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Review article

Post-traumatic osteoarthritis of the elbow

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ABSTRACT

Post-traumatic osteoarthritis of the elbow is an uncommon condition in which the clinical manifestations are often at variance with the radiological findings. In symptomatic forms, pain and stiffness are variably combined. When non-operative management fails, the decision to perform surgery is taken on a case-by-case basis depending on age, activity level, patient discomfort, and osteoarthritis location and severity as assessed by CT scan arthrography. Elbow instability or subluxation should be sought. Post-traumatic elbow osteoarthritis raises difficult therapeutic problems in young patients. The goal of treatment is to obtain a low level of pain with sufficient motion range to ensure good function, while preserving future surgical options and delaying elbow arthroplasty to the extent possible.

1. Introduction

Osteoarthritis is far less common at the elbow than at the other upper limb joints. In addition to trauma, causes include overuse injury, osteochondritis dissecans, osteochondromatosis, crystal-induced arthropathies, and sequelae of septic arthritis or haemophilia. Elbow injuries in children and adults can result in osteoarthritis due either to the initial cartilage damage or to sub-optimal internal fixation, malunion with joint surface incongruity, or instability. Although not a weight-bearing joint, the elbow is subjected to considerable forces whose resultant can reach 0.3 to 0.5 times the weight of the body at the humero-ulnar joint during everyday activities [1] and 3 times the weight of the body at the humero-ulnar and humero-radial joints during heavy labour [2]. Discordance between the clinical manifestations and radiological findings is common (Fig. 1).

In this lecture, the evaluation and various treatment options depending on age, clinical findings, and osteoarthritis location and severity are discussed.

2. Epidemiology

Few long-term data on post-traumatic elbow osteoarthritis are available. In a study of 139 patients, Guitton et al. [3] identified 32 patients who met Broberg and Morrey criteria for moderate-to-severe osteoarthritis 10 to 34 years after an elbow injury [4]. Osteoarthritis was more common after an intra-articular fracture of the distal humerus or fracture-dislocation than after a fracture of the radial head or olecranon. Subsequent long-term studies assessed the occurrence of osteoarthritis according to the joint involved.

2.1. Osteoarthritis after an intra-articular fracture of the distal humerus

Of 30 patients evaluated 12 to 30 years after internal fixation of a distal humerus fracture, 80% had elbow osteoarthritis, which was mild-to-moderate in 74% of cases [5].

2.2. Osteoarthritis after fracture of the radial head

Among 100 patients seen a mean of 18 years after non-operative management of Mason II or III fractures, 76% had mild-to-moderate osteoarthritis of the injured elbow compared to 16% for the uninjured elbow [6].

At re-evaluation 10 to 42 years after radial head resection for isolated radial head fracture in young patients, osteoarthritis was noted in 88% to 100% of elbows, with satisfactory function and no pain [7,8]. The osteoarthritis grade was II or III (89%) in one study [7] and I in most cases (65%) in another study [8].

Osteoarthritis is significantly less common after internal fixation of non-comminuted Mason II–III fractures than after radial head resection [9]. In Mason III fractures with more than three fragments, complications (inappropriate internal fixation, malunion, partial necrosis) are responsible for early osteoarthritic lesions that require revision surgery for arthroplasty or resection.

A fractured radial head silicone implant with inflammatory synovitis (known as siliconitis) is believed to worsen the osteoarthritic lesions secondary to elbow injuries and radial head resection. Among 20 patients seen 12 years after monoblock radial head

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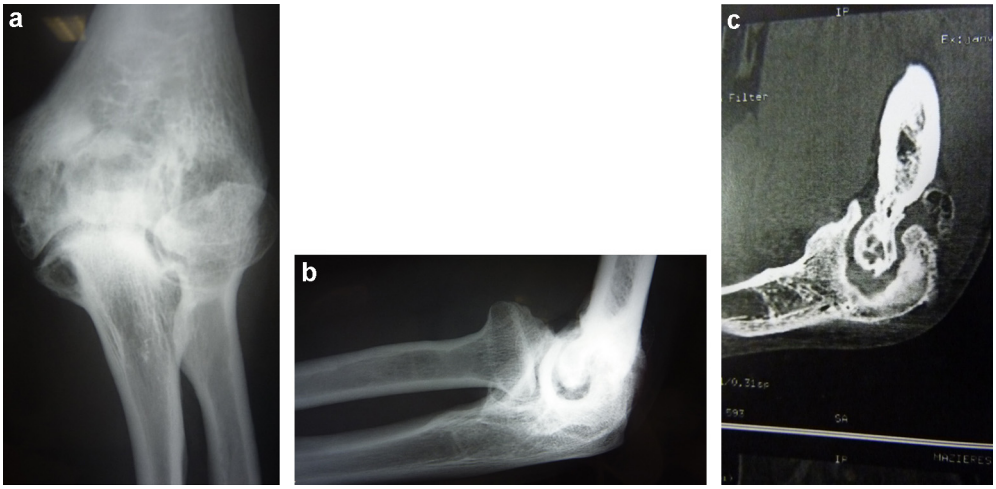

Fig. 1. a–c: sequelae in a 22-year-old man of a distal humerus fracture sustained in childhood. Occasional pain and severe stiffness. Able to play recreational rugby. Surgical abstention.

implantation [10], 9 had osteoarthritis confined to the humero-ulnar joint, which was mild in 6 patients, moderate in 2, and severe in 1. Another study evaluated 17 patients with a mean follow-up of 106 months after bipolar radial head arthroplasty [11]. Humero-ulnar osteoarthritis was noted in 12 patients, including 8 with grade I and 4 with grade II lesions; no patient had grade III osteoarthritis. The osteoarthritic changes did not correlate with pain intensity.

With a floating radial head prosthesis used to treat recent fractures, Judet et al. [12] found no evidence of osteoarthritis with a mean follow-up of 4 years. The risk of osteoarthritis is higher when arthroplasty is performed as a revision procedure or at a distance from the injury. Shore et al. [13] reported a 74% rate of osteoarthritis after 8 years in patients treated with metallic radial head arthroplasty 2.4 years on average after the injury.

2.3. Osteoarthritis after a fracture of the proximal ulna

Rochet et al. [14] reported grade I osteoarthritis in 6 of 18 patients 3 to 9 years after internal fixation for a comminuted fracture of the proximal ulna. The following criteria were of adverse prognostic significance:

- preoperatively, Regan and Morrey type 3 coronoid process, fracture-dislocation;
- postoperatively, joint surface step-off greater than 2 mm, joint surface incongruity [14].

2.4. Osteoarthritis after a fracture-dislocation of the elbow

Persistent incomplete reduction after the treatment of a fracture-dislocation of the elbow is among the lesions associated with the prompt development of osteoarthritis. Secondary treatment has been followed by osteoarthritis in 46% to 76% of cases [15].

2.5. Osteoarthritis after an elbow fracture in childhood

Very few long-term data are available. Osteoarthritis is due to incomplete reduction of intra-articular fractures, deformities related to growth-plate injury, or complications of the primary treatment (Fig. 1). The most common injuries are lateral condyle fractures; radial head fractures, which may be followed by hypertrophy with dysmorphism; olecranon fractures; and Monteggia fractures [16].

3. Evaluation

3.1. Clinical evaluation

In addition to patient age and location on the dominant or non-dominant side, the following should be recorded:

- the severity of the pain and stiffness, as well as the severity of instability if present. The characteristics of the pain should be analyzed in detail:
  - pain at the end of the motion range suggests an obstacle with impingement by an osteophyte,
  - pain throughout the motion range suggests advanced osteoarthritis,
  - nocturnal inflammatory pain should prompt an evaluation for a history of infection;
- occupational activities (manual labor or other) and sports activities, which influence the risk of progression;
- impact on recreational activities or on activities of daily living;
- level of functional demand;
- previous surgical procedures and postoperative events (e.g., impaired healing and infectious complications);
- previous non-operative treatments (e.g., local glucocorticoid injections and visco-supplementation).

The physical examination should include the following:

- an assessment of the skin (scars, flaps, fragile regions) and of any deformities;
- identification of painful sites and of the manoeuvres that trigger the pain;
- a search for a joint effusion and for evidence of inflammation;
- range of motion measurements, tests for stability, and a functional assessment based on Morrey's score [17];
- evaluations of:
  - the muscles and tendons, most notably the triceps tendon, as well as the attachments on the medial and lateral epicondyles,
  - nerve function, with special attention to the ulnar nerve (history of transposition, evidence of compression, instability, sensory evaluation [Weber's Test], and motor function) and posterior inter-osseous nerve, which is vulnerable to compression in front of a subluxated radial head or fractured silicone implant, usually in the absence of any deficit (radial tunnel syndrome);