CARPAL INSTABILITY

Essay

Submited for Partial Fulfilment
Of Master Degree
In Orthopaedic Surgery
M.Sc. (Ortho)

BY
SALAH ABDEL GAWWAD ABOSEIF
M. B. B. Ch

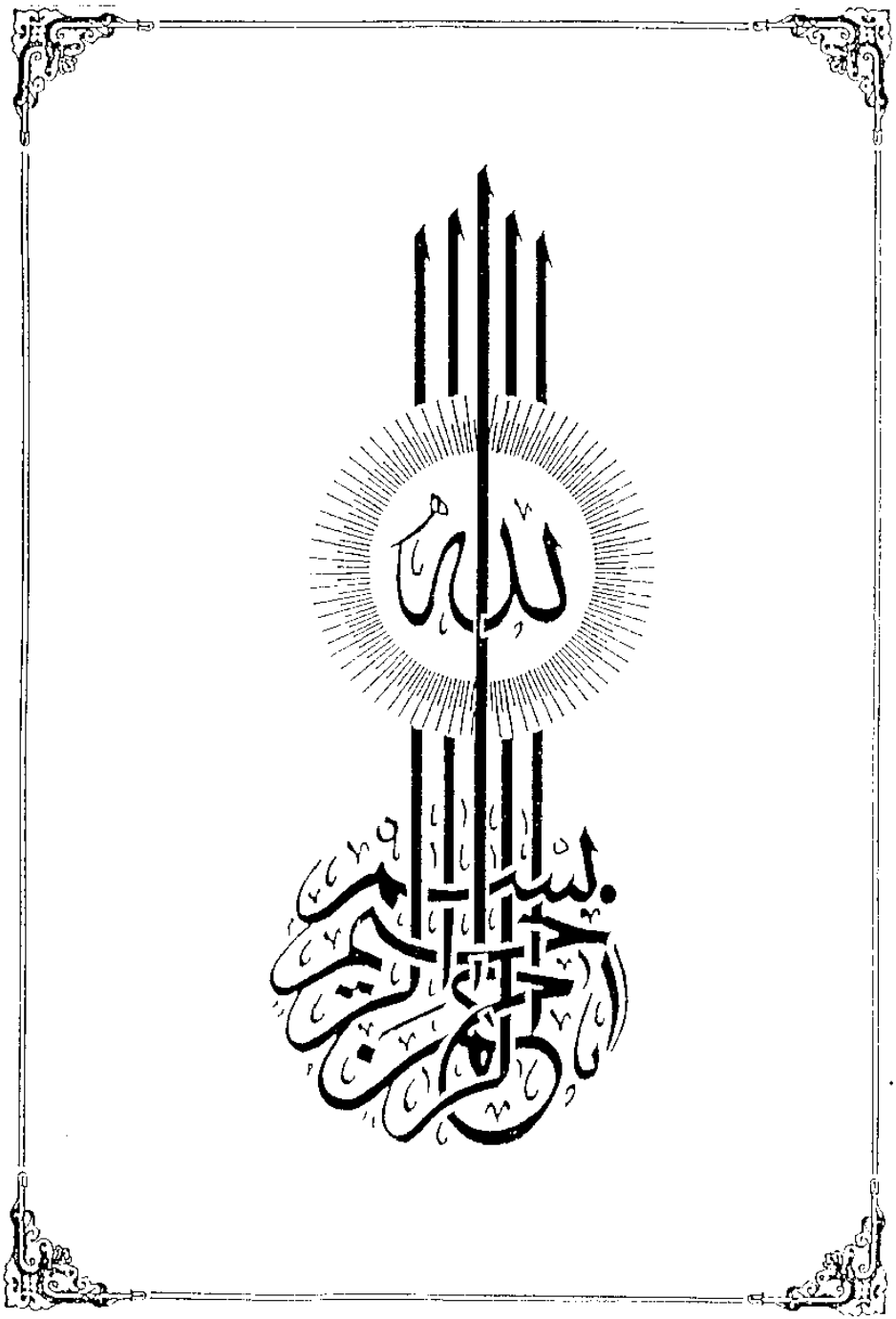
Supervised by
prof. Dr. MOHAMED NABIL KHALIFA
Prof. of Orthopaedic Surgery
Ain Shams University

Dr. MOHAMED SADEK EL SOKKARY
Lecturer Of Orthopaedic Surgery
Ain Shams University

FACULTY OF MEDICINE
AIN SHAMS UNIVERSITY

1992

"بسم الله الرحمن الرحيم"



ACKNOWLEDGEMENT

I Would like to express my deepest gratitude to prof. *Dr. Mohamed Nabil Khalifa.* Professor of orthopaedic Surgery, Ain Shams University for giving me the privillage of doing this piece of work under his supervision.

My sincere thanks to *Dr. Mohamed sadek El Sokkary*, lecturer of orthopaedic surgery, Ain Shams University for his support and guidance.

My deepest thanks to all my professors, Medical staff and Dear Colleagues in the orthopaedic Department for their encouragement and support.

Contents:-

"INTRODUCTION"

INTRODUCTION:

Carpal instability may occur from a variety of different fractures or dislocations with a combination of bone, ligament, capsule and tendon injury.

Ligament repair and proper reconstruction of fractured carpal component serve to preserve these support structures for maintenance of normal joint alignment and transmission of forces within this highly tuned and mechanically complex unit.

undoubtedly the ancients were aware of wrist problems, but not much was written until the begining of 19th century.

A theme reflected in the writtings of the continental physicians was that most injuries of this area were dislocations of the wrist diagnosed by clinical examination or confirmed by autopsy.

The advent of the x-ray allowed swift progression in understanding and classifying traumatic injuries of the wirst.

New information on muscle and tendon physiology, vascularity of the carpal bones, the location and function of intrinsic and extrinsic wrist ligaments and three dimentional motion of individual carpal bones has increased immeasurably our understanding of the surgical anatomy of the wrist

and will assist the efforts towards timely and anatomically accurate reconstruction following acute or delayed trauma.

It is the idea of this research to attract the attention to this interesting problem to review the anatomy and the kinematic concepts of the wrist, and to classify, diagnose and up to date approaches to management of carpal instability.

"ANATOMICAL" CONSIDERATIONS

Anatomy of the Carpal region:

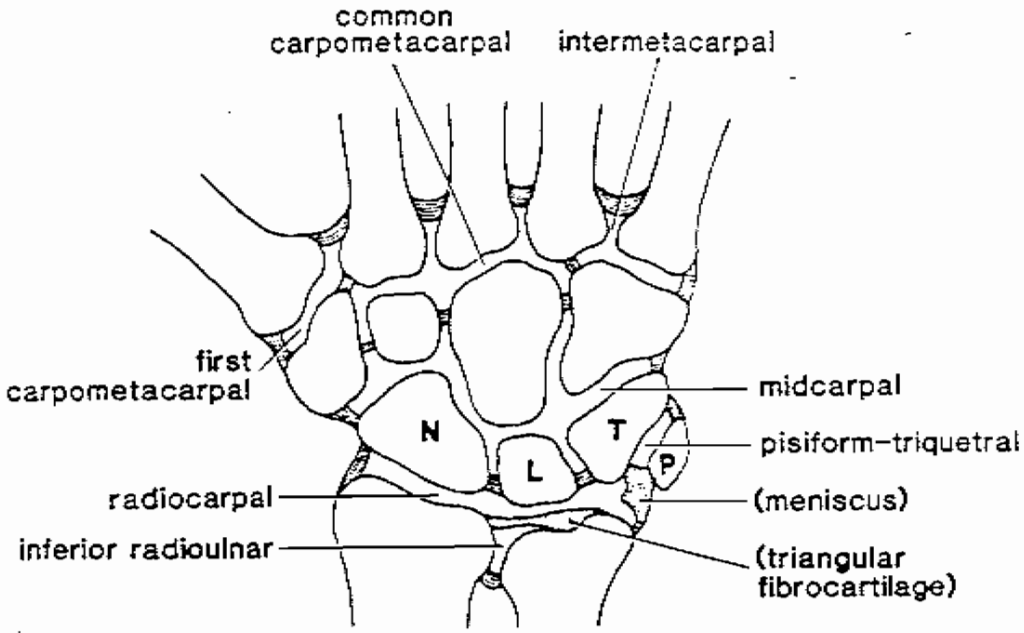
1 Bones and Joints:

The carpal bones are composed of the proximal and distal carpal rows which form with the distal radius, ulna and the base of the metacarpals the wrist joint.(21)

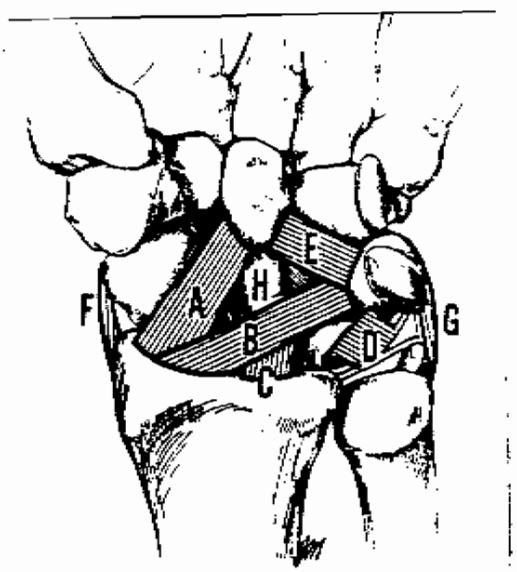
The distal carpal row (trapezium, trapezoid, capitate and hamate) forms a rigid supportive transverse arch upon which the five metacarpals of the hand are firmly supported.

The trapezium interfaces the thumb with the proximal row. It provides motion of 10° to 20° at the scaphotrapezial joint and 30° to 42° of rotation/ flexion-extension at the metacarpotrapezial joint,.(21) The capitate and trapezoid which shift minimally on each other are tightly articulated with the second and the third metacarpals. While the hamate which slides slightly on the capitate articulate with the fourth and fifth metacarpals.(21) [Fig .1]

The proximal carpal row consists of the lunate and triquetrum and the entire scaphoid which however, unequally positioned to function mechanically as part of both the distal and proximal carpal rows.(13) The pisiform though considered a carpal bone, is actually a sesamoid bone onto which the tendon of flexor carpi-ulnaris inserts.(14)



[Fig.1] Diagramatic representation of wrist compartments, relations with interosseous ligaments, triangular fibrocartilage, and meniscus. N=navicular, L=Lunate, T=triquetrum, P=pisiform.[21]



[Fig.2] The palmar ligaments of the wrist.[23]
The major intracapsular ligaments include:
A. Radiocapitate L.
B. Radiotriquetral L.
C. Radioscapholunate L.
D. Ulnolunate L.
E. capitio triquetral L.
F. Radial Collateral L.
G. ulnar Collat L.
H. The Space of Poirier

The proximal carpal row articulates with:-

1- distal articular surface of the radius which articulate with scaphoid and lunate.
2- the triangular fibro cartilage which articulate with lunate and triquetrum.

- The distal articular surface of the raduis is concave and tilted in two planes; In the sagittal plane there is an average of 14° volar tilt, in the frontal plane there is an average ulnar inclination of 22° .
- The triangular filo-cartilage is the ulnar continuation of the distal radius. It originates from firm attachements on the medial border of the distal radius and inserts into base of the ulnar styloid] .(14)

The mid carpal joint has an unique articular surface, shape, which as a whole, ressembles an acetabulum centered on the lunate. Laterally there is a convex distal scaphoid surface articulating with the trapezium and trapezoid.

The central part of the mid-carpal joint is a concavity of the scaphoid and lunate receiving a convex proximal head of the capitate. Finally the medial joint of hamate and trapezium is helicoid in configuration, providing for a sliding movement of the hamate on the triquetrum that influences angulation of the proximal row with wrist movements. (33)

II Ligaments of the wrist:-

There are two major groups of ligaments of the wrist, extrinsic and intrinsic. The extrinsic ligaments are those that link the carpal bones to the radius, ulna and metacarpals. The intrinsic ligaments interconnect individual carpal bones. (23)

(1) EXTRINSIC LIGAMENTS:-

The key ligaments of the wrist are volar and intracapsular ligaments.(23) [Fig.2]

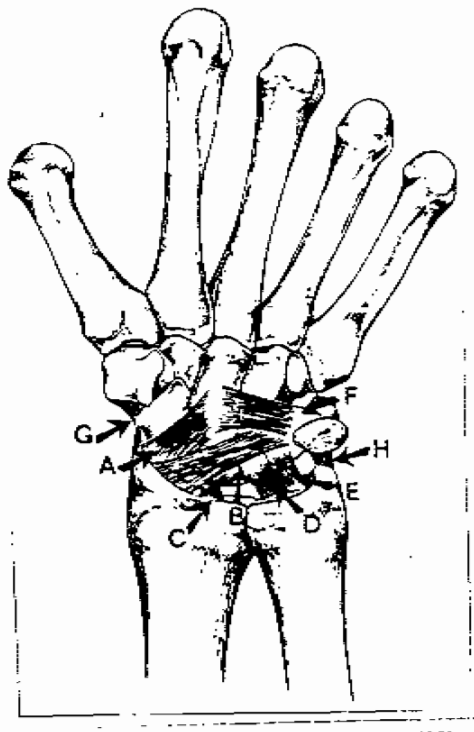
- The palmar extrinsic ligaments consists of two v.shaped ligamentous band : One is proximal and connects the forearm to the proximal carpal row; one is distal and connects the forearm to the distal carpal row.

Between these two rows of ligaments is a thinned area termed the ***space of poirier***. This area expands when the wrist is dorsiflexed and disappears on palmar flexion.

A rent develops during dorsal dislocations, and it is through this interval that the lunate displaces into the carpal canal. (23)

* The volar radio-carpal ligament consists of three deep strong intracapsular ligaments. ***The radiocapitate ligament*** is a strong intracapsular ligament that arises from the volar and radial aspect of the radial styloid process, traverses a groove in the waist of the scaphoid and ends in the center of the volar aspect of the capitate.(23) ***The volar radio triquetral ligament*** is the largest ligament of the

[Fig. 3] Volar view of wrist joint (sp =space of poirier; RCL = radiocapitate lig.; RTL = radio triquetral lig.; TCL = Transverse carpal liqament; CT = carpal tunnel.[30]



[Fig.4] Volar intracapsular wrist ligaments.[30]

A= radiocapitate ligament;
B= radiotriquetral ligament;
C= radioscaphoid ligament;
D= ulnolunate ligament;
E= ulnotriquetral ligament;
F= capitotriqetral ligament;
G= radial collateral;
H= ulnar collateral ligament.

wrist. (30) It arises from the volar aspect of the radial styloid process, it is dirceted across the volar aspect of the lunate to which it is connected, and ends in the palmar surface of the triquetrum, and is considered to be a single ligament.
This ligament acts as a volar sling for the lunate. (30)
The radio scaphoid ligament arises from the volar tip of the distal radius on the ulnar side of the radio triquetral ligament and is a distinct large ligament that is consistently present. (30) [Fig.3,4]
* ***The ulno-lunate and ulno-triquetral ligaments*** arise intra-articularly from the ulnar articular meniscus of the wrist joint and are directed to the lunate and trapezium respectively. (23),(30)

The dorsal radio-carpal ligament arises from the dorsal aspect of the radial styloid process and is directed across the dorsal surface of the lunate to terminate mainly into the dorsal aspect of triquetrum. This ligament acts to maintain the lunate in opposition with the distal radius. (30) [Fig.5]

(2) INTRINSIC LIGAMENTS:-

The intra-articular intrinsic ligaments of the wrist connect adjacent carpal bones.

They are collections of relatively short fibers that bind the bones of either the proximal or distal carpal rows to each other. (23)

In the proximal carpal row the strong scapho-lunate interosseous membrane begins volarly and follows the convex arc of the proximal edge of the