

# The patient with an acute painful wrist

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## Abstract

Patients with wrist pain commonly present to primary care and emergency departments. A detailed history and examination, alongside relevant imaging, will help find the correct diagnosis and ensure that patients receive the correct treatment in a timely manner. This article summarises the key points in history and examination and the role of imaging, including suggestions of which modality should be requested. Finally, important acute pathologies are highlighted, including fractures, soft tissue injuries and infection, with examples of their relevant imaging.

**Key words:** Imaging; Musculoskeletal; Pain; Wrist

**Submitted:** 4 April 2023; **accepted following double-blind peer review:** 31 July 2023

## Introduction

Musculoskeletal pain is the leading cause of morbidity in England (Public Health England, 2020). Wrist pain is a common cause of presentation, with a prevalence of 58 per 10 000 primary care consultations (Jordan et al, 2010), and accounts for up to 20% of emergency department attendances (Robinson et al, 2016). These figures demonstrate the significant burden that wrist pain places on health services. Accurate diagnosis is therefore vital for appropriate use of resources and to limit patients experiencing pain.

There is a wide array of underlying aetiologies for wrist pain, so there is no set UK guidance on managing wrist pain. Guidelines for certain pathologies such as distal radius fractures (National Institute for Health and Care Excellence, 2016; British Society for Surgery of the Hand and British Orthopaedic Association, 2018) are available, but their use requires a clinician to first consider the condition as a differential. Therefore, thorough history, examination and high clinical suspicion are required for diagnosis. This article is intended to equip clinicians, particularly those working in emergency settings, with a pragmatic approach to assessing acute wrist pain, focusing on common, important causes of unilateral acute wrist pain. Acute pain is rapid in onset and is usually related to an underlying pathological or traumatic process.

## History and examination

A history for a patient with wrist pain should identify onset, location, timing, duration, radiation, severity, history of trauma or recent illness, movements which either improve or ease the pain, and any known inflammatory arthropathies. **Table 1** identifies associated symptoms and signs to address, categorised as localised or systemic. It is also important to ascertain the patient's age, occupation and hand dominance.

An orthopaedic examination of the wrist should follow a 'look, feel, move' approach. 'Look' includes assessing for swellings, skin changes (including whether open), ecchymosis, erythema and deformity. 'Feel' includes palpating in a systematic manner to include the dorsal, volar, ulnar and radial aspects of the wrist. Knowledge of surface anatomy is helpful when examining the wrist and identifying potential pathologies, for example, tenderness of the anatomical snuffbox is suggestive of scaphoid pathology. Finally, based on history and examination findings, special tests can then be performed, such as the Kirk Watson test for suspected scapholunate instability (Bostock and Birks, 2022).

A diagnosis can be reached from a comprehensive history alone in up to 70% of patients with wrist pain (Forman et al, 2005). At the very least, when combined with examination, history will guide whether the patient needs imaging for further assessment, its urgency

### How to cite this article:

Harries K, Osmani HT, Patel J, Robinson P, Horwitz MD, Ahmed N. The patient with an acute painful wrist. *Br J Hosp Med.* 2023. <https://doi.org/10.12968/hmed.2023.0133>

**Table 1. Symptoms and signs to ask and observe for during history and examination of the painful wrist**

Associated localised symptoms and signs	Lacerations or wounds
	Swelling
	Erythema
	Pallor
	Warm to touch
	Paraesthesia
	Loss of power
	Stiffness
Associated systemic symptoms	Fever or high temperature
	Light headedness or dizziness
	Nausea

From Bostock and Birks (2022)

and referral to secondary care. Red flag symptoms that warrant urgent referral (NHS, 2022) to the emergency department include:

- Severe wrist pain
- Constitutional symptoms resulting from wrist pain
- Trauma causing a ‘snap, grinding or popping noise’ (NHS, 2022)
- Loss of power
- Paraesthesia
- Deformity or pallor to the wrist.

To confirm the diagnosis, or if there is any uncertainty, imaging is the next step.

## Role of imaging

When used appropriately, radiological imaging can identify many diagnoses. A plain radiograph is the mainstay for initial imaging, providing a quick and inexpensive investigation, with a relatively low dose of radiation. Misdiagnoses of a sprained wrist demonstrate the need for detailed review of radiographs, with 91% of these misdiagnoses caused by abnormalities missed by clinicians (Guly, 2002). For suspected fractures in the emergency department, National Institute for Health and Care Excellence (2016) guidelines state that a ‘trained reporter’ should complete a written report of radiographs before the patient is discharged. While this would reduce errors in diagnosis and time to correct treatment, it may not be possible given the volume of work and radiology staffing levels. A basic approach to assessing appendicular radiographs for emergency department clinicians is provided in [Table 2](#), although the authors would encourage all emergency department clinicians to undertake training in radiological interpretation. Posteroanterior and lateral views should be obtained for assessment. Additionally, scaphoid views should be obtained if a scaphoid fracture is considered.

Plain radiographs should be the initial choice of imaging modality in almost all presentations of wrist pain, and in many circumstances no further imaging is required. In the acute setting, further imaging would normally be considered after specialist orthopaedic referral. Computed tomography may be used to assess for fractures or penetrating trauma, in cases where there is high clinical suspicion despite a normal radiograph, in the presence of joint malalignment or for fractures requiring surgical management planning (Etli et al, 2020). The choice of further imaging for suspected scaphoid fractures (magnetic resonance imaging or computed tomography) may be time dependent or based on hospital policy (Rua et al, 2018; Kodumuri et al, 2021). Suspected ligament or tendon injuries require magnetic resonance imaging or ultrasound. Infectious causes may also require ultrasound or magnetic resonance imaging.

**Table 2. Approach to reviewing appendicular radiographs**

Assessment	Consideration
Adequacy	Check the anatomical area in question is in view
Alignment	Assess joint and bone alignment
Bones	Look for cortical disruption in all bones
Soft tissue	Look for soft tissue swelling and evaluate the bones deep to it
Foreign body	Look for radio-opaque or radiolucent foreign bodies
Satisfaction of search	Look for additional pathology if an abnormality is identified
Two views	Always review all views taken
Compare	If available, compare with previous radiographs

From Williams (2013)

## Acute presentations

### Fractures

Wrist and hand fractures account for 1.5% of all emergency department visits (American College of Radiology, 2018). Wrist fractures are partial or complete breaks affecting the distal radius and ulna, and carpal bones. These can affect one or multiple bones, and may present with associated dislocations of carpal bones or distal radioulnar joint. Common symptoms and signs are pain, swelling and potential deformity. Plain radiographs are needed to diagnose and differentiate fractures. [Table 3](#) provides details of common wrist fractures.

#### Distal radial fractures

Distal radial fractures are most common, accounting for 61% of wrist fractures (Mulders et al, 2019). They often occur as a result of a fall onto an outstretched hand, typically presenting with radial-sided wrist pain and swelling. They are often accompanied by other wrist fractures, with 55–61% having concomitant ulnar styloid fractures (Shahabpour et al, 2021), which may make it challenging to localise symptoms. Depending on the patient and the characteristics of the fracture, management may involve splints, casts, k-wires or plates. Displaced fractures can be reduced in the emergency department and, when needed, surgery should be performed

**Table 3. Common fractures and their mechanism of injury**

Fracture	Eponymous name	Mechanism of injury
Extra-articular distal radius with dorsal angulation ( <a href="#">Figure 1</a> )	Colles' fracture	Fall onto outstretched hand
Extra-articular distal radius with volar angulation ( <a href="#">Figure 1</a> )	Smith's fracture	Fall onto dorsum of outstretched hand with wrist flexed
Intra-articular fracture involving volar or dorsal lip of distal radius with associated radiocarpal joint dislocation	Barton's fracture (volar or dorsal)	Fall onto outstretched hand
Radial styloid fracture	Chauffeur's fracture	Direct impact to wrist or fall
Mid to distal third radial shaft fracture with distal radioulnar joint dislocation or subluxation	Galeazzi fracture	Fall onto outstretched hand with pronated forearm
Ulnar styloid fracture		Fall onto outstretched hand often behind the body
Scaphoid fracture		Fall onto outstretched hand
Triquetrum fracture		Fall onto outstretched hand in ulnar deviation
Hamate fracture		Direct impact to wrist, eg golf club hitting hard ground

From Tidy (2022)

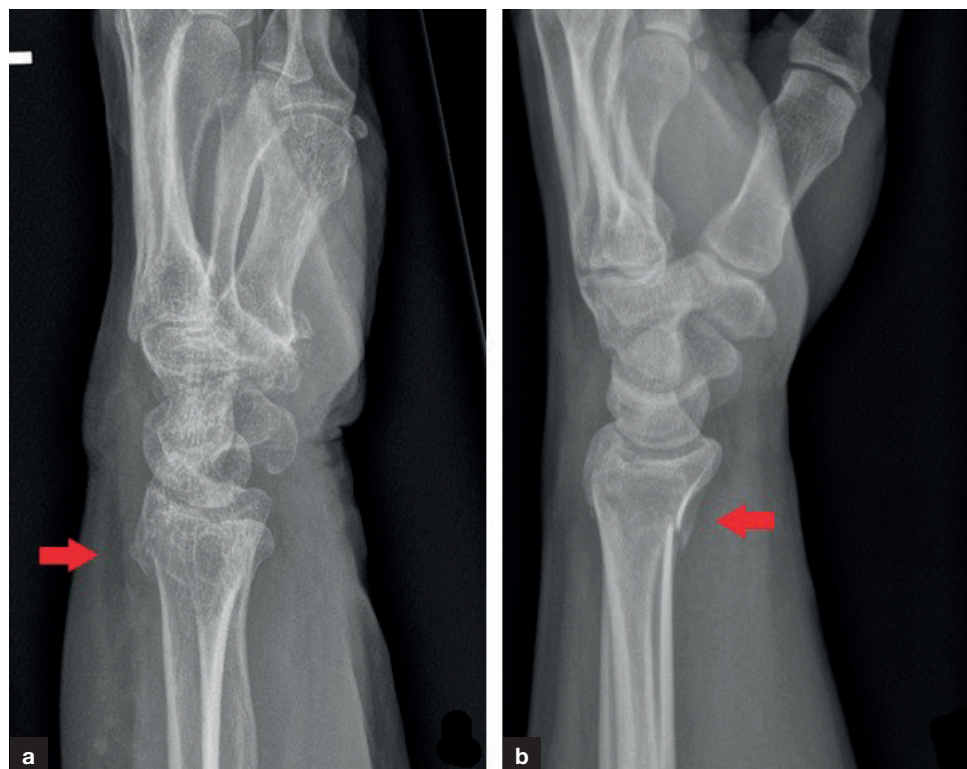
within 72 hours for intra-articular fractures, and within 7 days for extra-articular fractures (National Institute for Health and Care Excellence, 2016). It is also important to remember that the median nerve can be damaged, so its motor and sensory supply should be assessed (British Society for Surgery of the Hand and British Orthopaedic Association, 2018).

### Scaphoid fractures

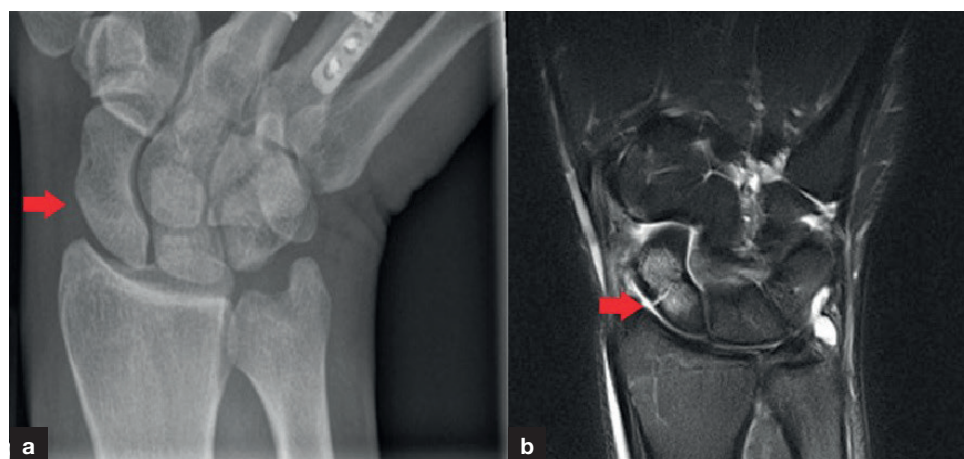
While many fractures are diagnosed on plain radiograph alone, carpal bone fractures are often occult (Shahabpour et al, 2021). Scaphoid fractures account for 90% of carpal fractures (Dias et al, 2020), usually in young patients. The classical presentation is tenderness in the anatomical snuffbox on examination, following a fall onto outstretched hand. If a scaphoid fracture is suspected, additional radiograph projections of the scaphoid should be obtained. As acute fractures are not always visible on plain film (Figure 2), even when radiographs are repeated after 10–14 days, magnetic resonance imaging is advised and can even be considered for first-line imaging (National Institute for Health and Care Excellence, 2016). Early cross-sectional imaging and diagnosis is needed because the majority of the blood supply to the scaphoid enters via the distal pole, so fractures risk avascular necrosis of the proximal fracture fragment, with consequent risk of osteoarthritis. Management can be non-operative, with immobilisation and a cast, or operative, using percutaneous screws or open reduction and internal fixation. This depends on the location and fracture characteristics, for example the most common type of scaphoid fracture is through the waist, and if displacement is 2 mm or less, then this should be managed with a cast (Dias et al, 2020).

### Soft tissue injury

In the acute setting of trauma with severe symptoms but normal or non-diagnostic radiographs, subluxation, tendon and ligament injuries should be considered. These will require magnetic resonance imaging or ultrasound, as agreed with local radiologists (in and out of hours), and can lead to disability if not diagnosed and treated. Acute wrist sprains may also affect the intrinsic or extrinsic ligaments (May and Varacallo, 2023), typically presenting with pain and swelling. While sprains of the extrinsic ligament tend to recover quickly, intrinsic sprains can result in secondary sequela if missed. Two important soft tissue structures prone to injury are the scapholunate ligament and triangular fibrocartilage complex.



**Figure 1.** Lateral wrist radiographs. a. Colles' fracture. b. Smith's fracture.



**Figure 2.** Occult scaphoid fracture, (a) not clearly seen on radiograph but (b) visible on magnetic resonance imaging.

### Scapholunate ligament injury

The scapholunate ligament is the most frequently injured carpal ligament (Andersson, 2017) and is often overlooked in the emergency department. It may be injured in isolation or associated with wrist fractures, with up to 40% of patients with distal radial fractures having concomitant scapholunate ligament injuries (Shahabpour et al, 2021). The ligament complex comprises dorsal, volar and intermediate components joining the lunate and scaphoid bones, with the dorsal fibres providing the greatest stability (Andersson, 2017).

Acute injury is often secondary to a fall onto outstretched hand, with radial-sided wrist pain and possible swelling. Depending on the degree of injury, ranging from sprain to partial or complete tears, there may be associated weakness and instability. When suspected, scapholunate ligament injuries can be assessed with the Kirk Watson test: radial deviation of the wrist while pressure is placed over the scaphoid tubercle volarly, causing the scaphoid to sublux off the radius if the scapholunate ligament is torn, with a ‘click’ typically felt (Bostock and Birks, 2022). However, false positive tests occur in up to 36% of the normal population (Bostock and Birks, 2022), so imaging is valuable.

Posteroanterior plain films should be assessed for widening of the scapholunate space, indicating scapholunate dissociation as a result of severe scapholunate ligament injury, known as the Terry-Thomas sign (Figure 3). Lateral views should be assessed for dorsal tilt of the lunate, indicating dorsal intercalated segment instability, a form of carpal bone instability. However, radiographs can often be normal, particularly in lower degree injuries, so dynamic scaphoid radiographs and magnetic resonance imaging should be considered. Magnetic resonance imaging will demonstrate disruption or distortion of the scapholunate ligament with surrounding high fluid signal, with or without widening of the scapholunate space. Finally, in the absence of positive imaging findings but high clinical suspicion, arthroscopy can be considered. Without treatment, scapholunate ligament injury results in carpal bone instability and changes the biomechanics of the wrist permanently, leading to osteoarthritis known as scapholunate advanced collapse (Figure 3) (Andersson, 2017). Depending on the degree of injury and instability, management may be immobilisation or surgical reconstruction.

### Triangular fibrocartilage complex injury

Triangular fibrocartilage complex injuries must be considered in both the emergency and primary care setting. The triangular fibrocartilage complex comprises a disc, meniscal homologue and ligaments that stabilise the distal radio-ulnar joint (Dunn et al, 2020). Acute trauma, with or without associated wrist fracture, usually follows a fall onto an outstretched hand with the forearm in pronation. Injuries cause ulnar-sided wrist pain that is worse on wrist supination and pronation. Examination will typically demonstrate focal tenderness between the ulnar styloid process and pisiform on the volar aspect of the wrist, with 95% sensitivity and 86% specificity for triangular fibrocartilage complex or ulnotriquetrial ligament injuries (Jawed et al, 2020). The triangular fibrocartilage complex compression test can confirm suspected injury: the forearm is pronated and the wrist compressed by pushing the



**Figure 3.** Frontal wrist radiographs. a. The Terry-Thomas sign – widening of the scapholunate space seen with a distal radial fracture. b. Scapholunate advanced collapse with old scaphoid fracture, collapse and destruction of the lunate, and gross widening of the scapholunate space.

hand proximally against the forearm, then radial and ulnar deviation of the wrist will cause a ‘click’ if positive for a triangular fibrocartilage complex tear (Bostock and Birks, 2022).

Triangular fibrocartilage complex injury cannot be assessed on plain radiograph, but these should be taken in the acute setting to rule out associated fractures, in particular ulnar styloid avulsion fractures. Magnetic resonance imaging is then used to demonstrate the extent and type of triangular fibrocartilage complex tear, which may be associated with a distal radioulnar joint effusion, and high fluid signal along the distal ulnar and styloid process (Figure 4). Treatment is usually conservative in the first instance with rest, simple analgesia, immobilisation and corticosteroid injections. If this is unsuccessful, or there is joint instability, surgical management is recommended (Dunn et al, 2020).

### Septic wrist

A true surgical emergency that requires urgent management is septic arthritis of the wrist. It is rare, accounting for 1.5% of presentations of wrist pain (Jennings et al, 2017). However, if left untreated septic arthritis of the wrist can cause joint destruction and, at worst, mortality. Risk factors include immunodeficiency, rheumatoid arthritis, diabetes mellitus, prosthetic implants, intravenous drug use or a history of recent surgery (NHS, 2023). Presentation



**Figure 4.** Traumatic triangular fibrocartilage complex tear on magnetic resonance imaging demonstrating high fluid signal along the distal ulna.

is typically a hot, erythematous, swollen and painful wrist, with systemic symptoms such as fever. Investigations will likely demonstrate elevated levels of white blood cells and C-reactive protein on blood tests. Differentiating septic arthritis from cellulitis or a non-infective arthritic flare, such as pseudogout or osteoarthritis, can be challenging. Therefore, a high clinical suspicion along with joint aspiration are required, with samples being sent for measurement of white blood cell levels, Gram stain, microscopy culture and sensitivity, as well as crystals. Plain film radiograph is often normal in the early stages. Ultrasound or magnetic resonance imaging may be used to assess for infection and potential damage, but the start of treatment must not be delayed while waiting for imaging. There may be a joint effusion, which is best appreciated on ultrasound (Figure 5). Magnetic resonance imaging is useful when radiograph and ultrasound are normal, as this may reveal early changes within the articular cartilage and subchondral bone. A fat–fluid level seen on magnetic resonance imaging, in the absence of trauma, is a specific sign for sepsis. When associated with bony destruction, osteomyelitis should be considered (Kumar et al, 2007). Treatment for septic arthritis requires open or arthroscopic washout and antibiotics (NHS, 2023).

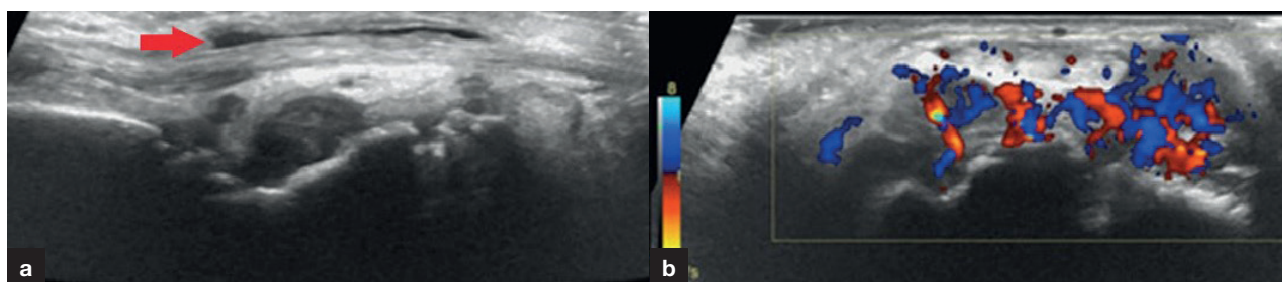
Pseudogout strongly mimics infection, with the wrist being the second most common joint affected after the knee, and history is essential when managing these cases. Extensive osteoarthritis can also become very inflamed and imitate infection. Plain film is useful to look for potential chondrocalcinosis in cases of pseudogout, or extensive degenerative changes in osteoarthritis, to differentiate from septic arthritis. A sexual health history is also important as gonococcal infection of the wrist must be considered (NHS, 2023).

### Ganglion cyst

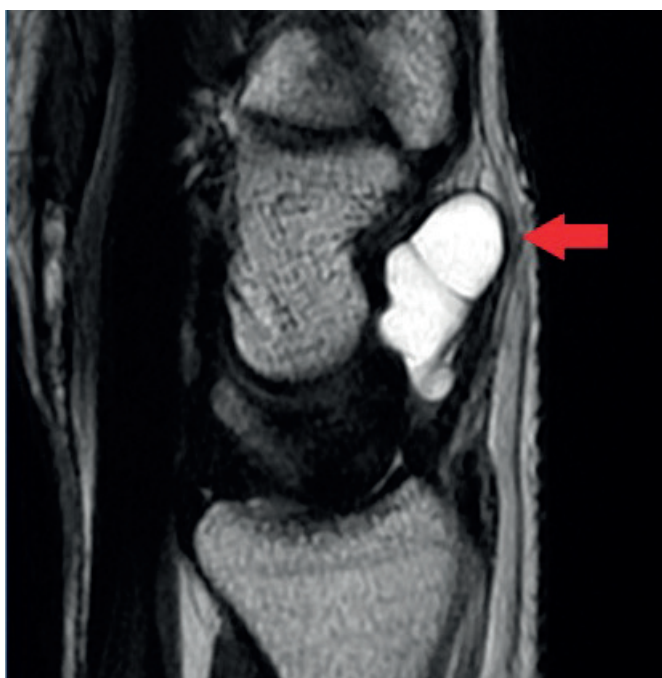
A final common pathology to consider in a patient with acute wrist pain is ganglion cysts, which are the most common cause of soft tissue swelling in the wrist (Suen et al, 2013). They are benign, fluid-filled, synovial cysts usually found on the dorsal aspect of the wrist, thought to arise as a result of repetitive microtrauma and stress of the wrist (Greugush and Habusta, 2023). While the majority are asymptomatic, they can cause pain by compressing adjacent structures and, if large enough, may limit range of movement. Examination will demonstrate a smooth, mobile, round mass which transilluminates. Ganglionic cysts can be diagnosed on clinical history and examination alone. Plain film should be used if there is concern about possible traumatic bony injury. Ultrasound and magnetic resonance imaging are not usually needed, but can be used if there is concern about alternative pathology such as tumour or vascular malformation (Greugush and Habusta, 2023). Magnetic resonance imaging will demonstrate a well-circumscribed high fluid signal, and ultrasound will show a rounded anechoic structure (Figure 6). Around 50% of cysts resolve spontaneously (Suen et al, 2013). If symptomatic, treatment options include aspiration alone, aspiration with corticosteroid injection, or excision (Greugush and Habusta, 2023).

### Conclusions

Acute wrist pain is a prevalent symptom with a multitude of aetiologies, ranging from benign to potential life-threatening pathology. This article has outlined history, examination and imaging protocols for investigating and diagnosing wrist pain, with appropriate use of emergency services. Common causes of acute pathologies have been discussed, to



**Figure 5.** Septic wrist. a. Ultrasound demonstrates fluid collection, with (b) hyperechoic fat and increased flow on colour Doppler indicating inflammation.



**Figure 6.** Well-circumscribed high fluid signal dorsal ganglion cyst on magnetic resonance imaging.

allow the clinician to consider differentials and have confidence when reviewing patients presenting with wrist pain.

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#### Conflicts of interest

The authors declare that there are no conflicts of interest.

#### Acknowledgements

The authors would like to thank Asif Saifuddin, consultant musculoskeletal radiologist at Royal National Orthopaedic Hospital NHS Trust, Stanmore, for contributing to the figures.

### Key points

- A plain radiograph is the initial imaging of choice for nearly all presentations of wrist pain.
- In the acute setting of trauma with normal or non-diagnostic radiographs, magnetic resonance imaging should be considered to look for occult fractures, subluxation, tendon, or ligament injuries. Ultrasound can also be an important rapid diagnostic tool.
- Scapholunate ligament and triangular fibrocartilage complex injuries are important soft tissue injuries to consider.
- Imaging for a suspected septic wrist must not delay starting treatment.
- Half of ganglionic cysts will resolve spontaneously, without need for intervention.

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