DIAGNOSTIC IMAGING OF THE WRIST

An Essay
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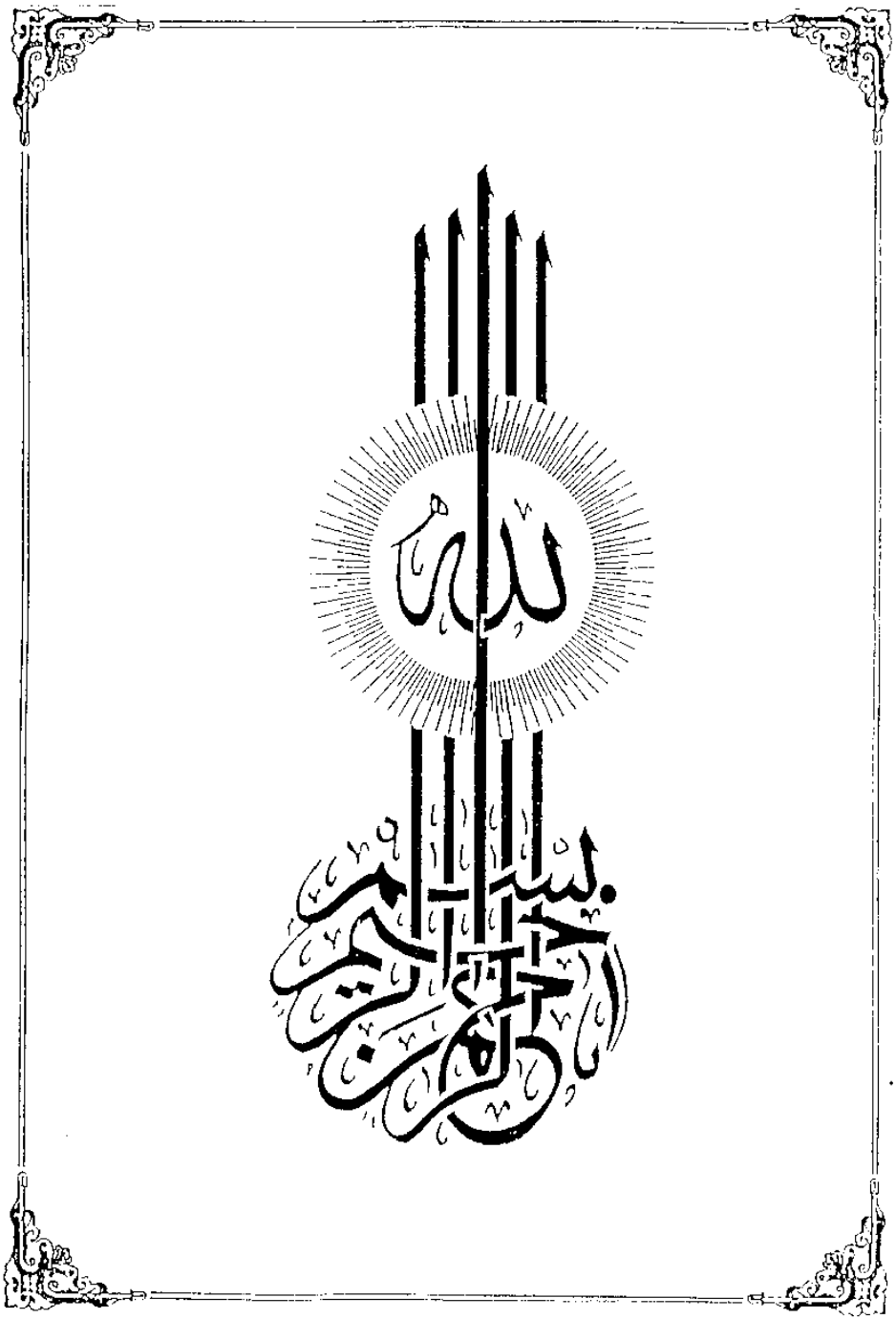

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INTRODUCTION

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Wrist pain is the common clinical presentation that may result from either acute or chronic trauma or may be the after math of underlying congenital, inflammatory or neoplastic disorders.

Analysis of wrist function requires understanding of normal anatomy of carpal bones and their variation as well as the articulation of the distal forearm. The ligamentous and cartilagenous structures about the wrist, radiologically invisible until the last few years, are becoming better understood.

The complex interaction of the carpal bones and the intricate carpal ligamentous network have been better explored with new imaging tools in the last few years.

Now, the radiologist working closely with the clinician can demonstrate important pathologic conditions causing wrist discomfort. In addition to the standard plain film examination new modalities exist for the identification of newly described pathologic entities.

The recognition of static bony pathologic states can often be demonstrated with plain film radiographs.

The identification of several dynamic pathologic condition has fostered the development of an array of dynamic imaging techniques to demonstrate these conditions. In addition to the standard plain film examination and special projections, wrist imaging now encompasses dynamic motion studies, three phase nuclide bone scans, conventional and computed tomography, arthrography and magnetic resonance imaging.

Co-operation between the examining clinician and the radiologist is necessary to tailor an appropriate imaging protocol.

ROUTINE RADIOGRAPHY OF THE WRIST, SPECIAL VIEWS

1. ROUTINE RADIOGRAPHY OF THE WRIST AND SPECIAL VIEWS (PLAIN RADIOGRAPH)

After the clinical history and physical examination, the conventional radiographic study is the first step in evaluation of wrist diseases.

The conventional radiographs are examined for bony abnormalities such as fractures or cortical interruption, erosions, bony production or periosteal reaction, and the degree and pattern of mineralization, soft tissue abnormalities are also sought, such as soft tissue calcification, focal or generalized soft tissue swelling and diseases of articular cartilage.

There are different views with plain radiography to show abnormalities of the wrist joint. These views include:

1. *Postero anterior view (PA view)*
2. *Lateral view*
3. *Oblique views*
4. *Carpal tunnel view*
5. *Carpal bridge view*
6. *Motion views or stress views.*

Technique:

1. Postero-anterior view: PA view:

The standard PA view is one taken with the forearm in neutral rotation this is accomplished by abducting the humerus 90° degrees from the chest wall and flexing the elbow 90 degrees **(Fig. 1.1 A-B)**

2. Lateral View:

This view is taken with the forearm in neutral rotation by maintaining the humerus adducted against the chest wall and flexing the elbow 90 degrees, the ulnar side of the wrist and the hand is maintained flat against the cassette, and there is straight alignment of the forearm with the dorsum of the hand **(Fig. 1.1 C-D)**

3. Oblique Views:

There are 4 views:

a. 45 degrees internal rotation (Semipronated) from PA radiograph **(Fig. 1.1 E-F)**

b. 45 degrees external rotation (Semisupinated) from PA radiograph **(Fig. 1.1 E-H)**

c. Radiograph obtained during radial deviation of the wrist **(Fig. 1.2 A-B)**

d. Radiograph obtained during ulnar deviation of the wrist **(Fig. 1.2 C-D)**

Fig 1.1 A,B:

Posteroanterior radiograph: normal carpal bones one well visualized.

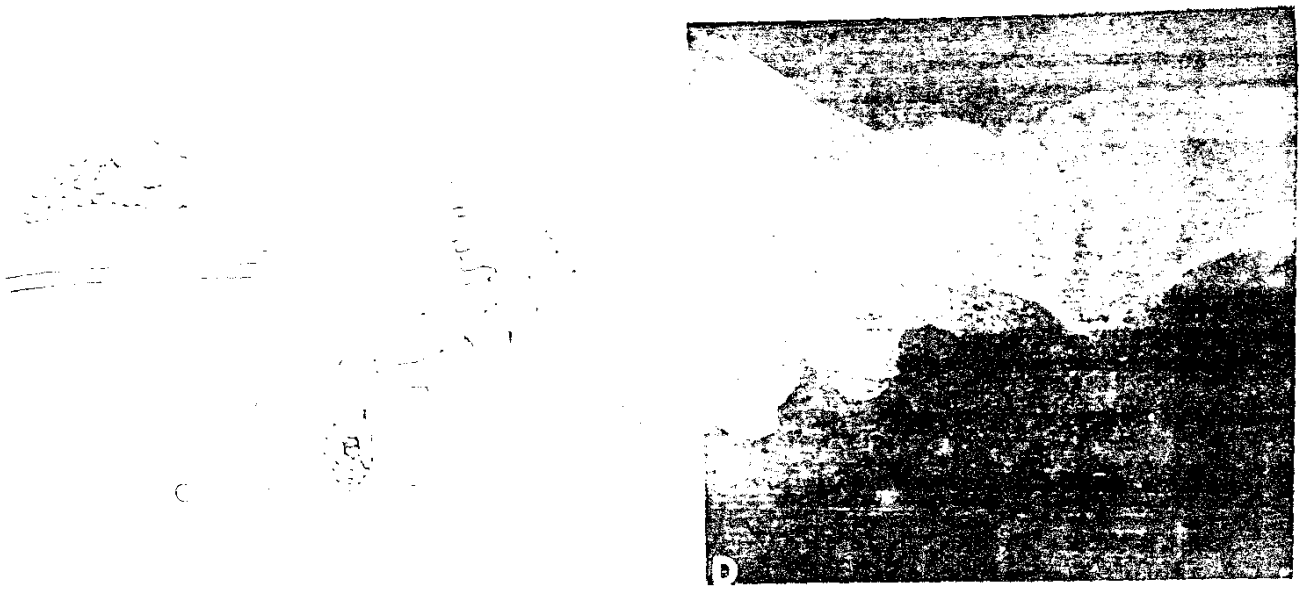

Fig 1.1 C,D:

Lateral radiograph: Normal carpal alignment and fat pad are seen

Fig 1.1 E,F:
Semipronated oblique radiograph: Normal
This view allows evaluation of the radial aspect of the wrist particularly the scaphoid and radial styloid, note the normal contour of the midportion of the scaphoid (arrowed)

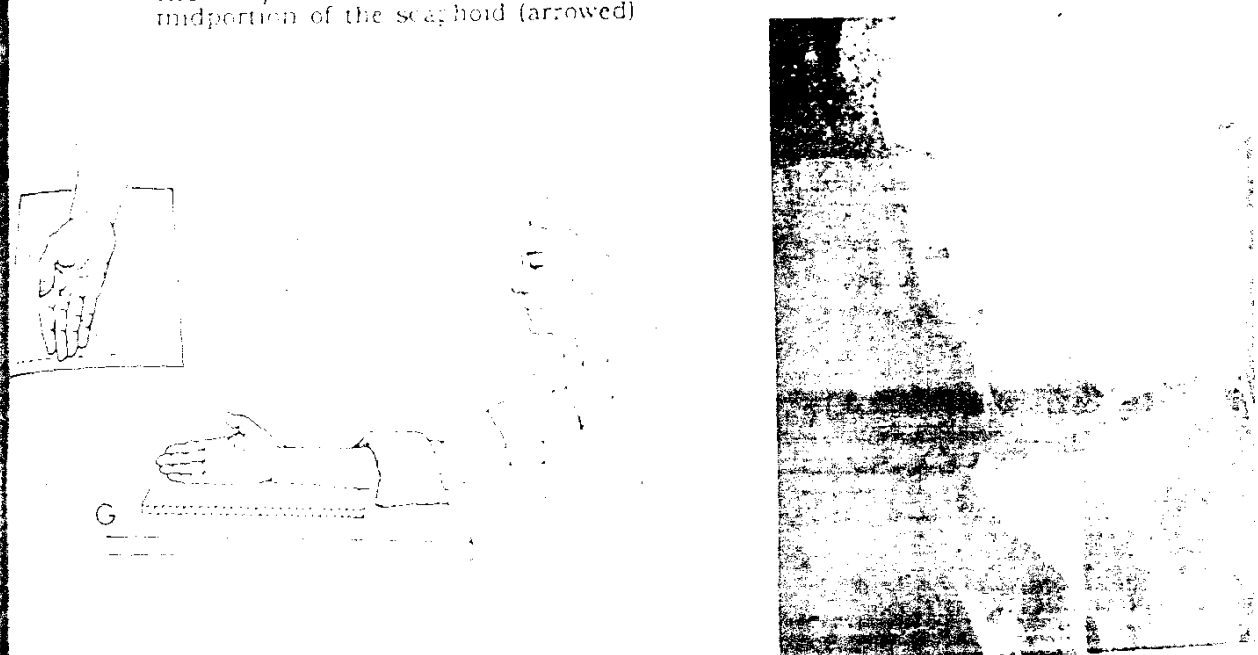

Fig 1.1 G,H:
Semisupinated oblique radiograph: Normal observe the pisiform bone which is separated from the remaining carpal bones, and the tangential view of the pisiform-triquetral joint (arrowed).

Sartoris D.J., Resnick D.
Plain film radiography, routine and specialized techniques and projections from Resnick D, Niwayama G., Diagnosis of bone and joint disorders vol. 1 1988.

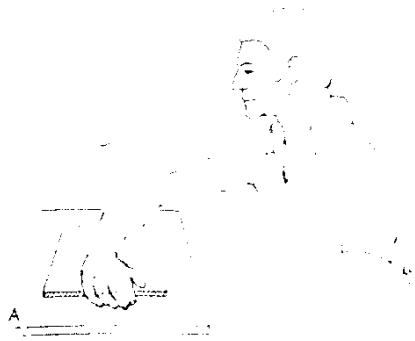

Fig 1.2 A,B:
Radial deviation of the wrist in which palmar flexion of the proximal carpal row occurs and the distal scaphoid rotates into the palm. The proximal carpal row moves in an ulnar direction with respect to the distal radius

Fig 1.2 C,D:
Ulnar deviation of the wrist.
The scaphoid lunate space may increase slightly and the scaphoid is exposed in full profile

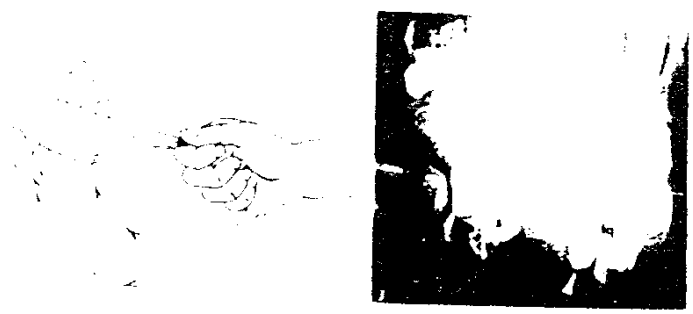

Fig 1.2 i,j:
Carpal tunnel view
The drawing i indicates that the long axis of the hand is placed in a vertical direction and the central ray is directed in an angle of 25 to 30 degrees to this long axis
In the normal situation J :
The trapezium (tm) , scaphoid (s), triquetrum (tq), pisiform (p) and hook of hamate arrowed can be delineated

Fig 1.2 L,M:
Carpal bridge view:
The drawing indicates that the wrist is flexed to approximately 90 degrees and the central ray is angled at 45 degrees in a supero inferior direction
This view demonstrate the scaphoid (s) and lunate (l) and is useful for diagnosing fractures foreign bodies and soft tissue swelling on the dorsum aspect of the wrist.

4. *Carpal tunnel view:*

Technique: (Fig. 1.2 I-J)

It can delineate the osseous structures and soft tissues of the carpal canal, including the hook of the hamate, pisiform, trapesium, trapezoid and tuberosity of the scaphoid [71] [55].

It is obtained by using Gaynor-Hart method. An infersuperior projection may create a confusing ring artifact representing an end-on view of the fifth metacarpal superimposed on the carpal bones with the central radiolucent area corresponding to the medullary canal. [8]

The patient's inability to completely hyperextend the wrist may result in slight positioning modification and thus unusual projection of the fifth metacarpal. [67]

5. *Carpal Bridge View:*

Technique: (Fig. 1.2 L-M)

This view demonstrates the osseous and soft tissue structures on the dorsum of the wrist [38]

6. A specialized anteroposterior projection with beam angulation has been used to define changes in the carpometacarpal joint [17]