Shoulder joint I
Normal anatomy and rotator cuff lesions

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Indications

Shoulder joint complaint
- Pain
- Trauma
- Swelling
- Osteoarthritis

Examination Technique

- Patient preparation:
- Fasting 4-6h
- Patient position: supine
- Procedure
  - Surface coil [one side]

Suspected inflammation or tumors
Extremity MRI
Examination protocol

- Axial scout
- Axial T1, gradient
- Coronal oblique T1, PD, T2
- Sagittal oblique T1 and/or T2
How to know the pulse sequence?!?
• Cortical bone
• Labrium (ant. , post. , ....)
• Ligaments (gleno -humeral ,...)
• Tendons ( supraspinatous , biceps,..)
• Calcification
Fat

Subcutaneous fat, dermoid cyst, ...

Fluid

Effusion, cyst, articular cartilage, ...

T1
Low signal

T2
High signal

T1
High signal

T2
Low signal

Fat

Subcutaneous fat, dermoid cyst, ...
Items to be evaluated

- **Tendons** [ supra & infraspinatus, subscapularis and biceps ]
- **Ligaments** [ gleno-humeral]
- **Bones** [ acromion & A/C joint]
- **Labrium**
- **Bursae**
Anatomy
Coronal images

T1, PD & T2
Coronal

T1 & T2
Q.
Coronal T1 & T2
- Tendons
- Ligaments
- Bones
- Labrium
- Bursae

Coronal images

T1, PD & T2

- Supraspinatous
- Inferior GHL
- A/C osteoarthritis
- Superior / inferior
- Subacromial bursa
Subacromial bursa
Axial images

T1 & T2 gradient
Middle GH ligament
Axial images

- Tendons
- Ligaments
- Bones
- Labrium
- Bursae

T1 & T2 gradient

- Subscapularis, Infraspinatous
- Biceps (in the groove)
- Middle GHL
- Humeral head (Hill-Sack’s)
- Anterior / posterior labrium
- Subscapularis / subcoracoid
Sagittal images

T1 or T2 gradient
Acromial shapes

- Flat undersurface 47%
- Curved inferior surface 39%
- Anterior hook or peak 11%
- Convex under surface 3%
Sagittal images

- Tendons
- Ligaments
- Bones
- Labrium
- Bursae

T1 or T2 gradient

- Supraspinatous
- Inferior GHL
- Acromial shape, AC arthritis
- All components
- Subcorocoid bursa
Additional only in the sagittal !!!

- Coraco - humeral ligament
- Coraco – clavicular ligament
- Rotator interval lesions
- **Direct** intra articular injection of 1ml Gd-DTPA diluted with 20 ml saline
- **Indirect** IV Gd DTPA injection followed by active joint movement and imaging after 10 minutes
MR arthrography
Items to be evaluated

- **Tendons** [supra & infraspinatus, subscapularis and biceps]
- **Ligaments** [gleno-humeral]
- **Bones** [acromion & A/C joint]
- **Labrium**
- **Bursae**
Rotator cuff Tendons

- Supraspinatus
- Infraspinatus
- Teres minor

Origin

- Subscapularis

Insertion

- Posterior aspects of scapula
- Anterior aspects of scapula

- Biceps tendon
Supraspinatous Tendon

**T1**
Low signal

**T2**
Low signal
Supraspinatous Tendon

Intermediate signal in T1 & PD not in T2 WIs
- Magic angle tendon at 55 to the static magnetic field
- Prominent muscle slip

Supraspinatous
Two muscle slips
Tendinosis / tendinopathy
- Tendon enlargement
- Intermediate signal T1 and T2 WIs

Normal tendon thickness = 2-4 mm
Intermediate signal in T1 and in T2 WIs within the tendon
Tendon degeneration

Type III acromion
- MR sensitivity 91%
- 2 times more common than complete tear
- Surface defect [Articular- Bursal]
- Small amount of fluid in the subacromial bursa
- MR arthrography in articular surface partial tear
- Abduction and external rotation (ABER) may help
Partial Tendon tear
Partial Tendon tear
Tendenopathy complicated by partial tear
**Primary signs**

- Tendon defect → communication between the glenohumeral joint and subacromial bursa.

- Full thickness tear

- MR sensitivity 88%
Full thickness tear

- Length of the gap
- State of the muscle
- Tendon defect
- Complete absence → humeral head in direct contact with the acromion
Full thickness tear
Full thickness tear

Secondary signs

- Fluid in the subacromial bursa
- Muscle retraction
- Obliteration of the peritendinous fat by granulation tissue
34% of asymptomatic individuals have rotator cuff tears
54% of asymptomatic individuals above 60 years have tears
Deposition of calcium in the supraspinatous tendon → ↑ tendon thickness

- Low signal in T1 and T2 WIs
- Usually asymptomatic
- Pain in 30-45% of cases
- Common at the critical zone
Calcific tendinitis
It is recommended that the term *tendinitis* not to be used in MR reports unless a definite relationship to tendon inflammation can be substantiated.
Infraspinatus Tendon
- Rare
- Young athletes
- Seen in all imaging planes
Abduction, external rotation, ABER
Subscapularis Tendon
- Uncommon
- Old patient with recurrent dislocation
- Axial images
- Supra and infraspinatous tears
- Biceps tendon abnormalities
Progressive painful compression of the supraspinatus tendon

- Usually affects the critical zone
- 95% rotator cuff tears result from chronic impingement
Osseous abnormalities

- Acromion shape, 4 types
- AC osteoarthritis
- Flat undersurface 47%
- Curved inferior surface 39%
- Anterior hook or peak 11%
- Convex under surface 3%

**Acromial shapes**

**Sagittal**

[Images of acromial shapes with percentages and labels]
80% of patients with rotator cuff tears have type III acromion
Osseous abnormalities

Impingement syndrome

AC osteoarthritis

Callus + osteophytes $\rightarrow$ impingement, subchondral cysts + marrow edema
Soft tissue abnormalities

- Supraspinatous tendon
  - Tendinosis
  - Calcific tendinitis
- Subacromial brusitis
- Biceps tendon abnormalities
Bursae

- Subacromial / subdeltoid bursa
- Subscapularis bursa
- Subcoracoid bursa

Communicates with the joint space in cases of full thickness tear of supraspinatus
Subacromial brusitis

- Fluid above the supraspinatous tendon with intact supraspinatous tendon = brusitis
Between the subscapularis and the MGHL may communicate with the joint space.

Between the coracoid process and subscapularis muscle communicates with the joint space.
AC osteoarthritis with supraspinatous tendenopathy
Subscapularis tear with joint effusion extending around the biceps tendon
Supraspinatus partial articular surface, tear with normal infraspinatus tendon
Supraspinatous partial, bursal surface, tear with SLAP type III lesion
Anatomy and technique
AC osteoarthritis with supraspinatous full thickness tear
Supraspinatous tendenopathy
Supraspinatus partial, articular and bursal surface, tears
AC osteoarthritis with supraspinatous tendenopathy and bursitis
AC osteoarthritis with supraspinatous full thickness tear, with severe muscle atrophy.
Supraspinatous partial thickness tear bursal surface
Supraspinatous tendinopathy and bursitis
سبحانك اللهم و بحمدك × نشهد ان لا اله الا انت × نستغفرك و نتوب اليك

Thank you

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