ROLE OF MAGNETIC RESONANCE IMAGING (MRI) IN DIAGNOSIS OF ELBOW JOINT LESIONS

Thesis
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By

Ahmed Galal Foad Hamam
(M.B,B.ch, M.S)
Faculty of Medicine
Ain Shams University

Supervised By

Professor Doctor. / NIVIENE MOSTAFA IBRAHIM
Professor of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Professor Doctor. / MOHAMED ABDEL-SALAM WAFA
Professor of Orthopedics
Faculty of Medicine
Ain Shams University

Doctor. / AZZA ABDEL-GHAFAR BORAAI
Assistant Professor of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Doctor. / SAMER MALAK BOTROS
Lecturer of Radiodiagnosis
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
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Introduction

The elbow is a joint which represents the important functional link between the upper arm and the hand and wrist.

The elbow is a complex hinge-pivot joint with three components: the humeroradial, humeroulnar and radioulnar articulations. Flexion and extension occur at the humeroulnar articulation, whilst pronation and supination occur at the radioulnar articulation. The elbow is surrounded by numerous ligaments, tendons and muscles.

The wide range of mechanical forces which act on this complicated joint makes it susceptible to a variety of injuries, which may be due to acute trauma or chronic overuse. **(*Teh et al, 2003).***

Although the elbow is one of the most stable joints in the body, elbow dislocations and fractures are not uncommon. ***(De Dios & Norris, 2004).***

Elbow abnormalities are increasing as the number of people participating in weight lifting and throwing and racquet sports continue to rise. ***(Kaplan et al, 2001).***

Magnetic Resonance Imaging (MRI) provides clinically useful information in assessing the elbow joint. Superior depiction of muscles, ligaments, and tendons as well as, the ability to directly visualize nerves, bone marrow, and hyaline cartilage are advantages of MRI compared to conventional imaging techniques.

These features of MRI may help establish the cause of elbow pain by depicting accurately the presence and the extent of bone and soft tissue pathology. ***(Higgins et al, 1997).***

MRI may be used to assess the status of the interosseus membrane when a longitudinal radioulnar dissociation is suspected. Also, MRI can be used to visualize major neurovascular structures that cross the joint.

As peripheral magnetic resonance angiography (MRA) is more widely used, it may have a role in the assessment of acute vascular injury in the elbow. ***(De Dios & Norris, 2004).***

Ongoing improvements in surface coil design and newer pulse sequences have resulted in higher quality MR images of the elbow that can be obtained more rapidly. Recent experience has shown the importance of MR imaging in detecting and characterizing disorders of the elbow in non-invasive fashion. ***(Higgins et al, 1997).***

Axial images are probably the most useful in evaluating the elbow for tendons, annular ligament, bones, neurovascular structures and muscles. The sagittal images are critical for assessment of biceps, triceps, tendons (longitudinally) and anterior/posterior muscle masses. While coronal images are prescribed for ligaments (medial and lateral), medial/lateral muscle masses, bones (especially medial/lateral epicondyles) and extensor-supinator, flexor-pronator conjoined tendons. ***(Stoller, 1998).***

Aim of the Work

The aim of this work is to:-

1. Evaluate the role of MRI in diagnosis of elbow joint lesions.
2. Assess the value of MRI over plain radiography as a basic diagnostic modality in elbow pain and dysfunction.
3. Assess the value of MRI over different diagnostic modalities as Computed Tomography scan (CT-scan) and ultrasound as required by the clinician according to the patient's provisional diagnosis.

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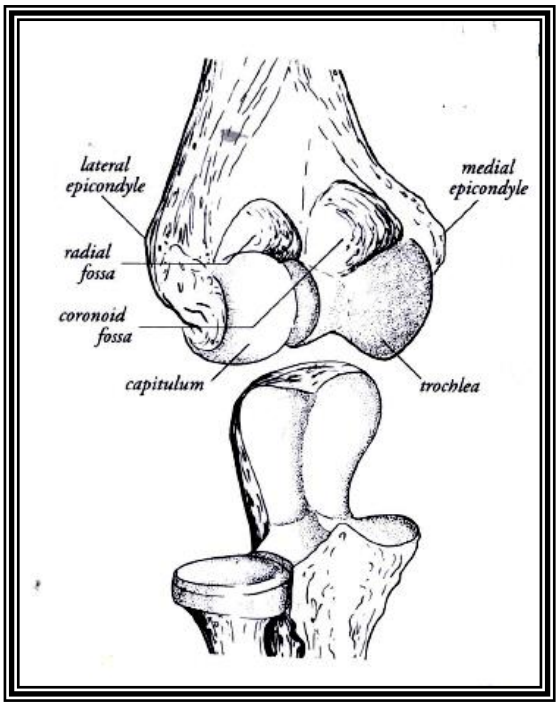
GROSS ANATOMY OF THE ELBOW JOINT

Bones and articulation

The elbow articulation is made up of three osseous structures (distal humerus, proximal ulna, and radius) that form three articulations (humero-radial, humero-ulnar, and proximal radio-ulnar).

The distal aspect of the humerus widens into a fan-like configuration. At the medial-most extent of the distal humerus, an osseous projection, the medial epicondyle, serves as the attachment site for the superficial flexor group of the forearm, as well as for the ulnar collateral ligament complex. The lateral epicondyle is the osseous projection that serves as the attachment site for the superficial extensor muscles of the forearm, as well as for parts of the radial collateral ligament complex. *(1).*

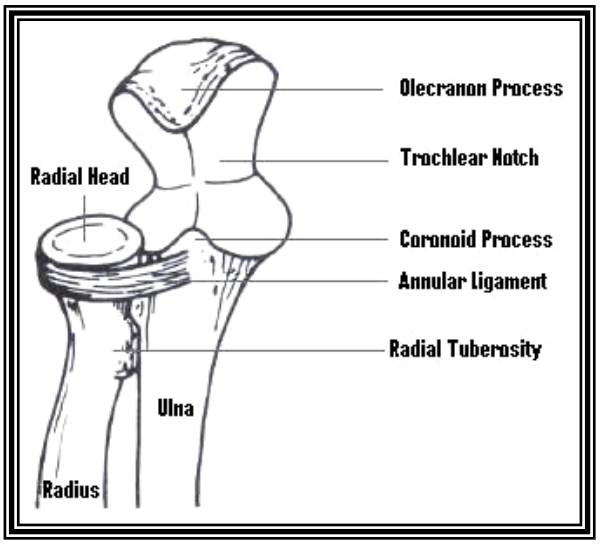
The distal aspect of the humerus is a wide flattened structure. The medial third of its articular surface termed the trochlea. The lateral part is the capitellum (Figure 1). There is a hollow area found on the posterior surface of the humerus above the trochlea, termed the olecranon fossa. A smaller fossa, the coronoid fossa, lies above the trochlea on the anterior surface of the humerus, and a radial fossa lies adjacent to it, above the capitellum. The anterior capsular attachment to the humerus is located above these fossae. *(2)*.



(Fig 1) The distal humerus. [3]

The articular surface of the proximal ulna is formed by the combination of the posterior olecranon and the anterior coronoid processes, with the articular surfaces taking the configuration of a figure eight. In the central portion of the waist of the eight, or the junction between anterior and posterior aspects of the ulna, the articular surface is traversed by a cartilage-free bony ridge, referred to as the trochlear ridge. (Figure 2).

The proximal end of the radius consists of head, neck, and tuberosity. The radial head is shaped like a mortar, with a cupped articular surface. The neck is the constricted portion of the bone distal to the articular surface. The tuberosity is beneath the medial aspect of the neck and serves as the attachment site for the biceps tendon. [1].



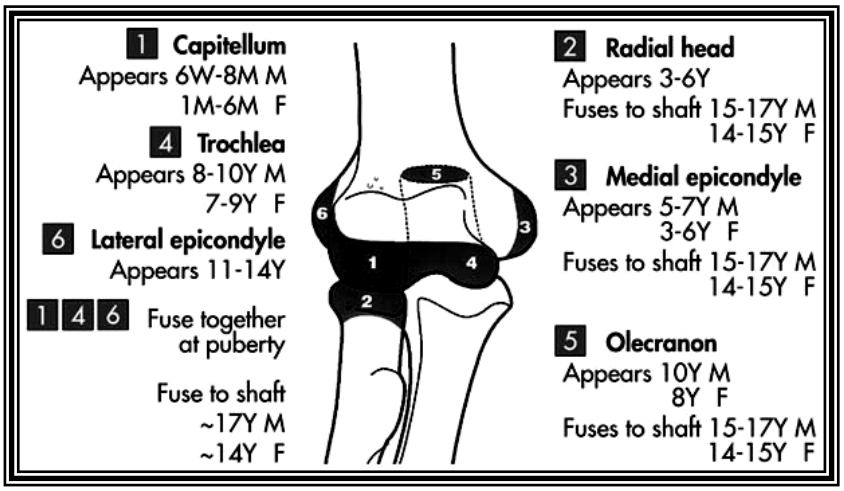
(Fig 2). Proximal radius and ulna. [3]

The radius articulates with the capitellum and the ulna articulates with the trochlea of the humerus in a hinge fashion. The proximal radio-ulnar joint is composed of the radial head, which rotates within the radial (sigmoid) notch of the ulna, allowing supination and pronation distally. The ulno-humeral articulation of the elbow is almost a true hinge joint, which allows for flexion-extension. The radius articulates with proximal ulna and rounded capitellum of the distal humerus. This tadio-capitellar joint allows for pronation-supination. Thus the osseous anatomy of the elbow joint allows for two complex motions: flexion-extension, and pronation-supination. [4]

Ossification centers

The epiphyseal–cartilage bone junction in the elbow is a point of structural weakness, susceptible to separation and displacement. The age of the patient and, more important, the relative sequence of identification of ossification centers is significant in recognizing epiphyseal injuries.

The ossification (Chondrification) centers of the elbow are illustrated in (Figure 3).



(Fig 3). Ossification centers of the elbow. [5]

The medial epicondyle is the last to fuse. Normally the trochlear ossification centre can not be seen prior to the appearance of the medial epicondyle. Therefore, an avulsed and trapped medial epicondyle is diagnosed by the absence of the epicondyle coexistent with the presence of the trochlear ossification center. [6].