Shoulder Injuries

Matt Woronczak
Advanced Musculoskeletal Physiotherapist – Emergency Department
Dandenong Hospital

the.emergencyphysio.com
Role of the Emergency Department

- Need to be mindful of WHAT IS IMPORTANT TODAY and hence what needs to be done right now:
  - Rule OUT significant pathology which might require immediate or prompt attention
    - Know your population, including what injuries are likely and which significant injuries need to be ruled out
  - Appropriately manage identified pathology and refer on to most appropriate service
Role of Imaging

- X-rays and other diagnostic imaging modalities may form a PART of the assessment of a limb injury, but they are not the FULL assessment.

- The patient should be examined as thoroughly as possible and a decision made as to whether imaging might be indicated and what the most appropriate modality might be.

- It is not always possible to perform a complete examination using all available tests on someone with an acute injury, due to pain / swelling. It is therefore important to realise the tests which are going to help rule out the most significant pathology.
Shoulder Complex
Shoulder Complex

- The shoulder complex consists of the:
  - Glenohumeral Joint
    - A ball and socket joint with a relatively shallow cup, which is very mobile and inherently unstable
    - Supported by series of ligaments, a labrum (which deepens the cup) and the rotator cuff to provide passive and dynamic stability
  - Scapulothoracic Joint
  - Acromioclavicular Joint
  - Sternoclavicular Joints
- Particular muscles will have a designated function on specific joints
- Dysfunction in any joint or the muscles and stabilising structures will affect the ability to move the shoulder complex
Shoulder Complex
Shoulder Movement

- For shoulder abduction, which has about 180 degrees of movement:
  - Only 120 degrees are from the glenohumeral joint
  - Need 90 degrees of external rotation for the greater tubercle to clear the coracoacromial arch; if cannot ER, then cannot abduct > 90
Shoulder Movement

- For shoulder abduction, which has about 180 degrees of movement:
  - Only 120 degrees are from the glenohumeral joint
  - 60 degrees from the scapulothoracic joint
    - In the first 90 degrees of abduction, there is clavicular elevation
    - In the last 90 degrees, there is clavicular posterior rotation
Shoulder Muscles

- Due to the complexity of the joint, there are many muscles involved in shoulder movements:
  - Rotator Cuff
    - Stabilise the shoulder joint (all)
  - External rotators (and assist in shoulder elevation)
    - Supraspinatus
    - Infraspinatus
    - Teres Minor
  - Internal rotators
    - Subscapularis
Shoulder Muscles

• Due to the complexity of the joint, there are many muscles involved in shoulder movements:

• Biceps Mechanism
  • Long head biceps
  • Labrum
Shoulder Muscles

- Due to the complexity of the joint, there are many muscles involved in shoulder movements:
  - Deltoid (power muscle)
    - 3 parts
      - Anterior – flexes shoulder
      - Middle – abducts shoulder
      - Posterior – extends shoulder
Shoulder Movement

- Scapular Stabilisers
  - Trapezius
  - Serratus Anterior
  - Rhomboids

- Other Power muscles
  - Pectorals
    - Adduction / horizontal flexion / internal rotation
  - Latissimus Dorsi / Teres Major
    - Adduction / internal rotation
SHOULDER ASSESSMENT
Shoulder

- What do we want to rule out?
  - Neurovascular compromise
  - Fracture
  - Dislocation
  - Significant soft tissue injury that requires prompt attention
    - Distal Biceps
    - Triceps
    - Massive Rotator Cuff tear in the younger person
  - Infection
  - Foreign bodies
  - Weird bony problems
    - Cysts
    - Tumours
    - Pagets, etc
Shoulder Assessment

- Subjective
  - If acute injury, get an idea:
    - Mechanism (understand the forces involved)
      - Longitudinal force
      - Abduction / ER
      - Lifting (traction)
  - Ability to continue
  - Management so far
Shoulder Assessment

- Subjective
  - Ask if any problems in that area before
    - How long has it been there?
    - What tends to stir it up?
    - What helps?
    - How long does it take to settle after activity?
    - How is it the next day? (especially in the morning)
    - Investigations / management

- Handedness

- Enquire about activity level (including occupation, sports)
  - Type
  - Duration
  - Frequency
Shoulder Assessment

- Observation

- Expose the part!
Shoulder Assessment

- Observation
Shoulder Assessment

- Observation
  - Deformity, Swelling
  - Redness, heat
Shoulder Assessment
Shoulder Assessment
Shoulder Assessment

- Observation
  - Distal neurovascular function
    - Colour, Movement, Warmth, Sensation
    - Capillary Return
    - Peripheral Pulses
  - Nerve function
    - Radial
    - Median
      - Anterior Intenoseus Nerve
    - Ulnar
    - Axillary nerve

- 8% of children with upper limb fractures have a nerve injury¹
- Nerve injuries in shoulder dislocations²:
  - 37% Axillary nerve
  - 29% Suprascapular nerve
  - 22% Radial nerve

¹ ROCK, PAPER, SCISSORS, OK': INTRODUCTION OF A SIMPLE GUIDELINE TO IMPROVE NEUROLOGICAL ASSESSMENT IN PAEDIATRIC PATIENTS PRESENTING WITH UPPER LIMB FRACTURES
A.G. Marsh, J. Robertson, A. Godman, J. Boyle, J. Huntley

Distal Neurovascular function
Shoulder Assessment

- AROM of shoulder
  - Flexion / Extension
  - Abduction / Adduction
  - HBB
  - ER / IR
  - Horizontal flexion

- Also need to consider joints above and below
  - Elbow – flexion / extension / supination / pronation
  - Chest wall
Objective Assessment

- Range of motion
  - Disregarding pain as a cause, where there is loss of ROM (for a non-fracture), discrepancy between ACTIVE and PASSIVE ROM may help to differentiate the problem
    - If there is less active ROM than passive ROM, this can indicate a muscular deficiency (e.g., rotator cuff tear)
    - If there is no difference between active and passive ROM, then it is likely that joint stiffness is limiting the ROM (e.g., Frozen Shoulder)
Shoulder Assessment

- **Palpation**
  - From medial of clavicle to at least elbow

- **Special Tests**
  - 30+ shoulder tests – most relatively useless in isolation
  - Murrell – Combined Tests:
    - Combined tests:
      - A positive impingement sign (internal or external rotation)
      - Weakness in external rotation
      - Weakness in supraspinatus (empty or open can)
    - Drop arm –ve
      - 98% chance of no rotator cuff tear

<table>
<thead>
<tr>
<th>Clinical Tests Positive</th>
<th>Age</th>
<th>Chance of Rotator Cuff Tear</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 3</td>
<td>Any</td>
<td>98%</td>
</tr>
<tr>
<td>Any 2</td>
<td>&gt;60</td>
<td>98%</td>
</tr>
<tr>
<td>None</td>
<td>Any</td>
<td>5%</td>
</tr>
</tbody>
</table>
Deciding to Image

- X-rays expose the patient to radiation, so we want to minimise the risk
  - Does it need to be done at all?
    - No commonly used decision making tools for shoulder imaging
    - Given importance of upper limb function, generally have a low threshold for imaging
      - Deformity
      - Swelling
      - Reduced ROM
      - Bony tenderness

- Have they had images taken prior to coming here that they do not have with them?
  - Can we view them online?
  - Can we get them transferred across from another site

- Are they (or could they be) pregnant? (on Symphony asks from 12-60)
  - If could be – urine pregnancy test
# Imaging Modalities

<table>
<thead>
<tr>
<th>Modality</th>
<th>Use</th>
<th>Radiation Dose (mSv)</th>
<th>Equivalent Normal Background Radiation</th>
<th>Increased risk of Ca from Ix</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray</td>
<td>Bony pathology, foreign bodies</td>
<td>0.005</td>
<td>&lt;1 day</td>
<td>1 in 11,000,000</td>
</tr>
<tr>
<td>CT</td>
<td>Clarification and classification of fracture</td>
<td>0.15</td>
<td>1 month</td>
<td>1 in 76,000</td>
</tr>
<tr>
<td>Bone Scan</td>
<td>Suspicion of malignancy; was previously used for potential stress injury but out of favour now with MRI</td>
<td>6.3</td>
<td>1.8 years</td>
<td>1 in 1,800</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Identification of soft tissue problems (ambiguous tendon pathology, ? UCL rupture) or foreign bodies not visible on x-ray</td>
<td>Nil</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>MRI</td>
<td>Soft tissue injuries where diagnosis is unclear; can show bone marrow oedema / fractures as well (although CT better for just bone)</td>
<td>Nil</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Deciding to Image

- Remove clothing, jewellery where possible
  - Creates a shadow
Principles of X-rays
Principles of X-rays

- X-rays are a 2-dimensional representation of a 3-dimensional structure

- As such, we ALWAYS need AT LEAST 2 orthogonal views (ie at 90 degrees to each other – usually at least an AP or PA and a lateral)
  - There are also special views for particular areas or when looking for particular pathologies

- Each of the views are relative to the part requested
  - For the shoulder, the images are AP and lateral to the SHOULDER
  - For the humerus / Clavicle / AC jt views, although the shoulder is included, the images are AP and lateral to the those bones / joints.
Standard Shoulder Views

Shoulder - AP

Shoulder – Y view Lateral
Other Shoulder Views

External rotation

Internal rotation

Shoulder – External Rotation

Shoulder – Internal Rotation
AC Joint

L

WEIGHT BEARING
Clavicle

Clavicle AP

Clavicle AP 20 degrees cephalad
Humerus

Humerus - AP

Humerus - Lateral
Principles of X-rays

- SYSTEMATIC APPROACH TO INTERPRETATION
  - First Impression
    - Anything obvious?
  - Adequacy
    - Neither under (too light) or over exposed (too dark)
    - Joints above and below the area of concern are visualised
  - Alignment
    - The type of x-ray views taken and the anatomical site visualised
Principles of X-rays

- B
  - Bones
    - Outline
      - The contours of the bone should be followed and any abnormality commented on
    - Density
      - Look at each bone in sequence and comment on whether it is:
        - Radiolucent = thinner bone (eg osteopenic)
        - Radioopaque = thicker than surrounding bone (eg Paget’s disease, chronic osteomyelitis, osteochondritis)
      - Check for trabecular interruption
Principles of X-rays

- C
  - Cartilage
    - Outline
  - Joint space
  - Loose bodies

- D
  - Don’t stop
    - Complete a full assessment of the entire image – don’t just stop when you find something!
Describing Findings

- Describe
  - Swelling
  - Foreign objects
  - Wounds
  - Fractures
  - Dislocations
  - Other bony findings eg ossicles

- Know your ANATOMY!
Describing Findings

- Location
  - Anatomical
    - Clavicle divided into medial, middle and lateral thirds
Describing Findings
Describing Findings

External rotation

Internal rotation
Describing Findings

- Radiolucent / Radiodense
  - Allows radiation to pass freely = transparent (more dark)
  - Eg fracture line

- Radio-opaque
  - Obstructs passage of radiant energy (more white)
  - Eg metal
Describing Fractures

- Pattern
  - Transverse / Horizontal
  - Vertical / Longitudinal
  - Oblique
  - Spiral
  - Comminuted
  - Stellate
  - Depressed
Describing Fractures

- Displacement
  - Undisplaced
  - Displaced
    - Describe the distal segment relative to the proximal segment, in the anatomical position

- Articular
  - Extra-articular
  - Intra-articular
    - Step / defect

- Angulation
  - Discuss in terms of the distal segment relative to the proximal segment in the anatomical position
Describing Subluxations and Dislocations

- **Location**
  - Which joint
    - Eg Glenohumeral joint or AC joint

- **Subluxation / Dislocation**
  - Subluxation = Partial loss of joint congruency
  - Dislocation = Complete loss of joint congruency

- **Pattern**
  - Which direction (relative to the anatomical position)
    - Posterior / Anterior

- **Other injury**
  - Is there associated bony injury (see previous slide)
Anterior Dislocation
Hill Sach’s Lesion
Bankart Fracture
Luxation Erecta
Posterior Dislocation
Lightbulb / Globe Sign
AC Joint
## AC Joint Injury – Rockwood Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>AC joint strain</td>
<td>Normal radiograph</td>
</tr>
<tr>
<td>Type 2</td>
<td>AC disrupted, CC strain</td>
<td>Mild vertical separation (normal AC interval 5-8 mm)</td>
</tr>
<tr>
<td>Type 3</td>
<td>AC and CC disrupted</td>
<td>CC distance 25-100% of contralateral side</td>
</tr>
<tr>
<td>Type 4</td>
<td>Distal clavicle positioned posterior to acromion</td>
<td></td>
</tr>
<tr>
<td>Type 5</td>
<td>Subcutaneous distal clavicle</td>
<td>CC distance &gt;100% contralateral side</td>
</tr>
<tr>
<td>Type 6</td>
<td>Distal clavicle positioned inferior to coracoid</td>
<td>Rare: Deep to conjoined tendon (coracobrachialis, short head biceps)</td>
</tr>
</tbody>
</table>

![Image of AC joint types](image)
AC Joint Injuries
Substantial Rotator Cuff Tear

- Exceptionally rare in children (more likely to fracture something)

- Younger adults, particularly involved in sport, or physical activities more likely to benefit from operative management
  = if suspicious of same, consider early US (via GP)

- Older adults (with less physical requirements) often do quite well with conservative management
Proximal Humeral Fractures
Glenohumeral Joint Dislocation
Glenohumeral Joint Dislocation

Shoulder Dislocation

- 90% of first time shoulder dislocations will involve tearing of the labrum (as well as tearing of the ligaments)
  - In recurrent dislocators, this usually hasn’t healed
- Most vulnerable position for the shoulder is abduction / external rotation = need to avoid for 6/52
- Need to strengthen shoulder muscles up
- Rx
  - Sling for comfort only
  - Avoid Abd / ER for 6/52
  - Physio once pain settles to start rehab (in non-threatening positions initially, but eventually into the vulnerable position)
Acromioclavicular Joint Injury
Acromioclavicular Joint Injury

- Paediatric and younger patients (older more likely to # NOH)
- FOOSH / Hip and shoulder / Fall onto point of shoulder
Acromioclavicular Joint Injury
Clavicle Fractures
Clavicle Fractures

- Paediatric and younger patients (older more likely to # NOH)
- FOOSH / Hip and shoulder / Fall onto point of shoulder
Clavicle Fractures
Clavicle Fractures

- Operative Intervention
  - Lateral clavicle fractures
  - Medial clavicle fractures potentially
  - Shortened midshaft (heals <2cm shorter)
Shoulder Assessment
Shoulder Assessment
Shoulder Assessment
SHOULDER
SHENANIGANS
CASE STUDY 1
Case Study 1

- 23 year old male
- Playing football – collided with another player = took blow to L shoulder and root of neck
- Triage:

BIBA - L) clavicle pain and deformity post collison with another football player. NV obs - limited ROM. 3mls penthrane, 10mg morphine and now not distressed with pain at triage. BP 120/-, HR 86, SaO2 99%, RR 16, chest clear
Case Study 1

- **Subjective**
  - L medial clavicular pain >> neck pain

- **Objective**
  - Obvious lump to medial clavicle / SC jt region – appears to be protruding anteriorly
  - Midline bony tenderness to neck “C5-C7”
  - Tender+++ lump medial end of clavicle
  - **Neurological exam**
    - Sensation normal
    - Power normal below elbow; unable to test above due to pain
    - Could not assess reflexes on injured side
Problem

- Requires Cx imaging as per NEXUS low risk criteria:
  - Cervical spine imaging IS indicated unless ALL of the following criteria are met:
    - No midline tenderness*
    - No focal neurologic deficit
    - Normal alertness
    - No intoxication
    - No painful distracting injury*
Problem

- Needs cervical spine imaging
- Patient could not lie flat due to shoulder pain (couldn’t go lower than 45 degrees)
- Collar would rest on bump on medial end of clavicle
- Luckily, patient sensible and compliant
- Clavicle, cervical spine imaging requested
Case Study 1
Case Study 1

Left clavicle
Clinical
Trauma
No fracture or dislocation
Case Study 1

[Images of radiographs showing cervical spine]
Case Study 1
Case Study 1
Case Study 2

- CT
  - Posterior dislocation SC jt
  - T1 spinous process # (no Mx)

- Patient admitted for 4/7, then discharged home and had surgery 9/7 post injury
Case Study 2

- 16/17 yr old male
- Well known to department over the previous year with various dislocations / re-dislocations & fractures / re-fractures
- Didn’t attend any followup in OPs
Case Study 2

- 16/17 yr old male
  - Well known to department over the previous year:
    - Dislocated shoulder with glenoid fracture
      - Put in sling, told not to use and referred to clinic for followup
      - Did not attend clinic and subsequently attended ED 4 more times over the next 3/52 with dislocations – dirtbike riding, playing football etc
      - I attempted to reason with patient who did not want to refrain from these activities. Mother not helpful. Also stressed importance of clinic followup which patient again did not attend

- Midshaft clavicle # with overlap
  - Reattended without sling complaining of pain
  - Failed to attend clinic
  - Fell again after 3-4 weeks motocross riding and re-fractured
  - Did not attend clinic

- Didn’t attend any followup in OPs
Case Study 2

- Presents about 3/12 after last clavicle re-# after a click at fracture site after elevating same to pick up something from the cupboard
- Reporting discoloured, cold L upper limb when elevating
- No symptoms at other times
- Persisting deformity
Case Study 2

- Objective:
  - Strong radial pulse but possibly weaker than other side
  - Otherwise distal NV function normal
  - If elevates arm, upper limb appears mottled and hand becomes cool
Case Study 2

- **Ultrasound Report** (Arterial and venous ultrasound of the left upper limb)
  - The left subclavian vein is patent
  - There is an *abdominal* flow at rest and of abduction
  - No DVT is identified
  - There is complete loss of flow within the subclavian artery at 45 degrees of abduction.
  - **Appearances are compatible with thoracic outlet syndrome. This may be post-traumatic given previous clavicular fracture. No evidence of venous obstruction.**
Thoracic Outlet Syndrome (TOS)

The thoracic outlet syndrome is a group of symptoms arising not only from the upper extremity, but also from the chest, neck, and shoulders. The symptoms are produced by a positional, intermittent compression of the brachial plexus and/or subclavian artery and vein.

Area of tingling or pain

Costoclavicular (Edens) syndrome
- Clavicle compressing vessels and nerves from the neck

Scalenes-anticus syndrome
- Scalenes compressing artery and nerves from the neck

Hyperabduction syndrome
- Pectoralis minor compressing vessels and nerves from the neck
Case Study 2

- CT Angiogram Report
  - The examination is performed with the arm in adducted position to demonstrate the normal anatomical disposition of the subclavian artery and vein.
  - Both the subclavian artery and vein are normal - no evidence of dissection or false aneurysm.
  - The anterior margin of the subclavian artery is 1 cm from the posterior aspect of the fractured clavicle/callus complex.
  - The subclavian vein is virtually in direct contact with the posterior aspect of the fractured clavicle/callus complex.
  - In the adductor position, there is no evidence of obstruction of either the vein or the artery.
  - The internal mammary artery and the proximal portion of the left vertebral artery and their origins from the subclavian artery are normal. The axillary artery is also normal.
Case Study 2

- CT Angiogram
Case Study 2

- CT Angiogram
Case Study 2

- CT Angiogram
• Supposed to go to clinic for review post op this week
CASE STUDY 3
Case Study 3

- 90 year old female
- Fall in garden - ? why – landed on R side
- R shoulder pain radiating down arm

| cranial nerves - normal eye movements, normal facial sensation and movements, nil tongue deviation, PEARL |
| upper limbs - 5/5 power left side, 4/5 right side due to pain, normal tone, brisk reflexes, sensation and coordination intact |
| lower limbs - 5/5 power, normal tone, unable to elicit knee or ankle jerk, plantars downgoing, sensation intact |
| soft calves, nil oedema, non tender |
| right shoulder joint painful and distal end of humerus painful, limited motion due to pain |
| ? humerus fracture |

- xray
- analgesia
- bloods
- urine

right humerus and elbow xray - NAD
CXR - ?blunting of right costodiaphragmatic recess
Case Study 2
Case Study 3
Case Study 3

- Secondary Physio referral in the AM
- Move wrist – OK
- Move elbow – OK
- Move shoulder – Problem
- Shoulder clearly dislocated
Case Study 3

- Patient brought to Procedure Room
- Attempted without sedation = no go
- Attempted with NO2 = no go
- With propofol = very difficult, but able to reduce
Case Study 3
Case Study 3
Case Study 3.5
Case Study 3.5
Case Study 3.5
Lesson

- For shoulder problems, GET SHOULDER VIEW!!!! (not humerus)
- Could not see glenoid properly in the humerus view (is AP and lateral to HUMERUS, not SHOULDER)
TEST TIME