

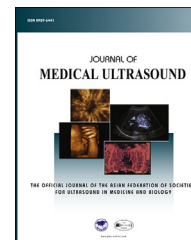


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EDUCATIONAL FORUM

The Third Eye of the Rheumatologist: Applications of Musculoskeletal Ultrasound in Rheumatic Diseases



Hsin-Hua Chen*

Division of Allergy, Immunology and Rheumatology, Department of Internal Medicine, Taichung Veterans General Hospital, Taichung City, Taiwan, ROC

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Abstract Rheumatologists manage patients with rheumatic diseases, which are of a wide range of musculoskeletal pathologies. Without clarification of the exact location of pathologies and the degree of inflammation, rheumatologists may have an incorrect assessment, leading to inappropriate management. In everyday practice, physical examination is limited by its sensitivity and power of assessment. Musculoskeletal ultrasonography (MSUS) is inexpensive, readily available, and allows side-by-side image comparisons. Thus, during the past 10 years, MSUS has become the “third eye” of the rheumatologist, in that it allows more detailed examination of muscles, bones, and joints, just as the stethoscope provides further details about the respiratory and circulatory systems. We briefly introduce how rheumatologists in Taiwan use MSUS for the diagnosis and treatment for rheumatic diseases.

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* Correspondence to: Hsin-Hua Chen, Division of Allergy, Immunology and Rheumatology, Department of Internal Medicine, Taichung Veterans General Hospital, Number 1650, Section 4, Taiwan Boulevard, Xitun District, Taichung City, Taiwan 40705, ROC.
E-mail address: shc5555@hotmail.com.

Introduction

Rheumatic diseases include a wide range of pathological entities, including connective tissue diseases [e.g., systemic lupus erythematosus, rheumatoid arthritis (RA), scleroderma, dermatomyositis/polymyositis, Sjögren syndrome, mixed connective tissue disease], spondyloarthropathies (e.g., ankylosing spondylitis, reactive arthritis, psoriatic arthritis), degenerative arthritis, metabolic disorders (e.g., gout, pseudogout, other crystal-induced arthritides), septic arthritis, and other diseases that

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affect the joints, bone, cartilage, tendons, and ligaments. The main tissues and organs affected by these diseases are the muscles, bones, joints, and soft tissues. A trained rheumatologist can use differential diagnosis after review of a patient's medical history, the performance of a physical examination and blood tests, and by follow-up after administration of appropriate treatment. However, imaging tests are often required to aid the diagnosis, assess disease severity, and guide treatment follow-ups. With the advancements in imaging technologies over the past decade, musculoskeletal ultrasonography (MSUS) can now provide rheumatologists with very clear gray-scale images of the musculoskeletal system. In addition, color or power Doppler ultrasound can be used to measure blood flow through small vessels to evaluate the extent of inflammation. Moreover, ultrasonography does not expose the patient to radiation, is inexpensive, is readily available, and allows side-by-side image comparisons. Thus, during the past 10 years, MSUS has become the "third eye" of the rheumatologist, in that it allows more detailed examination of muscles, bones, and joints, just as the stethoscope provides further details about the respiratory and circulatory systems. This article will briefly introduce how rheumatologists in Taiwan use MSUS for the diagnosis and treatment of rheumatic diseases.

Advantages and disadvantages of musculoskeletal ultrasound

The main benefits of MSUS are that there is no radiation exposure, it is relatively inexpensive, easy access is available, it is noninvasive and easily accepted by patients, it can be used to assess multiple regions and allows bilateral comparisons, and dynamic scans can be performed. The main disadvantages are that there may be differences in the interpretation of results by different operators, there is a long learning process, there is a need for coordination with physician availability, and it lacks the ability to examine areas behind the bones and air [1].

Why do rheumatologists perform musculoskeletal ultrasound?

Most ultrasound examinations, including abdominal sonography, cardiac sonography, and carotid/intracranial sonography, can be conducted by trained radiology technicians, followed by image interpretation and subsequent issuance of final reports and diagnoses by radiologists or physicians from other departments. Nevertheless, it is very difficult for technicians to perform MSUS, mainly because standardized ultrasound scans of different regions (so-called standard scanning routines) often do not provide physicians with the information they need, and may even mislead them.

For example, shoulder impingement syndrome may be suspected after an inquiry about the medical history and a physical examination of a patient, in which case additional dynamic ultrasound scanning should be performed to make a definite diagnosis. In addition, abnormalities in the ultrasound images of the rotator cuff ligaments in elderly patients

are often not the genuine reason for pain or movement problems. Thus, it is usually necessary for a physician, who has a greater breadth of knowledge, to interpret such images in concert with the physical examination results and inquiries about medical history before diagnosis. Moreover, if a lesion is discovered, ultrasound-guided aspiration is required so that further testing (such as microscopic examination or culture of synovial fluid) can be performed, or an ultrasound-guided injection may be needed for symptom relief. Only physicians, not technicians, can perform such invasive procedures. In Taiwan, the first MSUS procedures were performed by radiologists who were familiar with imaging of the musculoskeletal system. These doctors can examine the medical history and perform physical examinations to aid in the interpretation of the ultrasonography results, can issue a final report, and can even perform ultrasound-guided aspiration or injection. However, there are too few radiologists specialized in musculoskeletal ultrasound in Taiwan to examine a large number of patients with rheumatic diseases. If rheumatologists can also perform MSUS in person, they can combine the imaging results with their better understanding of patients and rheumatic diseases, and thereby provide better care. Furthermore, during the training of physicians, they can be taught to use ultrasonography as a complement to physical examinations.

Two hypothetical examples illustrate the benefits of rheumatologists performing MSUS. The first example is a patient (female) with early stage RA who has not yet been diagnosed. This patient initially presents with mild joint pain in her right wrist. If the joint pain is only accompanied by mild swelling and joint inflammation, a simple physical examination may falsely interpret the findings as normal. In addition, if serum indicators of inflammation, such as the erythrocyte sedimentation rate or C-reactive protein, are within the normal ranges, and levels of rheumatoid factor and anticitrullinated protein antibody are also normal, then RA may be excluded, and there is no opportunity for pre-emptive treatment. By contrast, if a rheumatologist trained in the use of MSUS examines the wrist inflammation by physical examination and then by MSUS, he/she can determine the presence of RA, administer therapy, and thereby reduce the risks associated with delayed diagnosis. Moreover, if bone erosion is present, active treatment and follow-ups can be managed in a more timely manner.

The second example is a patient who has been diagnosed with RA and is undergoing follow-up treatment. This patient has been treated for RA, and during the follow-up, the inflammatory indices decreased to within their normal ranges, and a simple physical examination indicated no joint inflammation, so the patient may be advised to move toward a more conservative treatment, such as a reduced drug dosage. However, if the rheumatologist performs MSUS to confirm the initial diagnosis and during the follow-up examinations, he/she can better decide on whether dosage reduction is appropriate. Dose reduction may be inappropriate if the Doppler ultrasound signals are still present in the joints and pass through the eroded bone (Figure 1) due to incomplete disease remission. Consequently, rheumatologists must be cautious about drug dose adjustment, and sonographic findings may help them to make better decisions on changes in therapy and dose.

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