UPPER LIMB

Chronic wrist pain: Diagnosis and management

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KEYWORDS
Wrist; Chronic pain; Carpus

Summary
Management of chronic wrist pain can be a challenging problem. A sound understanding of the anatomy is required to make a diagnosis. Here the commonest causes of chronic wrist pain are discussed with an overview on the principles of management.

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Introduction

Chronic wrist pain has been described as the ‘bad back’ of hand surgery. The management of chronic wrist pain can only be helped by having a good understanding of the basic anatomy and mechanics of the wrist joint as well as the effect that any ligament injury might have upon the intercarpal relationships.

The wrist is a complex joint with two rows of carpal bones articulating with each other, which in turn articulate with the radius and ulna. In addition to this, there is a complex relationship between the distal radius and ulna. Stability of the wrist joint is provided by ligaments which interconnect these bones. The ligaments of the wrist can be grouped as extrinsic and intrinsic.

The extrinsic ligaments of the wrist connect the forearm bones to the carpal bones on the dorsal and the palmar sides. The palmar ligaments were thought to be arranged as two rows in an inverted V-shape, the proximal one connecting the radius and ulna to the lunate and the distal one linking the radius to the capitate. However, more recently, anatomical studies and the introduction of arthroscopy have revealed that there are two layers of ligaments on the palmar side. The superficial palmar ligaments are the radioscaphocapitate (RSC), the long radiolunate and the ulnolunate. The deep ligaments are the short radiolunate, the ulnolunate, the ulnotriquetral and the radioscapholunate. On the dorsal side there is mainly one ligamentous complex, which is the radiolunotriquetral ligament.

The intrinsic ligaments of the wrist originate from and insert into the carpal bones in the same row (interosseous ligaments) and also link the proximal and distal carpal rows by crossing the midcarpal joint (midcarpal ligaments). The two main interosseous ligaments are the scapholunate and the lunotriquetral ligaments, which hold these respective bones together.

Causes of chronic wrist pain

For the ease of understanding the pathology and making a clinical diagnosis, the various causes of wrist pain may be classified as radial, central/dorsal or ulnar (Table 1). This is only a broad classification as some pathology, such as scapholunate dissociation (SLD) or scapholunate advanced collapse (SLAC), may present as radial and/or dorsal pain.

Radial-sided wrist pain

Tenosynovitis. Stenosing tenosynovitis of the first dorsal compartment tendons (DeQuervain’s disease) is one of the
commonest causes of radial-sided wrist pain. Fritz de Quervain has been credited with the description in 1895 of an entity involving the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) tendons. See more frequently in women, pain is localised to the radial side of the wrist and is aggravated by thumb movements. Finkelstein’s test (pain on ulnar deviation of wrist with the thumb clasped in the palm) is diagnostic. It often responds to conservative treatment with non-steroidal anti-inflammatory medication (NSAIDs), a short period of immobilisation in a splint which supports both wrist and thumb, or a steroid injection. Surgical decompression should be limited to patients who fail to respond to at least 6–8 weeks of non-operative measures. The compartment of EPB may in some cases be separate from that of APL, and care should be taken to decompress both APL and EPB tendons. Also, the APL may have two or more tendon slips, all of which have to be released for full benefit. Superficial branches of the radial sensory nerves should be identified and protected by blunt dissection at the incision site to reduce the risk of neuroma formation and avoid any disabling symptoms of altered sensation over the dorsal-radial aspect of the hand.

Flexor carpi radialis tendonitis is an uncommon cause of radial-volar wrist pain. The cause may be a primary inflammation as a result of overuse or it may be secondary to the soft tissue and bony abnormality adjacent to the tendon. Scaphotrapeziotrapezoid (STT) joint arthritis may be an underlying cause as the tendon runs adjacent to this joint. Immobilisation in a splint, NSAIDs and steroid injections are often successful in resolution of symptoms. In refractory cases, surgical decompression of the tendon including the synovial tunnel through which it passes before it dips dorsally to attach to the base of the index finger metacarpal, bordered by the scaphoid tuberosity, trapezial ridge and the transverse carpal ligament, may be required.

Intersection syndrome. DeQuervain’s disease must be differentiated from Intersection syndrome. Although this is generally thought to be due to friction between the APL and EPB muscle bellies and the radial wrist extensors, it was later demonstrated to be tenosynovitis of the second dorsal compartment. Pain and swelling about 4 cm proximal to the wrist joint is characteristic of this problem. Non-operative treatment, which includes modification of activities, the use of a thermoplastic wrist splint in 15° extension, and steroid injection into the second dorsal compartment should be tried first. Should these measures fail, surgical release of the second dorsal compartment should be considered.

Trapeziometacarpal osteoarthritis of the thumb. Exactly why osteoarthritis affects the basal joint of the thumb is poorly understood. Stability of the saddle-shaped joint surfaces is provided by small ligaments. Instability of this joint leading to excessive movements may result in osteoarthritis. Eaton and co-workers have staged basal joint arthritis as follows, based on radiological appearance:

Stage 1: Articular contours normal. Slight widening of joint space due to effusion or ligamentous laxity.
Stage 2: Slight narrowing of the trapeziometacarpal (TMC) joint with minimal sclerosis of the subchondral bone. STT joint is unaffected. Joint debris less than 2 mm.
Stage 3: Marked narrowing of the TMC joint. STT joint not affected. Joint debris more than 2 mm.
Stage 4: Identical to Stage 3 but with involvement of the STT joint.

Patients complain of radial-sided wrist pain which may be diffuse and poorly localised. There may be a visible prominence on the volar side of the base of thumb at the TMC joint level. The Swanson grind test may be used to confirm the diagnosis (pain on circular movements of the thumb metacarpal with axial compression). It should be differentiated from DeQuervain’s tenosynovitis, where the pain and tenderness are located more proximally over the radial styloid. Radiographic assessment should include standard PA, lateral and oblique views of the thumb (Fig. 1).

Stage 1 and 2 disease should be managed initially with conservative measures such as anti-inflammatory medications and a well moulded thumb spica splint. Stages 3 or 4 also may respond at least partially to the non-operative measures before surgical intervention is considered. Various surgical procedures have been described in the literature. These can essentially be categorised into those that remove a portion of the metacarpal, those that remove a portion of the trapezium and those that remove whole of the trapezium. Reconstruction following removal of the whole of the trapezium may leave an empty space, or involve use of a spacer which can be biological, silicone or metal (Fig. 2).

Davies et al. looked at comparative results and found no difference following trapeziectomy alone or with tendon interposition or ligament reconstruction. Total joint arthroplasty of the TMC joint is still in its infancy and has a high reported failure rate of the trapezial component.

Table 1 Main differential diagnosis of wrist pain.

<table>
<thead>
<tr>
<th>Radial-sided wrist pain</th>
<th>Tenosynovitis</th>
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<tr>
<td>OA 1st CMCJ</td>
<td>STT OA</td>
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<td>Scaphoid non-union</td>
<td>Ganglion</td>
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<td>Dorsal/central wrist pain</td>
<td>Kienbock’s disease</td>
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<td>Scapholunate dissociation</td>
<td>Scapholunate advanced collapse</td>
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<td>Stages</td>
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<td>Intra-osseous ganglion</td>
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<td>Ulnar-sided wrist pain</td>
<td>Ulnar abutment syndrome</td>
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<td>Ulnar impaction syndrome</td>
<td>Distal radioulnar joint</td>
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<td>Instability</td>
<td>degenerative arthritis/</td>
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<td>Instability</td>
<td>Instability</td>
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<td>Ulnar head chondromalacia</td>
<td>Triangular fibrocartilage complex</td>
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<td>ECU tendonitis/subluxation</td>
<td>TFCC tear</td>
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<td>Lunotriquetral instability</td>
<td>Piso-triquetral joint pathology</td>
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<td>Midcarpal instability</td>
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Fig. 1
Scaphotrapeziotrapezoidal (STT) joint osteoarthritis. Involvement of the STT joint is usually secondary to TMC joint osteoarthritis. Isolated involvement of the STT joint can be secondary to early rotatory subluxation of the scaphoid (RSS) (Fig. 3). Arthrodesis of the STT joint is generally accepted as the procedure of choice for the management of this problem.  

Scaphoid non-union. The scaphoid bone serves as a link between the proximal and distal carpal rows. It flexes on palmarflexion or radial deviation of the wrist and extends on dorsiflexion or ulnar deviation of wrist joint. Any loss in integrity of the scaphoid affects wrist motion and carpal alignment. Two main groups of blood vessels supply the scaphoid. The volar vessels, which are branches of the radial artery entering the distal tubercle, supply the distal 20–30% of the bone. The proximal 70–80% is supplied by branches of the radial artery entering through the foramina along the dorsal ridge. These vessels run from distal to proximal. Various anatomical studies have consistently demonstrated poor blood supply to the proximal pole. An interruption to the dorsal blood vessels may lead to ischaemia of the proximal end of the bone. An ulnar-directed force of sufficient magnitude on the radial side of the wrist with the wrist in 95–100° of extension has consistently been shown to produce fractures of the scaphoid. Intrinsic forces in the wrist cause the proximal portion of the scaphoid to extend along with the lunate while the distal portion flexes, leading to the ‘humpback’ deformity (Fig. 4). This increases the risk of non-union or malunion. This
extension of the lunate causes an adaptive carpal instability, which if left uncorrected may become static.

Tenderness in the anatomical snuffbox and over the tuberosity are sensitive but not specific tests of scaphoid fracture. Plain radiographs are helpful in not only confirming a non-union, but also in assessing the other carpal bones for instability. Other imaging modalities such as computed tomography or magnetic resonance imaging can help in providing further assessment of the degree of collapse and deformity in the scaphoid.

In most instances, non-unions of scaphoid fractures are treated by surgical means. If the non-union is stable with no radiological evidence of collapse, it may remain asymptomatic. However, Vender et al. in a retrospective review have demonstrated predictable progressive degenerative changes involving the radiocapitate and midcarpal joints following untreated symptomatic fractures of the scaphoid (Fig. 5). Some have suggested operative stabilisation and grafting of all displaced scaphoid fractures before the onset of osteoarthritis.

The goal of treatment in patients presenting with degenerative arthritis of the wrist as a sequel of scaphoid non-unions—scaphoid non-union advanced collapse (SNAC wrist)—is to achieve a pain-free wrist. The options available include wrist denervation, limited arthrodesis by scaphoid excision and four-corner fusion, or full wrist arthrodesis. The first two have the advantage that they retain the movement of the wrist, but the symptomatic improvement may not be longstanding, necessitating conversion to wrist fusion later. Proximal row carpectomy (PRC) may also be considered, but the lunate fossa of the radius must be free of any involvement as the capitate will articulate with the lunate fossa after removal of the proximal row of carpal bones.

**Scapholunate dissociation (SLD).** The ligaments of the wrist fail in tension. The position of the wrist at the time of an injury is critical in determining which ligaments might fail. Most wrist injuries occur with the wrist in extension. When the wrist moves from radial to ulnar deviation, the scaphoid extends. This puts the scapholunate ligament under tension. Loading of the wrist in this position can lead to rupture of the scapholunate ligament. In radial deviation, the triquetral–hamate ligament is stretched. An extension injury in this position can lead to injury to the lunotriquetral ligament. Mayfield and Johnson, in their cadaveric study, have demonstrated a predictable pattern of distribution of force across the wrist on loading a wrist in extension.

Injury to the scapholunate ligament leads to dissociation of this joint. Although the natural tendency of the scaphoid is to fall into flexion and pronation, in early stages the alignment of the scaphoid would be maintained by the intact ligaments connecting its distal pole to the distal carpal row (STT ligaments). With time, however, these distal ligaments weaken resulting in flexion and pronation of the scaphoid. This is termed RSS and appears radiologically as widening of the scapholunate gap (Fig. 6). It is important to appreciate that the gap seen on the plain radiographs is not due to a pure radial movement of the scaphoid, but is a result of rotational displacement. Hence any surgical procedure to address this problem should aim to lift the distal pole of the scaphoid.

Initially, SLD can be dynamic and may only be identified on PA radiographs by asking the patient to clench the fist (clenched fist view). In long-standing cases the instability becomes static. With time the capitate migrates proximally into the scapholunate gap. SLD leads to abnormal loading between the proximal pole of the scaphoid and the dorsal rim of the radius. This results in the development of degenerative changes in the radioscaphoid joint, which may progress to involve the midcarpal level.

The symptoms of SLD can vary depending on the severity and the time after the injury. Pain on the radial side of the wrist, weakness of grip and swelling localised to the scapholunate area are often the main complaints. Pain may be associated with a clicking sensation. Patients often have tenderness localised to the scapholunate area dorsally or over the anatomical snuffbox. A positive shift test, described by Watson is diagnostic of SLD. This is performed with the examiner and patient facing each other, as for arm...
after injury to the scapholunate ligament (‘Terry Thomas’ sign).

ligament; however, their use in partial tears is often limited. MR-arthrograms may help in further defining tears of the scaphoid and the adjacent carpal bones. Arthrography or helpful in demonstrating abnormal movements between the of scaphoid (the signet ring sign). Cine-radiography is often the form of a dense circle or ring over the distal two-thirds a PA view of the wrist, the scaphoid tubercle may project in back into position with a clunk. Even though the Watson’s tuberosity of the scaphoid is removed the scaphoid may go dorsal scaphoid displacement. When pressure over the distal pole will cause the scaphoid to move dorsally under this test may only be painful, without any perception of examiner’s index finger, normally inducing pain. Sometimes this test may only be painful, without any perception of dorsal scaphoid displacement. When pressure over the distal tuberosity of the scaphoid while the wrist is moved from ulnar to radial deviation. This moves the scaphoid from a position of extension to flexion. The examiner’s thumb placed over the distal tuberosity prevents the scaphoid from flexing. In cases of scapholunate ligament tears or in patients with a lax wrist, this resistance to flexion of the distal pole will cause the scaphoid to move dorsally under the posterior margin of the radius, which can be felt by the examiner’s index finger, normally inducing pain. Sometimes this test may only be painful, without any perception of dorsal scaphoid displacement. When pressure over the distal tuberosity of the scaphoid is removed the scaphoid may go back into position with a clunk. Even though the Watson’s test is the best known for scaphoid subluxation, its sensitivity and specificity are low.

Increased scapholunate joint space of more than 5 mm on plain radiographs is considered to be diagnostic of SLD (the Terry Thomas sign). With extreme flexion of the scaphoid, in a PA view of the wrist, the scaphoid tubercle may project in the form of a dense circle or ring over the distal two-thirds of scaphoid (the signet ring sign). Cine-radiography is often helpful in demonstrating abnormal movements between the scaphoid and the adjacent carpal bones. Arthrography or MR-arthrograms may help in further defining tears of the ligament; however, their use in partial tears is often limited. Arthroscopy is most accurate and is useful in directly visualising the ligament.

**Scapholunate advanced collapse (SLAC).** The scaphoid acts as a link between the proximal and the distal carpal rows. If this link is broken either by fracture of the scaphoid or rupture of the scapholunate ligament, then the lunate and the triquetrum collapse into a more stable position of extension (dorsal intercalated segmental instability [DISI]). This position is not physiological, which in turn increases the force transferred through the wrist cartilage leading to early degenerative changes of the SLAC (wrist) type.

SLAC wrists can be graded depending on the extent of the degenerative changes:

Stage 1a: Degenerative changes between the scaphoid and the radial styloid.
Stage 1b: Degenerative changes involving the whole of the radioscaphoid joint.
Stage 2: Degenerative arthritis involving the scaphocapitate (midcarpal) joint.

The most common cause of a SLAC wrist is RSS. Other causes include Preiser’s disease, Kienbock’s disease, and midcarpal instability, or it can be post-traumatic, following injuries involving the radioscaphoid or capitolunate joints.

Diagnosis can be confirmed on a plain radiograph (**Fig. 7(a) and (b)**). For chronic SLDs associated with RSS that are reducible, a dorsal capsulodesis, popularised by Blatt, is recommended. This has been modified by various others. The most popular technique is that of Brunelli, using a strip of the flexor carpi radialis tendon. The underlying principle of both is to lift the distal end of the scaphoid, thereby correcting the flexion and pronation deformity. In irreducible scapholunate dissociations, conservative treatment with NSAIDs, appropriate splints and steroid injection should be tried first before considering operative intervention. Chronic irreducible SLDs without secondary degenerative arthritis of the radiocarpal or midcarpal joints often need some form of bony procedure. Selective fusion of only the involved joints rather than the whole wrist will help to retain reasonable function. STT arthrodesis, also known as triscaphoid fusion, holds the scaphoid distally and helps to maintain its correct alignment. Other procedures such as scaphocapitate fusion or scapholunocapitate fusion (**Fig. 8**) have been shown to lead to more reduction of wrist movements. In cases with significant degenerative arthritis at the radiocarpal level, scaphoid excision and fusion of the capititate, hamate, triquetrum and lunate (four-corner fusion) may be the best option (**Fig. 9**). This retains some movement of the wrist at the radiocarpal level and helps to improve the discomfort. For this to be a success the articular cartilage of the radiolunate joint must be intact. For those individuals with involvement of the radiolunate joint, total wrist fusion would be the procedure of choice (**Fig. 10**).

**Dorsal/central wrist pain**

*Kienbock’s disease.* Peste, in 1843, first described collapse of the lunate which he though was as a result of acute trauma . Kienbock later postulated that this was the result of repeated minor injuries resulting in reduced blood supply to the lunate.
The exact aetiology of this condition remains unknown. Many authors have suggested trauma as a cause. It is likely that repeated trauma is more often the cause than a single one. Uneven loading of the radiocarpal joint has been suggested as another likely cause. Palmer and Werner noted that in neutral ulnar variance 82% of the load though the wrist joint is taken by the radiocarpal joint. This increases to 96% when there is a shortening of the ulna by 2.5 mm (negative ulnar variance). However, Kienbock’s disease can also occur in ulnar positive as well as ulnar neutral variance. D’Hoore found no difference in ulnar variance between a group of patients with Kienbock’s disease and an age and sex matched control group.

Staging is based on the radiological extent of the disease, as follows:

Stage I: No changes in plain radiographs, but MRI will show decreased signal within the lunate.

Stage II: Increased density of the lunate in plain radiographs. Height of lunate maintained with no collapse.

Stage III: There is collapse of lunate with loss of carpal height but the scapholunate relationship is maintained.

Stage IIIb: Collapse of the lunate and loss of carpal height is associated with RSS.

Stage IV: Generalised degenerative arthritis of the carpus associated with fixed RSS.

Patients may complain only of dorsal and central wrist pain in the early stages. Collapse of lunate architecture is usually associated with restriction of wrist movements. For very early cases simple immobilisation of the wrist in a splint or POP cast may be of help in improving symptoms. Unloading of the lunate can be achieved by joint levelling procedures, such as shortening the radius or lengthening the ulna in those with negative ulnar variance or by limited intercarpal fusion of the STT or scaphocapitate joints. Although excision and replacement of the lunate has been reported, the long-term results of replacement arthroplasty are not encouraging and it is generally not recommended. Hori et al. suggested revascularisation of the lunate by direct implantation of the 2nd or 3rd metacarpal artery and vein into the lunate.

Ganglion cysts. Ganglions are the most common soft tissue swellings of the wrist region. They are usually outpouchings of the capsule from the carpal joints, but may also arise in relation to the tendons. The commonest site of origin is from...
the scapholunate joint. There is almost always a connection to the underlying joint or tendon sheath which makes it difficult for these swellings to be removed completely on surgical excision. Patients often present with a painless swelling but in some cases they may complain only of wrist pain, with no visible swelling. This is particularly likely in early stages when the ganglion is small and not visible. An arthroscopy at this stage may help to identify a small ganglion as the cause of discomfort and an arthroscopic excision can be performed. As the swelling enlarges and becomes more clinically obvious, the pain may improve. Management options include reassurance, aspiration or surgical excision. Diaz and Buch, looking at their results of palmar ganglions, have found no difference in symptoms at 2- and 5-year follow-up regardless of whether the ganglions were excised, aspirated or left alone.31

Ulnar impaction syndrome (ulnocarpal abutment). With the forearm in supination, the radius lies alongside and parallel to the ulna. On pronation of the forearm, the distal radius moves around the ulna with the radial sigmoid fossa articulating with the ulnar head. This results in a relative lengthening of ulna. In people with a positive ulnar variance, this over lengthening of the ulna can cause abutment on the lunate, resulting in pain and discomfort. This happens more often with the wrist in slight ulnar deviation. The TFCC can get caught between the lunate and ulna. Over a period of time this may result in a central perforation of the TFCC. This degenerative tear of the TFCC is different to the traumatic variety32 (Table 2). Patients often complain of a catching sensation on forearm rotation with the wrist in ulnar deviation.

Plain radiographs may show a positive ulnar variance but ulnar impaction can be associated with neutral ulnar variance as well. It is important to obtain radiographs of the wrist with the forearm in the neutral position and the shoulder and elbow at right angles, as the relative length of the ulna can vary depending on forearm rotation. MRI may show evidence of bone oedema on the ulnar aspect of the lunate. Arthroscopy will help confirm a TFCC tear and also can be helpful in debriding the tear.

Treatment depends on various factors such as ulnar variance, TFCC integrity, lunotriquetral ligament status, DRUJ congruency and stability, and patient symptomatology. Patients with neutral or only mildly positive ulnar variance may respond to conservative measures such as rest, NSAIDs, splinting and possibly steroid injections. Surgical intervention will be needed in those with excessive positive ulnar variance. Individuals with TFCC tears may need debridement, which can be done either by open or arthroscopic
Table 2 Triangular fibrocartilage complex classification.

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<th>Class 1: Traumatic</th>
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<tr>
<td>A. Central perforation</td>
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<tr>
<td>B. Ulnar avulsion</td>
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<tr>
<td>With distal ulnar fracture</td>
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<tr>
<td>Without distal ulnar fracture</td>
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<tr>
<td>C. Distal avulsion</td>
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<tr>
<td>D. Radial avulsion</td>
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<tr>
<td>With sigmoid notch fracture</td>
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<td>Without sigmoid notch fracture</td>
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<tr>
<th>Class 2: Degenerative (ulnocarpal abutment syndrome)</th>
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<tr>
<td>A. TFCC wear</td>
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<tr>
<td>B. TFCC wear+lunate and/or ulnar chondromalacia</td>
</tr>
<tr>
<td>C. TFCC perforation+lunate and/or ulnar chondromalacia</td>
</tr>
<tr>
<td>D. TFCC perforation+lunate and/or ulnar chondromalacia+LT ligament perforation</td>
</tr>
<tr>
<td>E. TFCC perforation+lunate and/or ulnar chondromalacia+LT ligament perforation+ulnocarpal arthritis</td>
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Methods. In ulnar neutral or negative variance, this is all that may be needed. However, in cases of positive ulnar variance, ulnar length should be corrected as otherwise the symptoms may recur. This can be achieved either by an extra-articular ulnar shortening osteotomy or by a limited resection of the articular surface of ulnar head at the point of impaction with the carpus (Wafer procedure). The extra-articular shortening of the ulna remains the gold standard but Constantine et al. compared the results of the two procedures and noted equally good improvement of impaction symptoms in both groups, although the group having open ulnar shortening osteotomy needed more secondary procedures for hardware removal and non-union.

Ulnar impingement syndrome. Ulnar impingement has to be differentiated from an abutment. This occurs due to impingement of the distal ulna on the radius causing a painful pseudarthrosis. It is often iatrogenic following excision of the distal end of the ulna (Darrach’s procedure). On making a fist the unstable distal end of ulna converges on the radius causing pain and discomfort (Fig. 11(a) and (b)). It can also occur with growth arrests of the distal radius or ulna epiphysis. Patients complain of weakness of grip, pain over the DRUJ on forearm rotation and tenderness over the distal ulna. Radiographs may demonstrate a scalloping on the ulnar side of the distal radius (Fig. 11(b)). This problem can only be addressed by restoring the length of the ulna to provide stability to the TFCC and the ulnar sling mechanism. Watson and Brown have reported satisfactory outcome with an ulnar lengthening osteotomy in conjunction with a ‘matched’ resection of the advanced ulna. Ulnar head replacement is another satisfactory method of regaining ulnar length and achieving stability of the distal radioulnar joint (Fig. 12(a) and (b))

Distal radioulnar joint pathology. Stability of the DRUJ is provided by various structures such as the TFCC, ECU subsheath and pronator quadratus. Of these the TFCC is probably the most significant. Instability of the DRUJ can be post-traumatic, following an acute injury to these structures or it can be as a result of inflammatory arthritis. Ballotment of the prominent ulnar head confirms the diagnosis (the piano key sign). Acute tears of the TFCC with DRUJ instability can initially be treated with a period of immobilisation for about 4–6 weeks. Persistent instability will often need operative stabilisation.

Arthritis of the DRUJ may be post-traumatic (Fig. 13) or as a result of systemic disorders such as rheumatoid arthritis. Patients complain of weakness of grip and decreased range of motion, often associated with pain and clicking. Plain radiographs may show narrowing and irregularity of the joint and osteophytes. For early stages, conservative treatment by NSAIDs, steroid injection and activity modification may be tried. Failure of conservative measures may necessitate operative intervention to restore the congruity of the joint. Excision of the distal end of the ulna, which was first described in 1913 by Darrach and involves complete resection of the distal end of ulna, has a very poor long-term result in non-rheumatoid patients. Most individuals have weak grip strength and develop ulnar impingement syndrome. Watson described the technique of resection of the distal ulna to match the shape of the ulnar border of the distal radius. This has the advantage of retaining the length of the ulna, thus avoiding the problem of instability of the ulnar stump.

Pisotriquetral osteoarthritis. Instability of the pisiform leads to eventual degenerative arthritis of the pisotriquetral joint with pain over the ulnar aspect of the hand. Provocative tests such as the pisotriquetral grind test may be positive. Associated ulnar neuropathy may be seen in up to a third of patients. Diagnosis can be confirmed on radiographs from a 30° supination view. If initial non-operative treatment with splinting, NSAIDs and steroid injections fail to improve the symptoms, excision of the pisiform may have to be considered.

Extensor carpi ulnaris (ECU) subluxation. Anatomical studies have shown that the ECU tendon, which runs in the 6th extensor compartment, is held in the ulnar groove by a subsheath which is distinct from the extensor retinaculum of the wrist. In the event of a tear of this subsheath, the ECU tendon is likely to become unstable and sublux out of the
Figure 11 (a) and (b) Ulnar impingement syndrome. (a) Excision of distal end of ulna for DRUJ instability. (b) On radial deviation of wrist, the ulnar stump impinges on the radius (note the scalloping on the ulnar border of the radius).

Figure 12 (a) and (b) Ulnar head replacement for painful ulnar impingement. (a) Preoperative radiograph following resection of distal end of ulna for DRUJ instability following distal radius fracture. (b) Post-operative radiograph showing ulnar head replacement in situ, restoring DRUJ stability.
ulnar groove. ECU subsheath tears may occur in forced supination of the forearm with the wrist in palmar flexion and ulnar deviation. Patients complain of painful snapping on the ulnar border of the wrist. Acute injuries may be treated in a long arm cast with the wrist in dorsiflexion and some radial deviation, with the forearm pronated. In chronic cases repair of the subsheath and surgical stabilisation would be required.

Lunotriquetral ligament instability. Tears of the lunotriquetral ligament can occur as a result of an acute injury or as a consequence of ulnar abutment (degenerative). Hyperextension and radial deviation of the wrist results in tightening of the ulnocarpal ligaments and a fall onto the wrist in this position can disrupt the stretched lunotriquetral ligament. This results in dissociative carpal instability. However, when there is disruption of both the intrinsic (lunotriquetral) and extrinsic (radiotriquetral) supporting ligaments, the scaphoid and lunate as a unit fall into flexion (lunotriquetral) and extrinsic (radiotriquetral) supporting ligament. This results in dissociative carpal instability.

A positive ballottement test, as described by Reagan et al., where the lunate is held firmly by the thumb and index finger of one hand while the pisotriquetral complex is moved dorsally and palmarly with the other, is diagnostic.

Plain radiographs may be normal in partial tears. Evidence of static instability in radiographs suggests involvement of both the extrinsic and intrinsic ligaments. There may be a step-off between the lunate and triquetrum in the PA view. MR arthrography may confirm communication between the radiocarpal and midcarpal joints. Arthroscopy is the most sensitive investigation in confirming the diagnosis. Acute injuries may respond to immobilisation in a cast for 6 weeks. Chronic tears may need stabilisation by repair or reconstruction of the ligament or by lunotriquetral fusion.

References