RECENT TRENDS IN THE MANAGEMENT OF FRACTURES OF THE HEAD AND NECK OF THE RADIUS

THESIS

Submitted in Partial Fulfilment for
the Master Degree in Orthopaedic Surgery

BY

MOHAMED MOH. ABDEL-MONEIM KHADR
(M.B.B.CH)

Supervised By

Prof. Dr. HASSAN EL ZAHER HASSAN
Prof. of Orthopaedic Surgery
Faculty of Medicine, Ain Shams University

Prof. Dr. HUSSEIN EL KHATIB
Assistant Prof. of Orthopaedic Surgery
Faculty of Medicine, Ain Shams University

Dr. AHMED KAMEL ABD EL MOTAAL
Lecturer of Orthopaedic Surgery
Faculty of Medicine, Ains Shams Univesity

FACULTY OF MEDICINE
AIN SHAMS UNIVERSITY

1988

ACKNOWLEDGMENT

After due thanks to God the merciful and compationate.

I would like to express my sincere gratitude and cordial appreciation to Prof. Dr. Hassan El-Zaher Hassan, Prof. of Orthopaedic Surgery, Faculty of Medicine, Ain-Shams University; for his valuable supervision, constructive guidance, continuous encouragment and generous help during preparation of this work.

I am also deeply in debted to Prof. Dr. Hussein El-Khatib, Assistant Prof. of Orthopaedic surgery, Faculty of Medicine, Ain-Shams University; for his supervision, meticulous advice and fruitful suggestions were of utmost help throughout the work.

I am also fully thankful to Dr. Ahmed Kamel Abd El-Motaal, Lecturer of Orthopaedic Surgery, Faculty of Medicine, Ain-Shams University; for his sincere co-operation, keen follow up and honest assistance and support.

Finall my thanks should also extend to all members of the staff, my colleagues and those who helped in one way or another to establish this work; for their efforts, and participation.

Mohamed M.A. Khadr

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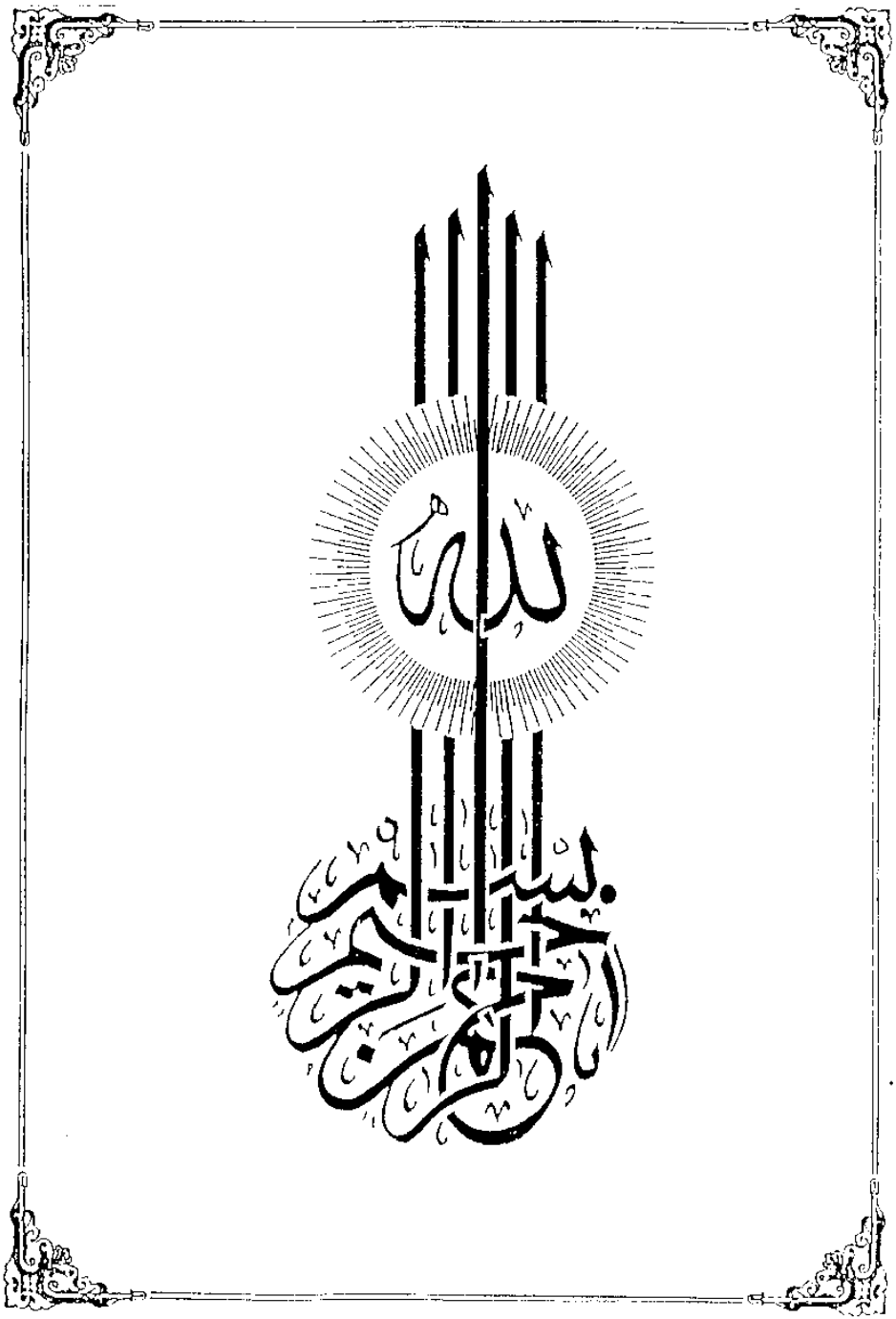

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The importance of the elbow joint need not be discussed, as it is known that the interference with flexion-extension, or pronation-supination movements which take place in this joint; may interfere with the ability to earn a livelihood, and also with performance of many acts necessary for satisfactory and gracious living (Dickson, 1949).

The elbow joint tolerates trauma very badly, even a minor trauma causing minor injury can be responsible for some residual loss of range of movement of the joint (Mason, 1954).

Fracture of the head of the radius is a serious injury, that might be overlooked clinically and radiologically as it might simulate a contusion around the elbow, and sometimes the fracture or its exact type may not be well seen on the radiograms.

Whilst the prognosis is good for recovery of a useful elbow, recovery of a normal elbow range is rare. So the aim of any orthopaedic procedure might be restoration of a functional stable range of motion as soon as possible.

Getting the full range of motion is not essential in the flexion-extension of the elbow, but this might be of importance in pronation and supination of the forearm.

ANATOMY
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In the elbow region, three bones; namely the lower end of the humerus proximally, the head of the radius and upper end of the ulna distally; come together in a specific distribution to form a complex called cubital articulation (DeLee et al., 1984).

Cubital articulation is formed from two joints which are the elbow joint and the superior radioulnar joint. They communicate together in contrast to the wrist, which is separated from the inferior radioulnar joint.

Both joints are contained within a common articular cavity and have intimate functional relationship.

The elbow joint is further subdivided into :

A. Humero-ulnar articulation : between the trochlea of the humerus and the trochlear notch of ulna.

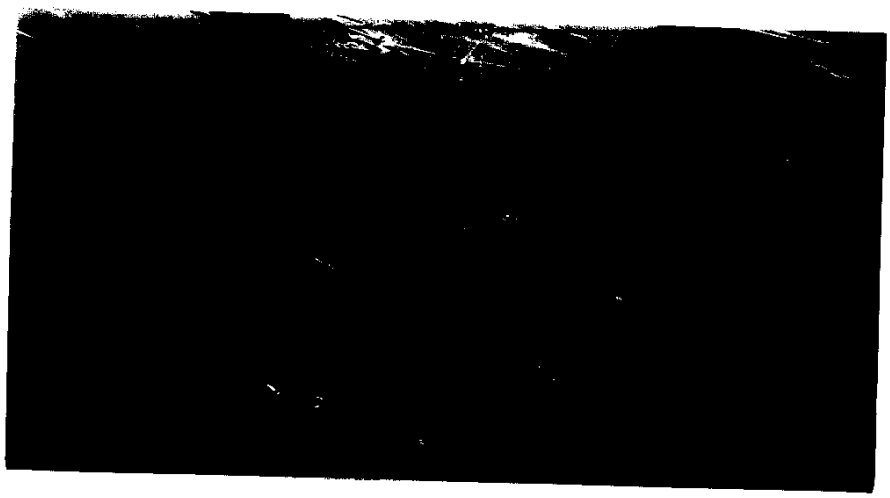
B. Humero-radial articulation : between the capitellum of the humerus and the facet on the upper articular surface of the head of the radius (Warwick & Williams, 1973).

The articular surfaces are coated by hyaline cartilage.

The Elbow Joint Proper :

Type of Joint :

The elbow joint is a compound synovial joint of the hinge or uniaxial variety with rotation constrained within a single plane, which allows flexion and extension. The ulna moving on the trochlea and the



(Fig. 1-1) Bones of right elbow joint. Anterior and posterior aspects. (Conwell, 1969).

(Fig. 1-3) Bones of right elbow joint.
Lateral and medial aspect; forearm flexed 90 degrees. (Conwell, 1969).

head of the radius moving on the capitellum of the humerus. However, the flexion-extension movements of the ulna do not constitute a pure swing but are accompanied by a small degree of congruent rotation : the ulna is slightly pronated during extension, and supinated during flexion (Warwick & Williams, 1973).

Most of the strength and the stability of the elbow lies in the articulation of the ulna with the humerus; the radius facilitates the dextrous motion of the hand. This is an important concept, because residual deformities of the radius with the humerus or the proximal ulna leads to loss of manual dextrity. Residual deformities of the humeroulnar joint can lead to loss of strength, stability, or flexion and extension motion of the elbow joint.

Bones of the Joint : (Fig. 1-1,1-2 & 1-3)

Lower End of Humerus :

It is expanded transversly. It is divided into medial and lateral condyles. Each is also divided into articular and non articular surfaces. The lateral condyle is bigger than the medial one.

The articular parts includes the trochlea, capitellum, while the non-articular part includes the medial and lateral epicondyles, together with the olecranon, coronoid and radial fossa (Warwick & Williams, 1973).

The articular portion of the humeral condyle is curved downwards and forwards until its plane is angulated 45 degrees to the shaft, so that its anterior and posterior surfaces lie infront of the corresponding surfaces of the shaft (Warwick & Williams, 1973; DeLee et al., 1984) (Fig. 1-4).

This accounts for the extent of motion at the elbow joint being not equal on both sides of the extended longitudinal axis of the humerus, but is greater in the anterior arc (Speed, 1942).

The centres of the arcs of rotation of the articular surfaces of each condyle lie on the same horizontal line through the distal humerus (DeLee et al., 1984).

The Trochlea :

It is formed of both the medial and lateral condyles. It is pulley shaped (largely concave transversely and convex antero-posteriorly), with a central groove lying in a sagittal plane and bounded by two convex lips (Kapandji, 1970). Milch (1956) believes, that they are very important in maintaining medial and lateral stability of the elbow.

It covers the anterior, inferior, and posterior surfaces of the lower end of the humerus. Posteriorly it is widest and its lips extend obliquely upward and laterally where its lateral edge is a sharp rim (Warwick & Williams, 1973).

On the posterior surface, the central groove is directed slightly laterally. This obliquity shares in producing the valgus carrying angle of the forearm when the elbow is extended.

On its lateral side, it is separated from the capitellum by a faint groove, but its medial margin is salient and projects downward more than the lateral flange of about 6 mm. So that, the joint line (roughly 2 cm below the line joining the two epicondyles) passes downwards and medially, thus it is in part the cause of the carrying angle which is present between the long axis of the humerus and the long axis of the

ulna and supinated forearm when the elbow is extended (Warwick & Williams, 1973).

Both the medial and lateral lips describe three-fifth of a circle (Wadsworth, 1982).

The trochlea articulates with the trochlear notch of ulna. When the elbow is extended, the inferior and posterior aspects of the trochlea are in contact with the ulna, but as the joint is flexed, the trochlear notch slides forwards on the anterior and inferior aspects of the trochlea leaving the posterior aspect uncovered (Warwick & Williams, 1973).

Because the trochlear notch of the ulna covers an arc of less than 180 degrees, though deep it is, it fails to grip the trochlea of the humerus to a sufficient extent in absence of soft tissue (Kapandji, 1970).

In the same way, like in the humerus, the trochlear notch of the ulna projects anteriorly and superiorly at an angle of 45 degrees to the ulnar shaft, and so lies anterior to the axis of the ulna. This anterior projection of these articular surfaces and their inclination at 45 degrees promotes flexion as follows :

1. Contact of the coronoid process with the humerus occurs only when the two bones are almost parallel, i.e. theoretically flexed to 180 degrees.
2. Even during full flexion the two bones are separated by a space which lodges the muscles.

In absence of these projections and inclinations, flexion would clearly be limited to 90 degrees by impact of the coronoid process on

the humerus; and during full flexion there would be no space left for the muscles, assuming that the bones could come into contact with each other as a result of for example, communication between the coronoid and olecranon fossa (Kapandji, 1970) (Fig. 1-4).

The Capitellum :

It is a part of the lateral condyle of the humerus and is much smaller than the trochlea. It lies lateral to the trochlea. It is not a complete sphere, but a hemisphere (the anterior half of the sphere) placed infront of the lower end of the humerus. It extends only on the anterior and inferior surfaces, unlike the trochlea, it does not extend posteriorly and stops short at the lower end of the humerus.

The capitello-trochlear groove has the shape of a cone with its wide base resting on the lateral lip of the trochlea.

It articulates with the disc-shaped head of the radius. The proximal surface of the radial head has a concavity corresponding to the convexity of the capitellum humeri. It is bounded by a rim which articulates with the capitello-trochlear groove (Kapandji, 1970).

In full extension of the elbow, the head of radius lies in contact with the inferior surface of the capitellum, but moves on its anterior surface when the joint is flexed (Last, 1984; Warwick & Williams, 1973).

The Non articular parts of the Lower End of the Humerus :

It includes the medial and lateral epicondyles, together with the olecranon, coronoid and radial fossae.

The Medial Epicondyle :

It is a part of the medial condyle of the humerus. It is the

terminal point of the medial supracondylar ridge, it is larger and extends downwards more than its lateral counterpart.

It is a conspicuous, blunt projection on the medial side which can be easily identified and felt subcutaneous (**Warwick & Williams, 1973**).

Its posterior surface is smooth and crossed by the ulnar nerve and its collateral artery " inferior ulnar collateral artery "; in a shallow sulcus where the nerve can be felt and rolled against the bone.

There is a smooth facet on its anterior surface for the origin of the superficial flexor muscles of the forearm (common flexor origin). Deeply on the distal border of this epicondyle is another small facet for the attachment of the medial (ulnar) collateral ligament (Last, 1984).

The medial epicondyle is really not an epiphysis but an apophysis. It does not in itself enter into the formation of the articular surface of the joint. It projects from the bone as a muscle and ligamentous attachment only. It does not contribute to the longitudinal growth of the humerus.

The Lateral Epicondyle :

It is a part of the lateral condyle of the humerus. It does not project laterally beyond the lateral border. It is much more smaller than the medial epicondyle, but it is directed forwards opposite to the medial one.

It can be felt through the skin at the back of the elbow and lies at the bottom of a well marked depression which can be seen when the elbow is extended and viewed from behind (**Warwick & Williams, 1973**).