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AB1128

# SENSITIVITY AND SPECIFICITY OF THE AUTOMATED SQUEEZE TEST (GAENSLER'S MANEUVER) FOR IDENTIFYING METACARPOPHALANGEAL SYNOVITIS BY MAGNETIC RESONANCE IMAGING

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**Background:** It is well known that an early diagnosis and treatment for Rheumatoid Arthritis (RA) prevents its complications, therefore there are many efforts to identify individuals at risk to develop RA. The Squeeze test has been used to detect synovitis in metacarpophalangeal joints, even though it is used in daily practice, there is a great variability in their performance among rheumatologists. [2]

**Objectives:** The aim of this study is to determine the diagnostic performance of the automated squeeze test (AST) on the metacarpophalangeal (MCP) joints to detect the presence of synovitis, edema, or erosions by magnetic resonance imaging (MRI) using the rheumatoid arthritis magnetic resonance imaging score (RAMRIS) in first-degree relatives (FDR) of RA patients, of whom clinically suspect arthralgia (CSA) in hands was suspected, as well as in RA patients.

**Methods:** It is an observational and cross-sectional study for a diagnostic test. A total of 60 patients, older than 18 years, were included and divided in three groups: CSA group: 22 with less than 1 year with arthralgia and required to be FDR of RA patients; early RA group: 22 patients who met ACR/EULAR 2010 Classification Criteria with less than 1 year with the disease; and late RA group: 16 patients who met ACR/EULAR 2010 Classification Criteria, with more than 1 year with the disease. The AST was performed in the 60 participants' dominant hand. The device was evaluated by MRI, which examined the same hand in the 60 patients.

**Results:** A total of 240 MCP joints were evaluated. The AUC for the total RAMRIS score >10 was [0.480 (95% CI 0.301-0.617)  $P=0.597$ ], for synovitis RAMRIS score > 7 was [0.459 (95% CI 0.331-0.669)  $P=0.791$ ], and for the presence of any synovitis by RAMRIS was [0.575 (95% CI 0.428-0.723)  $P=0.331$ ]. For the RAMRIS synovitis score, the most sensitive and specific cut-off of the force by AST was 4.645 kg with a 66.7% sensitivity and 50% specificity.

Abstract AB1128 Table 1. Baseline characteristics

	TOTAL	CSA n=22	ERA n=22	LRA n=16
Age mean (SD)	44.7 (13.7)	37.6 (10.9)	49.05 (11.9)	47.5 (16.2)
Female n (%)	50 (83.3)	18 (81.8)	18 (81.8)	14 (87.5)
TJC median (IQR)	4 (12)	0.5 (4)	5 (13)	10 (11)
SJC median (IQR)	3 (8)	0 (3)	5 (12)	7.5 (9)
DAS28-ESR median (IQR)			4.8 (1.5)	5.4 (1.4)
HAQ median (IQR)			0.64 (0.75)	1.47 (0.94)
CDAI median (IQR)			18.07 (16.8)	23.8 (15.5)
Married n (%)	41 (68.3)	12 (54.5)	15 (71.4)	14 (93.3)
Smoker n (%)	19 (31.7)	2 (22.7)	10 (45.5)	4 (25)
Morning stiffness n (%)	31 (51.7)	4 (18.2)	16 (72.7)	11 (68.8)
RF IgM positivity n (%)	46 (76.7)	9 (40.9)	12 (70.6)	4 (25)
ACPA positivity n (%)	25 (41.7)	19 (86.4)	20 (90.9)	7 (43.8)

Clinically suspect arthralgia, **CSA**; Early Rheumatoid Arthritis, **ERA**; Late Rheumatoid Arthritis, **LRA**; Tender Joint Count, **TJC**; Swollen Joint Count, **SJC**; Disease Activity Score – Erythrocyte Sedimentation Rate, **DAS28-ESR**; Health Activity Questionnaire, **HAQ**; Clinical Disease Activity Index, **CDAI**; Rheumatoid Factor, **RF**; Anti-citrullinated peptides antibodies, **ACPA**.

Figure 1

**Conclusion:** The application of AST with a force of 4.645 kg, to exert pain in the dominant hand, is a sensitive and specific technique to establish MCP joint inflammation, compared with other automated methods that had been recently tested.

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AB1129

# ULTRASOUND MEASUREMENT OF MUSCLE THICKNESS AT THE PROXIMAL FOREARM: VALIDITY ISSUES

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**Background:** The term *sarcopenia* defines the muscle strength loss and muscle mass loss due to aging, and it is one out of three criteria for the diagnosis of frailty in the elderly. A number of studies have related the handgrip strength with muscle thickness (MT) in the forearm measured by ultrasound (US)<sup>1</sup>, but a standardized scanning protocol has not been described and its interobserver reliability has not been investigated yet.

**Objectives:** The aims of this study were to provide detailed description of the scanning protocol to measure the MT in the forearm and to test its feasibility and interobserver reliability.

**Methods:** A total of 27 consecutive subjects were enrolled at Ospedale "Carlo Urbani", in Jesi (Ancona, Italy): 2 healthy volunteers recruited from among our staff, and 25 patients referred to the Rheumatology Department affected by rheumatoid arthritis (5), psoriatic arthritis (4), spondyloarthritis (3), polymyalgia rheumatica (2), systemic lupus erythematosus (1), systemic sclerosis (1), overlap SLE/SSc (1), Sjögren syndrome (1), anti-synthetase syndrome (1), undifferentiated connective tissue disease (1), osteoporosis (1), small vessels vasculitides (2) and fibromyalgia (2). The female to male ratio was 19/27, the mean age was 52.1 years (SD  $\pm 13.7$ ), and the mean Body Mass Index was 27.4 Kg/m<sup>2</sup> (SD  $\pm 4.2$ ). Four rheumatologists (SC, EC, GS, EF) trained in musculoskeletal US, with a different degree of experience, performed the examinations using a MyLab ClassC ( Esaote SpA) equipped with a broadband linear probe (frequency range 4-13 MHz). All subjects sat in front of the sonographer with their hands supinated and the forearm resting on the examining table. First, the coronoid process was imaged according to the "longitudinal scan of the coronoid recess" as indicated by the 2017 EULAR US guidelines. Then the probe was moved distally following bony cortex until the ulnar tuberosity was identified. Immediately distally to the ulnar tuberosity the bone turns flat and hyperechoic and this was taken as the anatomical reference for the measurement. Afterwards the probe orientation was changed to obtain a transverse view. During the rotation, the proximal third of the diaphysis of the radius was imaged. Two MT were measured, the ulnar MT (UMT) and the radial MT (RMT), between the subcutaneous tissue-muscle interface and the muscle-bone interface of each bone respectively. The measurement of UMT and RMT of both arms were registered, as well as the scanning time of all the examiners.

**Results:** We found an excellent interobserver reliability of this scanning protocol, with an interclass correlation coefficient (ICC) among the four sonographers of 0.975 (CI 0.955 - 0.987) for the right UMT, an ICC of 0.968 (CI 0.942 - 0.984) for the left UMT, an ICC of 0.932 (CI 0.878 - 0.966) for the right RMT and an ICC of 0.949 (CI 0.908 - 0.974) for the left RMT. The mean time required to acquire all measurements in each subject was less than five minutes (SC 4.4 min; EC 4 min; GS 4.2 min; EF 4.5 min).

**Conclusion:** The results of this study provide evidence in favour of both feasibility and interobserver reliability of US measurement of the forearm MT.

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# AB1130 RELIABILITY OF ULTRASOUND MEASUREMENT OF HYALINE CARTILAGE THICKNESS IN RHEUMATOID ARTHRITIS

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**Background:** Only few studies investigated the role of ultrasound (US) in the assessment of hyaline cartilage in rheumatoid arthritis (RA).

Recently, a positive correlation was found between the US measurement of the metacarpal head cartilage thickness (MCT) and both the anatomical MCT and the radiographic joint space width<sup>1</sup>.

**Objectives:** To evaluate inter- and intra-observer reliability in the assessment of MCT in RA patients and healthy subjects; to compare the agreement of the sonographers in the assessment of the MCT using different methods (i.e. semiquantitative and quantitative); to determine the inter-observer smallest detectable difference (SDD) of MCT measured by US.

**Methods:** US assessment was performed by two rheumatologists on 160 metacarpophalangeal (MCP) joints of 10 healthy subjects and 10 patients with RA (according to 2010 ACR/EULAR classification criteria) using a MyLab Twice (Esaote Biomedica, Genoa, Italy) equipped with a linear very high frequency probe (i.e. 10-22 MHz)

To assess inter-observer reliability, the hyaline cartilage of metacarpal head from II to V digits of both hands were examined independently on the same day by two rheumatologists (an experienced musculoskeletal sonographer and an investigator with limited US training).

To assess intra-observer reliability, all the subjects were re-scanned using the same scanning protocol and the same US setting by one sonographer after a week.

Hands were scanned with the MCP joints in maximal flexion (approximately 90°). The hyaline cartilage of all the metacarpal heads was scanned in longitudinal and transverse views in the central portion of the metacarpal head. Particular attention was paid on maintaining the probe in a position providing an angle of 90° between the direction of the US beam and the cartilage surface<sup>2</sup>.

MCT was scored both semi-quantitatively (using a five-grade scoring system<sup>3</sup>) and quantitatively (using the average value of the longitudinal and transverse measures).

The inter- and intra-observer agreements for assessing the MCT with the semiquantitative scoring system were calculated using Cohen's kappa and interpreted according to Landis and Koch.

The inter- and intra-observer agreements for assessing the MCT with the quantitative scoring system were calculated using intraclass correlation coefficients (ICC) and their 95% confident intervals (95%CI).

The SDD was determined using Bland-Altman 95% limits of agreement method.

**Results:** The inter- and intra-observer agreements for the semiquantitative assessment of the MCT were moderate [ $k=0.59$  (95%CI 0.35-0.83) and  $k=0.63$  (95%CI 0.39-0.87), respectively].

Considering all the measurements, a substantial inter-observer [ICC= 0.88 (95%CI 0.82-0.92)] and intra-observer [ICC= 0.88 (95%CI 0.87-0.94)] agreements for the quantitative assessment of MCT were found.

The SDD of the MCT measurement was: 0.11 mm for both longitudinal and transverse scans and 0.09 mm for the average of the two measures.

**Conclusion:** This study provides evidence in favor of the reliability of semiquantitative and quantitative US methods for assessing MCT in RA. Further studies are required to determine standard reference values of MCT by US in healthy subjects.

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# AB1131 HIGH-RESOLUTION ULTRASOUND ASSESSMENT OF CARTILAGE THINNING IN RHEUMATOID ARTHRITIS

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**Background:** Conventional radiography is the standard imaging modality to detect joint damage in rheumatoid arthritis (RA). Ultrasound (US) allows for a direct visualization of hyaline cartilage. To date, only few studies investigated the role of US in the assessment of cartilage damage in RA.

**Objectives:** To compare US qualitative and quantitative assessments of cartilage thinning at metacarpal head (MH) in RA patients and in an age-, sex- and height-matched healthy controls (H). To correlate cartilage damage and clinical parameters in RA.

**Methods:** US examination was performed on 318 metacarpophalangeal (MCP) joints of 40 consecutive RA patients and on 320 MCP joints of 40 age-, height- and sex-matched H using a MyLab Twice (Esaote Biomedica, Genoa, Italy), equipped with a high frequency linear probe (up to 22 MHz).

RA patients were enrolled according to the 2010 RA classification criteria. The hyaline cartilage of MH from II to V digits of both hands was examined with the MCP joints in maximal flexion.

Each MH was scanned in longitudinal and transverse views. Particular attention was paid on maintaining the probe in a position providing an angle of 90° between the direction of the US beam and the cartilage surface<sup>1</sup>.

Cartilage thickness (CT) was assessed both semi-quantitatively (using a reliable qualitative five-grade scoring system<sup>2</sup>) and quantitatively (using the mean value of longitudinal and transverse measurements of the CT). Finally, association between cartilage damage and clinical parameters was assessed.

## Results:

**Semiquantitative score:** Cartilage thinning (grade 2, 3 and 4) was found in at least one MH in 23 RA patients (57.5%) and in 4 H (10.0%) ( $p<0.01$ ). A significantly higher prevalence of cartilage damage (grade 2, 3 and 4) at joint level was found in RA patients (86 MCP joints, 27.0%) in comparison with H (13 MCP joints, 4.1%) ( $p<0.01$ ).

**Quantitative assessment:** CT of the MH ranged from 0.0 to 1.10 mm ( $0.60\pm0.26$  mm, mean $\pm$ SD) in RA patients and from 0.41 to 1.08 mm ( $0.67\pm0.12$  mm, mean $\pm$ SD) in H. Male had a thicker hyaline cartilage than female, both in RA patients ( $p<0.01$ ) and in H ( $p<0.01$ ). No significant difference was found between left and right side, both for RA patients ( $p=0.48$ ) and healthy subjects ( $p=0.94$ ).

Detailed quantitative measurements of CT of MH are reported in table 2.

**Abstract AB1131 Table 2.** US cartilage thickness measurement for each digit in RA patients and healthy controls.

	RA patients (n=39)	Healthy subjects (n=40)	Mean difference, 95% CI (mm)	P value
	Mean (mm)	Mean (mm)		
II MH	0.62	0.75	0.13; 0.06-0.21	<0.01
III MH	0.57	0.64	0.07; 0.02-0.13	0.01
IV MH	0.61	0.64	0.03; -0.03-0.09	0.35
V MH	0.62	0.65	0.03; -0.02-0.09	0.20
Sum	2.43	2.68	0.25; 0.03-0.46	0.02

95%CI: 95% confidence interval; L: left; MH: metacarpal head; R: right; RA: rheumatoid arthritis; SD: standard deviation; US: ultrasound.

A significant association was found between the CT value and age ( $r=0.528$ ,  $p<0.001$ ), disease duration ( $r=-0.376$ ,  $p=0.005$ ) and grade of the semiquantitative scoring system ( $r=0.80$ ,  $p<0.001$ ). No association was found between CT and BMI, weight, ACPA positivity and RF positivity.

**Conclusion:** This study demonstrated that a significantly higher prevalence of cartilage damage was found in RA patients using both the semiquantitative score and the quantitative assessment. In particular, in RA patients the hyaline cartilage of II and III MH is thinner in comparison with H. Finally, a significant association was found between the CT values and disease duration and age.

## REFERENCES

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