The multiple functions that the hand performs in daily life are usually taken for granted until they become affected by disease or injury. Depending on the nature of the disorder, patients have different capacities to adapt. Patients presenting with pain and dysfunction of the hand or wrist or both represent a wide spectrum, diverse in age, occupations, and avocations. These patients have a broad range of medical conditions that may or may not be related to their current problem. Each patient has a different story to tell about his or her hand and wrist and why he or she is seeking treatment. It is up to the clinician to sort out these various factors, some of which may seem confounding, and determine the most appropriate diagnosis and course of treatment.

This chapter presents guidelines that are useful in the evaluation of patients presenting with hand and wrist pain. Complete coverage of all of the various conditions that can affect the hand and wrist is beyond the scope of this chapter. Instead, the conditions discussed include the most common pathologies seen by general practitioners and hand surgeons. The conditions are grouped by their anatomic area to include pain localized to the volar, dorsal, radial, or ulnar wrist; the base of the thumb; and the palm and digits.

**Patient Evaluation**

**Anatomy**

The complex anatomy of the hand and wrist involves many structures interacting in close proximity to one another. Several different diagnoses can manifest with similar symptom patterns despite varying pathologies. A precise knowledge of the anatomy of the hand and wrist often eliminates several diagnostic considerations on the basis of the physical examination alone. The history of the illness and the examination also help to narrow further investigation by enabling the physician to choose appropriate additional diagnostic tests better. Several common sites of pain in the hand and wrist and their corresponding leading diagnoses are illustrated in Figure 50-1. Pain in one location can have multiple etiologies depending on the patient profile and the history of the problem. A thorough review of the pertinent regional anatomy is important to help differentiate successfully the many possible causes of hand and wrist pain.

**History**

Important patient factors include age, sex, hand dominance, occupation, and hobbies or sports. When determining the history of the problem, a history of recent or distant trauma should be sought and an estimation of the severity of the trauma should be noted. Next, questions about the duration and frequency of the pain and the intensity and quality should be addressed. The pain of degenerative arthritis is often described as a localized “toothache”-type pain, which is always present at a low level and increases with activity, whereas the pain of tendinitis may be sharp, poorly localized, and present only with activity. Rheumatoid arthritis (RA) manifests initially with hand and wrist involvement in 25% of patients and is characterized by joint effusion, with bilateral hand and wrist involvement and morning stiffness. Nighttime symptoms of a burning-type pain in the hand and wrist that are exacerbated by arm position are often associated with nerve entrapment syndromes. Specific activities that either cause pain or alleviate it should also be noted. Arthritis at the base of the thumb, or first carpometacarpal joint, is often aggravated by opening jars, turning doorknobs, and doing needlework or other hobbies.

**Physical Examination**

A thorough examination of the involved extremity and comparison with the uninvolved extremity are essential. Attention should be paid to abnormalities of the more proximal joints of the elbow and shoulder and the cervical
spine. As the differential diagnosis narrows, the examination should be tailored as needed to include or eliminate any possible systemic etiologies. As with other musculoskeletal examinations, a complete record of the range of motion of the involved joints and comparison measurements of the opposite side should be made. Any difference between active and passive motion should be noted. Careful palpation for the site of maximal tenderness is important in differentiating the source of pain and is particularly important when trying to exclude possible factors of secondary gain. Measurements of grip and pinch strength are also helpful in many situations as a diagnostic aid and a baseline measurement to follow for improvement. Many provocative maneuvers are useful in differentiating etiologies; these are discussed with the specific pathology with which they are associated.

**Imaging Studies**

Technologic advances have increased the availability of imaging studies for the hand and wrist. Improvements in magnetic resonance imaging (MRI) resolution using small joint coils allow more precise imaging of small structures in the hand and wrist. Advancements in ultrasound technology have allowed this tool to be increasingly used in the diagnosis of musculoskeletal complaints. With the multitude of ancillary studies available, it is important to be selective in using these to establish or refute diagnostic possibilities. In this era of cost containment, imaging studies should be used most often to confirm a diagnosis rather than to find one. An understanding of the advantages and limitations of each study is necessary to enable using them to their fullest potential.

Plain radiographs are the easiest and most readily available study that can be obtained in most offices. A routine hand or wrist series including anteroposterior, lateral, and oblique views is a useful screening tool but often lacks the specificity required. Depending on the suspected diagnosis, there are many available special views. These are discussed with the specific diagnoses to which they pertain later in this chapter.

If further detail of the bony anatomy is required, computed tomography (CT) is the best available tool today. The most common uses for CT in the hand and wrist include evaluation of intra-articular fractures of the distal radius and metacarpals, scaphoid fractures and nonunions, and intrasosseous cysts or tumors.

Advances in ultrasound and MRI technology have enhanced the ability to evaluate the soft tissue structures of the hand and wrist. Smaller ultrasound probes with higher resolution have made it possible to visualize and differentiate structures such as flexor tendons, ganglion cysts, and ligaments. Doppler ultrasound can help to differentiate vascular disorders of the hand. MRI technology is constantly improving and allowing for new uses in the hand and wrist. By altering the parameters of this test, information about anatomy and physiology can be obtained. Specific uses of these tests and others such as arthrography and bone scans are addressed with the diagnoses for which they are most useful.

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**Additional Diagnostic Tests**

**Neurodiagnostic Tests**

Neurodiagnostic tests including nerve conduction studies and electromyography are useful in the diagnosis of suspected neurologic disorders of the upper extremity. Specifying the type and nature of examination required enhances the information gained by these studies. If a nerve compression syndrome such as carpal or cubital tunnel syndrome is suspected, nerve conduction studies may be sufficient without the added cost and patient discomfort of formal electromyography testing. Nerve conduction studies evaluate the speed of conduction of motor and sensory nerves across a set distance at a specific location and compare this with established normal values. A decrease in the speed of nerve conduction, as evidenced by an increase in the latency, is seen with localized nerve compression and is shown in several different nerves concomitantly in demyelinating diseases such as multiple sclerosis. When more severe nerve injuries are suspected or if there is clinical evidence of muscle weakness or atrophy, an electromyogram can be useful to delineate better the extent of the process or rule out a myopathic process.
Injections and Aspirations

The use of injections and aspirations can be therapeutic and diagnostic. A so-called lidocaine challenge can be used to discriminate between different diagnoses when placed precisely in one joint or painful area. Corticosteroids can be given selectively in conjunction with the local anesthetic for more lasting relief and in some cases can be curative.5,11 Some of the most common sites for injection are the A1 pulley region of the finger for trigger finger, the carpal canal for carpal tunnel syndrome, and the first dorsal compartment of the wrist for de Quervain’s disease.

Aspiration of joints or other fluid collections such as ganglia can yield vital diagnostic information and can be therapeutic. If infection is suspected, aspiration should be used to obtain a sample of joint fluid for Gram stain, cell count, and culture. Diagnoses such as gout and pseudogout can be confirmed by crystal analysis under polarized light. Many ganglia and retinacular cysts can be treated temporarily or permanently with simple aspiration.12,13

Arthroscopy

Direct visualization of a joint via arthroscopy can be an invaluable diagnostic tool. Despite the increasing sensitivity of imaging techniques such as MRI, arthroscopy provides a dynamic evaluation that static imaging cannot provide.14 Since the first published report of a series of cases by Roth and colleagues in 1988,15 it has become the “gold standard” for evaluation of chronic wrist pain.16-18 With new surgical techniques being developed, surgeons often can proceed directly to the definitive treatment using arthroscopy entirely or in part.19-24

COMMON ETIOLOGIES FOR HAND AND WRIST PAIN

Wrist Pain: Palmar

Carpal Tunnel Syndrome

Carpal tunnel syndrome (CTS) is the most commonly diagnosed compression neuropathy in the upper extremity. It usually occurs as an isolated phenomenon, but symptoms of CTS can accompany many systemic diseases such as congestive heart failure, multiple myeloma, and tuberculosis.25,28 More commonly, CTS is associated with conditions such as pregnancy, diabetes, obesity, rheumatoid arthritis, and gout.26,36

The classic constellation of symptoms consists of nocturnal paresthesias in the affected digits; paresthesias or hypesthesias in the thumb, index, and long fingers; and weakness or clumsiness of the hand. Patients often complain of forearm and elbow pain that is aggravated by activities but is poorly localized and aching in nature. Occasionally, more proximal symptoms such as shoulder pain are the main presenting complaint.40 Past reports have indicated a 3:1 prevalence of CTS in women. Approximately half of patients are 40 to 60 years old, although CTS has occasionally been diagnosed in children.41,42

The diagnosis of CTS is usually clinical. Tinel’s sign, shown by radiating paresthesias in the median nerve distribution with gentle percussion over the volar wrist, indicates nerve irritation. Reproduction of symptoms with wrist flexion, as described by Phalen,43 and with the carpal compression test, as described by Durkan,44 has been shown to be more specific.45 Decreased sensitivity and thenar atrophy are late signs seen in advanced median nerve entrapment. Bilateral electrodiagnostic tests, specifically nerve conduction velocity testing, should be used to confirm the diagnosis, particularly in patients claiming a compensable injury or in patients with atypical signs or symptoms. Prolonged motor and sensory latencies across the carpal canal confirm pathologic compression of the median nerve.46-48 In patients with classic clinical findings, a study found that CTS could be diagnosed with a high degree of accuracy on clinical grounds alone and that the addition of electrodiagnostic tests did not increase the accuracy.49 When attempting to differentiate CTS from more proximal nerve entrapments such as cervical root compression or thoracic outlet syndrome, the addition of electromyography of the cervical paraspinal muscles and proximal conduction tests (H reflex, f waves) can be useful.50

Conservative treatment for CTS consists of splinting of the wrist in neutral position and consideration of oral nonsteroidal anti-inflammatory drugs (NSAIDs) for pain control. Splinting should be used sparingly during the workday to prevent secondary muscle weakness and fatigue but is best prescribed to prevent provocative wrist positioning at night. The splint should not hold the wrist in extension beyond 10 degrees (Figure 50-2). Although splinting may be beneficial for relief of symptoms in cases of mild compression, its long-term effectiveness is limited.51 The use of vitamin B6 (100 to 200 mg/day) has been helpful in some cases, but its efficacy has not been confirmed in a randomized trial. The popularity of injections of corticosteroid in the treatment of CTS has waxed and waned over the last half century. Although it has been shown to be quite effective in the short term, the long-term efficacy is mixed.52-54 Also, injections have been associated with exacerbation of the condition and permanent median nerve injury if performed incorrectly.55,56 For these reasons, injections are most often indicated in cases when the condition is thought to be temporary such as with pregnancy or if surgery must be deferred because of a medical condition or major life event.

Figure 50-2 Typical night splint used in the treatment of carpal tunnel syndrome.
Ulnar Nerve Entrapment: Guyon’s Canal

In 1861 Guyon published a description of the contents of an anatomic canal at the wrist. The distal branches of the ulnar nerve and the ulnar artery pass through this space. As it exits the canal, the ulnar nerve divides into its sensory and motor branches. Compression of the nerve within or proximal to the canal usually manifests with a combination of sensory and motor symptoms in the ulnar nerve distribution. Patients complain of numbness and paresthesias of the palmar aspect of the ring and small fingers. Motor symptoms are usually described as a cramping weakness with grasping and pinching. As with median neuropathy, atrophy of the intrinsics and objective sensory loss are late findings.

In contrast to carpal tunnel syndrome, in which patients usually have an ill-defined onset of symptoms, ulnar nerve compression in the canal of Guyon is often of more acute onset. It can be associated with repeated blunt trauma, a fracture of the hamate or the metacarpal bases, or occasionally a fracture of the distal radius. Space-occupying lesions such as a ganglion, lipoma, or anomalous muscle can also cause compression. Because of the difference in etiology, this nerve entrapment syndrome is often not amenable to conservative treatment. If there is an anatomic lesion such as a fracture or a mass, this must be addressed. If repetitive blunt trauma is the cause, without associated fracture or arterial thrombosis, splinting and activity modification can alleviate the symptoms.

Ulnar Nerve Entrapment: Cubital Tunnel Syndrome

Entrapment of the ulnar nerve as it passes through the cubital tunnel just posterior to the medial epicondyle of the elbow can manifest with symptoms localized to the ulnar border of the hand. Medial forearm pain and irritability of the ulnar nerve at the elbow may be associated as well. Presenting symptoms usually consist of paresthesias or numbness or both in the small and ring fingers. Percussion of the nerve in the cubital tunnel elicits Tinel’s sign. Prolonged elbow flexion reproduces the symptoms. In contrast to carpal tunnel syndrome, it is not unusual for patients to present with early atrophy of the intrinsics, most easily appreciated in the first dorsal interosseous muscle.

Electrodiagnostic studies can help to confirm the diagnosis and differentiate cubital tunnel syndrome from more distal compression of the ulnar nerve in Guyon’s canal (see later). If malalignment of the elbow is present or the patient relates a history of childhood trauma, radiographs should be obtained to rule out a supracondylar or epicondylar malunion. So-called tardy ulnar nerve palsy can develop years after a supracondylar fracture of the elbow.

Conservative treatment includes strategies to help the patient avoid having the elbow flexed for prolonged periods, particularly at night. Soft, or semirigid, elbow splints prevent elbow flexion beyond 50 to 70 degrees. Medial elbow pads can be used if the patient’s job or hobbies require resting the medial elbow on a hard surface. NSAIDs can be beneficial in acute or traumatic cases. Surgical decompression of the nerve is indicated if a patient fails to obtain relief from splinting and activity modification or if there is clinical or electrodiagnostic evidence of muscle denervation.

Flexor Carpi Radialis and Flexor Carpi Ulnaris Tendinitis

Similar to other tendinopathies around the wrist, irritation of the wrist flexors occurs with stress of the wrist in a particular position. Activities that require forced wrist flexion for prolonged periods or with repetition put patients at risk for inflammation around the flexor carpi radialis tendon or the flexor carpi ulnaris tendon or both. The condition manifests with tenderness along the course of the tendon, especially near its insertion. Wrist flexion against resistance with radial or ulnar deviation reproduces the symptoms. Treatment consists of splinting and rest, elimination of activities that cause pain, and oral NSAIDs. Injection of corticosteroid into the flexor carpi radialis or flexor carpi ulnaris sheath may be curative. Sharp pain, associated with an intense inflammatory localized reaction, is suggestive of calcific tendinitis and is most commonly seen around the flexor carpi ulnaris tendon. If calcific tendinitis is suspected, a plain radiograph can be useful in confirming the diagnosis but the calcification may not become apparent for 7 to 10 days after the onset of symptoms.

Hamate Fracture

An uncommon and underdiagnosed etiology of palmar pain in young, active individuals is a fracture of the hook of the hamate. These fractures can occur from a fall on an extended wrist, a “dubbed” golf shot, or from forcefully striking a ball with a club or bat. Plain radiographs of the wrist are usually...
read as normal. The condition should be established and treated expeditiously because it may lead to ulnar nerve entrapment, ulnar artery thrombosis, or rupture of flexor tendons. Pain in the base of the palm overlying the hamate is the most common presenting symptom. Often, the pain is present only with the activity that caused the fracture such as driving a golf ball or swinging a bat. Because of the proximity of the ulnar nerve, patients also can have sensory and motor symptoms of distal ulnar neuropathy. Occasionally, in the acute setting, vascular complaints such as cold intolerance or frank ischemia from ulnar artery thrombosis can be the presenting condition.

A carpal tunnel view, obtained with the wrist in a hyperextended position, may show the fracture (Figure 50-4A). Alternatively, a selective CT scan through the hamate is a more accurate way to confirm the diagnosis (Figure 50-4B). If diagnosed within 2 to 3 weeks of injury, casting should be attempted to allow the fracture to heal. If this fails or if the fracture is diagnosed late, surgical treatment is indicated, and most authors favor excision of the hook followed by a gradual return to activities.

**Wrist Pain: Dorsal**

**Ganglion**

Ganglia account for 50% to 70% of all soft tissue tumors of the hand and wrist. Of these, 60% to 70% occur around the dorsal wrist. These mucin-filled cysts usually arise from an adjacent joint capsule or tendon sheath. The most common site of origin is the scapholunate ligament, and the main body of the cyst may be located elsewhere on the dorsum of the wrist and attached to this ligament by a long pedicle. Although most ganglia occur as a well-circumscribed and obvious soft mass, some are subtler and are evident only with the wrist in marked volar flexion. As a result of their characteristic appearance, ganglia are not often misdiagnosed but should be differentiated from the less well-demarcated swelling of extensor tenosynovitis, lipomas, and other hand tumors. Plain radiographs are usually normal but occasionally show an intrasosseous cyst or an osteoarthritic joint. Some ganglia may not be clinically apparent and are known as “occult” ganglia. Ultrasound and MRI have been shown to be useful in the diagnosis of these ganglia.

Not all ganglia are painful. Patients may present with complaints of wrist weakness or simply because of the cosmetic appearance of the cyst. In approximately 10% of cases, there is evidence of associated trauma to the wrist. The ganglia may appear suddenly or develop over many months. Intermittent complete resorption followed by reappearance months or years later is common.

Most conservative measures such as splinting and rest have only a temporary effect on ganglia. They tend to diminish in size with rest and enlarge with increased activity. Spontaneous rupture is common, and at one time attempting to rupture the cyst with a heavy object such as a large book was recommended as treatment. Aspiration can be performed but has mixed results because of the thick gelatinous nature of the fluid within the cyst. Even if adequate decompression of the cyst can be achieved, reaccumulation of the fluid usually occurs. Aspiration in conjunction with irrigation or injection of corticosteroids can be effective in alleviating the symptoms for varying periods of time.

Occasionally, a ganglion can become so large that it can interfere with the function of the wrist by limiting the motion, especially in extension. Pressure of the mass on the terminal branches of the posterior interosseous nerve may be painful. Excision is generally curative but may result in short-term stiffness and some loss of terminal flexion secondary to surgical scarring. Occasionally, a patient desires excision of the cyst for cosmetic reasons. With proper excision, recurrence is less than 10%, but if the dissection is incomplete and fails to identify the origin of the cyst, recurrence rates can be 50%. Arthroscopic resection has been shown to be a safe and effective method of treating dorsal wrist ganglia.

**Carpal Boss**

Often confused with a dorsal ganglion, the carpal boss is a bony, nonmobile prominence on the dorsum of the wrist. It is an osteoarthritic spur that forms at the second or third carpometacarpal joints. The boss is most evident with the wrist in volar flexion. Patients usually present with pain and localized tenderness over the prominence. The condition is twice as common in women as in men, and most patients are in their 20s to 30s. It is not unusual for a small ganglion to be associated with the boss. Radiographs are best taken with the hand and wrist in 30 to 40 degrees of supination and 20 to 30 degrees of ulnar deviation to put the bony prominence on profile (the “carpal boss view”).
Conservative treatment consists of rest, immobilization, NSAIDs, and occasionally injection with corticosteroids. If persistently painful despite these measures, surgical excision of the boss may be necessary but is associated with a prolonged recovery and continued symptoms in a high percentage of patients.

**Extensor Tendinopathies**

The extensor pollicis longus (EPL) tendon can be irritated as it passes around Lister’s tubercle. This condition, in contrast to other tendinopathies around the wrist, carries a significant risk of tendon rupture. Early diagnosis and sometimes urgent operative treatment are necessary to prevent this complication. Localized pain, swelling, and tenderness are the hallmarks of this condition, and similar to other tendinopathies, initial treatment consists of decreased activity and splinting. A short course of oral anti-inflammatory medication can be useful in decreasing symptoms. Diagnostic injections with lidocaine can help to differentiate the condition from other causes of wrist pain, but corticosteroid injections are not routinely used in this condition because of a propensity for the EPL to rupture in chronic cases.

Commonly, a patient may present with a rupture of the EPL without antecedent pain or swelling. There is a well-known association of EPL rupture with fractures of the distal radius that likely occurs owing to a relative “watershed zone” of vascular supply within its tight retinacular sheath. Tendon rupture most often occurs with minimally displaced or nondisplaced fractures and can occur several weeks or months after the original injury. Individuals with RA and systemic lupus erythematosus are especially prone to rupture of the EPL and other tendons.

**Kienböck’s Disease**

Kienböck’s disease is so named for Kienböck who first described in 1910 what he postulated were avascular changes in the lunate. Nearly a century later, the cause of this disease remains unclear; it is likely multifactorial. Kienböck’s disease should be suspected when a young adult presents with pain and stiffness of the wrist and swelling and tenderness around the region of the dorsal lunate. There is an increased propensity of the disease among patients with an ulna that is anatomically shorter than the radius (so-called ulnar negative variance). Radiographs are needed to confirm and stage the process. Kienböck’s disease is staged by the degree of fragmentation and collapse of the lunate, associated osteoarthritis, and carpal collapse in a system originally proposed by Stahl. In this system, the earliest sign of the disease is a linear or compression fracture in the lunate. Later stages show sclerosis of the lunate, followed by lunate collapse and a loss of carpal height. In the final stage the carpus shows signs of diffuse osteoarthritis with complete collapse and fragmentation of the lunate (Figure 50-5). With the increased sensitivity of MRI, it is possible to identify avascular changes within the lunate before they become evident on plain radiographs. This is referred to as “stage zero” Kienböck’s disease.

The treatment for Kienböck’s disease is largely surgical. Depending on the stage of the disease and the postulated etiology, several surgical procedures have been described. In early stages of the disease, when there is little lunate collapse and no osteoarthritis, the goal of surgery is to “unload” the lunate by redistributing articular contact forces and allow it to revascularize. The most common procedure is a radial shortening osteotomy, performed to neutralize ulnar variance. In later stages, various intercarpal arthrodeses have been used to readjust and maintain carpal height and alignment. Microsurgical techniques have been used more recently to revascularize the lunate with promising early results.

**Scapholunate Interosseous Ligament Injury**

The interosseous ligament between the scaphoid and the lunate is a stout structure, especially dorsally, and usually Figure 50-5  Advanced Kienböck’s disease, showing carpal collapse, intercarpal and radiocarpal arthrosis, and fragmentation of the lunate. A, Posteroanterior view. B, Lateral view.
The radius and ulna must remain congruent through a 190-degree arc. Limitation of motion and pain with pronation and supination are consistent with a tear of the supporting ligaments and resultant distal radioulnar joint (DRUJ) instability. If a sufficient portion of the stability has been lost, the ulna appears clinically dislocated or subluxated, and there is severe limitation of forearm rotation. Lateral radiographs of the wrist in neutral and full pronation and supination are not generally specific enough to confirm ulnar subluxation. To evaluate better the congruency of the DRUJ through its range of motion and to assess for subtle subluxations, CT can be performed on both wrists simultaneously in positions of neutral, full pronation, and full supination.

Tears of the TFCC may manifest with painful clicking during wrist rotation. Patients generally have localized tenderness on the midaxial border of the wrist and directly beneath the extensor carpi ulnaris tendon. If forced ulnar deviation of the wrist or gripping or both reproduce the patient’s symptoms, a degenerative tear of the central portion of the TFCC is more likely. The degenerative tear is frequently a component of the ulnocarpal impaction syndrome, a condition associated with higher than normal loads on the ulnar carpus secondary to a congenitally positive ulnar variance.

Plain radiographs are most useful in determining ulnar variance and for ruling out fractures or arthritis as a cause of ulnar wrist pain. Because of the variable relationship of the radius and ulna depending on forearm rotation, it is important to take standardized films when measuring ulnar variance. A posteroanterior view of the wrist with the shoulder abducted to 90 degrees and the elbow flexed to 90 degrees shows the DRUJ in neutral forearm rotation and is easily reproducible (Figure 50-7). Because the ulna lengthens relative to the radius during power grip, a radiograph in

**Figure 50-6** Anteroposterior radiograph of the wrist showing scapholunate interosseous space widening (arrow) and scaphoid foreshortening associated with scapholunate interosseous ligament disruption.

requires a significant force to cause disruption. The typical mechanism of injury is a fall onto the outstretched hand with the wrist extended. Early diagnosis is essential to prevent the late sequelae of carpal collapse. The key radiographic features of scapholunate dissociation (scapholunate interval widening) are shown in Figure 50-6. The anteroposterior view shows the scapholunate interval better than the posteroanterior view. Early surgical intervention is recommended with the goals of maintaining carpal alignment and preventing an otherwise inevitable progression to carpal collapse and degenerative arthritis.

**Gout and Inflammatory Arthritis**

All of the inflammatory arthropathies including the crystal arthropathies can manifest as dorsal wrist pain. Approximately 25% of patients with a diagnosis of RA present initially with hand and wrist symptoms. The reader is referred to Chapters 94 to 96 for further details.

**Wrist Pain: Ulnar**

**Triangular Fibrocartilage Complex Injury and Ulnocarpal Impaction Syndrome**

One of the most complex and confusing areas of the wrist from a diagnostic standpoint is the articulation of the ulna with the carpus. The triangular fibrocartilage complex (TFCC), so named by Palmer and Werner, comprises the articular disk itself and the immediately surrounding ulnocarpal ligaments. It can be injured by a variety of acute and chronic mechanisms. Hyperpronation and hypersupination of the carpus during forceful activities are the usual causes of acute injuries, whereas repetitive pronation and supination more often cause attritional changes in the TFCC. Careful physical examination is important to determine the origin of the pain and to try to discover the maneuver or wrist position that most closely reproduces the symptoms.
the same position during maximal grip best shows impaction of the ulna on the carpus.

Ancillary studies for TFCC tears include three-compartmental arthrography and MRI. In arthrography, sequential injections of radiopaque dye are performed into the carpal joint, midcarpal joint, and DRUJ. The test is considered positive when the dye is seen leaking from one compartment to another. The site of the leak determines the location of the torn structure. Several studies have shown, however, that there are age-related attritional tears, which occur in the TFCC and other ligamentous structures of the wrist. Technologic advancements in MRI have improved the ability to visualize and diagnose abnormalities in the TFCC. MRI can be combined with arthrography to visualize better the TFCC and the intrinsic wrist ligaments. Peripheral detachments and central degenerative tears of the TFCC can be visualized. MRI remains highly operator dependent and technique dependent, and the studies should be interpreted in the context of the findings on physical examination.

Patients presenting with pain localized to the ulnar side of the wrist often respond to simple splinting and rest. This conservative treatment and NSAIDs can be used effectively while a workup is in progress. A course of rest and splinting, followed by a gradual return to activities, may completely alleviate ulnar-sided symptoms.

Despite the advancements in imaging techniques, there is often no substitute for direct visualization of the ulnocarpal joint or DRUJ or both. Arthroscopy has become an invaluable diagnostic and surgical tool. Tears of the TFCC can be visualized, and their clinical significance better determined. Arthroscopy, done in conjunction with fluoroscopy, can assess for instability of the DRUJ or intercarpal joints or both. Several surgical procedures can now be performed entirely or in part through the arthroscope.

Extensor Carpi Ulnaris Tendinitis and Subluxation

The extensor carpi ulnaris tendon can become irritated with forced pronation/supination activities such as putting topspin on a tennis ball. In severe cases the tendon can begin to sublux around the ulnar head as its restraining dorsal retinaculum becomes increasingly lax. Patients complain of pain with forceful rotation of the forearm, and sometimes there is an associated snapping of the extensor carpi ulnaris tendon. Early treatment consists of immobilization of the wrist and forearm to prevent rotation. Anti-inflammatory medication can help to decrease the inflammation more quickly. After an adequate period of rest, if the acute inflammation resolves, but the extensor carpi ulnaris tendon continues to be unstable, surgery may be indicated to reconstruct or release the sheath at the wrist.

Lunotriquetral Ligament Injury

Tears in the short, stout intraosseous ligament connecting the lunate and the triquetrum are uncommon and often difficult to diagnose. As with the aforementioned diagnoses, patients present with ulnar-sided wrist pain usually worsened by either pronation or supination. Forceful translation of the triquetrum against the lunate causes pain in affected individuals. If diagnosed within 3 to 4 weeks of injury, a short arm cast allows healing and eliminates symptoms. Chronic tears may lead to advanced carpal instability and collapse. MRI or wrist arthroscopy or both may be necessary to make the diagnosis. Treatment is predicated on the staging of instability and ranges from simple casting for acute instability to ligament reconstruction or intercarpal fusion for more advanced cases.

Pisotriquetral Arthritis

Degenerative changes in the pisotriquetral articulation are usually posttraumatic in nature. Patients may recall a fall onto the extended wrist with direct trauma to the ulnar side of the palm. Affected patients present with pain during passive wrist hyperextension and exacerbation with flexion against resistance. With palpation of the pisotriquetral joint, there is tenderness and often crepitus. As with many joints, splinting, NSAIDs, and occasionally injection with corticosteroid and lidocaine are the mainstays of conservative treatment. If this is inadequate to control the symptoms, surgical resection of the pisiform is indicated.

Wrist Pain: Radial and Base of Thumb

De Quervain’s Disease and Intersection Syndrome

One of the most common sites of tendon irritation around the wrist is in the first dorsal extensor compartment, a phenomenon known as de Quervain’s disease. The tendons involved are the extensor pollicis brevis and the abductor pollicis longus. At the level of the radial styloid, these two tendons pass through an osteoligamentous tunnel composed of a shallow groove in the radius and an overlying ligament. Anatomic studies have shown that a high percentage of patients have a divided first dorsal compartment, and this can account for failure of conservative treatment and injections.

Patients with de Quervain’s disease are typically women in their 30s and 40s, although men and women can develop the condition at any age. This is the most common tendinopathy to develop in postpartum women because of the specific hand and wrist position requirements in the care of an infant. Any activity requiring repeated thumb abduction and extension in combination with wrist radial and ulnar deviation can aggravate this problem. Patients complain of pain along the course of these tendons with grasping activities. Clinically, there is tenderness along the affected compartment and there may be swelling over the radial styloid. In severe cases a cracking sound can be elicited with movement of the involved tendons. Finkelstein’s test of forced ulnar deviation of the wrist with the thumb clasped in the fisted palm is pathognomonic of the condition.

A less common condition that may occur in the same general location in the wrist is intersection syndrome. Although initially attributed to friction between the first and second dorsal compartment tendons, Grundberg and Reagan subsequently showed that the condition represented a tendinopathy of the radial wrist extensors within the second dorsal compartment.

The primary treatment for de Quervain’s disease and intersection syndrome is rest with splinting. For
de Quervain’s disease, the wrist should be held in slight extension and the thumb abducted in a thumb spica splint to the level of the interphalangeal joint. Immobilization of the wrist alone, in approximately 15 degrees of extension, is usually adequate for intersection syndrome. The addition of a 2- to 4-week course of anti-inflammatory medication also can be helpful. Phonophoresis with a cortisone cream and injection of the compartment with cortisone are second-line treatments if immobilization alone fails to give adequate relief. Injection of corticosteroid into the affected first dorsal compartment is curative for de Quervain’s disease in approximately 75% of patients. Surgery may be indicated for patients who do not respond to a course of conservative treatment including injection. For de Quervain’s disease and intersection syndrome, surgery consists of releasing the stenotic retinacular sheath of the involved compartment.

*Basal Joint Arthropathy*

Inflammation and pain related to the carpometacarpal joint of the thumb are common and can occur at any age. In younger patients, instability secondary to ligamentous laxity is associated with joint subluxation and abnormal cartilage wear and may lead to pain with mechanical activities. In women older than 45 years, studies show 25% have radiographic evidence of degeneration of the basal joint. Patients generally present with pain at the base of the thumb, worsened by pinch and highly dexterous activities. They often report difficulty with tasks such as opening jars and bottles, turning doorknobs and keys, and other activities of daily living. The thumb carpometacarpal joint may be swollen and subluxed and is generally tender to palpation. The joint should be assessed for the presence of increased laxity by manual subluxation of the base of the metacarpal out of the trapezial “saddle” with radial and volar force. With advanced degenerative disease, crepitus is sometimes appreciated.

Radiographs should be obtained to determine the stage of the disease. The addition of a basal joint posteroanterior stress film, in which the patient presses the tips of the thumbs together firmly with the nail plates facing up, is helpful in assessing joint subluxation (Figure 50-8). The most commonly used staging system was developed by Eaton and Glickel and is based on the degree of involvement of the trapeziometacarpal joint and whether or not the scapholunate joint is involved. Advancing stages show increased subluxation of the basal joint, with development of joint space narrowing, osteophytes, and subchondral cysts.

Regardless of the stage of the disease, the first line of treatment is immobilization of the thumb metacarpal, leaving the interphalangeal joint free. Splinting has been shown to alleviate the symptoms of carpometacarpal joint inflammation in more than 50% of patients. NSAIDs can be a useful adjunct. Injections of corticosteroid are effective, usually for just a limited time. Although therapy for thenar muscle strengthening has been advocated, especially in early stages, its benefits are minimal and it can occasionally aggravate the problem.

Many patients are able to manage their symptoms with a combination of splinting, medications, corticosteroid injections, and activity modification. The most effective splints are those that are custom made of a moldable plastic material. They may be hand based as shown in Figure 50-9 or forearm based to immobilize the wrist as well. If these various nonoperative treatments are insufficient, surgery may be indicated in young patients to reconstruct the ligaments that stabilize the metacarpal base. In patients with advanced degenerative changes and whose symptoms continue to interfere sufficiently with their daily activities, surgery is indicated to replace the joint with a prosthetic device or to excise the trapezium and reconstruct the soft tissue supports.
Volar Ganglion

Another common location for ganglia is the radial side of the volar wrist. Ganglia typically originate from the scaphotrapezial joint but become superficial and are clinically evident at or near the distal wrist crease over the flexor carpi radialis tendon. Volar ganglia can occur in close proximity to the radial artery and should be differentiated from a radial artery aneurysm. Aspiration, if attempted, should be performed carefully to avoid vascular injury, and surgery should be preceded by performance of an Allen test to document patent ulnar arterial flow. Volar ganglia are associated with a higher recurrence rate and a higher complication rate than their dorsal counterparts.128

Scaphoid Fracture and Nonunion

Occasionally, a young or middle-aged patient presents with a nonunited scaphoid fracture without recollection of a traumatic incident. When evaluating a relatively young patient with pain at the base of the thumb, wrist swelling in the region of the anatomic snuffbox, and a decreased range of motion of the wrist, plain radiographs and a specialized ulnar-deviation “navicular” radiograph should be obtained to rule out scaphoid pathology. In patients in whom a scaphoid nonunion has been present for a significant period, secondary changes in carpal alignment and joint degeneration have usually occurred. Although splint or cast immobilization can be tried, surgical repair of the scaphoid or other wrist salvage procedure is usually required.

Palm

Trigger Finger

Painful clicking and locking of the digits in flexion is one of the most common causes of pain in the hand. This condition, caused by a thickening of the A1 retinacular pulley in the palm, is commonly known as trigger finger. The thumb is the most commonly affected digit, followed by the ring and long fingers.129 Patients may present with isolated activity-related pain in the proximal interphalangeal joint without frank clicking or locking. Early clicking is felt as a snapping sensation during digital motion and is frequently worse on awakening. As the condition progresses, the digital range of motion can be reduced and secondary proximal interphalangeal joint contractures develop. The final stage is a locked trigger finger that cannot be straightened actively.

Primary trigger finger is the most common type, found most often in middle-aged individuals. Triggering of the thumb is four times more frequent in women than in men.5 Secondary triggering is seen in association with such diseases as RA, diabetes, and gout. In this type, trigger fingers are often multiple and can coexist with other stenosing tendinopathies such as de Quervain’s disease or CTS. Congenital or developmental triggering can be identified in children and is much less common. Similar to its presentation in adults, the thumb is most commonly affected, but in contrast to adults, triggering often presents with the interphalangeal joint locked in flexion.

Nonoperative treatment of this condition consists primarily of splinting and local steroid injections. Splinting is most effective at night to prevent the digit from locking. In adults, injection of steroid into the tendon sheath has been shown to be quite effective (Figure 50-10).6,130 Injection is used infrequently in infants or children. When nonoperative treatments fail to give lasting relief, surgical treatment consists of longitudinal division of the A1 pulley at the level of the metacarpal head. It is a simple procedure that yields reliable and permanent results with few complications.

Retinacular Cysts

Retinacular ganglion cysts can occur in conjunction with a triggering digit or in isolation. They are located at the base of the digit over the A1 pulley as a discrete, firm, pea-sized nodule. They originate from the flexor tendon sheath or annular pulleys and contain synovial fluid. Patients usually complain of pain with gripping objects or with direct pressure over the cyst. A retinacular cyst is most easily treated initially by needle decompression, with care to avoid injury to the sensory nerves that lie immediately adjacent to the flexor tendon and associated cyst. Approximately 50% recur after aspiration, and surgical resection may be required.

Digits

Mallet Finger

Mallet finger refers to a loss of terminal extension of the distal interphalangeal joint of the digit and can be classified as bony or soft tissue depending on where the disruption in the extensor mechanism occurred. Mallet fingers can occur with minimal trauma such as tucking in bed sheets and may not be recalled by the patient. This sometimes leads to a delay in diagnosis and treatment. When a patient presents with a digit that droops at the distal interphalangeal joint and cannot be actively extended, but has full passive motion, a radiograph should be obtained to determine if there is an associated fracture of the distal phalanx. An extension splint is the treatment of choice for bony and soft
tissue mallet fingers. The distal interphalangeal joint should be held in full extension, and care should be taken not to force the distal interphalangeal joint into hyperextension to prevent dorsal skin ischemia and necrosis. Splinting is employed full time for 6 weeks. The patient should not remove the splint for showering or any other activity but may change the splint carefully for skin care, provided that the joint is maintained in extension throughout. Proximal interphalangeal flexion exercises are initiated from the outset and are important to help reset the tension in the extensor mechanism. Gentle distal interphalangeal flexion exercises are begun at 6 weeks, and splinting is decreased to nighttime between 6 and 8 weeks. Patients usually can expect a small extension lag, on the order of 5 degrees, and a return of most of their flexion.

Osteoarthritis of the Digits

Osteoarthritis of the interphalangeal joints is extremely common in older patients and is most often manifested as Heberden’s nodes of the distal interphalangeal joint. Despite gross deformities, pain and dysfunction may be minimal. A mucous cyst may appear in association with degenerative arthritis. Mucous cysts appear on the dorsum of the joint and can cause nail growth deformities owing to pressure on the germinal matrix (Figure 50-11). The changes in nail growth may precede clinical detection of the cyst. These cysts should not be aspirated with a needle because of the close proximity of the distal interphalangeal joint and the risk of secondary joint infection. Treatment consists of distal interphalangeal joint immobilization to control symptoms or surgical excision of the cyst and in particular the underlying osteophytic spurs.

Tumors

Benign bone tumors such as simple bone cysts and enchondromas are common in the phalanges. These usually cause no symptoms and frequently are diagnosed as incidental findings on routine hand radiographs. Enchondromas are most commonly located in the metaphysis of the proximal phalanx and may lead to fracture with minimal trauma as a result of weakening of the bone structure. If a pathologic fracture occurs, nonoperative treatment is indicated until the fracture heals. The bone tumor subsequently can be addressed with curettage and bone grafting. Occasionally, because of malalignment, earlier surgical intervention becomes necessary.

Many soft tissue tumors can occur in the hand and digits. Some common benign tumors are giant cell tumors of the tendon sheath, lipomas, and glomus tumors. Lipomas and giant cell tumors of the tendon sheath manifest clinically as painless, slow-growing masses in the palm and digits. Surgical excision is necessary for diagnosis. Glomus tumors arise from the pericytes in the fingertip or subungual area and typically present with intermittent sharp pain in the fingertip. These vascular tumors become intensely symptomatic when the hand is exposed to cold temperatures, owing to abnormal arteriovenous shunting through the hypertrophic glomus system. Surgical excision is generally curative and should be preceded by MRI to rule out multifocal sites.

Infection

The most common infection in the hand is the paronychia. It involves the fold of tissue surrounding the fingernail. *Staphylococcus aureus* is the usual pathogen, introduced by a hangnail, a manicure instrument, or nail biting. Patients present with an exquisitely painful and erythematous swelling involving a part of the nail fold. Occasionally, the infection can progress to surround the nail in a horseshoe fashion and undermine the nail plate. If seen early, within the first 24 to 48 hours, oral antibiotics and local treatment of the finger with warm soaks can be effective. Superficial abscesses can be drained with a sharp blade through the thin skin without requiring local anesthesia. Larger or more chronic infections require surgical drainage.

An infection of the distal pulp of the fingertip, known as a felon, is a particular problem in diabetic patients. This infection differs from other subcutaneous infections because of the vertical fibrous septa that divide and stabilize the pulp of the fingertip. Often patients have had some recent penetrating injury in the area. Because of the tightly constrained area of the infection, patients present with an intensely painful fingertip. There may be an area of “pointing” over the abscess. Surgical drainage is required followed by soaks and oral antibiotics, and intravenous antibiotics are generally recommended in diabetic patients.

Although similar in appearance to a paronychia, herpetic whitlow is caused by herpes simplex virus and must be differentiated from other fingertip infections because of a radically different treatment protocol.131,132 Whitlow was common among dental hygienists before the widespread use of gloves for all health care workers. As with bacterial infections, the area becomes painful and erythematous; local tenderness is much less severe, however. Diagnosis is by clinical presentation and history. If seen early, vesicles can be ruptured for fluid analysis and viral culture. Nonoperative treatment with oral antiviral agents is recommended.

![Figure 50-11](image-url) Dorsal view of a digit with an as yet clinically inapparent mucous cyst and the corresponding groove deformity of the nail plate.
Other hand and digit infections such as suppurrative flexor tenosynovitis, deep space infections of the palm, pyogenic arthritis, infections from bite wounds, and osteomyelitis should be evaluated initially with radiographs of the hand and appropriate blood work. If possible, antibiotics should be withheld until definitive cultures are obtained from the affected area. Antibiotics should be administered intravenously, and the hand and wrist should be immobilized. Most infections of this nature require surgical drainage for definitive treatment.

Selected References

45. Linskey ME, Segal R: Median nerve injury from local steroid injection for carpal tunnel syndrome, Neurosurgery 26:512–515, 1990.


