VALUE OF X-RAY OF THE HANDS IN THE DIAGNOSIS OF MEDICAL DISEASES

THESIS

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By

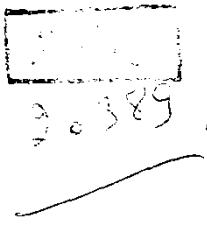
Eva Samy Mosaad

M.B.;B.Ch.

SUPERVISED BY

Dr. Jannette Boushra Hanna

Assist. Prof. of Radiodiagnosis



Dr. Heba Mohamed El Deeb

Lecturer of Radiodiagnosis

Department of Radiodiagnosis

Faculty of Medicine

Ain Shams University

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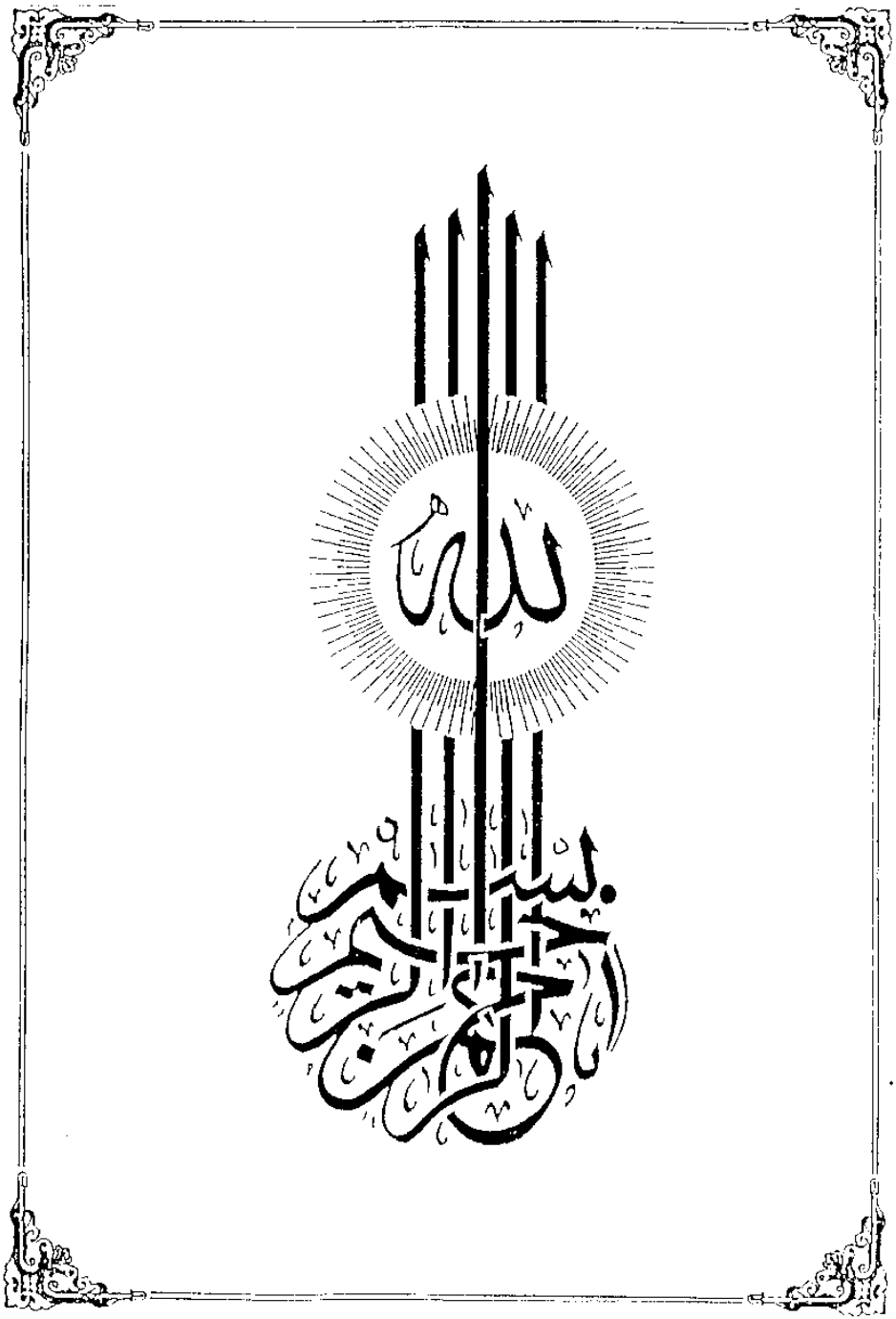

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INTRODUCTION AND AIM OF WORK

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How remarkable that the hand, the first human part X-rayed, may be the primary clue to underlying medical diseases. In many instances, the findings on the roentgenograph of the hand may be pathognomonic of the disease.

The aim of our work is to illustrate various systemic as well as localized diseases that manifest themselves roentgenographically in the hand and wrist.

The hand consists of 27 bones, which are subdivided into 3 groups: The phalanges or bones of the fingers, the metacarpales or bones of the palm and the carpals or bones of the wrist (Warwick and Williams 1973, Ballinger 1982).

The fingers:

The fingers are numbered and named, however the description by number is the more correct terminology.

Beginning at the lateral side, the numbers and names are the first or thumb, the second or index finger, the third or middle finger, the fourth or ring finger and the fifth or small finger.

There are 14 phalanges in the fingers, 2 in the thumb and 3 in each of the other fingers. The phalanges of the first finger are described as first and second or as proximal and distal. Those of the other fingers are described as first, second and third or as proximal, middle and distal.

The phalanges consist of a cylindrical shaft and two articular ends and are slightly concave anteriorly. The distal phalanges are small and flattened and have a roughened rim around their distal anterior end which gives them a spatular appearance.

The interphalangeal articulations are diarthrodial joints of the hinge type, having only forward and backward movements.(Ballinger 1982).

The palm:

There are five metacarpals corresponding in position to the palm of the hand. The metacarpals are simply numbered one to five, beginning at the lateral or thumb side of the hand.

The metacarpals consists of a body or shaft and two articular ends. They are cylindrical in shape and are slightly concave anteriorly. They articulate with the phalanges at their distal ends and with the carpus at their proximal ends.

With the exception of the thumb, the metacarpophalangeal articulations are diarthrodial joints of the condyloid type, having the movements of flexion, extension, abduction, adduction and circumduction.

In addition to these movements the thumb has axial rotation which places it in the saddle joint classification. (Warwick and Williams 1973, Ballinger 1982).

Wrist:

The wrist has 8 carpal bones. They are fitted closely together and arranged in two transverse rows. With one exception each of these bones has two names, both in common usage. The names of those in the proximal row, beginning at the lateral or thumb side, are the navicular or scaphoid, the lunate or semilunar, the triquetral or cuneiform (also called the triangular) and the pisiform. In the distal row beginning at the lateral side are the greater multangular or trapezium, the lesser multangular or trapezoid, the capitatum or os magnum (also called the capitate), and the hamate or unciform.

The carpals are composed largely of cancellous tissue with an outer layer of compact bony tissue. They are classified as short bones. The carpals articulate with each other, with the metacarpals and with the radius of the forearm. In the carpometacarpal articulations the first metacarpal and the trapezium form a saddle type of joint which has great freedom of movement, whereas the articulations between the second, third, fourth and fifth metacarpals and the trapezoid, capitate and hamate form gliding joints of limited movement.

The midcarpal articulations allow free flexion and extension and slight rotation.

The radio-carpal articulation which is considered the wrist joint proper, is a diarthrodial joint of the condyloid type which has all movements except rotation. (Meschan 1959, Ballinger 1982).

The dorsal surface of the articulated carpals is convex and the palmar surface is concave from side to side, and the groove formed by the concavity

is called the carpal canal or carpal tunnel. (Ballinger 1982).

Ossification of the wrist, carpus and hand:

The carpal bones:

All ossify from primary centres of ossification. Each bone is usually ossified from one centre. The capitate first and the pisiform last.

The capitate and hamate at the 4th month, the triquetral in the third year, the lunate during the fourth year and the scaphoid, Trapezium and trapezoid during the sixth year. The pisiform ossifys by the age of eleven. (Warwick and Williams 1973, sutton 1980).

The metacarpal bones:

Each one ossifys from two centres, a primary centre for the shaft and a secondary centre for the base or proximal end of the first and for the head or distal end of each of the other four.

The primary centres appear in the middle of the shaft about the 9th week of intrautrine life. The secondry centres for the heads of the second, third, fourth and fifth appear by the age of two and a half years. Also the secondry centre for the base of the first metacarpal appear by the age of two and a half years. (Warwick and Williams 1973).

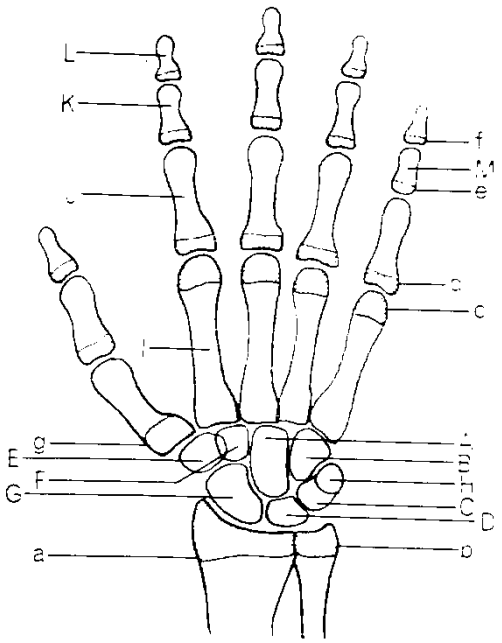
The Phalanges:

Each one ossifys from two centres, a primary centre for the shaft and a secondry centre for the proximal extremity.

Ossification of the shaft occurs as follows:

Distal phalanges in the eighth or ninth week, proximal phalanges in the tenth week and the middle phalanges in the eleventh week of intrautrine life.

The secondary centres appear in the proximal phalanges in two and a half years, in the middle and distal phalanges in the third year (Warwick and Williams 1973, Sutton 1980).



Ossification of the wrist, carpus and hand:-

A, Capitate 4 months. B, Hamate 4 months. C, Triquetral 3 years. D, Lunate 4th to 5th year. E, Trapezium 6 years. F, Trapezoid 6 years. G, Scaphoid 6 years. H, Pisiform 11 years. I, Metacarpals 10th fetal week. J, Proximal phalanges 11th fetal week. K, Middle Phalanges 12th fetal week. L, Distal phalanges 9th fetalweek. M, Middle phalanx of 5th digit 14th fetal week.

a Lower end of radius 1-2 years, fuses 20th year.

b Lower end of ulna 5-8 years, fuses 20th year.

c Metacarpal heads 2½ years, fuse 20th year.

d Base of proximal phalanges 2½ years, fuse 20th year.

e Base of middle phalanges 3 years, fuse 18-20 years.

f Base of distal phalanges 3 years, fuse 18-20 years.

g Base of 1st metacarpal 2½ years, fuse 20th year.

(Quoted from Sutton 1980).

PATHOLOGY OF DISEAES WHICH AFFECT THE HAND

I- DYSPLASIAS

1) Achondroplasia:

Achondroplasia is defined as an hereditary and congenital growth disturbance of enchondral bone formation associated with dwarfism.

Pathologically, achondroplasia exhibits retardation and irregularity of the growth of the cartilage of the epiphyseal ends of the bones. As a result there is a disproportionate dwarfism with an especially marked shortening of the bones of the extremities and base of the skull, but no great alteration in the axial skeleton, (Beeson et al 1979).

The cardinal features of achondroplasia are dwarfism of the short limb type, a large head, bulldog facies and perhaps trident hands enable the diagnosis to be made clinically in most cases (Sutton 1980).