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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 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).

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 surface².

MCT was scored both semi-quantitatively (using a five-grade scoring system³) 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 surface¹.

Cartilage thickness (CT) was assessed both semi-quantitatively (using a reliable qualitative five-grade scoring system²) 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 ± 0.26 mm, mean $\pm$ SD) in RA patients and from 0.41 to 1.08 mm (0.67 ± 0.12 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.

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