

What is the best way to diagnose a suspected rotator cuff tear?

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EVIDENCE-BASED ANSWER

The evaluation of a suspected rotator cuff tear should start with a history and a clinical exam of the shoulder (strength of recommendation [SOR]: **B**, based on a systematic review of cohort studies).¹ Three clinical test results in particular—supraspinatus weakness, weakness of external rotation, and impingement—or 2 positive tests for a patient older than 60 years were highly predictive of rotator cuff tear (SOR: **B**, based on individual prospective study).²

Either magnetic resonance imaging (MRI) or ultrasound can confirm a possible full-thickness tear (SOR: **B**, based on a systematic review of cohort studies).¹ If a patient has an implantable device prohibiting MRI imaging, conventional arthrography is an alternative (SOR: **A**, individual randomized controlled trial).³ Suspected partial-thickness tears are best verified with an ultrasound (SOR: **B**, based on a systematic review of cohort studies).¹

CLINICAL COMMENTARY

The best test is based on experience, availability, cost, and contraindications

A thorough history and detailed exam (with the patient disrobed) contributes to an accurate diagnosis. The mechanism of injury, such as falling on an outstretched arm or repetitive/excessive use of the shoulder like pitching a baseball, can begin to suggest a rotator cuff tear. Rotator cuff pain is typically located in the lateral deltoid and is aggravated by activities like combing one's hair or reaching for a wallet in the back pocket. Patients often have trouble sleeping, since they are unable to find a

comfortable position.

Other important factors to consider are cost, availability of a test in a timely manner, and the skill of the operators in carrying out and interpreting a given study. What constitutes the most accurate, cost-effective, expedient, or least invasive approach to the diagnosis of either full- or partial-thickness rotator cuff tears is controversial. For now the question as to what is "best" should be answered on the basis of clinical experience, availability, the expected sensitivity and specificity of a test at your institution, and the cost and contraindications for your patient.

Evidence summary

Rotator cuff tears can cause shoulder pain, decreased strength, and decreased range of motion. Clinical findings associated with a rotator cuff injury can vary. Full-thickness

and partial-thickness tears may present differently, and it is important to test clinically for both of these conditions.

A meta-analysis of 10 cohort studies found the overall sensitivity and specificity

TABLE

**Summary of test characteristics of diagnostic studies
for rotator cuff injuries**

DIAGNOSTIC STUDY	FULL-THICKNESS ROTATOR CUFF TEAR				PARTIAL-THICKNESS ROTATOR CUFF TEAR			
	SN	SP	LR+	LR-	SN	SP	LR+	LR-
Clinical exam ¹	0.9	0.54	1.96	0.19	Inconclusive due to small sample size			
Ultrasound ¹	0.87	0.96	21.75	0.14	0.67	0.94	11.17	0.35
MRI ¹	0.89	0.93	12.71	0.12	0.44	0.9	4.4	0.73
Arthrography ²	0.50	0.96	12.5	0.52	Not evaluated			
MR arthrography ¹	0.95	0.96	23.75	0.05	Inconsistent test performance			

Sn, sensitivity; Sp, specificity; LR+, positive likelihood ratio; LR-, negative likelihood ratio; MRI, magnetic resonance imaging.

of a clinical exam to rule out a full-thickness rotator cuff tear to be 0.9 (95% confidence interval [CI], 0.87–0.93) and 0.54 (95% CI, 0.47–0.61).¹ However, no single physical exam finding provided comparable accuracy. Another prospective study of 400 patients comparing 23 different clinical exams found that 3 simple clinical tests—supraspinatus weakness, weakness in external rotation, and the presence of impingement—were highly predictive of rotator cuff tear. When all 3 tests were positive, or when 2 tests were positive for a patient aged >60 years, there was a 98% chance of the patient having a rotator cuff tear.²

Ultrasound can be used to evaluate both suspected full- and partial-thickness rotator cuff tears. In a systematic review of 38 cohort studies, the overall sensitivity and specificity of ultrasound for full-thickness rotator cuff tears was 0.87 (95% CI, 0.84–0.89) and 0.96 (95% CI, 0.94–0.97).¹ For partial-thickness tears, ultrasound sensitivity was 0.67 (95% CI, 0.61–0.73).¹ The incidence of rotator cuff tears increases with age and with athletic activity.⁵

Positive and negative predictive values of a test depend on the prevalence of the condition in the study population. In the case of rotator cuff tears, such differences in prevalence of rotator cuff tears in the 38 cohort studies left it unclear whether a

negative ultrasound could reliably rule out a tear.

A meta-analysis of 29 cohort studies of MRI for the diagnosis of full-thickness tears found a pooled sensitivity of 0.89 (95% CI, 0.86–0.92) and a pooled specificity of 0.93 (95% CI, 0.91–0.95), respectively.¹ For partial-thickness tears, the pooled MRI sensitivity was lower at 0.44 (95% CI, 0.36–0.51), but with a high specificity of 0.90 (95% CI, 0.87–0.92).¹ This implies that MRI is the most valuable test to rule out a partial-thickness tear. However, we found no studies that directly compared the test characteristics of ultrasound and MRI.

Conventional arthrography can be used as an invasive alternative to MRI imaging for full-thickness tears, particularly when an implanted device precludes the use of MRI. One prospective trial (in which patients were randomized to the order in which MRI or arthrography were performed) of 38 patients showed arthrography to have a sensitivity of 0.50 and a specificity of 0.96 when used to diagnose full-thickness tears.^{3,6}

Magnetic resonance arthrography (MRA), based on 6 cohort studies, may be accurate in the diagnosis of a full-thickness tear, with a sensitivity of 0.95 (95% CI, 0.82–0.98) and specificity of 0.93 (95% CI, 0.84–0.97).¹ In these studies, diagnosis

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FAST TRACK

MRI or ultrasound can confirm a suspected full-thickness tear; partial-thickness tears are best verified with ultrasound

of partial-thickness tears with MRA was inconsistent.¹ The invasiveness of MRA limits its utility as compared with MRI and ultrasound. The **TABLE** summarizes these findings.

Recommendations from others

The American Academy of Orthopaedic Surgeons has a clinical guideline on shoulder pain,⁴ and the Brigham and Women's Hospital has a guide to the prevention, diagnosis and treatment of upper extremity musculoskeletal disorders.⁵ These guidelines emphasize the importance and utility of physical examination of the shoulder. A patient with a full-thickness tear will likely demonstrate compromised strength in shoulder active mid-arc abduction and resisted external rotation with elbow flexed at patient's side. However, a partial tear might not compromise strength. Atrophy of the infraspinatus or supra-spinatus muscles is sometimes seen with a full-thickness tear that is several weeks old.⁵

Following a clinical assessment, the guidelines give no preference to any of the diagnostic tests mentioned above, with the exception of arthrography in the presence of implantable devices. Plain X-rays are typically unrevealing, but could be used to rule out other reasons for pain, such as calcific tendonitis.

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