Common Shoulder Problems in Active (and Not So Active)Adults

Primary Care Hawaii 2022:
Caring for the Active and Athletic Patient

Jim Macintyre MD, MPE, FACSM, FAMSSM, Dip Sport Med

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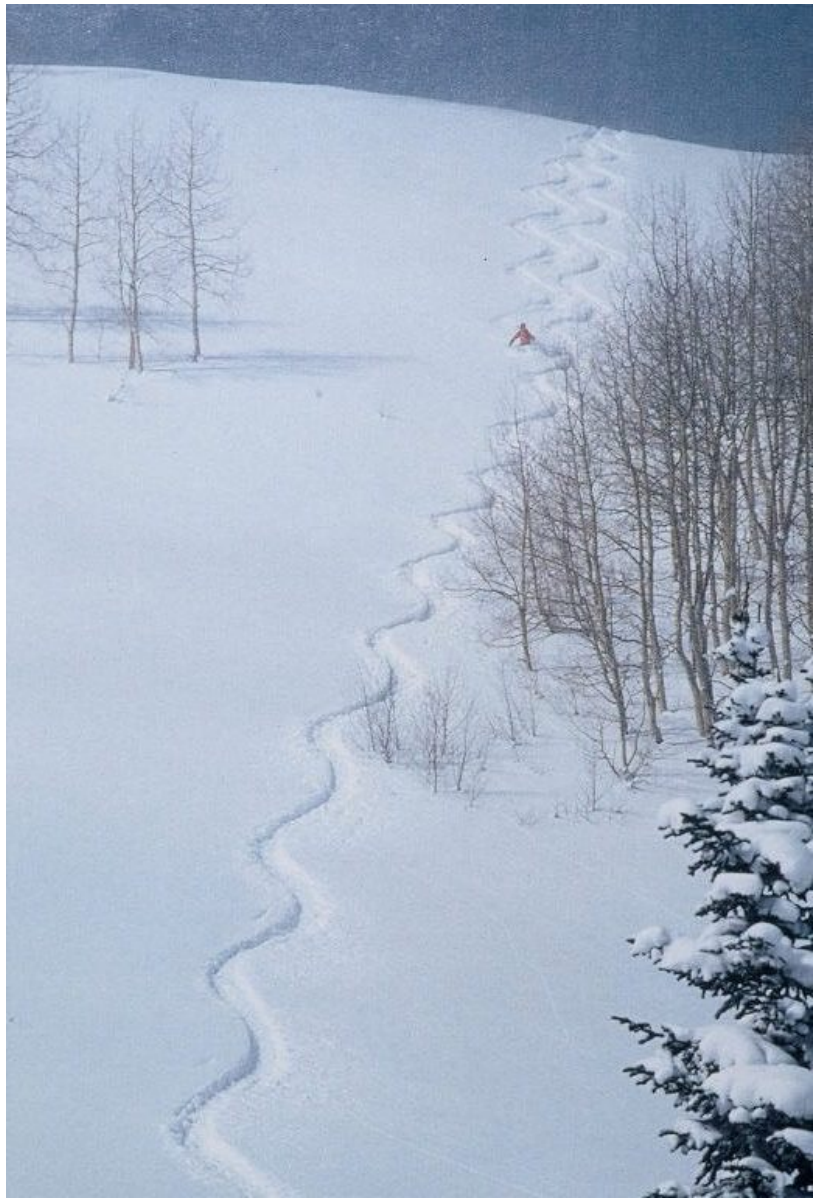
- Dr. Macintyre has no conflicts of interest
- No off-label medications will be discussed

Outline

- Shoulder anatomy
- Functional mechanics
- “Rotary Cup” Problems
- Shoulder Imaging
- Frozen shoulder
- Calcific tendonitis
- Scapular pain
  - First rib syndrome



Bony Architecture - Shoulder

- **Bones**
  - Sternum
  - Clavicle
  - Scapula
  - Humerus
- **Joints**
  - Sterno-clavicular
  - Acromio-clavicular
  - Scapulo-thoracic
  - Gleno-humeral

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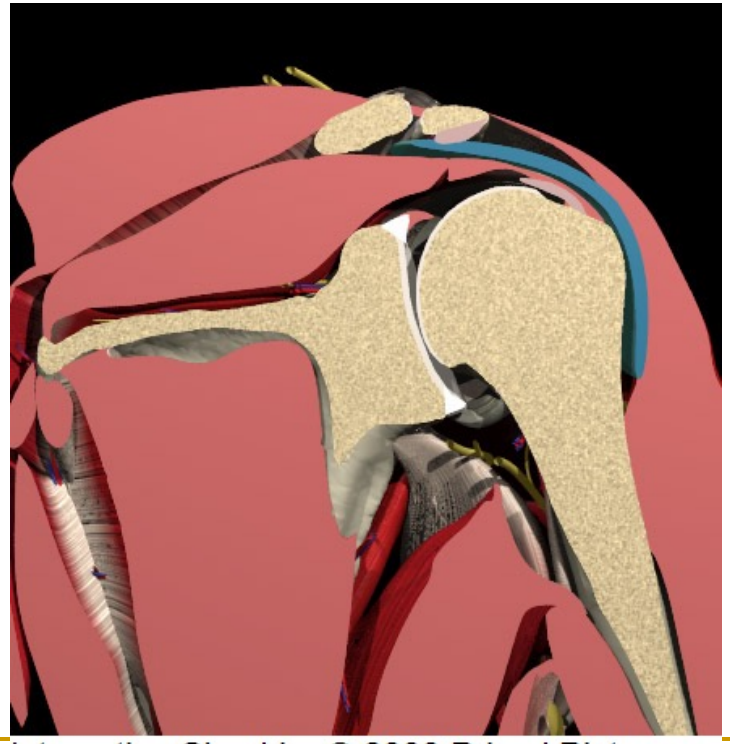
The gleno-humeral joint is like a golf ball sitting on a tee. The scapulothoracic joint is responsible for properly positioning the tee for optimum function.



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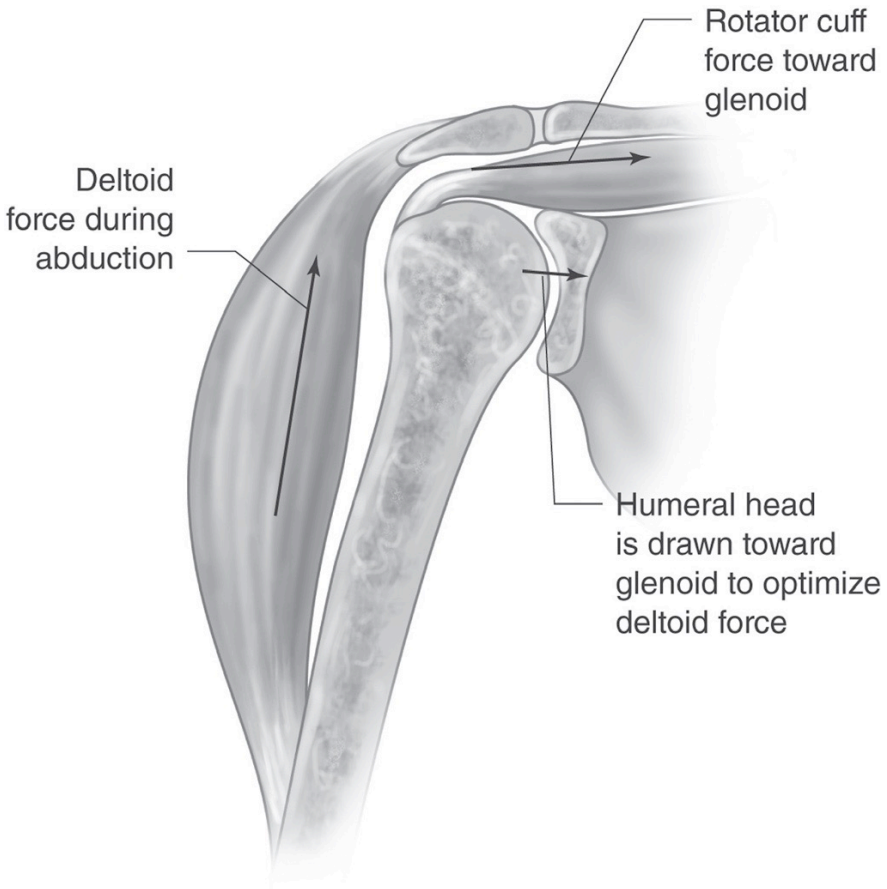
Functional Mechanics

- The gleno-humeral joint is only one link in a chain
- The entire chain must be recruited and coordinated for maximal performance
- Dysfunction at one site may lead to injury at another
- Culprit vs. Victim

Why is the Scapula Critical?

- The scapula positions the glenoid fossa for optimum function of the shoulder joint
- The shoulder works best when the arm is in the axis of the scapula
- Poor scapular positioning results in rotator cuff impingement

Functional Mechanics of Elevation



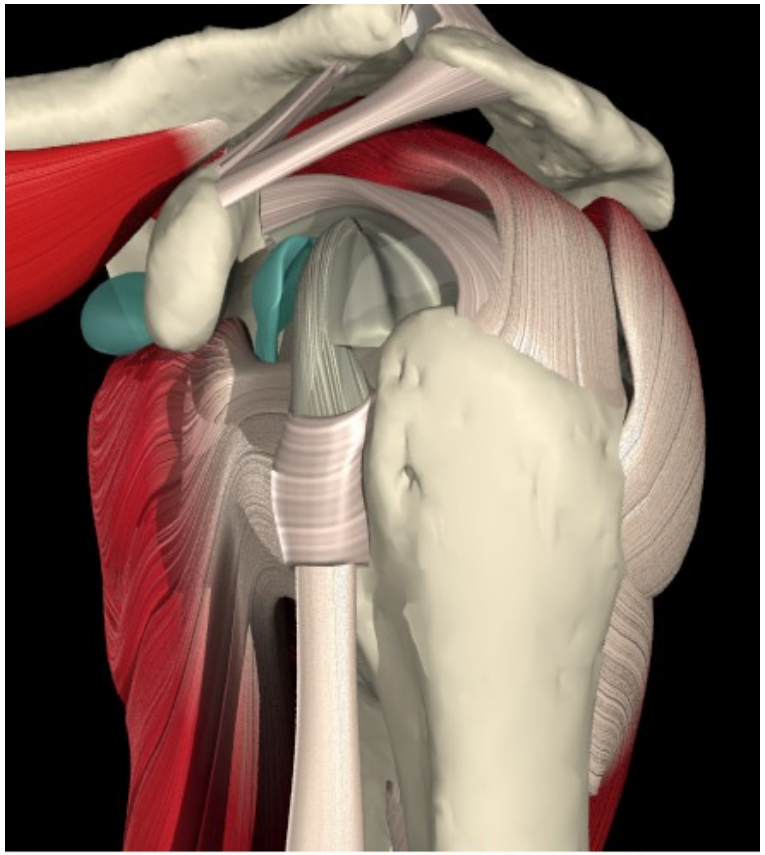
- The rotator cuff spins the humeral head on the glenoid to give the deltoid a better mechanical advantage
- If the cuff is not active or is fatigued, deltoid contraction causes superior migration of the humeral head, and impingement

Functional Mechanics

- Humeral head must be stabilized on glenoid by the rotator cuff
- Failure to stabilize for any reason leads to cuff problems

Rotator Cuff

- “Impingement"
- Tendonitis / Tendonosis
- Subacromial bursitis
- Tears



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Tendonitis vs. Tendonosis

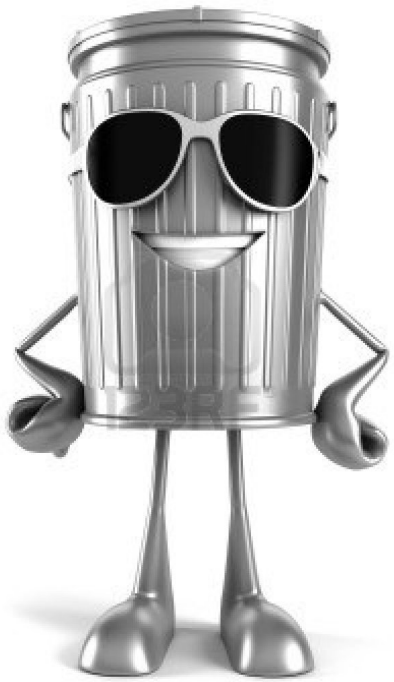
- **Tendinitis** is an acute inflammation of the tendon
  - Occurs in response to new activity, or stress
- **Tendinosis** is an intra-tendinous ***degeneration***
- **NOT** Inflammation
  - Commonly due to aging, repetitive microtrauma, overload or underload and/or vascular compromise
  - Loss of normal collagen / tendon architecture and an absence of inflammatory cells.

Cuff Tears: Blue Jean Analogy

- When you're young the cuff is tough, and it takes significant trauma / loading to tear it
  - You know you did something!
- When you age, the cuff gets thinner and may tear with minor or no specific trauma
  - Attritional tear
  - Many asymptomatic

Impingement

- The term impingement is a garbage can and represents multiple different etiologies
- Impingement is a ***symptom NOT a diagnosis***
- There are multiple causes for impingement each with different non-surgical and surgical treatments
- “One size fits all / Cookbook” diagnosis and treatment does ***NOT*** work (Especially for surgery)

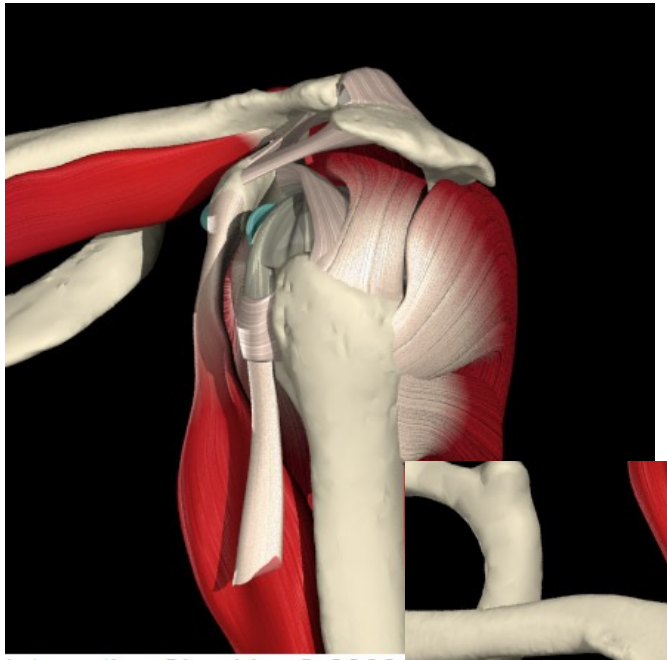


Tendonosis: Impingement

- Anatomic Outlet Obstruction / Stenosis
  - Anatomic structures impinging on the cuff
- Functional Outlet Obstruction / Stenosis
  - Functional abnormalities leading to impingement on the cuff
    - Stability
    - Posture
    - Capsular Tightness
    - Weakness
    - Scapular dyskinesis
- You must identify which of these problems is / are the “culprit” to achieve treatment success
- Classify every patient for optimum results

Tendonosis: Impingement

- Proper treatment requires accurate diagnosis so that underlying factors can be treated
- “Culprit vs Victim”
- Multiple different culprits result in the victim (cuff) being impinged



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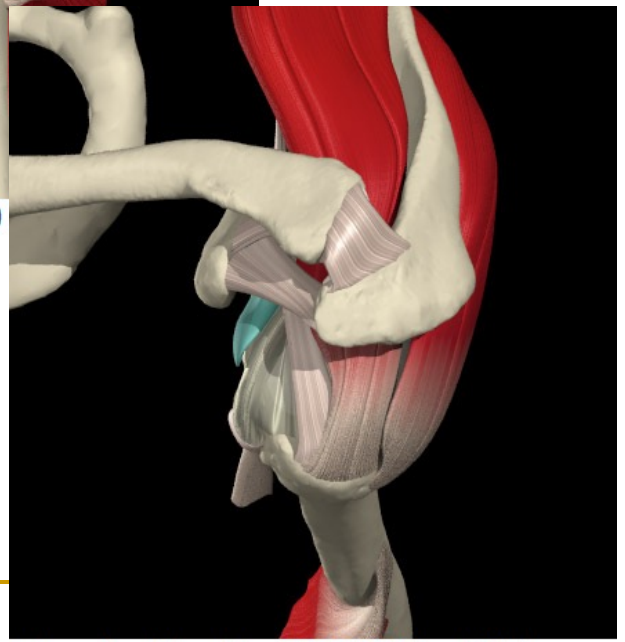

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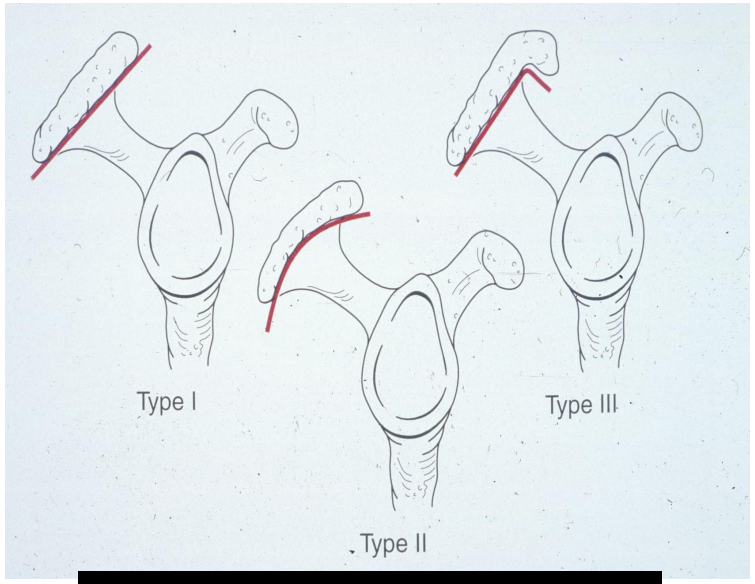
Anatomic Outlet Obstruction

- Acromial morphology
  - Hook
  - Lateral downsloping
- Subacromial spurring
- A-C Joint hypertrophy / degeneration
- Symptomatic Os Acromiale
  - Can be found in young pitchers



Functional Outlet Obstruction

- ***Anything*** which interferes with proper positioning of the humeral head on the glenoid or the scapula on the chest wall

Functional Outlet Obstruction

- Gleno-humeral instability
- Muscle imbalance
- Scapular instability
- Posture
- Tight Posterior capsule

Functional Outlet Obstruction

- Gleno-humeral instability
  - *Always* consider with impingement < 25 years old
  - If A-P translation increased it is likely that superior translation could be increased
- Cuff weakness
  - Fatigue / Overload
  - Muscle imbalance
  - Suprascapular nerve injury

Functional Outlet Obstruction

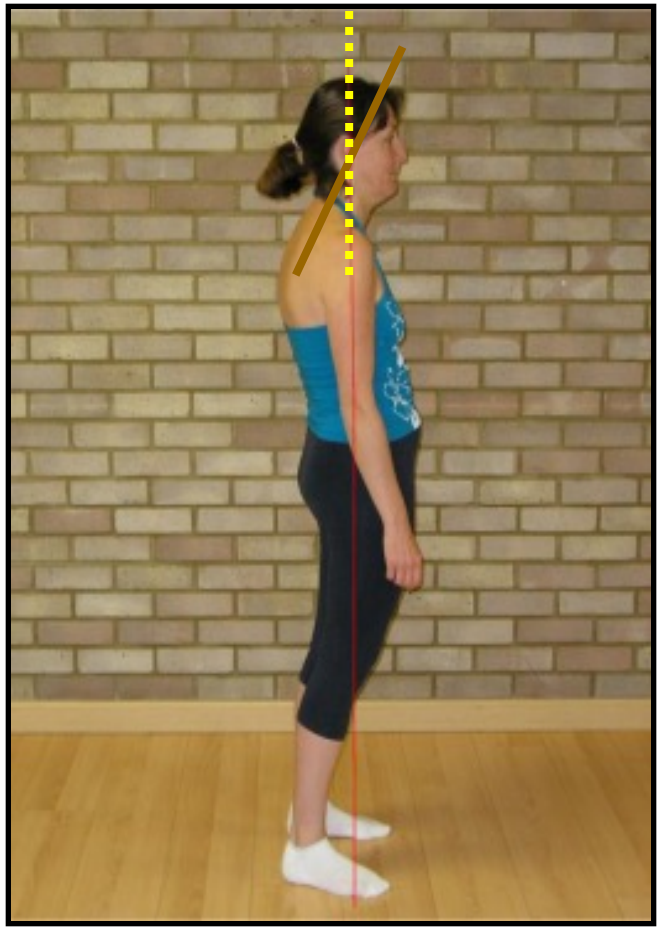
- Muscle imbalance
  - Common in swimmers
    - “Cadillacs in the front and Volkswagens in the back!”
    - Poor posture
    - Tight pec minor and anterior structures
    - Causes impingement during recovery phase

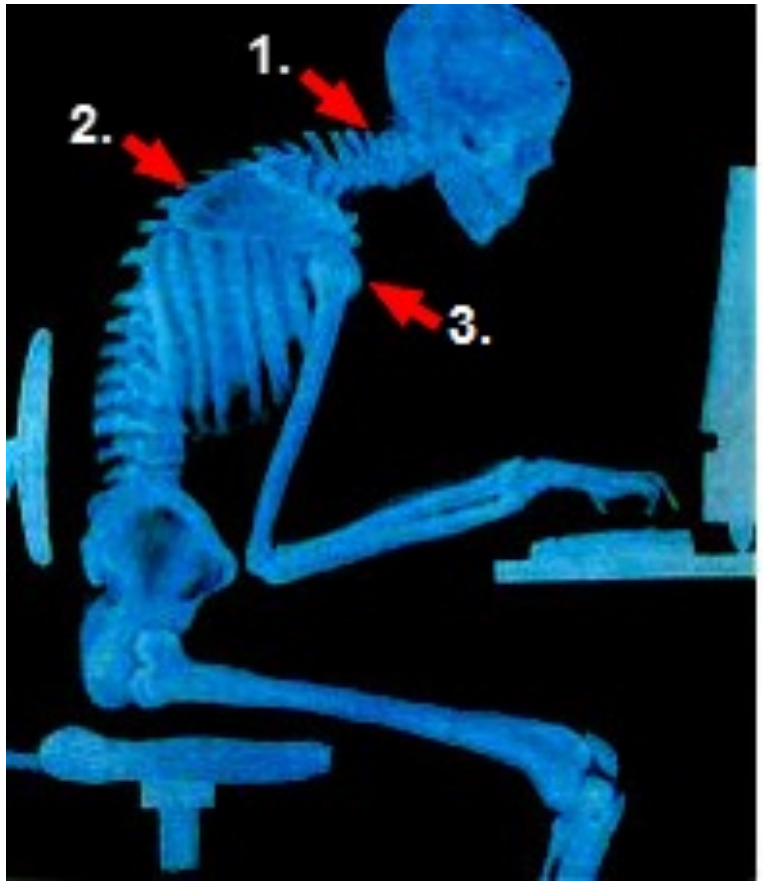
Functional Outlet Obstruction

- Scapular instability
  - Poor strength
  - Muscle imbalance
  - Long thoracic nerve palsy
  - Brachial plexus injury
  - Poor posture
  - Overly strong Upper traps (too many shrugs!)

Functional Outlet Obstruction

- ***Poor Posture is an Epidemic***
  - The shoulder works best with the humerus moving in the scapular plane
  - Motions out of the plane may result in impingement
- Poke neck posture
- Hunched shoulders
- Protracted scapulae
- Common with chronic texters, girls who are tall for their age

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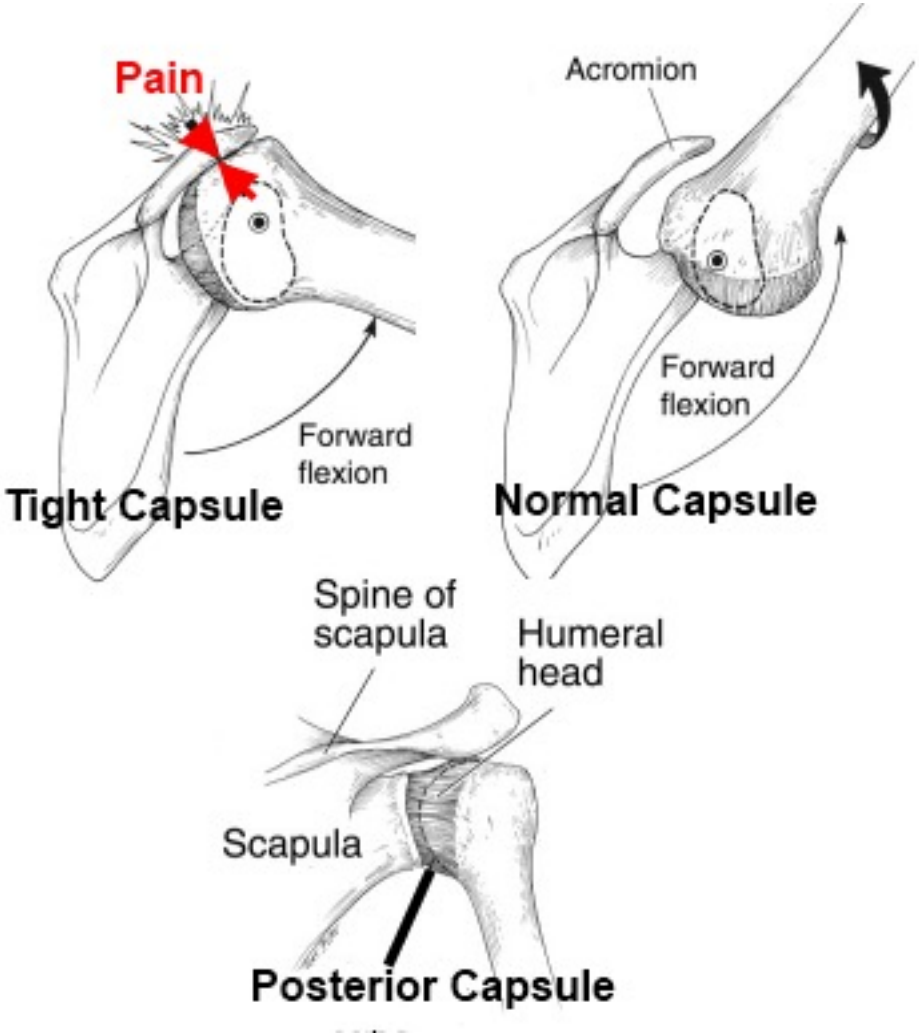
Functional Outlet Obstruction

- Tight Posterior capsule
  - Prevents normal translation and rotation of the humeral head
  - Posterior and superior translation of the humeral head on the glenoid leads to cuff impingement



Final Common Pathway

- Repetitive overload & trauma
  - *Inadequate time to adapt*

- Inflammation Bursa

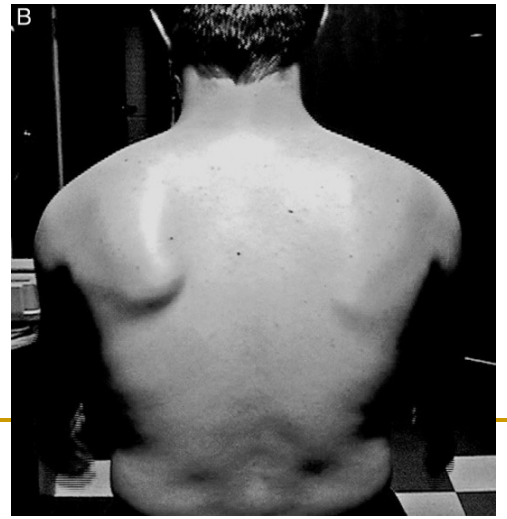
- Tendon Degeneration / Tear

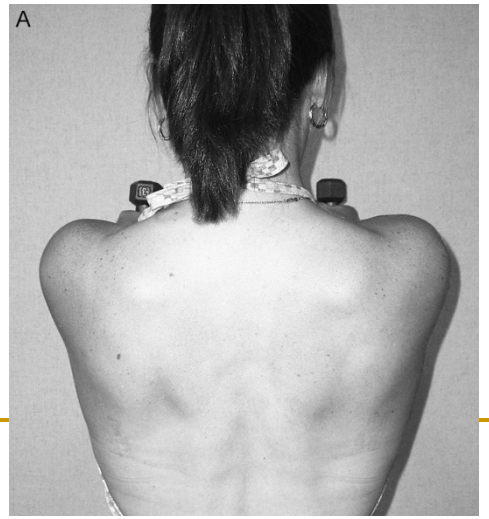
Examination is *Not* Just the Impingement Test

- Posture
- Neck ROM
- Look at patient from the back!!! Without a shirt or in tank top
  - Cuff wasting
  - Scapular positioning / stability / winging / motion
- Shoulder ROM
- Cuff strength
- Laxity / posterior capsule tightness
- Impingement tests

Scapular Dyskinesis: Assessment

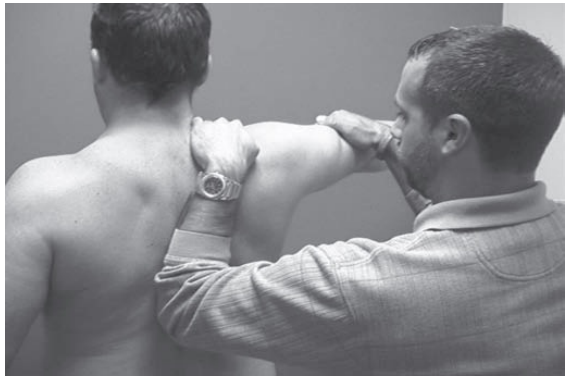
- Posterior view, with shirt off (sports bra / tank top)
- Looking for asymmetry from wasting of isolated muscles and/or muscle groups
- Active elevation in scapular plane and against resistance
- May appear as excessive motion on one side versus restricted motion on the other
- Abnormalities may be brought out by having the patient do a push-up





Scapular Special Tests: Multiple Variants

- Scapular Retraction Test
- Scapular Assistance Test
- Scapular Stabilization Test
- Scapular Reposition Test
  - I use a hybrid of these, not all of them
  - The scapula is moved toward retraction, posterior tilt and external rotation while the patient elevates the arm.
  - Scapular repositioning may reduce pain associated with impingement while increasing cuff and scapular strength



Full Thickness Cuff Tears with Age

- Screening study showed 22.1% had full-thickness rotator cuff tears.
  - 0% in the 20s to 40s
  - 10.7% in the 50s
  - 15.2% in the 60s
  - 26.5% in the 70s
  - 36.6% in the 80s
- Symptomatic 34.7%, Asymptomatic 65.3%.
  - Asymptomatic: 1/2 in the 50s, 2/3 over 60.

- Minagawa H et al. Prevalence of symptomatic and asymptomatic rotator cuff tears in the general population: From mass-screening in one village. Jorthop, 2013 Mar; 10(1): 8–12.

Rotator Cuff Treatment

- First identify and then treat the underlying problem / “Culprit” (Anatomic / Functional)
- Then:
  - Strengthen the weak
  - Stretch the tight
  - Restore muscle balance
  - Reposition the scapula
  - Correct posture
  - Improve technique (throwing / swimming)
  - Corticosteroid injection?
  - Surgery is a ***last*** resort

Rehabilitation Exercises

- “Look at their teeth”
- Give written sheet with photos
- I personalize the sheet with check boxes and put their name on it which helps them buy into the program, as it is clearly not a “cookbook” program
- Despite this, most patients won’t continue rehab after the injury stops hurting

Rehabilitation Exercises Failing?

- Rehab problems
  - Not doing exercises at all
  - Not doing exercises properly
  - Doing their own stretches / exercises that set them back
  - Not following return to sport guidelines
  - Wrong therapy at PT
- Solutions
  - Have patient demonstrate exercises – you'll be surprised
  - Ask about how they returned to activity
    - They may have been pain free, but returned too quickly and re-started the problem

Postural Corrections

- Posture takes years to develop and won't be corrected quickly
- Useful corrections
  - Postural self correction – Elevate sternum / xiphoid
  - Imagine "Body piercing" with string to elevate sternum
  - Tape X across shoulders
  - Figure of 8 splint or commercial braces
  - Swiss ball / foam roll
  - Physical Therapy / Biofeedback
  - ? Nagging?

Corticosteroid Injection?

- Most are tendinosis not tendonitis
- Rarely cures anything
- No long term benefit vs placebo / lidocaine
- Sometimes beneficial in short term
  - When patient cannot do rehab due to pain
  - Pain ablation test to prompt earlier imaging / MRI
    - Is the cuff strength normal once pain abolished?
- Repeated / frequent injections may lead to cuff deterioration

PRP Injection

- PRP injection led to significant long-term (>24 wk) pain relief
- PRP injection was not more effective than the control group for functional improvement
- Conclusions: PRP injection may provide benefit over the control group (sham injection, no injection, or physiotherapy alone) in reducing pain at long-term follow-up for patients with rotator cuff tendinopathy.

- Lin, M. T., Wei, K. C., & Wu, C. H. (2020). Effectiveness of platelet-rich plasma injection in rotator cuff tendinopathy: a systematic review and meta-analysis of randomized controlled trials. *Diagnostics*, *10*(4), 189.

PRP Injection

- Meta-analysis showed that PRP injection was safe and effective intervention for pain control and shoulder function in patients with RC disorders.
- Meta-analysis showed that PRP is safe and more effective for long-term shoulder pain symptoms and shoulder function associated with injury to the rotator cuff.
- However, more robust studies with a standardised reporting on PRP preparation techniques, PRP class used, and injection techniques are recommended

- A. Hamid, M. S., & Sazlina, S. G. (2021). Platelet-rich plasma for rotator cuff tendinopathy: A systematic review and meta-analysis. *PloS one*, *16*(5), e0251111

Surgical Treatment

- Subacromial decompression (SAD) is ***not*** the answer to all "Impingement"
- You can treat functional outlet obstruction with therapy, but you can't rehab anatomic outlet obstruction away
- SAD of little benefit in functional outlet obstruction
- SAD often works in anatomic outlet obstruction
- SAD may make instability patients worse
- Stabilization may be necessary for MDI and silent subluxators
- Posterior capsular release occasionally helpful

Adhesive Capsulitis “Frozen Shoulder”

- Adhesive Capsulitis of the Shoulder (ACS)
- Pathophysiology poorly understood
- Painful initial inflammatory phase with fibroblast proliferation and transformation to myofibroblasts resulting in inflammatory contracture, capsular hyperplasia and fibrosis
- Consensus definition:
  - “a condition characterized by functional restriction of both active and passive shoulder motion for which radiographs of the glenohumeral joint are essentially unremarkable”

American Shoulder and Elbow Society (ASES)

Adhesive Capsulitis Shoulder

- Four stages lasting ~ 24 months in total
  - 1. Painful stage (<3 months): gradual onset of symptoms of mild to severe pain, mild limitation of range ROM, and inability to lay on the affected shoulder.
  - 2. Freezing stage (3-9 months): severe nocturnal pain and significant loss of both active and passive ROM.
  - 3. Frozen stage (9-14 months): shoulder stiffness and pain at the end of motion or at night.
  - 4. Thawing stage (15-24 months): minimal pain and a gradual improvement of ROM due to capsular remodeling.

Adhesive Capsulitis: 2 Mechanisms

- Primary ACS is idiopathic and associated with diabetes, hypo/hyperthyroid, MI, stroke and other medical conditions
- Secondary ACS is due to trauma or other identifiable pathology producing pain with a secondary reluctance of the patient to move the shoulder, leading to contracture

Adhesive Capsulitis

- Incidence of 3%-5% in the general population and up to 20% in patients with diabetes
- 25% Bilateral

- Manske RC, Prohaska D. Diagnosis and management of adhesive capsulitis. Curr Rev Musculoskelet Med 2008; 1: 180-189

- Peak incidence in between the ages of 40 and 60 with female preponderance
- Rare in manual workers

- Robinson C et al. Frozen shoulder. J Bone Joint Surg Br 2012; 94: 1-9

Adhesive Capsulitis Treatment

- Physical therapy is a common first line treatment for frozen shoulder with very little high-quality evidence to support its use
- Cochrane review shows that physiotherapy alone has little to no benefit as compared to control groups
  - Green S, et al. Physiotherapy interventions for shoulder pain. Cochrane Database Syst Rev 2003; (2): CD004258
- Intensive physical rehabilitation using mobilization beyond pain limits had worse outcomes than active and active assisted exercises within pain limits
  - Diercks RL, Stevens M. Gentle thawing of the frozen shoulder: a prospective study of supervised neglect versus intensive physical therapy in seventy-seven patients with frozen shoulder syndrome followed up for two years. J Shoulder Elbow Surg 2004; 13(5): 499-502.

Adhesive Capsulitis Treatment

- Manipulation under anaesthesia
- Capsular distension / hydrodilation
- Intraarticular corticosteroid injection
  - All demonstrate similar outcomes

- Dodenhoff RM, et al. Manipulation under anesthesia for primary frozen shoulder: effect on early recovery and return to activity. J Shoulder Elbow Surg 2000; 9: 23-26
- Quraishi N et al Thawing the frozen shoulder. A randomised trial comparing manipulation under anaesthesia with hydrodilatation. J Bone Joint Surg Br 2007; 89: 1197-1200
- Kivimäki J, Pohjolainen T. Manipulation under anesthesia for frozen shoulder with and without steroid injection. Arch Phys Med Rehabil 2001; 82: 1188-1190

Adhesive Capsulitis Treatment

- Corticosteroid injections
  - Short term effectiveness for pain and ROM
  - Most effective when synovitis is present during early stage of ACS
  - No difference in efficacy between subacromial and intra-articular injection

- Shah N, Lewis M. Shoulder adhesive capsulitis: systematic review of randomised trials using multiple corticosteroid injections. Br J Gen Pract 2007; 57(541): 662-7.
- Lorbach O et al. Nonoperative management of adhesive capsulitis of the shoulder: oral cortisone application versus intra-articular cortisone injections. J Shoulder Elbow Surg 2010; 19(2): 172-9.
- Oh JH, et al. Comparison of glenohumeral and subacromial steroid injection in primary frozen shoulder: a prospective, randomized short-term comparison study. J Shoulder Elbow Surg 2011; 20(7): 1034-40.

Adhesive Capsulitis Treatment

- PRP Injections
  - RCT compared PRP injection with PT
  - Subjects in both groups showed a significant decrease in pain, improved shoulder functional scores, and increased ROM at all evaluation time points.
  - There was no significant difference in the measured outcomes between the two groups. However, there was less acetaminophen consumption after PRP vs PT
- Thu, A. C., Kwak, S. G., et al (2020). Comparison of ultrasound-guided platelet-rich plasma injection and conventional physical therapy for management of adhesive capsulitis: a randomized trial. *Journal of International Medical Research*, *48*(12), 0300060520976032.
- Nonrandomized trial, a single PRP injection was found to be more effective than a Corticosteroid injection in terms of improving pain, disability, and shoulder range of movement in patients with adhesive capsulitis at 12 weeks
- Barman, A., Mukherjee, et al (2019). Single intra-articular platelet-rich plasma versus corticosteroid injections in the treatment of adhesive capsulitis of the shoulder: a cohort study. *American journal of physical medicine & rehabilitation*, *98*(7), 549-557.

Adhesive Capsulitis Treatment

- Arthroscopic capsular release provides rapid improvements in motion and patient reported shoulder function with improvements maintained at mid and longer term

- Uppal HS et al. Frozen shoulder: A systematic review of therapeutic options. World J Orthop 2015; 6(2): 263-268
- Callum P et al. Short-term outcomes after arthroscopic capsular release for adhesive capsulitis J Shoulder Elbow Surg (2016)

Adhesive Capsulitis Treatment

- 3 sessions of Extracorporeal Shock Wave Therapy (ESWT) produced significant improvements in pain and function at 2 months with further improvements at 4 and 6 months
- Santoboni F et al. Extracorporeal Shockwave Therapy Improves Functional Outcomes of Adhesive Capsulitis of the Shoulder in Patients With Diabetes. Diabetes Care 2017;40:e12–e13
- 8-10 weekly sessions of intra-articular and subcutaneous infiltrations of Oxygen/Ozone produced pain relief and improved ROM
- Peretti G. Shoulder adhesive capsulitis, treatment with oxygen ozone: Technique and results. Ozone Therapy 2017; volume 2:7245

Adhesive Capsulitis and Cuff Tears

- Traditionally thought that in secondary ACS, cuff repair should be delayed until the shoulder has thawed, but a number of studies have shown that cuff repair can be safely treated with manipulation under anesthesia, and/or capsular release without an increase in complication rates compared with patients undergoing rotator cuff repair alone

- Zhang et al. Management of Concomitant Preoperative Rotator Cuff Pathology and Adhesive Capsulitis: A Systematic Review of Indications, Treatment Approaches, and Outcomes. Arthroscopy 2019;35:979-993.

Calcific Tendonitis

- Poorly understood with an unknown mechanism
- Chrystalline carbonated apatite within tendon substance
- Found in 10-40% of painful shoulders, but many non painful shoulders
- Factors related to deposition and resorption unknown
- Not linked to trauma or manual work
- 30-60 years, female preponderance

- Darrieutort-Laffite C, et al. Calcific tendonitis of the rotator cuff: from formation to resorption, *Joint Bone Spine* (2017), https://doi.org/10.1016/j.jbspin.2017.10.004

Calcific Tendonitis

- Mineralization begins with metaplasia of tenocytes into chondrocytes
- Amorphous calcification into the matrix vesicles within the chondrocytes
- Deposition of calcium in the tissues followed by spontaneous resorption of the calcific deposits

- Uhthoff HK, Loehr JW. Calcific Tendinopathy of the Rotator Cuff: Pathogenesis, Diagnosis, and Management. *J Am Acad Orthop Surg* 1997; 5: 183-191

Ultrasound Study of 302 OB-GYN Patients

- Overall prevalence of calcific tendinopathy 17.8 %
- 15.7% of all shoulders were painful,
  - calcific tendinopathy was found in 33 % of painful shoulders
- 84.3% of shoulders were asymptomatic
  - calcific tendinopathy was found in 8.5% of asymptomatic shoulders
- Supraspinatus (53.4 %) and infraspinatus (54.6 %) were the most frequently involved.
- Pain correlated to involvement of multiple tendons, increasing age and excessive body mass index

- Sansone V et al. Calcific tendinopathy of the rotator cuff: the correlation between pain and imaging features in symptomatic and asymptomatic female shoulders. Skeletal Radiol (2016) 45:49–55

Calcified Tendonitis

- Three stages;
  - Pre-calcifcation (silent) can last for 1-6 years
  - Calcification (impingement)
    - Deposits surrounded with fibrous tissue without inflammatory cells or vessels
  - Postcalcification / resorption (acute) lasting 3 weeks - 6 months
    - Associated with significant pain and restriction of motion but related to resolution of calcification

- Darrieutort-Laffite C, et al. Calcific tendonitis of the rotator cuff: from formation to resorption, *Joint Bone Spine* (2017), https://doi.org/10.1016/j.jbspin.2017.10.004
- ElShewy MT. Calcific tendinitis of the rotator cuff. *World J Orthop* 2016; 7(1): 55-60 Available from: URL: http://www.wjgnet.com/2218-5836/full/v7/i1/55.htm

Acute Resorptive Phase

- During the acute resorptive phase the periphery of the calcium deposits shows vascularization with macrophage and mononuclear giant cell infiltration together with fibroblast formation
- Crystals may migrate into subacromial bursa
- This produces an aggressive inflammatory reaction with inflammatory cell accumulation, excessive edema and rise of the intratendinous pressure producing severe pain

- Darrieutort-Laffite C, et al. Calcific tendonitis of the rotator cuff: from formation to resorption, *Joint Bone Spine* (2017), https://doi.org/10.1016/j.jbspin.2017.10.004
- ElShewy MT. Calcific tendinitis of the rotator cuff. *World J Orthop* 2016; 7(1): 55-60 Available from: URL: http://www.wjgnet.com/2218-5836/full/v7/i1/55.htm

Acute Calcific Tendonitis: Treatment

- ***Symptom Treatment***
  - Relief of pain
  - NSAIDs often insufficient for relief, with frequent need for narcotic medications

- ***Physiotherapy***
  - There is no solid evidence that different physical modalities including infrared, ultrasound, or deep heat have any effect on the natural history of the condition.

- ElShewy MT. Calcific tendinitis of the rotator cuff. *World J Orthop* 2016; 7(1): 55-60 Available from: URL: http://www.wjgnet.com/2218-5836/full/v7/i1/55.htm

Calcific Tendonitis: Treatment

- ***Extracorporeal shock wave therapy (ESWT)***
- ESWT has been used to treat symptomatic patients passing through the chronic formative phase with definite radiological evidence of calcium deposits
  - Vavken P et al. Focused Extracorporeal Shock Wave Therapy in Calcifying Tendinitis of the Shoulder: A Meta-Analysis*Sports Health: A Multidisciplinary Approach* 2009 1(2): 137-144
- Shockwave therapy is effective in improving the pain, functionality, quality of life and decreasing the size of calcified deposits. Shockwave therapy is proved to be superior to routine physiotherapy
  - Arooj Fatima , Ashfaq Ahmad et al (2022) Effects of High-Energy Extracorporeal Shockwave Therapy on Pain, Functional Disability, Quality of Life, and Ultrasonographic Changes in Patients with Calcified Rotator Cuff Tendinopathy, Hindawi BioMed Research International Volume 2022, Article ID 1230857, 9 pages https://doi.org/10.1155/2022/1230857

Calcific Tendonitis: Treatment

- ***Needling or puncture and lavage***
  - Needling has been shown effective
  - Lavage may add additional benefits
  - Corticosteroid benefits equivocal

- ElShewy MT. Calcific tendinitis of the rotator cuff. *World J Orthop* 2016; 7(1): 55-60 Available from: URL: http://www.wjgnet.com/2218-5836/full/v7/i1/55.htm

Critical Question: Where's the Pain?

Scapular Pain

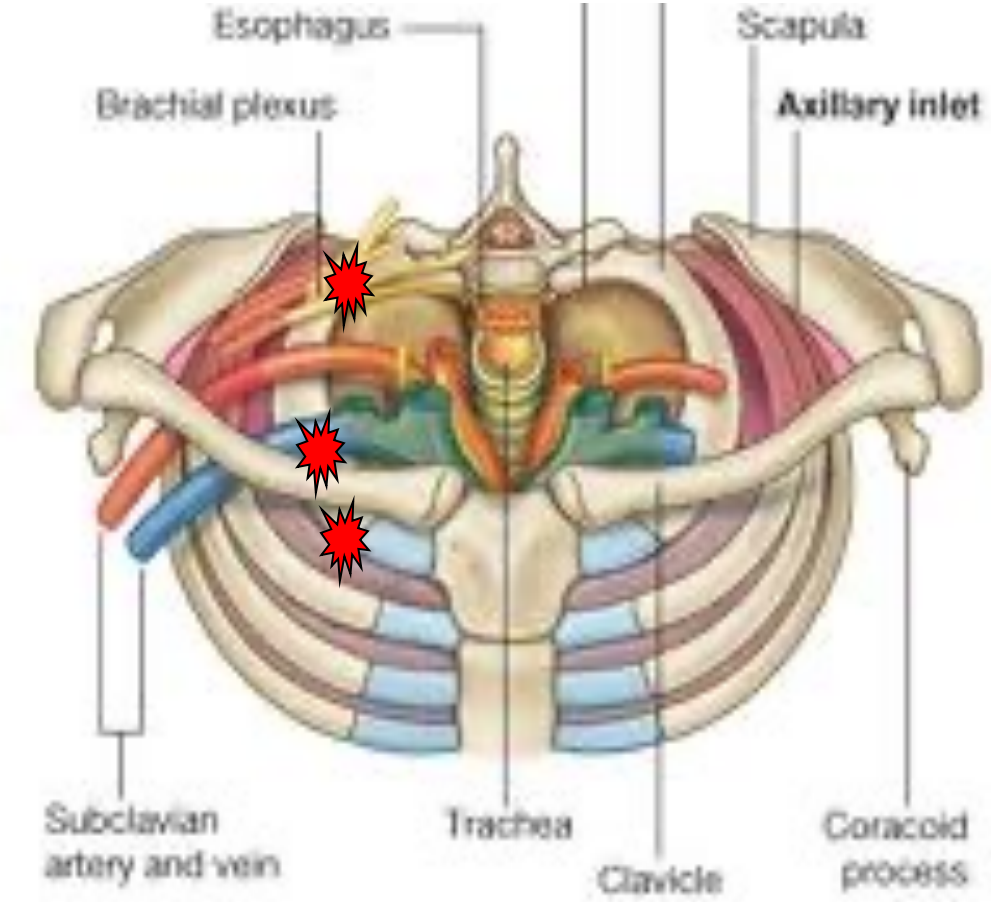
- Always essential to have the patient demonstrate the location of their “shoulder pain”
  - Trapezius or scapular pain is ***not*** shoulder joint pain
- Pain in the trapezius, scapula, and upper arm is related to
  - Rib dysfunction (Common)
  - Referred pain from cervical spine (Pretty Common)
  - True thoracic outlet syndrome (Rare)
  - True retroscapular problem (Really rare)
- ***Shoulder pain relieved by keeping the arm overhead is likely referred from the C-Spine***

First Rib Dysfunction: Symptoms

- Trapezius / Levator Scapulae spasm / pain
- Neck pain
- Headaches
- “Shoulder” pain
- “Radiculopathy”
  - Pain and paresthesia radiate to posterior aspect of upper arm and ulnar aspect of hand
  - No weakness
  - EMG/NCS and MRI are normal
  - Spurling’s Test negative
- Mid-back pain
- Chest, Sternoclavicular joint and sternal pain

First Rib Dysfunction: Examination

- 3 Strikes Rule
- Pain on palpation
  - Inferior to the clavicle
  - Superior to the clavicle over mid aspect of first rib
  - Superior to the clavicle over posterior aspect of first rib
- Side to side asymmetry of rib position when patient lying supine
- Reduced glide / mobility



Rib Dysfunction: Treatment

- Mobilization of the first rib
  - Multiple techniques, muscle energy, HVLA
  - Few are pleasant
  - Patients generally happy afterwards
  - Home mobilization with a towel / strap
  - “Snow Angels” on a Foam Roll

Achieving Functional Goals in Scapular Stabilization

- Rehab done Right!


Thank You! Any Questions?