Diagnosis and immediate care of injuries to the elbow and forearm

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INTRODUCTION

Commonly presenting to accident and emergency departments, the upper limb is often involved in trauma, either directly or as a result of a fall. Injuries associated with simple fractures may significantly affect outcomes. Accurate diagnosis of patterns of injury is vital.

HISTORY AND INITIAL EVALUATION

Certain signs raise the index of suspicion of a fracture. Pain, swelling and any deformity are obvious indicators as is the mechanism of injury. Appropriate X-rays should be obtained. Until proven otherwise, an open wound should be treated as an open fracture, and have the number of 'inspections' of soft tissue damage kept to a minimum. Accurate documentation of the neurovascular status of the limb distal to the site of injury is crucial. Neurological deficit or vascular compromise may require urgent specialist input, and compartment syndrome must not be overlooked in open and closed injuries (Brostrum et al, 1990).

ANATOMY

At the elbow, the bony landmarks are easily palpated. A disruption of the triangle formed by the medial and lateral condyles of the humerus with the tip of the olecranon, when the elbow is flexed, indicates abnormal anatomy (this becomes a straight transverse line with the elbow extended). The radial head is easily palpable at its articulation with the capitellum, and the medial epicondyle is straightforward to examine, pointing the way to the ulna nerve which lies posteriorly in the ulna groove. Palpation of the distal forearm may indicate a bony or ligamentous injury.

Wrist pain should always be sought with an elbow or forearm injury. Pain during, or loss of rotation, may point to an abnormality with any part of the radio-ulnar articulation in the forearm, and should not be assumed to be isolated to the proximal radius. Monteggia and Galeazzi fracture patterns (combination injuries) involve both a fracture of one of the forearm bones (ulna in Monteggia-type, radius in Galeazzi-type), and dislocation of either the proximal (Monteggia) or distal (Galeazzi) radio-ulnar joints (Reckling, 1982). The Essex–Lopresti variant involves a fracture of the radial head with a disruption to the interosseous ligament (or membrane). This has implications for treatment of the radial head injury.

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RADIOGRAPHS

Standard anterioposterior (AP) and lateral X-rays of the elbow, forearm and wrist should be obtained. At the elbow, a 'positive fat pad' is commonly seen, suggesting an occult fracture around the joint. There are three fat pads around the elbow – the posterior fat pad is most sensitive for the presence of a fracture (Smith and Lee, 1978). Once all the signs are known, occult radial head fractures are rarely missed (*Figure 1*).

FRACTURES

Fractures around the elbow vary with the patient's age and type of injury. Each has different implications for treatment and expected outcome.

The distal humerus

Injuries to the distal humerus vary widely. They may be divided into extra- and intra-articular. There is often significant swelling associated with these fractures, and it is vital to examine the distal limb for neurological damage and vascular compromise. Simple undisplaced fractures may be treated with a plaster cast, but most complex or displaced fractures require some orthopaedic input, and referral is appropriate (*Figure 2*). Immobilization in a temporary plaster backslab is advised for comfort.

The radial head

Radial head fractures are common, accounting for >30% of all elbow fractures. With little or no displacement, they can be treated with immediate mobilization, but a 'collar and cuff' for a few days may reassure the patient. Some authors advocate aspiration of the radio-capitellar joint to remove the

Figure 1. Posterior fat pad sign associated with a radial head fracture.

Figure 2. a. Both column intra-articular distal humeral fracture, (b) treated with open reduction and internal fixation.

haemarthrosis, and injection of a small volume of local anaesthetic. It appears to have little effect on long-term outcome, but may provide short-term comfort (Holdsworth et al, 1987). More complex fractures, with large, displaced fragments, may ultimately interfere with forearm rotation as well as the arc of flexion and stability of the elbow, and should be referred to orthopaedics for possible operative treatment (*Figure 3*).

The coronoid

Fractures of the coronoid tip may be treated conservatively, larger fracture fragments or fractures to other structures around the elbow can imply instability, and indicate that the joint has dislocated. Other injuries, e.g. fractures to the radial head and neck, capitellum, trochlea and medial epicondyle, must be looked for on X-rays (*Figure 4*). The 'terrible triad' of an elbow dislocation, and fractures to the radial head and the coronoid process is potentially devastating (McKee et al, 1998).

The neurovascular status of the limb must be assessed and documented before and after reduction of the elbow dislocation. Entrapment of either a vessel or a nerve can result. The arm should be immobilized in a flexed position, usually in a plaster backslab. X-rays must show the elbow joint to be reduced and congruent on both AP and lateral views. If they do not show this, there may be something interposed within the joint, or the alignment of the proximal radius and ulna may be abnormal. Again referral is advocated.

Figure 3. a. Comminuted radial head fracture, (b) treated with internal fixation.

The olecranon

Avulsion injuries to the posterior part of the elbow are mostly fractures to the olecranon process (*Figure 5*); rarely there may be a soft tissue rupture to the triceps insertion. This may appear on a lateral X-ray of the elbow as a flake of bone. Surgical repair is needed if active extension is lost (Murphy et al, 1987). Olecranon injuries also occur as a result of direct trauma to that part of the elbow.

The forearm

Single or both bone fractures to the radius and ulna are straightforward to diagnose (*Figure 6*). Any single bone fracture implies involvement of proximal or distal radio-ulnar joints, and should be examined appropriately. Standard X-rays must include these joints. Isolated radial shaft fractures and fractures to both forearm bones generally require surgical intervention, as they tend to displace even if initially well aligned. Fractures with >10° angulation or 50% displacement, those involving the proximal third of the ulna, or those involving the proximal or distal radio-ulnar joints should be considered for surgery (Schemitsch and Richards, 1992). Again, neurovascular status must be assessed, and a resting backslab plaster applied. Penetrating injuries may not cause a fracture, but damage to the forearm musculature as well as to nerves and vessels may cause a great deal of swelling, raising compartment pressures. Paraesthesia in the hand and especially extreme pain on passive stretch of forearm muscles may indicate impending compartment syndrome. If there is any doubt, an orthopaedic assessment should be sought, and ideally the compartment pressures should be measured. **HM**

Figure 4. a. Posterolateral dislocation of the elbow, (b) with associated coronoid and complex radial head fractures.

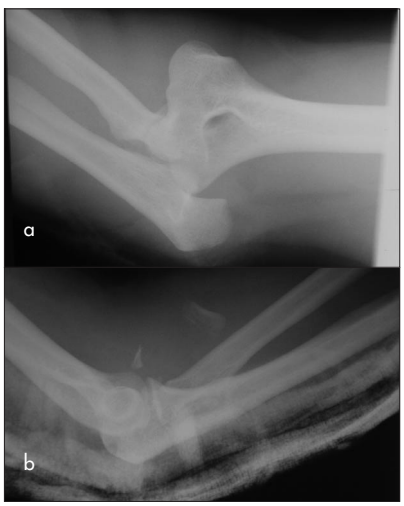

Figure 5. a. Simple olecranon fracture, (b) treated with a tension-band wire technique.

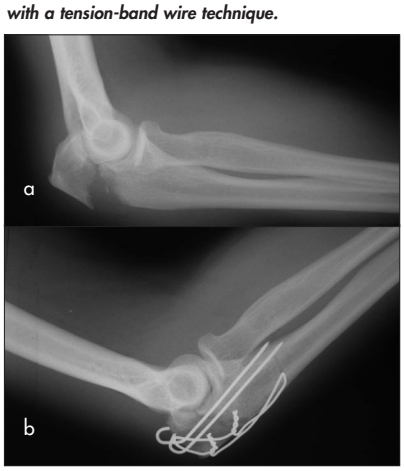

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Figure 6. a. Isolated 'night-stick' fracture of the ulna shaft, (b) fixed with a plate and screws.