

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
1. Chillemi C, Franceschini V, Dei Giudici L, et al. Epidemiology of isolated acromioclavicular joint dislocation. Emerg Med Int. 2013;2013:171609.	Review/Other-Dx	108 patients	To analyze the epidemiology of isolated AC dislocation in an urban population.	105 (97.2%) had an isolated AC dislocation, and 3 (2.8%) were associated with a clavicle fracture. The estimated incidence was 1.8 per 10000 inhabitants per year and the male-female ratio was 8.5 : 1. 50.5% of all dislocations occurred in individuals between the ages of 20 and 39 years. The most common traumatic mechanism was sport injury and the most common type of dislocation was Rockwood type III.	4
2. Zacchilli MA, Owens BD. Epidemiology of shoulder dislocations presenting to emergency departments in the United States. J Bone Joint Surg Am. 2010;92(3):542-549.	Review/Other-Dx	8,940 shoulder dislocations	To determine the incidence of shoulder dislocations presenting to hospital emergency departments in the United States and define demographic risk factors for these injuries.	A total of 8940 shoulder dislocations were identified, resulting in an overall incidence rate in the United States of 23.9 (95% confidence interval, 20.8 to 27.0) per 100,000 person-years. The male incidence rate was 34.90 (95% confidence interval, 30.08 to 39.73) per 100,000 person-years, with an incidence rate ratio of 2.64 (95% confidence interval, 2.39 to 2.88) relative to the female incidence rate. It was found that 71.8% of the dislocations were in males. Stratified by decade, the maximum incidence rate (47.8 [95% confidence interval, 41.0 to 54.5]) occurred in those between the ages of twenty and twenty-nine years; 46.8% of all dislocations were in patients between fifteen and twenty-nine years of age. There were no significant differences based on race. Dislocations most frequently resulted from a fall (58.8%) and occurred at home (47.7%) or at sites of sports or recreation (34.5%). Overall, 48.3% of injuries occurred during sports or recreation.	4
3. American College of Radiology. ACR Appropriateness Criteria®: Shoulder Pain-Atraumatic. Available at: <a href="https://acsearch.acr.org/docs/3101482/Narrative/">https://acsearch.acr.org/docs/3101482/Narrative/</a> . Accessed December 4, 2017.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition.	No abstract available.	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
4. Cerciello S, Edwards TB, Morris BJ, Cerciello G, Walch G. The treatment of type III acromioclavicular dislocations with a modified Cadenat procedure: surgical technique and mid-term results. Arch Orthop Trauma Surg. 2014;134(11):1501-1506.	Observational-Tx	28 patients	To prospectively evaluate the results of the modified Cadenat procedure in subjects with type III acromioclavicular joint injuries.	Twenty-five patients were evaluated at an average follow-up of 72 months. One patient had a re-dislocation 3 years after surgery. At the last follow-up, average visual analog scale score of was 0.96 (range 0-3), while mean constant score was 94.32 (range 90-99) and 92 % of patient were very happy or happy with their functional result. Radiographs showed complete reduction in 22 patients and loss of reduction in two cases. No major complications were recorded.	2
5. Kahn JH, Mehta SD. The role of post-reduction radiographs after shoulder dislocation. J Emerg Med. 2007;33(2):169-173.	Observational-Dx	73 patients	To determine whether post-reduction radiographs add clinically important information to what is seen on pre-reduction X-rays in Emergency Department (ED) patients with anterior shoulder dislocations.	On preliminary reading, all patients' shoulders were relocated on post-reduction X-rays (100%; 95% CI 93.5-100%). Forty of these patients had their X-rays read by a blinded attending radiologist. Sixteen fractures were seen on post-reduction X-rays, of which 6 (15.0%; 95% CI 5.7-29.8%) were not seen on pre-reduction X-rays. All patients (100%; 95% CI 91.2-100%) whose post-reduction films were read by blinded attending radiologists had shoulder relocation confirmed.	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
6. Emond M, Le Sage N, Lavoie A, Moore L. Refinement of the Quebec decision rule for radiography in shoulder dislocation. CJEM. 2009;11(1):36-43.	Observational-Dx	210 patients	To refine previously derived factors associated with clinically important fractures in ED patients with anterior glenohumeral dislocation and to develop a clinical decision rule for radiography in such patients.	A total of 222 patients were included in the study. Forty (18.0%) had clinically important fracture-dislocation. A clinical decision rule using 4 factors reached a sensitivity of 100% (95% confidence interval [CI] 89.4%-100%), a specificity of 34.2% (95% CI 27.7%-41.2%), a negative predictive value of 99.2% (95% CI 92.8%-99.9%) and a negative likelihood ratio of 0.04 (95% CI 0.002-0.27). Patients younger than 40 years are at high risk for clinically important fracture- dislocation only if the mechanism of injury involves substantial force (i.e., a fall greater than their own height, a sport injury, an assault or a motor vehicle collision). Patients 40 years of age or older are at high risk only in the presence of humeral ecchymosis or after their first dislocation. Projected use of the rule would reduce the absolute number of preradiation radiographs by 27.9% and of postreduction by 81.9%.	3
7. Vaisman A, Villalon Montenegro IE, Tuca De Diego MJ, Valderrama Ronco J. A novel radiographic index for the diagnosis of posterior acromioclavicular joint dislocations. Am J Sports Med. 2014;42(1):112-116.	Observational-Dx	150 patients	To introduce and to validate a novel radiographic index, in plain bilateral Zanca views, for the accurate diagnosis of posterior AC joint dislocations.	The average value of the AC width index per group (according to the Rockwood classification) was as follows: type I, 2.1% (range, -12% to 25%); type II, 4.2% (range, -19% to 29%); type III, 19.1% (range, -59% to 91%); type IV, 110.3% (range, 47% to 181%); and type V, -3.8% (range, -71% to 62%). There was a significant difference between the average width index in the patients with type IV injuries and those in the remaining groups (P < .05). The ROC curve showed that a width index of 60% has a sensitivity of 95.7% and specificity of 97.5%, with a positive predictive value of 96.7% and negative predictive value of 95.6% to predict a type IV injury. Intraobserver reliability was rated as substantial agreement for each of 3 observers; the interobserver reliability of the 3 independent raters was almost perfect.	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
8. Murachovsky J, Bueno RS, Nascimento LG, et al. Calculating anterior glenoid bone loss using the Bernageau profile view. <i>Skeletal Radiol.</i> 2012;41(10):1231-1237.	Observational-Dx	50 healthy subjects and 10 patients with multiple episodes of unilateral traumatic anterior shoulder dislocation.	To determine if it is possible to measure glenoid bone loss by using the Bernageau view and to compare it to a 3D CT scan.	In the 50 asymptomatic subjects, the AP distance was 24.48 mm +/- 3.32 mm in the left shoulder and 24.82 mm +/- 3.16 mm in the right shoulder. Comparing the X-ray study and the 3D CT scan of the ten patients with multiple episodes, there was no significant statistical difference of the AP normal distance in both methods (p = 0.646), the AP erosion distance (p = 0.386), as well as the percentage of bone loss (p = 0.513). Moreover, the differences between the percentages of bone loss in the X-ray, compared with the 3D CT scan were, on average 2.28 % (range 0 to 6.05 %).	2
9. Griffith JF, Yung PS, Antonio GE, Tsang PH, Ahuja AT, Chan KM. CT compared with arthroscopy in quantifying glenoid bone loss. <i>AJR Am J Roentgenol.</i> 2007;189(6):1490-1493.	Observational-Dx	50 patients	To investigate the accuracy of CT in determining the presence and severity of glenoid bone loss in patients with unilateral anterior shoulder dislocation.	Glenoid bone loss was evident in 41 (82%) of the 50 patients at arthroscopy. Compared with arthroscopy, CT had a sensitivity in detecting glenoid bone loss of 92.7%; specificity, 77.8%; positive predictive value, 95.0%; and negative predictive value, 70.0%. Three false-negative CT assessments had 5%, 10%, and 10% glenoid bone loss, respectively, at arthroscopy. Two false-positive CT assessments had 8.7% and 5.7% glenoid bone loss on CT, although no bone loss was apparent at arthroscopy. There was a strong correlation between CT and arthroscopy with respect to the severity of glenoid bone loss (r = 0.79, 95% CI = 0.659-0.877, p < 0.0001).	2
10. Mahadeva D, Dias RG, Deshpande SV, Datta A, Dhillon SS, Simons AW. The reliability and reproducibility of the Neer classification system--digital radiography (PACS) improves agreement. <i>Injury.</i> 2011;42(4):339-342.	Observational-Dx	50 randomly selected radiographs with a confirmed proximal humeral fracture.	To investigate if digital radiography improved inter-observer and intra-observer agreement levels with the Neer classification system.	In general, good (0.61-0.80) results were obtained using kappa value for inter-observer reliability throughout all grades. On further analysis, however, discrepancies persist in the classification between Neer type 1/2 and Neer type 5 categories. The latter was not restricted to more inexperienced surgeons. Intra-observer agreement (> 0.81) was excellent throughout all grades.	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
11. Ozaki R, Nakagawa S, Mizuno N, Mae T, Yoneda M. Hill-sachs lesions in shoulders with traumatic anterior instability: evaluation using computed tomography with 3-dimensional reconstruction. Am J Sports Med. 2014;42(11):2597-2605.	Observational-Dx	142 shoulders	To investigate the influence of the number of dislocations and subluxations on the prevalence and size of Hill-Sachs lesions evaluated by computed tomography (CT) with 3-dimensional reconstruction.	Hill-Sachs lesions were detected in 90 shoulders by initial CT evaluation and were found in 118 shoulders at arthroscopy. The Hill-Sachs lesions missed by initial CT were 15 chondral lesions and 13 osseous lesions. However, all 103 osseous Hill-Sachs lesions were detected by reviewing the CT data. In patients with primary subluxation, the prevalence of Hill-Sachs lesions was 26.7%, and the mean length, width, and depth of the lesions (calculated as a percentage of the diameter of the humeral head) were 9.0%, 5.3%, and 2.1%, respectively, while the corresponding numbers for primary dislocation were 73.3%, 27.7%, 14.8%, and 7.0%, all showing statistically significant differences. Among all 142 shoulders, the corresponding numbers were, respectively, 56.3%, 20.7%, 11.2%, and 4.8% in patients who had subluxations but never a dislocation; 83.3%, 33.4%, 19.1%, and 7.6% in patients with 1 episode of dislocation; and 87.5%, 46.8%, 22.2%, and 10.2% in patients with $\geq 2$ episodes, all showing statistically significant differences. There were no differences in lesion measurements in relation to the number of subluxations.	3
12. Oh JH, Kim JY, Choi JA, Kim WS. Effectiveness of multidetector computed tomography arthrography for the diagnosis of shoulder pathology: comparison with magnetic resonance imaging with arthroscopic correlation. J Shoulder Elbow Surg. 2010;19(1):14-20.	Observational-Dx	148 patients	To evaluate the diagnostic efficacy of computed tomography arthrography (CTA) in the assessment of various shoulder pathologies with arthroscopic correlation.	The sensitivity, specificity, and agreement were comparable in each imaging study for Bankart, SLAP, and Hill-Sachs lesions, and full-thickness rotator cuff tears, but those of CTA were significantly lower than MRA for partial-thickness cuff tears. The AUROC curve for CTA and MRA were not significantly different for any of the pathologies, except partial-thickness cuff tears.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
13. Fogerty S, King DG, Groves C, Scally A, Chandramohan M. Interobserver variation in reporting CT arthrograms of the shoulder. Eur J Radiol. 2011;80(3):811-813.	Observational-Dx	50 CT arthrograms	To analyze interobserver variation in reporting CT arthrograms of the shoulder.	The results were collated and analysed for the level of agreement. Hill-Sachs showed Kappa (K) statistic to be 0.37 (fair agreement), soft tissue Bankart 0.32 (fair agreement), bony Bankart 0.61 (substantial agreement), anterior capsular laxity 0.41 (moderate agreement) and glenohumeral osteoarthritis 0.20 (slight agreement). All the results were significant with a p value of <0.05. Nine (18%) of the 50 scans were in complete agreement. The results demonstrate that there can be considerable interobserver variation (IOV) in the reports of a CT arthrogram of a shoulder.	2
14. e Souza PM, Brandao BL, Brown E, Motta G, Monteiro M, Marchiori E. Recurrent anterior glenohumeral instability: the quantification of glenoid bone loss using magnetic resonance imaging. Skeletal Radiol. 2014;43(8):1085-1092.	Observational-Dx	36 patients	To investigate the accuracy of conventional magnetic resonance imaging (MRI) in determining the severity of glenoid bone loss in patients with anterior shoulder dislocation by comparing the results with arthroscopic measurements.	Glenoid bone loss was evident on MRI and during arthroscopy in all patients. Inter- and intrareader correlations of MRI-derived measurements were excellent (intraclass correlation coefficient = 0.80-0.82; r = 0.81-0.86). The first and second observers' measurements showed strong (r = 0.76) and moderate (r = 0.69) interreader correlation, respectively, with arthroscopic measurements.	2
15. Gottschalk MB, Ghasem A, Todd D, Daruwalla J, Xerogeanes J, Karas S. Posterior shoulder instability: does glenoid retroversion predict recurrence and contralateral instability? Arthroscopy. 2015;31(3):488-493.	Observational-Tx	143 patients	To determine whether glenoid retroversion is a predictor of posterior shoulder instability, contralateral instability, or recurrent instability in patients with traumatic, contact-related posterior shoulder instability.	Twenty-eight patients had posterior instability, whereas 115 patients had anterior instability. Patients with posterior instability had significantly more glenoid retroversion than patients with anterior instability (-15.4 degrees +/- 5.14 degrees v -12.1 degrees +/- 6.9 degrees ; P < .016). Patients with retroversion of more than -16 degrees showed a higher incidence of contralateral injuries (P < .036). However, no difference in postsurgical recurrent instability was noted.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
16. Owens BD, Campbell SE, Cameron KL. Risk factors for anterior glenohumeral instability. Am J Sports Med. 2014;42(11):2591-2596.	Observational-Dx	714 patients	To determine the modifiable and nonmodifiable risk factors for anterior shoulder instability in a high-risk cohort.	Complete data were available for 714 subjects. During the 4-year surveillance period, there were 39 anterior instability events documented at a mean of 285 days. While we controlled for covariates, significant risk factors of physical examination were as follows: apprehension sign (hazard ratio [HR], 2.96; 95% CI, 1.48-5.90; P = .002) and relocation sign (HR, 4.83; 95% CI, 1.75-13.33; P = .002). Baseline range of motion and strength measures were not associated with subsequent injury. Significant anatomic risk factors on MRI measurement were glenoid index (HR, 8.12; 95% CI, 1.07-61.72; P = .043) and the coracohumeral interval (HR, 1.20; 95% CI, 1.08-1.34; P = .001)	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
17. Pavic R, Margetic P, Bensic M, Brnadic RL. Diagnostic value of US, MR and MR arthrography in shoulder instability. Injury. 2013;44 Suppl 3:S26-32.	Observational-Dx	200 patients	To compare US, conventional MRI and MR arthrography findings in patients with anterior shoulder instability and with a clinical diagnosis of labral capsular ligamentous complex lesion.	A total of 200 consecutive patients who met the inclusion criteria were included in this study. The mean age was 39 years (range 15 to 83); 147 were male and 133 involved the right shoulder. Chronic instability was documented in 133 patients, whereas acute instability was documented in 67 patients. We detected a statistically significant difference between US and MR arthrography in SLAP (Superior Labrum Anterior to Posterior) lesions (Type II, III and IV), in Bankart lesions, in glenohumeral ligament lesions (superior, middle, anterior-inferior and anterior inferior glenohumeral ligament) in Hill-Sachs lesions, in diagnosing internal subacromial impingement and in normal findings. MR arthrography was superior to the US. A statistically significant difference was evident between MRI and MR arthrography findings in SLAP lesions (III and IV Type lesions), in glenohumeral ligament lesions (anterior inferior and posterior inferior glenohumeral ligament), in partial rotator cuff ruptures and in normal findings. MR arthrography diagnosed this lesion better than MRI without contrast. We also found a statistically significant difference between US and MRI findings in SLAP Type II lesions, in partial rotator cuff ruptures, in Hill-Sachs lesions and in diagnosing internal subacromial impingement.	3
18. Stecco A, Guenzi E, Cascone T, et al. MRI can assess glenoid bone loss after shoulder luxation: inter- and intra-individual comparison with CT. Radiol Med. 2013;118(8):1335-1343.	Observational-Dx	23 patients	To verify if magnetic resonance imaging (MRI) can quantify the area of bone loss without any significant difference from CT.	The mean glenoid surface area was 575.29 mm <sup>2</sup> as measured by MRI, and 573.76 mm <sup>2</sup> as measured by CT; the calculated mean glenoid bone loss was respectively 4.38% and 4.34%. The interobserver agreement was good (k>0.81), and the coefficient of variance was 5% of the mean value using both methods. The two series of measurements were within two standard deviations of each other.	3



**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
19. Magee T. 3-T MRI of the shoulder: is MR arthrography necessary? AJR Am J Roentgenol. 2009;192(1):86-92.	Observational-Dx	150 patients	To report the diagnostic sensitivity of 3-T conventional MRI versus MR arthrography of the shoulder in the same patient population.	Three full-thickness and nine partial-thickness supraspinatus tendon tears, seven SLAP tears, six anterior labral tears, and two posterior labral tears were seen on MR arthrography but not on conventional MRI. All additional MR arthrography findings were confirmed at arthroscopy. On conventional MRI, sensitivities and specificities compared with arthroscopy were as follows: anterior labral tear, 83% sensitivity and 100% specificity; posterior labral tear, 84% and 100%; SLAP tear, 83% and 99%; supraspinatus tendon tear, 92% and 100%; partial-thickness articular surface tear, 68% and 100%; and partial-thickness bursal surface tear, 84% and 100%. On MR arthrography, sensitivities and specificities compared with arthroscopy were as follows: anterior labral tear, 98% sensitivity and 100% specificity; posterior labral tear, 95% and 100%; SLAP tear, 98% and 99%; supraspinatus tendon tear, 100% and 100%; partial-thickness articular surface tear, 97% and 100%; and partial-thickness bursal surface tear, 84% and 100%. MR arthrography showed a statistical improvement in sensitivity ( $p < 0.05$ ) for detection of partial-thickness articular surface supraspinatus tears, anterior labral tears, and SLAP tears at 3 T.	3
20. Smark CT, Barlow BT, Vachon TA, Provencher MT. Arthroscopic and magnetic resonance arthrogram features of Kim's lesion in posterior shoulder instability. Arthroscopy. 2014;30(7):781-784.	Observational-Dx	41 shoulders	To describe the anatomic features of the glenoid and labrum for shoulders with and without Kim's lesions, as well as define the sensitivity, specificity, and reliability of magnetic resonance arthrogram for the detection of these lesions and determine the interobserver reliability of Kim's classification for posterior labral tears.	There were no differences in glenoid version, chondrolabral version, glenoid depth, and labral height between the groups. The sensitivity, specificity, positive predictive value, and negative predictive value for diagnosing Kim's lesions were 85.7%, 75%, 78.3%, and 83.3%, respectively. The kappa values for interobserver reliability for detecting and classifying Kim's lesions were 0.739 (substantial) and 0.329 (fair), respectively.	3

\* See Last Page for Key

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
21. Magee T. MR versus MR arthrography in detection of supraspinatus tendon tears in patients without previous shoulder surgery. <i>Skeletal Radiol.</i> 2014;43(1):43-48.	Observational-Dx	150 consecutive conventional shoulder MR and MR arthrography exams	We report the prevalence of supraspinatus tendon tears seen on MR arthrography that are not seen on conventional MR exam in the same patient population.	There were 113 full-thickness supraspinatus tendon tears seen on conventional MR exam while there were 119 full-thickness supraspinatus tendon tears seen on MR arthrography. The six additional full-thickness supraspinatus tendon tears seen on MR arthrography but not seen on conventional MR exam were confirmed at arthroscopy.	2
22. Merolla G, De Santis E, Campi F, Paladini P, Porcellini G. Infrapinatus scapular retraction test: a reliable and practical method to assess infrapinatus strength in overhead athletes with scapular dyskinesis. <i>J Orthop Traumatol.</i> 2010;11(2):105-110.	Observational-Dx	29 athletes	To analyze the interobserver and intraobserver reliability of the infrapinatus strength test (IST) and infrapinatus scapular retraction test (ISRT) in 29 overhead athletes with scapular dyskinesis, before and after 6 months of scapular musculature rehabilitation.	Values of ICC close to 1 at baseline and at 6 months indicated a higher interexaminer and intraexaminer reliability. IST force values registered a significant increase at 6 months for both examiners ( $P < 0.01$ ). The mean difference between IST and ISRT values were not significant at 6 months ( $P > 0.01$ ). The increase of glenohumeral internal rotation was significant at 6 months ( $P < 0.01$ ).	2
23. Wall LB, Teefey SA, Middleton WD, et al. Diagnostic performance and reliability of ultrasonography for fatty degeneration of the rotator cuff muscles. <i>J Bone Joint Surg Am.</i> 2012;94(12):e83.	Observational-Dx	80 patients	To investigate the diagnostic performance and observer reliability of ultrasonography in grading fatty degeneration of the posterior and superior rotator cuff muscles.	The accuracy of ultrasonography for the detection of fatty degeneration, as assessed on the basis of the percentage agreement with MRI, was 92.5% for the supraspinatus and infrapinatus muscles and 87.5% for the teres minor. The sensitivity was 84.6% for the supraspinatus, 95.6% for the infrapinatus, and 87.5% for the teres minor. The specificity was 96.3% for the supraspinatus, 91.2% for the infrapinatus, and 87.5% for the teres minor. The agreement between MRI and ultrasonography was substantial for the supraspinatus and infrapinatus (kappa = 0.78 and 0.71, respectively) and moderate for the teres minor (kappa = 0.47). The interobserver reliability for MRI was substantial for the supraspinatus and infrapinatus (kappa = 0.76 and 0.77, respectively) and moderate for the teres minor (kappa = 0.59). For ultrasonography, the interobserver reliability was substantial for all three muscles (kappa = 0.71 for the supraspinatus, 0.65 for the infrapinatus, and 0.72 for the teres minor).	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
24. de Jesus JO, Parker L, Frangos AJ, Nazarian LN. Accuracy of MRI, MR arthrography, and ultrasound in the diagnosis of rotator cuff tears: a meta-analysis. <i>AJR Am J Roentgenol.</i> 2009;192(6):1701-1707.	Meta-analysis	65 articles	To compare the diagnostic accuracy of MRI, MR arthrography, and ultrasound for the diagnosis of rotator cuff tears through a meta-analysis of the studies in the literature.	In diagnosing a full-thickness tear or a partial-thickness rotator cuff tear, MR arthrography is more sensitive and specific than either MRI or ultrasound ( $p < 0.05$ ). There are no significant differences in either sensitivity or specificity between MRI and ultrasound in the diagnosis of partial- or full-thickness rotator cuff tears ( $p > 0.05$ ). Summary ROC curves for MR arthrography, MRI, and ultrasound for all tears show the area under the ROC curve is greatest for MR arthrography (0.935), followed by ultrasound (0.889) and then MRI (0.878); however, pairwise comparisons of these curves show no significant differences between MRI and ultrasound ( $p > 0.05$ ).	M
25. Rutten MJ, Collins JM, de Waal Malefijt MC, Kiemeny LA, Jager GJ. Unsuspected sonographic findings in patients with posttraumatic shoulder complaints. <i>J Clin Ultrasound.</i> 2010;38(9):457-465.	Observational-Dx	50 patients	To prospectively assess the frequency of abnormal sonographic findings in patients with posttraumatic shoulder pain and/or disability in whom ultrasound (US) was not considered and to assess the effect of sonographic findings on working diagnosis and therapeutic strategy, to analyze the possible role of US in the diagnostic workup of these patients.	US showed relevant pathology in 45 (90%) of 50 patients, a proximal humerus fracture in 25 (50%) patients, and a rotator cuff tear in 43 (86%) patients. Twenty-three (92%) fractures were accompanied by a rotator cuff tear, and 23 (54%) rotator cuff tears were accompanied by a fracture. Ten fractures were initially missed radiographically. US findings changed the working diagnosis and therapeutic strategy in 37 (74%) and 26 (52%) patients, respectively.	2
26. Kamasaki T, Hayashida N, Miyamoto I, et al. PET/CT shows subjective pain in shoulder joints to be associated with uptake of (18)F-FDG. <i>Nucl Med Commun.</i> 2014;35(1):44-50.	Observational-Dx	122 participants	The aim of the study was to evaluate the capability of fluorine-18-fluorodeoxyglucose (F-FDG)-positron emission tomography (PET)/computed tomography (CT) in the screening of musculoskeletal inflammation and injury of the shoulder region.	SUVs for shoulder joints with rest and/or motion pain were significantly higher than those for pain-free shoulder joints. SUVs associated with mild and severe pain at rest were significantly higher than those associated with absence of pain at rest, and SUVs associated with moderate and severe pain on motion were significantly higher than those associated with absence of motion pain. Furthermore, SUVs were significantly correlated with uric acid in men ( $\beta=0.21$ , $P=0.02$ ) and in all participants ( $\beta=0.22$ , $P<0.001$ ).	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
27. Shin DS, Shon OJ, Byun SJ, Choi JH, Chun KA, Cho IH. Differentiation between malignant and benign pathologic fractures with F-18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography. <i>Skeletal Radiol.</i> 2008; 37(5):415-421.	Observational-Dx	34 patients	To evaluate the efficacy of FDG-PET/CT in differentiating malignant from benign pathologic fractures.	There were 19 malignant and 15 benign fractures. In the malignant fractures, PET/CT demonstrated high (mean SUVmax 12.0, range 4.3 to 45.7). FDG uptake in bone marrow in most cases (17/19). In benign fractures, there was low FDG uptake (mean SUVmax 2.9, range 0.6 to 5.5) within cortical bone or adjacent soft tissue around the fracture, rarely in the marrow. There were significant differences in the pattern of intramedullary FDG uptake ( $P < 0.001$ ) and in the mean SUVmax ( $P < 0.01$ ) between malignant and benign fractures. The sensitivity, specificity and diagnostic accuracy of FDG-PET/CT were 89.5%, 86.7% and 88.2%, respectively, with a cut-off SUVmax set at 4.7. The time interval between fracture and PET/CT did not significantly influence FDG uptake at the fracture site.	3
28. Shinozaki N, Sano H, Omi R, et al. Differences in muscle activities during shoulder elevation in patients with symptomatic and asymptomatic rotator cuff tears: analysis by positron emission tomography. <i>J Shoulder Elbow Surg.</i> 2014;23(3):e61-67.	Observational-Dx	9 patients	To investigate the muscle activity pattern by use of positron emission tomography (PET) in patients with symptomatic and asymptomatic rotator cuff tears.	The activity of the anterior and middle deltoid was significantly decreased in the symptomatic group compared with the asymptomatic group (anterior deltoid, $P = .02$ ; middle deltoid, $P = .03$ ). In contrast, the activity of the superior trapezius was significantly increased in the symptomatic group compared with the asymptomatic group ( $P = .02$ ).	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
29. Shinozaki T, Takagishi K, Ohsawa T, Yamaji T, Endo K. Pre- and postoperative evaluation of the metabolic activity in muscles associated with ruptured rotator cuffs by F-FDG PET imaging. Clin Physiol Funct Imaging. 2006;26(6):338-342.	Observational-Dx	4 patients	To examine uptake of 2-[(18)F]-fluoro-2-deoxy-D-glucose (FDG) using positron emission tomography (PET) into the bilateral shoulder muscles of four patients before and after unilateral rotator cuff repair.	The relative ratio of the subtracted standardized uptake value on the supraspinatus with a torn supraspinatus tendon to that of the subscapularis on the ipsilateral side was significantly lower than that on the normal side (0.69 +/- 0.05 versus 1.06 +/- 0.36). The relative ratio of the infraspinatus on the rupture side was also significantly lower than that on the normal side (0.91 +/- 0.09 versus 1.41 +/- 0.35). However, by 6 months postoperative, the reduced glucose metabolism in these muscles had recovered to the same levels as those on the normal side. As indicated by FDG PET, muscle metabolism in rotator cuff tears was reduced, subsequently recovering to the level of the normal side after operative repair.	3
30. Ackerman L, Shirazi P. Abnormal uptake in the shoulder joint area on bone scan. Semin Nucl Med. 2002;32(3):228-230.	Review/Other-Dx	3 cases	To present 3 cases of unilateral abnormal uptake in the shoulder.	No results stated in abstract.	4
31. Querellou S, Arnaud L, Williams T, et al. Role of SPECT/CT compared with MRI in the diagnosis and management of patients with wrist trauma occult fractures. Clin Nucl Med. 2014;39(1):8-13.	Observational-Dx	57 patients	To evaluate the utility of SPECT/CT in the management of occult carpal fractures.	From December 2009 to May 2011, 57 patients were enrolled. Fifty-seven SPECT/CT and 52 MRI scans were obtained. Twenty-eight patients had normal imaging results, whereas 29 patients presented bone bruise and/or fractures. Ten patients were concordant according to SPECT/CT and MRI; 2 patients presented fractures on SPECT/CT without MRI performed; 17 patients had partially discordant results. Only 1 patient presented a nonunion at the follow-up, whereas both investigations were positive.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
32. Rizzo PF, Gould ES, Lyden JP, Asnis SE. Diagnosis of occult fractures about the hip. Magnetic resonance imaging compared with bone-scanning. J Bone Joint Surg Am. 1993;75(3):395-401.	Observational-Dx	62 patients	To compare MRI with bone-scanning for the diagnosis of occult fractures about the hip.	36 patients who had evidence of a fracture on the MRI study also had a positive bone scan initially. 23 patients who had a negative finding on the MRI study had a corresponding negative bone scan. Two additional patients had evidence of avascular necrosis of the femoral head on both the MRI and the bone scan, and they were managed non-operatively. One patient had a positive MRI and a negative bone scan 24 hours after admission. A repeat bone scan, which was made 6 days later, was positive for a fracture of the femoral neck and the patient was managed with internal fixation. MRI was as accurate as bone-scanning in the assessment of occult fractures of the hip and provides an early diagnosis of occult fractures about the hip and may decrease the length of the stay in the hospital by expediting definitive treatment.	3
33. Koike Y, Sano H, Kita A, Itoi E. Symptomatic rotator cuff tears show higher radioisotope uptake on bone scintigraphy compared with asymptomatic tears. Am J Sports Med. 2013;41(9):2028-2033.	Observational-Dx	28 symptomatic patients, 26 asymptomatic patients, and 20 controls	To test the hypothesis that shoulders with symptomatic rotator cuff tears would demonstrate higher radioisotope uptake with bone scintigraphy than those with asymptomatic tears.	The mean radioisotope uptake in the symptomatic group was significantly higher than that in the asymptomatic group (P = .02) and the no tear group (P = .02). Ten of 28 shoulders (36%) in the symptomatic group showed increased radioisotope uptake exceeding 2 standard deviations from the mean of the no tear group. This percentage was significantly higher when compared with the asymptomatic group (0%) (P < .01).	3
34. Gulotta LV, Lobatto D, Delos D, Coleman SH, Altechek DW. Anterior shoulder capsular tears in professional baseball players. J Shoulder Elbow Surg. 2014;23(8):e173-178.	Review/Other-Tx	5 patients	To report on midsubstance glenohumeral capsular tears in professional baseball players.	The mean age was 33.5 years (range, 31-37 years), and all patients presented with anterior shoulder pain and the inability to throw. No patient had an acute traumatic injury. Magnetic resonance imaging provided the correct diagnosis in 4 patients, and the diagnosis was made with diagnostic arthroscopy in the fifth. Three underwent arthroscopic repair, and 2 underwent open repair of the anterior capsule. Of the 5 players, 4 (80%) returned to their preinjury level by a mean of 13.3 months (range, 8-18 months).	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
35. Nemeč U, Oberleitner G, Nemeč SF, et al. MRI versus radiography of acromioclavicular joint dislocation. <i>AJR Am J Roentgenol.</i> 2011;197(4):968-973.	Observational-Dx	47 patients	To describe the MRI findings of acromioclavicular joint dislocation in comparison with the radiographic findings.	Among 44 patients with Rockwood type I-IV injuries on radiographs, classification on radiographs and MR images was concordant in 23 (52.2%) patients. At MRI, the injury was reclassified to a less severe type in 16 (36.4%) patients and to a more severe type in five (11.4%) patients. Compared with the findings according to the original Rockwood system, with the adapted system that included MRI findings, additional ligamentous lesions were found in 11 (25%) patients.	3
36. Lee JT, Nasreddine AY, Black EM, Bae DS, Kocher MS. Posterior sternoclavicular joint injuries in skeletally immature patients. <i>J Pediatr Orthop.</i> 2014;34(4):369-375.	Review/Other-Dx	48 patients	To characterize posterior SC injuries in SI patients in terms of the prevalence of dislocation versus medial clavicle physeal fracture.	All patients treated operatively underwent primary repair without reconstruction. Twenty (50%), of the 40 patients treated operatively had a true SC joint dislocation and 20 patients (50%) had a medial clavicle physeal fracture. Twenty-two (46%) of the 48 total patients had an attempted closed reduction of which only 8 (36%) were successful. Among the 14 unsuccessful closed reductions, 12 (86%) were true dislocations (P<0.001). All successful closed reductions occurred in patients within 24 hours from injury. Eleven of the 48 (23%) patients' injuries were missed on initial presentation.	4
37. Bahrs C, Zipplies S, Ochs BG, et al. Proximal humeral fractures in children and adolescents. <i>J Pediatr Orthop.</i> 2009;29(3):238-242.	Observational-Tx	43 patients	To assess the rate of soft tissue entrapment, and investigate the long-term clinical and radiological results after an age- and deformity-focused treatment regimen according to national guidelines.	Operative and postoperative complications did not occur. All surgically treated fractures anatomically reduced and healed without loss of reduction. At a mean follow-up of 39 months (range, 12-118 months), all patients who were evaluated had excellent results according to the Constant score and had a normal range of motion and excellent strength of the shoulder joint.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
38. Ottenheim RP, van't Klooster IG, Starmans LM, et al. Ultrasound-diagnosed disorders in shoulder patients in daily general practice: a retrospective observational study. BMC Fam Pract. 2014;15:115.	Review/Other-Dx	240 patients	To determine the frequency of specific US-diagnosed shoulder disorders in daily practice in these patients and to investigate if the disorders detected differ between specific subgroups based on age and duration of pain.	With 29%, calcific tendonitis was the most frequently diagnosed disorder, followed by subacromial-subdeltoid bursitis (12%), tendinopathy (11%), partial-thickness tears (11%), full-thickness tears (8%) and AC-osteoarthritis (0.4%). For 40% of patients, no disorders were found on US. Significantly more full thickness-tears were found in the $\geq$ 65 years group. 'No disorders' was reported significantly more often in the <65 years group. The supraspinatus tendon was the most frequently affected tendon (72%).	4
39. Lecouvet FE, Dorzee B, Dubuc JE, Vande Berg BC, Jamart J, Malghem J. Cartilage lesions of the glenohumeral joint: diagnostic effectiveness of multidetector spiral CT arthrography and comparison with arthroscopy. Eur Radiol. 2007;17(7):1763-1771.	Observational-Dx	22 patients	to assess the diagnostic effectiveness of multidetector spiral CT arthrography (MDCTa) in detecting hyaline cartilage abnormalities of the shoulder joint, with correlation to arthroscopy.	The sensitivity and specificity of MDCTa for grade 2 (substance loss <50%) or higher and grade 3 (substance loss $\geq$ 50%) or higher cartilage lesions, the Spearman correlation coefficient between arthrographic and arthroscopic grading, and K statistics for assessing Intra and Interobserver reproducibility were determined. At MDCTa, sensitivities and specificities ranged between 80% and 94% for the detection of grade 2 or higher cartilage lesions, and between 88% and 98% for the detection of grade 3 or higher cartilage lesions. Spearman correlation coefficients between MDCTa and arthroscopic grading of articular surfaces ranged between 0.532 and 0.651. Interobserver agreement was moderate for grading all articular surfaces ( $\kappa$ = 0.457), but substantial to almost perfect for detecting lesions with substance loss ( $\kappa$ , 0.618-0.876).	2
40. Gallo RA, Sciulli R, Daffner RH, Altman DT, Altman GT. Defining the relationship between rotator cuff injury and proximal humerus fractures. Clin Orthop Relat Res. 2007;458:70-77.	Review/Other-Dx	30 patients	To correlate radiographic characteristics with rotator cuff tendon injury on magnetic resonance imaging after fractures of the proximal humerus.	Twelve patients (40.0%) had either complete ruptures or avulsions of at least one of the rotator cuff muscles. No abnormality was identified in the rotator cuff musculature in nine patients (29%). Severity of injury to the rotator cuff tendons increased substantially with respect to increasing AO and Neer classes and 5 mm or greater displacement of the greater tuberosity fragment.	4



**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
41. Petersen SA, Murphy TP. The timing of rotator cuff repair for the restoration of function. <i>J Shoulder Elbow Surg.</i> 2011;20(1):62-68.	Observational-Tx	36 patients	To evaluate the time to repair and subsequent functional outcome in patients who sustain an acute loss of shoulder strength as the result of a painful, traumatic, full thickness rotator cuff tear.	Pain scores improved from 7 to 1.4 (P < .01) and active elevation improved from 55 degrees to 133 degrees (P < .01). UCLA/ASES scores improved from 8/30 to 26/79, respectively (P < .01, P < .01). All but 2 of the 36 patients were satisfied with their result. Preoperative fatty atrophy did not correlate with postoperative function. Rotator cuff tear size had no influence on patient outcome if repaired before 4 months. Massive tears repaired after 4 months had the worst outcome.	2
42. Poeze M, Lenssen AF, Van Empel JM, Verbruggen JP. Conservative management of proximal humeral fractures: can poor functional outcome be related to standard transscapular radiographic evaluation? <i>J Shoulder Elbow Surg.</i> 2010;19(2):273-281.	Observational-Dx	55 patients	To investigate whether functional outcome could be predicted using the angulation of the fractured humeral head on the standard radiographic evaluation.	Mean (SD) angulations at time of the fracture were 53 degrees (19 degrees ) on AP view and 59 degrees (21 degrees ) on Y-view. After 1 week, these angulations were 47 degrees (20 degrees ) and 62 degrees (21 degrees ), respectively. Significant correlations between Constant-Murley (R(2)=0.43, P=.007) and DASH (R(2)=0.43, P=.04) outcome scores and the angulation of the humeral head fragment on the Y view, and not with AP angulation were found. The optimum predictive angulation at the Y view at time of fracture was 55 degrees or less for predicting adverse functional outcome with an area under the ROC curve of 0.78 (95% confidence interval [CI], 0.64-0.93; P=.006). Regression analysis showed that angulations on the initial Y view and after 1 week were the most important predictors of the functional outcome at a median of 2.2 years of follow-up.	3
43. Fjalestad T, Hole MO, Blucher J, Hovden IA, Stiris MG, Stromsoe K. Rotator cuff tears in proximal humeral fractures: an MRI cohort study in 76 patients. <i>Arch Orthop Trauma Surg.</i> 2010;130(5):575-581.	Review/Other-Dx	76 patients	To evaluate if concomitant injury to the rotator cuff is important for functional outcome in proximal humerus fractures, and to relate loss of function to malunion of the fractures.	Magnetic resonance imaging (MRI) examinations confirmed 22 rotator cuff tears (four full thicknesses) diagnosed at the time of injury, and 10 additional tears (three full thicknesses) at one year. Functional loss at one year significantly corresponded to the tears at the time of injury (P = 0.004), varus malunion of the head and displacement of tubercles (P < 0.001).	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
44. Moosmayer S, Heir S, Smith HJ. Sonography of the rotator cuff in painful shoulders performed without knowledge of clinical information: results from 58 sonographic examinations with surgical correlation. J Clin Ultrasound. 2007;35(1):20-26.	Observational-Dx	58 shoulders	To assess the value of sonography as an isolated diagnostic test for the detection and quantification of rotator cuff tears.	All 24 full-thickness tears observed at surgery had been diagnosed correctly via sonography. In 19 of 20 cases with an intact rotator cuff, preoperative sonography was negative. Thirteen of 14 partial-thickness tears were not detected via sonography; 1 was misinterpreted as a full-thickness tear. Location of the tears relative to the rotator cuff tendons was described correctly in 21 of 25 cases. For tear size measurement, the 95% range of agreement was less than +/-1 cm.	2
45. Dimitroulias A, Molinero KG, Krenk DE, Muffly MT, Altman DT, Altman GT. Outcomes of nonoperatively treated displaced scapular body fractures. Clin Orthop Relat Res. 2011;469(5):1459-1465.	Observational-Tx	49 patients	To assess the functional outcome after nonoperative management of displaced scapular body fractures.	All fractures healed uneventfully. The mean change of glenopolar angle was 9 degrees (range, 0 degrees -20 degrees ). The mean change of the DASH score was 10.2, which is a change with minimal clinical importance. There was a correlation between the change in this score with the ISS and presence of rib fractures.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
46. Armitage BM, Wijdicks CA, Tarkin IS, et al. Mapping of scapular fractures with three-dimensional computed tomography. J Bone Joint Surg Am. 2009;91(9):2222-2228.	Review/Other-Dx	90 fractures	To create a frequency map of a series of surgically treated scapular fractures that specifically involved the scapular body and/or neck.	Of ninety fractures that met the criteria for inclusion, 68% involved the inferior aspect of the glenoid neck and 71% involved the superior vertebral border. Seventeen percent of the patterns included articular extension, and 22% of the fractures entered the spinoglenoid notch. Of fractures involving the inferior aspect of the glenoid neck at the lateral scapular border, 84% traversed medially to exit just inferior to the medial extent of the scapular spine, and 59% of these inferior neck fractures also had propagation to the inferior third of the vertebral border. Among the fractures involving the spinoglenoid notch, the most common pattern was demonstrated by coexisting fracture lines; 60% of the fractures of the spinoglenoid notch exited just inferior to the glenoid, 65% extended to the superior-medial vertebral border, and 45% extended to the inferior-medial vertebral border. In contrast, articular fractures did not follow predictable patterns; they demonstrated the greatest variability in trajectory, which was almost random, and there was a wide distribution of exit points along the vertebral border.	4
47. Tadros AM, Lunsjo K, Czechowski J, Corr P, Abu-Zidan FM. Usefulness of different imaging modalities in the assessment of scapular fractures caused by blunt trauma. Acta Radiol. 2007;48(1):71-75.	Observational-Dx	44 patients	To analyze the usefulness of chest and scapular trauma radiographs, axial computed tomography (CT), and two- and three-dimensional (2D and 3D) reconstruction CT in detecting fractures of the six anatomical regions of the scapula.	Axial and 3D reconstruction tomographic studies were the only useful modalities in assessing fractures in all six anatomical scapular regions. Three-dimensional CTs reconstructed from chest and scapula axial views were equally sensitive and specific.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
48. Bozkurt M, Can F, Kirdeir V, Erden Z, Demirkale I, Basbozkurt M. Conservative treatment of scapular neck fracture: the effect of stability and glenopolar angle on clinical outcome. <i>Injury</i> . 2005;36(10):1176-1181.	Observational-Tx	18 patients	To determine the effect of stability and glenopolar angle on the clinical outcome of conservatively treated scapular neck fractures.	Twelve of the 18 patients had surgical neck fractures, whilst six of them had anatomical neck fractures. Anteroposterior radiographs and computerised tomography were performed for each patient. Glenopolar angle was measured through anteroposterior radiographs in the scapular plane. After 3-5 weeks of immobilisation, a rehabilitation programme was started, throughout which all the patients were treated in a 3-phase rehabilitation programme. The mean follow-up was 25 months, and the Constant score was 78.83+/-8.12 point (range: 68-94 points).	2
49. Ropp AM, Davis DL. Scapular Fractures: What Radiologists Need to Know. <i>AJR Am J Roentgenol</i> . 2015;205(3):491-501.	Review/Other-Dx	N/A	To review scapular anatomy and function, describe imaging features of traumatic scapular injury, and discuss the role of diagnostic imaging in clinical decision making after shoulder trauma.	No results stated in abstract.	4
50. Owens BD, Nelson BJ, Duffey ML, et al. Pathoanatomy of first-time, traumatic, anterior glenohumeral subluxation events. <i>J Bone Joint Surg Am</i> . 2010;92(7):1605-1611.	Observational-Dx	27patients	To determine the pathoanatomy associated with first-time, traumatic, anterior glenohumeral subluxation events with use of patient history, physical examination, radiographs, magnetic resonance imaging studies, and surgical findings.	Of the twenty-seven patients who sustained a first-time, traumatic, anterior subluxation, twenty-two were male and five were female, and their mean age was twenty years. Plain radiographs revealed three osseous Bankart lesions and two Hill-Sachs lesions. Magnetic resonance imaging revealed a Bankart lesion in twenty-six of the twenty-seven patients and a Hill-Sachs lesion in twenty-five of the twenty-seven patients. Of the fourteen patients who underwent surgery, thirteen had a Bankart lesion noted during the procedure. Of the thirteen patients who chose nonoperative management, four experienced recurrent instability. Two of the thirteen patients left the academy for nonmedical reasons and were lost to follow-up. The remaining seven patients continued on active-duty service and had not sought care for a recurrent instability event at the time of writing.	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
51. Widjaja AB, Tran A, Bailey M, Proper S. Correlation between Bankart and Hill-Sachs lesions in anterior shoulder dislocation. ANZ J Surg. 2006;76(6):436-438.	Review/Other-Dx	61 patients	To investigate the correlation between Bankart lesions and Hill-Sachs lesions on MRI for patients with traumatic anterior shoulder dislocations.	Although patients with one of these lesions were more than two-and-a-half times as likely to have the other, small study numbers precluded this result from achieving statistical significance. (odds ratio, 2.67 (0.83-8.61), P = 0.10). Younger age was a strong predictor of a recurrence of shoulder dislocation (odds ratio, 0.93 (0.89-0.98), P = 0.005). The presence of Bankart or Hill-Sachs lesions on MRI for the primary shoulder dislocation group was similar to the recurrent group (73% vs. 72% for Bankart lesion and 67% vs. 70% for Hill-Sachs lesion).	4
52. Bernhardson AS, Bailey JR, Solomon DJ, Stanley M, Provencher MT. Glenoid bone loss in the setting of an anterior labroligamentous periosteal sleeve avulsion tear. Am J Sports Med. 2014;42(9):2136-2140.	Observational-Dx	83 patients	To determine differences in the amount of glenoid bone loss and to compare demographic factors of instability in patients with and without ALPSA tears.	The patients with an ALPSA lesion had more preoperative instability events than those without (8.2 vs 3.6, respectively; P = .04). The mean glenoid bone loss measured by 3D CT was 12.7% (range, 0%-22.3%) for those with ALPSA tears versus 6.25% (range, 0%-23.1%) for those without (P = .002). The mean duration of total instability for those with ALPSA tears was 42.9 months versus 46.3 months for those without (P = .95). Lastly, the mean bone loss based on arthroscopic measures was 11.4% for patients with ALPSA tears and 4.3% for those without ALPSA tears (P = .017). From the existing magnetic resonance imaging/arthrography scans reviewed, 82% of patients could be correctly identified as having an ALPSA lesion.	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
53. Gyftopoulos S, Beltran LS, Yemin A, et al. Use of 3D MR reconstructions in the evaluation of glenoid bone loss: a clinical study. <i>Skeletal Radiol.</i> 2014;43(2):213-218.	Observational-Dx	15 patients	To assess the ability of 3D MR shoulder reconstructions to accurately quantify glenoid bone loss in the clinical setting using findings at the time of arthroscopy as the gold standard.	There were a total of 15 patients (13 men, two women; mean age, 28, range, 19-51 years). There was no significant difference, on average, between the MRI (mean 3.4 mm/12.6 %; range, 0-30 %) and OR (mean, 12.7 %; range, 0-30 %) measurements of glenoid bone loss (p = 0.767). A 95 % confidence interval for the mean absolute error extended from 0.45-2.21 %, implying that, when averaged over all patients, the true mean absolute error of the MRI measurements relative to the OR measurements is expected to be less than 2.21 %. Inter-reader agreement between the two readers had an IC of 0.92 and CC of 0.90 in terms of percentage of bone loss.	2
54. Eisner EA, Roocroft JH, Edmonds EW. Underestimation of labral pathology in adolescents with anterior shoulder instability. <i>J Pediatr Orthop.</i> 2012;32(1):42-47.	Observational-Dx	43 patients	To characterize the ability of physical examination and MRI to identify intra-articular pathology in those adolescents suspected of having anterior shoulder instability.	The clinical suspicion of anterior labral tear was 59% accurate (positive predictive value of 79%) and the MRI was 86% accurate (positive predictive value of 95%). Among all included patients, 23 adolescents (24 shoulders) were identified with a preoperative clinical suspicion of anterior labral tear based on history, physical examination, and plain radiographs (8 girls/15 boys). Mean age at surgery was 15.9 years (13.3 to 18.8). In this suspected anterior labral tear cohort, 79% had arthroscopic confirmation of the clinical suspicion, but 58% had extension of the labral tear either superior or posterior. MRI was 100% sensitive, 55% specific for an isolated anterior tear; yet, the MRI was 46% sensitive, 100% specific at identifying the larger anterior + labral tears. A statistically significant difference existed between the extent of the labral tear found on MRI and that found at the time of surgery (P=0.006), with tears of the glenoid labrum often extending beyond what was predicted by MRI.	3
55. Murthi AM, Ramirez MA. Shoulder dislocation in the older patient. <i>J Am Acad Orthop Surg.</i> 2012;20(10):615-622.	Review/Other-Dx	N/A	To discuss shoulder dislocation in older patients.	No results stated in abstract.	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
56. Bhatia DN, DasGupta B. Surgical treatment of significant glenoid bone defects and associated humeral avulsions of glenohumeral ligament (HAGL) lesions in anterior shoulder instability. <i>Knee Surg Sports Traumatol Arthrosc</i> . 2013;21(7):1603-1609.	Observational-Tx	7 patients	To report a retrospective case series of seven anterior bony instability patients who were diagnosed with this unusual association and to evaluate the results of a modified Latarjet procedure and simultaneous HAGL repair using a new subscapularis-sparing approach.	Radiological and arthroscopic evaluation confirmed the combined lesion complex in 7 (11 %) patients. Follow-up evaluation (mean 20.6 months) suggested an excellent outcome (Rowe score: median 95, range 95-100); a statistically significant improvement was seen in the follow-up OSIS (median 12, range 12-14, p = 0.018) and WOSI score (median 28, range 17-102, p = 0.018) as compared to the preoperative score (median OSIS 50, range 32-53; median WOSI 1,084, range 919-1,195). Clinical tests for subscapularis function revealed a functional subscapularis muscle; no significant differences were detected in pre- versus postoperative internal rotation strength and in the operated versus normal contralateral shoulder (ns). The dual-window subscapularis-sparing approach provided adequate exposure for combined reconstruction of the humeral and glenoid lesions, and no complications were encountered.	2
57. Boileau P, Thelu CE, Mercier N, et al. Arthroscopic Bristow-Latarjet combined with bankart repair restores shoulder stability in patients with glenoid bone loss. <i>Clin Orthop Relat Res</i> . 2014;472(8):2413-2424.	Observational-Tx	70 patients	To whether an arthroscopic Bristow-Latarjet procedure with concomitant Bankart repair (1) restored shoulder stability in this selected subgroup of patients, (2) without decreasing mobility, and (3) allowed patients to return to sports at preinjury level.	At latest followup, 69 of 70 (98%) patients had a stable shoulder, external rotation with arm at the side was 9 degrees less than the nonoperated side, and 58 (83%) returned to sports at preinjury level. On latest radiographs, 64 (91%) had no osteoarthritis, and bone block positioning was accurate, with 63 (90%) being below the equator and 65 (93%) flush to the glenoid surface. The coracoid graft healed in 51 (73%), it failed to unite in 14 (20%), and graft osteolysis was seen in five (7%). Bone block nonunion/migration did not compromise shoulder stability but was associated with persistent apprehension and less return to sports. Use of screws that were too short or overangulated, smoking, and age higher than 35 years were risk factors for nonunion.	2

\* See Last Page for Key

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
58. van Grinsven S, Hagenmaier F, van Loon CJ, van Gorp MJ, van Kints MJ, van Kampen A. Does the experience level of the radiologist, assessment in consensus, or the addition of the abduction and external rotation view improve the diagnostic reproducibility and accuracy of MRA of the shoulder? Clin Radiol. 2014;69(11):1157-1164.	Observational-Dx	76 patients	The aim of this study was to relate lesions of the rotator cuff to the fracture patterns in patients with proximal humerus fracture.	Inter-observer k-values ranged from 0.03 for joint capsule lesions to 0.45 for humeral head lesions. The overall kappa was 0.21 (95% CI; 0.12-0.30). We also observed markedly lower sensitivity and specificity rates than those reported in the literature for most lesions. The more experienced radiologist correctly diagnosed 78.9% of all lesions compared to 65.4% for the less experienced radiologist (P < 0.001; McNemar's test).	4
59. Jonas SC, Walton MJ, Sarangi PP. Is MRA an unnecessary expense in the management of a clinically unstable shoulder? A comparison of MRA and arthroscopic findings in 90 patients. Acta Orthop. 2012;83(3):267-270.	Observational-Dx	90 patients	To assess the accuracy of MRA in a group of patients undergoing anterior stabilization for clinical instability.	83 of the 90 patients had glenoid labrum tears at arthroscopy. Only 54 were correctly identified at MRA. All normal glenoid labra were identified at MRA. This gave a sensitivity of 65% and a specificity of 100% in identification of all types of glenoid labrum tear. 74 patients had anterior glenoid labral tears that were detected at an even lower rate of sensitivity (58%)	3
60. van Grinsven S, Kesselring FO, van Wassenaer-van Hall HN, Lindeboom R, Lucas C, van Loon CJ. MR arthrography of traumatic anterior shoulder lesions showed modest reproducibility and accuracy when evaluated under clinical circumstances. Arch Orthop Trauma Surg. 2007;127(1):11-17.	Observational-Dx	58 MRA exams	To prospectively evaluate the influence of observer experience, consensus assessment, and abduction and external rotation (ABER) view on the diagnostic performance of magnetic resonance arthrography (MRA) in patients with traumatic anterior-shoulder instability (TASI).	Overall kappa ranged from poor (k = 0.17) to moderate (k = 0.53), sensitivity from 30.6-63.5%, and specificity from 73.6-89.9%. Overall, the most experienced radiologists (R1-R2) and teams (T2-T3) agreed significantly more than the lesser experienced radiologists (R3-R4: p = 0.014, R5-R6; p = 0.018) and teams (T2-T3: p = 0.007). The most experienced radiologist (R1, R2, R3) and teams (T1, T2) were also consistently more accurate than the lesser experienced radiologists (R4, R5, R6) and team (T3). Significant differences were found between R1-R4 (p = 0.012), R3-R4 (p = 0.03), and T2-T3 (p = 0.014). The overall performance of consensus assessment was systematically higher than individual assessment. Significant differences were established between T1-T2 and radiologists R3-R4 (p<0.001, p = 0.001) and between T2 and R3 (p<0.001/p = 0.001) or R4 (p = 0.050). No overall significant differences were found between the radiologists' assessments with and without ABER.	3

\* See Last Page for Key



**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
61. Khoury V, Van Lancker HP, Martineau PA. Sonography as a tool for identifying engaging Hill-Sachs lesions: preliminary experience. J Ultrasound Med. 2013;32(9):1653-1657.	Observational-Dx	9 patients	To develop a sonographic technique that allows preoperative identification of engaging Hill-Sachs lesions.	In patients with engaging lesions, there was an abrupt change in the contour of the humeral head when the shoulder was in 90 degrees of abduction and 90 degrees of external rotation.	3
62. Antonio GE, Griffith JF, Yu AB, Yung PS, Chan KM, Ahuja AT. First-time shoulder dislocation: High prevalence of labral injury and age-related differences revealed by MR arthrography. J Magn Reson Imaging. 2007;26(4):983-991.	Review/Other-Dx	66 patients	To evaluate abnormalities and age-related differences after first-time shoulder dislocation.	Forty-eight patients (73%) showed anteroinferior labral avulsion, consisting of: 6% (4/34 vs. 0/32) Perthes; 23% (8/34 vs. 7/32) free ALPSA (anterior labrum periosteal sleeve avulsion) lesion; 6% (1/34 vs. 3/32) adherent ALPSA; 23% (9/34 vs. 6/32) Bankart; 14% (5/34 vs. 4/32) inferiorly displaced avulsed labrum; 2% (1/34 vs. 0/32) GLAD. Extensive labral detachment (extended above 3 o'clock position) was present in 31% (11/28 vs. 4/20). There were 14% (6/34 vs. 3/32) superior labrum anterior-posterior (SLAP) lesion; 27% (1/34 vs. 17/34) rotator cuff tendon tear; 71% (25/34 vs. 22/32) Hill-Sachs defect. Young patients were more likely to have extensive labral avulsions (P = 0.054), but less likely to have rotator cuff tears (P < 0.001).	4
63. Amin MF, Youssef AO. The diagnostic value of magnetic resonance arthrography of the shoulder in detection and grading of SLAP lesions: comparison with arthroscopic findings. Eur J Radiol. 2012;81(9):2343-2347.	Observational-Dx	59 patients	To determine the usefulness of magnetic resonance arthrography (MRA) in diagnosis and grading of superior labrum anterior to posterior (SLAP) lesions of the Glenoid Labrum Compared with surgery.	Out of fifty nine patients, 25 patients had positive MR findings in conventional MRI, and 34 patients had negative MR findings, who underwent MR arthrography; 10 out of them had normal arthrogram (only 6 of them underwent arthroscopy), 22 had SLAP (superior labrum anterior to posterior) lesions, one had Bankart's lesion and one had internal impingement syndrome. These results were compared with arthroscopy results. The overall sensitivity of MRA in detection of SLAP lesions was 90% while the specificity was 50%, negative predictive value (NPV) was 66.6% and positive predicative value (PPV) was 81.8%. MRA and arthroscopy results were concurrent in 79.3% patients.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
64. Iqbal HJ, Rani S, Mahmood A, Brownson P, Aniq H. Diagnostic value of MR arthrogram in SLAP lesions of the shoulder. <i>Surgeon</i> . 2010;8(6):303-309.	Observational-Dx	124 patients	To evaluate the diagnostic performance of MR Arthrogram in SLAP tears.	Out of 124 cases, 54(43.54%) had normal MR Arthrogram, 32 (25.8%) had impingement or cuff related problems, 2 (1.61%) had Bankart lesions, and in 36 (29%) cases SLAP lesions were identified. Out of 54 patients with normal MR Arthrogram, 44 were discharged to physiotherapy and 10 underwent arthroscopy, showing SLAP lesion in one patient. Out of 32 patients with impingement or cuff problems, 19 were discharged to rehabilitation and 13 underwent surgery. Out of 36 patients with SLAP lesions, 5 recovered spontaneously, 5 were awaiting outpatient review and 26 underwent arthroscopy showing SLAP lesions in 22 cases. Overall, only 51 patients underwent arthroscopy. The MR Arthrogram was falsely positive in 4 cases (15.38%) and falsely negative in one case (3.84%). The sensitivity of MR Arthrogram was 95.6% (22/23), specificity 85.7% (24/28), positive predictive value 84.6% (22/26) and the negative predictive value was 96% (24/25).	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
65. Genovese E, Spano E, Castagna A, et al. MR-arthrography in superior instability of the shoulder: correlation with arthroscopy. Radiol Med. 2013;118(6):1022-1033.	Observational-Dx	42 patients	To evaluate magnetic resonance (MR) arthrography in the detection and classification of lesions that may cause superior instability.	We detected 31 superior labral anterior posterior (SLAP) lesions, all confirmed on arthroscopy with three cases of underestimation: in the detection of SLAP lesions, the sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) of MR arthrography were 100%; in the evaluation of the type of SLAP lesion, sensitivity was 100%, specificity was 78.5%, accuracy was 92.8%, PPV was 71.7% and NPV was 100%. All cases of capsular laxity (13/42) and biceps tendon lesions (3/42) were confirmed on arthroscopy with sensitivity, specificity, accuracy, PPV and NPV of 100%. Eleven cuff lesions were detected on MR arthrography, 10 of which confirmed at arthroscopy: sensitivity was 100%, specificity was 96.8%, accuracy was 97.6%, PPV was 90.9% and NPV was 100%. Associated lesions were found in 38/42 patients.	3
66. Rowan KR, Andrews G, Spielmann A, Leith J, Forster BB. MR shoulder arthrography in patients younger than 40 years of age: frequency of rotator cuff tear versus labroligamentous pathology. Australas Radiol. 2007;51(3):257-259.	Review/Other-Dx	243 patients	To compare the frequency of rotator cuff pathology versus labroligamentous pathology in patients younger than 40 years and to determine whether routine MR arthrography is justified in all patients in this age group, regardless of the clinical symptoms.	In the 243 patients younger than 40 years with clinical history of potential labral pathology, 39% (95/243) showed a labral tear and 2.1% (5/243) had a full-thickness rotator cuff tendon tear. In the 89 patients with no history suggesting labral pathology, 19% (17/89) showed an unsuspected labral tear and 4.5% (4/89) had a full-thickness rotator cuff tear.	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
67. Acid S, Le Corroller T, Aswad R, Pauly V, Champsaur P. Preoperative imaging of anterior shoulder instability: diagnostic effectiveness of MDCT arthrography and comparison with MR arthrography and arthroscopy. <i>AJR Am J Roentgenol.</i> 2012;198(3):661-667.	Observational-Dx	40 patients	To assess the diagnostic effectiveness of MDCT arthrography in the preoperative planning of anterior shoulder instability compared with MR arthrography and arthroscopy.	In detecting glenoid rim fractures, MDCT arthrography had a sensitivity of 100% (12/12), a specificity of 96% (27/28), and better agreement with surgery (kappa = 0.94) than did MR arthrography (kappa = 0.74). For the depiction of glenoid cartilage lesions, MDCT arthrography had a sensitivity of 82% (18/22), a specificity of 89% (16/18), and slightly better agreement with surgery (kappa = 0.70) than did MR arthrography (kappa = 0.66). In identifying anterior labral periosteal sleeve avulsion lesions, MDCT arthrography had a sensitivity of 93% (26/28), a specificity of 100% (12/12), and better agreement with surgery (kappa = 0.89) than did MR arthrography (kappa = 0.74). For the diagnosis of humeral avulsion of the inferior glenohumeral ligament lesions, MDCT arthrography had a sensitivity and a specificity of 100% (2/2) and better agreement with surgery (kappa = 1) than did MR arthrography (kappa = 0.79).	2
68. Roy JS, Braen C, Leblond J, et al. Diagnostic accuracy of ultrasonography, MRI and MR arthrography in the characterisation of rotator cuff disorders: a systematic review and meta-analysis. <i>Br J Sports Med.</i> 2015;49(20):1316-1328.	Meta-analysis	82 articles	To perform a meta-analysis on the diagnostic accuracy of medical imaging for characterisation of RC disorders.	Diagnostic accuracy of US, MRI and MRA in the characterisation of full-thickness RC tears was high with overall estimates of sensitivity and specificity over 0.90. As for partial RC tears and tendinopathy, overall estimates of specificity were also high (>0.90), while sensitivity was lower (0.67-0.83). Diagnostic accuracy of US was similar whether a trained radiologist, sonographer or orthopaedist performed it.	M

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
69. Park GY, Kim JM, Sohn SI, Shin IH, Lee MY. Ultrasonographic measurement of shoulder subluxation in patients with post-stroke hemiplegia. J Rehabil Med. 2007;39(7):526-530.	Review/Other-Dx	41 patients	To evaluate the ultrasonographic measurement of shoulder subluxation in patients with post-stroke hemiplegia.	Intraclass correlation coefficients of the repeated ultrasonographic lateral/anterior distance measurements in the unaffected and affected shoulders were 0.979/0.969 and 0.950/0.947, respectively. Ultrasonographic lateral/anterior distance ratios were negatively correlated with Motricity Index scores of the affected shoulder abduction ( $r = -0.490$ , $p < 0.001$ / $r = -0.671$ , $p < 0.001$ ). Ultrasonographic anterior distance ratio was negatively correlated with Modified Ashworth Scale score of the affected shoulder ( $r = -0.374$ , $p < 0.05$ ). However, there was no correlation between radiographic distance ratios and clinical evaluation scores.	4
70. Al-Shawi A, Badge R, Bunker T. The detection of full thickness rotator cuff tears using ultrasound. J Bone Joint Surg Br. 2008;90(7):889-892.	Observational-Dx	143 patients	To investigate whether an orthopaedic surgeon can develop both the technical skills involved in acquiring ultrasound images and interpreting pathological findings with a similar degree of accuracy as trained musculoskeletal radiologists.	There were 78 full thickness tears which we confirmed by surgery or MRI. Three moderate-size tears were assessed as partial-thickness at ultrasound scan (false negative) giving a sensitivity of 96.2%. One partially torn and two intact cuffs were over-diagnosed as small full-thickness tears by ultrasound scan (false positive) giving a specificity of 95.4%. This gave a positive predictive value of 96.2% and a negative predictive value of 95.4%. Estimation of tear size was more accurate for large and massive tears at 96.5% than for moderate (88.8%) and small tears (91.6%). These results are equivalent to those obtained by several studies undertaken by experienced radiologists.	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
71. Fotiadou AN, Vlychou M, Papadopoulos P, Karataglis DS, Palladas P, Fezoulidis IV. Ultrasonography of symptomatic rotator cuff tears compared with MR imaging and surgery. Eur J Radiol. 2008;68(1):174-179.	Observational-Dx	88 patients	To compare the accuracy of ultrasonography and magnetic resonance imaging in the detection of rotator cuff tears.	Full-thickness tear was confirmed in 57 cases, partial-thickness tear in 30 cases and degenerative changes without tear in 1. In all 57 cases of full-thickness tear and in 28 out of 30 cases of partial-thickness tear the supraspinatus tendon was involved. The accuracy in the detection of full-thickness tears was 98 and 100% for ultrasonography and magnetic resonance imaging, respectively. The accuracy in the detection of bursal or articular partial-thickness tears was 87 and 90% for ultrasonography and magnetic resonance imaging, respectively.	3
72. Frei R, Chladek P, Trc T, Kopecny Z, Kautzner J. Arthroscopic evaluation of ultrasonography and magnetic resonance imaging for diagnosis of rotator cuff tear. Ortop Traumatol Rehabil. 2008;10(2):111-114.	Observational-Dx	20 patients	To determine the ability of ultrasonography and MRI to correctly diagnose rotator cuff tears.	Sensitivity of USG--1.0, specificity 0.9. Sensitivity of MRI--0.92, specificity 1.0. DISCUSSION: Clinical examination and physical tests are not fully reliable diagnostic tools in patients with shoulder pain, because symptoms of different conditions overlap. Using ultrasound to visualize the shoulder area has some advantages to other imaging techniques such as CT scan or MRI, and has a very good sensitivity and good specificity. Many authors agree that MRI is one of the most effective methods for the diagnosis of rotator cuff tear.	3
73. O'Connor PJ, Rankine J, Gibbon WW, Richardson A, Winter F, Miller JH. Interobserver variation in sonography of the painful shoulder. J Clin Ultrasound. 2005;33(2):53-56.	Observational-Dx	24 patients	To quantify interobserver variation in a comprehensive sonographic shoulder examination between radiologists with different levels of sonographic experience.	There was good agreement (kappa >0.60, p <0.01) between the experienced operators for full-thickness rotator cuff tear, tendon calcification, dynamic signs of impingement, and abnormality of the long head of biceps tendon. There was no significant agreement between the experienced operators and the less experienced operator in several categories, including (and importantly) full-thickness rotator cuff tears (kappa=0.18-0.21)	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
74. Le Corroller T, Cohen M, Aswad R, Pauly V, Champsaur P. Sonography of the painful shoulder: role of the operator's experience. <i>Skeletal Radiol.</i> 2008;37(11):979-986.	Observational-Dx	65 patients	To determine the role of the operator's experience in the sonographic evaluation of the painful shoulder and to validate assumptions about its technical performance in routine practice.	The sensitivity of the expert ultrasound operator was 95.3% for full-thickness rotator cuff tears (41/43), 70.6% for partial-thickness tears (12/17), 64.3% for intratendinous tears (9/14), 100% for abnormality of the long head of biceps tendon (seven of seven), 88.9% for supraspinatus tendinosis (16/18), 96.4% for subacromial bursa abnormalities (53/55), and 91.7% for acromioclavicular joint osteoarthritis (33/36). The two sonographic operators were in very good agreement about full-thickness rotator cuff tears (kappa = 0.90), supraspinatus tendinosis (kappa = 0.80), abnormalities of the long head of biceps tendon (kappa = 0.84), subacromial bursa abnormalities (kappa = 0.89), and acromioclavicular osteoarthritis (kappa = 0.81). The agreement was only moderate for partial-thickness tears (kappa = 0.63) and intratendinous tears (kappa = 0.57).	2
75. Menendez ME, Ring D, Heng M. Proximal humerus fracture with injury to the axillary artery: a population-based study. <i>Injury.</i> 2015;46(7):1367-1371.	Review/Other-Dx	388,676 patients	To determine the prevalence and predictors of axillary artery injury secondary to proximal humerus fracture, and to characterise its influence on inpatient mortality, length of stay, cost and discharge disposition.	Factors associated with axillary artery injury were male sex (odds ratio (OR): 1.6, 95% confidence interval (CI): 1.2-2.0), atherosclerosis (OR: 3.7, 95% CI: 2.5-5.4), open fracture (OR: 2.9, 95% CI: 1.9-4.5) and the presence of concomitant injuries, including brachial plexus injury (OR: 109, 95% CI: 79-151), shoulder dislocation (OR: 3.4, 95% CI: 2.0-5.8), scapula fracture (OR: 3.4, 95% CI: 2.1-5.4) and rib fracture (OR: 2.5, 95% CI: 1.6-4.0). Axillary artery injury was associated with increased length of stay, costs and mortality, but it did not affect discharge disposition.	4
76. Bozlar U, Ogur T, Norton PT, Khaja MS, All J, Hagspiel KD. CT angiography of the upper extremity arterial system: Part 1-Anatomy, technique, and use in trauma patients. <i>AJR Am J Roentgenol.</i> 2013;201(4):745-752.	Review/Other-Dx	N/A	To describe the arterial anatomy of the upper extremities, the technical aspects of upper extremity CT angiography (CTA), and CTA use in trauma patients.	No results stated in abstract.	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
77. Fritz J, Efron DT, Fishman EK. Multidetector CT and three-dimensional CT angiography of upper extremity arterial injury. <i>Emerg Radiol.</i> 2015;22(3):269-282.	Review/Other-Dx	N/A	To outline the role of MDCT angiography in the diagnosis and management of upper extremity arterial injury, discuss strategies for MDCT angiography acquisition and concepts of data visualization, and illustrate various types of injuries.	No results stated in abstract.	4
78. Koman LA, Nunley JA, Wilkinson RH, Jr., Urbaniak JR, Coleman RE. Dynamic radionuclide imaging as a means of evaluating vascular perfusion of the upper extremity: a preliminary report. <i>J Hand Surg Am.</i> 1983;8(4):424-434.	Observational-Dx	44 patients	To determine the efficacy of dynamic radionuclide imaging (DRI) in documenting arterial perfusion patterns of the upper extremities and to define indications for this procedure as a diagnostic tool.	DRI provided the correct diagnosis in all but four extremities (92%). Limited resolution precluded precise anatomic definition of aneurysms in three limbs and of digital artery occlusion, with adequate collateral circulation in the fourth limb.	3
79. IASP Task Force on Taxonomy. IASP Taxonomy. 2012; Available at: <a href="http://www.iasp-pain.org/Taxonomy">http://www.iasp-pain.org/Taxonomy</a> .	Review/Other-Dx	N/A	To list the taxonomy as written by the International Association for the Study of Pain	No abstract available.	4
80. Bykowski J, Aulino JM, Berger KL, et al. ACR Appropriateness Criteria(R) Plexopathy. <i>J Am Coll Radiol.</i> 2017;14(5S):S225-S233.	Review/Other-Dx	N/A	Evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for plexopathy.	No results stated in abstract.	4
81. Carpenter EL, Bencardino JT. Focus on advanced magnetic resonance techniques in clinical practice: magnetic resonance neurography. <i>Radiol Clin North Am.</i> 2015;53(3):513-529.	Review/Other-Dx	N/A	To focus on advanced magnetic resonance techniques in clinical practice	Magnetic resonance neurography (MRN) provides the greatest degree of soft tissue contrast in the evaluation of peripheral nerves. Utilization of MRN relies on (1) peripheral nerve anatomy, (2) the spectrum of pathology, and (3) familiarity with dedicated MR imaging techniques. Although there remain several pitfalls in MRN imaging, awareness of these pitfalls improves imaging quality and limits misinterpretation. Most importantly, maintaining a direct line of communication with the referring clinician allows for the greatest degree of diagnostic accuracy.	4



**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
82. Marquez Neto OR, Leite MS, Freitas T, Mendelovitz P, Villela EA, Kessler IM. The role of magnetic resonance imaging in the evaluation of peripheral nerves following traumatic lesion: where do we stand? Acta Neurochir (Wien). 2017;159(2):281-290.	Review/Other-Dx	7 articles	To analyze the use of magnetic resonance (MR) for the evaluation of traumatic peripheral nerve diseases that are surgically treatable.	The included articles were identified using a computerized search and the resulting databases were then sorted according to the inclusion and exclusion criteria. This yielded 10,340 articles (MEDLINE, n = 758; EMBASE, n = 9564; and Cochrane, n = 18). A search strategy was then built by excluding articles that only concern plexus injury and adding the terms 'neuropathies', 'DTT' and 'neurotmesis'. In total, seven studies were included in the review effectively addressing the role of MRI in the evaluation of traumatic peripheral nerve injury. We extracted all relevant information on the imaging findings and the use of magnetic resonance in trauma.	4
83. Chhabra A, Thawait GK, Soldatos T, et al. High-resolution 3T MR neurography of the brachial plexus and its branches, with emphasis on 3D imaging. AJNR Am J Neuroradiol. 2013;34(3):486-497.	Review/Other-Dx	N/A	To illustrate the relevant anatomy and the various common pathologies of the brachial plexus and describe the respective imaging findings at 3T MR neurography, with emphasis on 3D imaging.	No results stated in abstract.	4

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
84. Greyson ND, Tepperman PS. Three-phase bone studies in hemiplegia with reflex sympathetic dystrophy and the effect of disuse. J Nucl Med. 1984;25(4):423-429.	Observational-Dx	85 patients	To look systematically at a large group of patients and to determine the radionuclide bone-image patterns occurring in them.	Nine patients (10%) had normal three-phase bone images. Fifty-five patients (65%) showed decreased blood flow and blood-pool images of the hands and wrists with normal delayed bone scintigrams, indicating the effect of paralysis or disuse. Twenty-one patients (25%) had diffuse increased uptake with periarticular accentuation, felt to be bone-scintigraphic evidence of reflex sympathetic dystrophy of the hands and wrists; in two patients this occurred before its clinical appearance. Thirteen of the 21 reflex sympathetic dystrophy syndromes (RDS)-involved limbs (62%) had increased blood flow, whereas 8 (38%) had decreased flow. Gross limb blood flow appears to be related to the degree of muscle activity, but flow may be altered by the presence of sympathetic changes. A possible dissociation between whole-limb flow and bone blood flow in paralyzed limbs involved with RDS is discussed. The elbow was involved in only one case, and a true "shoulder hand" distribution was seen in only 11 of 21 cases (52%). Five patients (6%) had leg involvement on whole-body imaging.	4
85. Kline SC, Holder LE. Segmental reflex sympathetic dystrophy: clinical and scintigraphic criteria. J Hand Surg Am. 1993;18(5):853-859.	Observational-Dx	8 patients including an additional 127 hand scans.	To evaluate the potential of three-phase radionuclide bone scan to provide objective evidence of segmental RSD.	The delayed phase of the three-phase radionuclide bone scan was found to be highly sensitive (100%) for this small group of patients. Consecutive bone scans (n = 127) performed during a 6-month period for a variety of upper extremity problems were reviewed, and a segmentally diffuse pattern of tracer uptake was found to be highly specific (98%) for segmental reflex sympathetic dystrophy.	3

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
86. Park SA, Yang CY, Kim CG, Shin YI, Oh GJ, Lee M. Patterns of three-phase bone scintigraphy according to the time course of complex regional pain syndrome type I after a stroke or traumatic brain injury. Clin Nucl Med. 2009;34(11):773-776.	Observational-Dx	50 patients	To evaluate different patterns represented on 3-phase bone scintigraphy (TPBS) according to the time course of complex regional pain syndrome (CRPS) type I (CRPS-I) after a stroke or traumatic brain injury.	In the early acute stage within 6 weeks, minimal uptake on all TPBS phases was observed in the 90% of the patients in the CRPS-I group and in 75% of the patients in the non-CRPS group. In the acute stage of CRPS in the range of 2 to 20 weeks, moderately increased uptake was seen for 78%, 83%, and 83% of the patients in the CRPS group for the 3 phases, respectively. However, only 16% of the patients in the non-CRPS group had moderately increased uptake as seen on all TPBS phases. In the late stage of more than 21 weeks, there was no distinct difference in uptake between the 2 groups. A sequential change during the time course for the CPRS-I group was statistically significant (P < 0.05).	3
87. Ringer R, Wertli M, Bachmann LM, Buck FM, Brunner F. Concordance of qualitative bone scintigraphy results with presence of clinical complex regional pain syndrome I: meta-analysis of test accuracy studies. Eur J Pain. 2012;16(10):1347-1356.	Meta-analysis	12 studies	To summarize the existing evidence quantifying the concordance of qualitative BS in the presence or absence of clinical CRPS I.	The pooled mean sensitivity of 12 two-by-two tables was 0.87 (95% CI, 0.68-0.97) and specificity was 0.69 (95% CI, 0.47-0.85). The pooled mean sensitivity for the subgroup with clearly defined diagnostic criteria (seven two-by-two tables) was 0.80 (95% CI, 0.44-0.95) and specificity was 0.73 (95% CI, 0.40-0.91).	M
88. Schurmann M, Zaspel J, Lohr P, et al. Imaging in early posttraumatic complex regional pain syndrome: a comparison of diagnostic methods. Clin J Pain. 2007;23(5):449-457.	Observational-Dx	175	To compare the diagnostic power of the aforementioned methods (x-ray, thermography, 3-phase bone scans, and MRI) in identifying patients with clinically diagnosed CRPS I in a group of patients with distal radial fracture.	We evaluated the changes on TPBS according to clinical stages based on time course. In the early acute stage within 6 weeks, minimal uptake on all TPBS phases was observed in the 90% of the patients in the CRPS-I group and in 75% of the patients in the non-CRPS group. In the acute stage of CRPS in the range of 2 to 20 weeks, moderately increased uptake was seen for 78%, 83%, and 83% of the patients in the CRPS group for the 3 phases, respectively. However, only 16% of the patients in the non-CRPS group had moderately increased uptake as seen on all TPBS phases. In the late stage of more than 21 weeks, there was no distinct difference in uptake between the 2 groups. A sequential change during the time course for the CPRS-I group was statistically significant (P < 0.05).	2

**Shoulder Pain-Traumatic  
EVIDENCE TABLE**

Reference	Study Type	Patients/ Events	Study Objective (Purpose of Study)	Study Results	Study Quality
89. Lee GW, Weeks PM. The role of bone scintigraphy in diagnosing reflex sympathetic dystrophy. J Hand Surg Am. 1995;20(3):458-463.	Meta-analysis	6 studies	To analyze of the literature relating three-phase bone scanning to reflex sympathetic dystrophy in the upper extremity.	The data show a wide variability in scintigraphic accuracy in patients with clinically obvious reflex sympathetic dystrophy. The results of bone scintigraphy correlate best with the clinical diagnosis of reflex sympathetic dystrophy within the first 20-26 weeks of onset. Even then, the sensitivity in the most recent series approximates 50%. After 26 weeks, there is a poor correlation between three-phase bone scanning and reflex sympathetic dystrophy.	M
90. Wertli MM, Brunner F, Steurer J, Held U. Usefulness of bone scintigraphy for the diagnosis of Complex Regional Pain Syndrome 1: A systematic review and Bayesian meta-analysis. PLoS One. 2017;12(3):e0173688.	Meta-analysis	27 studies	To assess the impact of different RTs, specifically the Budapest criteria, and the assumed imperfect nature of the RT on the diagnostic accuracy of BS.	The pooled sensitivity was 0.804 (95% credible interval (CI) 0.225-1.0, 21 studies) and specificity 0.853 (95%CI 0.278-1.00). Sensitivity and specificity of BS increased when accounting for the imperfect nature of the RT. However, in studies using Budapest criteria as reference, the sensitivity decreased (0.551; 95% CI 0.046-1) and the specificity increased (0.935; 95% CI 0.306-1). Shorter disease duration and a higher proportion of males were associated with a higher proportion of positive BS (27 studies, disease duration <52 weeks Wilcoxon test p = 0.047, female proportion Spearman correlation -0.63, p = 0.009).	M
91. American College of Radiology. ACR Appropriateness Criteria® Radiation Dose Assessment Introduction. Available at: <a href="http://www.acr.org/~media/ACR/Documents/AppCriteria/RadiationDoseAssessmentIntro.pdf">http://www.acr.org/~media/ACR/Documents/AppCriteria/RadiationDoseAssessmentIntro.pdf</a> .	Review/Other-Dx	N/A	Guidance document on exposure of patients to ionizing radiation.	N/A	4

## Evidence Table Key

### Study Quality Category Definitions

- *Category 1*: The study is well-designed and accounts for common biases.
  - *Category 2*: The study is moderately well-designed and accounts for most common biases.
  - *Category 3*: There are important study design limitations.
  - *Category 4*: The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:
    - a) the study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
    - b) the study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
    - c) the study is an expert opinion or consensus document.
  - M = Meta-analysis
- 

Dx = Diagnostic

Tx = Treatment