

## Assessment for impingement syndrome:

- **Painful Arc Test.** This is when the patient abducts the arm. This test is positive if pain is experienced between 60 to 120 degrees. Start out w/ no pain, then feel pain, then pain goes away again (this is b/c the subscapularis muscle ends up pulling the head of the humerus downward, thus clearing the acromion).
- Swelling from tendonitis
- Scapular/humeral rhythm/movement is off
- The normal biomechanical movement when abducting the arm is externally rotation of the shoulder joint. If you **externally rotate arm during abduction**, you would most likely avoid impingement because it moves the greater tubercle out of the way. If you are unable to do so, you could increase the risk of impingement.
- As an LMT, if you know that the person cannot adequately perform external rotation during abduction, you need to look at what muscles could be tight, i.e., in this case, most likely a tight subscapularis which causes the humerus to be stuck in internal rotation. Therefore you could treat it by releasing the tight muscle. With this example, i.e., subscapularis, when it is tight it causes the arm to be stuck in medial rotation. You'd treat this by releasing this muscle.
- **Force coupling of muscles** – *upward rotation of the scapula is necessary when performing abduction.* Forced coupling means that there are muscles above and below that are spinning in different direction like turning a steering wheel. This could prevent impingement by in this case, the upper traps and serratus anterior (actions that assists in upward rotation of scapula and protraction of scapula) primarily spin the scapula in upward rotation in a coordinated fashion. If there is a problem in one or both of these muscles, impingement could occur

## Three ways in to biomechanically prevent impingement:

- **Retraction of the scapula**, i.e., prevent protraction of shoulder; good posture
- **External rotation of the humerus** while performing abduction
- **Forced coupling of the scapula.** The scapula needs to be upwardly rotated when abduction occurs or you would cause impingement. Two forces move in opposite directions to produce the same movement. Goal is to keep the acromion away from the greater tubercle by spinning it by elevating it with rotation. If one of these muscles are imbalanced, it could lead to impingement.

## When you abduct the arm, this is what happens:

- The *clavicle rotates posteriorly*
- You have the *scapulo-humeral rhythm*
- The major function of *subscapularis during abduction is to pull down the head of the humerus to prevent impingement and prevent the humerus and acromion from jamming.* If there is dysfunction in subscapularis, it wouldn't be able to pull the head of the humerus down this could lead to impingement and ultimately cause tendonitis, bursitis, etc.
- If the deltoid muscle is the only muscle to contract, the deltoid pulls medially. If you don't have proper scapula spinning of the muscles (forced coupling), and deltoid is the only muscle contracting during abduction, the humerus won't really move. **The deltoid muscles rely on help from other muscles to spin the humerus.** Therefore, deltoid abducts with the help of the muscles involved in scapular spinning (i.e., muscles involved with forced coupling). Without the help from these other muscles, it would lead to impingement because it gets stuck.

## SHOULDER REGION:

- The shoulder joint is actually a shoulder region.
- For the humeral & scapular bones to work, there are not just these joints involved.
- When a patient performs abduction exercises, it is more beneficial to perform scaption, i.e., horizontally abduct the arm slightly medially and then abduct. To move in the plane of the glenoid fossa – 45 degrees anteriolaterally. This is to reduce possible impingement. The shoulder is not meant to abduct laterally.

- ***The Seven Joints of the Shoulder Region:***
  1. **Glenohumeral joint**
  2. **Subacromial space** (a pseudo-joint) – this is a small space under the acromion process that contains the coracoacromial ligament. Any swelling of soft-tissue structures will reduce the space and potentially cause impingement. The greater tubercle can potentially hit the coracoacromial ligament during abduction.
  3. **Acromioclavicular joint** – moves considerably with abduction
  4. **Scapulo-thoracic (scapulo-costal) joint/space:** A pseudo-joint located between the scapula and ribs that needs free movement. If there is dysfunction and reduced mobility here, treat by performing joint movement, pull scapula away.
  5. **Sternal-clavicular joint**
  6. **Sternal-costal joint (anteriorly)**
  7. **Costo-vertebral joint (posteriorly)**
- If you have dysfunction in any one of these joints, it will affect the function of all the other joints to varying degrees.