

# Musculoskeletal Ultrasound: An Emerging Technology in Canada

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**Objective.** To assess the attitudes of rheumatologists on the usefulness of musculoskeletal ultrasound as an alternative to standard x-ray and magnetic resonance imaging (MRI) techniques.

**Methods.** A cross-section of 5 Canadian rheumatologists from various regions in Canada was interviewed to provide an overview of practitioners' attitudes regarding musculoskeletal ultrasound.

**Participants:** Hector Arbillaga, MD, Private Practice, Lethbridge, Alberta; Maggie Larché, MBChB, MRCP(UK), PhD, McMaster University, Hamilton, Ontario; Johannes Roth, MD, Children's Hospital of Eastern Ontario; Andy Thompson, MD, FRCPC, St. Joseph's Healthcare, the University of Western Ontario, London, Ontario; John Wade, MD, FRCPC, Private Practice, Vancouver, BC

**Results.** Four of the 5 rheumatologists interviewed recognize the clinical value of musculoskeletal ultrasound in rheumatology and responded positively to the prospect of integrating it increasingly into their practice. There was a consensus regarding several significant barriers to the further acceptance of the technology in Canada.

**Conclusions.** The majority of the rheumatologists interviewed are extremely strong advocates for the use of ultrasound and hope to increase its application in their daily practice, as resources allow.

## Introduction

### *Barriers to acceptance in Canada relative to Europe*

In Europe, the use of musculoskeletal ultrasonography has been accepted by rheumatologists as an alternative to conventional imaging and is now routinely used in daily practice, both privately and in healthcare institutions. Mounting evidence points to the superiority of ultrasound to clinical examination, x-ray and magnetic resonance imaging (MRI) in certain applications in joint and muscle disease, cartilage and tendon pathology, scleroderma, vasculitis, and other conditions.<sup>1</sup> In Canada, however, ultrasound use remains infrequent in rheumatology practice. Participants in a recent interview series cited 4 significant reasons for the relative lack of acceptance of ultrasonography in Canada.

*Economic factors* are considered a primary impediment. Dr. Maggie Larché, who has an adult and pediatric practice with approximately 300 patients and has been practicing for 5 years, received her ultrasound training in Great Britain, where, as in other parts of Europe, physicians are salaried as opposed to receiving reimbursement on a per-patient basis. In Germany, France, and Spain, they are reimbursed by insurance companies; this is an option that both she and Dr. John Wade, who has been in practice for 20 years and sees approximately 2000 patients, suggested might be worthy of consideration. Their view is that until rheumatologists can persuade the Canadian government of the importance of ultrasound in rheumatology, reimbursement will remain an issue, and that Canadian rheumatologists should advocate for it collectively.

A second economic consideration is the purchase of ultrasonography equipment. According to Dr. Johannes Roth, a pediatric rheumatologist who has been practising for 9 years, potential economic models include cross-financing, institutional funding of the acquisition of ultrasound equipment, and industry partnerships, particularly in the burgeoning stages of ultrasonography use in Canada.

**The role of radiologists** is a central element to this discussion. Participants agreed that a salient point of distinction between the Canadian and European practice environments is that, in the latter, ultrasound remains virtually the exclusive domain of radiologists; however, there are examples, such as the emergency physicians who have defined their own areas of ultrasound use. Dr. Hector Arbillaga, who has been in private practice for 5 years with a focus on adult rheumatology patients, noted that Canadian radiologists are adamant about maintaining control of imaging procedures and that regulatory changes on this front would be required to remedy the situation. Dr. Larché stated that radiologists should allow rheumatologists to utilize ultrasound as deemed appropriate, in the same fashion as cardiologists and obstetrician/gynecologists.

**Lack of training and knowledge transfer** between experts and physicians-in-training are major obstacles in enhancing the integration of musculoskeletal ultrasound in Canada. The development of recognized training programs and international standards of competency are important objectives with regard to ultrasound gaining more widespread use in daily clinical practice.<sup>2,3</sup> Dr. Wade emphasized the need for Canadian rheumatologists to encourage each other to learn the technology.

None of Dr. Arbillaga's colleagues currently use ultrasound. Dr. Roth currently employs ultrasound both in research and in a clinical context. He has been practicing in Canada for 2 years, having received his training while attending medical school in Germany, and is aware of only 2 other pediatric rheumatologists in Canada who use ultrasound in their practice. Dr. Larché, who has been utilizing ultrasound for the past 5 years, estimated that there are fewer than 10 rheuma-

tologists in Canada using the technique; she is the only rheumatologist in her practice to do so.

To promote the advancement of this technology in Canada, said Dr. Arbillaga, it will be extremely important for young rheumatologists to receive standardized training in the daily use of ultrasonography as a critical tool in the rheumatologist's armamentarium to improve the quality of care among patients with rheumatoid diseases. In addition, Dr. Wade noted that in the United States and Europe, the uptake of this technique in recent years has been rapid: "Canadian rheumatologists have the luxury of seeing what their European counterparts are doing."

One of the reasons cited for inadequate training in Canada is the amount of time one would be required to be absent from one's practice to become proficient in ultrasonography. Dr. Wade noted that the European countries in which this learning process comprises an integral part of medical training have produced a large number of recognized experts in the field and are leading the way in disseminating information into their local communities – which has not occurred in Canada.

**Equipment and operator dependence, and variability of scan quality** were cited by Drs. Arbillaga, Thompson, and Larché as a barrier. Reliance on technical expertise to achieve the greatest level of accuracy continues to be a concern. Dr. Andy Thompson, a rheumatologist who has been in practice for 7 years and sees 2000–3000 patients per year, noted a lack of standardization in ultrasonography procedures and stated that important findings can easily be missed, depending on the technician's skill level: "A slight turn of the probe in one direction or another might yield a different result."

Participants agreed that accessibility and affordability of x-ray and MRI are significant considerations in the choice of imaging technique. Dr. Arbillaga considers MRI to be an expensive option that – unlike ultrasound – is not always immediately available. He noted the continued usefulness of x-ray in assessing the progression of rheumatologic disease. Dr. Wade's utilization of MRI is limited by both access and cost. He

stated that, unlike ultrasound, which he currently uses, MRI will likely never be available to the vast majority of rheumatologists. While ultrasonography has traditionally been used as an imaging technique to identify soft-tissue swelling or tendons, Dr. Wade anticipates that power Doppler ultrasonography will be used in the future to assess disease activity.

Ultrasound does not represent a viable option to Dr. Thompson, who relies on x-ray and MRI, the latter only rarely and not typically for inflammatory disease. His interest in ultrasonography prompted him to complete the 1-week training module in Italy; his post-training view is that ultrasound has little current practical application due to the lack of standardized outcome measures. He also expressed concern regarding the potential negative impact of overtreatment. He offered the example of a patient who is progressing well in treatment and in whom there is no clinical indication of disease. If ultrasound reveals a possible anomaly and the patient's medication dose is increased, he or she may be exposed to additional medication toxicity without a concomitant increase in benefit.

### **Utility of musculoskeletal ultrasound as a clinical tool in rheumatology**

Participants generally recognized ultrasound as a valuable imaging tool with 3 clinical applications: facilitating early diagnosis, monitoring of disease progression and responses to therapy, and indicating the persistence of pathology in a patient deemed to be in remission. While Dr. Thompson does not concur with his colleagues on the value of adopting ultrasonography for the above uses, he stated that it may be useful in interventional procedures such as aspirating or injecting joints.

Dr. Arbillaga considers ultrasound as "a major advance" in monitoring patients; currently, most monitoring is done clinically. The technology is highly sensitive in the detection of synovitis and the presence of erosions, tendinitis, and cysts, as well as changes in skin and subcutaneous tissue, as occurs in scleroderma.

Dr. Roth pointed out that juvenile idiopathic arthritis is a disease of the musculoskeletal system and that the use of ultrasound in pediatric rheumatology has the potential to significantly contribute to ensuring best possible outcomes. He added that the state of children's joints will greatly affect their quality of life for approximately 70 years to come: "If one considers average life expectancy, it is hugely important to tailor treatment to individual needs, with the appropriate tools at one's disposal." MRI is a valuable tool in his practice for the assessment of the temporomandibular joint, for example, which cannot as yet be assessed by ultrasound. However, ultrasound is his preferred imaging technique as it can be performed rapidly and frequently in-clinic without radiation or other side effects. In addition, he noted that it plays a role in differentiating between synovitis, arthritis, and unspecific pain, all of which can be difficult to determine from clinical examination alone. Furthermore, ultrasound can provide the benefit of avoiding the secondary costs of treating disease, and its utility in improving patient care has been underscored in the literature.

Dr. Larché considers the fact that ultrasound provides more information than other imaging techniques in imaging synovial vascularity as a significant advantage. It aids in the differential diagnosis of synovitis and in determining whether a change in therapy is required, which may be indicated by synovial vascularity. She noted that there is extensive discourse in the scientific press about imaging remission. Practitioners discuss clinical remission and disease activity scores. She contends that discussion should also focus on assessment of remission. She has witnessed the positive impact of ultrasound on patients' sense of inclusion in the treatment process: "They love to see what is under their skin and the color signal within the joint. I spend time explaining what is happening in the scan, which provides patients a sense of empowerment and involvement."

Dr. Wade's use of ultrasound for daily assessment reflects his point of view that "(i)t is one of the best tools – even better than MRI – for determining cartilage

thickness." He cited that one of the most important factors in achieving long-term results is to preserve cartilage, which is enhanced with the use of ultrasound. It defines cartilage thickness much better than MRI at a fraction of the cost and without side effects. In addition, in his view, ultrasound will become a decision-making tool regarding initiating therapies, adding on therapies, and making a clinical decision to switch from a disease-modifying antirheumatic drug to a biologic agent or other medication that might reduce inflammation and control rheumatologic disease over the long term. As such, Dr. Wade regards ultrasound as a new frontier for rheumatology, empowering the rheumatologist to make clinical decisions and affording patients insight into the same concerns that rheumatologists face, namely, inflammation and damage in the joint.

### **Musculoskeletal ultrasound in Canada: future perspectives**

Dr. Arbillaga anticipates using ultrasound in perhaps 2–3 months. As an enthusiastic advocate, he looks forward to it being increasingly incorporated into the future practice of rheumatology with a view toward offering better long-term patient outcomes, as defined by such factors as disease progression, joint erosions and preservation of function.<sup>4</sup> Dr. Larché noted the lack of a training program in Canada, a situation that she and several of her colleagues are attempting to remedy. Dr. Wade corroborates the point of view that ultrasound may well be the future of rheumatology.

### **Conclusion**

The benefits of this emerging technology are evident to the majority of physicians interviewed, who currently use ultrasound to varying degrees. For 4 of the 5 rheumatologists, the challenges to be overcome do not, in fact, represent enough of a barrier to preclude its application in clinical practice.

In light of the steep learning curve involved in the more pervasive use of ultrasonography in rheumatology in Canada, one must weigh the investment required both in economic and human resources against the technology's added clinical value. This perceived trade-off to achieve competency<sup>5</sup> is being viewed positively by a growing number of Canadian rheumatologists.

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