

# Shoulder dislocation

## Epidemiology

Anterior shoulder dislocation is the commonest dislocation in the body, and makes up 95% of shoulder dislocations.

It occurs in around 2% of individuals at some stage.

Dislocation is more common in the dominant limb.

In young people it is much more common in males. By the 6<sup>th</sup> to the 7<sup>th</sup> decade it is more common in females.

Instability is bilateral in around 15%.

## Conceptualizing instability

Two acronyms are used to think about shoulder instability:

[Thomas & Madsen]

1. **TUBS**: traumatic unidirectional dislocations with a Bankart lesion, often require surgery.
2. **AMBRII**: Atraumatic multidirectional bilateral shoulder instability, often responds to rehabilitation and occasionally Inferior capsular shift and rotator Interval closure may be required.

## Anatomy and stability

The shoulder has more movement than any other joint, at the expense of stability.

### Bony factors

1. Glenoid
  - Shallow cup, deepened by glenoid labrum, 35mm by 25mm.
  - Has superior tilt of 5 degrees, helping to control inferior instability.
  - Has a retroversion with respect to the body of the scapula of 7 degrees.
  - Cartilage is thicker peripherally, deepening socket.
2. Humeral head
  - Surface has three times the articular cartilage of the glenoid, with only 25 to 30% of the humeral head cartilage articulating at any time with the glenoid.
  - Cartilage is thicker centrally.

Dislocation → Complete separation of glenohumeral surfaces  
Subluxation → Symptomatic " of the surfaces without dislocation

- The radius of curvature of the head and glenoid are normally within 2mm. The glenoid and labrum have a slightly smaller radius of curvature than the humeral head, but with compression of the humeral head into the glenoid with muscular contraction, they become congruent.

### 3. Labrum

- The labral attachment in the anterior superior quadrant is variable, but any detachment below the glenoid equator is believed to be pathological.

### Ligamentous factors

The ligaments act as check reins and are most important at the extremes of movement. They do not act during mid range activities.

1. Superior glenohumeral ligament – extends from the anterosuperior edge of the glenoid, near the origin of LHB, runs to top of lesser tuberosity of the humerus.
  - a. Primarily resists downward movement and external rotation of the humerus with the arm adducted. A sulcus sign present in ER implies a deficient rotator interval and therefore sup gh lig.
2. Middle glenohumeral ligament – originates from the supraglenoid tubercle, superior labrum or glenoid neck. Runs to the inferior half of the lesser tuberosity.
  - a. Resists anterior translation with the arm abducted to 45 degrees
  - b. Most variable of the ligaments; is poorly defined or absent in 40% of population
3. Inferior glenohumeral ligament Complex
  - a. Has two bands (thicker anterior and thinner posterior) separated by an axillary pouch
  - b. The anterior band resists forwards translation with the arm abducted
  - c. The posterior band is a posterior stabilizer with the arm flexed and internally rotated
  - d. Most important ligament complex for GH stability, especially in abduction, whence it forms a pouch or sling for stability.
4. Coracohumeral ligament – runs from the horizontal arm of the coracoid to the transverse humeral ligament.
  - a. Acts in concert with superior glenohumeral ligament
5. Joint capsule
  - a. Reinforced anteriorly by the glenohumeral ligaments
  - b. Weaker posteriorly

SGHL — limits (I) subluxation in adduction  
 stability in (P) & (I) directions

MGHL — limits ER, (P) translation in 45° abduction position, (I) translation in adduction

IGHL — 1° restraint in abduction  
 acts like a hammock  
 3 bands — (A) axillary  
 (P) 2

### *Muscular factors*

The rotator cuff and long head of biceps are vital for dynamic stability. The rotator cuff steers the head during forceful muscular contraction.

The LHB provides dynamic restraint to ant and post translation.

### *Other factors*

Concavity compression

Negative intra-articular pressure.

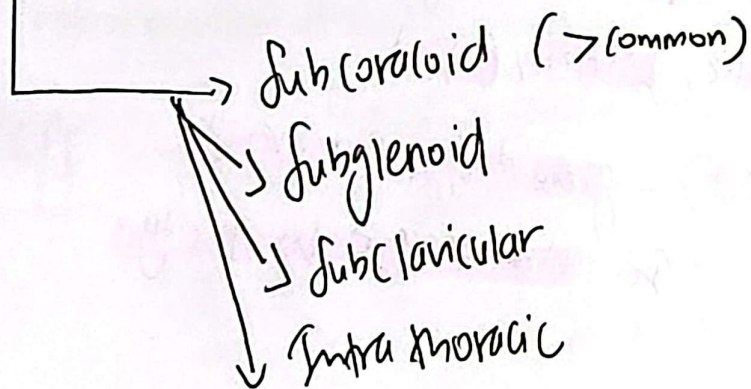
Adhesion/cohesion of joint fluid (this is not seen in shoulder replacement).

These are most important during mid range activities.

## **Anterior shoulder dislocation**

### **Aetiology**

Usually follows a fall onto the upper limb where the humerus is flexed, abducted and externally rotated.





# Restraints

## Static

- 1) Congruity of articular surface
- 2) Glenoid labrum
- 3) Intra-articular -ve (P)
- 4) Capsule
- 5) Ligaments
  - Glenohumeral
    - SHL
    - MGL
    - IGHL
  - Coracohumeral

## Dynamic

- 1) Joint compression force
- 2) Proprioception
- 3) Long head of triceps
- 4) Rotator cuff (M)
- 5) Periscapular (M)

- Pect. Major/Minor
- Lat dorsi
- Teres major
- Coracobrachialis
- Trapezius
- Rhomboid Major/Minor
- Subclavius
- Serratus (R)
- Levator Scapulae
- Triceps long head

### Joint Reaction force

↳ humeral head remain centered in glenoid fossa if

- o glenoid & humeral jt surfaces congruent
- o humeral jt reaction force directed in effective glenoid arc.

# Classification

- 2 reasons why shoulder unstable
- ① Structural changes
  - ② Unbalanced (a) recruitment

## (A) Hawkins

### 1) Frequency

- ACUTE
- CHRONIC
- FIRST TIME
- RECURRENT

### 2) Direction

- (A)
- (P)
- Multidirectional
- Inferior

### 3) Onset

- Traumatic
- Atraumatic
- Overuse

### 4) Volition

- Voluntary
- Involuntary

### 5) Degree

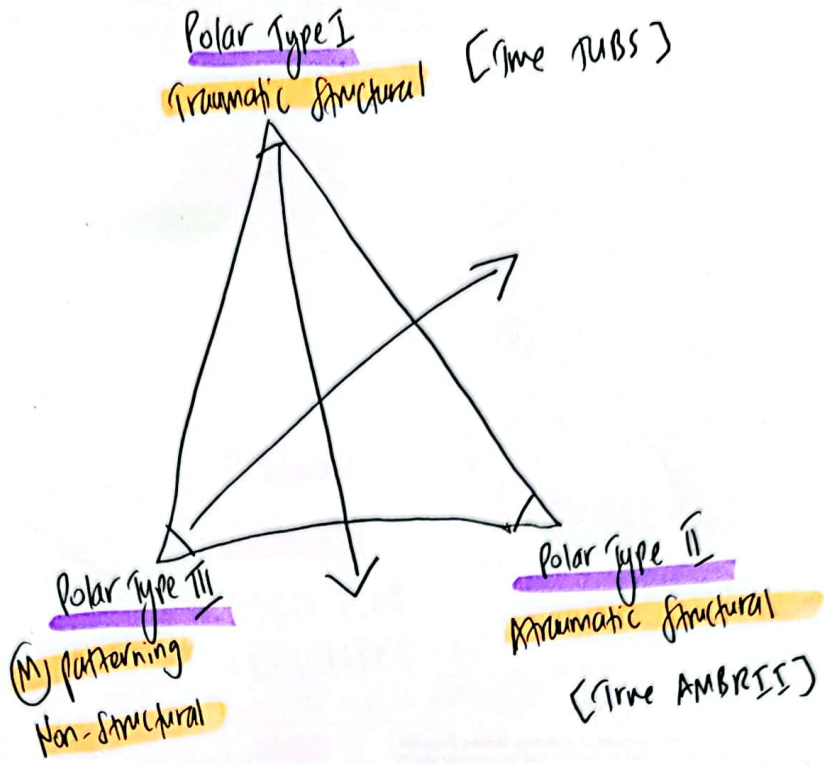
- Dislocation
- Subluxation

## (B) Thomas & Matsen

### 1) TUBS

### 2) AMBRIE

(C) Stannore



⇒ Traumatic instability → loose shoulder, MDI, voluntary dislocation, habitual dislocation  
→ Structural or Non-Structural

Initial assessment

- (A) History
  - Dislocation +/- Lock out
  - Slipping
  - Mechanism
  - Post reduction pain
  - Weakness
- (B) Physical examination
  - ROM & (M) balance, (M) wasting
  - Laxity of jts
  - Provocation signs
  - Assessment of collateral damage [SLAP, Rotator cuff tear, loose body]
- (C) Imaging
  - Xray
  - MRI (to assess extent of damage) [bone, capsule, Labrum, Cuff]
  - CT scan (bony defect) - glenoid dysplasia or #
  - CT arthrography - id labral tears & lig. laxity



SLAP → Tear starts @ 12 o'clock extend from 10 to 2 o'clock  
Bankart → Tear @ 3-6 o'clock position (⊗⊕)

## Pathology

Detachment of the anterior labrum and anterior rim of the glenoid – Bankart lesion.

Indentation on postero-lateral aspect of humeral head – Hill-Sachs lesion

Stretching of inferior glenohumeral ligaments.

In cadavers, a pure Bankart lesion will not cause instability- there must also be stretching of the capsule.

There is further damage to the soft tissues with each dislocation.

## Clinical

In an acute dislocation the patient has typically fallen onto the arm in a flexed, abducted and ER position, then had it reduced and immobilized. A traumatic dislocation will not usually spontaneously reduce.

Ask about the positions that produce the patient's symptoms:

1. If overhead, abducted, externally rotated, think anterior instability
2. If on late cocking when pitching, think anterior instability
3. If flexed, adducted, internally rotated, think posterior instability
4. If on pushing open heavy door, think posterior instability
5. If on follow-through in a throw, think posterior instability
6. If on carrying a heavy suitcase, think inferior instability

In recurrent dislocation, there may be a catching sensation, followed by numbness or weakness (dead arm syndrome) whenever the arm is used in an overhead position, e.g. when serving in tennis. When the arm is in a neutral position it usually doesn't have any symptoms.

The most consistent functional impairment is the inability to throw a ball overhead.

The apprehension relocation test should be positive.

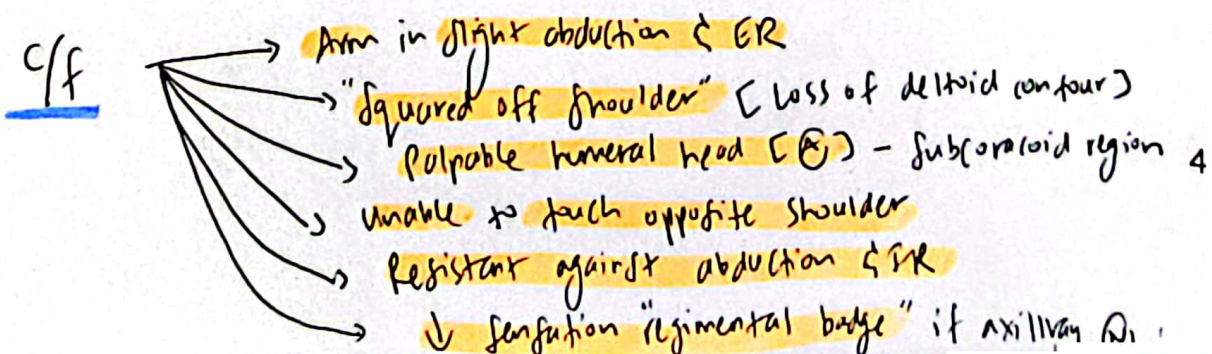
Remember to always test for ligamentous laxity.

## Imaging

Plain XR

If possible, films documenting an initial dislocation should be obtained.

Typical position of the humeral head on the AP is inferior to the coracoid.



A Hill-Sachs lesion will be best demonstrated on an AP with internal rotation; another way of visualizing the Hill Sachs lesion is with the Stryker notch view. This is taken with the hand resting on the head, the patient lying on the table and the AP beam directed 10 degrees cephalad. (P Brouca cleavage defect)

Duckworth prefers an apical oblique view, to show a bony Bankart lesion or a Hill-Sachs lesion.

Note that a Hill Sachs lesion occurs in 38%-90% of patients with a primary glenohumeral dislocation. Patients with a Hill-Sachs lesion have an 82% chance of redislocation, whereas patients without a Hill Sachs lesion have only a 50% chance of redislocation.

CT arthrogram or MRI will reveal an associated cuff tear. Labral tears occur in 56% of patients with anterior dislocation.

Duckworth gets an MRI:

1. If there is no XR evidence of a dislocation, e.g. Bankart lesion, or documented dislocation
2. If the story doesn't add up

#### EUA

This can be particularly useful in the heavily muscled athlete who can't relax properly.

The anterior and posterior drawer signs are often one grade higher when the patient is anaesthetized.

#### Arthroscopy

This can allow examination of the labrum and the undersurface of the cuff and can be combined with EUA.

### Complications

#### Rotator cuff tear

Occurs in more than 40% of patients over 40 and more than 80% of patients over 60.

#### Nerve palsies

Axillary nerve palsies occur in more than 35%.

The risk of an axillary nerve palsy increases with age, duration of dislocation, and force of trauma.

Axillary nerve lesions have a good prognosis for complete recovery.



Arthroscopy

- Accurate assess strc. damage in shoulder
- Assess static & dynamic processes in shoulder
- 'Drive through' sign indicates shoulder laxity
- Differentiate btw. Polar hp II & III

EMG

- To evaluate btw type II & III by studying (N) scapulothoracic rhythm
- Voluntary instability → instability by certain (M)  
ab (N) suppressed while others ab (P) recruited.

R<sub>2</sub>

- Examine & document NV status
- Prepare trolley for (MR ↓ sedation & antidote for the meds.

### (1) Kocher maneuver

- Bring the limb in neutral position
- Traction & External rotation
- ER till 90° avoid excessive force preventing #
- Flexion & Adduction
- DR & patient's hand to opposite shoulder

### (2) Modified Hippocratic Method

- Patient supine
- Traction on shoulder & slight abduction
- Counter-traction to the body & towel wrapped around the axilla

### (3) Milch's technique

- Patient supine
- Surgeon (R) hand upon (L) shoulder & finger support on top of shoulder, thumb against dislocated humeral head
- (R) hand fix the head not to move, (L) hand abducts arm into overhead position. But the head rotates in place.
- Head gently pushed over rim of glenoid & reduce it. (i.e. surgeon's thumb)

### (4) Stimson technique

- Patient prone @ edge of table
- Wt taped to the wrist & 10lb wt hanging from arm



## Treatment

### Reduction

All maneuvers should be gentle, with good levels of sedation and muscle relaxation. Miller et al showed (JBJS 2002) that intra-articular lignocaine (20mL) was safe, effective and patients left hospital much quicker than with intravenous sedation for reduction. Patient monitoring wasn't required.

### *Kocher maneuver*

1. Progressive ER then rapid adduction and internal rotation
2. Associated with iatrogenic fracture
3. Not recommended

### *Spaso technique*

1. The patient is supine. The arm is pulled vertically up to provide traction, then externally rotated slightly to reduce
2. If the pec major starts to spasm at any time back off on traction

### *Stimson technique*

The patient is placed prone on the bed with 10lb of weight hanging from the arm. Reduction takes around 10 minutes.

## Immobilization in sling

### *Position of immobilization*

Usual position is in adduction and internal rotation.

JBJS May 2001: Itoi et al used MRI to show that holding the arm in external rotation actually resulted in better coaptation of the Bankart lesion than holding in internal rotation. They placed arms in 29 degrees of internal rotation and 35 degrees of external rotation to demonstrate this. In internal rotation the anterior portion of the labrum shifts medially and the anterior structures are lax.

A follow up letter commented that MRI of a posterior dislocation showed better coaptation of the ligaments with the arm internally rotated.

Length of immobilization: OKU 7 says that length of immobilization has not been shown to correlate with results. In patients under 22 the incidence of shoulder instability is virtually unaffected by the length of immobilization. Hovelius found in a prospective study that there was no difference in the rate of recurrence of instability between patients slinged for 3 weeks vs. those allowed early use of the arm. One regime is to place in a sling for 3 weeks, starting isometric exercises immediately, then

# Rx plan

## Education / Discussion

- Explain Natural Hx
- Logic for Rx options
- Correct misconceptions

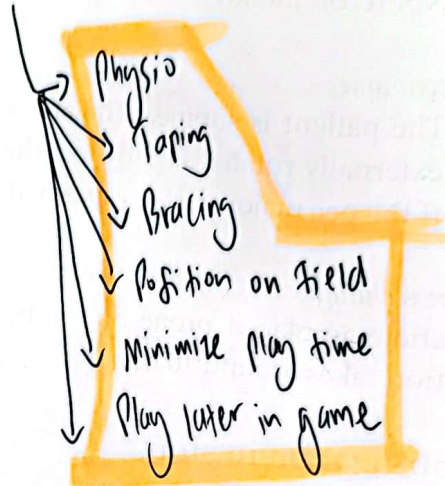
## Elite Athlete

- Discussions (pt, team doctor & coach)
- Timing of intervention relative to season
- duration of rehabilitation

## Arthroscopic Reconstruction

Soft tissue injury & minimal bone involvement

[Simple soft tissue Bankart lesion & SLAP lesion]



## Open Reconstruction

- Bone Bankart lesion
- Large Hill Sachs
- H.A.H.L lesion
- ASSTD - Large rotator cuff tear

## Principles

### Surgical Stabilisation

- Purely structural instability
- traumatic / atraumatic
- R / L / Multidirectional
- subluxed / dislocated

### Non operative

#### (M) patterning

- non
- Struc. instability
- R / L / MDT
- sublux / dislocated

#### Mixed (M) patterning

- Structural instability
- traumatic / atraumatic
- R / L / MDT
- sublux / dislocated

operate if (M) component can be corrected



moving onto isotonic exercises. Patients older than 30 may be placed in a sling for only a week to try to avoid stiffness.

## Physiotherapy

The rotator cuff, deltoid and scapular muscles are strengthened, and range of motion exercises are started after 6 weeks. The patient is allowed to return to sport when he has a full range of motion, and strength equal to the other side, after at least a three month healing period.

Patients with posterior instability tend to do better with nonoperative methods than patients with anterior instability.

## Operative treatment

Can be open or arthroscopic. OKU 7 says open procedure have a lower recurrence rate. Arthroscopic procedures have used staples in the past, with considerable morbidity as the staples migrated, often into the joint or the subacromial bursa. Arthroscopic transglenoid suture techniques have fared better.

1. **Bankart type repair**, with repair of the torn glenoid labrum and capsule (gold standard). Long term followup at mean of 12 years has 92% good or excellent results and redislocation rate of less than 5%.  
*anatomical*
2. **Putti-Platt type repair**, with shortening and double breasting of the subscapularis – provides good stability at the expense of decreased external rotation
3. **Magnuson-Stack repair** – transposition of the subscapularis from the lesser tuberosity to the greater tuberosity  
*non anatomical*
  - a. The Putti-Platt and Magnuson-Stack repairs limit external rotation and lead to a dramatic increase in early onset glenohumeral arthritis.
4. **Bristow-Latarjet repair**, where the antero-inferior capsule is reinforced by redirecting muscles across the front of the joint – the coracoid process with its attached muscles is transposed to the front of the neck of the scapula (conjoint tendon)
5. Boyd-Sisk – transfer of biceps laterally and posteriorly
6. Osteotomies e.g. correction of reduced retroversion angle of the humeral head (Brostrom and Kronberg)

### Technique of Bankart repair (Matsen)

He makes no attempt to tighten the capsule. There is controversy as to whether a capsulorrhaphy should be done in pure ant instability (but it is the only thing to do in MDI)

- Bristow-Latarjet** → high success rate & triple effect
- 1) ↑ or restore glenoid contact surface area
  - 2) Conjoint tendon stabilizes jt when Abd. & ER reinforces ⊕ subscap. & ⊕ capsule
  - 3) Repair of capsule

## Polar Group I

- Surgical stabilisation
  - Anatomical → Bankart repair [Gold Standard]
  - Non anatomical → Rutti-Platt, Magnuson Stack, Bristow-Latarjet

- Bankart repair → restore detached labrum to @ glenoid ∴ reattachingIGHL

- capsular shift adopted to cope w/ 2° capsular stretching after multiple dislocations

↓ defect > 25% of surface area need bone reconstruction

∴ to deepen socket & support capsule

## Polar Group II & III

MDI → Broad term, pts lumped together  
→ instability at least 2 directions

(A) → Atraumatic structural

→ Acquired MDI, 2° repetitive microtrauma giving undue stress on soft tissues or to rapid, forceful movements contribute to dev. of overall laxity of jt

Rule out  
pathological condition  
i.e. labral lesion

↪ assess at (M) patterning

→ ankles (drimmers & throwers)

→ fx of instability 2° overload & fatigue in stabilising  
(M) of shoulder may have dislocation

It → assess (M) patterning & direction of instability

↓ EMG analysis

↪ (M) strength good but co-ordination problem



**A** → biofeedback exercises → improve jt. position sense & relearning correct movement patterns  
improve scapulothoracic & glenohumeral movement patterns

**Surgery**

After movement patterning dealt with

Structural component - bone, cartilage, labral

capsular shift by neer

Laterally based capsular shift to ↓ capsular volume

Laser & Radio freq. capsulotomy

↳ to shrink capsule

for anterior & posterior instability

Goal is to balance capsular tension on all sides

bone procedure

Tensioning anterior & posterior capsule by shifting inferior aspect of capsule

↳ anterior instability

(important for stability of abducted arm)

glenoid neck osteotomy

for excessive retroversion on glenoid

↳ Hill Sachs lesions

↳ autograft bone blocks used < 5% defect

↳ prosthetic replacement > 5% defect

**B** → Atraumatic Non Structural

↳ loss of coordination of antagonistic & synergistic muscles

↳ habitual dislocation

↳ involuntary "

**A**

regain neuromuscular control & patterning

surgery avoided if possible

Deltopectoral approach. Subscapularis and subjacent capsule incised 5mm medial to the lesser tuberosity. The subscapularis and capsule are retracted medially as a unit and the humeral head is retracted with a humeral head retractor. The Bankart lesion is exposed and the labrum held away with an angled spiked retractor. The anterior lip of the glenoid is roughened up, then holes are placed in the glenoid 5mm apart and 3-4mm back from the edge of the glenoid, and using an angled curette the holes are extended onto the anterior aspect of the neck.

The sutures are then passed through the medial capsule and the base of the labrum, and tied so the knots lie over the capsule rather than the glenoid. The subscapularis and capsule is then repaired.

If an unexpected deficiency of the anterior glenoid is noted at surgery, it can be addressed by transferring the coracoid process into the defect.

Postoperatively the patient is limited to passive 90 FF and 0 ER for three weeks, then 140 FF and 40 ER for the next three weeks.

### **Prognosis**

Redislocation rates range from 47% to 100%.

Recurrence can occur regardless of the type or duration of immobilization.

Lavaging the haematoma from an acute dislocation reduces the redislocation rate.

One third of initial dislocations do not recur.

One fifth of recurrent dislocations stabilize spontaneously.

### **Chronic dislocation**

A dislocation is termed chronic if it has been for 6 weeks or more.

If the shoulder has been dislocated for 6 months or more an arthroplasty can be an appropriate salvage.

### **Posterior dislocation**

#### **Epidemiology**

Up to 70% of posterior shoulder dislocations are missed.



## Aetiology

The muscles passing anterior to the shoulder joint axis of rotation are stronger than the ones passing behind, and in a very violent contraction, as in an epileptic fit or electrocution, they may force the humeral head posteriorly.

Labral detachment is only seen in around 10% of cases.

## Clinical

Usually caused by electrocution or fitting.

The arm is flexed, adducted and internally rotated, and attempts at external rotation are resisted.

Recurrent episodes usually take the form of subluxation rather than dislocation.

With posterior instability there may be slight winging of the scapula. Tenderness on palpation of the posterior joint line is seen in 2/3.

The posterior apprehension test (jerk) test involves forward flexion and internal rotation of the shoulder with a posterior force on the elbow. This leads to posterior subluxation, which is reduced by bringing the arm out into abduction. The reduction produces a palpable and audible clunk.

## Imaging

AP may have a light bulb appearance

Axillary view will confirm the diagnosis.

May develop a reverse Hill-Sachs lesion.

May be associated with lesser tuberosity fractures.

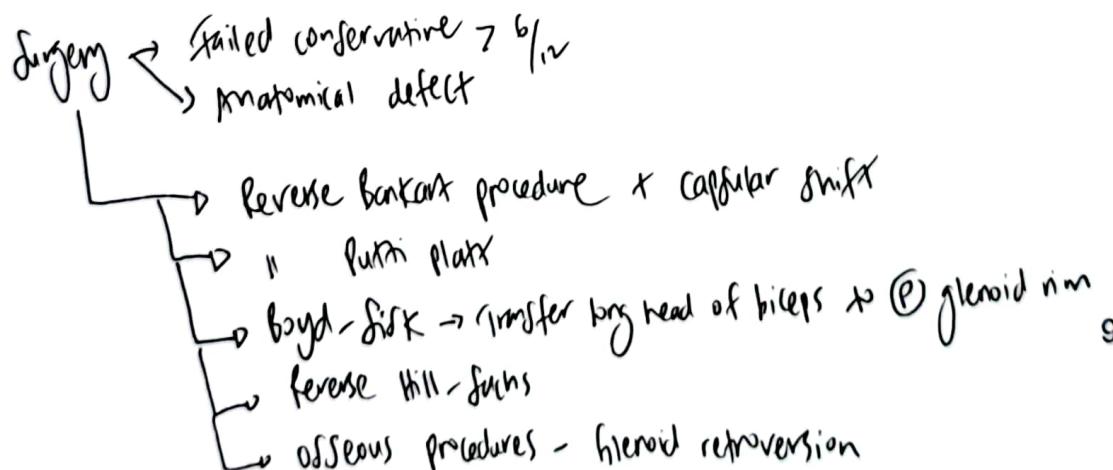
## Treatment

Closed reduction.

Physiotherapy should emphasize posterior deltoid strengthening and external rotator strengthening. → 70% satisfaction following 6/12 rehab

Recurrent dislocations may warrant surgery but the results are not as good as in anterior dislocations.

The posterior capsule may be plicated arthroscopically.



Open techniques include posterior capsulorrhaphy and glenoid osteotomy. The posterior capsular reconstruction may be augmented with a posterior bone block, and the shoulder is held abducted and externally rotated in a spica for 6/52. It has been thought that excessive retroversion of the head may contribute, (treated with an internal rotational osteotomy of the humerus) but this is actually rarely the case. Defects in bony anatomy are rarely implicated, so the usual approach is a posterior capsular shift.

The surgical approach to the shoulder is via a deltoid split, from the posterolateral corner of the acromion (which marks the junction of the middle and posterior thirds), followed by an infraspinatus splitting incision. In the approach, remember that the axillary nerve is 65mm from the posterolateral corner of the acromion (the suprascapular nerve is 20mm medial to the glenoid rim).

A CT scan should be performed prior to operation and if there is excessive glenoid retroversion an opening wedge osteotomy should be considered.

Chronic posterior dislocation can be managed with the McLaughlin operation. This involves reduction of the humeral head and transfer of the subscapularis into the reverse Hill-Sachs defect.

### **Multidirectional instability**

Associated with capsular and ligamentous laxity, and often shoulder muscle weakness and incoordination. The instability may occur during mid range activities.

Little force is required to displace the joint and subluxation may occur during daily activities. The patient feels the joint has become loose and they may feel it slip out and clunk back in with different activities.

Often familial and bilateral, because often reflects developmental abnormalities.

*Often painful, whereas traumatic anterior and posterior instability is often not painful. Other symptoms include transient neurological symptoms, and of course instability.*

Athletes who perform repetitive manouevres eg throwers, gymnasts; can develop mdi of a limb due to the stretching of tissues.

MDI can present as a traumatic dislocation for the first time: it is critical to pick up the difference between MDI and a "TUBS" on examination because the treatment of each are different, and you can make an MDI worse by only operating for anterior instability. Beware the voluntary dislocator- a contra-indication to operative repair.