MSK radiologist questions shoulder ultrasound data

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After reviewing the clinical literature on ultrasound imaging of the shoulder, Dr. David Stoller, director of musculoskeletal MRI at the California Pacific Medical Center in San Francisco, concluded that a significant amount of data was either flawed or inaccurate.

In his presentation at the 2005 International Skeletal Society meeting in Singapore, Stoller highlighted several such studies. Diagnostic Imaging asked study authors to comment on Stoller's critiques.

In one study, ultrasound and MRI showed comparable accuracy in detecting and quantifying partial and full-thickness rotator cuff tears (Detection and quantification of rotator cuff tears: Comparison of ultrasonographic, magnetic resonance imaging, and arthroscopic findings in 71 consecutive cases. J Bone Joint Surg Am 2004;86-A(4):708-716). Thus the decision regarding which modality to use—provided the imager has experience with both—does not depend on accuracy. Other factors, such as a patient's clinical history or costs, should influence that choice, study authors concluded.

"This study was significantly biased toward ultrasound," Stoller said. The difference between normal and injured cuffs in the sample fails to reflect what is common in clinical practice, Stoller said. And the surgeon who selected the clinical population was the same one confirming lesions at surgery. In addition, Stoller disagreed with the study's classification of cuff pathology and had significant reservations about its MRI protocol.

"The study is biased toward patients with advanced rotator cuff disease," said study coauthor Dr. David A. Rubin, chief of the musculoskeletal radiology section at Washington University's Mallinckrodt Institute of Radiology. The study may not represent the general population referred for shoulder imaging, and its methods may not universally apply to all practices. But its findings still stand, Rubin said.

Researchers wanted to establish whether ultrasound and MRI are equivalent for confirming or ruling out rotator cuff tears in patients with shoulder pain, he said. Asserting equivalent accuracy outside the scope of this study, however, isn't clinically relevant, Rubin said. There are several other conditions underlying shoulder pain, occult on ultrasound, that are equally or more important than rotator cuff pathology.

"When you do a shoulder ultrasound and you see the rotator cuff is normal, you're done with ultrasound. On MR you can see 10 other reasons why the patient has pain. The analogy I use for our orthopedic surgeons is that when you are imaging the shoulder you are in a dark cave," Rubin said. "If you are imaging with ultrasound and if you are very good at it, you have a very big flashlight. If you do it with MR or MR arthrography, you turn on the lights."

Another study singled out by Stoller points out that ultrasound's accuracy on some shoulder lesions is limited, due to its difficulty in distinguishing tendinopathy from partial-thickness tears (Detection and measurement of rotator cuff tears with sonography: analysis of diagnostic errors. AJR 2005;184(6):1768-1773). This distinction may not be clinically relevant, though, because both conditions can be managed nonoperatively, the authors wrote. This assertion contradicts the norm regarding diagnosis and management of rotator cuff tears, Stoller said. He quoted one expert, Dr. Wesley M. Nottage, an orthopedic surgeon and shoulder arthroscopist, that even partial cuff tears need to be managed aggressively, while a significant amount need surgical repair.

The study authors declined to comment.

A third study evaluated by Stoller involved assessment of 80 labral quadrants in 20 cadavers (Sonography of the glenoid labrum: A cadaveric study with arthroscopic correlation. AJR 2000;174(6):1717-1722). It concluded that labral tears can be ruled out when the labra appear normal on sonography. Accuracy, sensitivity, and specificity values are based upon abnormal (torn or degenerated) versus normal labrum.

The key consideration in shoulder imaging is finding or ruling out labral tears. MSK imagers might
deem other considerations (such as whether the labrum is normal or degenerated) as irrelevant. The study both overlooks and contradicts existing data on living patients with labral injuries assessed with noncontrast MRI, Stoller said. "We weren't writing the article to say that ultrasound should be routinely used to evaluate the labrum," said coauthor Dr. Jon A. Jacobson, director of musculoskeletal imaging at the University of Michigan Medical School's radiology department in Ann Arbor. The article noted the ability to image the posterior labrum with ultrasound during a routine shoulder examination. Ultrasound is quick and could potentially add more information to the diagnostic algorithm, considering that abnormal findings related to cartilage would likely indicate the need for an MR arthrogram, Jacobson said. "We weren't saying ultrasound can compete or is as good as MR. We are just saying, 'This is one area you can see with ultrasound, and it's free since you are looking at the shoulder anyway,'" he said. Another study errs in omission, Stoller said (US of the shoulder: non-rotator cuff disorders. Radiographics 2003;(2):381-401). In it, ultrasound has a promising role in the evaluation of the labrum, with sensitivities and specificities ranging from 88% to 95% and 67% to 100%, respectively. Researchers quote a specific article (Radiology 2001;219(1):29-34) to back up this assertion. But the article cited has design flaws regarding ultrasound's capabilities in this setting. The conclusions of the Radiographics study are thus misleading, Stoller said. "This is a serious error of attribution," he said. The study's principal investigator declined to comment. In other research, most patients with shoulder pain preferred sonography to MR. (Sonography and MRI of the shoulder: comparison of patient satisfaction. AJR 2004;183(5):1449-1452). The study also found that MRI caused increased pain in 40 of 118 patients enrolled. The investigators might have exaggerated the length of a routine MRI exam, while downplaying ultrasound’s review time, Stoller said. In addition, the study provides no details about coil, patient positioning, or degree of increased pain for the MR component. And it seems biased toward ultrasound regarding the preference question directed to patients. Stoller contends that researchers could have rephrased the question of preference by highlighting the fact that ultrasound has a slightly lower accuracy on full-thickness rotator cuff tears and is inferior in detecting labral and capsular lesions and other causes for shoulder pain. "(Stoller's) reservation is a true one, and it is one I would certainly hope that most people who read the study would note. But, again, what the study does is to address just one limited question," said coauthor Rubin of Mallinckrodt. "I would not want an ultrasound for my shoulder if I thought it an inferior study diagnostically, but that wasn't what was addressed here." Researchers did not ignore MR capabilities, but they concentrated specifically on patient comfort, Rubin said. Even a routine shoulder MR involves tight spaces and the need to lie still. Moreover, an MR exam is impersonal. Ultrasound is a different type of exam, with more patient-physician interaction. All of these factors influence patient perception of the exam. "The study was essentially about patient comfort, which includes both physical and emotional comfort," Rubin said. A final study found low interobserver variability in the sonographic detection and characterization of rotator cuff tears (Sonography of the rotator cuff: Analysis of interobserver variability. AJR 2004;183(5):1465-1468). But an orthopedic surgeon self-selected gross tears on physical examination, confirming nine normal cuffs out of 130 patients, Stoller said. The study notes that this sample reflects a type of patient population commonly seen by a subspecialized shoulder surgeon. But this sample is unlikely to represent patients routinely referred for shoulder sonography. In addition, Stoller's own study showed greater interobserver variability between an expert sonographer, a sonologist, and MRI. The study authors declined to comment.

Disclosures:

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