

## Clinical Evaluation Versus Ultrasonography: Who Is the Winner?



Over the past 10 years, ultrasonography (US) has been proven to be useful for the evaluation of soft tissue in rheumatology. US has several features that make it a perfect tool for rheumatologists. It is inexpensive, rapid, noninvasive, quantitative, repeatable, readily accessible, and well accepted by patients. It provides information on the physiologic state of the joint and is particularly sensitive to inflammatory changes. Spatial resolution of very high frequency transducers is relevant and clearly superior to any other imaging technique reaching the histologic details. The term “acoustic microscopy” appears to be particularly appropriate for new equipment that reaches a resolution power lower than 0.1 mm. Power Doppler, color Doppler, contrast media, and 3-dimensional US can further increase the impressive potential of ultrasound<sup>1,2</sup>. These exciting new tools can give us the opportunity to learn not only live anatomy<sup>3</sup>, but also live physiology and histology. This level of sensitivity could reveal new ways to diagnose aggressive diseases very early.

The diagnostic potential of US in patients with early arthritis appears to be much greater than conventional radiography (low sensitivity) and magnetic resonance imaging (too expensive). However, US should not be regarded as an alternative to other imaging techniques because, at the moment, it is the only one that can be coupled with the conventional clinical approach to the patient in the standard rheumatologic setting. Sonographic examination should be directed to the site of clinical symptoms, or where abnormalities or confusing findings are present on other imaging studies. In comparison with radiography, US has the potential advantage of depicting tendon lesions, enthesitis, fluid collection, synovial proliferation, cartilage damage, and even minimal interruptions of the cortical bone profile that are frequently missed by conventional radiography because of their size and localization<sup>4,7</sup>. Synovial proliferation, which is easily recognized without contrast agents at sonographic examination, remains obscured with other standard

diagnostic procedures. US may also play a major role in disease management and may be helpful in the selection of candidates for surgical procedures.

US is recommended when there is an elusive clinical problem. US of a single joint or anatomic area usually requires a few minutes for data acquisition. The time required for sonographic examination is dependent on a number of factors, including the anatomical complexity of the joint. The entire examination of a complex joint such as the knee, including patient positioning, lasts an average of 10 minutes. Additional physician time must be added for analysis of the data set and an adequate written comment. Analysis time is obviously influenced by examiner experience. There is a considerable decrease in the required analysis time as experience increases. A basic requirement in acquiring excellent images is a solid knowledge of anatomy.

Obviously, nothing is perfect, and US has several drawbacks that can explain the relevant discrepancy between its theoretic potential and clinical use in daily rheumatological practice. Musculoskeletal sonography is the most operator-dependent imaging technique and requires an almost endless learning curve. Moreover, top quality equipment with a full range of low, high, and very high frequency probes may be very expensive (150,000–200,000 €). Several problems and pitfalls may affect sonographic activity. Major technical issues responsible for false-negative findings are related to the low quality of the sonographic equipment. Low frequency transducers (< 7.5 MHz) are not appropriate for a detailed assessment of small anatomical parts. False-positive findings generally are due to the misinterpretation of sonographic images. Interpretation errors can be reduced with observer experience. New generation sonographic equipment can overcome several limitations of conventional sonography by improving the detection, reproducibility, and better scoring algorithms of minimal tissue damage. As US imaging improves and becomes more widespread, it is expected to play a greater role in the diagnosis of rheumatic diseases.

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*See Ultrasonography is superior to clinical examination in the detection and localization of knee joint effusion in RA, page 966.*

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In the past few years, there has clearly been an increasing recognition of the value of sonographic imaging in the assessment of patients with rheumatoid arthritis (RA). High resolution US can be used to detect and measure bone erosions<sup>8,9</sup>. Its accuracy, reproducibility, and diagnostic efficacy have been documented, even if experience is limited with regard to the use of US for documenting the progression of the erosions.

Clinical detection of synovitis in patients with RA has a relevant influence on decision-making and, in particular, on the definition of the most appropriate therapeutic approach. It is now clear that the sonographic probe is a magnification lens for synovitis, which allows a striking improvement of our capability to detect both early and hidden features of synovitis.

In this issue of *The Journal*, Kane and colleagues report the results of an elegant study demonstrating that US is more sensitive than clinical examination in the detection of suprapatellar bursitis, knee effusion, and Baker's cyst in patients with RA<sup>10</sup>. Bad news for the old-style rheumatologists that are still reluctant to open their minds to ultrasound!

Although musculoskeletal examination remains a fundamental clinical skill in rheumatology, it is evident that even a highly accurate examination cannot compete with information provided by high-resolution sonographic images of the various compartments of the knee in terms of both sensitivity and specificity. High sensitivity of US has also been reported for other anatomical areas<sup>11</sup>. A further relevant practical consequence of a sonographic-based approach to joint examination is the precise localization of fluid collection and the safe and correct needle placement for aspiration and/or corticosteroid injection<sup>12</sup>.

However, no competition can occur between clinical assessment and US. The final message of the authors is very clear and correct: US is not an alternative to clinical examination. It should be regarded as a tool that complements conventional clinical examination and allows an immediate evaluation of the morphological, structural, and dynamic features of the tissues involved in an inflammatory process. Clinical assessment of the knee is difficult in several elusive pathological conditions; it doesn't allow the collection of detailed and unequivocal information on both the extent and complications of synovitis<sup>13</sup>. Sonographic and physical assessment should be closely linked. Dual examination may be particularly useful to identify which structure corresponds to the most painful area or palpable mass.

Although US is still largely underused by rheumatologists, over the last few years there has been an explosion of interest that is confirmed by the constant increase of articles published in the most renowned rheumatological journals and by increasing requests for sonography courses and training in musculoskeletal ultrasound.

The future of US in rheumatology is critically dependent on 3 factors. The first factor is the standardization of sonographic scoring. The second factor is the training of new specialists (a certification procedure for sonographic training should be established). The third factor is a cooperative interaction with musculoskeletal radiologists. High quality dedicated sonographic equipment might in some settings be most effectively operated with the sharing of financial and clinical obligations by radiology and rheumatology.

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## REFERENCES

1. Carotti M, Salaffi F, Manganelli P, Salera D, Simonetti B, Grassi W. Power Doppler sonography in the assessment of synovial tissue of the knee joint in rheumatoid arthritis: a preliminary experience. *Ann Rheum Dis* 2002;61:877-82.
2. Schmidt WA, Volker L, Zacher J, Schlafke M, Ruhnke M, Gromnica-Ihle E. Colour Doppler ultrasonography to detect pannus in knee joint synovitis. *Clin Exp Rheumatol* 2000;18:439-44.
3. Canoso JJ. Ultrasound imaging: a rheumatologist's dream. *J Rheumatol* 2000;27:2063-4.
4. Backhaus M, Burmester GR, Sandrock D, et al. Prospective two year follow up study comparing novel and conventional imaging procedures in patients with arthritic finger joints. *Ann Rheum Dis* 2002;61:895-904.
5. Balint PV, Kane D, Wilson H, McInnes IB, Sturrock RD. Ultrasonography of enthesal insertions in the lower limb in spondyloarthropathy. *Ann Rheum Dis* 2002;61:905-10.
6. D'Agostino MA, Said-Nahal R, Hacquard-Bouder C, Brasseur JL, Dougados M, Breban M. Assessment of peripheral enthesitis in the spondylarthropathies by ultrasonography combined with power Doppler: A cross-sectional study. *Arthritis Rheum* 2003;48:523-33.
7. Grassi W, Filippucci E, Farina A, Cervini C. Sonographic imaging of tendons. *Arthritis Rheum* 2000;43:969-76.
8. Wakefield RJ, Gibbon WW, Conaghan PG, 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.
9. Grassi W, Filippucci E, Farina A, Salaffi F, Cervini C. Ultrasonography in the evaluation of bone erosions. *Ann Rheum Dis* 2001;60:98-104.
10. Kane D, Balint PV, Sturrock RD. Ultrasonography is superior to clinical examination in the detection and localization of knee joint effusion in rheumatoid arthritis. *J Rheumatol* 2003;30:966-71.
11. Naredo E, Aguado P, De Miguel E, et al. Painful shoulder: comparison of physical examination and ultrasonographic findings. *Ann Rheum Dis* 2002;61:132-6.
12. Koski JM. Ultrasound guided injections in rheumatology. *J Rheumatol* 2000;27:2131-8.
13. Iagnocco A, Coari G, Palombi G, Valesini G. Knee joint synovitis in Sjogren's syndrome. Sonographic study. *Scand J Rheumatol* 2002;31:291-5.

