# Scientific Osteopathic Approach To Patients With Shoulder, Elbow, Wrist Or Hand Pain

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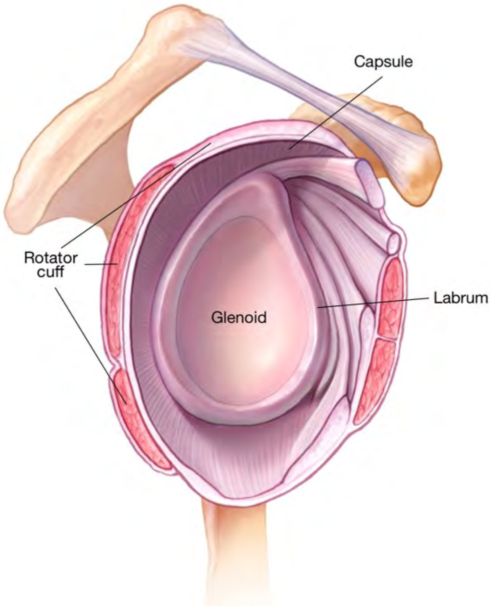


**Figure 5 - Glenoid cavity**

- Is a ball/socket joint.
- The humeral head is larger than the glenoid fossa.
- At any point during elevation of the arm, only 25 to 30% of the humeral head is in contact with the glenoid fossa.
- Static stability is provided by the ligaments.
- Dynamic stability is provided by the rotator cuff.

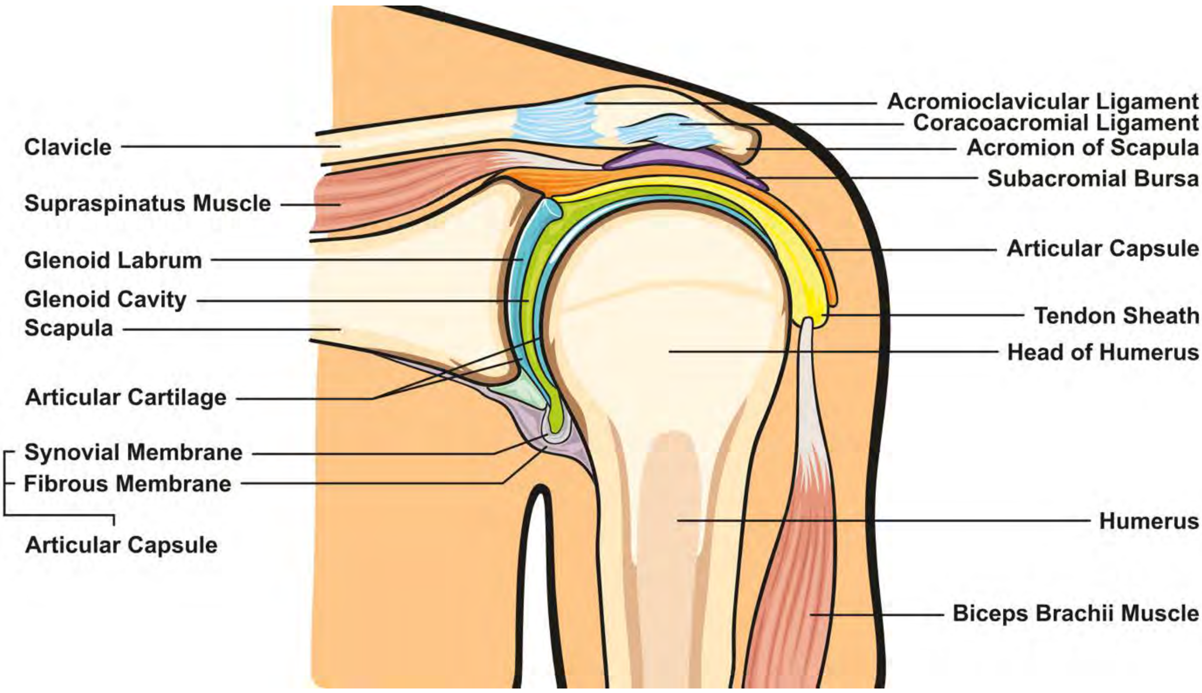


**Figure 6 - Shoulder joint**

**The scapulothoracic joint (ST)**

- This is not a true joint.

**The sternoclavicular joint (SC)**

- Weak synovial joint but kept strong by ligaments.
- 2 saddle shaped surfaces (incongruent surfaces).
- Contains a fibrocartilaginous disc as a shock absorber.
- This disc prevents displacement forward of the clavicle.
- It is the only real joint that connects the arm to the axial skeleton.

**The acromioclavicular joint (AC)**

- This is a weak joint and susceptible to sprain and separation.
- Closed packed position with humerus abduction 90°.
- Contains an intraarticular disc, suspended on the upper part of the capsule.
- The posterior capsule is reinforced by the trapezius muscle.
- Has a synovia.

**Ligaments**

- **Joint capsule** of the glenohumeral joint.
- **Glenohumeral ligaments:** three thickenings:
  - Superior.
  - Middle.
  - Inferior.
- **Coracohumeral ligament:** strong band of fibrous tissue that passes from the base of the coracoid process to the anterior part of the greater tubercle of the humerus.
- **Transverse humeral ligament:** broad fibrous band that spans the bicipital groove between the greater and lesser tubercles, changing the groove into a canal for the long head of the biceps (surrounded by synovial sheet).
- **Coracoacromial ligament:** between the coracoid and acromion process. This ligament protects the superior component of the joint.
- **Coracoacromial arch:** is formed by the coracoid process, acromion process and the coracoacromial ligament between them. The supraspinatus muscle passes under this arch. The arch protects the head of the humerus and prevents superior displacement above the glenoid cavity.
- **Coracoclavicular ligaments:**
  - Trapezoid.
  - Conoid.

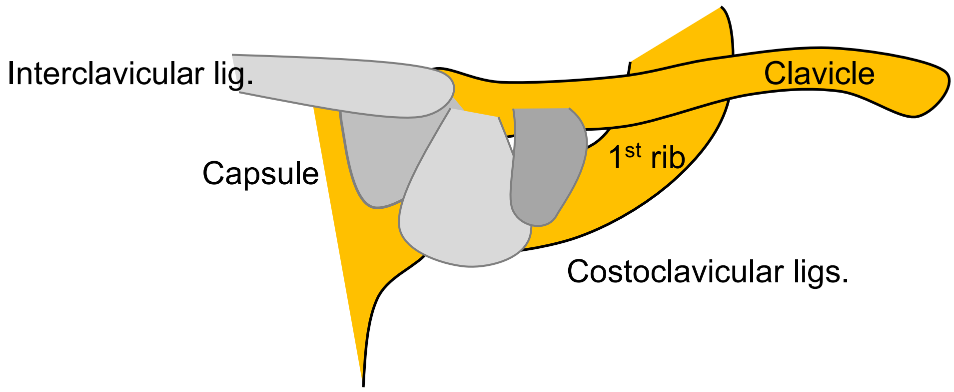


**Figure 9 - Sternoclavicular ligaments**

## Muscles

**The stabilizing rotator cuff:**

The rotator cuff muscles stabilize the head of the humerus in the glenoid fossa.

**They each have a different action:**

- **Supraspinatus:** abductor.
- **Infraspinatus:** external rotation.
- **Teres minor:** external rotation.
- **Subscapularis:** internal rotation.

Together they actively help stabilize the shoulder.

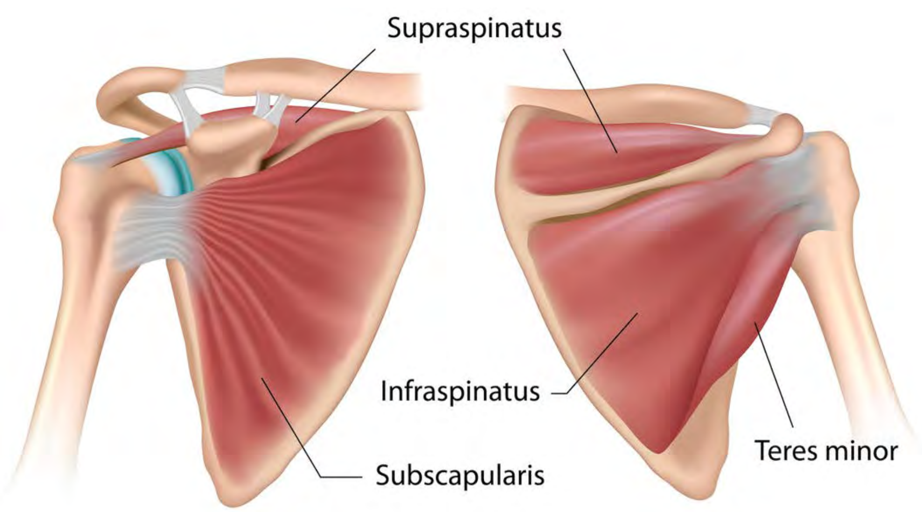


**Figure 10 - Rotator cuff muscles**

**Segmental innervations and actions**

| Muscle | Innervation | Action |
|---|---|---|
| Supraspinatus | $C_{5-6}$<br>Suprascapular n. | Start abduction and stabilization of the shoulder |
| Infraspinatus | $C_{5-6}$<br>Suprascapular n. | External rotation, extension, horizontal abduction, adduction, and stabilization of the shoulder |
| Teres minor | $C_{5-6}$<br>Axillary n. | External rotation, adduction, extension, horizontal abduction, stabilization of the shoulder |
| Subscapularis | $C_{5-6-7}$<br>Subscapular n. | Internal rotation, stabilization of the shoulder |
| Deltoid | $C_{5-6}$<br>Axillary n. | Anterior fibers: abduct, flex, internally rotate, horizontally adduct the shoulder<br>Middle fibers: abduct the shoulder<br>Lower fibers: abduct, externally rotate, extend, horizontally abduct the shoulder |
| Trapezius | Cranial nerve XI, $C_3$ | Upper fibers:<br>unilateral cervical lateral flexion to the ipsilateral side, cervical rotation to the contralateral side, elevation and upward rotation of the scapula,<br>bilateral cervical extension<br>Middle fibers: adduct the scapula<br>Lower fibers: depress and upwardly rotate the scapula |
| Latissimus dorsi | $C_{6-7-8}$<br>Thoracodorsal n. | Adduction, extension, internal rotation of the shoulder |
| Teres major | $C_{5-6-7}$<br>Subscapular n. | Extension, adduction, internal rotation of the shoulder |

### 3.1.3. Mobility in the Scapulothoracic Joint (ST)

**The scapula can move:**

- In translation lateral and medial.
- In cranial and caudal translation.
- In rotation around an anteroposterior axis.
- In rotation around a laterolateral axis (anterior and posterior tipping).

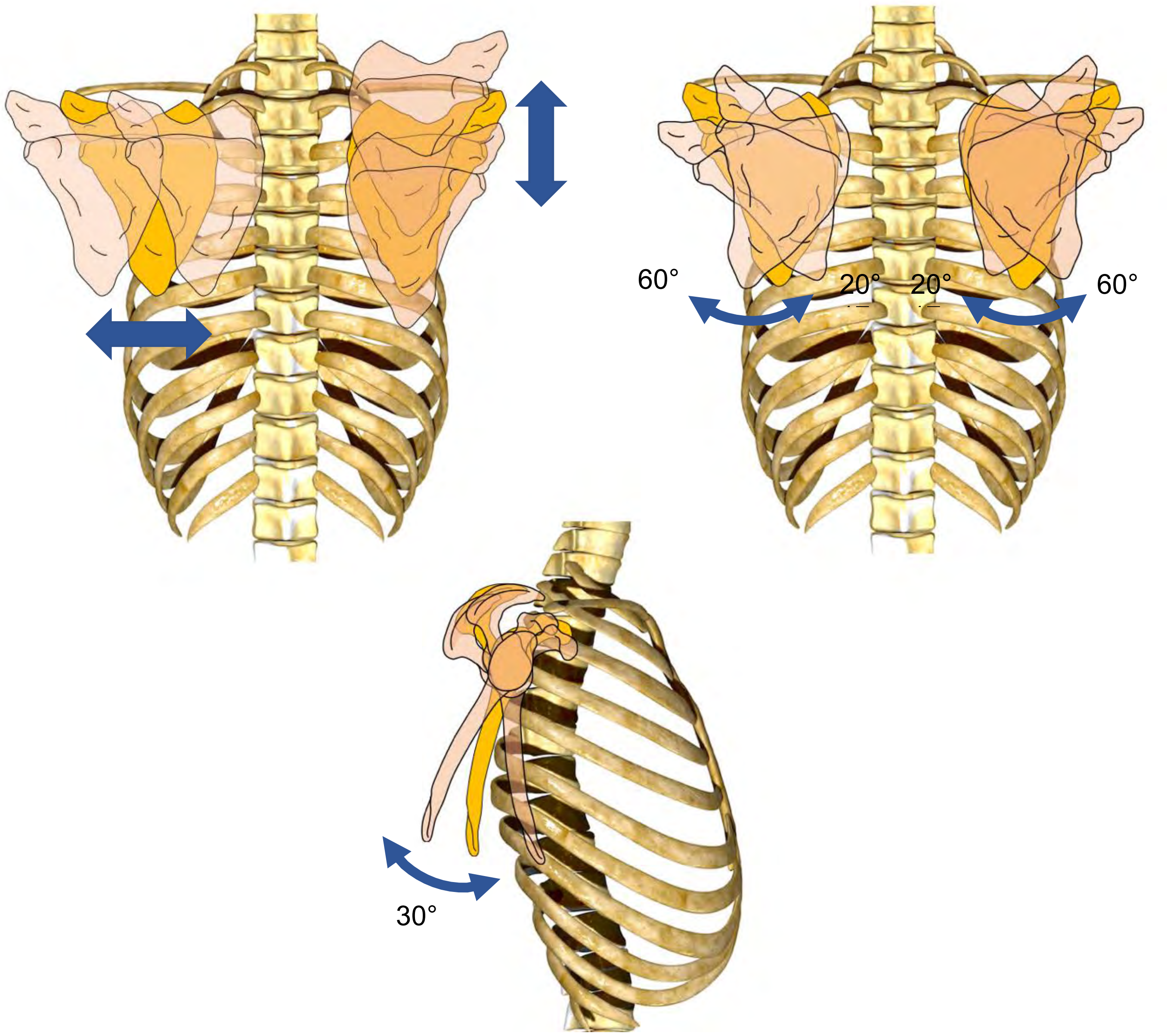


**Figure 47 - Mobility in the scapulothoracic joints**

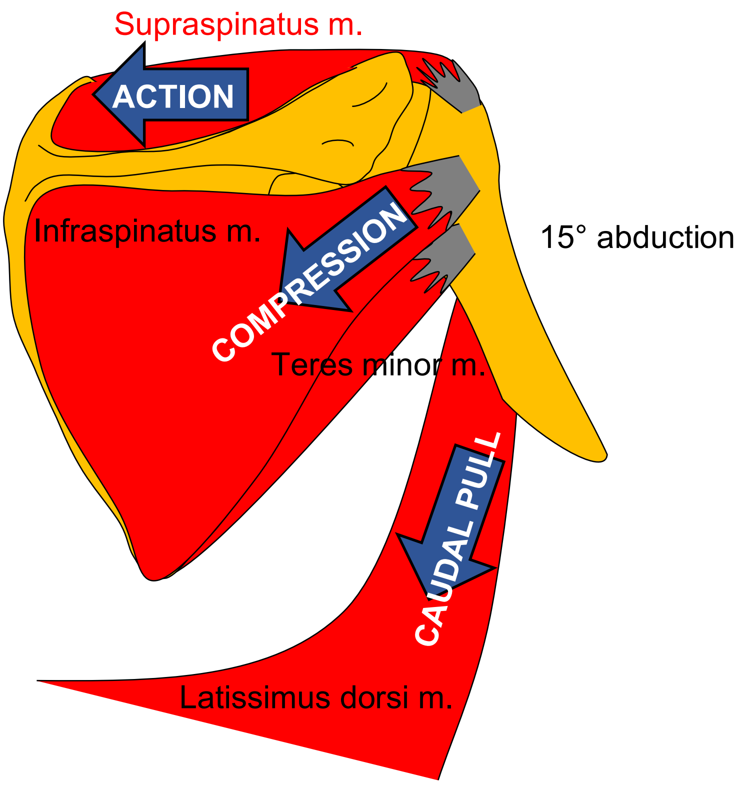


**Figure 56 - Shear forces**

**Further abduction**

The further abduction is done by the deltoid m.

The deltoid m. produces a superior shear force at the glenohumeral joint.

The subscapularis m. resists this superior shear but adds an internal rotation.

The infraspinatus m. and the teres minor m. also resist this superior shear and neutralize the internal rotation of the subscapularis m.

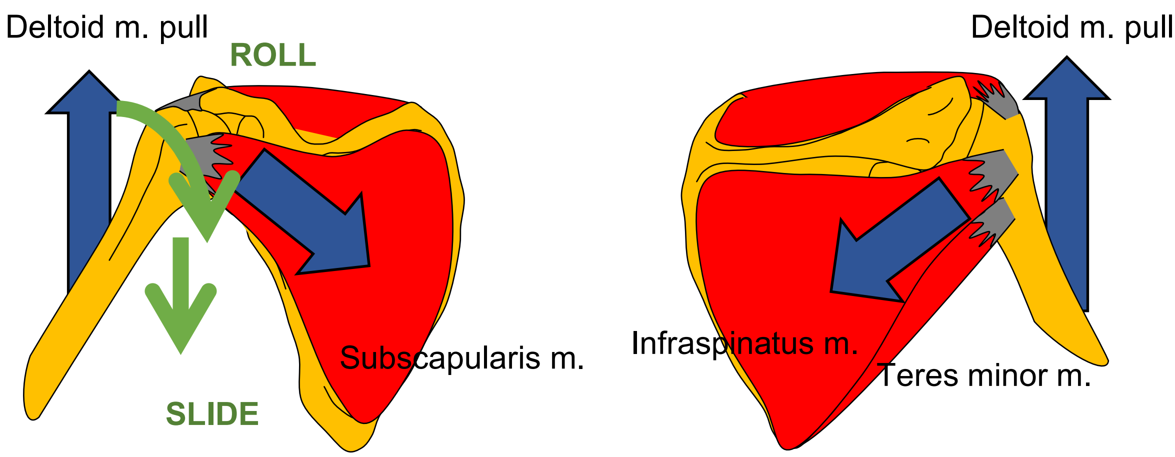


**Figure 57 - Shear forces**

### 3.1.5. The Scapulohumeral Rhythm (or Glenohumeral Rhythm)

It concerns the interaction between the scapula and the humerus.

This interaction is important for the optimal function of the shoulder.

When the normal position of the scapula in relation to the humerus has changed, this will cause a dysfunction of the scapulohumeral rhythm.

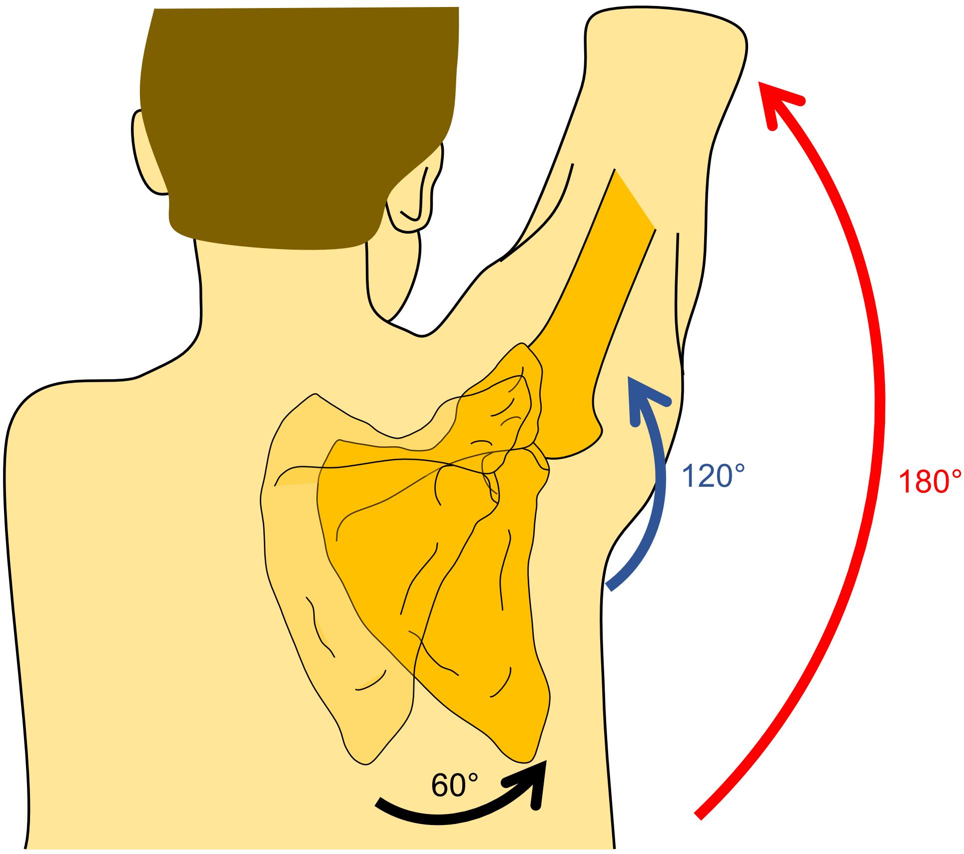


**Figure 58 - Scapulohumeral rhythm**

When the arm is abducted 180°, 60° occurs by rotation of the scapula and 120° by rotation of the humerus.

**In arm abduction and flexion, there are 3 phases in the shoulder:**

- Muscle action: supraspinatus (15%), deltoid (50%) and rotator cuff (50%).
- Stabilization of the head of the humerus:
  - Early phase: teres minor depresses the head.
  - Late phase: subscapularis and infraspinatus compress the head.
  - More than 90°: supraspinatus remains active.

    - Tendon calcification.
    - Repetitive tendonitis.
    - Not being able to hold the head of the humerus secure in the glenoid fossa.
    - Arthritis.

**Symptoms:**

- Pain around the shoulder.
- Sleep disturbance because of the pain.
- Shoulder weakness during daily activities.
- Mostly at the dominant hand side.

**Tests:**

- **Infraspinatus:** resisted external rotation.
- **Teres minor:** resisted external rotation with arm abducted more than 45°.
- **Subscapularis:** lift-off test.
- **Supraspinatus:** resisted elevation or start abduction.

**Test criteria:**

- Pain.
- Inability to do the contraction.
- Muscle weakness.

**Video 2 - Provocation tests rotator cuff tears**

**Figure 128 - Ganglion cyst**

### 4.3.22. Wartenberg's Syndrome

(also called cheiralgia paresthetica)

This is compressive neuropathy of the superficial sensory radial nerve at the wrist.

**Symptoms:**

- Pain.
- Paresthesia's over the dorsoradial hand.
- No motor deficits.

**Cause:**

- Scissoring action of the brachioradialis and the tendon of the extensor carpi radialis longus during forearm pronation.

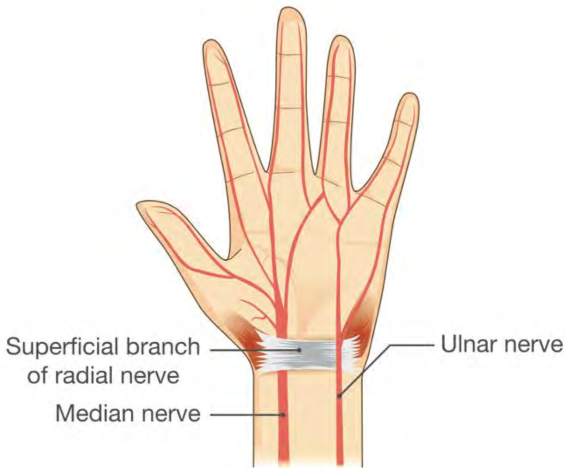


**Figure 129 - Superficial branch of radial nerve**

become inflamed from the constant rubbing against the two thumb muscles.

The same movement is involved when pulling a rake against hard ground. Racket sports, weightlifting, canoeing, and rowing can also stress the wrist extensor tendons.

As the tenosynovium becomes more irritated and inflamed, it swells and thickens.

**Symptoms:**

- Pain and swelling in the tenosynovium that covers the tendons.
- Crepitus.
- Swelling and redness at the intersection point.

Pain can spread down to the thumb or up along the edge of the forearm.

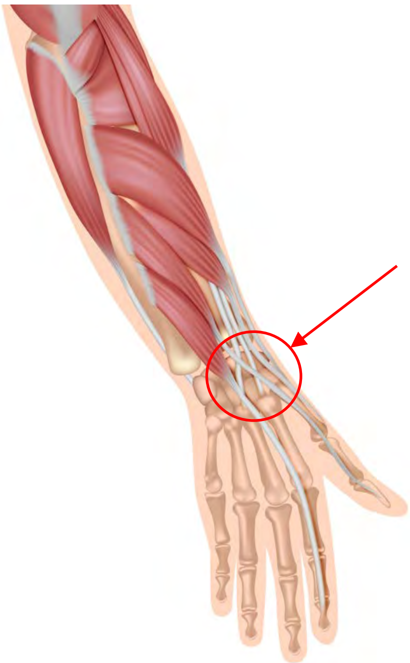

**Figure 131 - Intersection syndrome**

## 4.3.25. Scapholunate Dissociation

Scapholunate dissociation happens when the ligaments between the scaphoid and lunate are disrupted, usually due to an injury from a fall on an outstretched hand.

The patient may present with wrist pain or difficulty with grasping objects and grip strength.

The exam may show tenderness over the scapholunate junction.

A widening of the space between the scaphoid and lunate to greater than 3 mm on X-ray is indicative of this injury.

**Figure 132 - Scapholunate dissociation**

### 4.3.26. Kienbock’s Disease

This is an avascular necrosis of the lunate bone that can lead to progressive wrist pain and abnormal mobility.

It is more common in male patients.

**Cause:**

- History of trauma.
- Deficient blood supply to the lunate bone.

**Symptoms:**

- Dorsal wrist pain, often movement related.

**Figure 133 - Kienbock's disease**

- Bruising.
- Pain over the distal radius.
- Limited range of motion.
- Ecchymosis.
- Tenderness over the fracture site.

It is important to document a neurovascular exam as the median nerve, radial artery and tendon of the extensor pollicis longus are often very close to the fracture site.

**Figure 147 - Colles fracture**

**A Colles fracture in elderly patients often causes problems such as:**

- Wrist deformity.
- Bad healing.
- Radius shortening.
- The immobilization for 4 to 6 weeks is long and can cause Sudeck's atrophy.
- Ischemia of the hand.

### 4.3.38. Volar Plate Rupture

This rupture is caused by a hyperextension injury of a finger.

The rupture is distal to the attachment at the middle phalanx.

**Symptoms**

- Maximal tenderness at the volar aspect of the involved joint.

- Test for full flexion and extension as well as collateral ligament stability.

**Treatment:**

- Splint at 30 degrees of flexion and progressively increase extension for two to four weeks.
- Buddy tape the joint if the injury is less severe.

This lesion can evolve towards a swan neck deformity. In this case, the extensor tendons pull the PIP into hyperextension and the DIP into flexion.

## 4.3.39. Referred Pain Patterns in the Upper Extremity

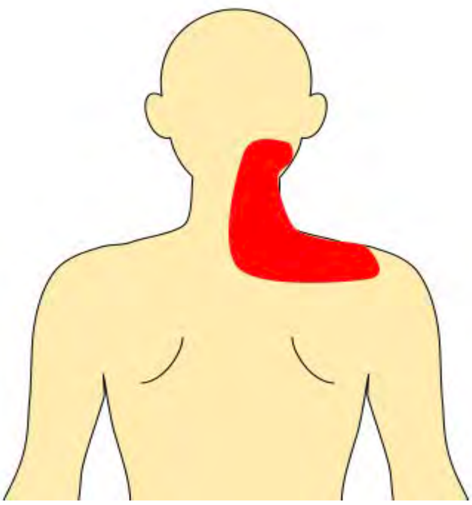

**Figure 148 - Referred pain pattern from C4**

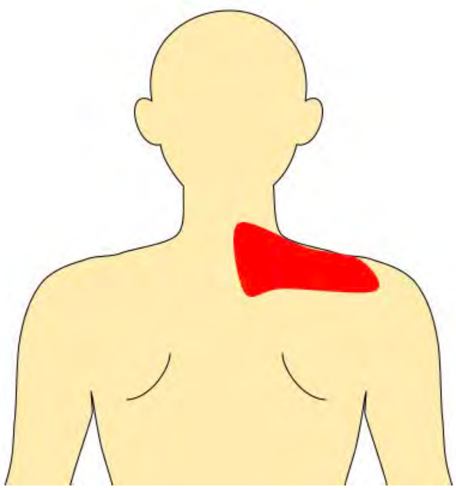

**Figure 149 - Referred pain pattern from C5**

### *5.5.2.16. Test for Flexion of the Shoulder with Upper Rib Participation*

The patient is in a supine position on the table.

The osteopath stands next to the patient and palpates the upper 2 to 6 ribs at the level of the chondrosternal joints.

He/she brings the patient's shoulder into full flexion/abduction and palpates whether the ribs stay immobile.

When a rib on the same side moves ventrally while performing flexion and abduction, this means that the contralateral rib is blocked in inhalation.

This type of rib lesion limits the flexion/abduction of the contralateral shoulder.

**Video 81 - Test for shoulder flexion with upper rib participation**

### 6.1.4. Mobilization of a Dorsal Lesion of the Medial Clavicular Head Against the Manubrium

The patient is supine on the table.

The osteopath stands next to the patient.

He/she hooks the fingers on the dorsal medial side of the clavicle.

With the arm as a lever and with the hook grip, he/she mobilizes the medial head of the clavicle in ventral direction.

**Video 107 - Mobilization of a posterior lesion of the clavicle**

### 6.1.7. General Mobilization of the Scapulothoracic Joint

The patient is in side lying on the table.

The osteopath stands in front of the patient.

He/she contacts the scapula with both hands.

**Directions of the mobilization:**

- Cranial.
- Caudal.
- Lateral.
- Medial.
- Rotation.

The arm of the patient can be used as a lever.

**Video 110 - Mobilization of the scapulothoracic joint**

### 6.4.4. SCT for Dysfunction of the Posterior Acromioclavicular Joint

**Tender point:** lies at the top and behind the lateral head of the clavicle.

**Position:**

- The arm is pulled in caudal direction, backwards and with internal rotation with a force of 10 kg.

**Video 162 - SCT posterior acromioclavicular joint**

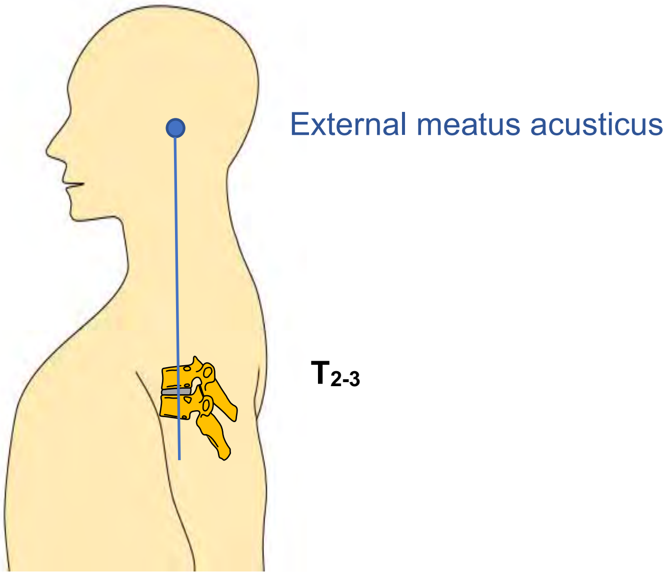


**Figure 189 - Superior region for the cervical spine and shoulders**

The $T_{2-3}$ region must be in a well-balanced position and mobility to provide stability for cervical spine and shoulders.

**Lesions that compromise the shoulder stability in the sagittal plane are:**

- Upper thoracic flexion lesion.
- Lower thoracic flexion lesions with high diaphragm position.
- Upper cross syndrome.

This means that we always correct these lesions when we want to improve the stability of the shoulder.

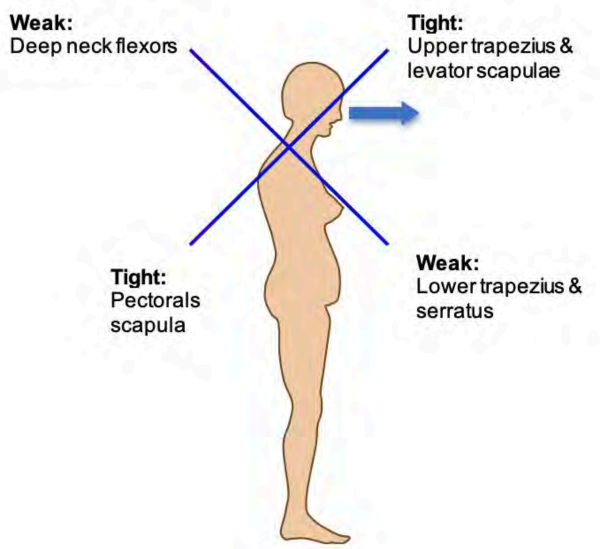


**Figure 190 - Upper cross syndrome**

### 7.6.2. Frontal Plane

In the frontal plane we observe the frontal central gravity line.

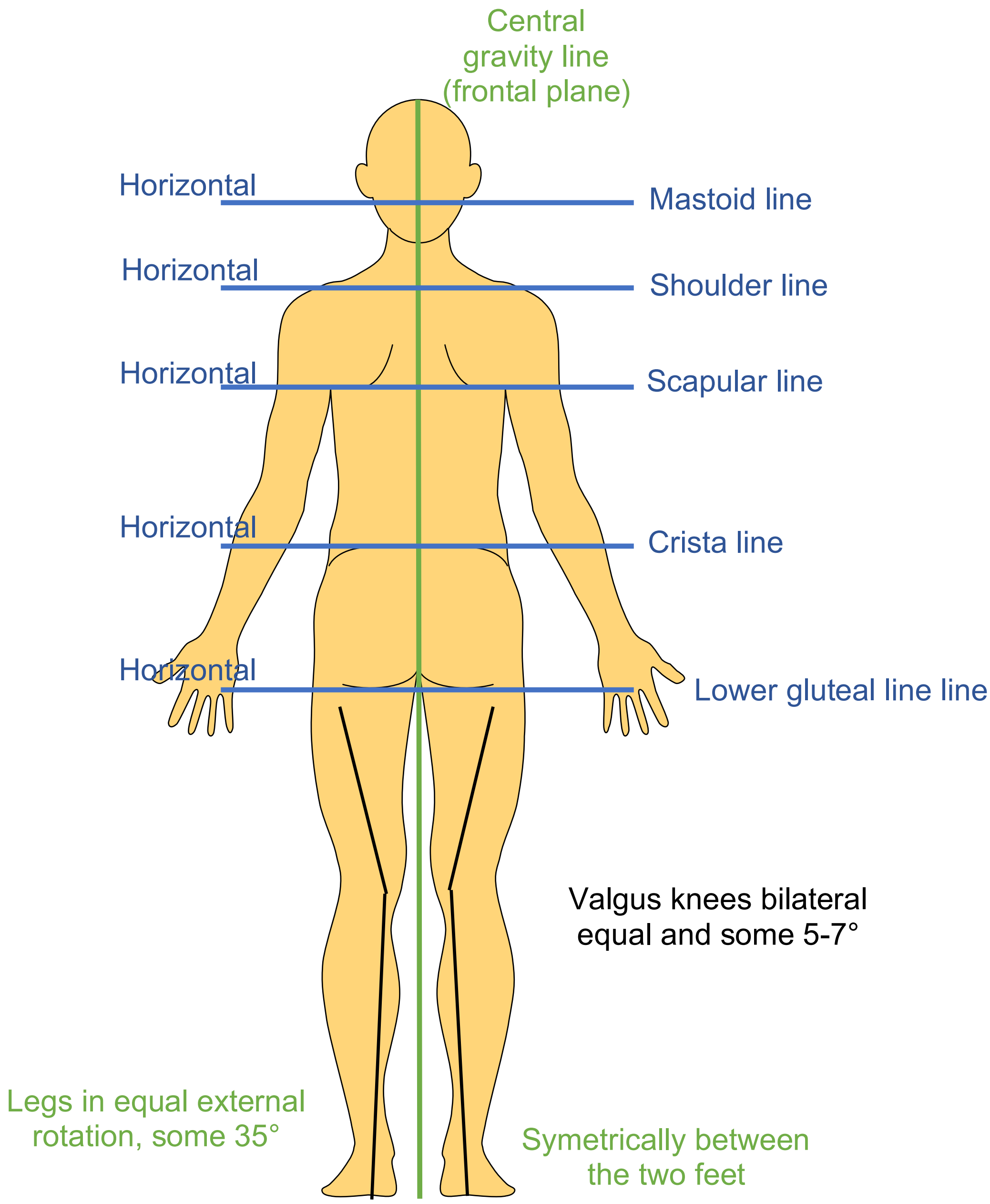


**Figure 191 - Frontal central gravity line**

**Lesions that compromise the shoulder stability in the frontal plane are:**

- Shift and sidebending lesions in the upper thoracics. They compromise the shoulder stability bilaterally, one side comes in compression, the other side in decompression.

**Facilitation theory:** visceral and somatic pain afferents connect with adjoining spinothalamic neurons and there may be some overlap of the neurons, visceral afferents have collaterals connecting to the spinothalamic neurons receiving somatic pain afferents. This can cause impulses to travel up the somatic spinothalamic path and causes the sensation of pain in the skin.

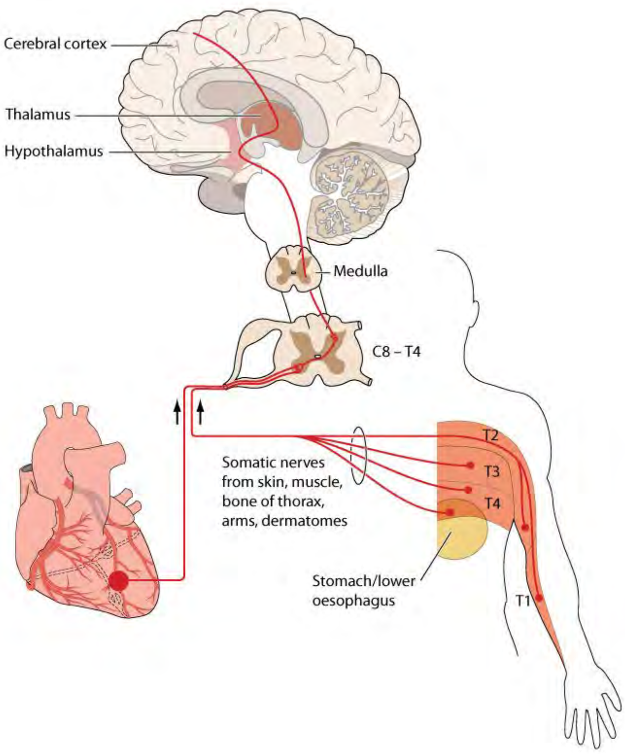


**Figure 198 - Example of referred pain**

## 7.9.4. Somatogenic and Psychogenic Pain

| **Somatogenic** | **Psychogenic** |
|---|---|
| Originating from an actual physical cause (= Pain generators):<br>• Damage<br>• Near damage<br>• Inflammation<br>• Infection<br>• Ischemia (Substances released during ischemic reactions such as bradykinin stimulate pain receptors)<br>• Temperature (Too high or too low) | No physical pain generator |
| | Not imaginary and can be intense |

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