3 Radial head

3.1 Assessment of fractures and soft tissues

Fractures of the radial head are caused by a fall on the outstretched hand, with the forearm slightly flexed and pronated. Fracture patterns range from simple and nondisplaced to multifragmentary and severely impacted. Elbow dislocation and associated soft-tissue injuries are not uncommon, as are fractures of the distal radius.

The patient is usually in pain and cannot rotate the forearm. As extension is also difficult and painful, an AP view is taken perpendicular to the forearm (Fig. 6.3.1-7) with additional lateral and oblique radiocapitellar views. However, simple x-rays are often difficult to interpret, and an accurate assessment of the fracture configuration and associated injuries may only be possible at the time of surgery. Additional imaging techniques (CT scan, MRI) are seldom indicated.

3.2 Treatment options

- Stable fractures that do not interfere with forearm rotation are best treated by early motion.

Small impacted portions of the radial head (< 30% of the joint surface) or fractures displaced < 2 mm may be treated nonoperatively.

Unstable fractures (Fig. 6.3.1-8) include those with displaced or loose fragments,
associated fractures of the capitellum, olecranon or coronoid process, elbow dislocations, ligamentous avulsions, and distal wrist injuries. These unstable fracture configurations are best treated by operative reconstruction or radial head replacement.

### 3.3 Preoperative planning

#### 3.3.1 Positioning and approach
The patient is positioned supine with the arm on an armrest or table. The extremity is prepared from the axilla to the hand to allow rotation of the forearm and flexion and extension of the elbow during operative fixation. The standard lateral approach is most commonly used (Fig 6.3.1-9). Care must be taken to avoid any harm to the deep branch of the radial nerve, which runs anteriorly to the capsule, and the radial head is to stay posterior to the anterior border of the anconeus muscle. To minimize the risk of disrupting the lateral collateral ligament, the capsular incision should remain in front of the anterior margin of the anconeus muscle and parallel to the fascial limit of the extensor carpi ulnaris muscle. The anular ligament, a true thickening of the capsule, is opened laterally or slightly anteriorly to allow full inspection of the fragments. In selected cases an osteotomy of the lateral epicondyle should provide an extensile approach.

![Fig 6.3.1-8a–c Typical radial head fractures (21-A and 21-B).](image)

- a Displaced shearing fractures, B2 +/- small intermediate fragment.
- b Complex articular fracture with lateral impaction, B3.
- c Extraarticular tilt of radial head, A2, often combined with ligamentous avulsion and elbow instability.

#### 3.3.2 Reduction techniques and tools
Direct reduction and temporary fixation are obtained with a dental hook and fine pointed forceps. Gentle rotation of the forearm allows inspection of the circumference of the radial head and neck. Provisional fixation is then performed with 1.0 mm K-wires (Fig 6.3.1-10a–b).

#### 3.3.3 Choice of implants
One or more 1.5, 2.0, or 2.4 mm screws can provide stable fixation with interfragmentary compression to fix marginal or wedge fragments. In impacted fractures the same screws can be used as position screws, ie, not as lag screws, to avoid compression, which would narrow and distort the radial head. In fractures that are impacted, comminuted, or associated with a fracture of the radial neck, a mini T-plate or L-plate may be used to support the repair.

### 3.4 Surgical treatment—tricks and hints

From the perspective of operative reconstruction, four types of fracture patterns should be identified: wedge, impacted, multifragmentary, and radial neck fractures (Fig 6.3.1-10a–c).

- **Wedge fractures**: The fracture is easily reduced and fixed with one or two small lag screws. Small pieces of capitellar cartilage are frequently found entrapped in the fissure and should be removed. The screw heads should be countersunk to allow free forearm rotation.

- **Impacted fractures**: Impacted fragments can be found as depressions of the peripheral or central articulating surface of the radial head. These are gently elevated using a dental hook or small elevator. If necessary, the remaining defects may be filled with small amounts of cancellous bone.
obtained from the lateral epicondyle. Provisional fixation is secured by means of K-wires. Small screws are used as position screws or a small mini plate may be added to support reduction.

- Multifragmentary fractures: The fragments are carefully reduced and provisionally fixed with K-wires. Two or three 2.0 mm screws are used to hold the reduced articular surface, as described. Usually, one portion of the radial head remains intact and some thin periosteal connections remain between the fragments. These should be preserved while reducing the fragments. Even in complex injuries there are sites where a small T-plate or L-plate can be contoured and adapted without impinging on the proximal radioulnar joint. Prosthetic replacement of the radial head represents a realistic option for badly comminuted fractures.

- Radial neck fractures: These fractures are uncommon in adults. Once the head is realigned, the resulting defect is filled with bone graft, and supporting screws or a mini plate are placed to avoid displacement.

A recent study suggests that comminuted fractures involving the entire head, with less than three fragments, are best treated with ORIF with small screws and plates. If three or more fragments are present, they should be excised and the head replaced with a head prosthesis. Following fixation of the radial head, the anular ligament is repaired and stability of the elbow is checked through a full range of motion. In cases with associated elbow dislocation, detachment of the lateral ligament complex from the humerus is repaired with nonresorbable sutures placed either through drill holes in the bone or with suture anchors. In the rare event that instability persists, the medial complex should be explored and repaired or a hinged external fixator should be applied.

### 3.5 Postoperative treatment

As described with olecranon fractures, a well padded splint may be placed, with the elbow in extension to avoid edema. After surgery, active exercise is started by elevating the arm in a supine position and flexing the elbow by gravity. An active exercise program is then started. A posterior removable splint may exceptionally be worn for 3–4 weeks.
3.6 Pitfalls and complications

If intraoperative reconstruction of the radial head becomes impossible, replacement with a prosthesis is an option to restore stability and avoid secondary valgus and migration (Fig 6.3.1-10d). Check the correct rotation!

3.7 Results

A study involving 56 patients has shown a 17% rate of nonunion and implant failure after open reduction and internal fixation of radial head fractures, including complex, multifragmentary fractures. Some loss of full supination, pronation, or extension may be expected, but without the overall function being disturbed. In cases where the fixation failed, the reconstructed head functioned well as a spacer and late resection led to good results without compromising function.