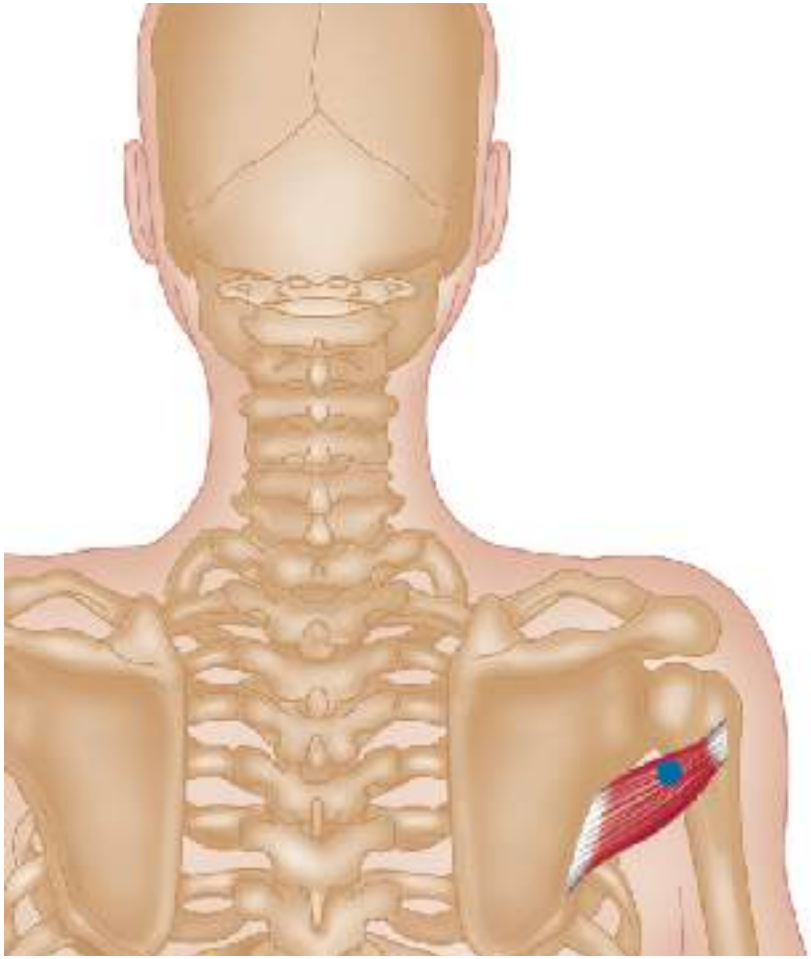
NAT – the modifications

- **Biceps Tendinopathy & Belly**
- **Early phase I or phase I modification**
- **The patient who plateaus**
  - The PA
- **Triceps tendonitis and posterior frozen shoulder**
- **Two person techniques**
- **Glenohumeral Arthritis**
- **RSD/CPRS1**

Important structures

- Lateral myofascia of UEX & Deltoid
- Teres Minor
- Teres Major
- Subscapularis
- Long head Biceps
- Long head Triceps
- Infraspinatus

NAT Key Muscles – Teres Minor



ORIGIN

- Upper two-thirds of lateral border of dorsal surface of scapula.

INSERTION

- Lower facet on greater tubercle of humerus. **Capsule of shoulder joint.**

ACTION

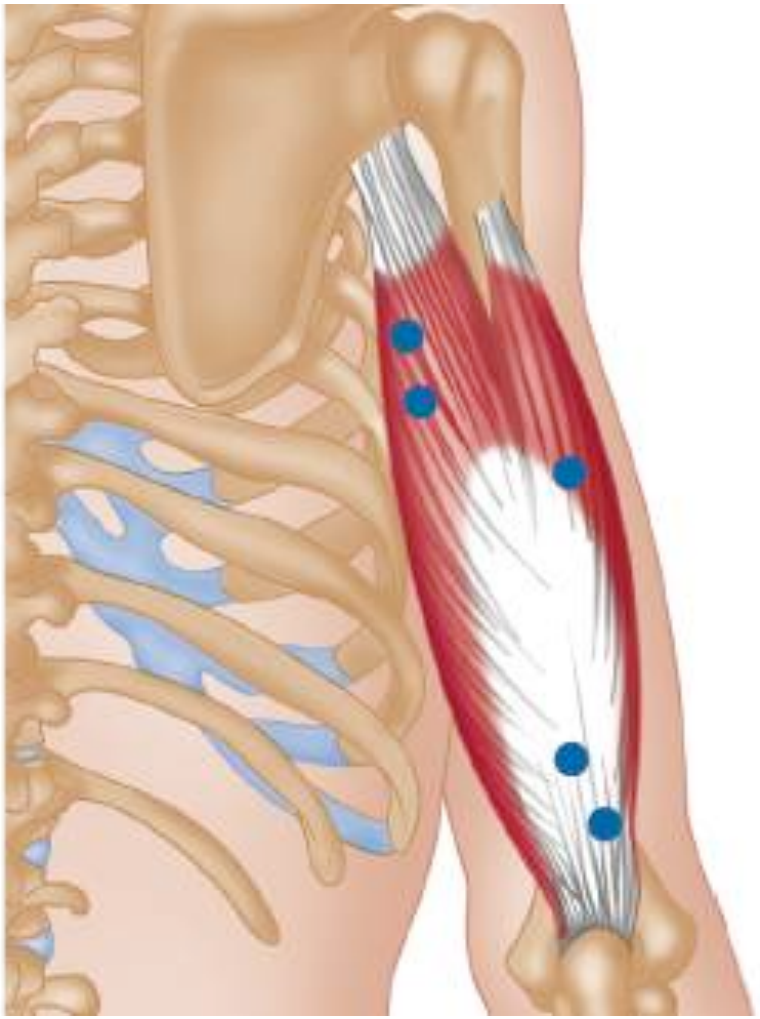
- As a rotator cuff muscle, helps prevent upward dislocation of shoulder joint. Laterally rotates humerus. Weakly adducts humerus.

NERVE

- Axillary nerve, C5, 6, from

ANTAGONISTS: subscapularis, pectoralis major, latissimus dorsi.

NAT Key Muscles – Triceps – Long Head



ORIGIN

- Long head: infraglenoid tubercle of scapula.

INSERTION

- Posterior part of olecranon process of ulna.

ACTION

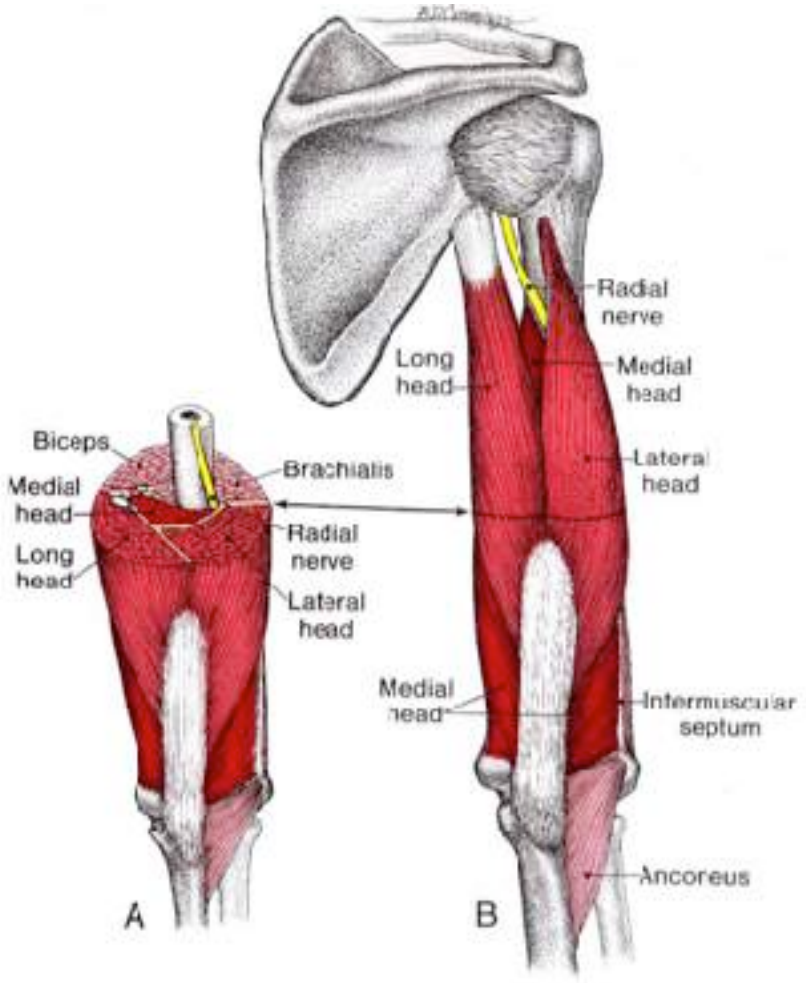
- Extends (straightens) elbow joint.
- Long head can adduct humerus and extend it from flexed position.

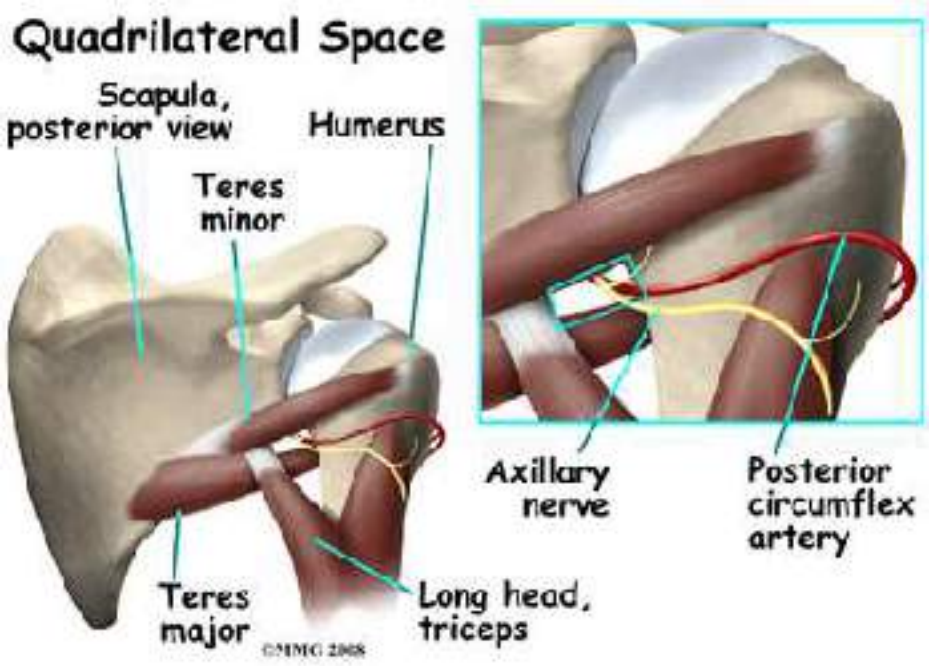
ANTAGONIST: biceps brachii.

NERVE

- Radial Nerve, C6, 7, 8, T1.

NAT Key Muscles – Triceps – Long Head





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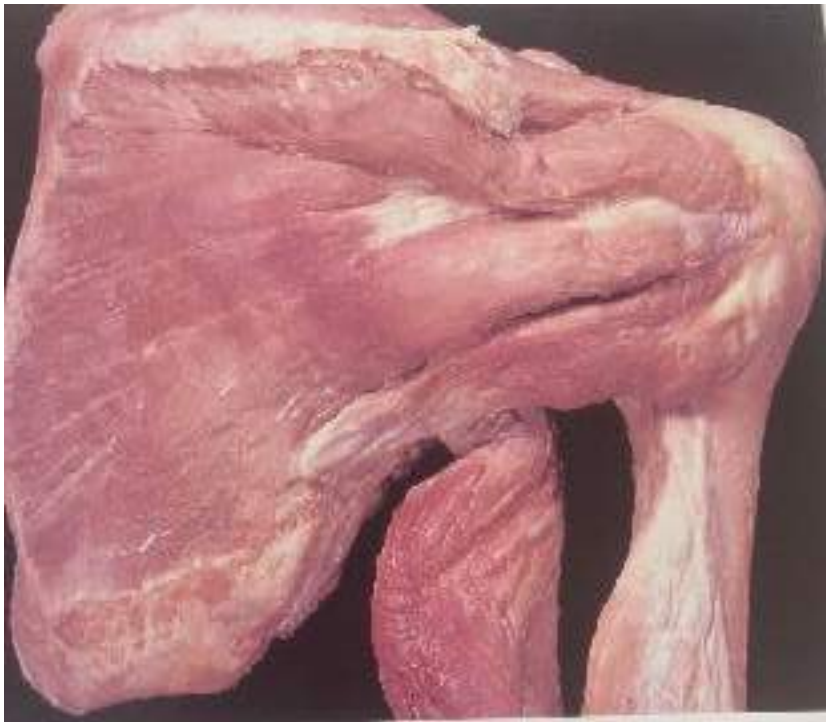
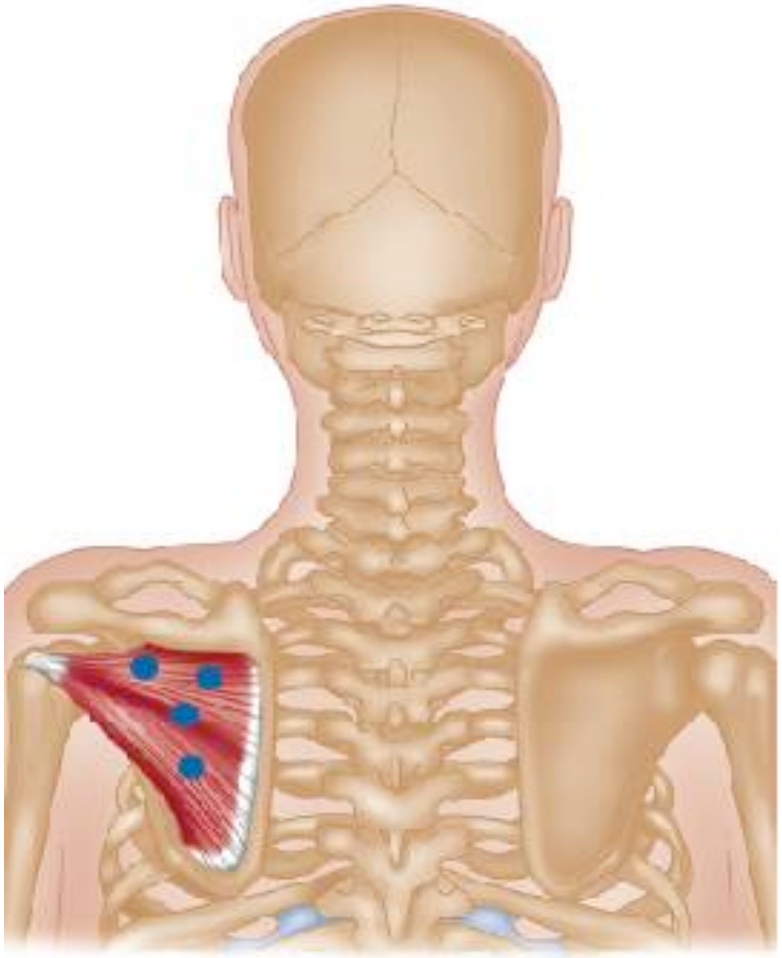
Triceps In Vivo



NAT Key Muscles – Infraspinatus



ORIGIN

- Infraspinous fossa of scapula.

INSERTION

- Middle facet on greater tubercle of humerus. Capsule of shoulder joint.

ACTION

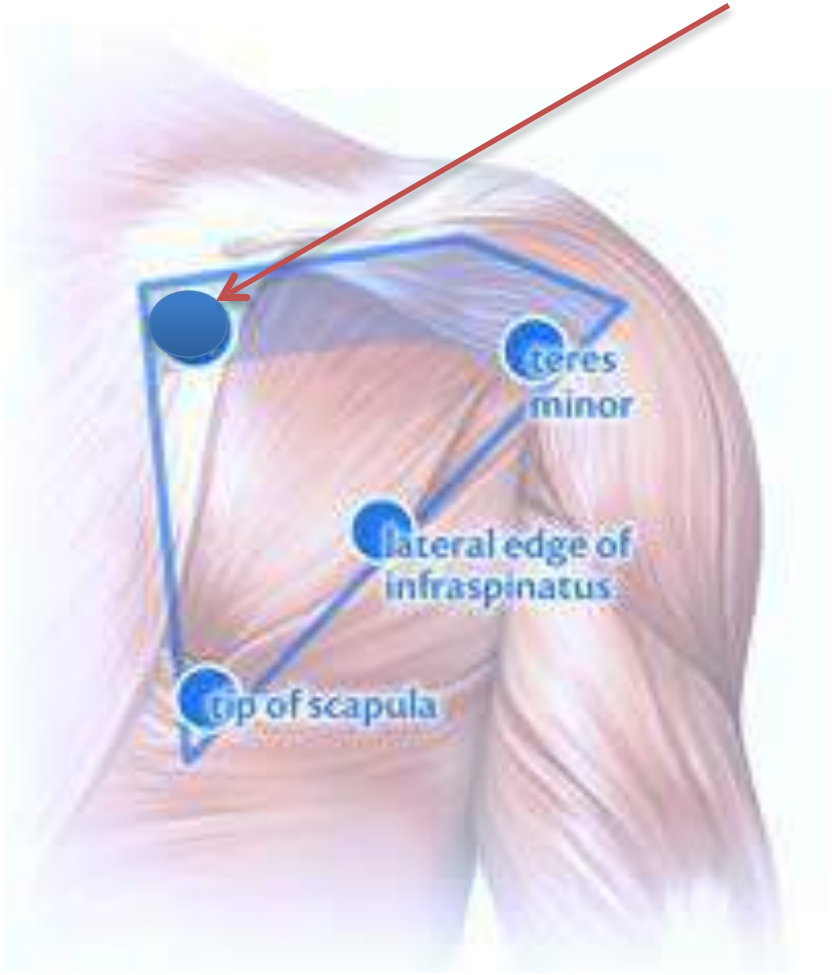
- As a rotator cuff muscle, helps prevent posterior dislocation of shoulder joint. Laterally rotates humerus.

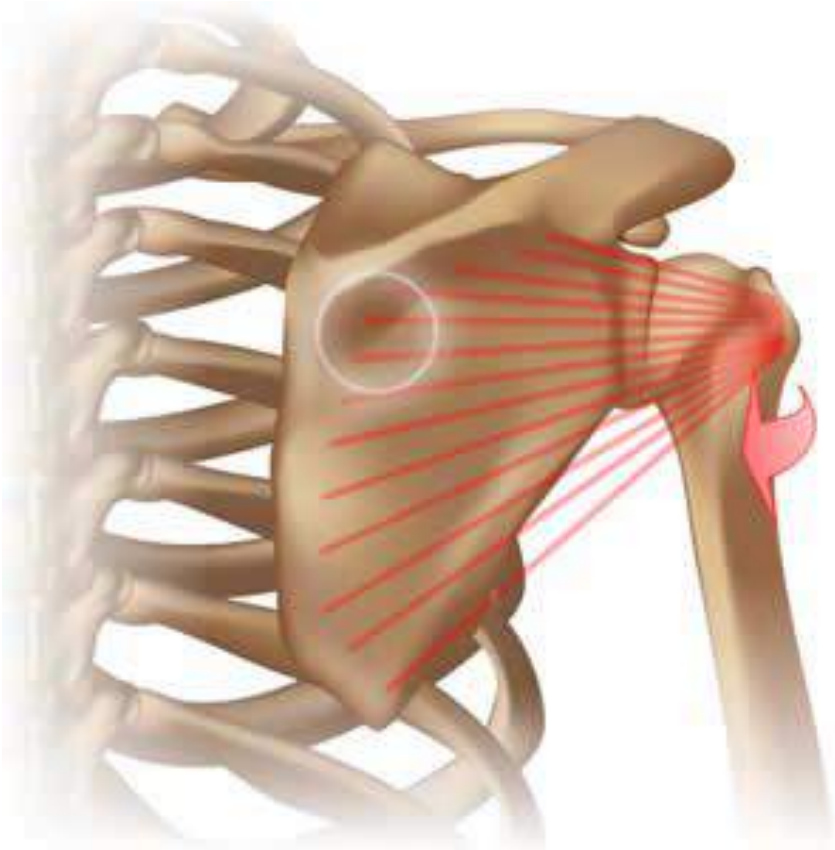
ANTAGONISTS: subscapularis, pectoralis major, latissimus dorsi.

NERVE

- Suprascapular nerve, C(4), 5, 6, from upper trunk of brachial plexus.

The Infraspinatus NAT Trigger Point





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External rotation, Apley and the Biceps belly

- With the patient supine slightly flex the arm.
- Working slowly and gently - find the trigger point in the middle of the biceps belly. This is usually about four finger breadths above the fold of the elbow. Pause on this nodule. Hold this trigger point for up to five minutes until it is completely pain free.
- Find the trigger point and move slowly to another area ‘within it’ once one area of the trigger point has fatigued (see hot zones). Do not come away early as this may trigger a spasm. (We tend to use our elbows for comfort), but you can use your thumbs if you like - but go slowly and carefully.

Early (Pre) or Phase I

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Early Phase I, Phase I and Triceps Modification

Early phase I or Phase I modification

- Deep work into the LHT, Teres Minor & Posterior capsule with the patient **prone**, can also speed-up a phase I problem.
- The aim is to stimulate a small localized acute inflammatory reaction in the posterior part of the capsule. This purges the chronic inflammatory cascade.
- This can be very painful for the patient and should not be done until you are comfortable and familiar with the NAT.

What to do if the movement plateaus 1 & 2

1. Start Anterior

2. Supine work on Lateral epicondylar mm

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What to do if the movement plateaus 3 & 4

3. SHB/Pec Min

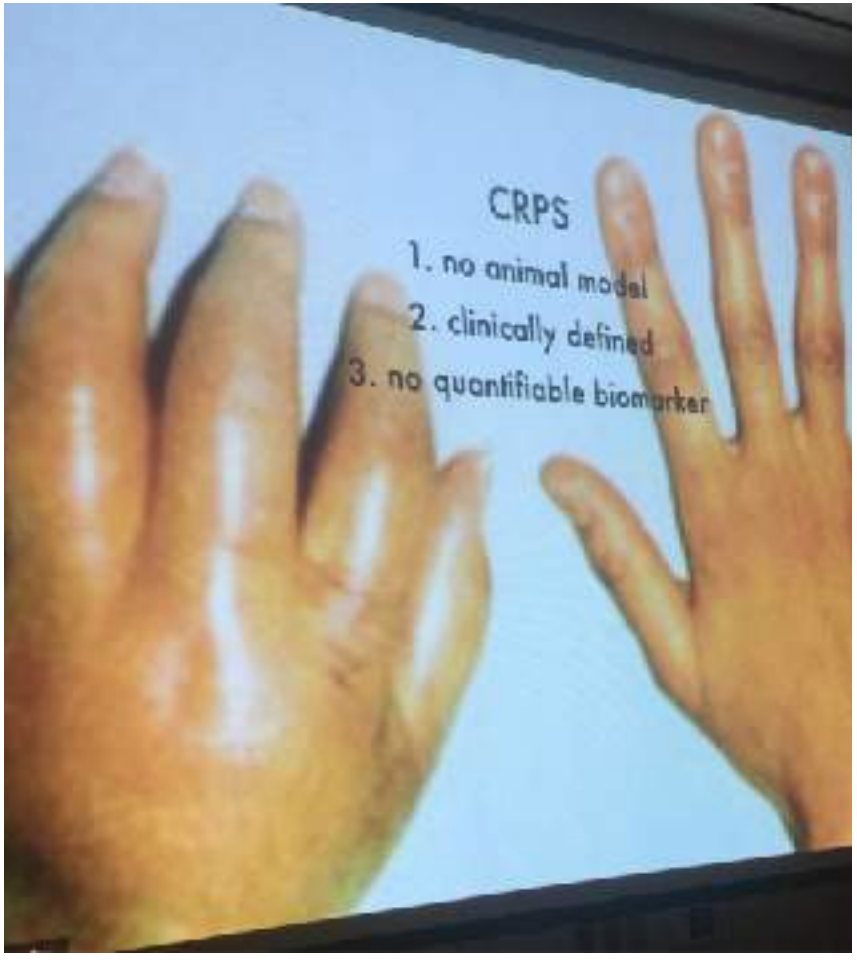
4. Infraspinatus

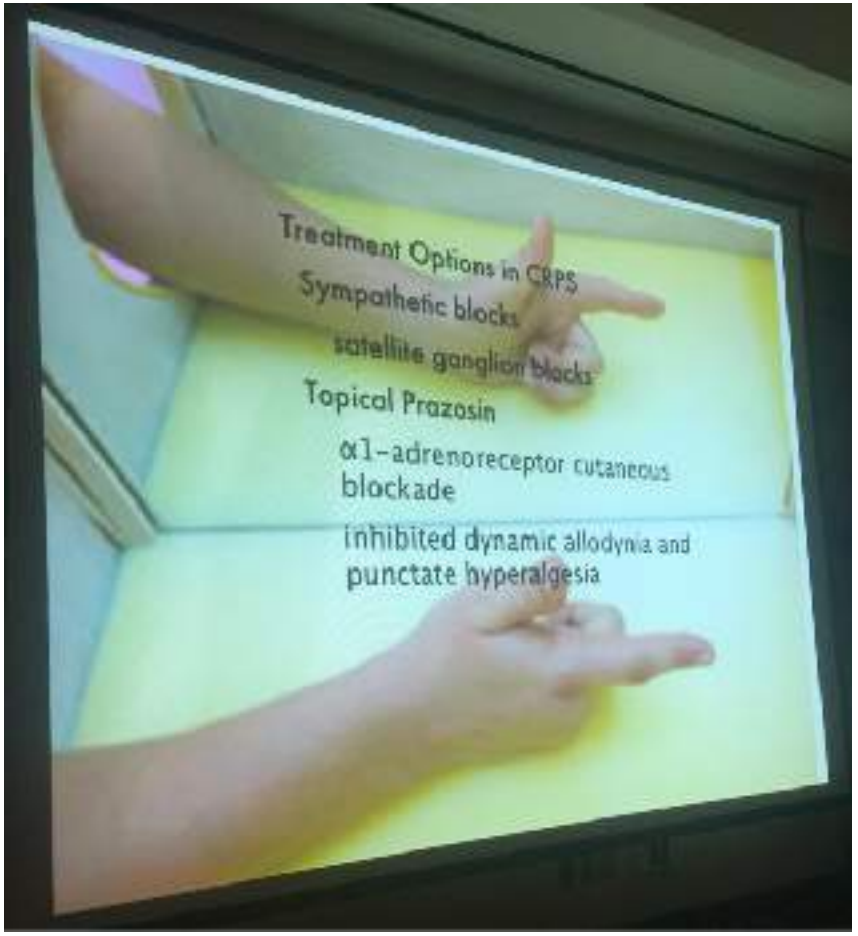
Two person techniques Step 1 Anterior/ Step 2 Lateral

Step 1 Anterior (Phase II onwards)

Step 2 Lateral Modification

Chronic Regional Pain Syndrome





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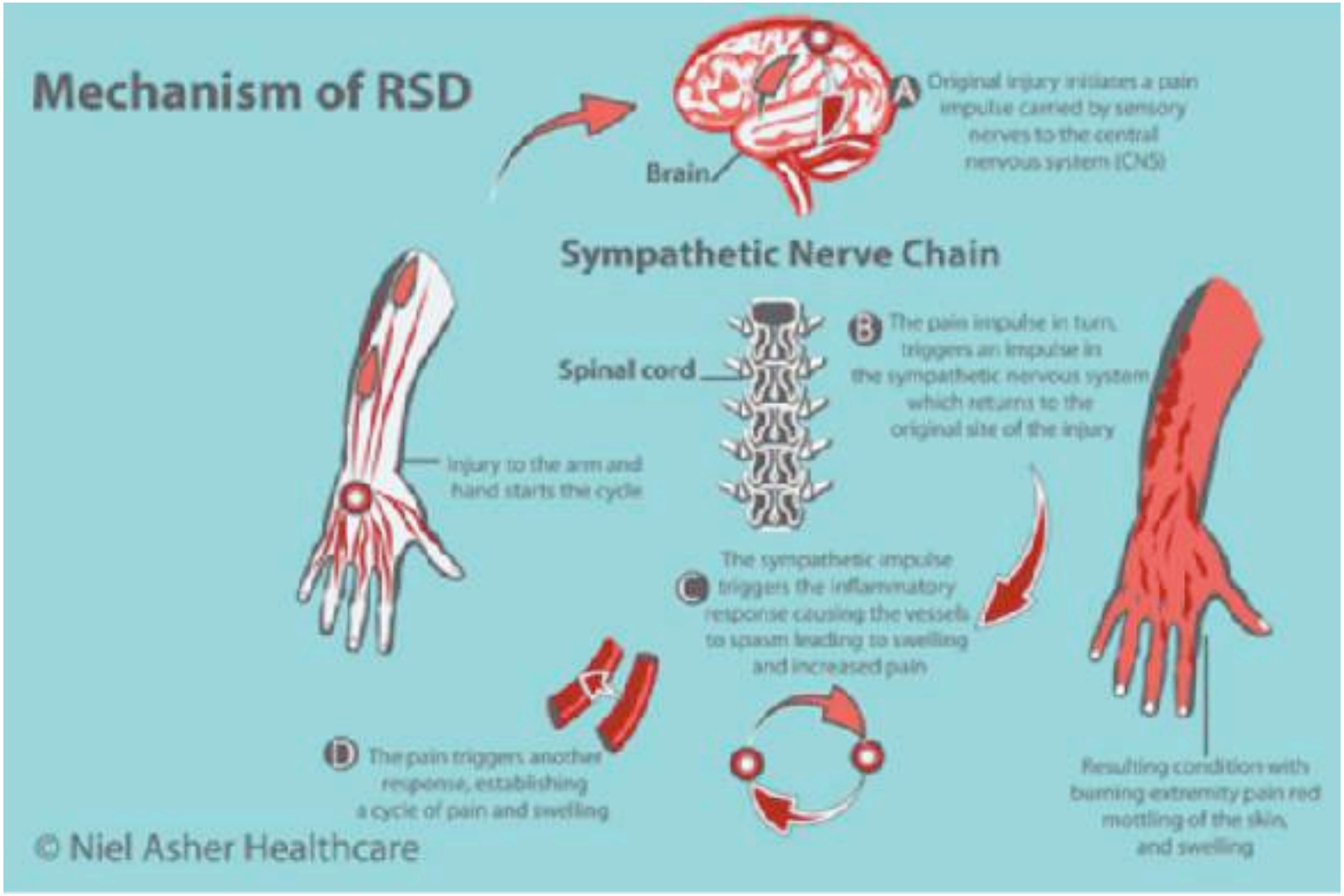
What is CRPS?

- Chronic syndrome
- Sequelae of trauma or injury and immobility FSS
- 7% of fractures
- F:M 4:1
- Initial – Inflammatory changes
- Chronic – Autonomic features
- Autonomic changes, Sympathetic-afferent coupling, inflammatory and immune alterations, brain changes, genetic and psychological factors

Symptoms

- Prolonged pain - can be constant and from uncomfortable to severe
- “Burning” or “pins and needles” - like the limb is being squeeezed
- Pain spreading e.g from finger to entire arm
- Heightened sensitivity to touch
- Change in skin colour and blotchiness in affected area as well as skin texture (shiny and thin appearance)
- Abnormal sweating of limb
- Stiffness and problems with coordinating movement of muscles
- Fixed abnormal posture/jerking or tremors in limb

Chronic Regional Pain Syndrome



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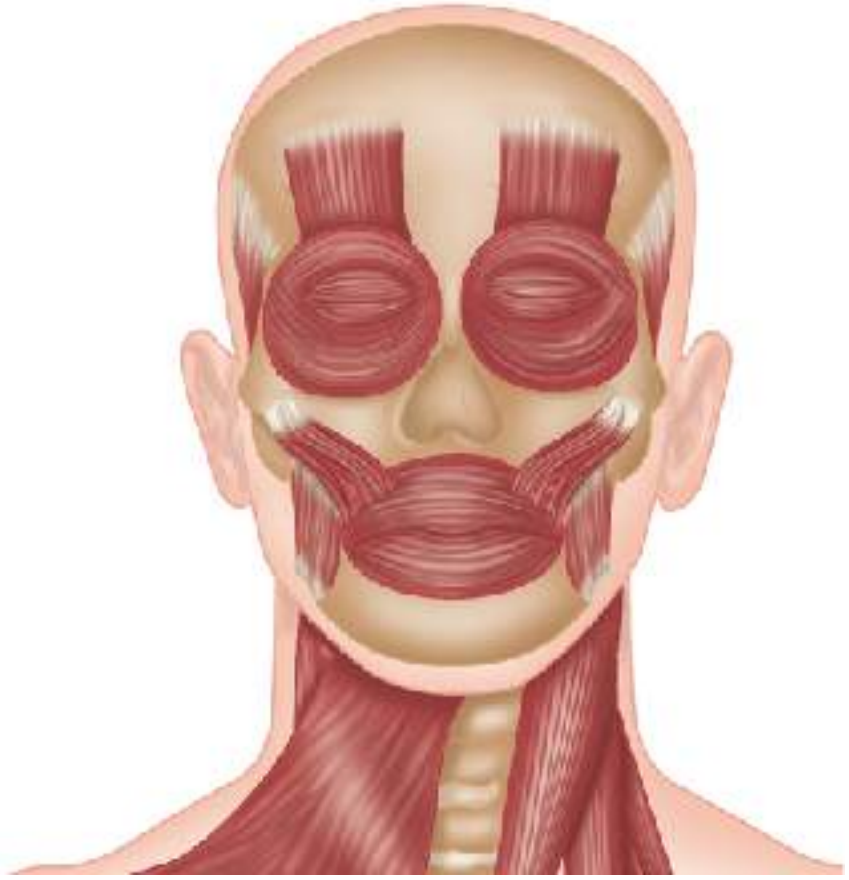
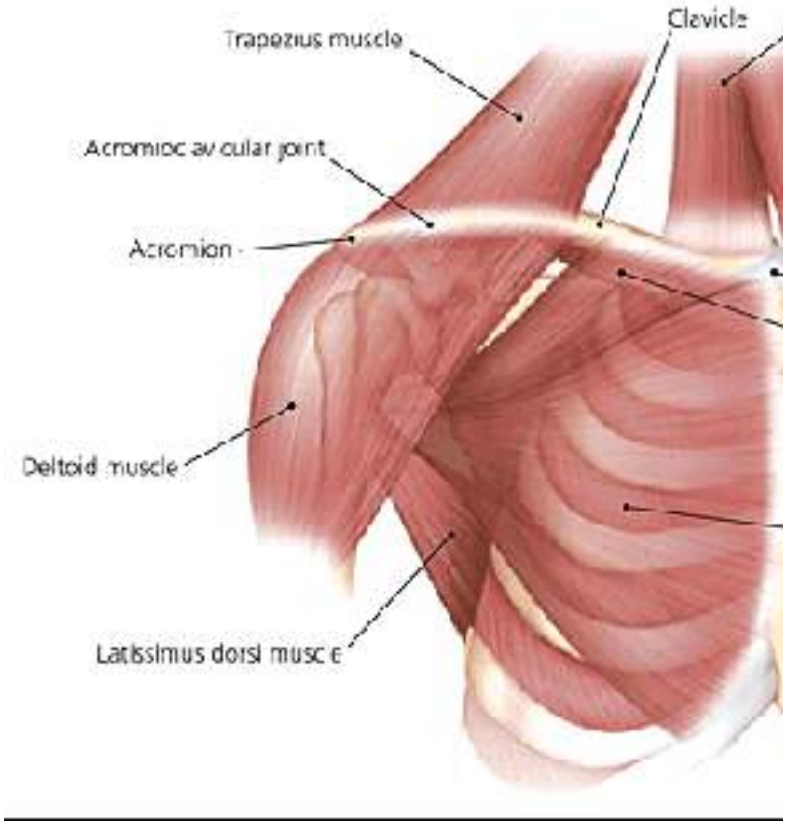
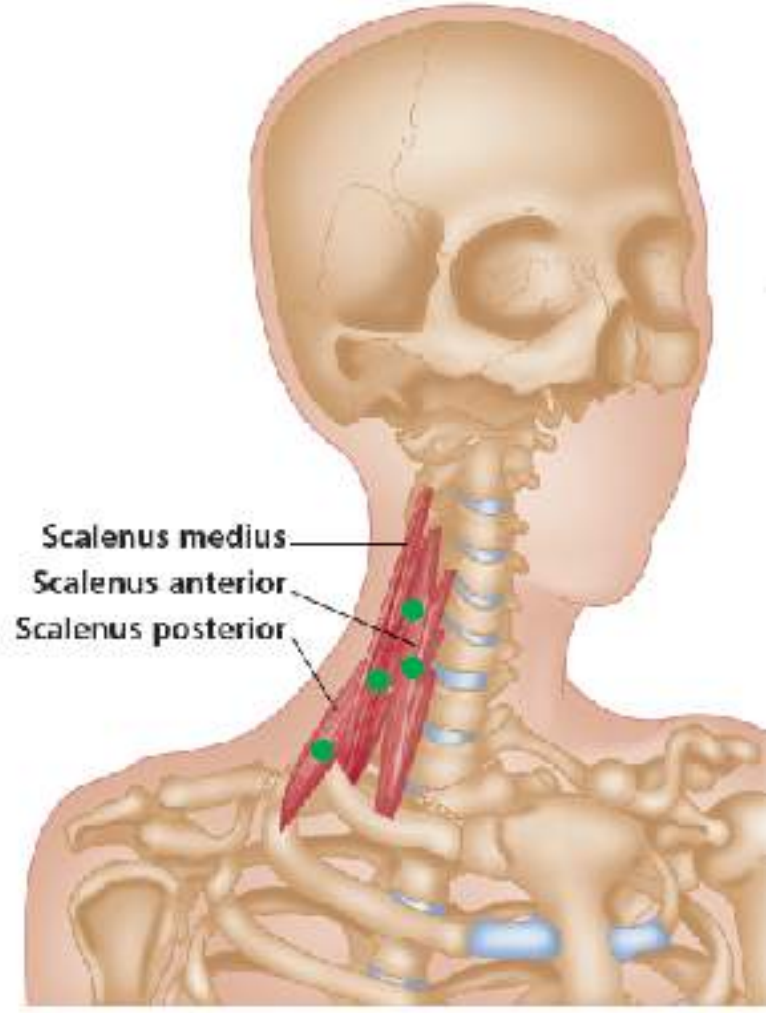
Platysma

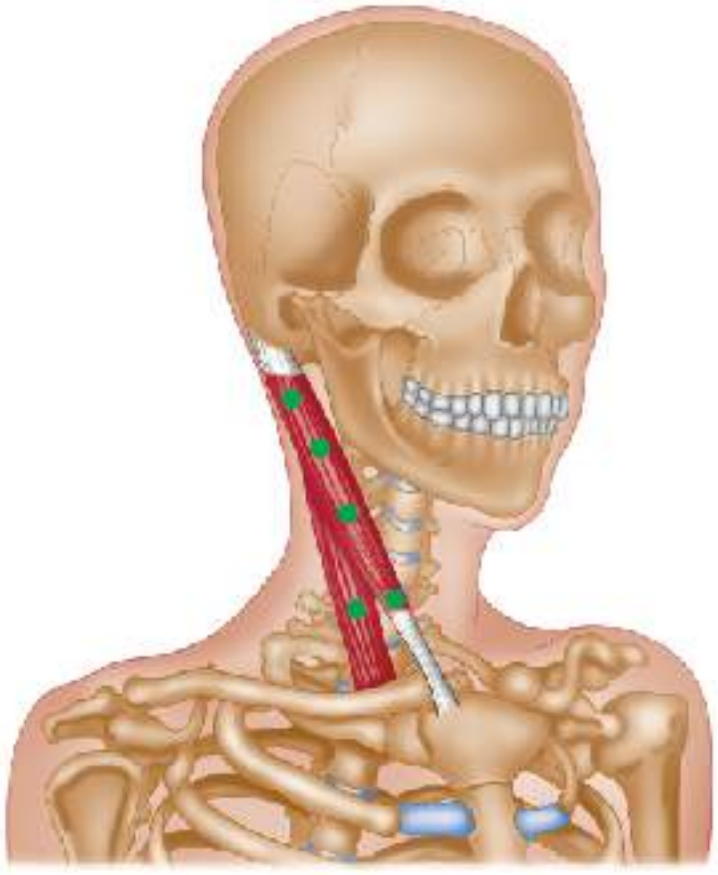




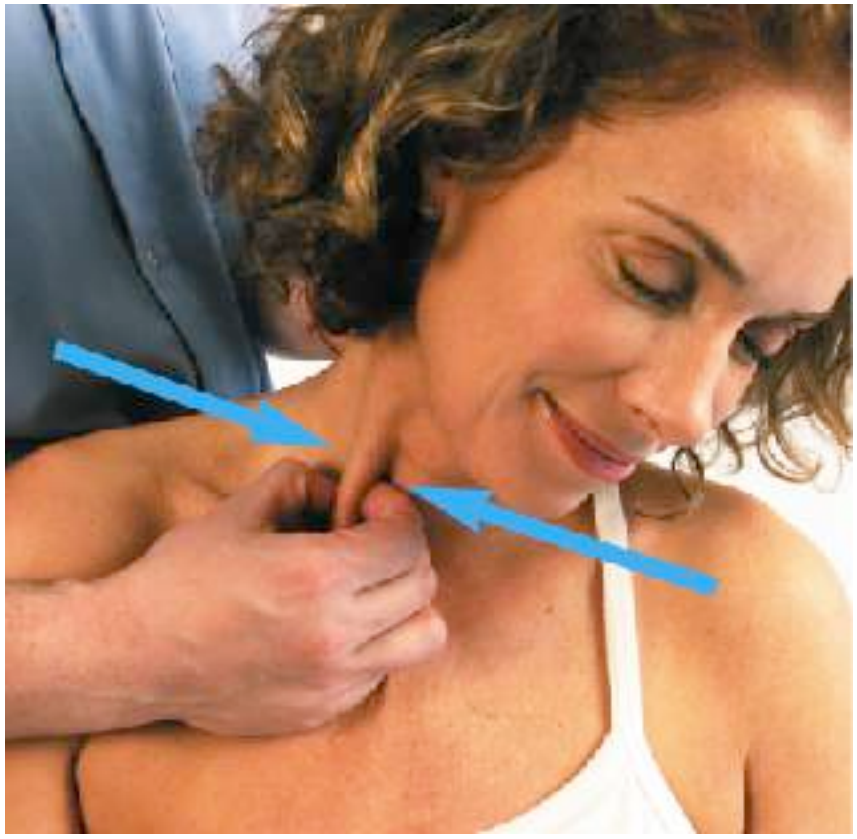
Subclavius

Scalenes



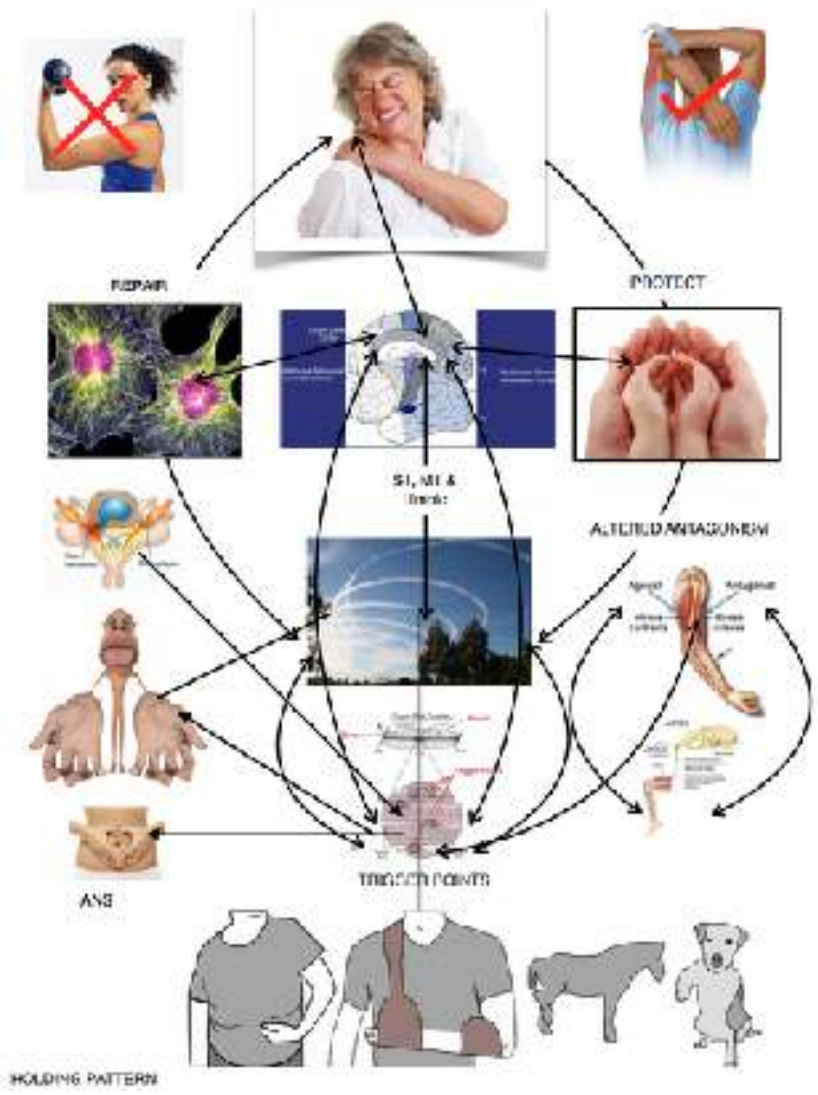


Sternocleidomastoid



Role of exercise! – Why?

NAT – Neuroplastic Trigger Point Hypothesis



NAT – Hypothesis

Spinal cord reflex responses:

- Konstamm reflex
- Reciprocal inhibition
- Post-Isometric relaxation
- Post-activation depression

Autonomic (ANS) responses

Neuroplastic:

- Co-coordination
- Co-facilitation

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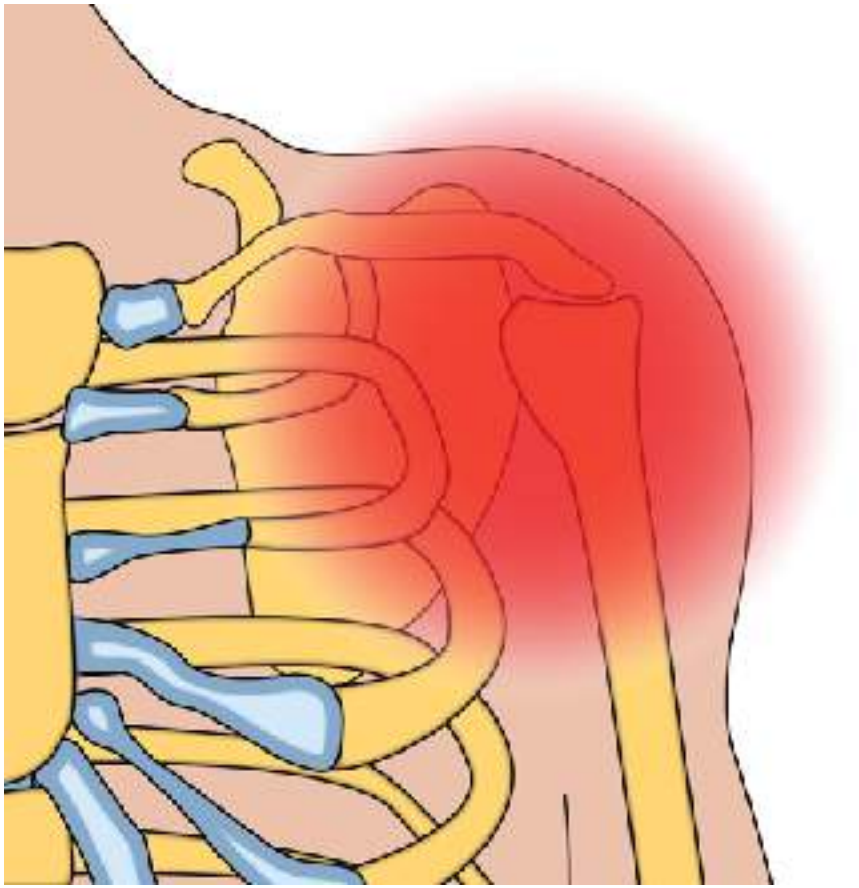
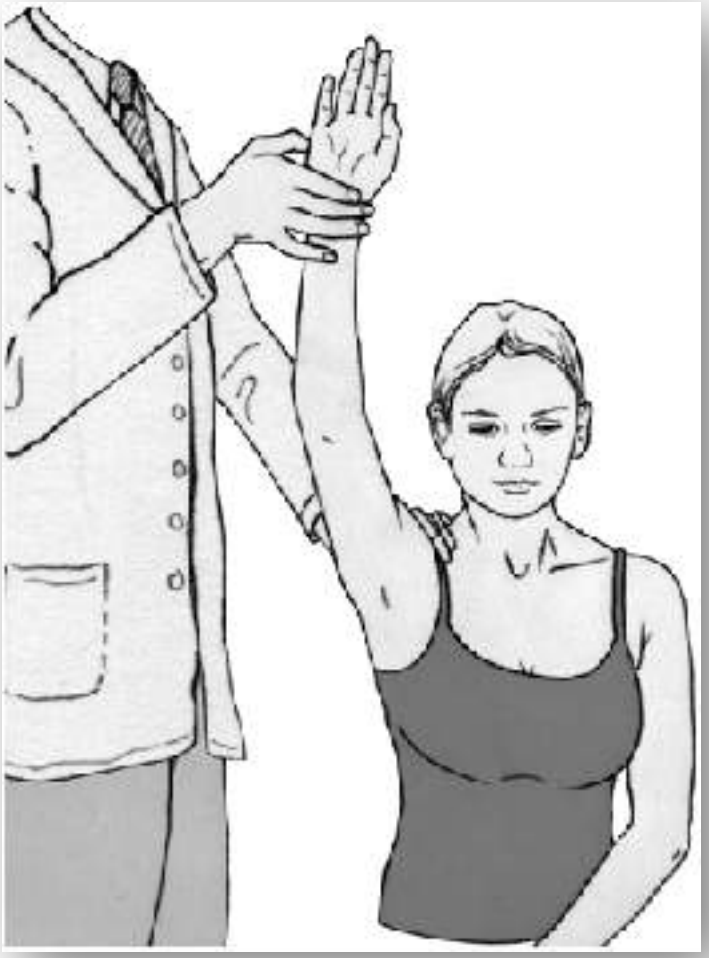
Day 2

- Review of day 1
- The Rotator Cuff (RC)
- SPS
- AC Joint
- Lunch
- The Hip
- NAT Hip
- Q & A



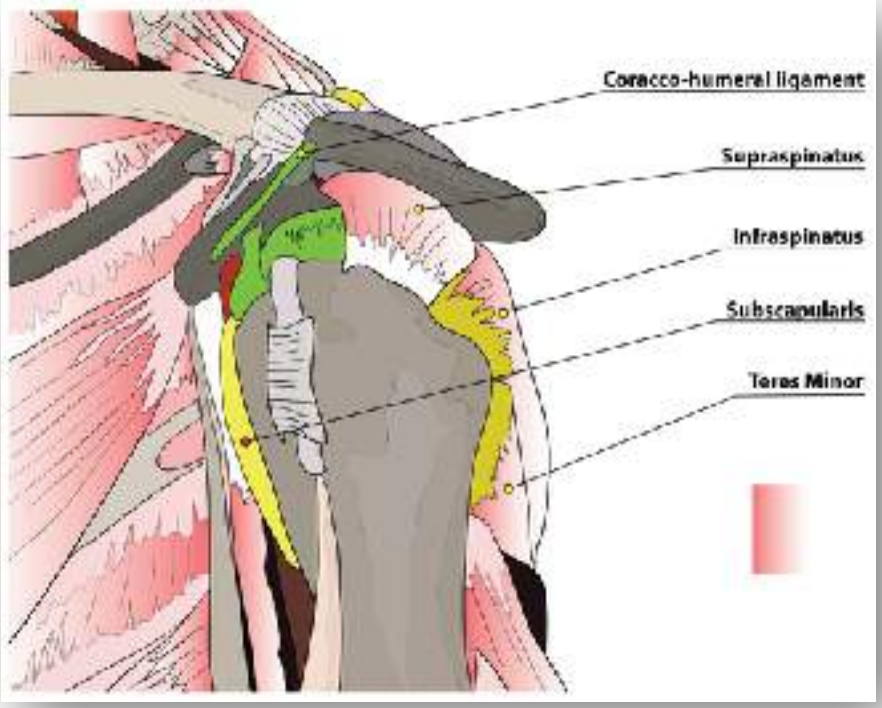
The three big problems

- Rotator cuff tendinopathy (RCT)



The Rotator Cuff Overview – Lewis 2014

- Shoulder pain and weakness most commonly experienced during shoulder external rotation and elevation.
- Lack of diagnostic accuracy of the special orthopedic tests and the
- Poor correlation between structural changes identified on imaging and symptoms.
- Graduated exercise programme are equal to those achieved with surgery for RC tendinopathy, as well as atraumatic partial and full thickness RC tears.
- Education is an essential component of rehabilitation.
- There are still substantial deficits in our knowledge regarding RC tendinopathy,



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The Rotator Cuff Tendon

- Not anatomically distinct in vivo
- RC tendons fuse to form an aponeurosis (continuou common tendon) over the humeral tuberosities
- Postural tendon – large ball on small socket
- Tougher than industrial Steel

5 Layered Structure

– Short, wide, layers intertwined with synovia & with ligaments

– Loose CT

– CHL (superficial)

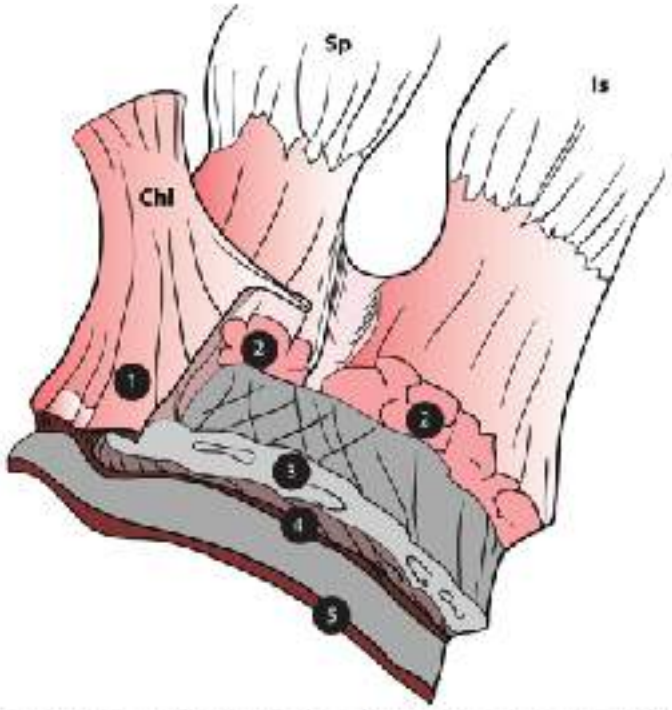
– Joint capsule

Cellular level: Type I Collagen

Maintenance & response to:

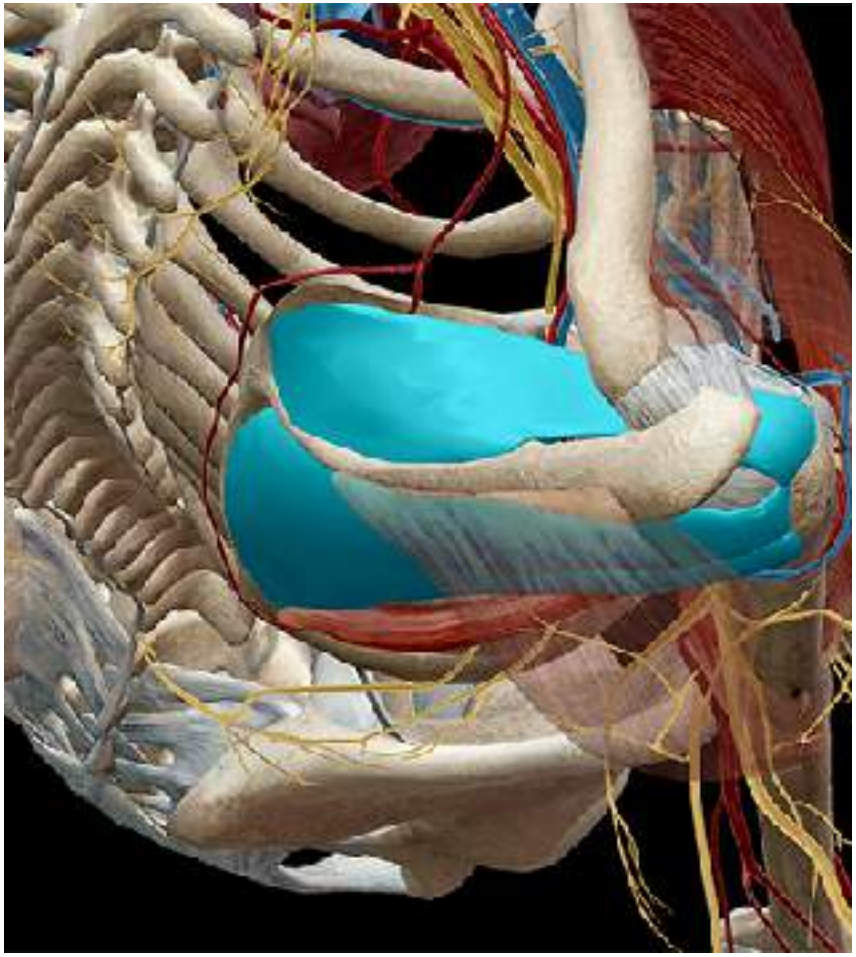
– Normal loads

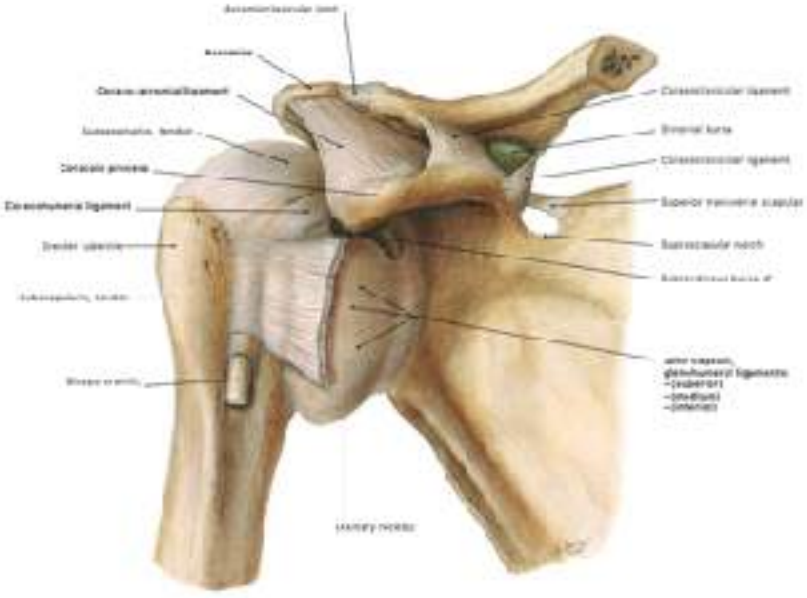
– Abnormal loads



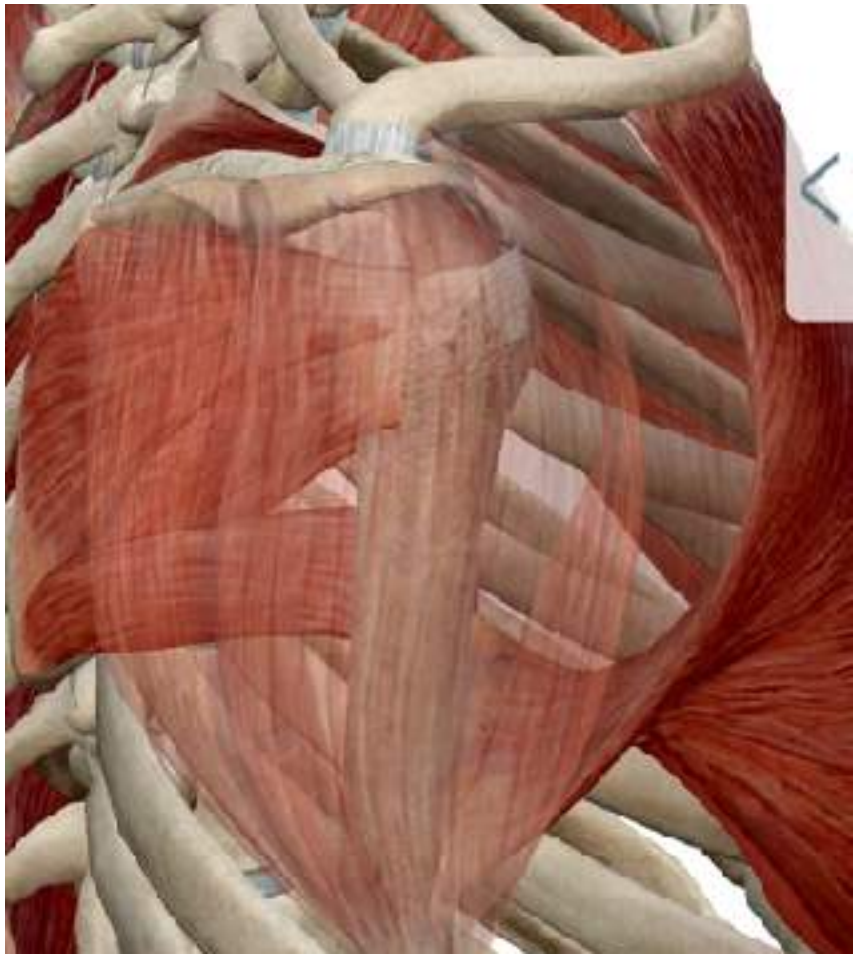
Chl = Coracohumeral ligament, Sp = Supraspinatus, Is = Infraspinatus
1. Coracohumeral ligament, 2. Cut portion of supraspinatus and cut portion of infraspinatus, 3. Fibrous cuff interblend, 4. Bursa, 5. Joint surface

The Muscles

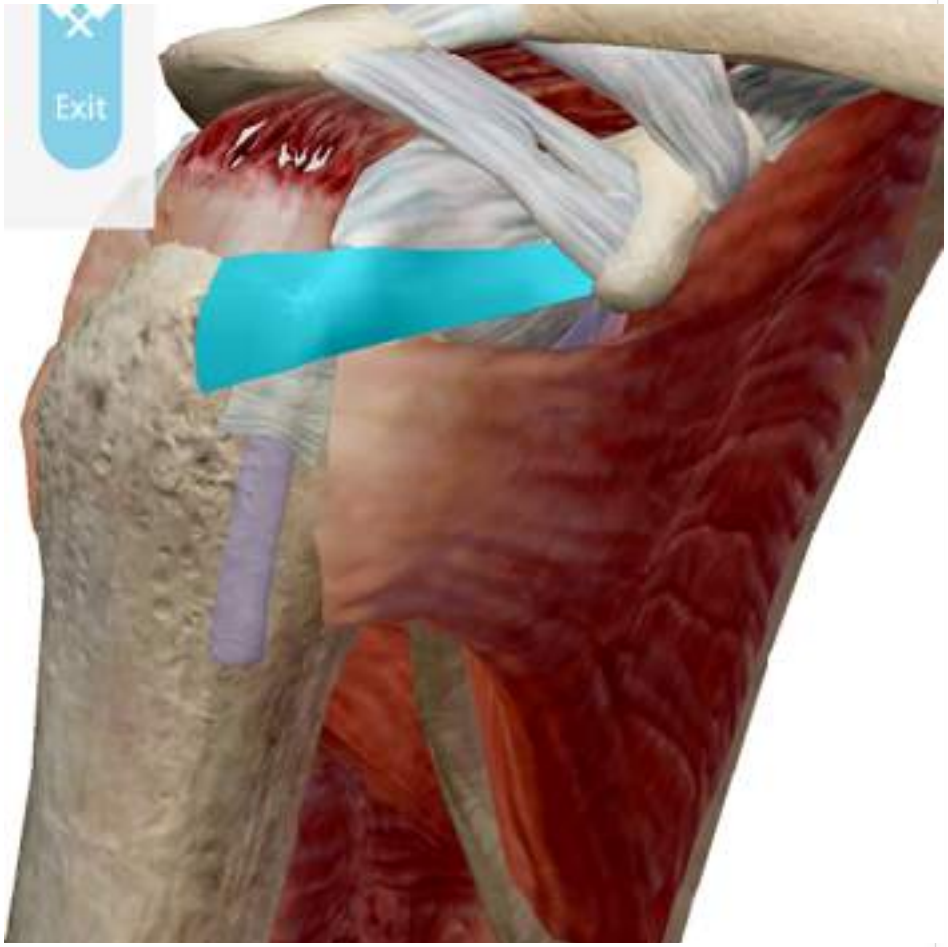




Cuff



Cuff Tear SSP, Corracohumeral Liagament (CHL)



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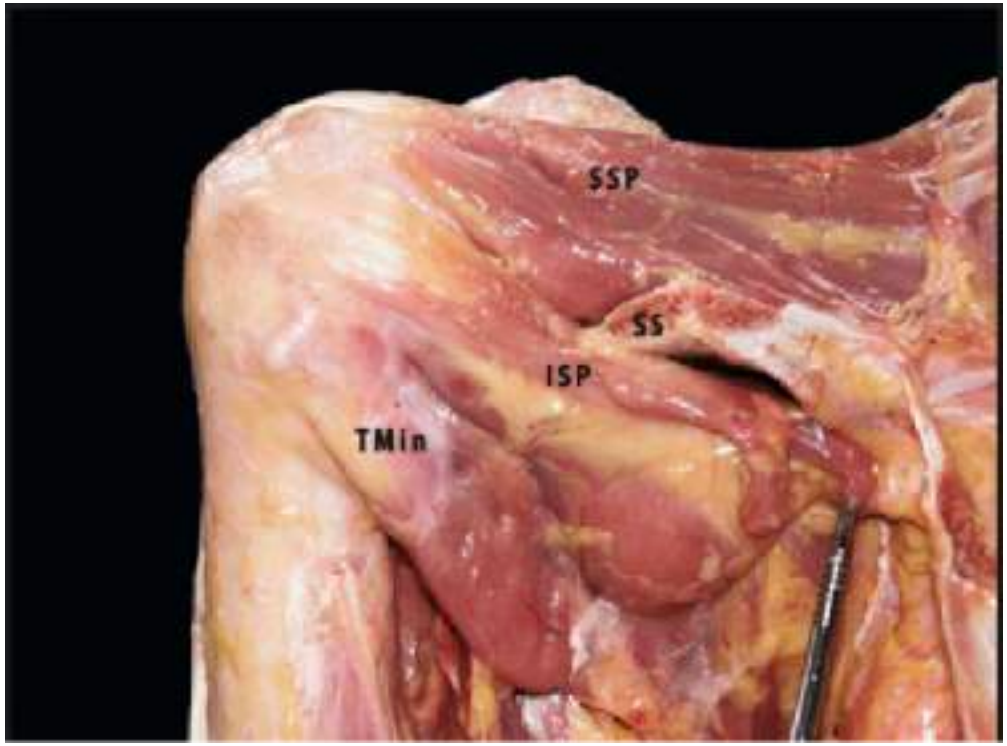
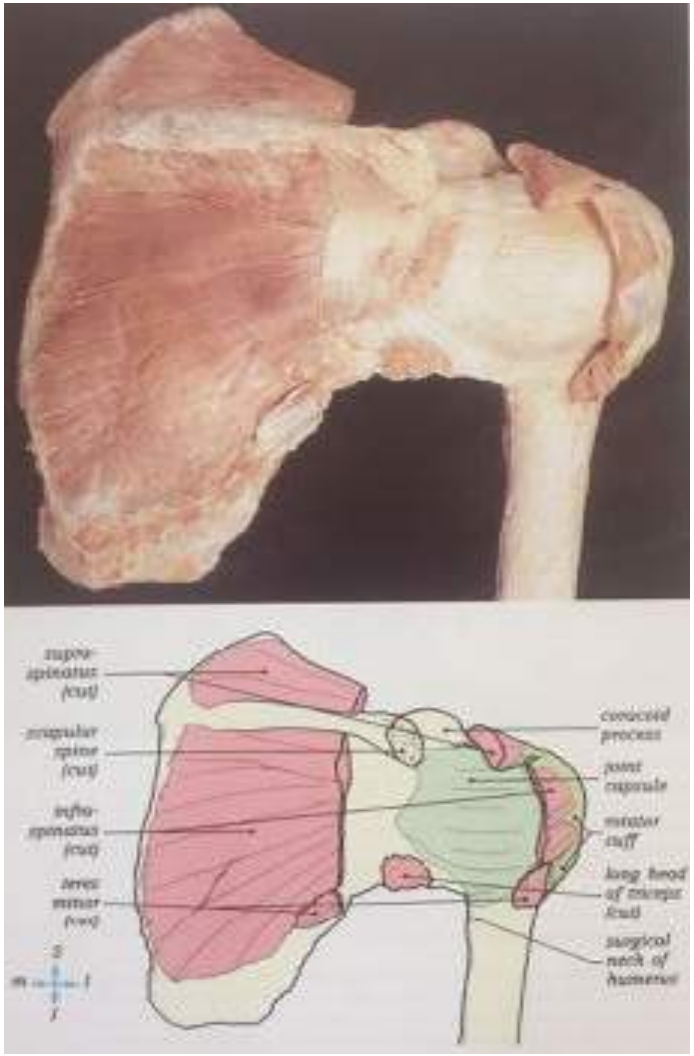
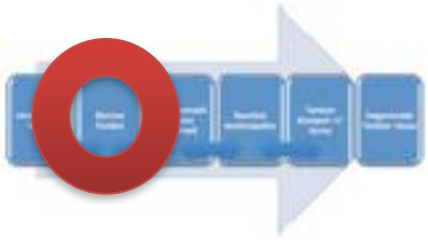
Cuff In Vivo

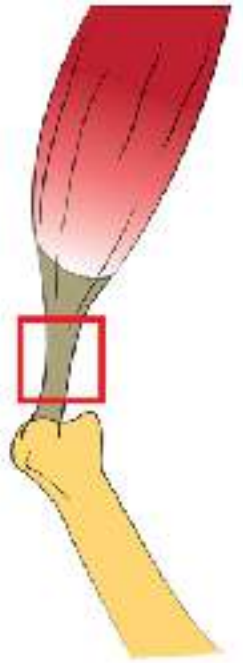


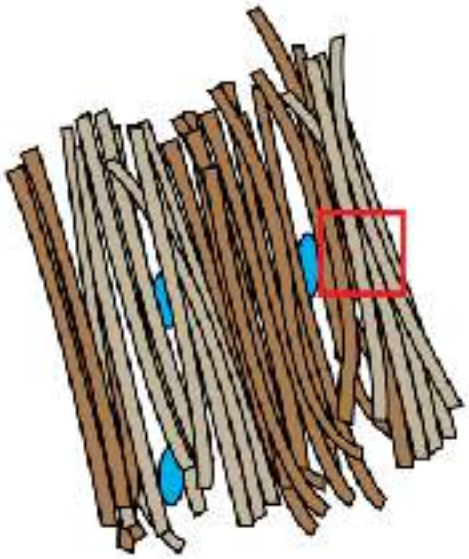


Shoulder Tendons – Type I Collagen

- **Stronger than steel**
- **Type I is the major shoulder collagen (22 types)**
- **Unlike others type I tendon fibers are parallel**
  - Translates muscle force to bone
- **Thick thick and thin like spaghetti**
- **Two layers**
  - **Bursal** side supraspinatus tendon fibers are thicker/larger than **articular** side
  - Ultimate failure stress of bursal side is double that of articular side fibers (Nakajima et al 1994)
- **Similar findings for other tendons**







Rotator Cuff Tear Presentation

Typical History:

- Patient usually over 40
- Sudden onset of pain
- Pain may be severe
- Band like around Deltoidius insertion
- Onset may be associated with trauma or no apparent reason (degenerative)
- Weakness is a predominant feature
- Patient may complain of restriction of movement

Typical Signs:

- Full passive range of movement
- Limited, painful, active range of motion
- Weakness on manual muscle testing
- Positive Drop arm test
- Adventitious movements

Epidemiology

- Multifactorial
- Age related degeneration.
- Well over 50% of 80's = rotator cuff tear.
- Smoking, hypercholesterolemia, and genetics
- Substantial full-thickness rotator cuff tears, in general, progress and enlarge with time.
- Pain, or worsening pain, usually signals tear progression in both asymptomatic and symptomatic tears and should warrant further investigation.
- Larger (>1-1.5 cm) symptomatic full-thickness cuff tears have a high rate of tear progression and, therefore, should be considered for earlier surgical repair in younger patients only (<35yrs)

Natural History

Three stages:

- Stage I occurs in patients < 25 years with swelling (oedema) and hemorrhage of the tendon and bursa.
- Stage II involves tendinitis and fibrosis of the rotator cuff in patients aged between 25 and 40 years of age.
- Stage III involves tearing of the rotator cuff, either partial or full-thickness, and occurs in patients > 40 years of age.

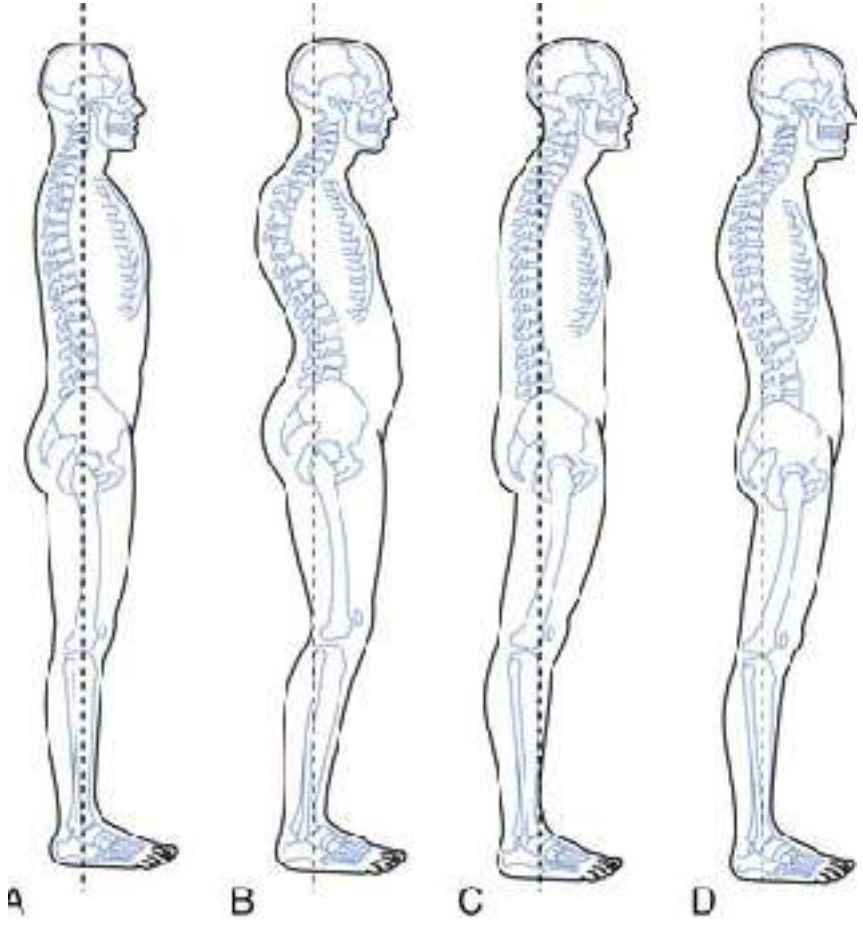
Research has demonstrated that 10% of partial-thickness tears heal and 10% become smaller, but 53% of tears will propagate and 28% progress to full-thickness tears.

A full thickness tear will not heal spontaneously.

Posture

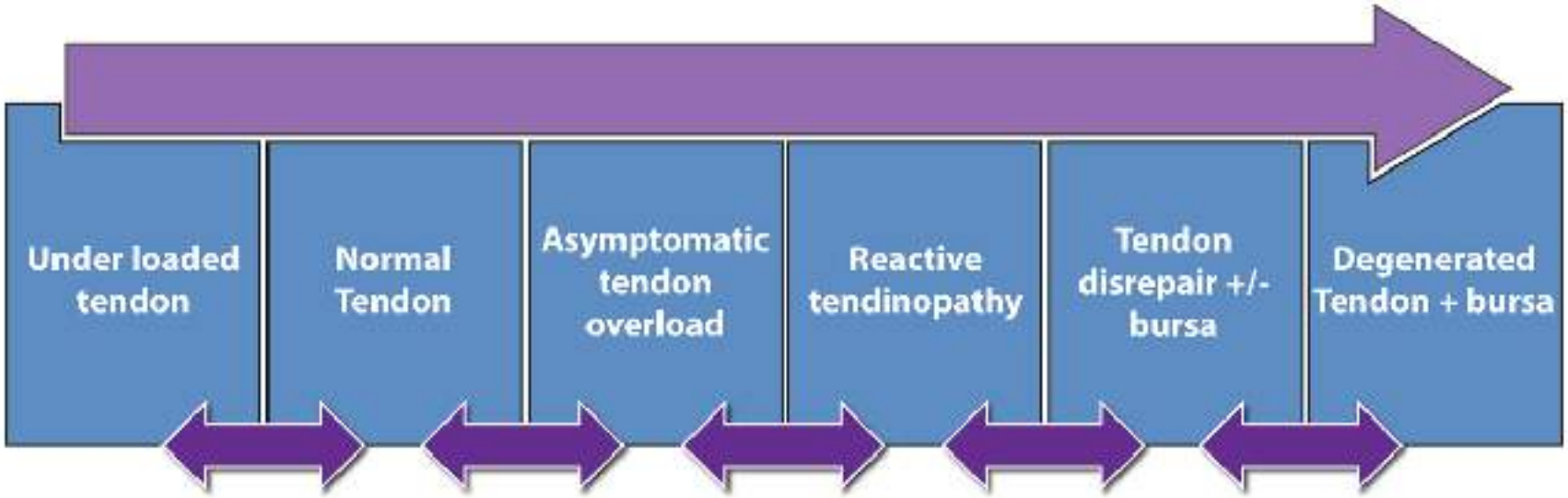
- **525 residents of a mountain village who participated in an annual health check**
- **Questionnaires and physical examination**
- **Ultrasonographic examination**
- **Posture was classified by 2 observers into 4 types according to the classification of Kendall, as follows:**
  - A. Ideal alignment,
  - B. Kyphotic-lordotic posture,
  - C. Flat-back posture,
  - D. Sway-back posture

"Postural abnormality represented an independent predictor of both symptomatic and asymptomatic rotator cuff tears. These results may help define preventive measures for rotator cuff tears and in designing rehabilitation therapies for shoulder disease."



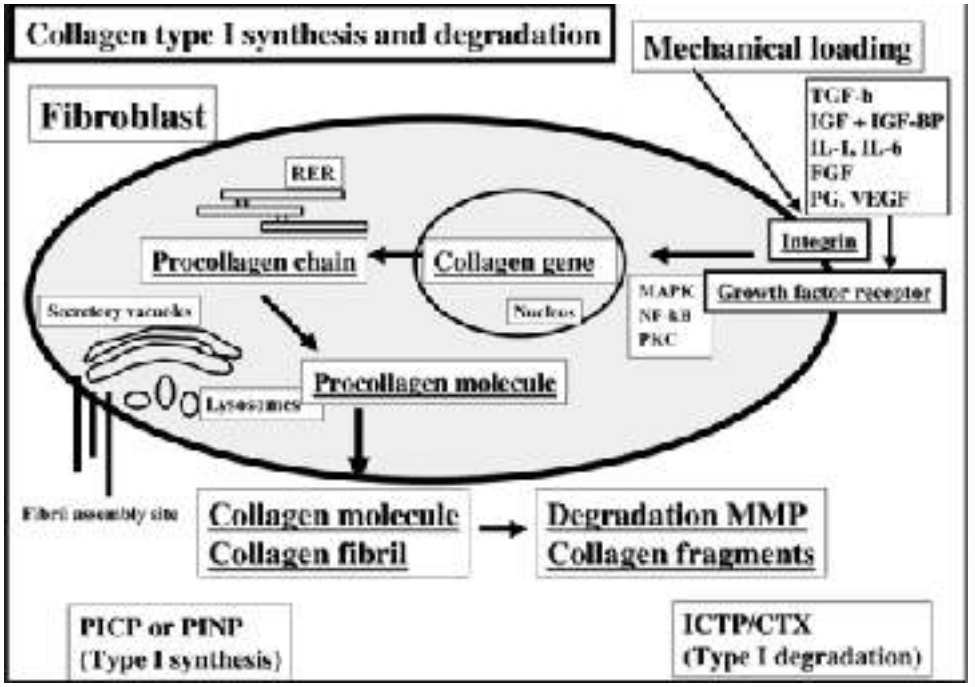
Model for continuum of rotator cuff tendinopathy – 6 stages

Lewis JS (2010) *BJSM* Rotator cuff tendinopathy



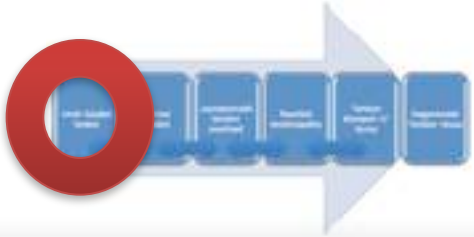
Normal Tendon

- Fixed amount of tendon up to age 18
- Name: Fibroblast =tenocyte =chondrocyte
- Affected by mechanical loading
- Matrix and ground substance made by tenocyte = proteoglycan (protein+sugar) which has a -ve charge
- Hydrophilic as a form of shock-absorption
- Type I collagen is 50% water – doesn't react well to compression

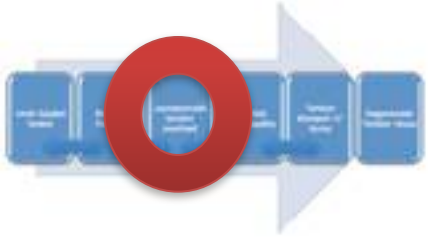


Under-loaded

- Lifestyle related
- Only become a recent phenomena
- Tendons constantly remodeling from loading – lack of Exx!
- Tendons can not heal in the presence of nicotine. Free radicals attack fibroblasts & decrease cell health SURGERY WILL NOT WORK
- Increased adiposity=increased pro inflammatory cytokine release)
- Hypercholesterolaemia
- Oxidative stress – using anti-oxidants, omega3 and Exx demonstrated to improve RC



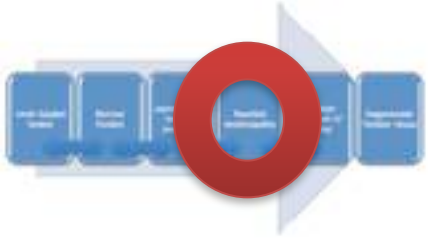
Asymptomatic tendon overload

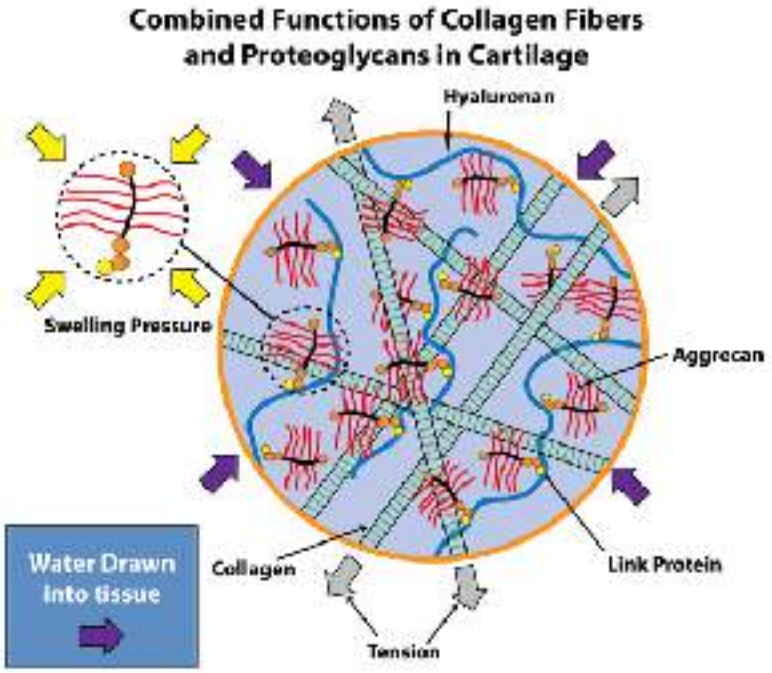


- **Tendons like small and gradual changes**
  - Returning to fitness
  - New years resolutions
- **Acute overload**
  - >3% sudden eccentric load – tear
  - >5% sudden eccentric load – rupture
- **Compensation elsewhere – other rotator cuff mm**
- **Posture and loss of GH centering**
- **Trigger Points Develop**
- **Take a break & move around**

Reactive tendinopathy

- **Reactive tendon:**
  - Increase fibroblast stimulation
  - Increased water absorption
  - Tendinopathy
  - Pressure effects cause proteoglycans to line up into a cartilage like pattern
  - This makes tendon more springy
- **This is often when patients present for treatment**
- **Reversible with proper management**





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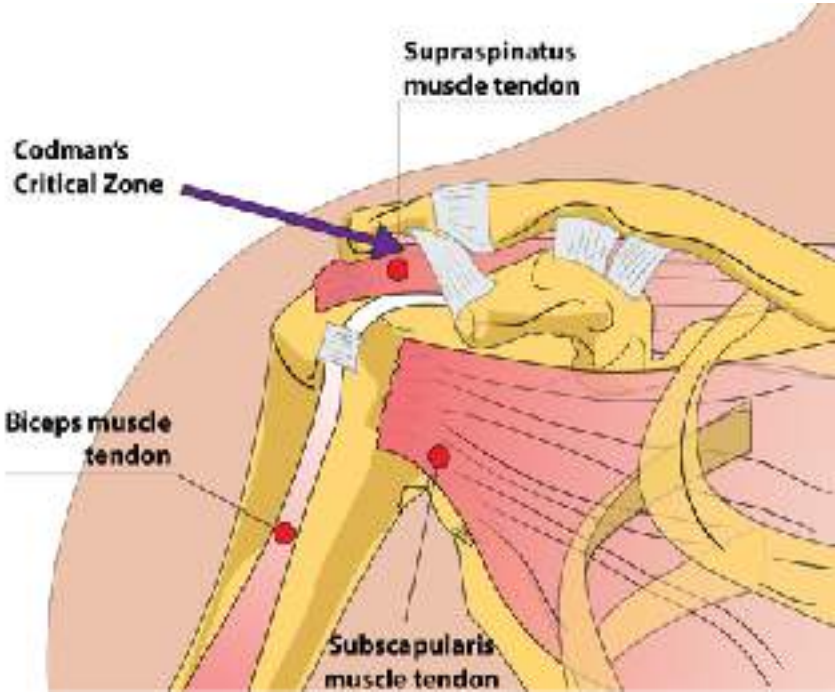
Pressure effects

- **Lack of space due to evolutionary anatomy**
- **Codman's Critical Zone**
- **Compression effects**
- **Abnormal tendon swells with challenge**
- **Corracohumeral lig**
  - Increased tension on abduction
  - Disproportionate influence on acromion side (spur)
- **TT:**
  - Relative rest + NAT
  - Ibuprofen (NSAID)
  - Regain homeostasis
  - Can take weeks



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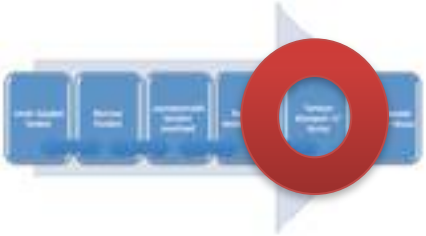
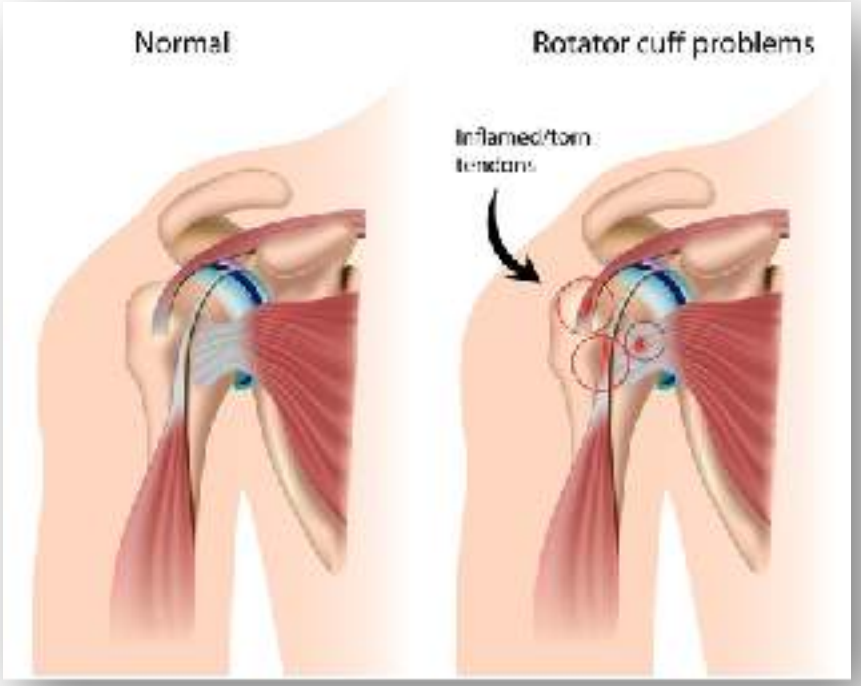
Tendon disrepair

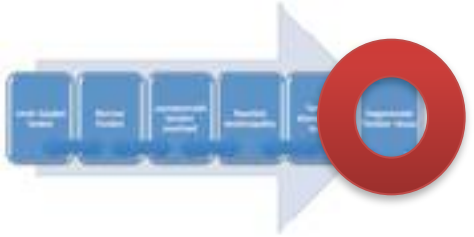


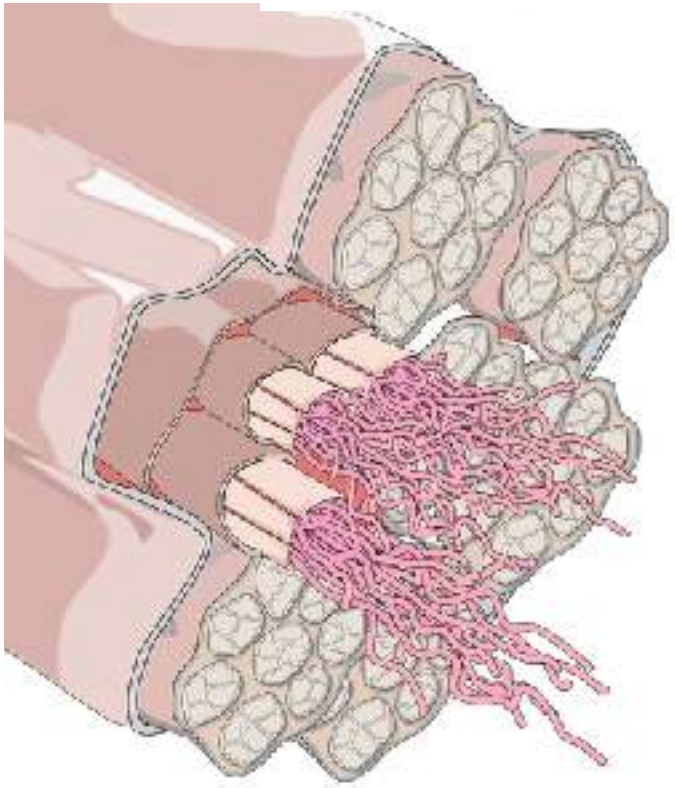
- Be very careful
- Treat as if ♯
- Slow everything down
- Severe pain on use but no pain at rest
- Beginning of loss of parallel alignment of collagen
- +/- Bursa infiltration
- S/S & I/S main mm – external rotators
- LHB overload to prevent?



Degeneration

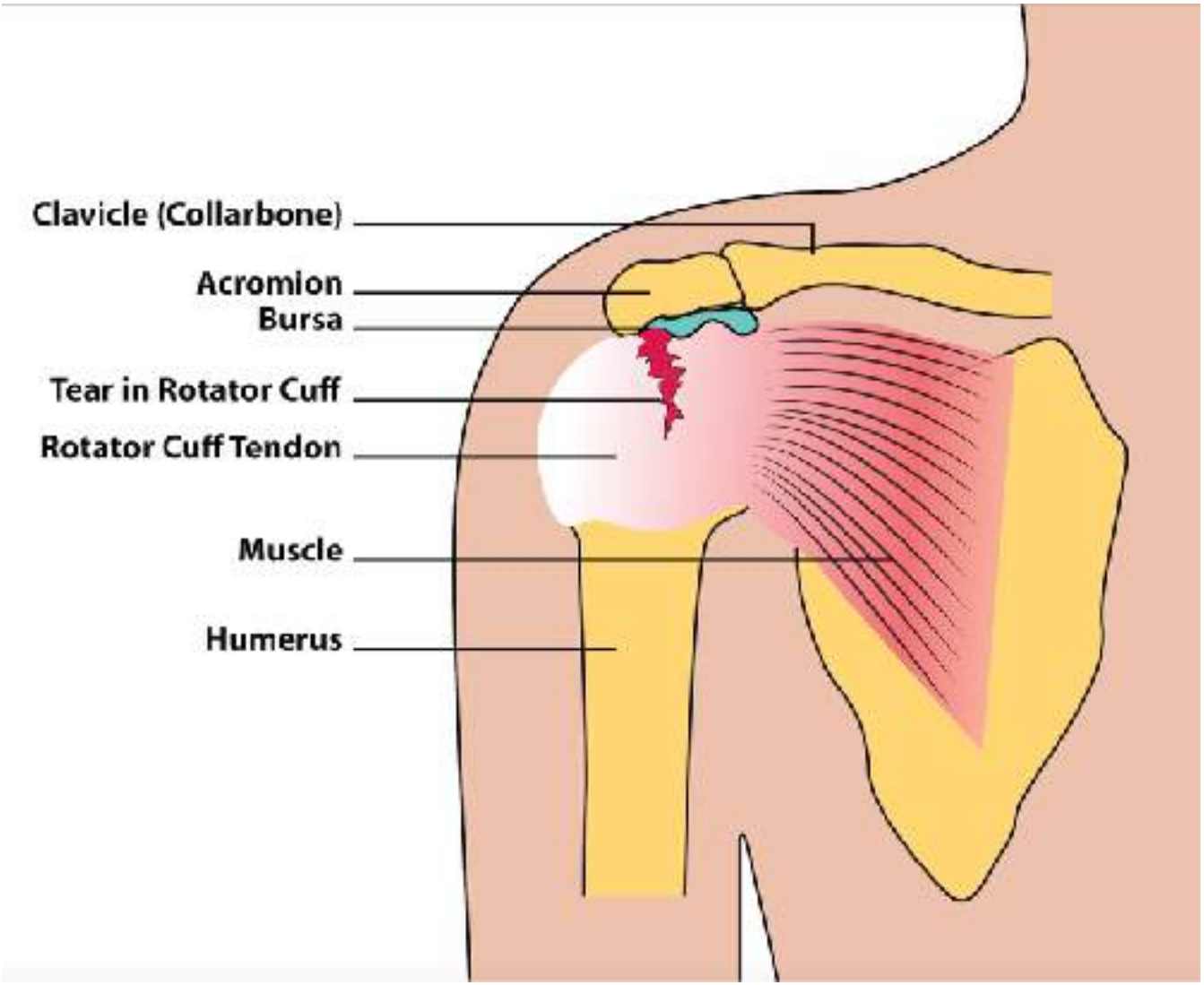
- **FFT/rupture**
  - Boiled Spaghetti
- **Loss of:**
  - Movement
  - Compression
  - Centering
  - Sensoro-motor control
- **Night pain (critical zone S/S)**
- **Bursa Infiltration**
- **Classic symptoms**
- **Research suggests Exx first**
  - Add loading carefully
  - Structured rehab
  - Often not successful with surgery due to withered tendon





Abnormal arrangement of collagen fibers

Tears



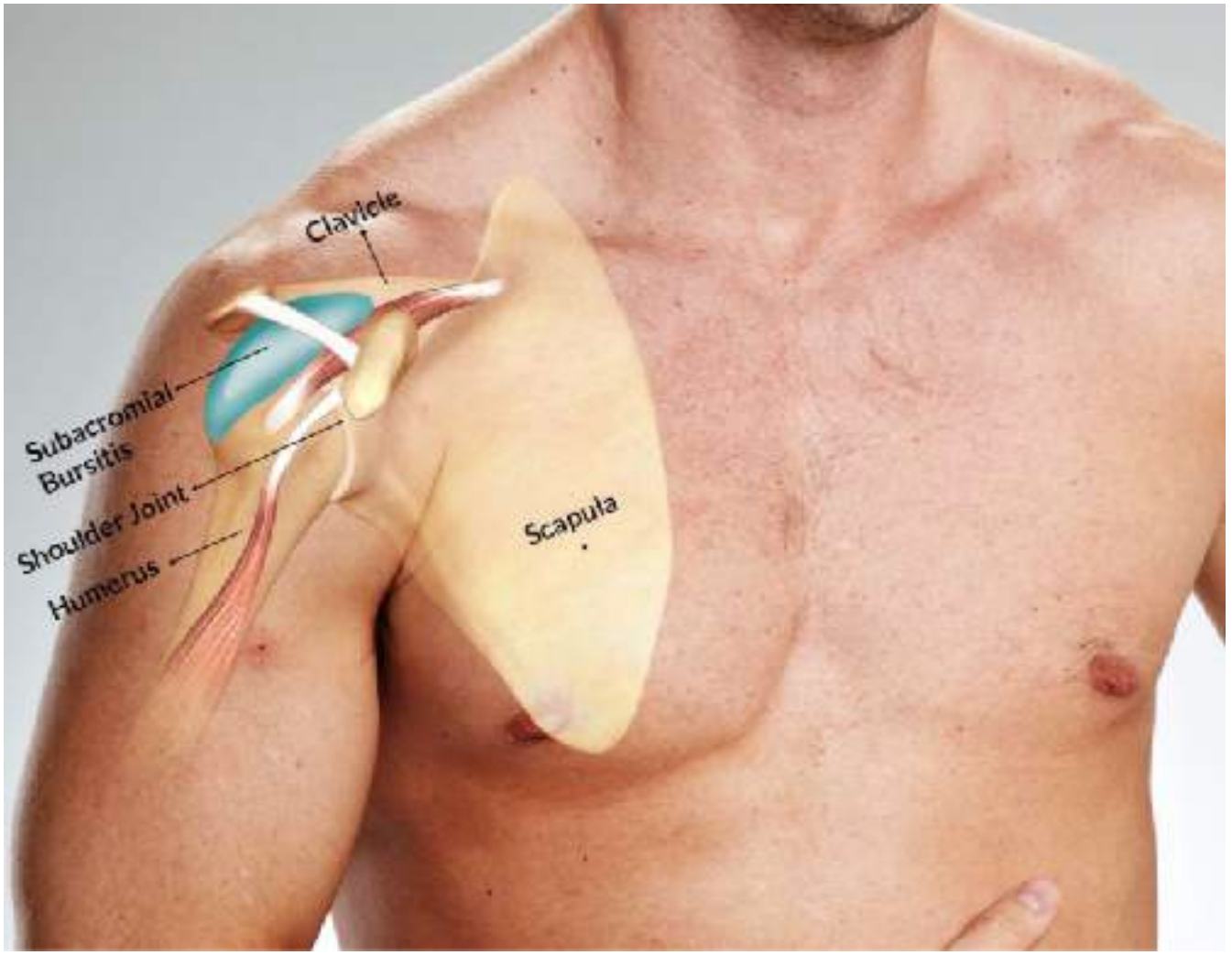
Classification of tears

According to the site	Articular side or bursal side	
According to thickness	Grade I	Less than a quarter thickness
	Grade II	Less than a half thickness
	Grade III	More than half thickness

Classification of full thickness tears:

Small	less than 1cm	
Moderate	1-3 cm	
Large	more than 3 cm	
Massive	more than 5 cm	

Treating the Sub Acromial Space - SPS



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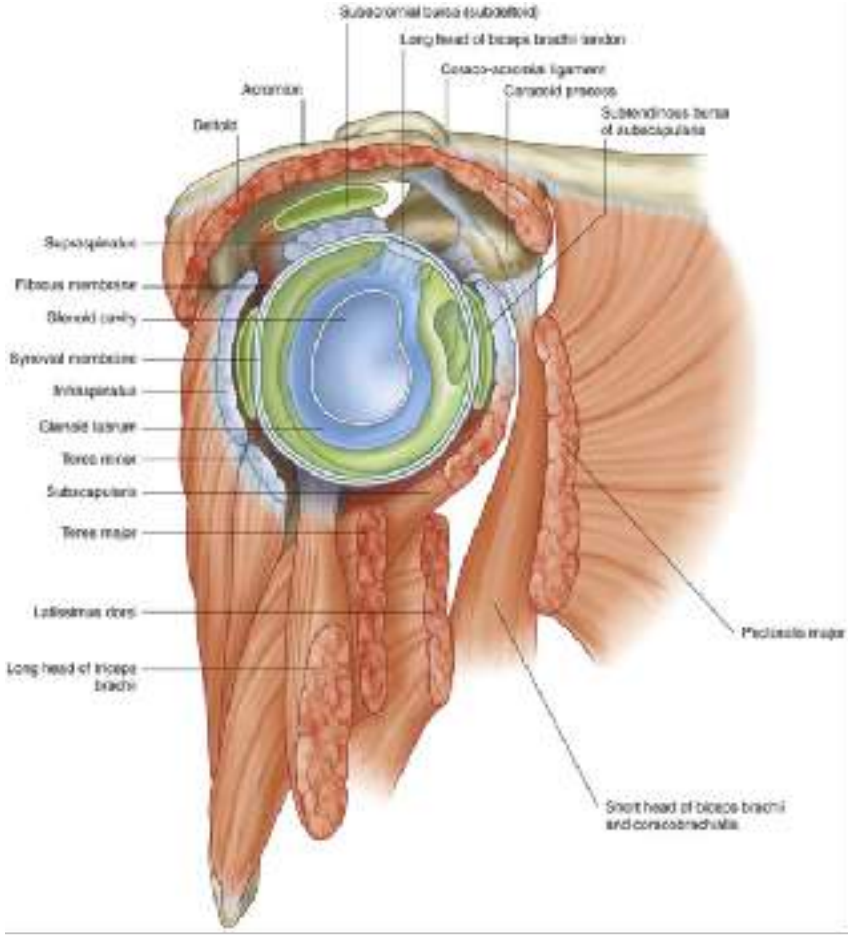
SPS – Anatomy



- Contains:
  - 6-12 Bursae
  - SSP Tendon
    RC Tendon
  - Rotator Interval
  - LHBT
- Impingement accounts for 44 to 65% of all shoulder complaints (Van der Windt 1996)
- Overhead activity/sport
- 2 types - Structural and functional.