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Clinical versus Ultrasound Examination to Detect Synovial Effusion of the Wrist in a Patient with Rheumatoid Arthritis

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Abstract

Objectives: The aim of this study is to understand whether or not, and to what extent, clinical examination (CE) of joint involvement in rheumatoid arthritis depends on clinical experience and whether or not, despite clinical experience, ultrasound examination provides more accurate results than CE.

Methods: 51 rheumatologists with different professional experience measured in years since MD graduation. All clinicians studied the same patient and they evaluated the wrists and indicated the presence/absence of swelling and its extent (mild, moderate, severe). Three experienced sonographers blinded to clinical findings each performed ultrasound (US) examination of the patient's wrists.

Results: US analysis showed that the patient's right wrist had moderate joint effusion, whereas the left wrist had mild joint effusion; similar results were obtained with power Doppler imaging of both wrists. Only about 50% of the clinicians involved recognized joint effusion in both wrists. The CE findings were independent of clinical experience. The results of CE were coherent with US evaluation only in a percentage of 23%.

Conclusions: This study underscores again the superiority of US in the assessment of inflammatory processes and the inaccuracy of CE, even if performed by rheumatologists with extensive professional experience.

Keywords: Ultrasound; Clinical examination; Rheumatoid arthritis; Wrist

Introduction

Rheumatoid arthritis (RA) is a chronic, systemic autoimmune disease characterized by joint inflammation with progressive deformity, disability and destruction of the joints involved. Accurate assessment of disease activity is particularly important when it comes to evaluating efficiency of treatment and predicting the outcome of the disease [1,2]. Clinical evaluation (CE), although an essential tool in assessing joint inflammation, is not an optimal method of evaluation due to its poor reproducibility and accuracy [3]. In recent years musculoskeletal ultrasound (US) has become common practice in the evaluation of patients with RA and a very important tool to RA activity evaluation. Several publications have shown that US is superior to CE in the evaluation of RA activity [4-7]. This study sets out to understand whether or not, and to what extent, CE of joint effusion depends on clinical experience and whether or not, despite clinical experience, ultrasound examination provides more accurate results than CE.

Materials and Methods

Study population

The study involved 51 rheumatologists present at the annual meeting of the SIR (Italian Society of Rheumatology): 9 with less than 5 years' clinical experience, 13 with between 5 and 10 years' experience, 13 with between 10 and 20 years' experience and 16 with more than 20 years' experience. Professional experience was measured in years since MD graduation. All clinicians studied the same patient suffering from RA. They evaluated the patient's right and left wrists and indicated the presence/absence of wrist swelling and the extent of swelling (mild, moderate, severe). All Rheumathologists were blinded about patients clinical history.

US Assessment

Three experienced sonographers blinded to clinical findings each performed US examination of the patient's wrists by assessing the presence/absence of joint swelling and its entity. Examination was performed using an Esaote MyLab70 machine with a multifrequency linear probe (6-18 Mhz).

Statistical Analysis

A dichotomous scoring system was adopted to classify each wrist as clinically/US normal (clinical/US absence of joint swelling) or abnormal (clinical/US presence of joint swelling). Absolute frequencies of clinical and US features were reported. Joint effusion was defined according to the OMERACT (Outcome Measures in Rheumatoid Arthritis Clinical Trials) definitions and was evaluated using a four-grade scoring system (grade 0, no effusion; grade 1, minimal amount of joint effusion; grade 2, moderate amount of joint effusion; grade 3, extensive amount of joint effusion). Also power Doppler synovitis scoring was evaluated using a four-grade scale (grade 0, absence of signal; grade 1, mild vessel signal; grade 2, moderate vessel signal; grade 3, marked vessel signal) [8].

Results

US findings

US analysis showed that the right wrist had moderate joint effusion (Figure 1), whereas the left wrist had mild joint effusion (grade 2 and 1, respectively); similar results were obtained with power Doppler imaging of both wrists (grade 2 and 1 respectively).

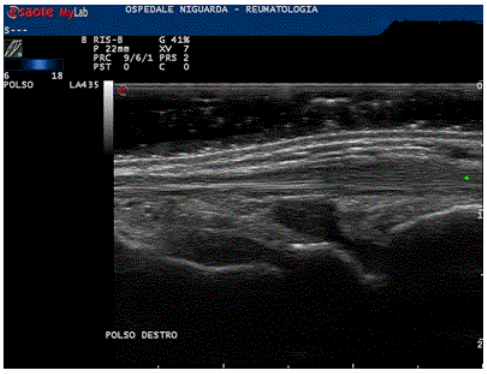

Figure 1: Ultrasound of the right wrist with joint effusion (grade 2).

CE Findings

Overall, only about 50% of the clinicians involved recognized joint effusion in both wrists (Table 1). The entity of synovitis detected by CE is shown in Table 1 below.

		Right	Left	Total
Absent		25 (49%)	22 (43%)	47 (46%)
Present		26 (51%)	29 (57%)	55 (54%)
	Mild	24 (47%)	21 (41%)	45 (44%)
	Moderate	2 (4%)	8 (16%)	10 (10%)
	Severe	0 (0%)	0 (0%)	0 (0%)

Table 1: CE: overall assessment.

CE and Professional Experience

When grouping the clinicians by their clinical experience, we found no significant differences (chi-squared test) between the groups, thus confirming that clinical evaluation was independent of the number of years since graduation (Table 2).

		Present	Absent	Total		
		Mild	**Moderate**	**Severe**		
Total score	**<5 years**	8 (44.4%)	2 (11.2%)	0 (0%)	8 (44.4%)	18 (100%)
p>0.1	**5-10 years**	8 (30.8%)	1 (3.8%)	0 (0%)	17 (65.4%)	26 (100%)
	10-20 years	10 (38.5%)	4 (15.4%)	0 (0%)	12 (46.1%)	26 (100%)
	>20 years	19 (59.4%)	3 (15.4%)	0 (0%)	10 (31.2%)	32 (100%)
	Total	45	10	0 (0%)	47	102
Right wrist	**<5 years**	5 (55.6%)	0 (0%)	0 (0%)	4 (44.4%)	9 (100%)

p=0.07	**5-10 years**	3 (23.1%)	0 (0%)	0 (0%)	10 (76.9%)	13 (100%)
	10-20 years	4 (30.8%)	1 (7.8%)	0 (0%)	8 (61.4%)	13 (100%)
	>20 years	12 (75%)	1 (6.3%)	0 (0%)	3 (18.7%)	18 (100%)
	Total	24	2	0	25	51
Left wrist	**<5 years**	3 (33.3%)	2 (22.2%)	0 (0%)	4 (44.5%)	9 (100%)
p > 0.1	**5-10 years**	5 (38.5%)	1 (7.7%)	0 (0%)	7 (53.8%)	13 (100%)
	10-20 years	6 (46.2%)	3 (23.1%)	0 (0%)	4 (30.7%)	13 (100%)
	>20 years	7 (43.7%)	2 (12.5%)	0 (0%)	7 (43.8%)	18 (100%)
	Total	21	8	0	22	51

Table 2: CE grouped by clinical experience.

CE versus US Findings

The results of CE were coherent with US evaluation only in a percentage of 23% (Table 3). We then assessed the extent of the discrepancy (distance) between the CE and US results. We defined three classes to do this:

1. CE results differed from US results by only one level in the scale (i.e. moderate vs. mild; absent vs. mild; moderate vs. severe) – short distance.

2. CE results differed from US results by two levels in the scale (i.e. moderate vs. absent; mild vs. severe) – mid distance.

3. CE results differed from US results by three levels in the scale (i.e. absent vs. severe) – high distance.

The high distance was not considered because subsequent US examination showed that the patient had moderate joint thickening in the right wrist and mild joint thickening in the left wrist, meaning that the third-level distance was impossible to observe. The distance observed was mainly low, particularly for the left wrist, where we found no responses with higher distances.

		Right	**Left**	**Total**
Coherent		2 (4%)	21 (41%)	23 (23%)
Not coherent	**Total**	49 (96%)	30 (59%)	79 (77%)
	Low	24 (47%)	30 (59%)	54 (53%)
	Mid	25 (49%)	0 (0%)	25 (24%)
	High	0 (0%)	0 (0%)	0 (0%)

Table 3: Coherence between CE and US results.

We also found that the coherence of the clinical responses and ultrasonography responses was independent of clinical experience, regardless of the wrist being evaluated (Table 4). The chi-squared test was applied to estimate significance.

Not coherent	**Coherent**	**Total**				
		Low	**Mid**	**High**		
Total score						
p >0.1	<5 years	11 (61.1%)	4 (22.2%)	0 (0%)	3 (16.7%)	18 (100%)
	5-10 years	11 (42.3%)	10 (38.5%)	0 (0%)	5 (19.2%)	26 (100%)
	10-20 years	11 (42.3%)	8 (30.8%)	0 (0%)	7 (26.9%)	26 (100%)
	>20 years	21 (65.7%)	3 (9.3%)	0 (0%)	8 (25.0%)	32 (100%)
	Total	54	25	0 (0%)	23	102
Right wrist						
p=0.07	<5 years	5 (55.6%)	4 (44.4%)	0 (0%)	0 (0%)	9 (100%)
	5-10 years	3 (23.1%)	10 (76.9%)	0 (0%)	0 (0%)	13 (100%)
	10-20 years	4 (30.8%)	8 (61.5%)	0 (0%)	1 (7.7%)	13 (100%)
	>20 years	12 (75%)	3 (18.8%)	0 (0%)	1 (6.2%)	18 (100%)

	Total	24	25	0	2	51
Left wrist						
p > 0.9	<5 years	6 (66.7%)	0 (0%)	0 (0%)	3 (33.3%)	9 (100%)
	5-10 years	8 (61.5%)	0 (0%)	0 (0%)	5 (38.5%)	13 (100%)
	10-20 years	7 (53.8%)	0 (0%)	0 (0%)	6 (46.2%)	13 (100%)
	>20 years	9 (56.3%)	0 (0%)	0 (0%)	7 (43.7%)	18 (100%)

Table 4: Coherence between CE and US results grouped by clinical experience.

Discussion

CE is a fundamental clinical skill in rheumatology and the clinical detection of joint inflammation in AR is the corner store of clinical diagnosis and management [9]. Inaccurate CE may have several important consequences. Firstly, undetected joint inflammation may result in erroneous diagnosis and inadequate therapy. It should be noted that systemic therapy may not always be appropriate in order to achieve the required effect because medication needs to be administered to suit the severity and type of the disease. Indeed, overestimation of synovitis may lead to the administration of more potent medications than is actually required. Furthermore, CE of joints is critical when it comes to evaluating activity/remission and, therefore, the management of the disease [10-12]. Routine execution of ultrasound examination and CE may also improve CE skills. Several studies suggest that US may be superior to CE in the detection of joint inflammation [4-6,13,14]. Our study compared US and CE in the assessment of the wrists of a patient with RA and underscores again the superiority of the US method in detecting inflammatory processes. This is probably due to the fact that US can visualize minimal synovial involvement that is not yet perceivable by CE [15,16].

In line with previous reports our results show that CE is less accurate to detect RA activity compared to US [4-6,13,14]. This study also showed low overall agreement between US and CE findings when assessing synovitis, independent of clinical experience. Moreover, just as in CE, in the US study the clinical experience of operators has little or no significance when US is performed by trained sonographers doing standardized joint scans [8,17,18]. Although clinical examination remains a fundamental element in rheumatology, it is now evident that even highly accurate clinical examination cannot provide as much information as an US study [4]. Ultrasound examination should not, however, be seen as an alternative to clinical examination: it should be regarded as a complementary process, one that complements clinical examination and allows for more accurate and immediate evaluation of the tissues involved in the inflammatory process. Some limitations of our study should be mentioned. First, the evaluation of only one joint does not allow to fully assess disease activity. Second, physical examination should include a larger number of patients.

In conclusion, US is an excellent instrument for RA inflammatory assessment and the use of ultrasonography in routine rheumatology practice will lead to improved diagnostic ability and better management of the disease.

References

1. Smolen JS, Aletaha D (2011) Monitoring rheumatoid arthritis. Curr Opin Rheumatol 23: 252-258.
2. Smolen JS, Aletaha D (2010) The assessment of disease activity in rheumatoid arthritis. Clin Exp Rheumatol 28: S18-27.
3. Hanson MT, Keiding S, Lauritzen SL, Manthorpe R, Sørensen SF, et al. (1979) Clinical assessment of disease activity in rheumatoid arthritis. Scand J Rheumatol 8: 101-105.
4. Kane D, Balint PV, Sturrock RD (2003) Ultrasonography is superior to clinical examination in the detection and localization of knee joint effusion in rheumatoid arthritis. J Rheumatol 30: 966-971.
5. Wakefield RJ, Freeston JE, O'Connor P, Reay N, Budgen A, et al. (2008) The optimal assessment of the rheumatoid arthritis hindfoot: a comparative study of clinical examination, ultrasound and high field MRI. Annals of the Rheumatic Diseases 67: 1678-1682.
6. Szkudlarek M, Klarlund M, Narvestad E, Court-Payen M, Strandberg C, et al. (2006) Ultrasonography of the metacarpophalangeal and proximal interphalangeal joints in rheumatoid arthritis: a comparison with magnetic resonance imaging, conventional radiography and clinical examination. Arthritis Research & Therapy 8: R52.
7. Jain M, Samuels J (2010) Musculoskeletal ultrasound in the diagnosis of rheumatic disease. Bull NYU Hosp Jt Dis 68: 183-190.
8. Wakefield RJ, Balint PV, Szkudlarek M, Filippucci E, Backhaus M, et al. (2005) Musculoskeletal ultrasound including definitions for ultrasonographic pathology. Rheumatol 32: 2485-2487.
9. Doherty M, Doherty J (1992) Clinical examination in rheumatology. Wolfe publishing, London Vol.1.
10. Anderson J, Caplan L, Yazdany J, Robbins ML, Neogi T, et al. (2012) Rheumatoid arthritis disease activity measures: American College of Rheumatology recommendations for use in clinical practice. Arthritis Care & Research 64: 640-647.
11. Gaujoux-Viala C, Mouterde G, Baillet A, Claudepierre P, Fautrel B, et al. (2012) Evaluating disease activity in rheumatoid arthritis: which composite index is best? A systematic literature analysis of studies comparing the psychometric properties of the DAS, DAS28, SDAI and CDAI. Joint Bone Spine 79: 149-155.
12. Felson DT, Smolen JS, Wells G, Zhang B, van Tuyl LH, et al. (2011) American College of Rheumatology/European League against rheumatism: Provisional definition of remission in rheumatoid arthritis for clinical trials. Annals of the Rheumatic Diseases 70: 404-413.
13. Damjanov N, Radunovic G, Prodanovic S, Vukovic V, Milic V, et al. (2012) Construct validity and reliability of ultrasound disease activity score in assessing joint inflammation in RA: comparison with DAS-28. Rheumatology (Oxford) 51: 120-128.
14. Naredo E, Bonilla G, Gamero F, Uson J, Carmona L, et al. (2005) Assessment of inflammatory activity in rheumatoid arthritis: a comparative study of clinical evaluation with gray scale and power Doppler ultrasonography. Annals of the Rheumatic Disease 64: 375-381.
15. Grassi W (2003) Clinical evaluation versus ultrasonography: who is the winner? J Rheumatol 30: 908-909.

16. Karim Z, Wakefield RJ, Quinn M, Conaghan PG, Brown AK, et al. (2004) Validation and reproducibility of ultrasonography in the detection of synovitis in the knee: a comparison with arthroscopy and clinical examination. Arthritis Rheum 50: 387-394.

17. Backhaus M, Burmester GR, Gerber T, Grassi W, Machold KP, et al. (2001) Guidelines for musculoskeletal ultrasound in rheumatology. Ann Rheum Dis 60: 641-649.

18. Thiele RG (2012) Ultrasonography applications in diagnosis and management of early rheumatoid arthritis. Rheum Dis Clin North Am 38: 259-275.