The Role of Musculoskeletal Ultrasound in Occupational Medicine

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304: Musculoskeletal Ultrasound in Occupational Medicine: Looking Into the Future

TRACK: OEM Clinical Practice
Feasibility and Implementation of Musculoskeletal Ultrasound Training in Occupational Medicine Residency Education

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TRACK: OEM Clinical Practice

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The 1-hour lecture will be an overview/introduction to musculoskeletal ultrasound split between presenters. The lecture will include topics including the physics of ultrasound, knobbyology, image optimization, technique including patient placement, review of shoulder anatomy/sonoanatomy (with a live demonstration), miscellaneous anatomy/sonoanatomy pertinent to occupational medicine, interventional techniques with a live demonstration (cadaveric vs. gel model), and the future of musculoskeletal ultrasound in workers compensation injury, reimbursement, and finally certification.
“Prediction is difficult, especially about the future.”

“You have to know the past to understand the present.”

NAÏVELY CONFIDENT

CLUELESS
You don’t know what you don’t know

DISCOURAGINGLY REALISTIC
You know what you don’t know

MASTERY ACHIEVED
You know it
1 Hz = 1 cycle/sec
Anisotropy /ˌænəsˈɔtrəpi/ is the property of being directionally dependent, which implies different properties in different directions, as opposed to isotropy.
We have identified strong out-of-band emission at 2.3–2.5 GHz associated with several peryton events. Subsequent tests revealed that a peryton can be generated at 1.4 GHz when a microwave oven door is opened prematurely and the telescope is at an appropriate relative angle.
Fig. 3 from Hailu-Selassie et al. (2010a). A) modern human. B) KSD-VP-1. C) gorilla. D) chimpanzee. Yes, pictures of the actual specimen would have been nice and certainly no less informative than these x-rays.
“It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest.”

“No pleasure is comparable to the standing upon the vantage-ground of truth.”
“One of the essential qualities of the clinician is interest in humanity, for the secret of the care of the patient is in caring for the patient.”

“I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.”
Musculoskeletal ultrasound: taking sports medicine to the next level
Kimberly G. Harmon,1 Francis G. O'Connor2

Ultrasound (US) technology is rapidly modernizing the way medicine is practiced in the field of sports medicine. US is cost-effective and is considered the most readily available imaging tool in the emergency department. Imaging in elite and professional athletes is commonplace, as more and more clinicians are realizing the benefits of this imaging modality. Musculoskeletal ultrasound (US) has gained widespread acceptance in clinical sports medicine due to the speed and ease of image acquisition. It is possible to image the extremities, joints, ligaments, tendons, muscles, and nerves in only a few minutes. Musculoskeletal US can be performed without patient sedation and can be used as an office-based diagnostic tool. The musculoskeletal US examination is simple and can be performed by any practitioner with the appropriate education and training.

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Brief history parallel to the enthusiasm showed by rheumatologists at the American College of Rheumatology meeting for the musculoskeletal ultrasound
Angel Checa

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Musculoskeletal ultrasonography (MSU), a successful minimally invasive diagnostic modality, has gained increased interest in the past few years. It is not only cost-effective, but it has shown to be an excellent diagnostic tool when performed by an experienced rheumatologist. Along with an increase in MSU usage, there have been new indications for this imaging modality in the musculoskeletal arena. The American College of Rheumatology (ACR) is a group of rheumatologists that have been interested in the utilization of MSU for disease diagnosis. Rheumatologists have been present at ACR meetings for several years, sharing their experiences with MSU usage and discussing new applications for the modality.

Rheumatol Int (2011) 31:117–119
“A major hurdle in brain-machine interfaces (BMI) is the lack of an implantable neural interface system that remains viable for a lifetime.”
Echogenicity

- Anechoic
- Hyperechoic
- Hypoechoic

Depth Vs Resolution

- Low frequency → High frequency
- Low resolution → High resolution
- Longer depth → Shorter depth

Anisotropy

- Normal Bicep Tendon: Hyperechoic
- Bicep Tendon: Anisotropy (hypoechoic)

$c = \lambda \nu$

- speed of light
- frequency (Greek letter, \(\nu\))
- wavelength (Greek letter, \(\lambda\))
Non-ionizing, low-cost, on-demand, dynamic, point-and-shoot, instant resulting, handy dandy imaging modality

But wait, there’s more...
Imaging Algorithms for Evaluating Suspected Rotator Cuff Disease: Society of Radiologists in Ultrasound Consensus Conference Statement

Figure 1

The Role of Musculoskeletal Ultrasound in Occupational Medicine

...guideline-endorsed...
“Interestingly, one finding of this study is that, when performed by specially trained operators, shoulder US may not be as user dependent as previously thought since, for the diagnosis of a full-thickness RC tear, diagnosis was similar whether trained radiologists, sonographers or orthopaedists performed the US examination.”
Medical Treatment Guidelines
Washington State Department of Labor and Industries

Shoulder Conditions
Diagnosis and Treatment Guideline

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   B. Subacromial Impingement Syndrome without a Rotator Cuff Tear
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   D. Labral tears including superior labral anterior posterior (SLAP) tears
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   F. Acromioclavicular arthritis
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“The substitution of MSK US for MSK MRI, when appropriate, would lead to savings of more than $6.9 billion in the period from 2006 to 2020.”
“The substitution of MSK US for MSK MRI, when appropriate, would lead to savings of more than $6.9 billion in the period from 2006 to 2020.”

“Our cost-savings projections assume that US can replace MRI, not that both tests will be performed in a single patient, which might increase costs.”

B. Diagnostic imaging
Conventional X-ray, MRI, and ultrasound are the best imaging tools to corroborate the diagnosis of a shoulder condition [7-11]. MRI has been considered the gold standard; however, research has demonstrated the efficacy of ultrasound, done by a skilled provider or technician, to diagnose rotator cuff tears. A systematic review found ultrasound to have a pooled sensitivity of .95 and specificity of .96 in detecting full thickness rotator cuff tears [7]. Ultrasound was nearly as effective as MRI in diagnosing partial tears, therefore ultrasound may be recommended to diagnose full and partial thickness tears [9].

However, it is important to take into consideration that the sonographers and orthopaedists who performed the US examination in the included articles were specially trained, and that there is a steep learning curve to US.14
“Therefore, the use of ultrasound at the point of care must be linked to specific training that should be defined in curriculum such as the one recently updated by the American Medical Society for Sports Medicine (AMSSM).”
Training Guidelines for Physicians and Chiropractors Who Evaluate and Interpret Diagnostic Musculoskeletal Ultrasound Examinations

Approved November 2, 2014

Physicians (MD, DO, and DPM) who perform and/or interpret diagnostic MSK ultrasound examinations should meet at least 1 of the following:

1. Completion of a residency and/or fellowship program that includes structured training and performance and/or interpretation and reporting of at least 100 diagnostic MSK ultrasound examinations, under the supervision of a physician qualified to perform MSK ultrasound examinations.

If completion of residency and/or fellowship occurred more than 36 months ago:

a. The supervision and/or performance, interpretation, and reporting of at least 50 diagnostic MSK ultrasound examinations per year and 10 hours of AMA PRA Category 1 Credits™ specific to MSK ultrasound within the previous 36 months must be documented.

b. If the supervision and/or performance and interpretation of 50 diagnostic MSK ultrasound examinations per year cannot be documented, 30 hours of AMA PRA Category 1 Credits™, American Osteopathic Association (AOA) Category 1-A Credits, or Council on Podiatric Medical Education (CPME)-approved credits specific to MSK ultrasound must be completed, including at least 1 ultrasound course that provided hands-on training in MSK applications.
If I’ve heard it once, I’ve heard it a hundred times. I’ve heard it from critics and admirers, from radiologists and nonradiologists, from individuals I respect and from those I do not respect. And what they say is: “Ultrasound [sonography] is the stethoscope of the future.” Unfortunately, this prediction is likely to be true.

Although the stethoscope is one of the most widely employed diagnostic instruments, it is also one of the most poorly used. When I was a medical student, I was profoundly impressed with what could be diagnosed with this simple instrument. The stethoscope is a logical extension of the examiner’s body. As I walk about the hospital, I see stethoscopes jauntily draped over the shoulders or hung around the necks of just about everyone: nurses, therapists, medical students, interns, etc. This instrument has become more a badge of dignity than a diagnostic tool. I’m sure the patients don’t know that the bulk of these medical artisans haven’t an inkling as to the power of the tool they so casually display.

There probably are some physicians around who still realize what can be diagnosed with a stethoscope, but I would guess that they are few, and few have the training to do so. We are facing a problem that has plagued medicine for generations: the inability to maintain or continue the education of those who have had it. The stethoscope is an example of how we could easily neglect the education of our profession. And if we do, we do so at our peril.

If sonography is the stethoscope of the future, so be it. But shouldn’t an effort be made to integrate this technology more appropriately into the general practice of medicine? Having a medical license and the price of a machine are not the criteria that should be applied to the use of this diagnostic modality (especially when the price of the machine can be quickly amortized to the financial benefit of the unqualified practitioner and to the financial detriment of medicine in general and the patient in particular).

We are facing a problem that has plagued medicine for generations: the inability to maintain or continue the education of those who have had it. The stethoscope is an example of how we could easily neglect the education of our profession. And if we do, we do so at our peril.
“Providing health care is like building a house. The task requires experts, expensive equipment and materials, and a huge amount of coördination.

Imagine that, instead of paying a contractor to pull a team together and keep them on track, you paid an electrician for every outlet he recommends, a plumber for every faucet, and a carpenter for every cabinet.

Would you be surprised if you got a house with a thousand outlets, faucets, and cabinets, at three times the cost you expected, and the whole thing fell apart a couple of years later?”

“He wanted to show that fate ruled people's lives, and that those who interfered with it did so to their sorrow”
A recent policy change at Blue Cross Blue Shield (BCBS) for Texas, Illinois, New Mexico, and Oklahoma regarding musculoskeletal (MSK) ultrasound illustrates how the status of reimbursement for diagnostic imaging can change overnight.

MSK US Volume

- Radiologists (+123%)
- Podiatrists (+1,847%)

Modified from Sharpe RE et al. JACEP 2011. 40(3):141

DENYING PAYMENTS FOR MUSCULOSKELETAL ULTRASOUND: HOW DID WE GET HERE?

Levon N. Nazarian, MD, Archie A. Alexander, MD, JD, LLM
Use of the commons is below the carrying capacity of the land. All users benefit.

If one or more users increase the use of the commons beyond its carrying capacity, the commons becomes degraded. The cost of the degradation is incurred by all users.

Unless environmental costs are accounted for and addressed in land use practices, eventually the land will be unable to support the activity.

Denying Payments for Musculoskeletal Ultrasound: How Did We Get Here?
Levon N. Nazarian, MD, Archie A. Alexander, MD, JD, LLM
THE STARTUP THAT'S BRINGING AI TO ULTRASOUNDS AND MRIS
Thank you all!


10. Missing sisters- A shortage of girls will haunt India for decades


12. Radiologists Must Play Central Role in Point-of-Care Ultrasound Training

13. Handheld ultrasound: Threat or opportunity?


20. Uncertainty and the welfare economics of health care

21. The Unanticipated Consequences of Purposive Social Action


27. AIUM: Collaboration drives musculoskeletal ultrasound


32. http://www.ob-ultrasound.net/history1.html