Fractures of the Radial Head

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KEYWORDS

• Radial head • Fracture • ORIF • Locking plate • Arthroplasty • Outcome

KEY POINTS

- Radial head fractures are associated with a high rate of concomitant ligament tears. The authors recommend viewing radial head fractures not merely as osseous lesions but as osteoligamentous lesions.
- Simple fractures displaced less than 2 mm can be treated nonoperatively. Prolonged rehabilitation should raise suspicion of complicating additional injuries.
- The treatment of choice for 2 to 5 mm displaced partial articular fractures remains debatable. Several investigators report good results of nonoperative treatment comparable to open reduction and internal fixation (ORIF) but with lower complication rates. However, rate of osteoarthritis seems to be higher with nonoperative treatment.
- ORIF is preferred whenever an anatomic and stable reduction can be achieved. Modern implants and techniques, such as radial head–specific low-profile locking plates, extend the indications for ORIF.
- If anatomic and stable reduction cannot be achieved, radial head arthroplasty remains the treatment of choice.

INTRODUCTION AND ANATOMIC PRINCIPALS

The elbow joint plays a critical role in the functionality of the human upper extremity. It facilitates complex actions of the hand that are indispensable to daily activities. Injuries of the elbow joint are accompanied by pain and a limited range of motion (ROM), resulting in restriction of the aforementioned tasks. This has also been shown for fractures of the radial head.[1,2] The outcome of these fractures depends largely on the severity of the injury. Though undisplaced stable fractures have a good prognosis with nonoperative treatment, it is necessary to identify the displaced unstable fractures and determine whether reduction and fixation is possible, or whether replacement must be performed to prevent pain, stiffness, and secondary arthrosis.

The vulnerability of the elbow joint is based on its intricate anatomy in which 3 separate articulations are functionally combined and rely on distinct active and passive stabilizers such as muscles, bony structures, and ligaments. The radial head is related to the functionality and

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influences the biomechanics of all 3 of these separate articulations.

The lateral aspect of the elbow joint is represented by the articulation of the radial head with the capitellum. Its stability comes from the opposite congruity of the convex capitellum and the concave radial head. Moreover, the lateral collateral ligament (LCL) prevents varus angulation.[3] The lateral ulnar collateral ligament (LUCL), together with the lateral bony prominence of the proximal ulna, the supinator crest, resist posterior subluxation of the radial by acting as a hammock. A deficiency of these structures may result in posterolateral rotatory instability (PLRI).[4]

In the center of the elbow joint, the radial head articulates with the lesser sigmoid notch of the proximal ulna to form the proximal radioulnar joint (PRUJ). The joint is stabilized by the annular ligament. Elbow fractures are often associated with injuries to the annular ligament; however, the clinical relevance has not been clarified.[5]

The radial head acts as the main stabilizer of longitudinal forearm stability because it resists proximalization of the radius in axial loading of the forearm.[6] At the elbow, approximately 60% of the mechanical load goes through the radial column. Loss of the radial head shifts 100% of the loading onto the ulnar column (Fig. 1). Thus, sole resection of the radial head due to unreconstructable fractures should not be performed, particularly not in an acute setting. Doing so could lead to early erosion of the ulnar joint and proximal migration of the radius, or to possible pain and limited function (Fig. 2).[7]

Further relevant stabilizers of the elbow joint are found at the medial aspect of the elbow, as represented by the trochlea and the proximal ulna. The 2 bony components show an anatomic fit and close joint congruency, offering stability and guidance during movement. Ligamentous stability is given by the medial collateral ligament (MCL), of which the anterior bundle acts as the main stabilizer against valgus stress.[8] The radial head plays the role of the secondary valgus stabilizer. Thus, MCL and radial head integrity influence each other. This should be acknowledged when dealing with radial fractures, which are often accompanied by lesions of the collateral ligaments.

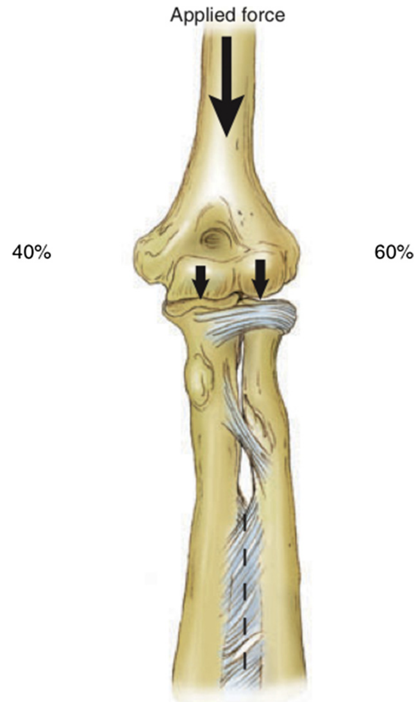

Fig. 1. Force transmission through the elbow. (*From* An K, Zobitz ME, Morrey BF. Biomechanics of the elbow. In: Morrey BF, Sanchez-Sotelo J, editors. The elbow and its disorders. 4th edition. Philadelphia: Elsevier; 2009. p. 39–63; with permission.)

EPIDEMIOLOGY

Fractures of the radial head are the most common elbow injuries, accounting for approximately 30% of all elbow fractures in adult patients. Duckworth and colleagues[9] reported an incidence in Scotland of 55 of every 100,000 inhabitants. Though the investigators did not find a significant difference specifically by gender, they discovered a bimodal distribution of patient age and mechanism of trauma at the time of injury according to gender. The fracture incidence in men peaked at 37 years of age with high-energy traumas, whereas simple falls were dominant in women at 52 years. This observation was corroborated by Kaas and colleagues[10] in 2010. Both study groups reported no significant differences by gender or age in the type of fracture or the incidence of accompanying ligamentous or osseous lesions. However, differences were observed for the injury mechanism. Hence, the investigators stated that the incidence of accompanying lesions increased proportionally to the type of fracture according to the Mason classification.

CLASSIFICATION

The Mason classification system, reported in 1954, is the accepted classification system for fractures of the radial head.[11] The classification distinguishes undisplaced fractures (type I), displaced fractures (type II), and fractures that are displaced with comminution (type III). A fourth type was added by Johnston[12] in 1962, describing