The Role Of Different Imaging Modalities In The Evaluation Of Ulnar-Sided Wrist Pain

Essay

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Dedication

To my precious family

CONTENTS

List of Abbreviations

AP	Antero-posterior
AVN	Avascular necrosis
D	Deltoid ligament
2D	Two dimensional
3D	Three dimensional.
DB	Decibels
DISI	Dorsal intercalated segmental instability
DISI	Dorsal intercalated segmental instability
DMCI	Fldorsal midcarpal instability
DRUJ	Distal radioulnar joint
ECU	Extensor carpi ulnaris
ED	Extensor digitorum
EDM	Extensor digiti minimi
EPL	Extensor policis longus
ER	Extensor retinaculum
FCU	Flexor carpi ulnaris
FCR	Flexor carpi radialis
FDP	Flexor digitorum profundus
FDS	Flexor digitorum superficialis
FPL	Flexor policis longus
FSPGR	Fast spoiled gradient echoes
FSE	Fat spin echo
FOV	Field of view
FPL	Flexor Pollicis longus
FS PD FSE	Fat-suppressed PD-weighted fast spin-echo
GRE	Gradient recoiled echo.
Hz	Hertz
LTL	Luno-triquetral ligament
MCI	Midcarpal instability
MDCT	Multi- detector Computed tomography
MHz	Mega Hertz
MPR	Multiplanar reformations
MRI	Magnetic resonance imaging
MRA	Magnetic resonance arthrography

PD	proton density.
PMCI	Palmar midcarpal instability
RF	Radiofrequency
RLT	Radiolunotriquteral ligament
RSC	Radioscaphocapitate ligament
RSL	Radioscapholunate ligament
RT	Radiotriquteral ligament
SLL	Scapho-lunate ligament
SNR	Signal noise ratio
SPIR	Spectral presaturation with inversion recovery
STIR	Short time inversion recovery.
TE	Echo time
TFCC	Traingular fibrocartilage complex
TR	Repetition time
TS **TT**	Triquteroscaphoid ligament Triquterotrapezoid ligament
UCL	Ulnar collateral ligament.
UL	Ulnolunate ligament
US	Ultrasound
UT	Ulnotriquteral ligament
VISI	Volar intercalated segmental instability

Introduction

Ulnar sided wrist pain is a common cause of upper extremity disability. Presentation can vary from acute traumatic injuries to chronic degenerative conditions. Because of its overlapping anatomy, complex differential diagnosis and varied treatment outcomes, the ulnar sided wrist pain has been referred to as the "blackbox" of the wrist and its pathology has been compared with that of the low backpain ***(Sachar, 2008).***

Wrist pain often proves to be a challenging presenting complaint. Determing the cause of ulnar sided wrist pain is difficult because of the complexity of the anatomical and biomechanical properties of the ulnar side of the wrist. ***(Lichman & Joshi, 2008)***

The ulnar side of the wrist consists of variable anatomical structures that contribute to stability yet allows for dynamic motion and ability to generate powerful grip through ulnar deviation ***(Sachar, 2008).***

The differential diagnosis of ulnar sided wrist pain can be divided into six elements: osseous, ligamentous, tendinous, vascular, neurologic, and miscellaneous ***(Shin et al., 2004).***

The role of imaging in wrist pain has received much attention but remains controversial. There is considerable disagreement about which imaging study, if any, should be performed in a given situation ***(Blebea et al., 2009).***

Numerous imaging modalities are available for the evaluation of ulnar sided wrist pain. In almost all cases, plain radiographs are made first. The decision to use more advanced imaging modalities is based on the suspected diagnosis ***(Shin et al., 2004).***

Initial radiographic evaluation could reveal abnormalities, such as fractures, inflammatory arthritis, osteoarthritis or a congenital anomaly ***(Watanabe et al., 2010)***

Arthrography had been the favored imaging modality for the evaluation of ruptures of the interosseous ligaments and tears of the triangular fibrocartilage complex ***(Loredo et al., 2005)***.

Ultrasound (US) allows for the reliable identification of a variety of traumatic lesions affecting tendons, annular pulleys, ligaments, vessels, and nerves as well as inflammatory diseases of tendons and some degenerative conditions in the wrist and hand ***(Watanabe et al., 2010).***

Computed Tomography (CT) is useful in detecting or excluding occult fractures, to document the extent of fractures for staging purposes and to determine subluxation of the wrist as well as malrotation of the radius and ulna. The advantages of multi- detector CT (MDCT) include a quick and accurate examination with multiplanar (two- dimensional) and volumetric (three-dimensional) reformation ***(Kaewlai et al., 2008).***

MDCT arthrography, when compared with conventional arthrography, shows more precisely the site of a tear or perforation of the interosseous ligaments of the wrist and the triangular fibrocartilage (TFCC) ***(Watanabe et al., 2010).***

Magnetic Resonance Imaging (MRI) plays an important role in the assessment of the internal derangement of joints and is reported to be an excellent modality for diagnosing hand and wrist disorders. It has greater sensitivity for soft tissue characterization and subtle bone marrow changes and also useful for evaluating occult and stress fractures ***(Bittersohl et al., 2007)***

Direct MR arthrography is especially useful for evaluating TFCC as well as wrist ligaments however, it is a fairly complicated and time consuming technique compared with non enhanced MR imaging ***(Watanabe et al., 2010).***

Aim of the work

The purpose of this study is to evaluate the role of different imaging modalities in assessment of the causes of the ulnar sided wrist pain.

Anatomy of the Wrist Joint

The wrist joint is considered to be the most complex articulation in the human body. However, its anatomy can be simplified into three major compartments: the distal radioulnar joint (DRUJ), the radiocarpal joint, and the midcarpal joint ***(Moser et al., 2008***); they often intercommunicate through a common synovial cavity ***(Isenberg et al, 2004).***

The Carpal Bones:

The 8 bones of the carpus serve as a link between the distal radius and ulna and the metacarpals of the hand. The carpal bones are arranged in 2 rows **(Fig. 1).**

- The proximal row consists of the scaphoid, lunate, triquetrum and pisiform.
- The distal row consists of the hamate, capitate, trapezoid, and trapezium ***(Litchman & Joshi, 2009)***

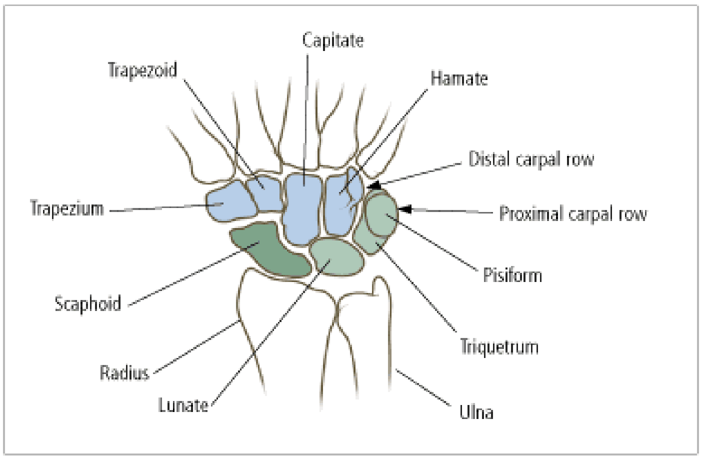

Fig. (١): The bones of the wrist (Daniels et al., 2004)

Gilula identified three arcs **(Gilula's arcs) (Fig. 2)** that circumscribe the proximal (first arc) and distal (second arc) joint surfaces of the first carpal row (scaphoid, lunate and triquetrum) and the opposing joint surface formed by the convexity of the capitate and hamate bones (third arc) ***(Vezeridis et al., 2010).***

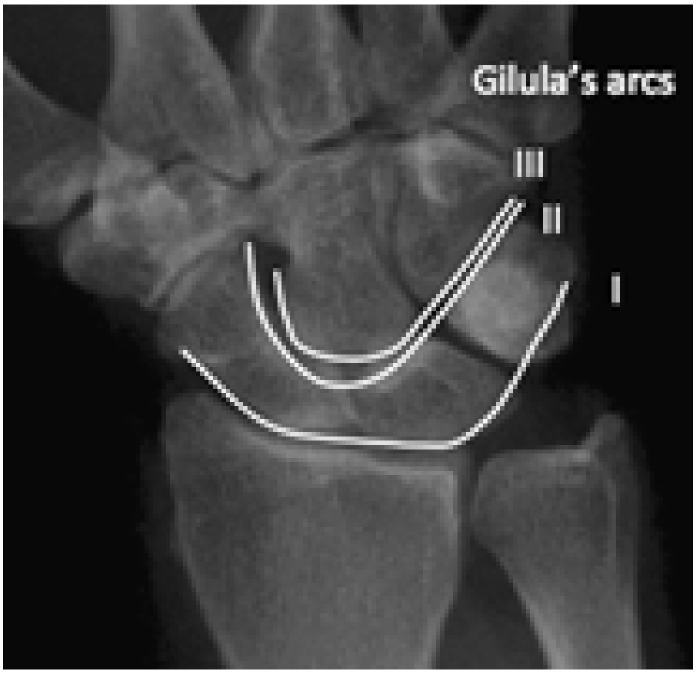

Fig. (2): Radiograph showing Gilula's arcs. Three smooth arcs normally outline proximal (arc I) and distal (arc II) cortical margins of the proximal carpal row and proximal carpal surfaces (arc III) of the hamate and capitate are shown in a postero-anterior (PA)view of the wrist **(Vezeridis et al, 2010)**

In the evaluation of the neutral lateral radiograph, a normal coaxial alignment of the radius, lunate, and capitate should be expected **(Fig. 3)** ***(Kaewlai et al., 2008).***

Fig. (3): Lateral radiograph showing normal coaxial alignment of the radius, lunate, and capitate **(Kaewlai et al., 2008)**

Mid Carpal Joint:

It is between scaphoid, lunate and triquetrum proximally, and trapezium, trapezoid, capitate and hamate distally **(Fig. 4)** ***(Johnson and Ellis, 2005).***

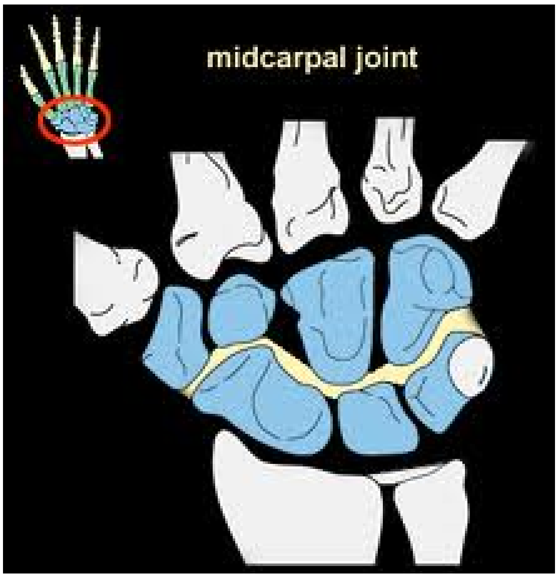

Fig. (4): Midcarpal joint (Richards & Loudon, 1997).

Radio-Carpal Joint:

The radio-carpal joint is a synovial joint composed of:

1) The articular surfaces: They are the distal end of radius and the triangular articular disc that form an elliptical concave surface which articulates with the convex surface formed by scaphoid, lunate and triquetrum **(Fig. 5)** ***(Johnson and Ellis, 2005).***

2) The fibrous capsule: it is lined by synovial membrane which is separate from the distal radioulnar and intercarpal joints ***(Johnson and Ellis, 2005).***

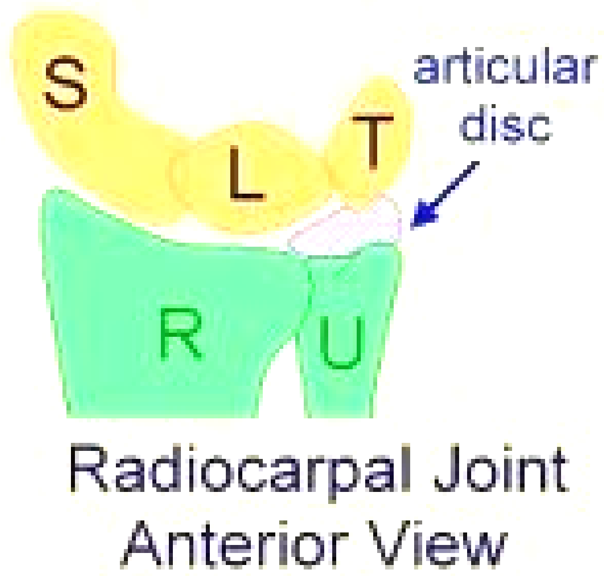

Fig. (5): Radio-carpal joint (Neumann, 2002).

Distal Radioulnar Joint:

It is a synovial joint between the convex head of the ulna and sigmoid notch of the radius. It is composed of the TFCC, superficial and deep radio-ulnar ligaments and oblique fibers of the distal interosseous membrane **(Fig. 6)** ***(Soucacos & Darlis , 2009).***