MRI evaluation of the shoulder: Beyond rotator cuff

Poster No.: C-2447
Congress: ECR 2015
Type: Educational Exhibit
Authors: C. Rumie\textsuperscript{1}, A. Vasquez\textsuperscript{1}, J. A. Abreu\textsuperscript{1}, A. P. Guarnizo\textsuperscript{1}, O. Rivero\textsuperscript{1}, J. Ocampo\textsuperscript{1}, R. Gómez\textsuperscript{2}; \textsuperscript{1}Bogota/CO, \textsuperscript{2}CO
Keywords: Musculoskeletal system, MR, Education, Biological effects
DOI: 10.1594/ecr2015/C-2447

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.
As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.
You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.
Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.
www.myESR.org
Learning objectives

The objectives of this exhibit are:

- To expose the normal shoulder anatomy on magnetic resonance imaging (MRI) in order to recognize the structures involved in different pathologies beyond the rotator cuff.

- To describe the spectrum of diseases that affect the shoulder with the exception of rotator cuff pathology

- Illustrate the main imaging findings on MRI of different pathologies that affect the shoulder articulation, not including rotator cuff pathology.
Background

Shoulder pain is a common reason for consultation. Most of patients with shoulder pain will need imaging test to find out lesions involving the rotator cuff and rule out lesions affecting other structures that can potentially cause this symptom.

Diagnostic images are a useful tool that allow differentiation of multiple pathologies affecting the shoulder articulation.

One of the main diagnostic methods for shoulder pathologies is Magnetic Resonance Imaging (MRI), which can offer information regarding the different structures that conform this articulation including bones, tendons, muscles, nerves and adjacent soft tissues, which could each cause different disorders expressed clinically by a single common symptom characterized as articular pain.

1. Normal Anatomy

The shoulder is a ball and socket joint which is the reason it has a greater range of motion and it is composed by four separate articulations including : Glenohumeral, acromioclavicular, sternoclavicular and scapulothoracic joints.

The osseous structures of shouder include: the acromion, the clavicle meets the acromion in the acromioclavicular joint and the coracoid process.

Finally the shoulder has several other important structures:

- The rotator cuff is a complex of muscles & tendons that arise from the scapula, and attach to humerus giving it support and allowing a wide range of motion. All these tendons blend with the fibrous capsule to form the musculotendinous cuff + glenohumeral ligaments.
- The bursa is a small sac of fluid that cushions and protects the tendons of the rotator cuff.
- A cuff of cartilage called the labrum forms a cup for the ball-like head of the humerus to fit into.
Findings and procedure details

This exhibition illustrates various articular and extra-articular musculoskeletal disorders not including rotator cuff pathology such as adhesive capsulitis, neoplastic pathology and shoulder instability conditions among others, which may represent common causes of shoulder pain.

2. Main pathologies that involve shoulder not including rotator cuff lesions.

2.1 Adhesive capsulitis of the shoulder

Also known as “frozen shoulder” is a condition characterized by thickening and contraction of the shoulder joint capsule and surrounding synovial which generates pain and movement limitation.

Its incidence in the general population is between 3 to 5%, whereas the incidence is twice in diabetic patients. This condition typically affects women between the 5th to 6th decades of life. Adhesive capsulitis may be primary (idiopathic) or secondary to repetitive trauma, endocrine - rheumatologic conditions or surgery.

MR key imaging findings include:

- Inferior glenohumeral ligament <4mm

- Axillary recess thickening up to 1.3 cm or more

- Thickening of the joint capsule. (Figure 1)

- Soft tissue thickening within the rotator interval.

- Soft tissue encasing the biceps anchor.

- Increase enhancement of the capsule and synovium within the axillary recess and rotator interval.

2.2 Distal clavicle osteolysis

Distal Clavicle Osteolysis is a relatively uncommon disease but an important cause of shoulder pain. Is a pathologic process characterized by resorption of subchondral bone in the distal clavicle. Atraumatic cases are more common than traumatic and typically affects men.
MR key imaging findings include:

- Resorption of cortical distal clavicle.
- Periarticular swelling
- Increased intra-articular fluid
- Bone marrow edema (Figure 2)
- Periarticular cyst-like erosions
- Periostitis of clavicle

2.3 Neoplastic disease

Both benign (Figures 3-4) and malignant pathology may cause shoulder pain. Enchondroma (Figure 3) is the most common benign lesion affecting the shoulder, meanwhile metastatic lesions are the most common malignant lesion (Figure 5). Other malignant pathologies seen are synovial sarcoma (Figure 6) and multiple myeloma.

2.4 Shoulder instability

The glenohumeral dislocation is the most frequent dislocation, representing about 50% of all shoulder dislocations.

Shoulder instability can be divided into:

- Anterior: 95% of all cases usually result from disruption of the anterior band of the inferior glenohumeral ligament.
- Posterior: Rare, usually results from disruption of the posterior band of the inferior glenohumeral ligament or disruption of the posterior labrum or glenoid rim.
- Multidirectional: usually due congenital joint capsule laxity.
- Superior: Usually associated with multidirectional instability.

2.4.1 Osseous injuries associated with shoulder instability

- Hill-Sachs lesion: Impaction of the anterior glenoid margin on the postero-superior margin of the humeral head (Figure 7).
- Bankart lesion: Detachment of the anterior inferior labrum from the glenoid (Figure 8), and is usually as a result of previous anterior shoulder
dislocation. It may be labral only, or involve the bony margin (bony Bankart).
(Figure 9)

2.4.2 Paralabral cyst of the shoulder

The paralabral cysts are usually produced after a labrum rupture, they are pockets of joint fluid developed outside of the joint under tears of the labrum (Figure 10). They can be unilocular or multilocular cystic structures.

Paralabral cysts do not cause pain by themselves, however labral tears can cause shoulder pain. Some cysts can grow and cause radicular pressure around the shoulder; the most common nerve affected is the suprascapular nerve.

Key MR Imaging Findings:

- Oval or rounded, thin walled, sometimes multiloculated image.

- Classically of high signal intensity on T2-weighted images and low signal intensity on T1-weighted images.
**Fig. 1:** Coronal Proton density (A) and fat saturated T2WI (B and C) MR images of the right shoulder from a patient with chronic pain and decreasing range of motion. The capsule is thickened, redundant, with increase intrasubstancial signal intensity of the antero- inferior glenohumeral capsuloligamentary complex (White arrow on C) with a diameter of 13 mm (red line figure 1A)

© Fundación SantaFe de Bogotá - Bogota/CO

**Fig. 2:** Axial Proton density (A) and Coronal fat saturated T2WI (B and C) MR images from a 28-year-old man with shoulder pain in the last 4 months. He lifted weights for the last 5 years. Bone marrow edema at distal clavicle is seen. There is no degenerative lesion associated.

© Fundación SantaFe de Bogotá - Bogota/CO
Fig. 3: Sagittal Proton density (A) fat saturated T2WI (B) and coronal STIR (C) MR images of the left shoulder demonstrate bone marrow signal intensity alteration in the metaphyseal region of the proximal humeral shaft by a mass with low signal intensity in A and high signal intensity in B and C. There are multiple cystic appearance images within the lesion and very low signal images in keeping with chondroid matrix. These findings are compatible with an enchondroma.

© Fundación SantaFe de Bogotá - Bogota/CO

Fig. 4: Sagittal Proton density (A) and fat saturated T2WI (B) MR images of the left shoulder demonstrate small round intramedullary lesion of the humerus which looses signal intensity on fat saturated images representing an intraosseus lipoma. (White arrow).

© Fundación SantaFe de Bogotá - Bogota/CO
**Fig. 5:** Coronal fat saturated T2WI (A) proton density (B) and sagittal proton density (C) MR images of the left shoulder of a patient with a history of prostate cancer with pain. Expansive endomedulary heterogeneous signal intensity (A) and predominately hypointense (B and C) lesion involving the proximal humerus. The lesion is accompanied by cortical disruption and perilesional soft tissues edema. This lesion has an aggressive metastatic appearance and is secondary to known prostate cancer.

© Fundación SantaFe de Bogotá - Bogota/CO

**Fig. 6:** Coronal fat saturated T2WI (A and C) and Proton density (B) MR images of the left shoulder demonstrate a scapular extra-articular mass with osseous involvement of the body and spine of the scapula with extension to the supraspinatus muscle. Histopathology revealed the presence of synovial sarcoma.

© Fundación SantaFe de Bogotá - Bogota/CO
**Fig. 7:** Axial - sagittal proton density (A and B) and Coronal fat saturated T2WI (C) MR images of the right shoulder demonstrate flattened, impacted posterolateral humeral head with osseous edema on a Hill Sachs lesion.

© Fundación SantaFe de Bogotá - Bogota/CO

**Fig. 8:** Axial (A) and coronal fat saturated T2WI (B) MR images of the left shoulder demonstrate impacted anteroinferior glenoid margin fracture with osseous edema associated (white arrow).

© Fundación SantaFe de Bogotá - Bogota/CO
**Fig. 9:** Axial fat saturated T2WI of the right shoulder. The anterior glenoid labrum is displaced with bone involvement, representing a Bankart osseous lesion.

© Fundación SantaFe de Bogotá - Bogota/CO

**Fig. 10:** Axial and coronal fat saturated T2WI of the right shoulder demonstrate a paralabral cyst at the level of glenoid neck in relation with suprascapular nerve. There is not alterations of the signal intensity of the supraspinatus muscle that suggest denervation changes.

© Fundación SantaFe de Bogotá - Bogota/CO
Conclusion

- Shoulder pain is a common cause of medical consultation which can be challenging. Most of the requested images are intended to find lesions involving the rotator cuff, but it is important to know that there are different structures that can potentially cause shoulder pain.

- Magnetic resonance imaging is a useful complementary tool in the evaluation of shoulder disorders.
Personal information

C. Rumie, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

A. Vasquez, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

J.A. Abreu, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

A.P. Guarnizo, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

O. Rivero, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

J. Ocampo, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.

R. Gomez, Department of Radiology, Fundación SantaFe de Bogota University Hospital, Carrera 7B # 123-90, Bogotá.
References


