

# **1 Upper limbs**

## The hand

Hand injuries are common in sport, with ball-handling sports, gymnastics and fighting both in the ring and recreationally producing many of these injuries. Plain films play a major role in the diagnosis of hand problems following trauma and should be the initial method of examination.

### Routine views

There are two standard views of the hand (Fig. 1.1). A *PA view* is taken with the patient seated, the forearm resting on the table and the hand lying prone on the cassette. The fingers are slightly and evenly spread, with a straight tube centred on the head of the third metacarpal.

An *oblique view* is obtained by raising the radial side of the hand and supporting the hand on a 45 degree wedge. The fingers are straight and slightly separated and the tube is again centred on the third metacarpal head.

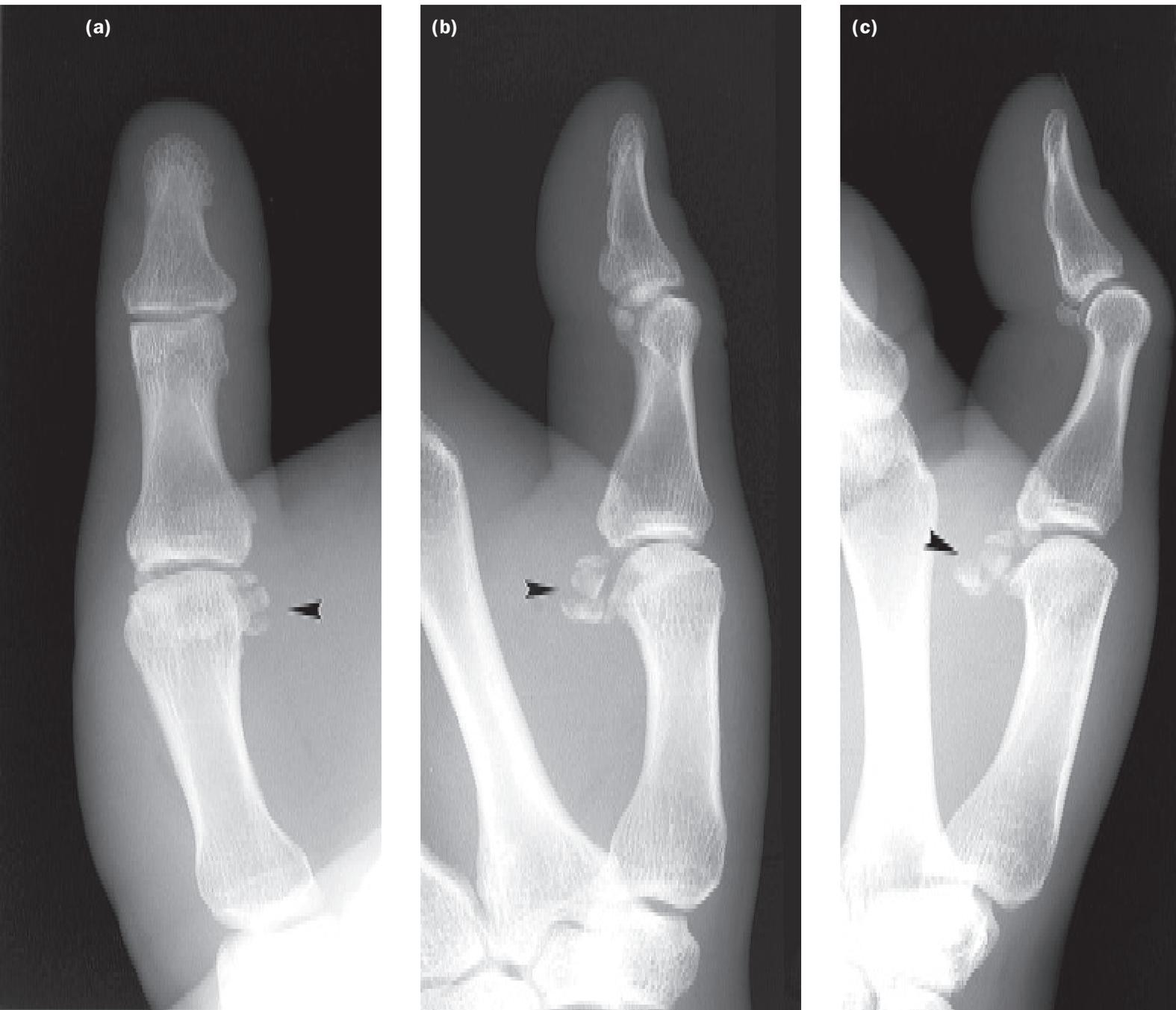
↓ **Figure 1.1** (a) A PA view. (b) An oblique view of the hand of a young footballer. The fractures of the bases of the third and fourth metacarpals are identified on the PA projection but an oblique view is necessary to help appreciate the dorsal dislocations of the fourth and fifth carpometacarpal joints.



### Conditions requiring additional views

**1. Injury to the thumb and first carpometacarpal joint.** Common sporting injuries include fractures at the base of the first metacarpal and injury to the ulnar collateral ligament (skier's thumb). Because the thumb lies in a different anatomical plane to the remainder of the hand, a specific thumb series is required (Fig. 1.2). A true AP, an oblique and a lateral view of the thumb should be obtained. The AP view of the thumb is taken with the hand in internal

rotation and the dorsal surface of the thumb lying flat on the cassette. The film is centred on the metacarpophalangeal joint. With the examination of all digits, an oblique view allows additional assessment of articular margins. Small separated fragments may be best seen in this view. A lateral view of the thumb is also centred on the metacarpophalangeal joint. A well-positioned lateral view is essential for assessment of the first carpometacarpal joint.

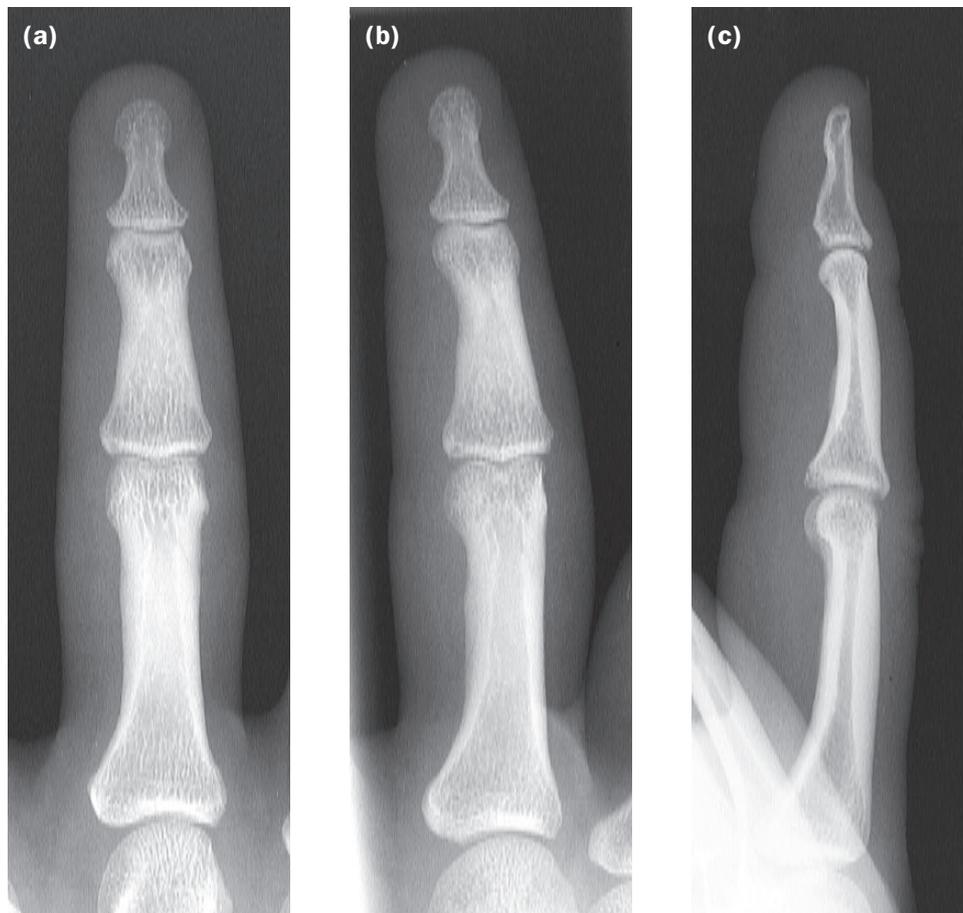


↑ **Figure 1.2** (a) an AP, (b) an oblique and (c) a lateral view of the thumb. A cricketer, in attempting to catch the ball, has suffered a comminuted fracture of the medial sesamoid (arrowheads) caused by direct impact of the ball.

**2. Injury to fingers.** Fingers are commonly injured in sport (Fig. 1.3). A standard finger series is a *PA, oblique and lateral views* (Fig. 1.4). Whenever possible, the finger should lie fully extended against the cassette. These views are centred on the proximal interphalangeal joint and coned almost to the edge of the soft tissues. Finger injuries always require a true lateral view for fracture identification and the assessment of displacement. The small fragments displaced by both volar plate injuries and ligamentous avulsions will be seen on the ventral and dorsal aspects of the phalanges (Fig. 1.5). An oblique view can be valuable for demonstrating minor volar plate avulsions. Lateral views can be taken individually or with the fingers 'splayed' on a stepped sponge.



→ **Figure 1.3** A fishhook fragment lodged in the middle phalanx. The patient wasn't quick enough to avoid his companion's cast. Fingers are commonly injured in sport due to their exposed position and their role in intricate tasks.



← **Figure 1.4** A finger series is (a) a PA view, (b) an oblique view and (c) a lateral view. In this case, a footballer has been hit on the end of the finger by a football, causing axial loading and injury to the proximal interphalangeal joint. The cartilaginous volar plate has most likely been injured. Fusiform soft tissue swelling around the joint is a characteristic radiological sign of this injury.

↓ **Figure 1.5** A lateral view is important for the identification of an avulsed fragment. In this case, forced extension of a flexed finger has caused the flexor digitorum profundus to avulse a bone fragment from its insertion on the anterior aspect of the base of the distal phalanx. The fragment appears to be hinged on the volar plate of the distal interphalangeal joint. This injury is known as a 'jersey finger'.



**3. Metacarpal fractures.** Punching injuries are the commonest cause of metacarpal fractures, most commonly involving the neck of the fifth metacarpal. If a metacarpal fracture is seen on the standard views, a lateral or just-off lateral view (Fig. 1.6) is useful for assessing displacement.



↑ **Figure 1.6** A punching injury has resulted in fractures of the shaft of both the fourth and fifth metacarpals and the base of the third metacarpal. A lateral view shows anterior angulation of the distal fragments at the fourth and fifth metacarpal fractures.



**4. Injury to the base of the fifth metacarpal.** Fractures of the base of the fifth metacarpal are also commonly the result of a punching injury and the fractures and fracture/dislocations can be difficult to see on routine hand views. They are often unstable, behaving like small Bennett's fractures. Associated fractures of the hamate can also occur. An AP oblique view of the hand should be obtained (Fig. 1.7). This view is taken AP, lifting the radial side of the hand. The beam is centred on the midshaft of the fifth metacarpal with coning to include the hamate.

**5. Skier's thumb.** A stress view, applying valgus stress to the first metacarpophalangeal joint, often helps to demonstrate injury to the ulnar collateral ligament when an avulsed fragment is not present (Fig. 1.8).

← **Figure 1.7** An anterior oblique view of the hand demonstrates the presence of a fracture dislocation at the fifth metacarpophalangeal joint (arrow). There is also an old ununited fracture of the ulnar styloid process.



→ **Figure 1.8** In the absence of an avulsed fragment, a stress view is useful in making the diagnosis of an ulnar collateral ligament rupture.

**6.** *Injury to the metacarpophalangeal region.* A Brewerton's view (Fig. 1.9) can be helpful for demonstrating subtle intra-articular fractures of the articular surfaces. This is taken AP, with only the dorsal surface of the fingers touching the cassette and the metacarpophalangeal joints flexed 45 degrees.



↑ **Figure 1.9** A normal Brewerton's view, showing the articular surfaces of the metacarpophalangeal joints.



## The wrist

For normal hand function, the wrist must be able to move and stabilise the hand while forces are being transferred from the arm to the hand (e.g. in throwing and racquet sports) and the hand to the arm (e.g. in swimming and weightlifting). In sport, the wrist is most commonly injured by impact resulting from falls. Overuse problems also occur and are seen in many sports, especially racquet and throwing sports, weightlifting, gymnastics, wrestling and boxing. The wrist is anatomically complex and many injuries require careful imaging to help establish a diagnosis. There has previously been a rather

← **Figure 1.10** A normal wrist series.

**(a)** The PA view shows smooth carpal curves and the intercarpal joint spaces are uniform. **(b)** The oblique view offers additional information, particularly in the area of the scaphoid and scaphotrapezial joints. **(c)** The lateral view is positioned with zero rotation and shows satisfactory alignment of the third metacarpal and the long axis of the radius. The pisiform overlies the scaphoid tubercle.

