

# Evolution in the use of musculoskeletal ultrasonography in a Rheumatology Unit over 14 years

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## SUMMARY

The aim of this article is to evaluate the use of musculoskeletal ultrasound in the daily clinical practice of a rheumatology unit.

We conducted a descriptive retrospective analysis of the ultrasound examinations performed during 2011 and a comparison of these examinations with those performed between 1998 and 2003 and between 2007 and 2008. A total of 712 ultrasound examinations performed in 2011 were reviewed. Out of the total, examinations of individual areas of the body represented 11.6% versus 45.9% of the examinations made between 2007 and 2008 and 100% of those performed before 2003. The remaining 88.4% of ultrasound examinations performed in 2011 were intended to investigate inflammation in 25.8%, differential diagnosis of arthralgia in 17.1%, enthesitis in 12.6% and temporal arteries in 17.3%, and to conduct ultrasound-guided procedures in 10.6% and study microcrystalline pathologies in 4.7%.

In our unit, ultrasonography is evolving from being a mere investigation of individual areas of the body to becoming a clinical information tool, which contributes to the diagnosis and monitoring of the disease activity in the patient as a whole.

**Key words:** Ultrasonography, Musculoskeletal, Doppler.

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## ■ INTRODUCTION

Ultrasonography examination (USE) has proven an excellent technique for a fast, efficient, and accurate evaluation of soft tissues in rheumatic diseases. Over the last few years, great advances in ultrasound equipment have been achieved, such as better image quality and higher Doppler sensibility. These improvements have proven very valuable in that they have contributed to simplify the diagnosis of inflammatory disease and the monitoring of disease activity and therapy response. They have also proven useful in guided procedures, such as arthrocentesis and intra-articular injections (1, 2).

The latest literature supports the idea that ultrasound has the potential to assist in clinical assessment of patients; hence USE is becoming a clinically validated complement. Therefore the definitions given by OMERACT (3, 4) and the OMERACT

filter validity (*i.e.*, true, discrimination and feasibility) in ultrasonography studies published in recent years have played an important role.

The objective of our study was to analyze whether the improvements in ultrasound equipment and the evidence provided in the literature over the last 15 years are changing the patterns in the use of this imaging technique in the clinical practice. Our hypothesis was that this change is in progress and we validated it by comparing the type of USE performed over three different periods of time.

## ■ MATERIALS AND METHODS

A descriptive retrospective analysis of USEs performed at the rheumatology ultrasonography clinic of La Paz Hospital (Madrid) in 2011 (T3) was conducted. A total of 712 exams were performed during this

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period. Only planned USEs were reviewed. Urgent USEs and those for scientific studies were excluded. USEs were performed on outpatients referred by other rheumatologists of the unit.

The following data were collected for every USE: gender and age of the patient, reason for referral, USE type, anatomical areas explored and ultrasonographic diagnosis.

These USEs were compared with those performed in the same department between January 2007 and June 2008 (T2, 1000 exams) and between 1998 and 2003 (T1, 3142 in total, 100% being anatomical type). The equipment used was a Logiq 5. The operator and the source of referral did not change in the 3 periods (T1, T2 and T3). The operator was a rheumatologist qualified in USE with experience in microcrystalline pathologies, chronic inflammatory joint diseases and temporal arteritis.

The type of exam to be performed was selected according to the reason for referral. Anatomical ultrasonography consisted in the study of a joint or another specific anatomical area because dysfunction was suspected only in that site. An examination of inflammatory activity was performed in patients suffering from rheumatoid arthritis or another chronic peripheral arthritis to identify which joints were swollen and the severity of inflammation. Therefore, several joints were assessed systematically in grey scale and Doppler modes: wrists, metacarpophalangeal joints, proximal inter-phalangeal joints, ankles, metatarsophalangeal joints and other symptomatic joints. Investigations of arthralgia for differential diagnosis purposes were performed to identify whether the patient was at an initial stage of a systemic inflammatory disease or was suffering from another condition such as, for example, osteoarthritis, tendonitis, carpal tunnel syndrome.

USEs to evaluate enthesitis were performed using the Madrid Sonographic Enthesis Index (MASEI) (5), which considers 12 enthesal points (bilateral triceps, quadriceps, proximal and distal patellar

enthesitis, Achilles tendon and plantar fascia). Temporal artery examinations were conducted for the diagnosis of temporal arteritis, and for monitoring disease activity and response to therapy by exploring typical signs, such as hypoechoic halos, stenosis or obstruction in any of the four temporal artery branches explored.

Ultrasonography-guided procedures included arthrocentesis and intra-articular injections. Examinations for suspected microcrystalline diseases were performed with the evaluation of knees, wrists, ankles, first metatarsophalangeal joints and other swollen joints.

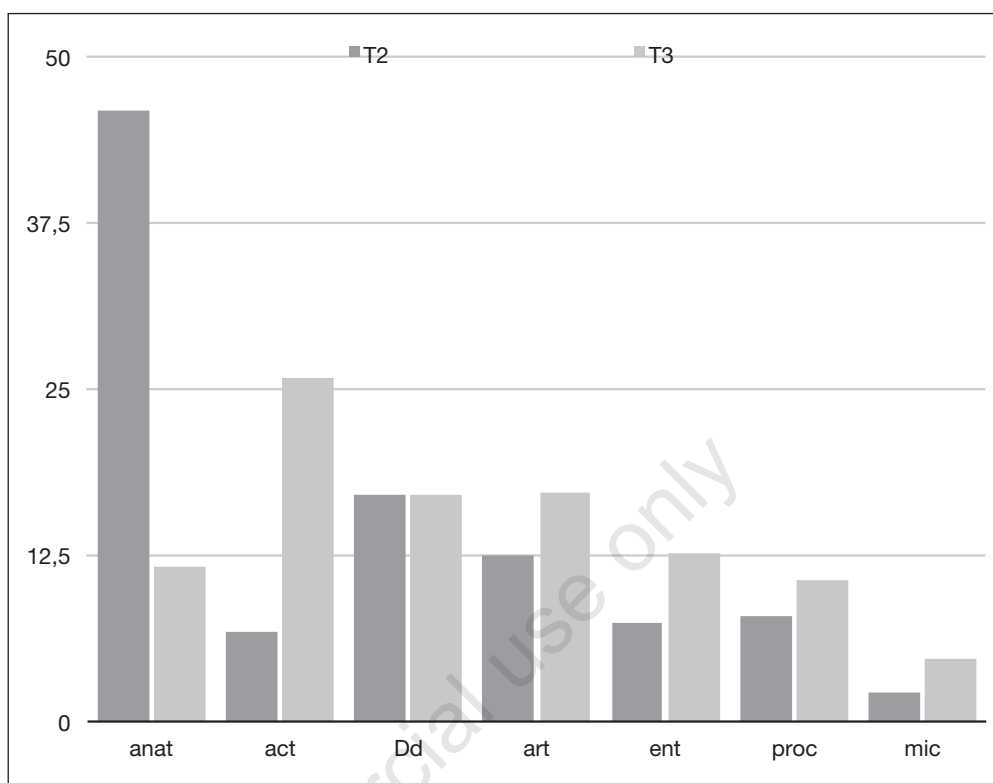
## ■ RESULTS

In T3, 712 patients underwent an ultrasonography examination. Most of them, 507 (71.2%) were women. The average age was  $57.4 \pm 16.5$  years.

USEs were performed in 184 patients (25.8%) to investigate inflammatory activity and in 122 patients (17.1%) for differential diagnosis of arthralgia. A total of 123 USEs (17.3%) were conducted to evaluate temporal arteries. Of these examinations, 75 (60.9%) were performed for diagnosis of temporal arteritis and 48 (39.02%) for disease monitoring. Enthesis evaluation or MASEI USEs were performed in 90 patients (12.6%).

Eighty-three patients (11.6%) underwent an anatomical USE. The shoulder was the most explored joint (21 exams, 25.3%), followed by the knee (15 exams, 18%) and the ankle and foot joints (16 exams, 19.2%). Sonographic-guided procedures were performed in 76 patients (10.6%), mainly in shoulders, carpal and hand joints, Baker cysts, ankles and feet joints. USEs for the diagnosis of a microcrystalline pathology were less frequent, namely 34 (4.7%).

These results were compared with those observed in T2 (January 2007-June 2008, 1000 exams), in which anatomical USEs represented 45.9% of the total, differential diagnosis examinations were 17.1%, temporal arteries examinations were 12.5%,



**Figure 1** - Comparison of ultrasound (US) examinations types performed in T2 and T3 (%). anat, anatomical; act, activity; Dd, differential diagnosis; art, temporal arteritis; ent, enthesitis; proc, US guided procedures; mic, microcrystalline.

**Table I** - Comparison of ultrasound examinations (USEs) in 3 periods in our Rheumatology Unit.

	T1 - N (%)	T2 - N (%)	T3 - N (%)
Anatomical USE	3142 (100)	459 (45,9)	83 (11,6)
Inflammatory activity USE	0	68 (6,8)	184 (25,8)
Differential diagnosis USE	0	171 (17,1)	122 (17,1)
Temporal arteritis	0	125 (12,5)	123 (17,3)
Enthesitis	0	75 (7,5)	90 (12,6)
Ultrasound-guided procedures	0	80 (8)	76 (10,6)
Microcrystalline USE	0	22 (2,2)	34 (4,7)
<b>Total</b>	<b>3142</b>	<b>1000</b>	<b>712</b>

sonography-guided procedures were 8%, inflammatory activity evaluation were 6.8%, enthesitis evaluations were 7.5% and microcrystalline pathology examinations were 2.2% (Fig. 1).

We also compared the results with those obtained in T1 (1998-2003), before the introduction of Doppler ultrasound (Table I). In T1, only USEs of individual anatomical areas were performed, the shoulder being the most investigated area, followed by knee, ankle and foot.

## ■ DISCUSSION AND CONCLUSIONS

These results show an evolution in the use of USEs performed in our clinic. While in the past few years they were performed mainly from the examination of specific anatomical areas, they are now more often adopted to investigate the course of a disease as a whole. It has therefore evolved from being an examination to understand merely what is occurring in a specific ana-

tomical site to being used to determine what is occurring at the systemic level in patients.

In T1, only anatomical USEs were performed. In this period, we were at the beginning with the use of ultrasonography in our unit (6). In addition only the grey scale mode was available in the ultrasound equipment. In T2, with the introduction of the Doppler equipment, this type of ultrasonography accounted for 49.5% of the total (7), and dropped to only 11.6% in T3, as it was surpassed by the other types of USEs. In T3 the most frequent examinations were intended to assess the inflammatory activity and were followed by the evaluation of temporal arteries, which significantly increased compared with the previous series of T2. Actually, all types of USEs increased with the exception of anatomical examinations that dropped markedly. This change in the pattern of use is due, in our opinion, both to technological progress (i.e. higher resolution of ultrasound probes and introduction and improvement of Doppler technology) and to the availability of more data in the literature demonstrating the validity of ultrasound for the diagnosis and activity assessment in various rheumatic diseases. This new trend was also reported by other papers, which show a change in the use of ultrasonography on the part of rheumatologists who are now relying on ultrasonography not only to understand what is occurring in specific anatomical sites, but also for investigations at a more systemic level (8, 9).

The use of ultrasonography in suspected rheumatoid arthritis has enabled an early diagnosis of this pathology by demonstrating subclinical joint inflammatory activity and erosions with a sensitivity that is 6.5 times greater than in conventional radiography (10). Ultrasonography has also proven helpful in the assessment of inflammatory activity in rheumatoid arthritis, especially with the use of Doppler echo (11, 12). The concept of ultrasonographic diagnosis can now, therefore, be extended to other conditions, such as spondyloarthritis. In this disease, ultrasonography has shown a sensitivity and specificity greater than 80% (13). USEs for differential diagnosis and for ac-

tivity monitoring of different joint inflammatory diseases have become a common procedure (3, 4). This therefore reflects a change in the rheumatologic clinical practice according to the *treat to target* strategy, which requires a rigorous control of the patient. In this case, the USE can play an important role in assisting treatment decisions.

The low number of microcrystalline USEs performed, despite the high frequency of these conditions in our clinic, may be explained by the fact these diseases are commonly assessed by optic microscopy for detection of crystals, in addition to clinical examination and laboratory tests.

Over time, as shown in Table I, the number of USEs per month performed in our unit remained stable, though the type of examination has clearly changed, with a marked reduction of anatomical USEs. In our opinion, this reduction may be explained in part by the fact that radiologists also perform anatomical USEs and also use other imaging techniques, such as magnetic resonance imaging. In addition, regional pain does not require a tight follow up as in autoimmune inflammatory diseases. Nevertheless, anatomical USE continues and will continue to play an important role in the examination of patients, as it is at the basis of all scientific and practical knowledge in musculoskeletal ultrasonography. Multiple basic sonographic lesions have been defined in the last few years. This advance will further promote the evolution of *pathology ultrasonography* (with several joints being evaluated instead of an individual joint).

In our clinic, we are witnessing that the USE is becoming more than a complement to mere anatomic evaluations. It is an important and helpful tool for the diagnosis and assessment of several inflammatory diseases and the study of vasculitis. It has therefore become a valuable part of the therapeutic decision-making process. The results found in our department may not reflect the experience of all rheumatology US clinics, but, as the USE is increasingly helpful in daily clinical practice (8, 9), it is likely for a similar change to occur on a larger scale.

## ■ REFERENCES

1. D'Agostino MA, Ayrál X, Baron G, Ravaud P, Breban M, Dougados M. Impact of ultrasound imaging on local corticosteroid injections of symptomatic ankle, hind-, and mid-foot in chronic inflammatory diseases. *Arthritis Rheum.* 2005; 53: 284-92.
2. Naredo E, Cabero F, Beneyto P, Cruz A, Mondéjar B, Uson J, et al. A randomized comparative study of short term response to blind injection versus sonographic-guided injection of local corticosteroids in patients with painful shoulder. *J Rheumatol.* 2004; 31: 308-14.
3. Wakefield RJ, Balint P, Szkudlarek M, Filipuzzi E, Backhaus M, D'Agostino MA, et al. Musculoskeletal ultrasound including definitions for ultrasonographic pathology. *J Rheumatol.* 2005; 32: 2485-7.
4. Joshua F, Lassere M, Bruyn GA, Szkudlarek M, Naredo E, Schmidt WA, et al. Summary findings of a systematic review of the ultrasound assessment of synovitis. *J Rheumatol.* 2007; 34: 839-47.
5. De Miguel E, Cobo T, Muñoz-Fernández S, Naredo E, Usón J, Acebes JC, et al. Validity of enthesitis ultrasound assesment in spondylarthropathy. *Ann Rheum Dis.* 2009; 68: 169-74.
6. Bohórquez C, Peiteado D, De Miguel E, Martín Mola E. Análisis descriptivo de ecografía del aparato locomotor en una consulta de reumatología. *Rev Esp Reum.* 2004; 31: 349-350S.
7. Monteiro P, de Miguel E, Martin Mola E. Ecografía músculo-esquelética em reumatologia. Órgão oficial da sociedade portuguesa de reumatologia. *Acta Reumatol Port.* 2009; 34: 388-94.
8. de Miguel E, Andreu JL, Naredo E, Möller I; Grupo de Trabajo de Ecografía de la Sociedad Española de Reumatología (ECOSER). Situación de la ecografía en la reumatología española 2012. *Reumatol Clin.* 2012; 8: 310-4.
9. Raftery G, Hide G, Kane D. Comparison of musculoskeletal ultrasound practices of a rheumatologist and a radiologist. *Rheumatology.* 2007; 46: 519-22.
10. Wakefield RJ, Gibbon WW, Conaghan PG, O'Connor P, McGonagle D, Pease C et al. The value of sonography in the detection of bone erosions in patients with rheumatoid arthritis. A comparison with conventional radiography. *Arthritis Rheum.* 2000; 43: 2762-70.
11. Torp-Pedersen ST, Terslev L. Settings and artefacts relevant in colour/power Doppler ultrasound in rheumatology. *Ann Rheum Dis.* 2008; 67: 143-9.
12. Balint PV, Mandl P, Kane D. "All that glitters is not gold" - Separating artefacts from true Doppler signals in rheumatological ultrasound. *Ann Rheum Dis.* 2008; 67: 141-2.
13. D'Agostino MA. Enthesis. *Best Pract Res Clin Rheumatol.* 2006; 20: 473-86.