# Diagnosis of ulnar-sided wrist pain: a pragmatic approach for the non-specialist


## ABSTRACT

Ulnar-sided wrist pain is often unfairly labelled as the 'back pain' of the wrist. This reputation comes from the complexity of diagnosing problems related to this area of the wrist. This article summarizes the anatomy and biomechanics of the wrist and presents a logical approach to diagnosing the aetiology of the pain. The problems are categorised based on the anatomical structure from which the pain arises: either bony, soft tissue-related or arising from nerves or vascular structures. The article also outlines the relevant examination findings and the most appropriate investigation that would yield a diagnosis with any given presentation. A linked article detailing the imaging of ulnar-sided wrist pain is included in this issue (https://doi.org/10.12968/hmed.2019.80.8.461).


Ulnar-sided wrist pain is a frequently encountered problem that is notoriously difficult to diagnose. It is the presenting complaint for a multitude of traumatic and degenerative conditions and can afflict all age groups.


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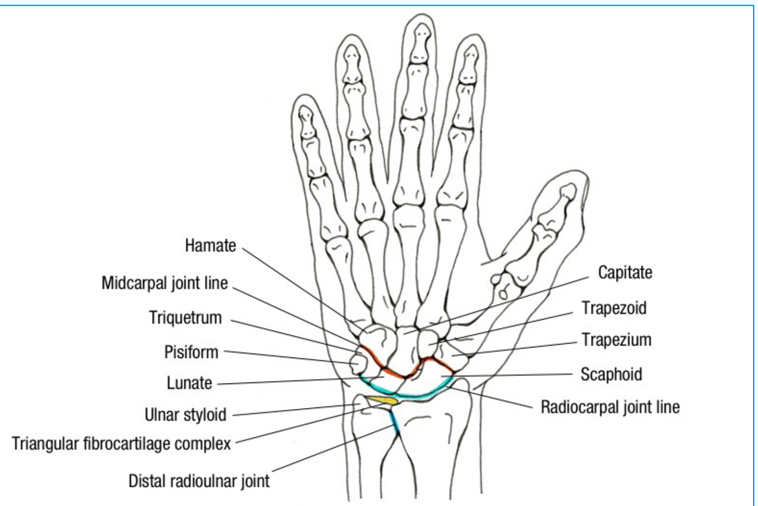


Figure 1. Illustration of the volar aspect of a right wrist, demonstrating bony anatomy, triangular fibrocartilage complex and the radiocarpal and midcarpal joint lines.

The anatomy of the ulnar side of the wrist is complex with a number of small structures in close proximity. The diagnostic challenge is further compounded by the subtle clinical and radiological findings. This article presents an anatomical approach to the assessment and appropriate investigation of ulnar-sided wrist pain. The emphasis is on considering the bony and soft tissue structures within the ulnar side of the wrist, so it is appropriate to start with an overview of these structures.

## Wrist anatomy and biomechanics

The wrist is a compilation of joints connecting the forearm to the carpus and metacarpals (*Figure 1*). The movements include flexion, extension, radial and ulnar deviation, pronation and supination. The movements rarely occur in isolation and most activities of daily living require a composite of movements in the three different planes.

The most proximal joint in the wrist is the distal radioulnar joint. This is the articulation between the ulna head and the distal radius. A series of strong fibrous tissues known collectively as the triangular fibrocartilage complex stabilizes the distal radioulnar joint and also connects the ulna with the carpal bones (Lees, 2013). The relationship between the distal end of the radius and ulna is referred to as the ulnar variance and is relevant when considering the diagnosis of ulnocarpal impaction syndrome for example.

The radiocarpal joint is the next joint along and is the layman's 'wrist' joint. Together with the midcarpal joint this is responsible for most of the flexion and extension occurring at the wrist, although the carpometacarpal joints also contribute to a lesser extent.

Radial and ulnar deviation also occurs at the radiocarpal and midcarpal joints. This ability is conferred by the absence of any tendinous insertions into the carpus and the strong intrinsic ligaments that link the carpal bones into two distinct rows (proximal and distal rows) also referred to as intercalated segments. With the exception of the flexor carpi ulnaris that inserts into the pisiform and hook of hamate, the remaining tendons crossing the wrist insert more distally into the metacarpal bases and beyond. The forces generated by these tendons cause the proximal and distal rows to move to accommodate the changes in space made on the radial and ulnar side of the wrist in deviation (Trumble et al, 2017). In ulnar deviation, for example, the carpus will be squeezed against the ulnar soft tissue structures (triangular fibrocartilage complex) and this forms the basis of the clinical test where putting the wrist in ulnar deviation reproduces pain arising from these structures if pathological.

## History taking

This component of the assessment is key to identifying the underlying cause. Establishing the patient's hand dominance, occupation and hobbies can help determine the aetiology of the pain. It is also critical in considering management steps and treatment goals. The presenting complaint must be explored in depth. It is important to determine the chronicity of the problem, any precipitating events or injuries, exacerbating and relieving factors, along with associated symptoms. These could include clicking or snapping sensations, stiffness or altered sensation. In the final systematic review, it is important to ask about neck pain, which may signify spinal degenerative changes that can produce radiculopathy, and pains in other joints, as ulnar-sided wrist pain can be a primary presentation of inflammatory arthritis.

## Examination

### Inspection

It is important to observe and compare both hands and wrists, with the forearms exposed up to the elbows. Many of the pathologies discussed have little to see on inspection but swellings are important to note. These may represent ganglia, tumours or synovitis. Muscle wasting, either interosseous (hollowing of the first web space and guttering over the dorsum of the hand) or hypothenar, is suggestive of advanced ulnar neuropathy. Furthermore it is imperative to look for features of systemic disease such as psoriatic plaques or rheumatoid nodules at the elbows.

### Palpation

This is often the most informative element of the examination. Asking the patient to point with one finger to where the pain is coming from before palpation helps the clinician to formulate a provisional differential diagnosis. Palpation must be systematic, ensuring that radial structures are palpated first and working through the landmarks outlined below and illustrated in *Figure 2* to help localize the source of the ulnar-sided pain.

Tenderness of the hook of hamate can suggest a fracture of the hook. This can be symptomatic alone or produce compression of the adjacent ulnar nerve in Guyon's canal, commonly producing a motor neuropathy or mixed motor and sensory ulnar neuropathy.

A positive fovea sign signifies pathology within the triangular fibrocartilage complex and is elicited by the examiner pressing his/her thumb into the soft spot on the ulnar border of the wrist between the ulnar styloid, flexor carpi ulnaris tendon and pisiform (Tay et al, 2007).

The final step in palpation around the ulnar aspect of the wrist is the pisiform grind test. This involves pinching the pisiform between finger and thumb, compressing it dorsally (into the triquetrum) and gliding it radially and ulnarly. Pain with this manoeuvre is suggestive of degenerative changes within the pisotriquetral joint.

### Movement

Assessment and measurement of the range of motion in the three planes (flexion or extension, radial or ulnar deviation, and pronation or supination) must be bilateral. While

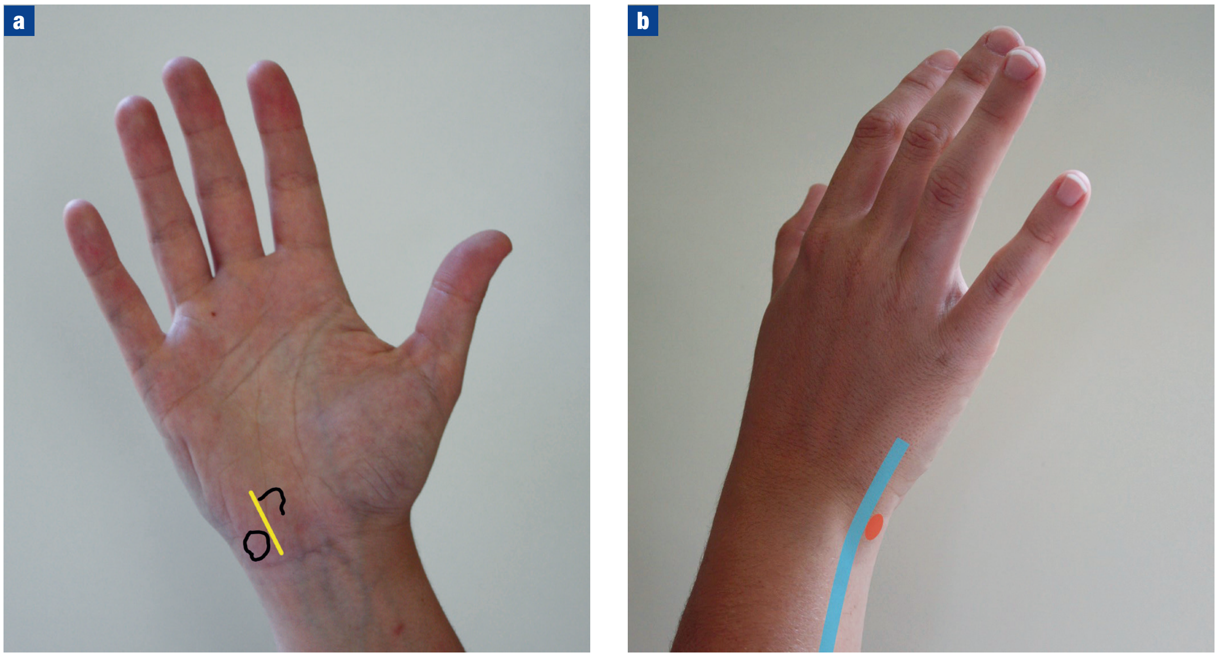


Figure 2. Key surface anatomy landmarks to orientate the examiner. **a.** On the volar aspect, the superficial pisiform bone can be palpated easily, with the flexor carpi ulnaris tendon inserting therein, and the hook of hamate located distal and radial to the pisiform. Between these bony landmarks runs the ulnar nerve in Guyon's canal (in yellow). **b.** On the dorsal aspect, the course of the extensor carpi ulnaris tendon (highlighted in blue) can be palpated, down to its insertion at the base of the fifth metacarpal. The fovea (in red) is located at the soft spot just distal to the end of the ulna, between the extensor carpi ulnaris and flexor carpi ulnaris.

not necessarily specific to identifying a diagnosis, this is important in highlighting the potential severity of disability and monitoring change after interventions. Assessing the range of movement can often uncover instability of the distal radioulnar joint or the extensor carpi ulnaris tendon, which will jump in and out of its groove on rotation of the forearm. While assessing movements, a useful quick adjunct is the test for extensor carpi ulnaris tendinitis, where the examiner resists the patient performing wrist extension in ulnar deviation. A positive test will produce pain localized to the extensor carpi ulnaris tendon as it runs over the distal ulna and inserts into the base of the fifth metacarpal.

### Specific tests

As well as assessing the neurological and vascular status of the limb, two specific tests are advocated to complete the examination, illustrated in *Figure 3*. Both of these tests are performed with the patient resting his/her elbow on the table and hand pointing up (arm wrestling position).

The ulnocarpal stress test is performed by axially loading the wrist in maximum ulnar deviation, while pronating and supinating the wrist. This is a provocative test, that while sensitive to the presence of pathology, is not very specific as it can be painful in cases of ulnar impaction syndrome, triangular fibrocartilage complex tear or lunotriquetral ligament tears (Nakamura et al, 1997).

The final test, known as the ballottement test, is performed to determine the stability of the distal radioulnar joint. This is done with the wrist in neutral initially and should always be done in comparison to the asymptomatic side. Using both hands the examiner clasps the distal radius between the finger and thumb in one hand and the distal ulna in the other. With one hand stabilizing the radius, the ulna is moved volarly and dorsally. Moving the patient's wrist into radial deviation tightens the structures on the ulnar side of the wrist and should reduce the extent of movement of the ulna at the distal radioulnar joint. Instability at the distal radioulnar joint is most commonly associated with distal radius fractures following disruption to the sigmoid notch. The triangular fibrocartilage complex is an important stabilizer of the distal radioulnar joint and triangular fibrocartilage complex tears can result in instability. Pain on palpation and on examining the stability of the distal radioulnar joint can point towards distal radioulnar joint osteoarthritis.

## An anatomical approach to investigation and diagnosis

After obtaining the history and completing an examination, a list of differential diagnoses should be considered. This article discusses the most common pathologies responsible for ulnar-sided wrist pain, categorised into problems of the bone, soft tissue and neurological structures. Clearly there can be some overlap, for example a fracture of the hook of the hamate may also cause symptoms of ulnar nerve compression in Guyon's canal. However, considering the origin of the pain in light of the anatomical structures can help decide upon appropriate investigations where necessary.

### Bone

A number of pathologies involve the bone and joints of the wrist. Where bony diagnoses are suspected, plain radiographs provide a useful first step. These bony

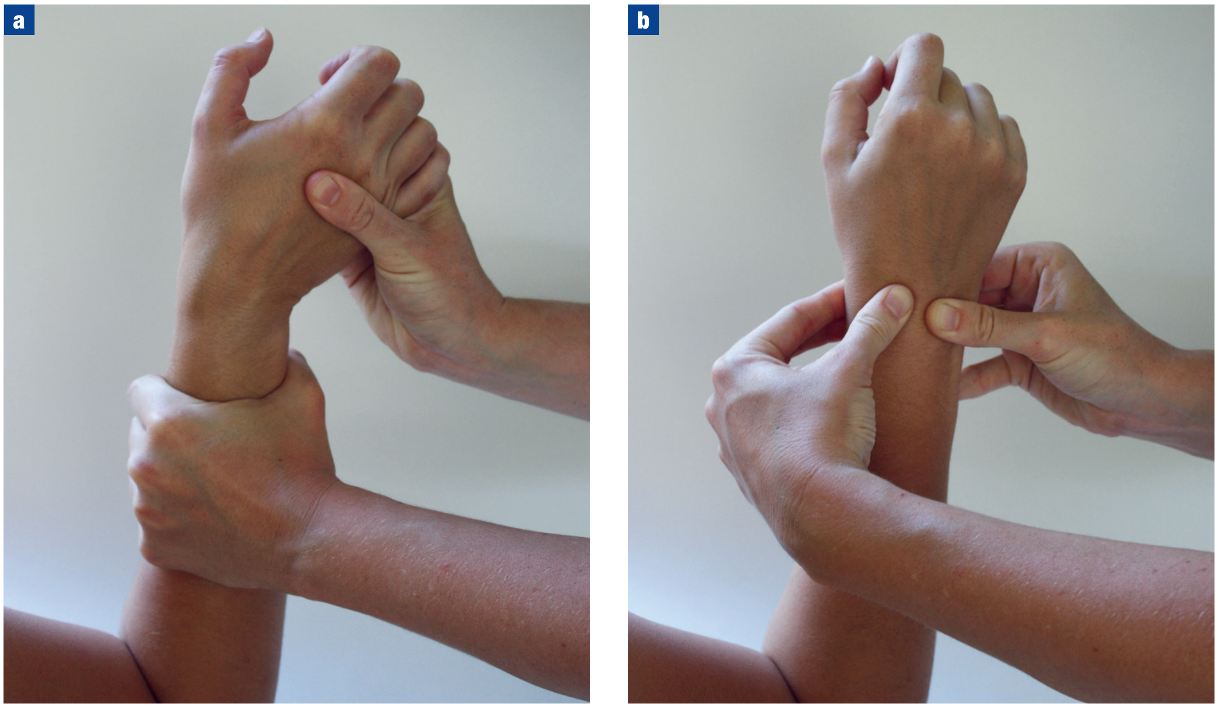


Figure 3. **a.** The ulnocarpal stress test. **b.** The ballottement test for distal radioulnar joint stability.

pathologies should be considered as either static or relational as a means of planning appropriate investigative steps thereafter if necessary.

**Static bony diagnoses**
Static pathologies such as fracture of hook of hamate, pisotriquetral arthritis or Kienböck's disease are those in which the pathology is evident irrespective of the position of the wrist. There is localized tenderness on palpation, meaning that the diagnosis can often be established clinically. Plain radiographs can help confirm the diagnosis. A series of plain posterior-anterior and lateral views of the wrist can be supplemented by a carpal tunnel view to visualize the pisotriquetral joint or a hook of hamate fracture.

Classically, Kienböck's disease presents with central dorsal wrist pain and localized tenderness to palpation over the lunate, but it should remain a differential for patients with ulnar-sided pain. In advanced stages of Kienböck's disease, sclerosis or collapse of the lunate will be evident on plain radiographs but early disease will only be revealed on magnetic resonance imaging, which will show reduced vascularity of the lunate (Porteous et al, 2012).

**Relational bone diagnosis**
Some pathologies responsible for ulnar-sided wrist pain cause symptoms as the bony structures move in relation to each other. These pathologies are most often revealed on dynamic examination and importantly may require dynamic investigations, with the wrist moved into specific or multiple positions.

First the distal radioulnar joint can be the source of pain either secondary to distal radioulnar joint instability or from degenerative changes within the joint. An unstable distal radioulnar joint is often clearly seen on clinical examination. Where the diagnosis is in doubt, a computed tomography scan of the wrist is helpful. The soft tissue causes of distal radioulnar joint instability also warrant investigation (see below).

The second relational bony disorder to consider is ulnar impaction syndrome or ulna abutment. This occurs when the distal part of the ulna abuts against the proximal carpal row, with symptoms more prominent with increased ulnar load (e.g. power grip, ulnar deviation). It is most commonly seen in patients with positive ulnar variance, where the distal end of the ulna is longer in relation to the distal radial articular surface, but it can occur in patients with normal or negative ulnar variance. Positive ulnar variance can be secondary to malunion or malformation of the radius or indeed a variation of normal (Cerezal et al, 2002). Positioning of the arm for imaging to determine variance is therefore key. The commonly accepted position for radiographs is with the wrist in neutral, ensured by abducting the shoulder to 90° and elbow flexed to 90° (90/90 view) (Watanabe et al, 2010).



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Determining the ulnar variance is a necessary first step in investigation of a patient with positive ulnar impaction examination findings (e.g. ulnar grind test).

Magnetic resonance arthrogram remains the next line of investigation after plain 90/90 films. The triangular fibrocartilage complex that sits between the distal ulna and proximal carpus is commonly degenerate in ulnocarpal impaction syndrome and can be evaluated on magnetic resonance imaging, along with identifying any bony oedema within the lunate, against which the ulna is abutting.

### Soft tissue
Plain radiographs are of limited value in the evaluation of soft tissue causes of ulnar wrist pain.

In the investigation of swellings or masses around the wrist, the examination should reveal the most likely diagnosis. Ultrasound examination is a useful means of characterizing a lesion and confirming a diagnosis.

Ultrasound is also useful in the diagnosis of extensor carpi ulnaris tendinitis or instability. The extensor carpi ulnaris tendon sits within a subsheath in the sixth extensor compartment of the wrist, close to the ulnar styloid. The tendon can become inflamed and symptomatic, often tender on palpation and the pain is reproducible with resisted wrist extension in ulnar deviation. Furthermore, if the subsheath is ruptured the extensor carpi ulnaris tendon can sublux around the ulnar styloid on pronation, snapping back into its groove with supination, worsening inflammation and pain. Features of tendinitis or tenosynovitis can be seen statically on ultrasound and extensor carpi ulnaris instability can be diagnosed by visualizing the subluxation of the tendon from its groove on forearm rotation.

Magnetic resonance imaging is the mainstay in the diagnosis of ulnar wrist pain thought to be arising from soft tissue pathology or indeed where focused clinical examination and initial radiographs fail to reveal an obvious cause.

The triangular fibrocartilage complex plays a major role in stabilizing the ulnar wrist and is intimately related to the bony structures known to cause pathology in ulnar-sided wrist pain.

Tenderness to palpation in the fovea suggests a triangular fibrocartilage complex injury. Even if this is absent but there is distal radioulnar joint or lunotriquetral instability or ulnar impaction syndrome, magnetic resonance arthrography is useful to identify the presence or location of triangular fibrocartilage complex tears,

## KEY POINTS

- Ulnar-sided pain is the presenting feature for numerous traumatic and degenerative conditions.
- Ulnar-sided wrist pain can be difficult to diagnose because of the density of structures present within a small area.
- In considering the cause of ulnar-sided pain, an anatomical approach is helpful, breaking the problem down into bony, soft tissue or neurovascular.
- Bone-related causes of ulnar-sided pain can be static or dynamic. Dynamic problems are best investigated by modalities allowing some dynamic assessment.
- Magnetic resonance arthrogram is the most sensitive investigation for assessing intra-articular soft tissue problems.
- Ultrasound is best for assessing tendon-related pathology.

and identify any oedema in the carpal bones. Magnetic resonance arthrogram will also provide information on the integrity of the interosseous ligaments of the carpus and reveal degenerative changes within the joints of the wrist. While magnetic resonance arthogram is sensitive and specific for triangular fibrocartilage complex tears as per Asaad et al (2017), arthroscopic evaluation of the wrist remains the final step in diagnosing soft tissue causes of ulnar-sided wrist pain (DaSilva et al, 2017).

### Neurovascular

In a systematic approach to a patient with ulnar-sided wrist pain, one should always consider neurological causes of the pain. A formal neurological examination of the upper limbs should be undertaken, assessing for tone, power in all myotomes, sensation in dermatomes and reflexes, to exclude proximal pathologies (e.g. cervical radiculopathy) as a cause of wrist pain.

Further assessment of the ulnar nerve is also key. The ulnar nerve is vulnerable to compression at multiple points along the arm. The most common site of compression is at the elbow, within the cubital tunnel, but it can also be compromised at the level of the wrist in Guyon's canal, which is particularly relevant in patients reporting ulnar-sided wrist pain.

Tinel's test can be performed on the ulnar nerve at elbow and over Guyon's canal to aid diagnosis (Beekman et al, 2009). Guyon's canal is approximately 4 cm long, conducting the ulnar nerve (both sensory and motor components initially) and ulnar artery into the hand. It runs between the hook of hamate radially and the pisiform bone ulnarly.

Nerve conduction studies will confirm the clinical diagnosis and the location of compression within the ulnar nerve. There are multiple potential aetiologies for distal ulnar nerve compressions, including the presence of a space-occupying lesion such as a ganglion or lipoma in the canal, a hook of hamate fracture or habitual external compression (seen in cyclists, caused by handlebars) (Capitani and Beer, 2002; Bachoura et al, 2013; Wang et al, 2014). An ulnar artery aneurysm or thrombus can also cause compression on the ulnar nerve in Guyon's canal. This highlights the importance of checking the vascular status of the limb and completing an Allen's test to check for patency of the ulnar artery during the examination.

Magnetic resonance imaging of the wrist is useful after nerve conduction studies to identify and characterize any lesion within Guyon's canal and plan for operative intervention.

## Conclusions

Ulnar-sided wrist pain is difficult to correctly diagnose and treat. The first step in diagnosis should always be a thorough history and examination, through which the problem can usually be isolated into bony, soft tissue or neurological pathologies. Investigations can then be requested that appropriately focus on the areas of concern. **BJHM**

*Conflict of interest: none.*


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