Sonographic Evaluation of Synovium of Wrist Joint in Rheumatoid Arthritis Patients during Activity

Thesis

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by

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Nesma Abd El Hakim Mohamed

List of Contents

List of Abbreviations

ACPA	Anti-citrullinated protein antibody
Anti-CCP	Anti-cyclic citrullinated peptide
CDUS	Colour Doppler Ultrasound-
CTR	Carpal tunnel release
CTS.....	Carpal tunnel syndrome
DIP	Distal interphalangeal
FDP	Flexor digitorum Profundus
FDS	Flexor digitorum superficialis
GSUS	Gray scale ultrasound
IFN-γ.....	Interferon gamma
MCP	Metacarpophalangeal
PACS	Picture archieving and comunication system
PD-US	Power Doppler ultrasonography
PIP	Proximal interphalangeal
RA	Rheumatoid arthritis
RF	Rheumatoid Factor
VEGF	Vascular endothelial growth factor

List of Figures

List of Tables

Introduction

Rheumatoid arthritis (RA) is an autoimmune disease that causes chronic inflammation of the joints. It is a destructive joint disease that is caused by inflammation in the tissue that normally produces lubrication fluid for joints. When this tissue remains inflamed, it leads to deformity by loosening joint ligaments and to joint destruction by eroding away cartilage and bone ***(Firestein et al., 2012).***

Autoimmune diseases are illnesses that occur when the body's tissues are mistakenly attacked by their own immune system. The immune system contains a complex organization of cells and antibodies designed normally to "seek and destroy" invaders of the body, particularly infections. Patients with autoimmune diseases have antibodies and immune cells in their blood that target their own body tissues, where they can be associated with inflammation. While inflammation of the tissue around the joints and inflammatory arthritis are characteristic features of rheumatoid arthritis, the disease can also cause inflammation and injury in other organs in the body. Because it can affect multiple other organs of the body, rheumatoid arthritis is referred to as a systemic illness and

is sometimes called rheumatoid disease. Rheumatoid arthritis is a classic rheumatic disease. Rheumatoid arthritis that begins in people under 16 years of age is referred to as juvenile idiopathic arthritis or JIA ***(McInnes and* Georg., *2011).***

Rheumatoid arthritis is a common rheumatic disease, affecting approximately 1.3 million people in the United States, according to current data. The disease is three times more common in women as in men. It afflicts people of all races equally. The disease can begin at any age and even affects children (juvenile idiopathic arthritis), but it most often starts after 40 years of age and before 60 years of age. Though uncommon, in some families, multiple members can be affected, suggesting a genetic basis for the disorder ***(Koopman et al., 2017).***

The presence of auto antibodies such as Rheumatoid Factor (RF) and anti-citrullinated protein antibody (ACPA) (Tested as anti-cyclic citrullinated peptide (anti-CCP) can precede the clinical manifestation by many years ***(Nielen et al., 2004).***

The wrist joint is one of the joints that are affected early in the course of the rheumatoid arthritis. It shows the rheumatic changes such as bone erosions, joint effusion and

tendinopathy. So, the wrist joint changes with rheumatoid arthritis could be used for diagnosis of the disease activity ***(Goldring et al., 2013).***

Within the last decade, musculoskeletal sonography and Power Doppler ultrasonography (PD-US) have been become an established imaging technique for the diagnosis and follow-up of patients with rheumatic diseases. This has been made possible through technological improvements resulting in faster computers and higher frequency transducers ***(Hau, 2011).***

US & PD are commonly used to assess soft tissue pathology, detect fluid collection and measure synovial vascularity due its capability to provide data that can be used to evaluate the level of joint inflammation and assess rheumatoid arthritis. It can also be used to visualize cartilage and bone surfaces. The real-time capability of ultrasonography allows dynamic assessment of joint and tendon movements to visualize the structural abnormalities. US is helpful in the guidance of aspiration, biopsy, and injection therapy. It is very patient friendly because of its non-invasive nature, lack of ionizing radiation and in addition it is not time consuming. Because it is relatively inexpensive, US can be repeated as often as necessary to monitor therapy ***(Hau, 2011).***

Aim of the Work

Our goal in this study is to demonstrate the role of Ultra-Sonography and Power Doppler in diagnosis of activity in rheumatoid arthritis in the hands and wrist joints among different aged population and correlate it with the laboratory investigation.

Anatomy of the Wrist and Hand Joints

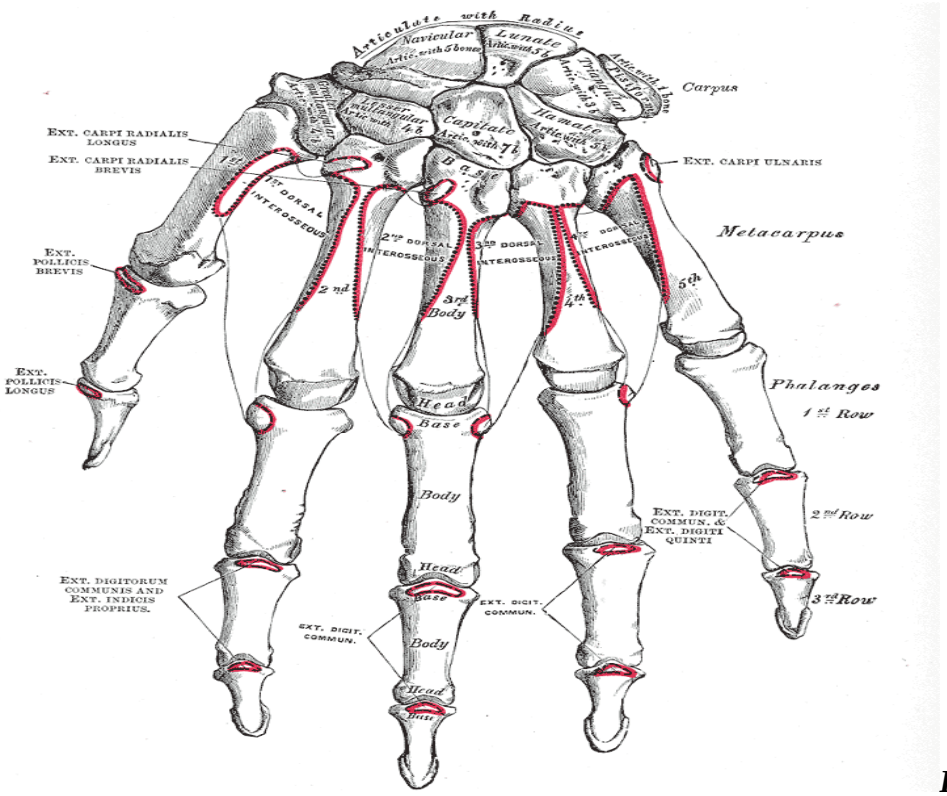

Fig. (1): *Bones of the left hand from the dorsal aspect.* ***(Standring, 2010).***

Bones of the wrist (Carpus): The carpus contains eight bones in proximal and distal rows of four. Proximally, in lateral to medial order, are the scaphoid, lunate, triquetral and pisiform; in the distal row is the trapezium, trapezoid, capitate and hamate. The pisiform articulates with palmar surface of the triquetral, thus separated from the other carpal bones, all of which articulate with their neighbors. The

other three proximal bones form an arch proximally convex, articulating with the radius and articular disc of the inferior radioulnar joint. The arch's concavity is a distal recess embracing, proximally, the projecting aspects of the capitate and hamate; the two rows are thus mutually and firmly adapted ***(Roger, 2015).***

Fig. (2): *Carpal anatomy, three-dimensional (3D) CT images show the normal wrist. C = capitate, H = hamate, L = lunate, P = pisiform, S = scaphoid, Td = trapezoid, Tm = trapezium, Tr = triquetrum* ***(Rathachai et al, 2008).***

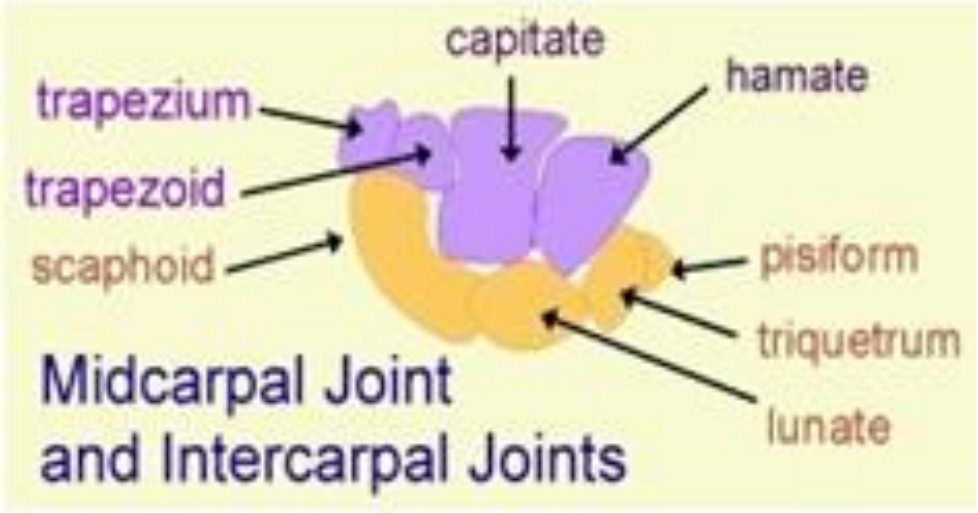

Fig (3): *Carpal bones, mid carpal, and inter carpal joints* ***(Neumann, 2002).***

Carpal arcs (Gilula arcs or lines) are three smooth arcs (fig.4):

1. **Arc I** outlines the proximal surface of the scaphoid, lunate, and triquetrum.
2. **Arc II** represents the smooth arc that defines the distal surface of these same three carpal bones.
3. **Arc III** outlines the proximal surface of the capitate and hamate.

The continuity of the carpal arcs should be assessed on all frontal wrist radiographs. Disruption of one of these arcs suggests an abnormality at that site. In the evaluation of the neutral lateral