Diagnostic Imaging Pathways - Shoulder (Pain or Instability)

Population Covered By The Guidance

This pathway provides guidance on the imaging of adult patients with new onset traumatic and non-traumatic shoulder pain or instability.

Date reviewed: August 2013
Date of next review: 2017/2018
Published: October 2013

Quick User Guide

Move the mouse cursor over the PINK text boxes inside the flow chart to bring up a pop up box with salient points.
Clicking on the PINK text box will bring up the full text.
The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>RRL</th>
<th>EFFECTIVE DOSE RANGE</th>
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</thead>
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<tr>
<td></td>
<td>None</td>
<td>0</td>
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<tr>
<td></td>
<td>Minimal</td>
<td>&lt; 1 millisieverts</td>
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<td>Low</td>
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<td>5-10 mSv</td>
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<tr>
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<td>High</td>
<td>&gt;10 mSv</td>
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Pathway Diagram
Image Gallery

Note: These images open in a new page

1. **Anterior Shoulder Dislocation**
   
   Image 1 (Plain Radiograph): Anterior shoulder dislocation showing anterior, medially and inferiorly displaced humeral head.

2. **Supraspinatus Tendon Tear**
   
   Image 2 (Ultrasound): Full thickness supraspinatus tendon tear of the left shoulder (arrow).

3. **Glenoid Labral Tear**
Teaching Points

- Plain radiography is the initial diagnostic modality for the evaluation of traumatic shoulder pain.
- If impingement syndrome is suspected due to rotator cuff insufficiency, ultrasound is recommended in addition to plain radiography.
- CT of the shoulder may be useful in complex fracture-dislocation injuries of the shoulder, as a presurgical tool.
- MRI is useful as an alternative in suspected rotator cuff insufficiency, when ultrasound is not available or in complex cases.

Plain Radiography

- Initial investigation of choice for all shoulder problems.
- Can detect most fractures, dislocations, calcific tendonitis and other skeletal causes of pain such as arthritis and bone tumour.
- Different situations require different types of plain films (AP/lateral/axillary views). Shoulder trauma protocols should have 3 views, 2 of which are orthogonal.
  - Axillary, scapular Y-view and AP view in trauma.
  - Routine axillary views in non-traumatised shoulder.
  - Impingement views in clinically suspected impingement syndrome and/or rotator cuff tears to detect subacromial spur.

Ultrasoundography

- High accuracy in the detection and staging of full-thickness rotator cuff tears, but less sensitive in partial-thickness tears.
- A recent meta-analysis reported a pooled 96% sensitivity and 93% specificity for full thickness rotator cuff tears and 84% sensitivity and 89% specificity for partial thickness rotator cuff tears compared to arthroscopic or open surgical findings as the reference standard.
- US is comparable to MRI in the hands of an experienced user. In many institutions, US has replaced MR imaging in the initial evaluation of rotator cuff.
- Equally sensitive but less specific than MR arthrography in the detection of full thickness tears, and less accurate than MR arthrography in the detection of partial thickness tears.
- May be considered in the evaluation of patients >40 years of age with primary traumatic anterior shoulder dislocation as rotator cuff tear is more common in this age group.
- Useful in guiding aspiration of calcium deposits or bursal injections.
- Useful in evaluating the long head of biceps tendon.
- Advantages: no ionising radiation, non-invasive, no contrast agent, relatively inexpensive, readily available.
- Limitations:
  - User-dependent.
Less sensitive in detecting partial thickness rotator cuff tears 7, 8
Cannot accurately evaluate the labral-ligamentous complex and other deep shoulder structures

Magnetic Resonance Imaging (MRI)

- Allows accurate assessment of soft tissue injuries and has significant clinical impact 11
- Highly accurate in the assessment of full thickness rotator cuff tears. A recent metaanalysis reported a pooled 91% sensitivity and 97% specificity for full thickness rotator cuff tears and 80% sensitivity and 95% specificity for partial thickness rotator cuff tears, compared to surgical procedures as the reference standard 12
- Equally sensitive to MR arthrography and comparable in clinical impact for full thickness rotator cuff tears, but less accurate in the detection of partial-thickness tears 8,11-13
- Comparable accuracy to US in the assessment of both full and partial thickness rotator cuff tears, but less accurate in the detection of partial-thickness tears 8
- Indicated in the investigation of rotator cuff disease when US expertise is unavailable or when further investigation of rotator cuff pathology is needed

Advantages
- No ionising radiation
- Non-invasive
- Demonstrates other lesions such as acromioclavicular joint osteoarthritis, occult fractures and avascular necrosis
- Comprehensive display of soft tissue anatomy
  - Demonstration of the causes for impingement
  - Useful in characterisation and staging of bone tumours

Limitations
- Less specific than MR arthrography for rotator cuff tears, and less sensitive for detection of partial tears 8

MR Arthrography

- Involves an MRI following the intra-articular injection of a dilute contrast agent (gadolinium)
- Most accurate imaging modality for defining
  1. Rotator cuff pathology 8,11,14
     - 96% sensitive, 99% specific and 98% accurate for full thickness tears, and 80% sensitive, 97% specific and 95% accurate for partial thickness tears compared to arthroscopy 14
     - Superior depiction of partial-thickness tears compared to conventional MRI 11
     - MR arthrography is less sensitive for bursal-sided partial thickness tears than articular-sided partial thickness tears 15
  2. Labral/capsule abnormalities in gleno-humeral instability 16,17
- Disadvantages: invasive, limited availability and high expense. Some studies report limited clinical value in patients already destined for arthroscopy 18,19

Computed Tomography (CT)

- Superior to plain radiographs in evaluation of complex fractures and fracture-dislocations involving the head of the humerus 3,20
- Allows planning of treatment of complex proximal humeral fractures \(^{3,20}\)

**CT Arthrography**

- Role has been largely taken over by MR arthrography
- Alternative for assessment of gleno-humeral instability (usually following dislocation) when MRI is unavailable \(^{21-23}\)
- Allows accurate evaluation of labral abnormalities \(^{21}\)
- Poor accuracy in the detection of partial thickness rotator cuff tears \(^{21,23}\)

**References**

**Date of literature search:** May 2013

The search methodology is available on request. Email

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. Download the document

12. Smith TO, Daniell H, Geere J-A, Toms AP, Hing CB. The diagnostic accuracy of MRI for the


Shoulder (Pain or Instability)

- Arthrogram
- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Ultrasound

Contrast Medium (Gadolinium versus Iodine)

- Gadolinium Contrast Medium
- Iodine-Containing Contrast Medium
- Magnetic Resonance Imaging (MRI)
- Plain Radiography/X-rays

Radiation Risk of Medical Imaging During Pregnancy

Radiation Risk of Medical Imaging for Adults and Children

Ultrasound

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