Fractures of the forearm and carpus

Dan Armstrong

Abstract

Fractures of the carpus and forearm include a wide range of injuries, but all have their own complexities and nuances. Injuries that are unrecognized, or inappropriately managed can lead to significant pain and disability later on. This article looks at common and less common injuries and the considerations required for each.

Keywords Carpal fractures; complications; forearm fractures; surgery

Distal radius fractures

Distal radius fractures are the most common orthopaedic injury. Fractures tend to occur in two age groups (a bimodal distribution); young patients, where the injury is high energy, and older people, where the injury is low energy.

Classification and description of distal radial fractures

There are multiple eponyms used for distal radius fractures (Table 1). There are also multiple classifications of distal radius fractures, including Fernandez (mechanism), Frykman (joint involved), AO etc, but there are some specific terms that will be clear to anyone, regardless of background knowledge of classification systems.

Clinically it is important to discuss whether the injury is:

- isolated – no other more important life- or limb-threatening injuries are present.
- neurovascularly intact – is there any neurological or vascular deficit?
- open or closed (avoid 'compound' or 'simple' as these can be confusing).

With regards to the X-ray interpretation consider the following about the fracture:

- extra- or intra-articular
- associated ulna injury (styloid, head, neck, distal radio-ulnar joint (DRUJ))
- shortening of the bone (relative to its original length)
- displacement of the distal part (dorsal/volar, radial/ulna)
- comminution (two pieces or multiple parts).

Figure 1 shows a dorsopalmar (DP) radiograph and a lateral radiograph of a distal radius fracture. The DP view may also be described as a posteroanterior (PA) view. The radiograph should not be taken anteroposterior (AP). Taking into account that we have assessed the patient clinically (isolated injury, neurovascular status normal, closed injury), we can describe the radiograph, as follows.

'There is a fracture of the distal radius which is extra-articular. There does not appear to be an ulnar injury, however the DRUJ on the PA view is not congruent. There is dorsal displacement of the distal fragment, with dorsal angulation. There is also some shortening. Though the fracture does seem to be mainly in two parts, there is fragmentation dorsally.'

Descriptively, this is much better than just saying it is a Colles' fracture!

Figure 2 shows another distal radius fracture. We can describe it as an intra-articular distal radius fracture involving the volar part of the radiocarpal joint. There does not seem to be an ulnar injury. The volar fragment has become shortened, moving proximally. The carpus has then dislocated from the radiocarpal joint and moved volar and proximally.

Again, this could be described as a volar Barton's, but that does not point out the radiocarpal subluxations explicitly. The person that dealt with this injury also has misunderstood the injury. They have put a plaster backslab on the dorsal surface of the wrist. The whole wrist wants to move volarly; as such the plaster needs to be volar to try and restrict this subluxation. This injury is unstable and requires fixation as conservative treatment will fail.

Distal radius fractures can also be very subtle. Consider the radiograph of the left wrist (Figures 3 and 4). The star (aka 'Red Dot' from when X-rays were hard copy and there was an actual red dot placed on the radiograph) reveals that there is an injury but it is very subtle.

Arrow 1 in Figure 4 shows a fracture of Lister's tubercle (between the 2nd and 3rd dorsal compartments). Arrow 2 shows a volar break in the cortex of the radius; however, owing to superimposition of the ulna, this is harder to see. Arrow 3 shows an intra-articular gap from the fracture extending into the joint.

Complications of distal radial fractures

Extensor pollicis longus (EPL) is the long extensor of the thumb. It has its own compartment (3rd) and has the unique action of thumb retropulsion (place your palm flat on the table and lift your thumb away from the table – retropulsion). It has a risk of spontaneous rupture with distal radius fractures. It is more common in **undisplaced** fractures than displaced fractures. There are multiple theories as to why it happens, some believing that displacement causes disruption of the enclosing compartment thereby 'decompressing' the EPL tendon. It is at its most avascular around Lister's tubercle and it is likely that this combined with increased intracompartmental pressure results in rupture. This rupturing is most often around the 6-week period, although it can still occur while the patient is immobilized.

Other complications associated with distal radius fractures include:

- carpal tunnel syndrome (early or late)
- radiocarpal arthrosis (2–30%). This may be asymptomatic. If the articular step off is greater than 1–2 mm then 90% of patients will get posttraumatic osteoarthritis (OA)
- malunion/non-union
- compartment syndrome
- complex regional pain syndrome.

Dan Armstrong *BMedSci BMBS MRCSEd FRCS (Tr&Orth) Dip Hand Surg is a Consultant Hand and Wrist Surgeon at the Pulvertaft Hand Centre, Derby, UK. Conflicts of interest: none declared.*

Classification of distal radius fractures

Eponym	Description
Colles'	Extra-articular fracture of the distal radius with dorsal displacement of the distal fragment often associated with shortening and dorsal angulation
Smith's (reverse Colles')	Extra-articular fracture of the distal radius with volar displacement of the distal fragment often associated with shortening and volar angulation
(Dorsal) Barton's	Intra-articular fracture involving the radiocarpal joint (dorsal side), often with subluxations of the carpus as a result
(Volar) Barton's	Intra-articular fracture involving the radiocarpal joint (volar side), often with subluxations of the carpus as a result
Chauffeur's fracture	Radial styloid fracture
Die Punch	Depressed lunate fossa fracture (and therefore intra-articular)

Table 1

Surgical intervention

Indications for intervention are often discussed and much debate remains concerning the most appropriate management. A recent paper (Karanta et al.) randomized volar locking plates with percutaneous K-wire fixation. The paper appeared to show an earlier recovery of the plated patients but at 12 weeks and beyond, no significant difference in function was seen.

Numerous factors need to be taken into account regarding fixation. Frank discussion with patients will normally help guide acceptable treatment choices for both surgeon and patient.

Patient preference needs to be considered along with hand dominance and occupation. A self-employed manual labourer may manage to keep his customers and business if the fracture is surgically plated, with the seemingly early functional advantage it conveys. Lower demand patients or those whose financial security does not depend on an early return to work may be entirely happy to be in plaster for 6 weeks.

Figure 1 Distal radius fracture I.

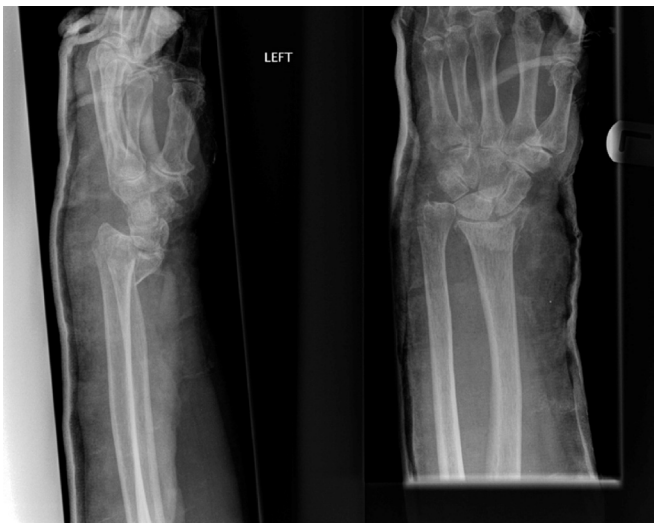

Figure 2 Distal radius fracture II.

Characteristics of the fracture are also important. Initial management of any fracture is splintage (the most effective analgesia), supplemental pain relief and reduction of the fracture (again this improves pain).

A significant question that needs addressing prior to instigation of treatment is: 'If treated conservatively will the fracture maintain its position/is it stable?' Consider the distal radius fracture shown in Figure 5.

What treatment is required for this fracture? Firstly this is a child as the growth plates are still open. This means that as part of the injury, the bone undergoes plastic deformation. Unless a significant force is reapplied (another fall or an orthopaedic surgeon's manipulation) this fracture will stay deformed. The fracture in Figure 5 is stable, extra-articular and minimally displaced. My practice with these buckle (or torus) fractures is to place the wrist in a futura splint for comfort for two weeks. The splint is then discarded by the patient. The fracture is stable and as such needs no further imaging.

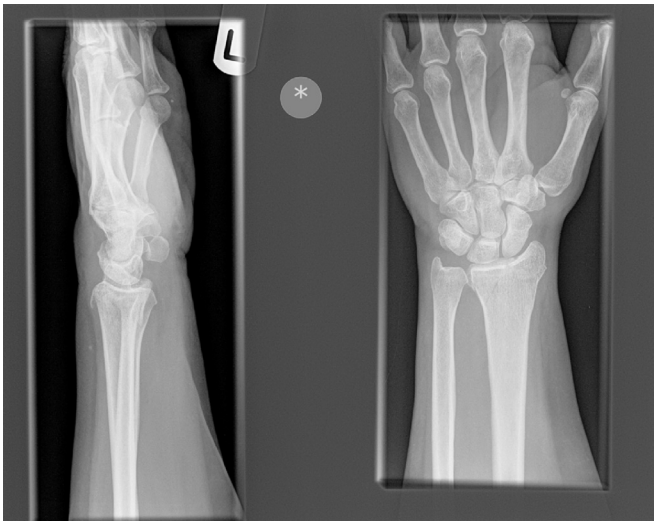

Figure 3 Distal radius fracture III.