

The American College of Radiology, with more than 30,000 members, is the principal organization of radiologists, radiation oncologists, and clinical medical physicists in the United States. The College is a nonprofit professional society whose primary purposes are to advance the science of radiology, improve radiologic services to the patient, study the socioeconomic aspects of the practice of radiology, and encourage continuing education for radiologists, radiation oncologists, medical physicists, and persons practicing in allied professional fields.

The American College of Radiology will periodically define new practice guidelines and technical standards for radiologic practice to help advance the science of radiology and to improve the quality of service to patients throughout the United States. Existing practice guidelines and technical standards will be reviewed for revision or renewal, as appropriate, on their fifth anniversary or sooner, if indicated.

Each practice guideline and technical standard, representing a policy statement by the College, has undergone a thorough consensus process in which it has been subjected to extensive review, requiring the approval of the Commission on Quality and Safety as well as the ACR Board of Chancellors, the ACR Council Steering Committee, and the ACR Council. The practice guidelines and technical standards recognize that the safe and effective use of diagnostic and therapeutic radiology requires specific training, skills, and techniques, as described in each document. Reproduction or modification of the published practice guideline and technical standard by those entities not providing these services is not authorized.

1998 (Res. 31)  
Revised 2003 (Res. 17)  
Amended 2006 (Res. 35)  
Effective 10/01/03

## **ACR PRACTICE GUIDELINE FOR THE PERFORMANCE OF A SHOULDER ULTRASOUND EXAMINATION**

---

### **PREAMBLE**

These guidelines are an educational tool designed to assist practitioners in providing appropriate radiologic care for patients. They are not inflexible rules or requirements of practice and are not intended, nor should they be used, to establish a legal standard of care. For these reasons and those set forth below, the American College of Radiology cautions against the use of these guidelines in litigation in which the clinical decisions of a practitioner are called into question.

The ultimate judgment regarding the propriety of any specific procedure or course of action must be made by the physician or medical physicist in light of all the circumstances presented. Thus, an approach that differs from the guidelines, standing alone, does not necessarily imply that the approach was below the standard of care. To the contrary, a conscientious practitioner may responsibly adopt a course of action different from that set forth in the guidelines when, in the reasonable judgment of the practitioner, such course of action is indicated by the condition of the patient, limitations on available resources, or advances in knowledge or technology subsequent to publication of the guidelines. However, a practitioner who employs an approach substantially different from these guidelines is advised to document in the patient record information sufficient to explain the approach taken.

The practice of medicine involves not only the science, but also the art of dealing with the prevention, diagnosis, alleviation, and treatment of disease. The variety and complexity of human conditions make it impossible to always reach the most appropriate diagnosis or to predict

with certainty a particular response to treatment. Therefore, it should be recognized that adherence to these guidelines will not assure an accurate diagnosis or a successful outcome. All that should be expected is that the practitioner will follow a reasonable course of action based on current knowledge, available resources, and the needs of the patient to deliver effective and safe medical care. The sole purpose of these guidelines is to assist practitioners in achieving this objective.

### **I. INTRODUCTION**

The clinical aspects of this guideline (Introduction, Indications, Specifications of the Examination, and Equipment Specifications) were developed collaboratively by the American College of Radiology (ACR) and the American Institute of Ultrasound in Medicine (AIUM). Recommendations for physician requirements, written request for the examination, procedure documentation, and quality control vary between the two organizations and are addressed by each separately.

This guideline has been developed to assist practitioners performing a sonographic examination of the shoulder. In some cases, an additional and/or specialized examination may be necessary. While it is not possible to detect every abnormality, following this guideline will maximize the detection of abnormalities of the shoulder.

In experienced hands, shoulder ultrasound has been demonstrated to be an accurate and cost-effective

examination that is comparable to MRI for the evaluation of full-thickness rotator cuff tears.

## **II. QUALIFICATIONS AND RESPONSIBILITIES OF PERSONNEL**

Application of this guideline should be in accordance with the [ACR Practice Guideline for Performing and Interpreting Diagnostic Ultrasound Examination](#).

## **III. INDICATIONS FOR A SHOULDER ULTRASOUND EXAMINATION**

The indications for ultrasound of the shoulder include, but are not limited to, evaluation of shoulder pain or dysfunction.

## **IV. WRITTEN REQUEST FOR THE EXAMINATION**

The written or electronic request for a shoulder ultrasound examination should provide sufficient information to demonstrate the medical necessity of the examination and allow for its proper performance and interpretation.

Documentation that satisfies medical necessity includes 1) signs and symptoms and/or 2) relevant history (including known diagnoses). Additional information regarding the specific reason for the examination or a provisional diagnosis would be helpful and may at times be needed to allow for the proper performance and interpretation of the examination.

The request for the examination must be originated by a physician or other appropriately licensed health care provider. The accompanying clinical information should be provided by a physician or other appropriately licensed health care provider familiar with the patient's clinical problem or question and consistent with the state scope of practice requirements. (2006 - ACR Resolution 35)

## **V. SPECIFICATIONS OF THE EXAMINATION**

Patients should be examined in the sitting position, preferably on a rotating seat.

Examination of the shoulder should be tailored according to the patient's clinical circumstances and range of motion.

The biceps tendon should be examined with the forearm in supination and resting on the thigh or with the arm in slight external rotation. The tendon is examined in a transverse plane (short axis) where it emerges from under the acromion to the musculotendinous junction distally. Longitudinal views (long axis) should be obtained of the biceps tendon. These views should be used to determine if

the tendon is properly positioned within the bicipital groove, subluxed, dislocated, or torn.

To examine the subscapularis tendon, the arm should be in external rotation. Both transverse (long axis) and sagittal (short axis) views should be obtained. Dynamic evaluation as the patient moves from internal to external rotation may be helpful.

To examine the supraspinatus tendon the arm can be extended posteriorly, and the palmar aspect of the hand can be placed against the superior aspect of the iliac wing with the elbow flexed and directed towards midline (instruct patient to place the hand in the back pocket). Other positioning techniques may also be helpful. To scan the supraspinatus and infraspinatus tendons along their long axis, it is important to orient the transducer approximately 45 degrees between the sagittal and coronal planes to obtain a longitudinal view. The transducer should then be moved posteriorly to visualize the tendons. Transverse views should be obtained by rotating the probe 90 degrees to the long axis of the tendons. The more posterior aspect of the infraspinatus and teres minor tendons should be examined by placing the transducer at the level of the glenohumeral joint below the scapular spine while the forearm rests on the thigh with the hand supinated. Internal and external rotation of the forearm is helpful in identifying the infraspinatus muscle and its tendon and in detecting small joint effusions. To visualize the teres minor tendon, the probe should be angled slightly inferiorly. Throughout the examination of the rotator cuff, the cuff should be compressed to detect nonretracted tears. In the evaluation of rotator cuff tears, comparison with the contralateral side may be useful.

While examining the rotator cuff, it is also important to evaluate for bursal thickening, fluid, loose bodies, tendon calcification, and muscle and bony abnormalities. If symptoms warrant, the acromioclavicular joint, the supraspinatus notch, and the spinoglenoid notch should also be evaluated. Dynamic evaluation of the rotator cuff is also useful.

## **VI. DOCUMENTATION**

Adequate documentation is essential for high-quality patient care. There should be a permanent record of the ultrasound examination and its interpretation. Comparison with prior relevant imaging studies may prove helpful. Images of all appropriate areas, both normal and abnormal, should be recorded. Variations from normal size should generally be accompanied by measurements. Images should be labeled with the patient identification, facility identification, examination date, and image orientation. An official interpretation (final report) of the ultrasound examination should be included in the patient's medical record. Retention of the ultrasound

examination images should be consistent both with clinical need and with relevant legal and local healthcare facility requirements.

Reporting should be in accordance with the [ACR Practice Guideline for Communication of Diagnostic Imaging Findings](#).

## VII. EQUIPMENT SPECIFICATIONS

Shoulder ultrasound should be performed with real-time scanners using high-frequency linear array transducers. Center frequencies between 7 and 10 MHz are usually best for imaging the rotator cuff. When the rotator cuff is much deeper than normal, a 5 MHz transducer may be required for adequate penetration.

## VIII. QUALITY CONTROL AND IMPROVEMENT, SAFETY, INFECTION CONTROL, AND PATIENT EDUCATION CONCERNS

Policies and procedures related to quality, patient education, infection control, and safety should be developed and implemented in accordance with the ACR Policy on Quality Control and Improvement, Safety, Infection Control, and Patient Education Concerns appearing elsewhere in the ACR Practice Guidelines and Technical Standards book.

Equipment performance monitoring should be in accordance with the [ACR Technical Standard for Diagnostic Medical Physics Performance Monitoring of Real Time Ultrasound Equipment](#).

## ACKNOWLEDGEMENTS

This guideline was revised according to the process described in the ACR Practice Guidelines and Technical Standards book by the Guidelines and Standards Committee of the Commission on Ultrasound in collaboration with the American Institute of Ultrasound in Medicine (AIUM).

### Collaborative Subcommittee:

#### ACR

Kenneth W. Chin, MD  
Catherine W. Piccoli, MD

#### AIUM

Sharlene A. Teefey, MD, Chair  
Ronald S. Adler, MD, PhD  
Levon N. Nazarian, MD

#### ACR Guidelines and Standards Committee

Edward G. Grant, MD, Chair  
Lori L. Barr, MD

Gretchen A.W. Gooding, MD  
Ulrike M. Hamper, MD  
Robert D. Harris, MD  
Barbara S. Hertzberg, MD  
Mindy M. Horrow, MD  
Robert A. Kane, MD  
Frederick W. Kremkau, PhD  
Jon W. Meilstrup, MD  
Laurence Needleman, MD  
Catherine W. Piccoli, MD  
Ronald R. Townsend, MD

Carol M. Rumack, MD, Chair, Commission  
Paul H. Ellenbogen, MD, CSC

## REFERENCES

1. Bachmann GF, Melzer C, Heinrichs CM, et al. Diagnosis of rotator cuff lesions: comparison of US and MRI on 38 joint specimens. *Eur Radiol* 1997;7:192-197.
2. Bouffard JA, Lee SM, Dhanju J. Ultrasonography of the shoulder. *Semin Ultrasound CT MR* 2000;21:164-191.
3. Erickson SJ. High-resolution imaging of the musculoskeletal system. *Radiology* 1997;205:593-618.
4. Farin PU, Jaroma H. Acute traumatic tears of the rotator cuff: value of sonography. *Radiology* 1995;197:269-273.
5. Farin PU, Kaukanen E, Jaroma H, et al. Site and size of rotator cuff tear: findings at ultrasound, double-contrast arthrography, and computed tomography arthrography with surgical correlation. *Invest Radiol* 1996;31:387-394.
6. Hammar MV, Wintzell GB, Astrom KG, et al. Role of US in the preoperative evaluation of patients with anterior shoulder instability. *Radiology* 2001;219:29-34.
7. Lund PJ, Nisbet JK, Valencia FG, et al. Current sonographic applications in orthopedics. *AJR* 1996;166:889-895.
8. Mack LA, Matsen FA III, Kilcoyne RF, et al. US evaluation of the rotator cuff. *Radiology* 1985;157:205-209.
9. Sonnabend DH, Hughes JS, Giuffre BM, et al. The clinical role of shoulder ultrasound. *Aust NZJ Surg* 1997;67:630-633.
10. Teefey SA, Hasan SA, Middleton WD, et al. Ultrasonography of the rotator cuff: a comparison of the ultrasonographic and arthroscopic findings in one hundred consecutive cases. *J Bone Joint Surg Am* 2000;82:498-504.
11. Teefey SA, Middleton WD, Yamaguchi K. Shoulder sonography: state of the art. *Radiol Clin North Am* 1999;37:767-785.

12. van Holsbeeck MT, Kolowich PA, Eyler WR, et al. Ultrasound depiction of partial-thickness tear of the rotator cuff. *Radiology* 1995;197:443-446.
13. van Holsbeeck MT, Craig JG, Booffard JA, et al. *RSNA Special Course in Ultrasound*. Oak Brook, Ill: Radiological Society of North America; 1996:177-123.
14. Wiener SN, Seitz WH Jr. Sonography of the shoulder in patients with tears of the rotator cuff: accuracy and value for selecting surgical options. *AJR* 1993;60:103-107.
15. Winter TC III, Teefey SA, Middleton WD. Musculoskeletal ultrasound: an update. *Radiol Clin North Am* 2001;39:465-483.
16. Winter TL III, Richard ML, Matsen FA III. *Ultrasound of the Shoulder*. Oak Brook, Ill: Radiological Society of North America; 1997;volume 1.
17. Yamaguchi K, Tetro AM, Blam O, et al. Natural history of asymptomatic rotator cuff tears: a longitudinal analysis of asymptomatic tears detected sonographically. *J Shoulder Elbow Surg* 2001;10:199-203.