

Lecture .1.

Injuries of the upper limb:

1-Fractue clavicle

Mechanism of injury:fall on outstretched hand breaks the clavicle(the outer fragment is pulled down by the weight of the arm & the inner $\frac{1}{2}$ is held up by the sternomastoid muscle)

Clinical feature:pain , obvious lump, occassionally sharp fragment threatens the skin , vascular complication are rare.

X-ray: usually # occure in the middle $\frac{1}{3}$ of the bone.

Rx: support the arm in a sling or straapping in figure of 8 bandge until pain subside 2-3 weeks, so active shoulder exercise should encourage.

Complications: malunion, non union , vascular injuiry.

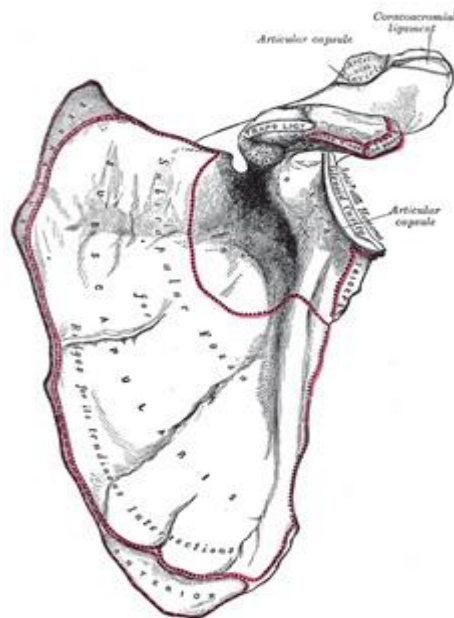
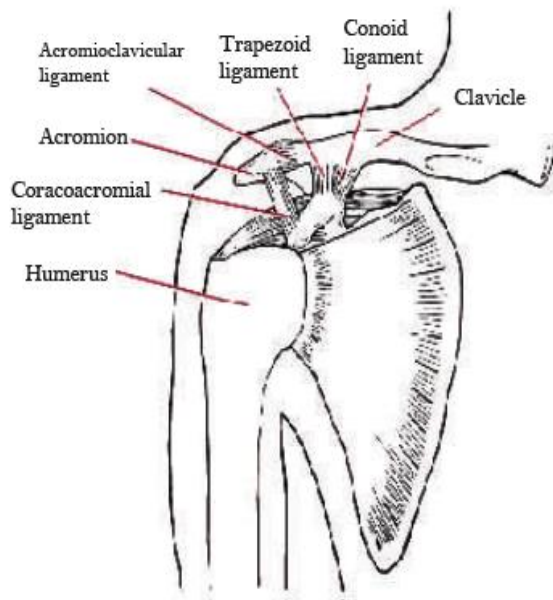
2-Fracture scapula:

Body, neck, acromion, coracoid & may associated with sternoclavicular joint dislocation, or # ribs.

Clinical feature: shoulder movement are painful but possible, also breathing is painful when thoracic injury involved.

X-ray: showing types & site of #.

Rx: reduction is usually unnecessary, sling the arm for comfort & from the start practice exercise of shoulder, elbow & fingers.

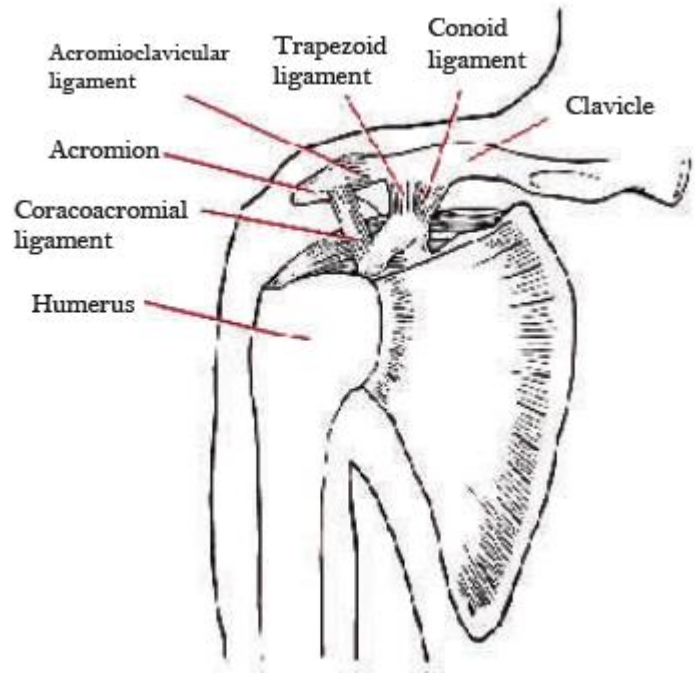


3-The Acromioclavicular joint

How the AC joint is injured?

The AC joint is a quite common sporting injury especially in contact sports. It is usually injured by a fall directly onto the shoulder or a fall onto the arm or a tackle.

The ligaments that bind the clavicle to the acromion are firstly stretched, and then torn. Depending on the severity of the injury the clavicle can tear away from the acromion causing a noticeable lump to appear on top of the shoulder. The injury results in considerable pain, swelling and loss of shoulder movement.



Grading of an AC joint injury:

The most commonly used classification system recognizes 6 severities of AC joint injury.

Grade I

A slight displacement of the joint. The acromioclavicular ligament may be stretched or partially torn. This is the most common type of injury to the AC Joint.



Grade 2

A partial dislocation of the joint in which there may be some displacement that may not be obvious during a physical examination. The acromioclavicular ligament is completely torn, while the coracoclavicular ligaments remain intact.



Grade 3

A complete separation of the joint. The acromioclavicular ligament, the coracoclavicular ligaments and the capsule surrounding the joint are torn. Usually, the displacement is obvious on clinical exam. Without any ligament support, the shoulder falls under the weight of the arm and the clavicle is pushed up, causing a bump on the shoulder.



Grades I-III are the most common. Grades IV-VI are uncommon and are usually a result of a very high-energy injury such as ones that might occur in a motor vehicle accident.

Clinical feature:

Pain with no deformity --→ strain or sublaxation.

Pain with prominent deformity--→ dislocation.

X-ray: slight elevation of the clavicle----->sublaxation, while considerable separation--
-→dislocation .

Rx:

- sublaxation: usually not affect the shoulder function& not require any special treatment only rest the arm in a sling until pain subside(not more than week)& shoulder exercise begin.
- dislocation:in physically active patient open reduction & internal fixation by screw through A.C.J & rest in a sling for 3 weeks, while in physically inactive patient (less demand) treated same as sublaxation(although lump persist ,disability usually mild)

Complications:

osteoarthritis of the A.C.J. , usually treated conservatively, if pain is marked , the outer end of the clavicle is excised.

4-Sternoclavicular joint:

Uncommon injury by fall on outstretched on the shoulder , the inner end of the clavicle is usually displaced anteriorly producing visible or palpable prominence or displaced posteriorly causing pressure on the trachea or large vessels.

Treatment: by a sling& internal fixation carry unnecessary risk.

Complication: slight deformity & might discomfort during strenuous exercise.

5-The Shoulder joint:

One of the large joints that commonly dislocated.

Predisposing factor:

- a) shallowness of the glenoid socket.
- b) extraordinary range of movement.
- c) underlying conditions such as ligament laxity, or glenoid dysplasia.
- d) stressful activity of upper limb.

Anterior shoulder dislocation:

- most common type about 96% of total shoulder dislocation.
- 40% recurrent.
- 15% fracture greater tuberosity.

Mechanism of injury: fall on the hand, the humerus driven forward, tearing the capsule or avulsion of the glenoid.

Clinical features: pain is severe ,the patient support the arm with the opposite hand & try to prevent any kind of examination, feeling of bulge below the clavicle in patient not too much muscular, arm examination for nerve & vessels injury before reduction.

X-ray:-

- **A.P view** will show the overlapping shadow of the humeral head & glenoid fossa with the humeral head usually lying below & medial to the socket.
- **Lateral view** showing the humeral head out of line with the socket.

Treatment: MUA with full relaxation.

Method of reduction:

- 1- Stimson method: Patient prone position with the arm hanging over the side of the bed, after 15-20 minutes, the shoulder reduce.
- 2- Hippocratic method: gentle traction of the arm with shoulder in slight abduction with counter traction to the body.
- 3- Kocher method: by bending the arm 90° without traction, 75° lateral rotation then elbow lifted forward (adducted) & medial rotation, this method not recommended because may cause nerves or vessels or bony injury.
 - X-ray taken to confirm reduction & exclude # & the arm rested in a sling for 3 weeks (in young age group) to decrease incidence of recurrence & 1 week over 30 years old to decrease incidence of stiffness, through this period elbow & fingers movement are encouraged.

Complications:

- **early:**
 - 1- Rotator cuff tear.
 - 2- Nerve injury: axillary nerve is most commonly injured, patient unable to abduct shoulder & small patch of anesthesia over the deltoid muscle, occasionally median, radial, ulnar or musculocutaneous nerves injury.
 - 3- Vascular injury: axillary artery injury before or after reduction so examination for sign of ischemia important (pre & post) reduction.
 - 4- Fracture-dislocation: need open reduction & internal fixation.

- **late:**

- 1- Shoulder stiffness.
- 2- Old unreduced fracture- dislocation:

→if less than 6 weeks ----→trial of closed reduction, if fail open reduction.

→if more than 6 weeks--→ young do open reduction,olderly active neglect.

- 3- Recurrent dislocation.

Posterior shoulder dislocation:

- very rare & form about 2-4% of shoulder dislocation.

Mechanism of injury: this occur most commonly during fit or convulsion or with electric shock, of following fall on to the flexed, adducted arm or blow to the front of shoulder.

Clinical feature: arm held in medial rotation with locking , flattening in front of the shoulder& this type of dislocation usually apparent because swollen may obscure deformity & sometime may be associated with posterior glenoid rim or lesser tuberosity fractures.

X-ray: Posterior dislocation may be missed initially on frontal(A.P) radiographs in 50% of cases, as the humeral head appears to be almost normally aligned with the glenoid.the internally rotated humeral head takes on a rounded appearance known as the light bulb sign& away from glenoid fossa called(empty glenoid sign).Lateral view show subluxation or dislocation.

Treatment: MUA by pulling arm with the shoulder adduction for few minutes then laterally rotation while the humeral head is pushed forward then if :

→reduce& stable sling for 3 weeks----->exercise .

→reduce& unstable → shoulder spica in abduction & lateral rotation for 3 weeks--->exercise.

Complications:

- 1- unreduced dislocation.
- 2- recurrent dislocation.

Inferior shoulder dislocation (Luxatio erecta):

- incidence(1-2)%
- *Luxatioerecta*
 - uncommon form of shoulder dislocation
 - Extremity held over head in fixed position with elbow flexed.
 - Severe hyperabduction of arm resulting in impingement of humeral head against acromion& head felt in or below axilla.

X-ray: humeral head sitting below glenoid& it's important to search for associated #.

Treatment: M UA by pulling the arm upward with counter-traction downward on top of the shoulder , if fail open reduction is needed then the arm rest in sling for 3 weeks to allow soft tissue healing.

Note:

In all of these dislocations , it's important to examine for neurovascular injury before & after the reduction.

Fractures of the proximal humerus:

Usually occur in middle age & most common in osteoporotic & post-menopausal woman, in young age group occur after sever trauma.

Mechanism of injury: fall on outstretched hand; it's either displaced or undisplaced.



Clinical feature;

pain , bruises of the arm & deformity.

Neer classification:

The two main components of the classification are:

1. number of fracture parts
2. displacement

Parts:

The Neer system divides the proximal humerus into 4 parts and considers not the fracture line, but the displacement as being significant in terms of classification. The four parts are:

1. humeral head
2. greater tuberosity
3. lesser tuberosity
4. humeral shaft

Displacement

Displacement is on a per-part basis. A fracture part is considered displaced if angulation exceeds 45 degrees, or if the fracture is displaced by more than 1cm.

As such the simplest displaced fracture which is possible is a two-part fracture, however a minimally displaced fracture, even if this includes multiple fracture lines, merely constitutes an type I, one-part fracture. This classification important in functional outcome & guide to treatment.

Classification

One-part fracture

- fracture lines involve 1 - 4 parts
- none of the parts are displaced (i.e. <1cm **and** <45 degrees)

These undisplaced / minimally displaced fractures account for ~ 70 - 80% of all proximal humeral fractures and are almost always treated conservatively.

Two-part fracture

- fracture lines involve 2 - 4 parts
- one part is displaced (i.e. >1cm **or**>45 degrees)

Four possible types of two-part fractures exist (one for each part):

1. surgical neck: most common
2. greater tuberosity
 - frequently seen in the setting of anterior shoulder dislocation
 - a lower threshold of displacement (> 5mm) has been proposed
3. anatomical neck
4. lesser tuberosity: uncommon

These fractures account for approximately 20% of proximal humeral fractures.

Three-part fracture

- fracture lines involve 3 - 4 parts
- two part are displaced (i.e. >1cm **or**>45 degrees)

Two three-part fracture patterns are encountered:

1. greater tuberosity and shaft are displaced with respect to the lesser tuberosity and articular surface which remain together

2. lesser tuberosity and shaft are displaced with respect to the greater tuberosity and articular surface which remain together

These fractures account for approximately 5% of proximal humeral fractures.

Four-part fracture

- fracture lines involve parts
- three parts are displaced (i.e.>1cm **or**>45 degrees) with respect to the 4th

These fractures are uncommon (<1% of proximal humeral fractures)

The fracture pattern can be complex and difficult to assess adequately with plain x-rays, so a CT scan may be required to better understand the severity of the fracture.

Treatment:

- Type I----> rest the arm in a sling for 6 weeks & active exercise later.
- Type II----> MUA & sling arm for 6weeks , if failure open reduction & internal fixation by percutaneous pinning, plate & screws or intramedullary nailing.
- Type III---->open reduction & internal fixation.
- Type IV---->young age patient by open reduction & internal fixation & reconstruction by interosseous sutures, in elderly patient treated by prosthetic replacement.

Complications:

1-vascular injury.2-stiffness of shoulder joint.3-malunion.4- avascular necrosis.



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Fracture shaft of humerus:

- Traumatic & pathological
- 3-5% of all fractures
- Bimodal age distribution
 - young patients with high-energy trauma
 - Elderly, osteopenic patients with low-energy injuries or due to 2ndary metastasis.
- Fracture location: proximal, middle or distal third.
- Fracture pattern: spiral, transverse, comminuted or oblique.

Clinical features:

- Pain, bruises at site of fracture, radial nerve examination before & after treatment by extension of metacarpo-phalangeal joints.

Holstein-Lewis fracture :

a spiral fracture of the distal one-third of the humeral shaft commonly associated with neuropraxia of the radial nerve (22% incidence).

X-ray: to show types & site of fracture.

Treatment:

Nonoperative

Splint for 7-10 days until pain & odema subside followed by functional brace (3-6) weeks, or using hanging cast from shoulder to wrist joint to pull the fragment in alignment with elbow 90° with sling to neck for 2-3 weeks replaced by functional cast for 6 weeks.

indications

- gold standard and indicated in vast majority of humeral shaft fractures
- criteria for acceptable alignment include:
 - $< 20^{\circ}$ anterior angulation
 - $< 30^{\circ}$ varus/valgus angulation
 - < 3 cm shortening

absolute contraindications :

- severe soft tissue injury or bone loss
- vascular injury requiring repair
- brachial plexus injury

outcomes

- 90% union rate

Operative treatment

Indications:

- 1- Severe multiple injuries
 - 2- Open fracture
 - 3- Segmental fracture
 - 4- Displaced intraarticular extension of the fracture
 - 5- Pathological fracture
 - 6- Floating elbow
 - 7- Radial nerve palsy after manipulation
 - 8- Non-union
- **Type of fixation either by plate and screws or intramedullary nail (in closed fracture) while in open fracture using external fixation with antibiotic cover, ATS and wound debridement and later on either secondary suture of the wound or skin graft in case of skin and soft tissue loss.**

Complications:

Early:

- 1- Vascular injury (brachial artery injury)
- 2- Nerve injury
- 3- Radial nerve palsy (wrist drop + paralysis of metacarpophalangeal joint extension)

Late:

- 1- Delayed union and malunion
- 2- Joint stiffness