A COMPARATIVE STUDY BETWEEN THE DIAGNOSTIC VALUE OF ULTRASONOGRAPHY AND MAGNETIC RESONANCE IMAGING IN EVALUATION OF THE SHOULDER JOINT IN PATIENTS WITH RHEUMATOID ARTHRITIS

Thesis

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LIST OF ABBREVIATIONS

ACJ	Acromio-clavicular joint
ACR	American College of Rheumatology
ARA	American Rheumatism Association
CBC	Complete blood count
CDS	Color duplex sonography
cm	Centimeter
CNS	Central nervous system
CR	Conventional radiography
CRP	C-reactive protein
CT	Computed tomography
D	Dimension
DAS	Disease activity score
DIP	Distal interphalangeal joint
DMARD	Disease modifying anti rheumatic drug
FSE	Fast spin-echo
EULAR	European league against rheumatism
ESR	Erythrocyte sedementation rate
Gd-DOTA	Gadolinium diethylene
Gd-DTPA	Gadolinium diethylene triamine penta acetic acid
GHJ	Glenohumeral joint
GHL	Glenohumeral ligaments
HAQ	Health Assessment Questionnaire
HB%	Hemoglobin percentage
HLADR	Human leucocytic antigen DR
IV	Intravenous
LGL_S	Large granular lymphocytes
LN	Lymph node
Max	Maximum

MA	Milli ampere
MCP	Metacarpophalangeal joints
MHAQ	Modified Health Assessment Questionnaire
MHz	Mega hertz
Min	Minimum
min	minutes
ml	Milliliter
mm	Millimeter
MR	Magnetic resonance
MRI	Magnetic resonance imaging
MS	Morning stiffness
MTP	Metatarsophalangeal joint
No.	Number
NSAID	Non steroidal anti-inflammatory drug
P	Probability
PCV	Packed cell volume
PIP	Proximal interphalangeal joint
PMN	Polymorphonuclear
PR	Plain radiography
RA	Rheumatoid arthritis
RF	Rheumatoid factor
ROM	Range of motion
SA-SD	Subacromial - subdeltoid
SD	Standard deviation
SC	Sterno-clavicular
Sec	Second
SF	Synovial fluid
SPSS	Statistical package for Social Sciences
RC tears	Rotator cuff tears
TB	Tuberculosis
US	Ultrasonography
VAS	Visual analogue scale
WBC	White blood cell count
WHO	World health Organization

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Introduction

Rheumatoid arthritis (RA) is a chronic, systemic**,** disabling, disfiguring, autoimmune disease characterized by symmetric joint inflammation and destruction that often involves the small joints of the hands, wrists, knees and feet, with progressive destruction, deformity, and disability of the joints. Criteria for diagnosing rheumatoid arthritis include the presence of bone destruction and signs of inflammation in the joints of the hands and feet **(Szkudlarek *et al*., 2004).** Although the exact cause of RA remains unclear, the disease is well characterized by clinical manifestations associated with synovial inflammation of joints **(Mosher, 2004).**

Rheumatoid arthritis is characterized by painful swelling, deformity and deterioration of joints. RA occurs throughout the world and affects all races. It affects 0.5 – 1% of the worldwide population with age of onset between 40 and 50 years old **(Scheel *et al*., 2002)**. Women are affected approximately 3 times more often than men. The prevalence increases with age and the sex differences diminishes in the older age group **(Sutton, 2003)**.

RA can affect any diarthrodial joint, those most commonly involved initially are the small joints of the hands, wrists, knees and feet. At the onset there may be any pattern of joint disease, but usually it is bilateral, symmetrical and polyarticular. As the disease becomes established, the arthritis spreads to the elbows, shoulders, sternoclavicular joints, hips, ankles and subtalar joints **(Edward and Harris, 1995).**

The shoulder joint becomes involved later than the peripheral joints in RA. However, during the first two years of RA history, nearly 50% of the patients have shoulder symptoms **(Hamalainen, 1995).**

RA of the shoulder not only affects the synovium within the glenohumeral joint but also involves the distal third of the clavicle, various bursae and the rotator cuff, and multiple muscles around the neck and chest wall. Involvement of the rotator cuff in RA has been recognized as a principle cause of morbidity. One likely mechanism behind tears is that the rotator cuff insertion into the greater tuberosity is vulnerable to erosion by the proliferative synovitis that develops there **(Resnick and Niwayama, 1997)**.

A thorough history and physical examination can usually determine the cause of a painful shoulder. In most cases, the diagnosis and cause of glenohumeral arthritis are fairly obvious. Imaging studies such as radiographs, computed tomography (CT), arthrography, ultrasonography (US) and magnetic resonance imaging (MRI) are used to confirm and further define the pathologic process **(Green and Norris, 1994)**.

Radiography is the most widely utilized imaging modality for early RA where determination of radiographic progression remains to be a crucial part to evaluate therapy **(Molenaar *et al*., 2004)**. Conventional radiography is however, insensitive for showing bone damage in early disease and is totally unsuitable for assessing synovial inflammation. The recognition of these limitations has led to intense interest in the multiplanar imaging capabilities of magnetic resonance imaging (MRI) in RA and to an increasing use of ultrasound (US) for assessing synovitis and bone damage **(McGonagle *et al*., 2001)**.

Diagnostic US documents synovitis, determines the presence or absence of an effusion, differentiates bursitis, tendonitis, tendon rupture, documents intra- and peri-articular abnormalities, eg: erosions **(Alarcon *et al*., 2002)**. US has an important role in assessing soft tissue involvement in RA since it is widely available and clearly differentiates

inflammatory and non-inflammatory changes **(Iagnocco *et al*., 2003).** Although US may be less sensitive than MRI, it is likely to be more sensitive and specific than clinical examination **(Bruyn *et al*., 2004)**.

MRI is an excellent technique for imaging the anatomy of the rheumatoid joint. It allows visualization of bone and soft tissue in three dimensions as it employs multiplanar tomography **(Anderson *et al*., 1998).** MRI is capable of revealing synovitis and tendonitis in early RA as well as bone edema. These features are visible before radiographic joint damage occurs **(Mc Queen *et al*., 2003).**

Ultrasound and magnetic resonance imaging have already been compared with conventional radiography for the assessment of the peripheral joints of RA patients in several studies, and both have been found to have a higher sensitivity than radiography in detecting erosions **(Wakefield *et al*., 2000).** Little attention has so far been paid to the proximal joints of the arms, although the shoulder joints tend to show abnormal changes in a high percentage of patients when RA first becomes manifest **(Petersson, 1986).**

Hermann and colleagues compared 3 imaging modalities, conventional radiography, US and MRI, in rheumatoid arthritis patients with shoulder pain **(Hermann *et al*., 2003)**. However, they did not compare clinical examination for soft tissue changes with US and MRI findings. In addition, Hermann and colleagues limited their examination to the glenohumeral joint. However, it is well known that shoulder pain may originate from the acromioclavicular joint, which appears to be involved more often than the glenohumeral joint in patients with RA **(Lehtinen *et al*., 2000)**.