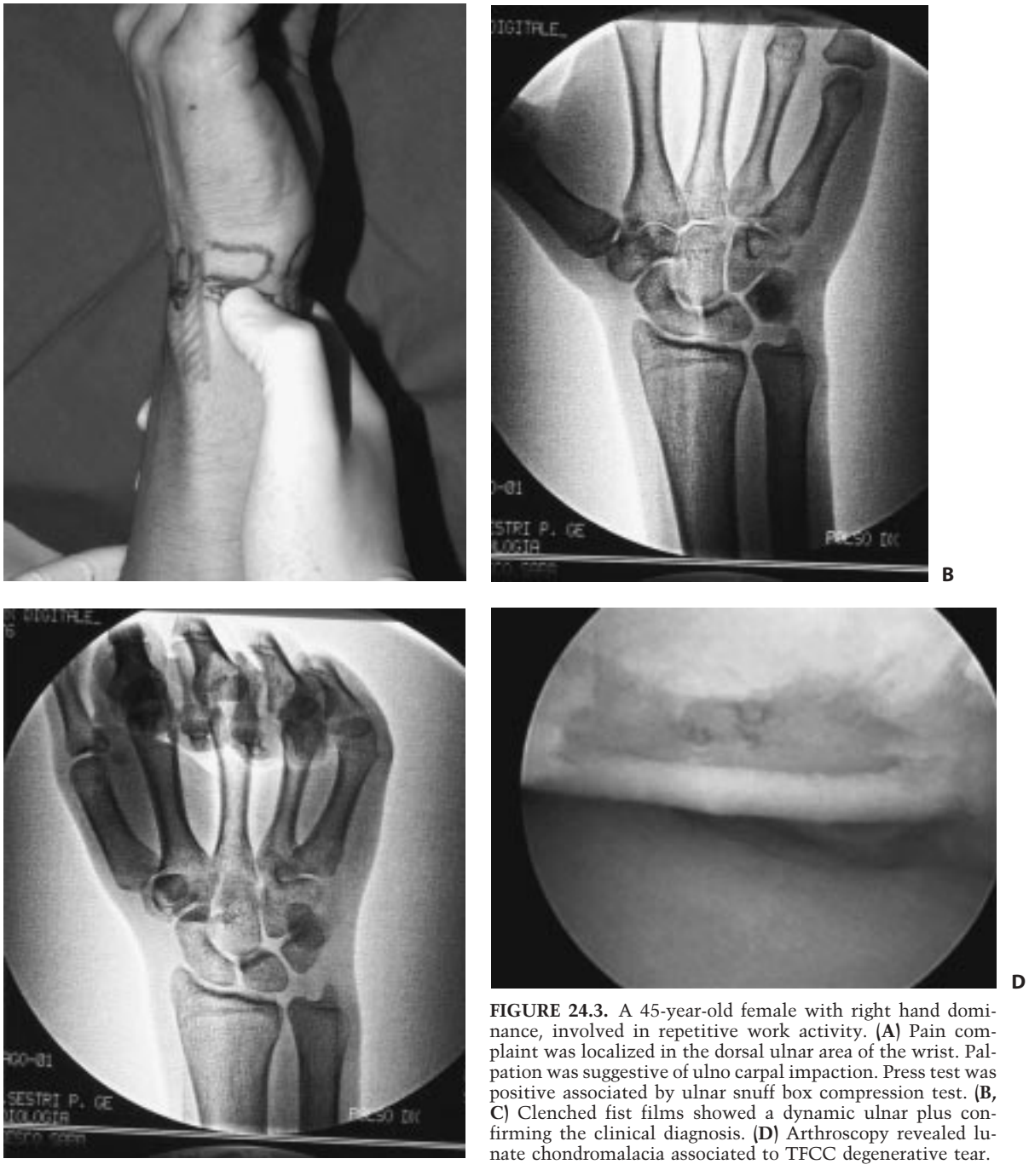

FIGURE 24.3. A 45-year-old female with right hand dominance, involved in repetitive work activity. **(A)** Pain complaint was localized in the dorsal ulnar area of the wrist. Palpation was suggestive of ulno carpal impaction. Press test was positive associated by ulnar snuff box compression test. **(B, C)** Clenched fist films showed a dynamic ulnar plus confirming the clinical diagnosis. **(D)** Arthroscopy revealed lunate chondromalacia associated to TFCC degenerative tear.

DIAGNOSTIC ARTHROSCOPY

When pathologies of extra-articular origin can be clinically excluded but physical examination does not point to a certain diagnosis of the disorder affecting the intra-articular structures, and even imaging techniques do not shed enough light on the causes of the patient's problem, arthroscopy must be performed to reach a diagnosis. Arthroscopy has increased the surgeon's knowledge about the origin of wrist pain, allowing not only a direct view of the anatomic elements involved in the pathological process but also enabling the surgeon to appreciate the consistency of intra-articular structures by palpation using a second instrument (probe). In particular, regarding pathologies of the intra-articular soft tissues, arthroscopic examination gives precise information about the location and dimensions of ligamentous injuries (Figures 24.2 and 24.3), chondral wear (Figure 24.4) and synovitis. Partial ligamentous injuries, that at present cannot be shown even with the most sophisticated imaging equipment (Figure 24.5) are readily identifiable by arthroscopy.

F2 F3 F4 F5

Arthroscopy of the wrist is one of the more useful tools available to the physician for assessment and treatment of the intra-articular disorders of the radiocarpal, mediocarpal, and distal radioulnar joints. Arthroscopy provides an in-depth diagnostic complement to imaging examination, causes minimal invasion and allows for quick rehabilitation, usually with few complications[24,25] and with the possibility for immediate treatment.

Arthroscopy plays an important role in the diagnostic and therapeutic algorithms for the treatment of intra-articular wrist disorders (joint fractures, acute and chronic instability, osteochondrosis and intra-articular mobile bodies, and painful posttraumatic stiffness). Accurate clinical examination must precede arthroscopic evaluation. Classification of chronic wrist pain as pain of intra-articular or extra-articular origin appears to be crucial in determining when arthroscopic evaluation is indicated.

Development of the topographic approach was prompted by the need to provide the surgeon with a guide for identifying the multitude of local and

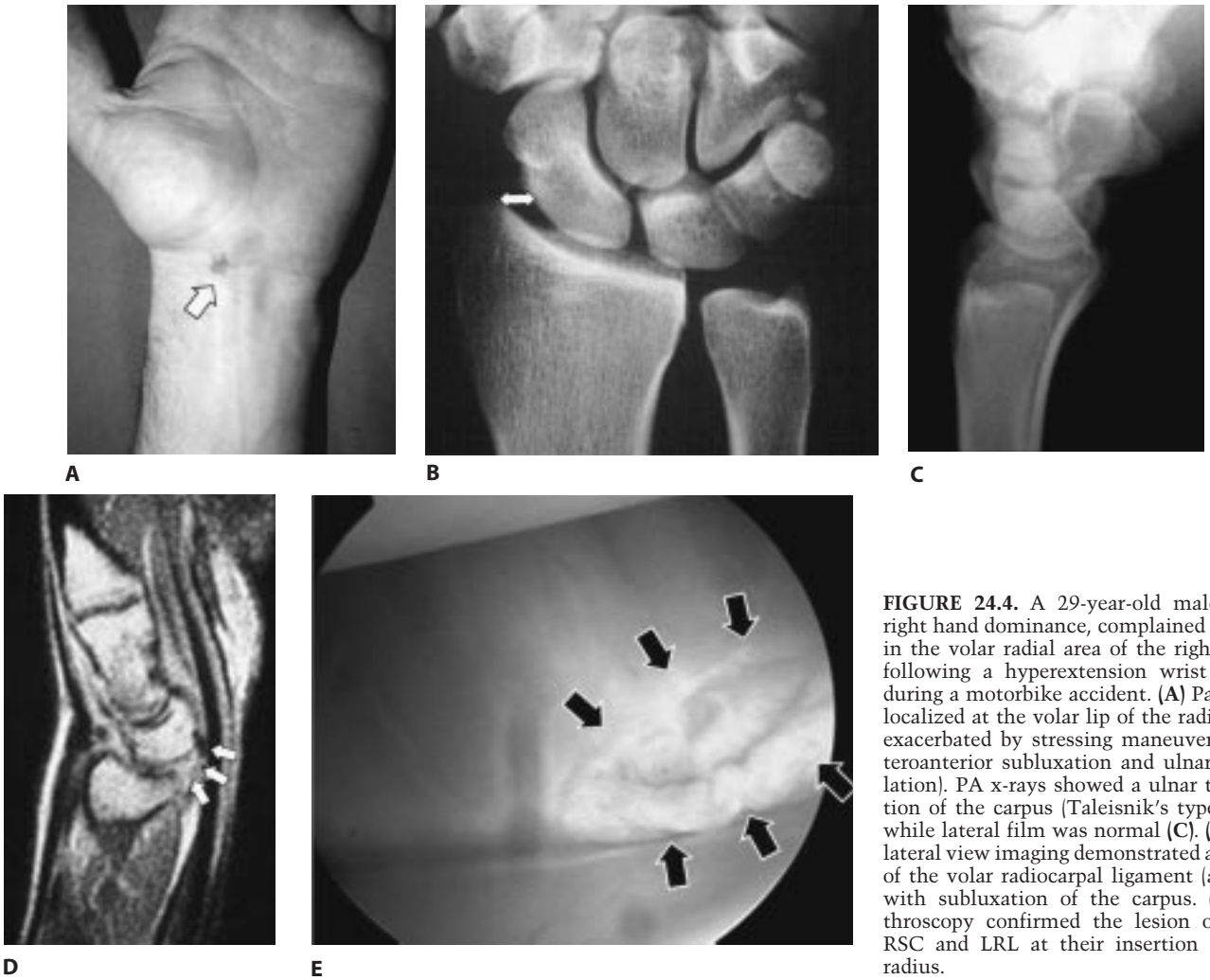

FIGURE 24.4. A 29-year-old male with right hand dominance, complained of pain in the volar radial area of the right wrist following a hyperextension wrist injury during a motorbike accident. **(A)** Pain was localized at the volar lip of the radius and exacerbated by stressing maneuvers (posteroanterior subluxation and ulnar translation). PA x-rays showed a ulnar translation of the carpus (Taleisnik's type 1) **(B)** while lateral film was normal **(C)**. **(D)** MR lateral view imaging demonstrated a lesion of the volar radiocarpal ligament (arrows) with subluxation of the carpus. **(E)** Arthroscopy confirmed the lesion of both RSC and LRL at their insertion on the radius.

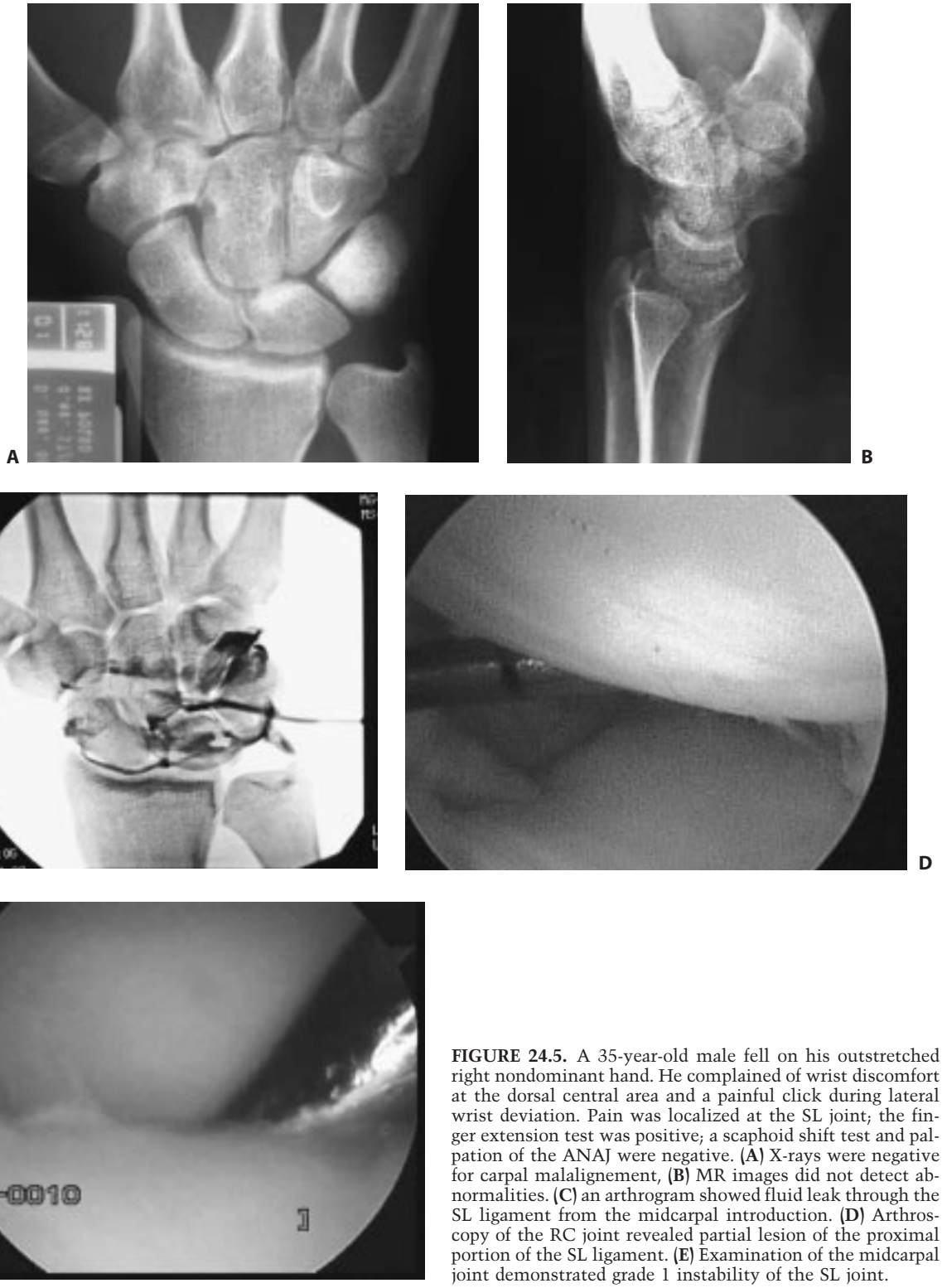

FIGURE 24.5. A 35-year-old male fell on his outstretched right nondominant hand. He complained of wrist discomfort at the dorsal central area and a painful click during lateral wrist deviation. Pain was localized at the SL joint; the finger extension test was positive; a scaphoid shift test and palpation of the ANAJ were negative. **(A)** X-rays were negative for carpal malalignement, **(B)** MR images did not detect abnormalities. **(C)** an arthrogram showed fluid leak through the SL ligament from the midcarpal introduction. **(D)** Arthroscopy of the RC joint revealed partial lesion of the proximal portion of the SL ligament. **(E)** Examination of the midcarpal joint demonstrated grade 1 instability of the SL joint.

general disorders affecting the wrist. Although it may not be exhaustive or complete, it provides a correlation between the more common disorders and the different structures forming the joint that are possible sources of intra-articular or extra-articular wrist pain. A topographic method of classification of the more commonly used clinical tests is also suggested.

Indications for both diagnostic and therapeutic arthroscopy for wrist disorders are still expanding. The asterisks in Table 24.3 mark the current best indications for arthroscopy.

References

1. Adolfsson L. Arthroscopy for the diagnosis of post-traumatic wrist pain. *J Hand Surg* 1992;17B:46–50.
2. Berger RA. Arthroscopic anatomy of the wrist and distal radioulnar joint. *Hand Clin* 1999;15:393–413.
3. Cooney WP. Evaluation of chronic wrist pain by arthrography, arthroscopy, and arthrotomy. *J Hand Surg* 1993;18A:815–822.
4. Kelly EP, Stanley JK. Arthroscopy of the wrist. *J Hand Surg* 1990;15B:236–242.
5. Mikic ZD. Age changes in the triangular fibrocartilage of the wrist joint. J Anat 1978;126:367–384.
6. Viegas SF, Patterson RM, Hokanson JA, et al. Wrist anatomy: Incidence, distribution, and correlation of anatomic variations, tears, and arthrosis. *J Hand Surg Am* 1993;18:463–475.
7. Brown DE, Lichtman DN. The evaluation of chronic wrist pain. *Orthop Clin North Am* 1984;15:184.
8. Nagle DJ. Evaluation of chronic wrist pain. J Am Acad Orthop Surg 2000;8:45–55.
9. van Vugt RM, Bijlsma JWJ, van Vugt AC. Chronic wrist pain: diagnosis and management. Development and use of a new algorithm. Ann Rheum Dis 1999;58:665–674.
10. Nelson DL. The importance of physical examination. *Hand Clin* 1997;13/1:13–15.
11. Czitrom AA, Lister GD. Measurement of grip strength in the diagnosis of wrist pain. *J Hand Surg Am* 1988;13:16–19.
12. Hildreth DH, Breidenbach WC, Lister GD, et al. Detection of submaximal effort by use of the rapid exchange grip. *J Hand Surg Am* 1989;14:742–745.
13. Nelson DL. Additional thoughts on physical examination of the wrist. Hand Clin 1997;13/1:35–37.
14. Taleisnik J. Classification of carpal instability. In: Taleisnik J, ed. *The wrist*. New York: Churchill Livingstone, 1985, pp. 229–238.
15. Taleisnik J. Pain on the ulnar side of the wrist. *Hand Clin* 1987;3:51–68.
16. Hankin FM, White SJ, Braunstein EM. Dynamic radiographic evaluation of obscure wrist pain in the teenage patient. *J Hand Surg* 1986;11A:805–809.
17. Zinberg EM, Palmer AK. The triple-injection with arthrogram. *J Hand Surg* 1988;13a:803–809.
18. Herbert TJ, Faithfull RG, McCann DJ, Ireland J. Bilateral arthrography of the wrist. J Hand Surgery 1990;15B:233–235.
19. Zlatkin MB, Chao PC. Chronic wrist pain: evaluation with high-resolution MR imaging. *Radiology* 1989;173:723–729.
20. Schreibman KL, Freeland A, Gilula LA, et al. Imaging of the hand and wrist. *Orthop Clin North Am* 1997;28:537–582.
21. Johnstone DJ, Thorogood S, Smith WH, Scott TD. A comparison of magnetic resonance imaging and arthroscopy in the investigation of chronic wrist pain. *J Hand Surgery* 1997;22B:714–718.
22. Morley J, Bidwell J, Bransby-Zachary M. A comparison of the findings of wrist: arthroscopy and magnetic resonance imaging in the investigation of wrist pain. *J Hand Surgery* 2001;26B: 6:544–546.
23. Schae Del-Hoepfner M, Iwinska-Zelder J, Braus T, et al. MRI versus arthroscopy in the diagnosis of scapholunate ligament injury. *J Hand Surgery* 2001;26B:17–21.
24. Whipple TL, Marotta JJ, Powell JH. Techniques of wrist arthroscopy. *Arthroscopy* 1986;2:244–252.
25. Roth JH, Haddad RG. Radiological arthroscopy and arthrography in the diagnosis of ulnar wrist pain. *Arthroscopy* 1986;2: 234–243.
. Wood MB, Linscheid RL. Abductor pollicis longus bursitis, *Clin Orthop* 1973;93:293–296.

Q1

Suggested Readings

1CMC Grind Test

Swanson AB, Swanson GD (1983): Osteoarthritis in the hand. *J Hand Surg* [Am] 8:669–675.

Topper SM, Wood MB, Ruby LK (1997): Ulnar styloid impaction syndrome. *J Hand Surg* [Am]; 22: 699–704.

2–3 CMC Shear Test

Joseph RB, Linscheid RL, Dobyns JH, et al (1981): Chronic sprains of the carpometacarpal joints, *J Hand Surg* [Am] 6:172–180.

Ballottement Test

Reagan DS, Linscheid RL, Dobyns JH (1984): Lunotriquetral sprains. *J Hand Surg* [Am];9:502–514.

"Catch-up Clunk" (Lichtman's Test)

Lichtman DO, Schneider JR, Swafford AR, et al (1981): Ulnar midcarpal instability of the wrist: Clinical and laboratory analysis. *J Hand Surg* [Am] 6:515–523

Derby's Method for LT Dissociation

Burkhart SS, Wood MB, Linscheid RL (1982): Post-traumatic recurrent subluxation of the extensor carpi ulnaris tendon. *J Hand Surg* [Am] 7:1–3.

EDM Test

Drury BJ (1960): Traumatic tendovaginitis of the fifth dorsal compartment of the wrist. *Arch Surg* 80: 554.

EIP Test

Spinner M, Olshansky K (1973): The extensor indicis proprius syndrome. *Plast Reconstr Surg* 51:134–138

EPL Test

Lanzetta M, Howard M, Conolly WB (1995): Post-traumatic triggering of extensor pollicis longus at the dorsal radial tubercle. *J Hand Surg* [Br] 20:398–401

EUP Subluxation Provoc Test

Burkhart SS, Wood MB, Linscheid RL (1982): Post-traumatic recurrent subluxation of the extensor carpi ulnaris tendon. *J Hand Surg* [Am] 7:1–3.

Finger Extension Test

Weinzweig J, Watson HK, Patel J, Fletcher J (2001): The finger extension test: a reliable indicator of carpal pathology. Presentation to the 16th International Wrist Investigators' Workshop, Seattle, October 4, 2000.

Finkelstein's Test

Finkelstein H (1930): Stenosing tendovaginitis at the radial styloid process, *J Bone Joint Surg* [Am], 12:509–540.

FRC Palpation Test

Friedman SL, Palmer AK (1991):The ulnar impaction syndrome, *Hand Clin* 7:295–310.

Intersection Syndrome

Wood MB, Linscheid RL (1973): Abductor pollicis longus bursitis, *Clin Orthop* 93:293–296

1 line long

LT Shear Test

Kleinman WB (1985): Diagnostic exams for ligamentous injuries. American Society for Surgery of the Hand, Correspondence Club Newsletter: 51

Palpation of Anatomic Snuffbox/ Articular-Nonarticular Junction of Scaphoid (ANAJ)

Watson HK, Weinzweig J (1997): Physical examination of the wrist. *Hand Clin* 13/1:17–34

Palpation of Extensor Digitorum Brevis Manus

Shaw JA, Manders EK (1988): Extensor digitorum brevis manus muscle. A clinical reminder, *Orthop Res* 17:867–869.

Phalen's Test

Phalen GS (1951): Spontaneous compression of the median nerve at the wrist. *JAMA* 145:1128–1133

Piano Key test

Cooney WP, Bishop AT, Linscheid RL (1998): Physical examination of the wrist. In Cooney WP, Linscheid RL, Dobyns J (Eds.) *The Wrist: Diagnosis and Operative Treatment*. pp. 236–261. Mosby, Saint Louis, Missouri, USA

Press Test

Lester B, Halbrecht J, Levy IM, Gaudinez R (1995): "Press test" for office diagnosis of triangular fibrocartilage complex tears of the wrist. *Ann Plast Surg* 35:41–45.

Radio-Carpal Subluxation Test

Tubiana R, Thomine JM, Mackin E (1995): *Examination of the Hand and Wrist*. Philadelphia, Mosby, pp 185–197

Scaphoid Shift (Watson's) Maneuver

Watson HK, Weinzweig J (1997): Physical examination of the wrist. *Hand Clin* 13/1:17–34

SL Shear Test

Dobyns J, Linscheid RL, Beabout J et al.. (1975): Traumatic instability of the wrist. AAOS Instructional Course Lectures. 24 : 182.

Tinel's Sign over the Sensory Branch of Radial Nerve (Wartenberg's Neuralgia)

Lanzetta M, Foucher G (1995): Association of Wartenberg's syndrome and De Quervain's disease: a series of 26 cases. *Plast Reconstr Surg* 96(2):408–412

Triquetral Impingement Ligament Tear (TILT) Test

Weinzweig J, Watson HK (1996): Triquetral impaction ligament tear [TILT] syndrome. *J Hand Surg* 21B:36.

Ulno-Carpal Impaction Test

Friedman SL, Palmer AK (1991):The ulnar impaction syndrome. *Hand Clin* 7:295–310.

Ulnar Snuff Box Compression Test

Cooney WP, Bishop AT, Linscheid RL (1998): Physical examination of the wrist. In Cooney WP, Linscheid RL, Dobyns J (Eds.) *The Wrist: Diagnosis and Operative Treatment*. pp. 236–261. Mosby, Saint Louis, Missouri, USA.

Tubiana R, Thomine JM, Mackin E (1995): *Examination of the Hand and Wrist*. Philadelphia, Mosby, pp 185–197

Ulnar Styloid Impaction Test

Topper SM, Wood MB, Ruby LK (1997): Ulnar styloid impaction syndrome. *J Hand Surg* [Am]; 22:699–704.

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Number for Reference?