



Shoulder Injuries: Surgical Advances and Treatment

By Anthony Pribila, PT, DScPT, CMPT, CMP, CEAS



Who Am I & What Will We Be Learning?

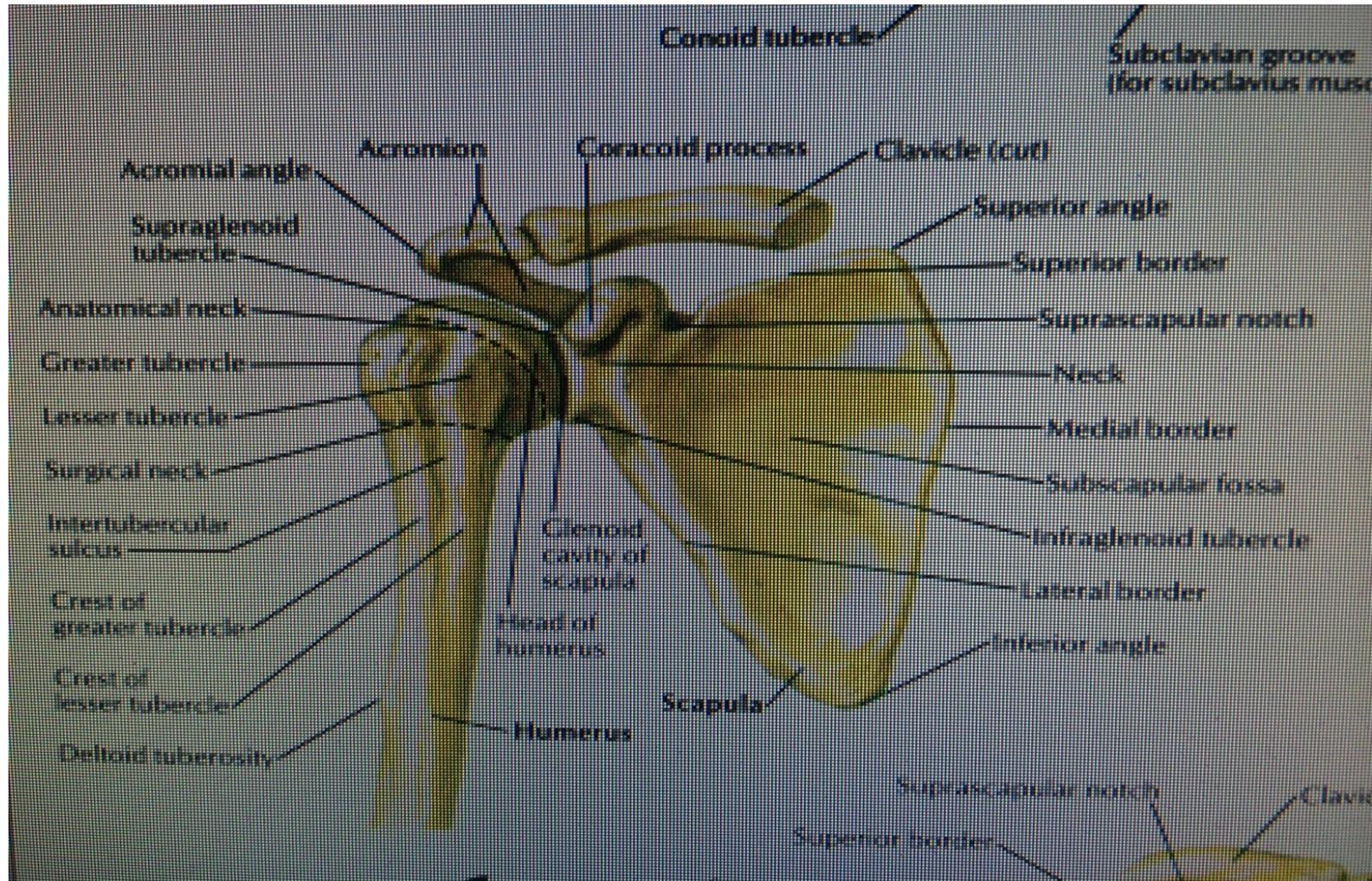




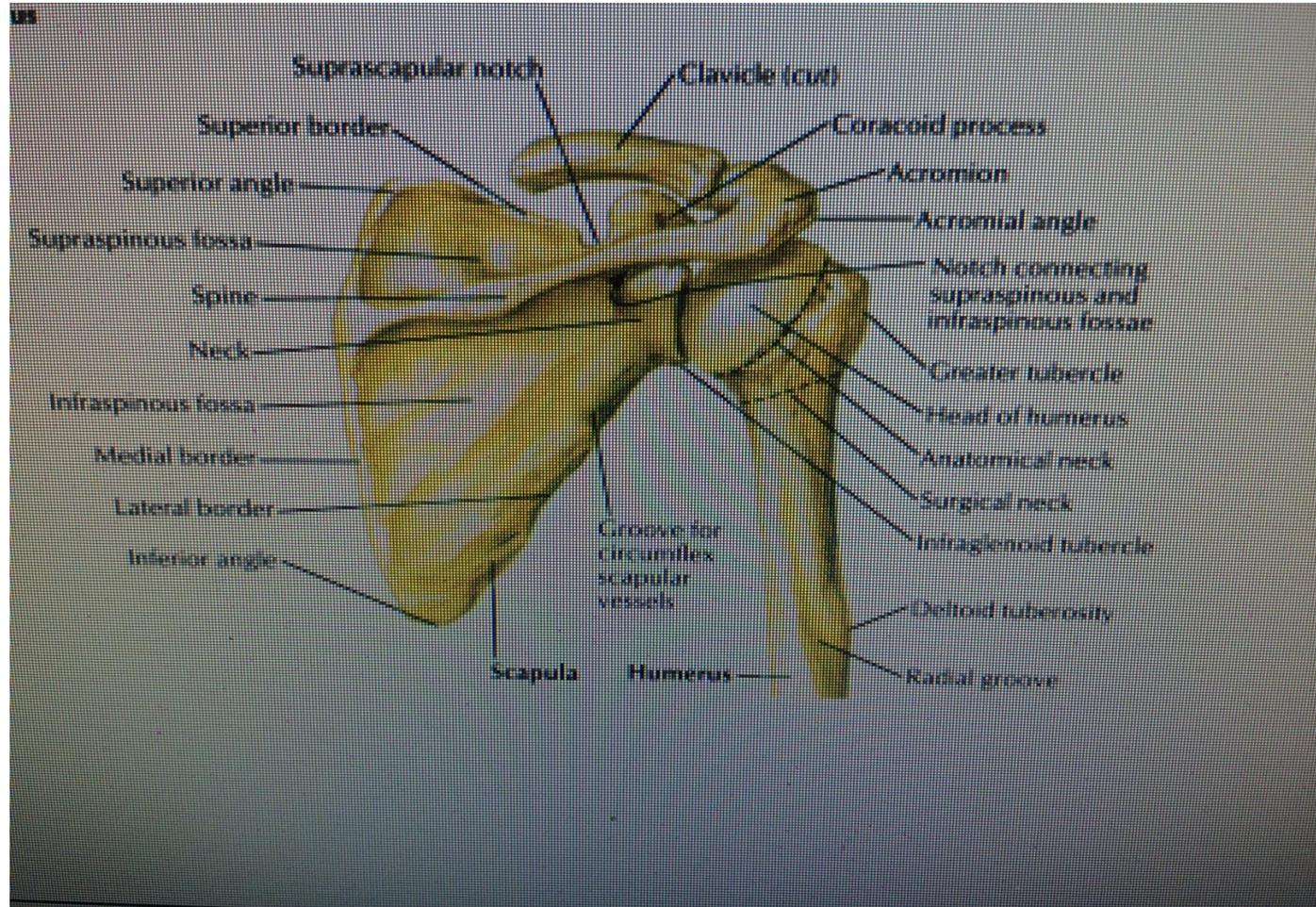
Objectives

- 1) Anatomy and physiology
- 2) Apply biomechanical knowledge of joints to examine and diagnose/hypothesize the movement dysfunction at the joint
- 3) Recognize the clinical presentation of the movement dysfunctions
- 4) Become aware of some of the most common surgical approaches for injuries
- 5) Proper indications and contraindications post op.

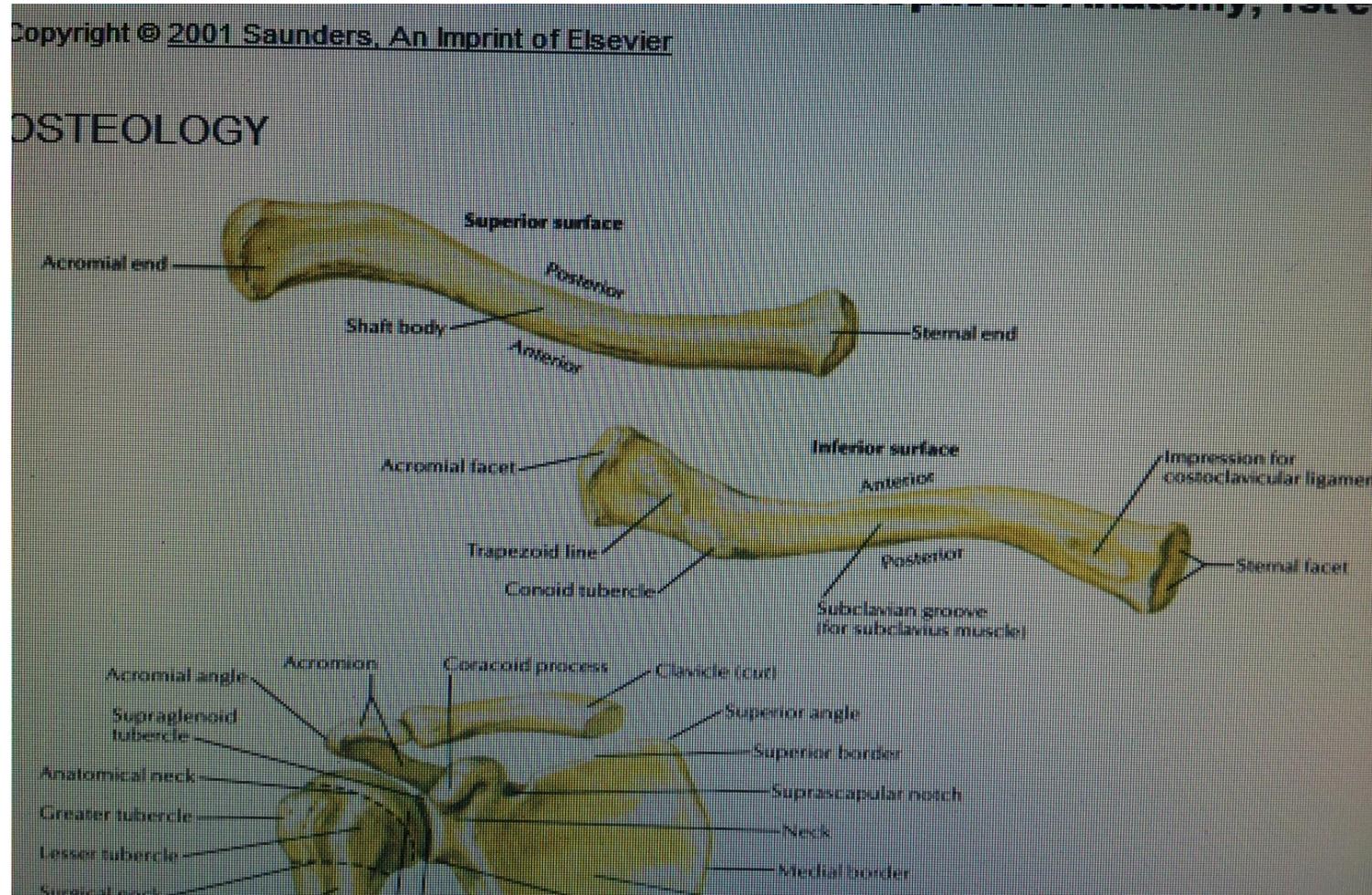
Shoulder Anatomy- Bones (ant.)



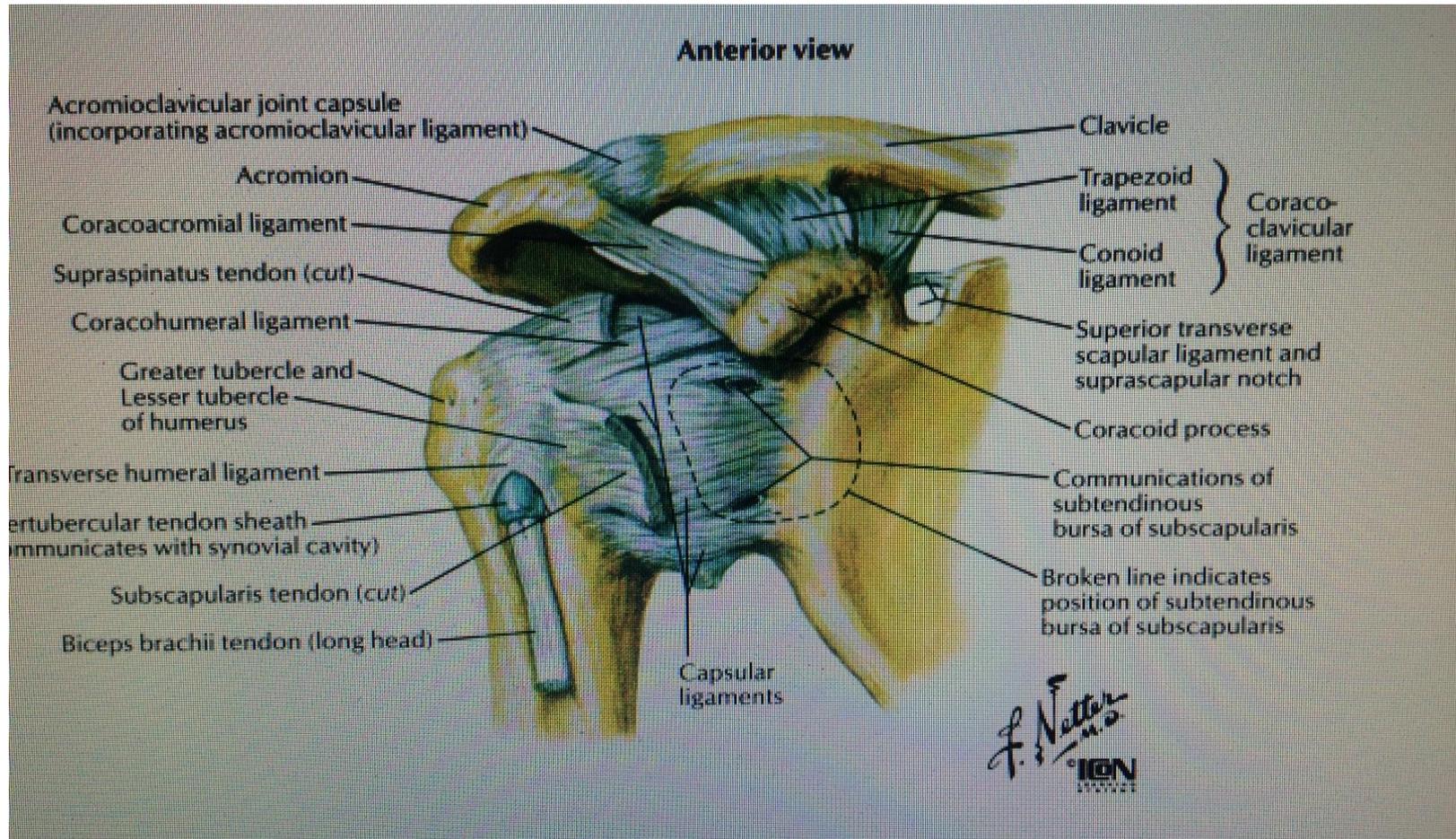
Shoulder Anatomy-Bones (pos.)



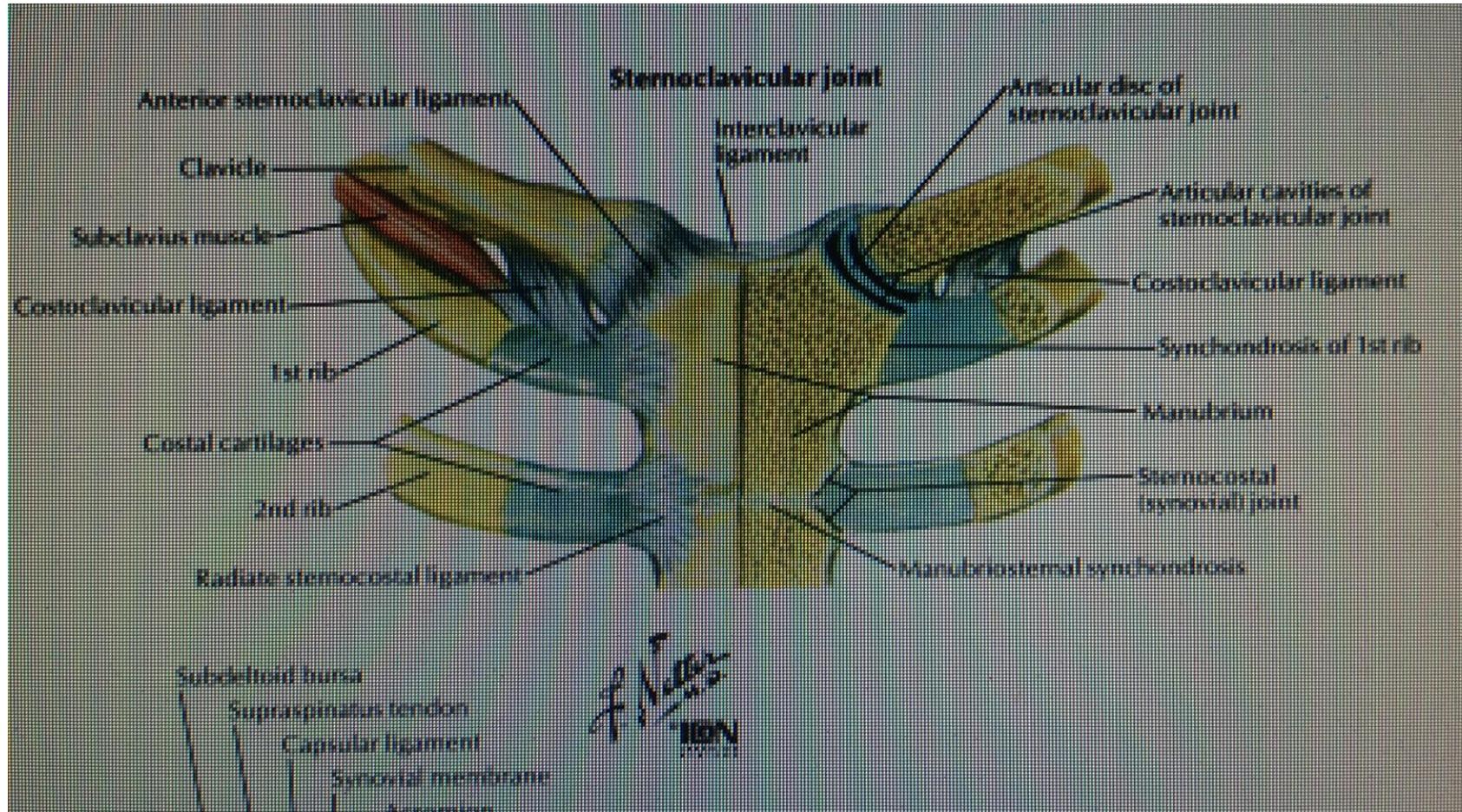
Shoulder Anatomy-Bones (clavicle)



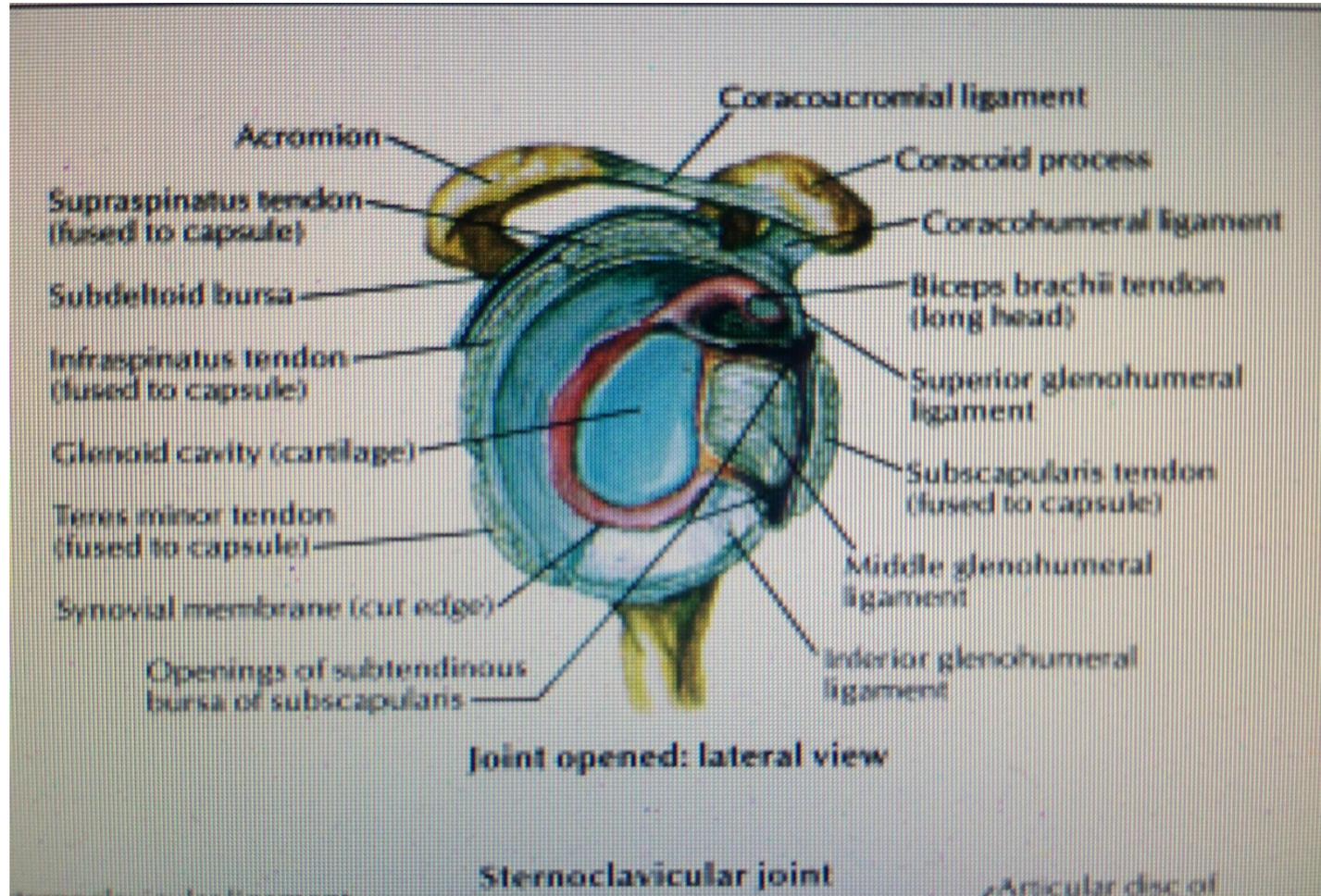
Shoulder Anatomy-Joints (ant.)



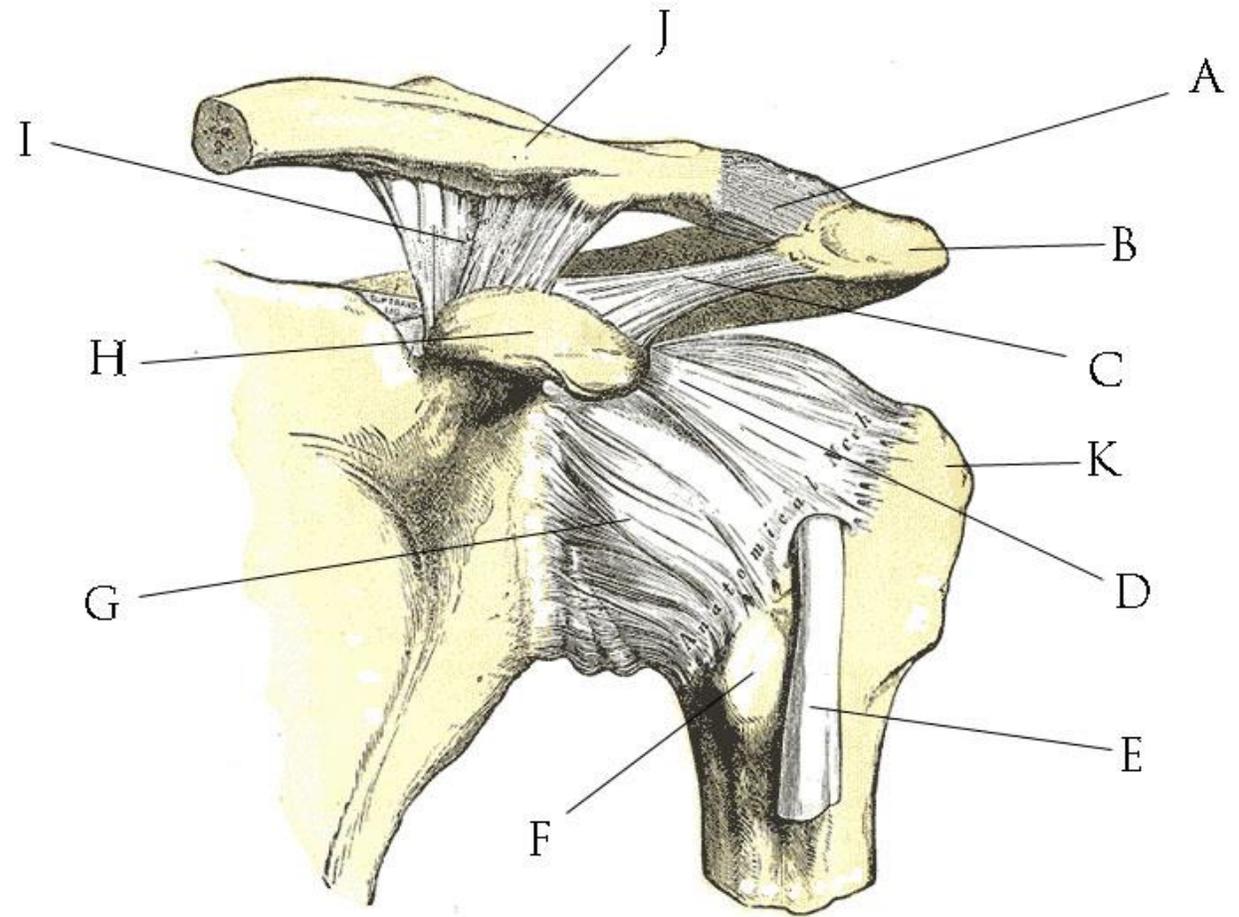
Shoulder Anatomy-Joints (ant.)



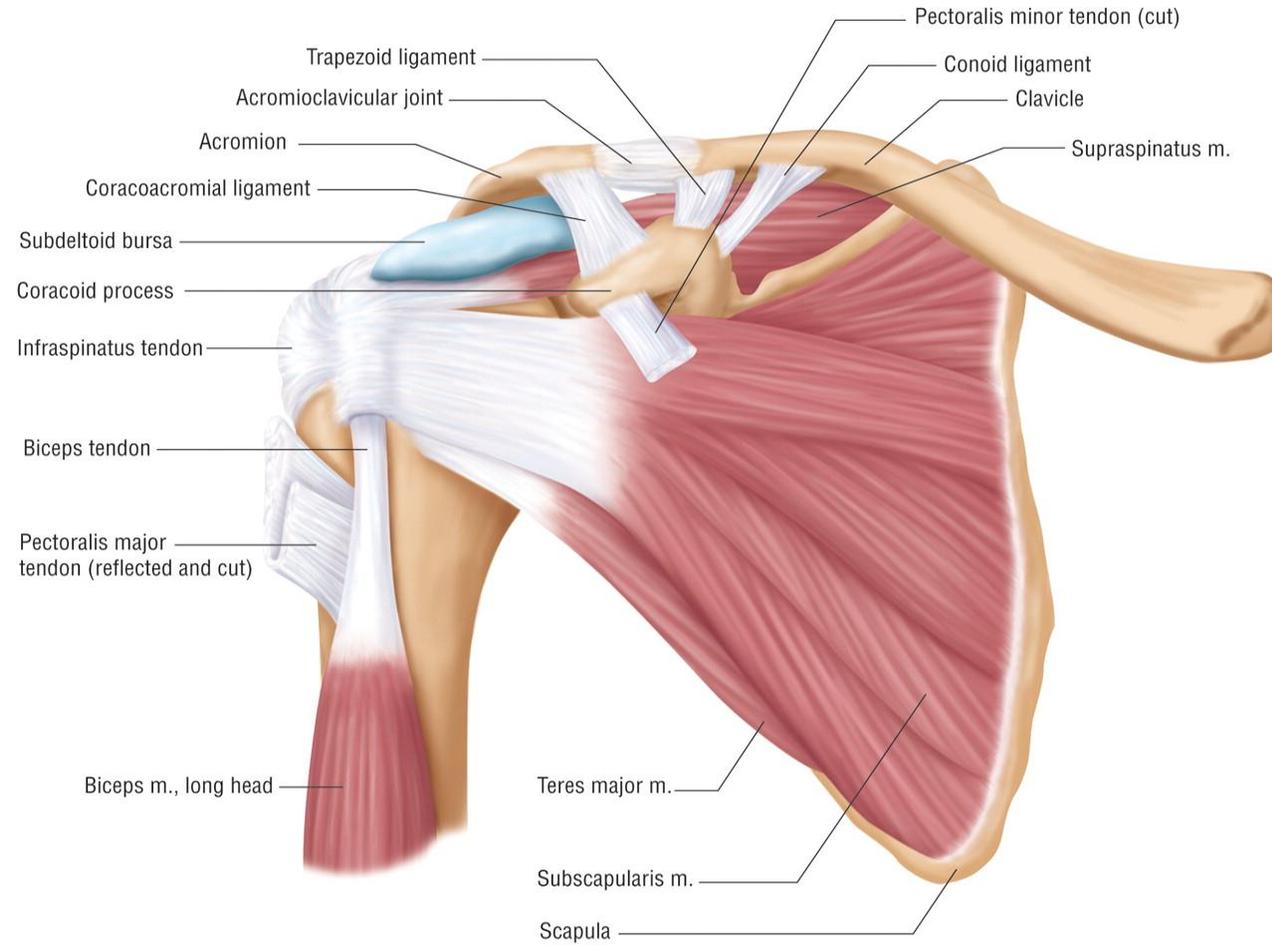
Shoulder Anatomy-Articulations (lat.)



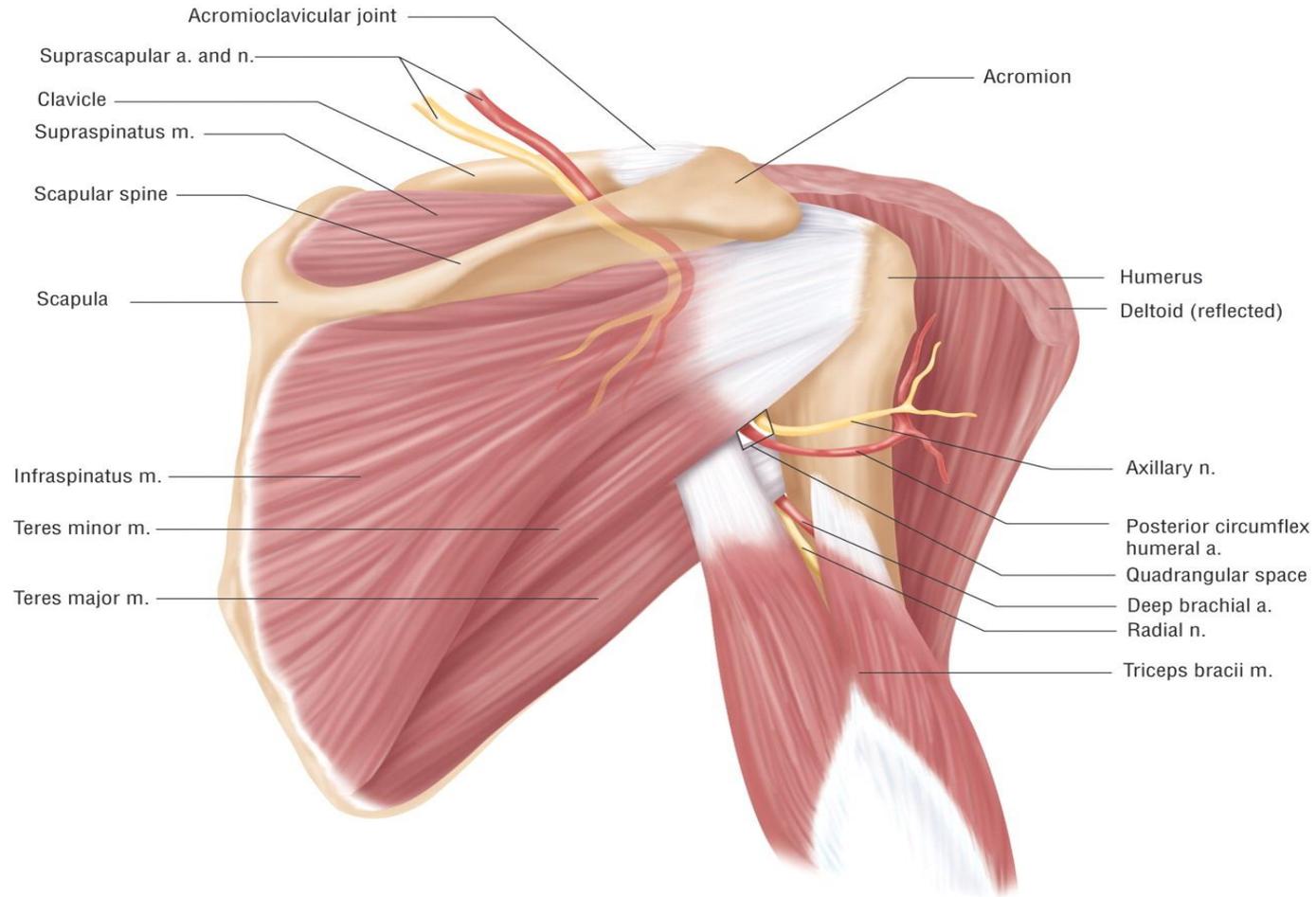
Question #1
Can you identify the
Acromion Process?



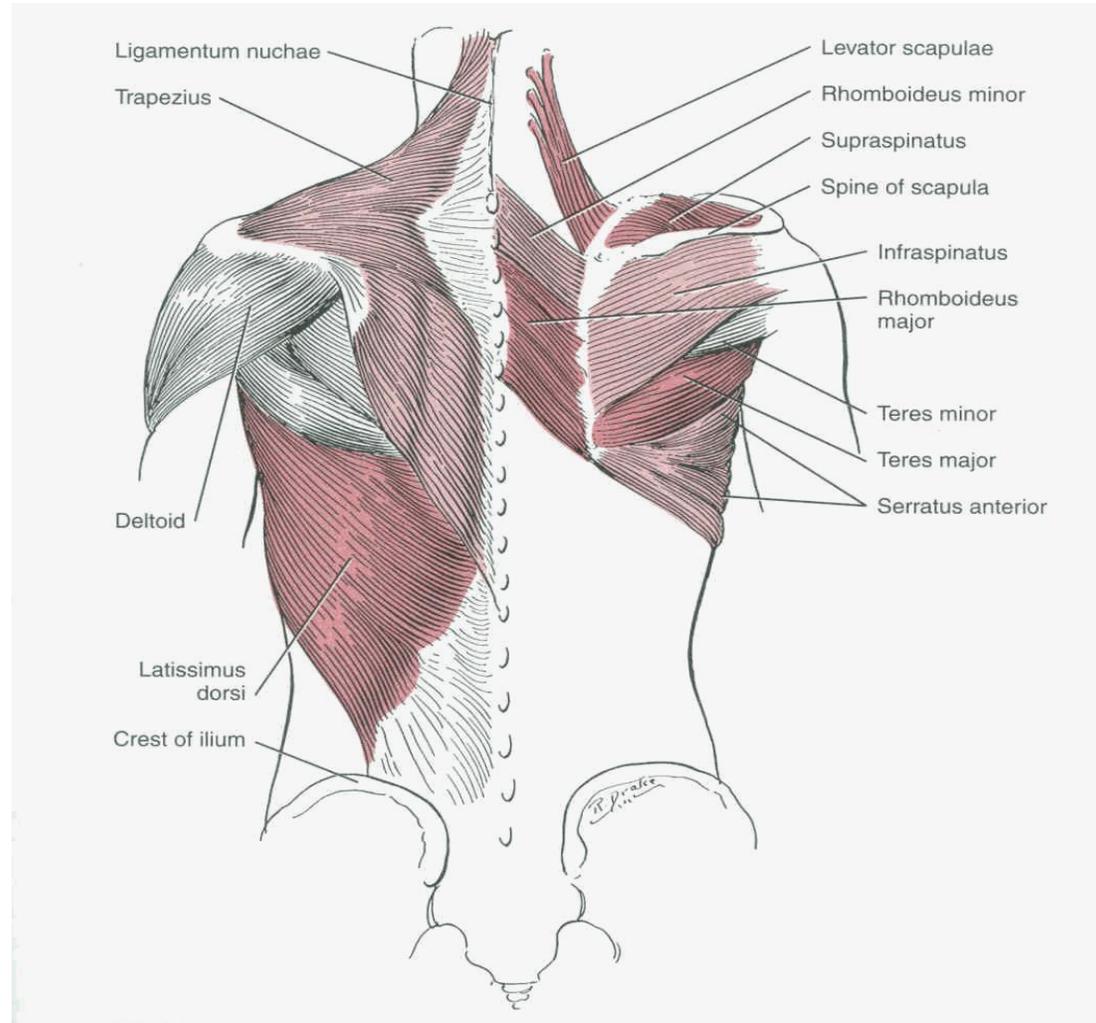
Shoulder Anatomy-Muscles (ant.)



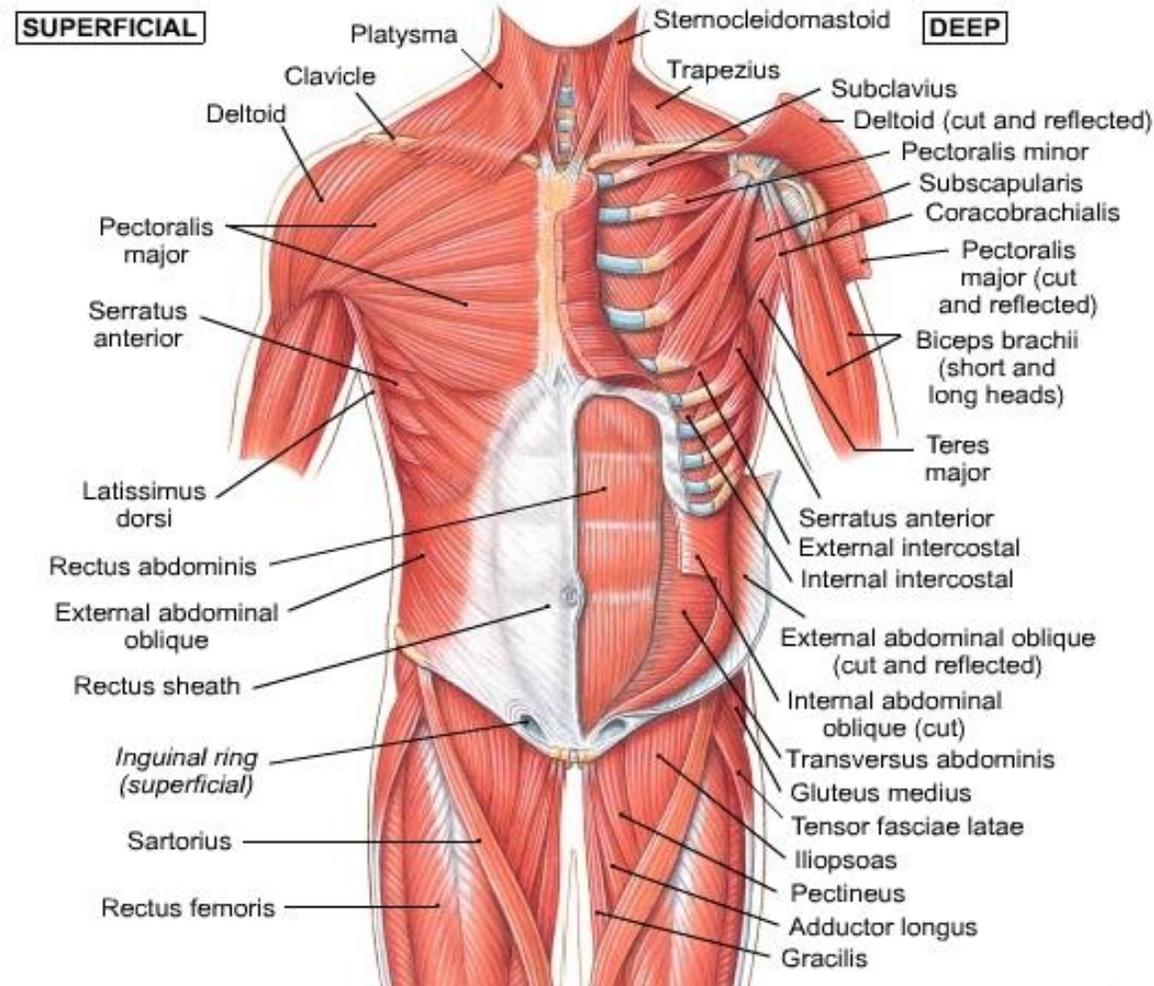
Shoulder Anatomy-Muscles (post.)



Shoulder Anatomy-Accessory Muscles (post.)

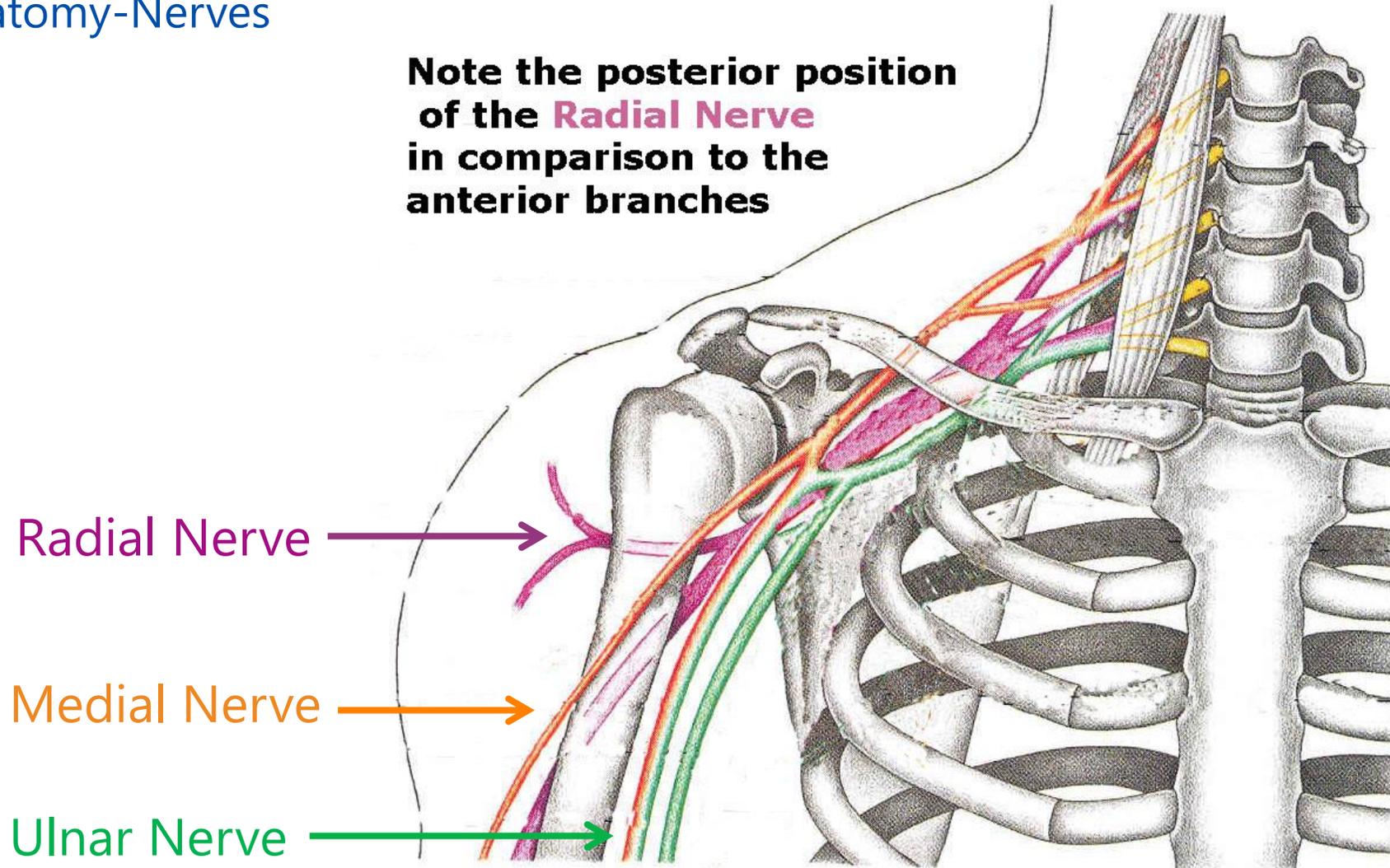


Shoulder Anatomy-Accessory Muscles (ant.)

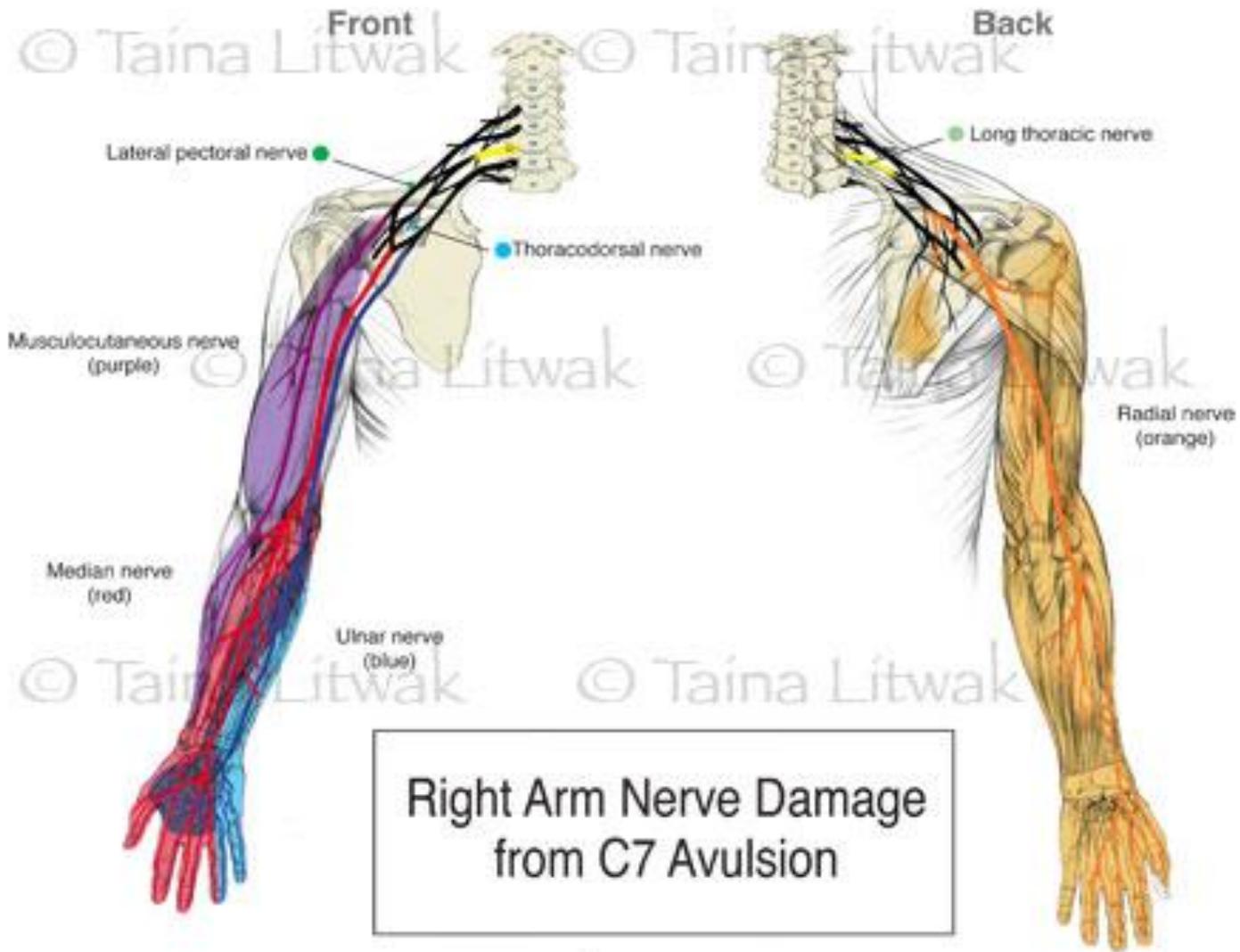


Shoulder Anatomy-Nerves

Note the posterior position of the Radial Nerve in comparison to the anterior branches



Shoulder Anatomy-Nerves



How do tissues get damaged?





Causes of Tissue Damage

- › Direct Physical Trauma
- › Overuse Syndrome
- › Exhausted Adaptive Potential (EAP)
- › Repetitive Stress Syndrome



Direct Physical Trauma

- › Obvious recollection of trauma
- › Immediate or rapid onset of symptoms or dysfunction



Overuse Syndrome

- › No previous trauma or weakness necessary
- › Must involve a SUDDEN CHANGE of routine, involving repetitive activity e.g, footwear, activity level, repetitive high reaching, posture
- › Symptoms/dysfunction occur at the time of, or rapidly following **suddenly changed environment with repetitive activity.**



Exhausted Adaptive Potential

- › No **recent history** of direct trauma or overuse to explain current S+S
- › Most often has a **past history** of trauma (may be postural) – “the longer the worser”
- › Symptoms very often a **distance** from the original “**culprit**” i.e., almost never obvious!
- › Often have had exhaustive medical investigations/treatments



Repetitive Stress Syndrome

- › Patient often free of trauma history
- › Reports specific **repetitive** activity that has **gradually or insidiously** brought on the signs and/or symptoms
- › Patient reports gradually increasing fatigue or symptoms with **repetitive** activity over **increasing time**



Treatment / Management Strategies For Tissue Damage

Direct Trauma

- › If damage is amenable to physiotherapy the R.I.C.E. concept is adopted initially
- › Unless contra-indicated (by obvious instability or serious pathology e.g, a “dislocation”) treatment requires EARLY ACTIVATION
- › The discovery of serious pathology may require immobilization e.g, bed rest; sling



Treatment / Management Strategies For Tissue Damage

Overuse Syndromes

- › Although the R.I.C.E. concept and even immobilization may be necessary...
- › A ban on the activity that is the obvious cause of the problem is essential
- › Graduated strengthening or re-education on how to graduate return to activity



Treatment / Management Strategies For Tissue Damage

Exhausted Adaptive Potential

- › Find the real “culprit” and any other “accessories” and treat them
- › THEN treat any local pathology



Treatment / Management Strategies For Tissue Damage

Repetitive Strain Syndrome

- › Analyze the patient's job or sport
- › Determine any underlying CAUSE of the patient's lack of strength or fitness
- › Specifically improve strength and/or fitness
- › Treat any localized tissue damage



Concepts and Definitions Related to Mechanical Loads

- › Compressive force (compression) - Force that tends to shorten or squeeze something, decreasing its volume.
- › Tensile force (tension) - A force which tends to stretch or elongate something.
- › Shear force - Force acting on a substance in a direction perpendicular to the extension of the substance.



Shoulder Evaluation

- › History / Mech. Of Injury /Precautions
- › Posture and Observation
- › Palpation (soft tissue palp., sensation)
- › ROM
- › Strength
- › Biomechanics and joint eval
- › Spine and accessory eval
- › Special testing
- › Neurological (balance/coord.) eval



Scapular Motion Dysfunctions

- › Basic anatomy – Axis of motion?
- › Osteokinetics – How does it move?
- › Myokynetics – Which muscles are involved?
- › Pathokinetics – Who's the 'culprit'?



Osteokinetics

› X-ray studies

› Visualize *

› Palpate *

› Theorize *



Therefore.....

During scapular motion, the scapular muscles must be contracting either:

- › Concentrically
- › Eccentrically
- › Isometrically



During Elevation Through Flexion

- › Upper and lower trapezius contract isometrically
- › Lower serratus anterior contracts isometrically
- › Levator scapulae contracts eccentrically
- › Rhomboids contract eccentrically



In Summary between 0° and 150°

› Upper and lower trapezius contract concentrically

› Middle and lower serratus anterior contract concentrically

› Levator scapulae contracts eccentrically

› Rhomboids contract eccentrically



Between 150° and 200°

- › Lower serratus contracts isometrically and changes the axis of shoulder girdle motion
- › Lower trapezius is the **only** scapular muscle capable of contracting concentrically at this point

- › Upper serratus anterior contracts eccentrically
- › Pectoralis minor contracts eccentrically

How do I apply all of this magnificent knowledge?





What can adversely affect the STRENGTH (concentric)?

- › Palsy - nerve root (C6 lower serratus)
- peripheral (long thoracic)
- › Posture - inhibits lower trapezius
- › Spinal Segmental Instability - 'universal pattern' of weakness - inhibits trapezius



What Can Affect the LENGTH (eccentric)?

- › Post-traumatic scarring - ?surgery; ?ms. tear
- › Posture - adaptive shortening - levator scapulae; pec minor
- › 'Facilitated segment' - potentially **any** scapular muscle due to segmental innervation



Segmental innervation of shoulder/arm muscles

- › Spinal Accessory Nerve Cr. n. 11- Trapezius
- › C3 and C4 - levator scapulae, SCM
- › C5 - Deltoid, Infraspinatus, Teres Minor,
- › C 6 - Teres Major, Pec Major, Subscapularis, Biceps, Supinator, ECRB
- › C7- Triceps, FPL, PL, ECU
- › C8 - EPL, ED, EDI
- › T 1- Hand- Dorsal Interossi



Segmental Innervation of Scapular Muscles

- › C3 and C4 - levator scapulae
- › C5 and C6 - rhomboids
 - latissimus dorsi
 - serratus anterior
- › C7 and C8 - pectoralis minor
 - serratus anterior



Peripheral Nerve Innervation

- › Dorsal Scapular- Rhomboids, Levator Scap.
- › Axillary- Deltoid, Teres Minor
- › Long Thoracic- Serratus Ant.
- › Medial Pectoral- Pec Minor
- › Medial & Lat. Pectoral- Pec Major



Peripheral Nerve Innervation

- › Thoracodorsal- Lats
- › Suprascapular- Supraspinatus, Infraspinatus
- › Lower Subscapular- Teres Major, Subscapularis (+ Upper)
- › Musculocutaneous- Biceps, Brachialis, Coracobrachialis



Peripheral Nerve Innervation

- › Radial- Triceps, Brachioradialis, ECRL, ECRB, (Deep)-ECU, Supinator, EDM, ED.
- › Medial- Pro-Teres, FCR, PL, FCU, FDS, PQ.
- › Deep Ulnar- Add. Pol., Abd-Digiti minimi, Flex. Digiti minimi, Opp. Digiti minimi, Lumbricals, Abd. Pol Brev.

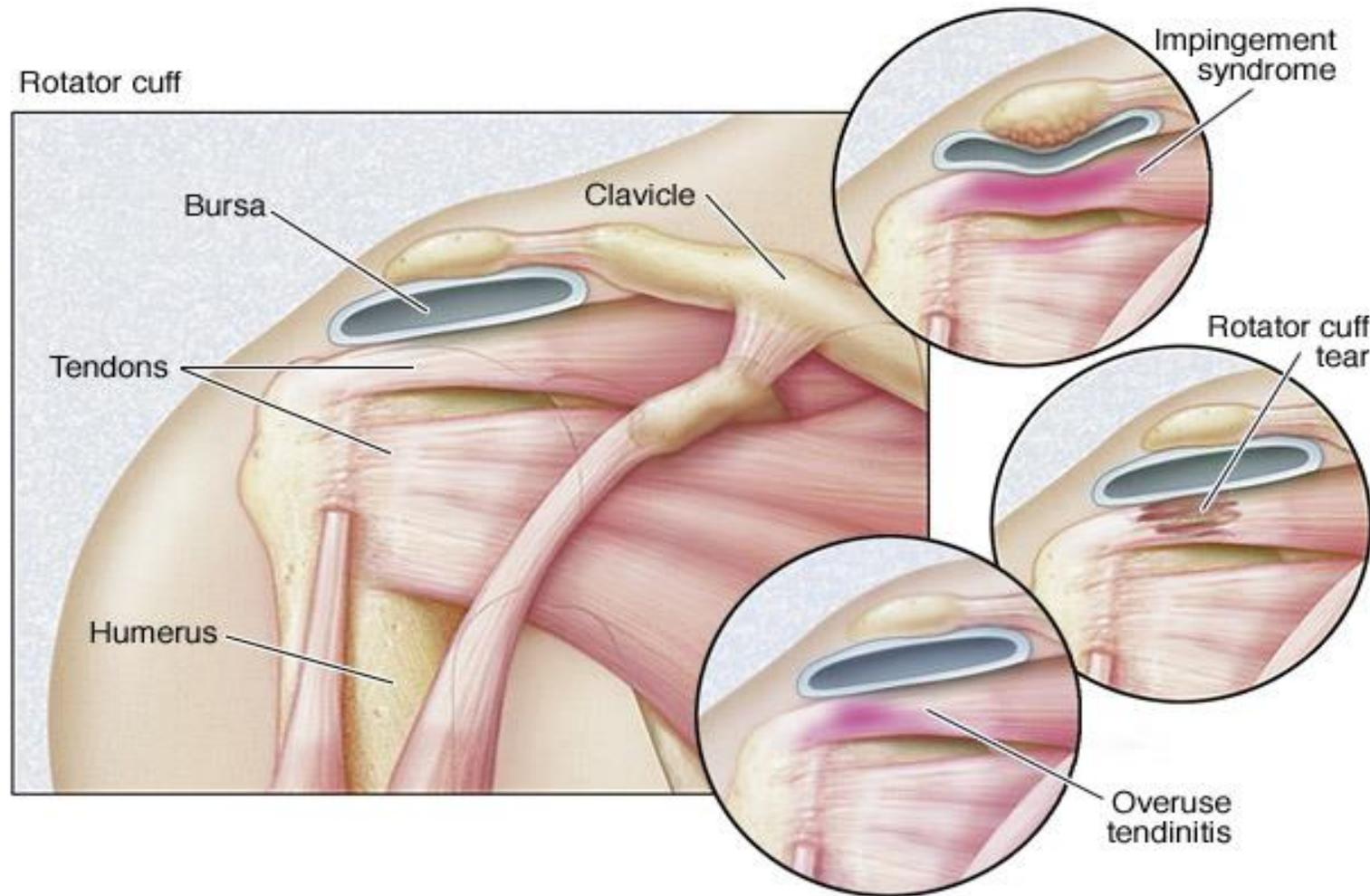


Consider.....

- › Post-traumatic hypomobility left C2/3 joint
- › Secondary hypermobility right C2/3 joint
- › Hypertonus of right levator scapulae
- › Impingement syndrome e.g., of right biceps tendon within glenohumeral joint (**and/or**)
- › Hypermobility/instability right glenohumeral joint

Which structure do ***you*** think will get treated?

Most Common Shoulder Injuries



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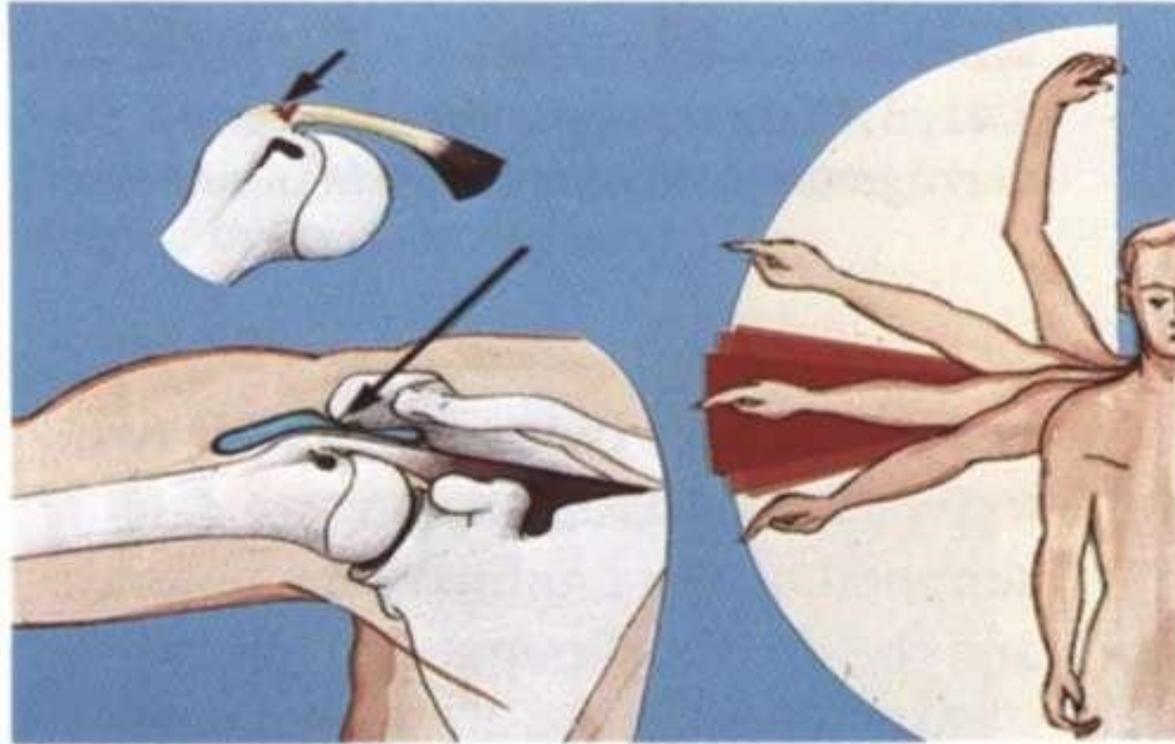
Common Dysfunctions

Shoulder Impingements

- › ext. T 1/2 dysfunction
- › 1st rib elevation
- › Levator scap hypertonus
- › A/C elevation & protraction
- › S/C elev. & protr. (↓ant. rot.)
- › GH ant. Positioning
- › C 3/4 &/or C 5/6 hypermobile



Impingement / Bursitis



3.37 *The tenoperiosteal site (arrowed) gives rise to a painful arc. After the arm attains the horizontal, the head of the humerus starts to drop slightly in the glenoid cavity and gains additional clearance.*

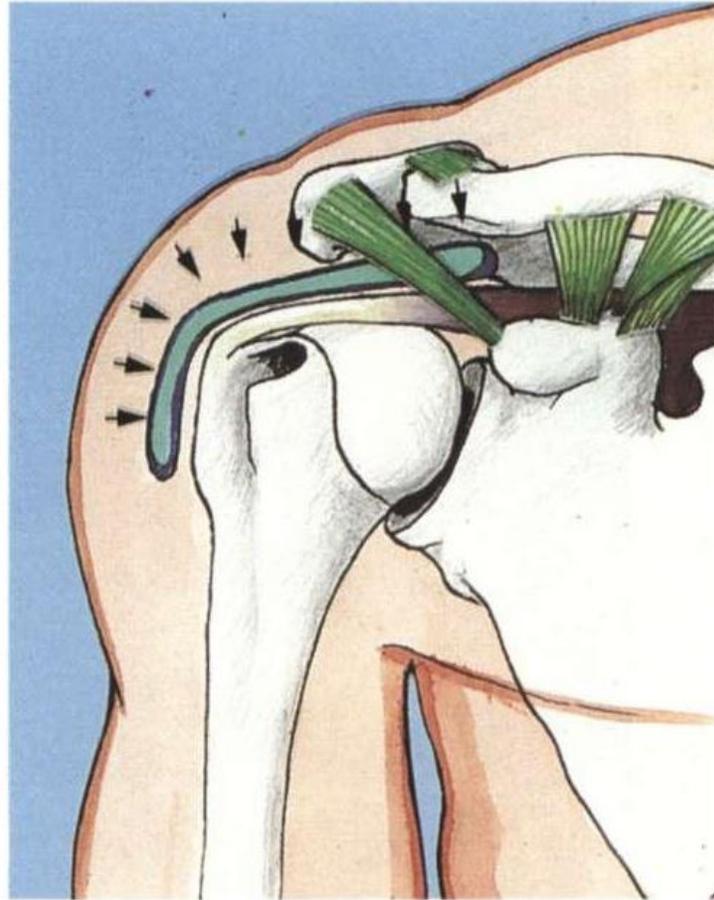


Common Dysfunctions

Shoulder A/C Dysfunction

- › Upper Trap hypertonus, lower inhibition
- › A/C elevation and protraction
- › GH ant. Positioning
- › Pec Hypertonus, Rhomboid inhibition

A/C Dysfunction / Bursitis



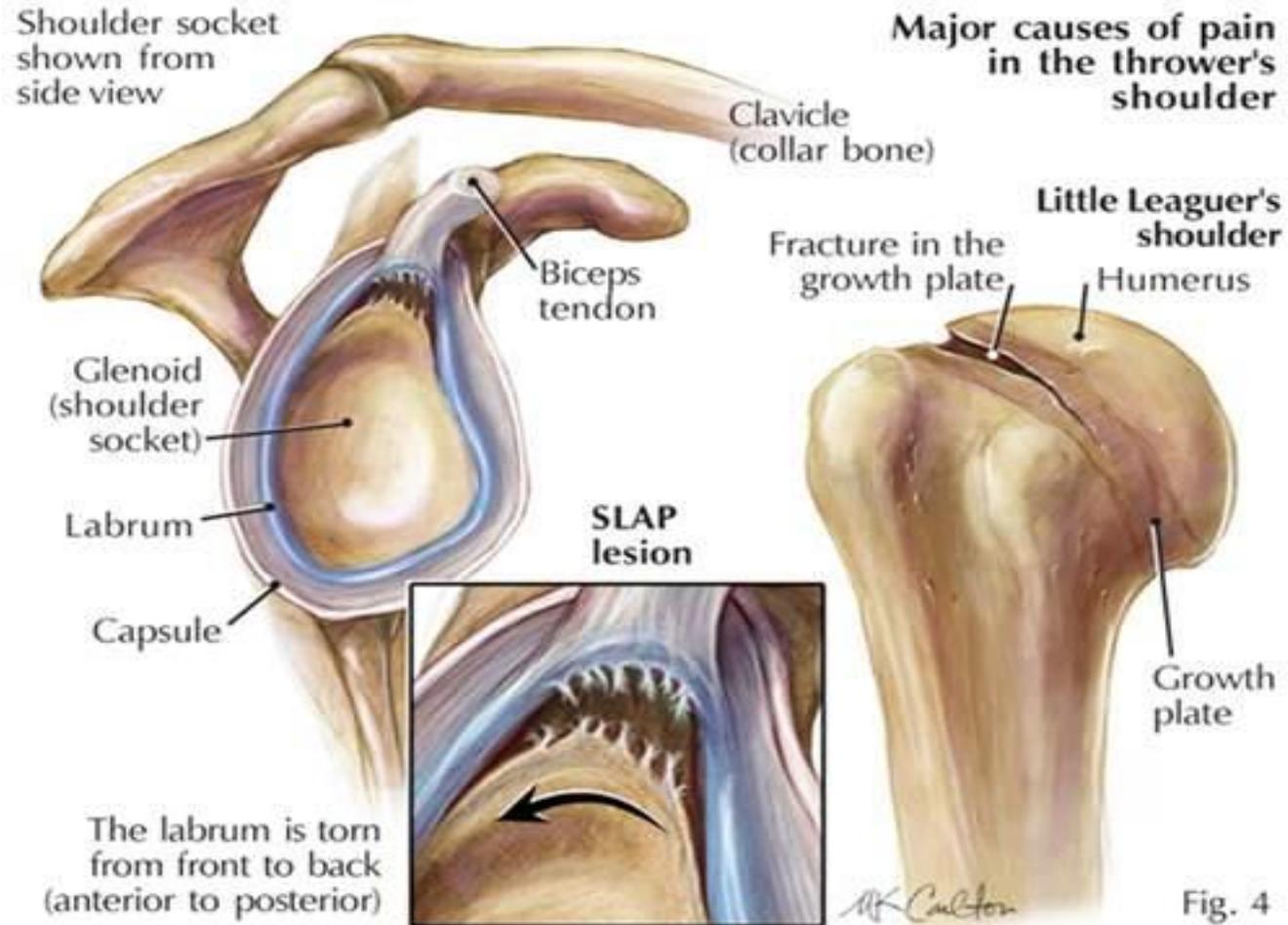
3.29 *The whole extent of the bursa is extremely tender and often thickened. A large portion of the lesion may lie in the restricted space under the acromial arch.*

Question #2

A/C Dysfunction can lead to RTC tears by which of the following?

- A.) Upper Trap and Pec Hypertonus
- B.) A/C Elevation and Protraction
- C.) GH ant. Positioning
- D.) Lower Trap and Rhomboid Inhibition
- E.) All of the above

Slap Lesion/ Little Leaguer's Shoulder



Arthroscopic Repair

Goals of Rotator Cuff Repair

- › Restoration of anatomy
- › Restoration of biomechanics
- › Strong fixation
- › Promote healing
- › Improve shoulder function
 - Sharpy fibers develop 10-12 weeks post op.

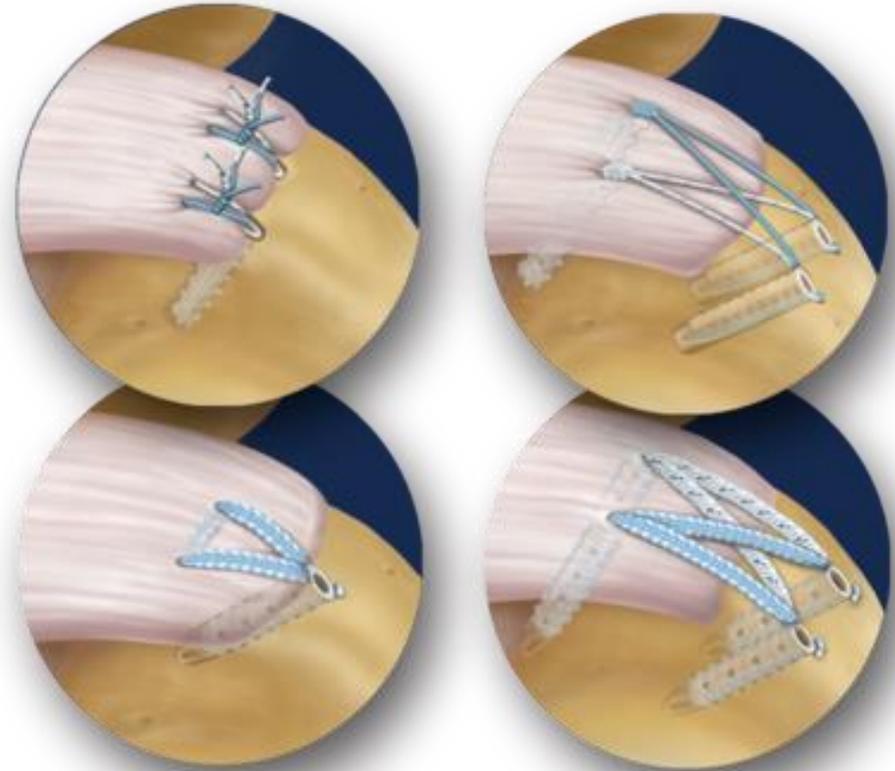


Arthroscopic / Mini RTC Repair

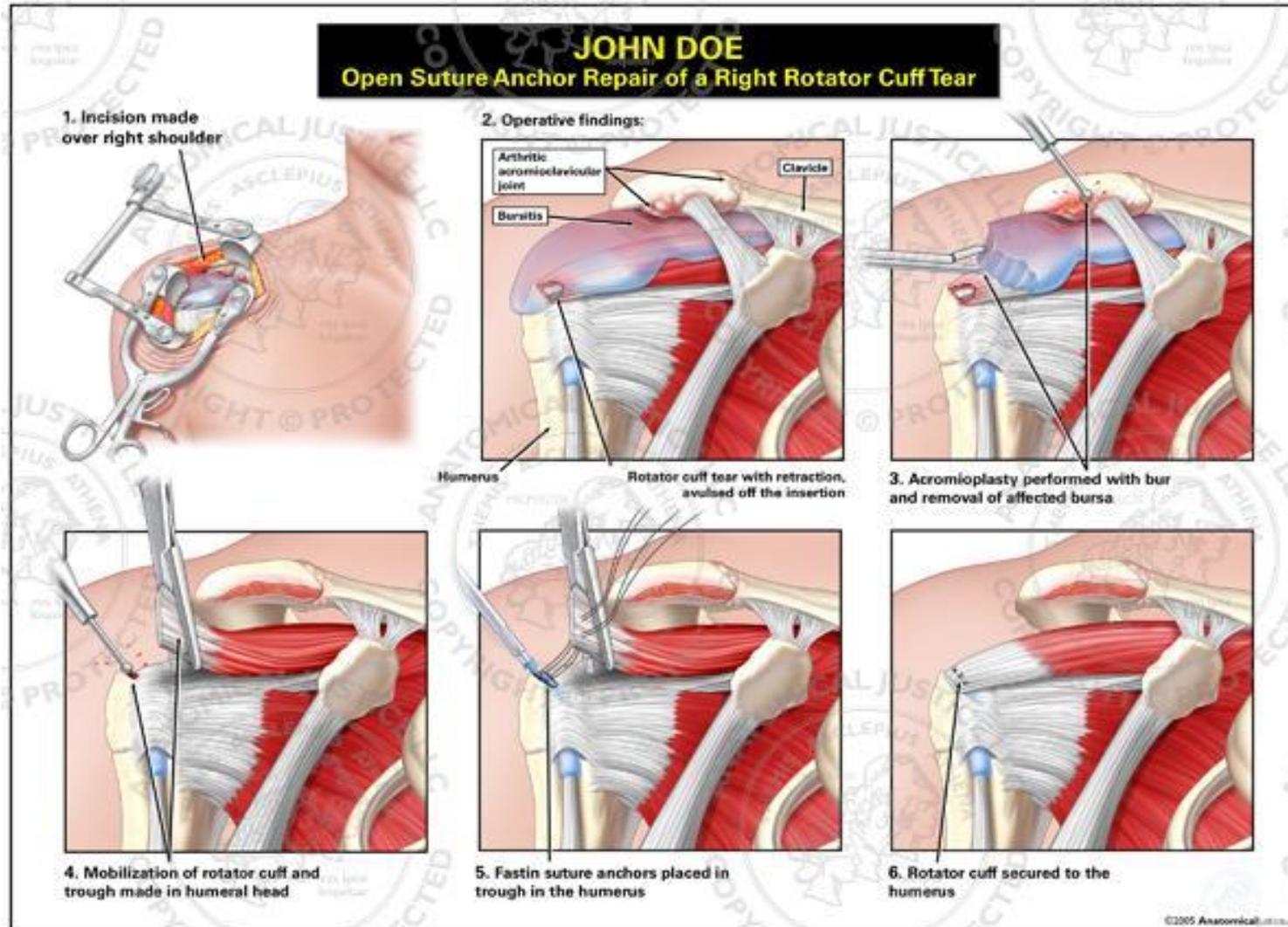


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Rotator Cuff Repair

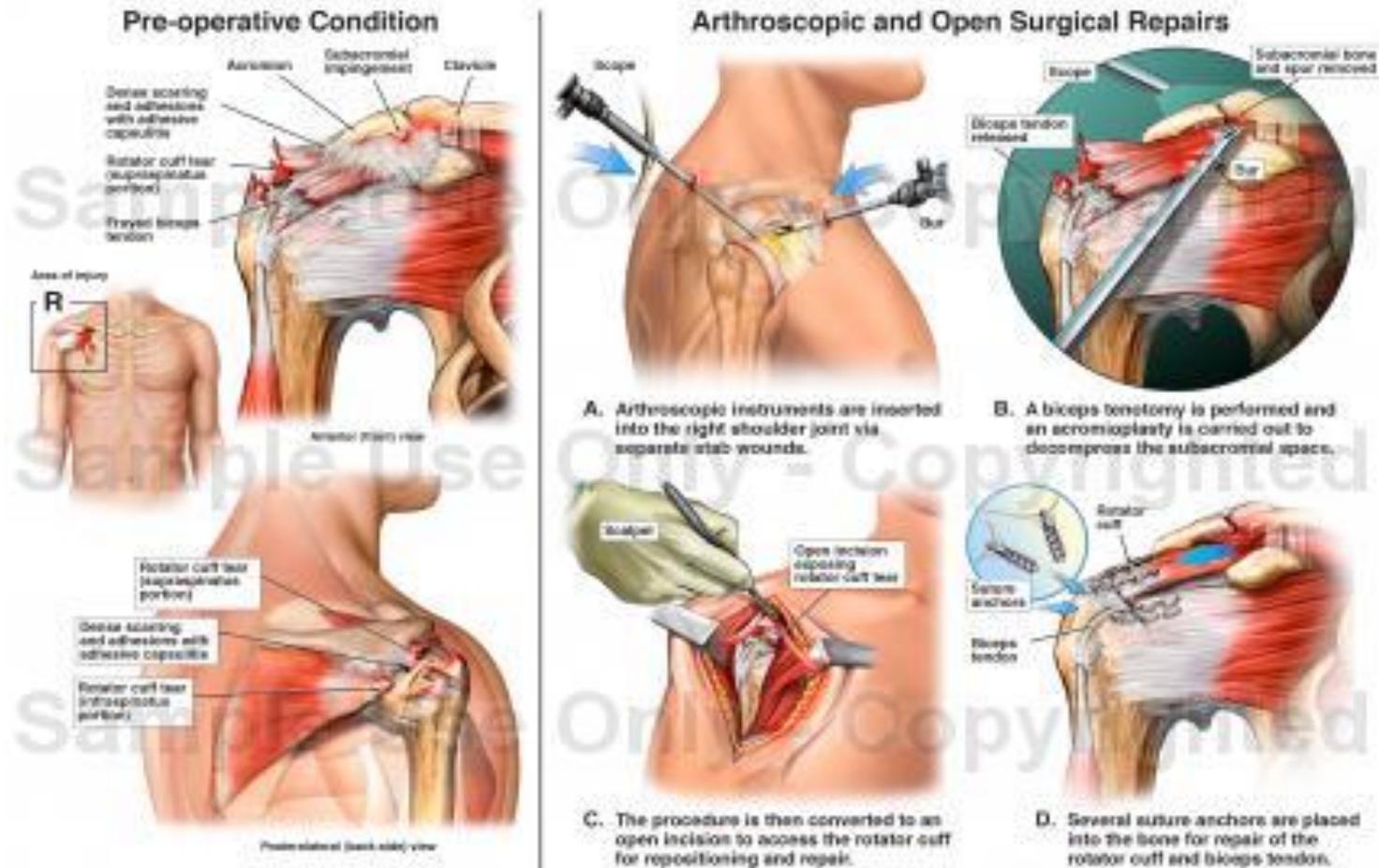


Open Rotator Cuff Repair



Arthroscopic Rotator Cuff Repair w/ Decompression

Right Shoulder Rotator Cuff Tear with Surgical Decompression and Repair





Rotator Cuff Repair Protocol

Phase I - Immediate Post-Surgical Phase (Days 1-10)

- › Goals: Maintain Integrity of the Repair
- › Gradually Increase Passive Range of Motion
- › Diminish Pain and Inflammation
- › Prevent Muscular Inhibition

Week 1

- › Abduction pillow brace
- › Pendulum Exercises
- › PROM Exercise (Cane or -PVC-Bar)
- › ER/IR in Scapular Plane at 45 degrees of abduction (pain-free ROM)
- › Passive PROM with PT
- › Shoulder PROM Flexion/Abd to approximately 90°
- › Elbow/Hand Gripping & ROM Exercises
- › Flexion with elbow bent to 90 degrees
- › External Rotation to 10°
- › PROM Internal Rotation in pain free range
- › Cryotherapy for Pain and Inflammation
- › Ice 15-20 minutes every hour



Rotator Cuff Repair Protocol

Phase II - Protection Phase (Week 2 - Week 6)

- › Goals: Allow Healing of Soft Tissue
- › Do Not Overstress Healing Tissue

Week 3-4

- › Continue Use of Sling or Brace (physician or therapist will determine when to discontinue)
- › Passive Range of Motion to Tolerance
- › Continue pendulums, Cane PROM ex's and start on pulleys
- › Flexion to 130-150 degrees
- › ER to 0 -30 degrees
- › IR to at least 45 degrees

- › Diminish Pain and Inflammation
- › Prevent Muscular Inhibition

- › ER/IR in Scapular Plane
- › Initiate scapular isometrics on week 4
- › Continue Use of Cryotherapy as needed
- › Continue All Precautions
- › No lifting
- › No excessive motion



Rotator Cuff Repair Protocol

Phase III – Intermediate Phase (Weeks 7-14)

- › Goals: Full PROM (Week 8-10)
- › Maintain Full Passive ROM
- › Gradual Restoration of Shoulder Strength
- › Gradual Return to Functional Activities

Week 7-8

- › Continue Stretching & PROM (as needed to maintain full ROM)
- › ER to 65 degrees
- › Progress Strengthening Program
- › IR and ext. Tubing
- › Prone Rowing
- › Prone Horizontal Abduction
- › Prone Extension
- › Elbow Flexion and Extension light strengthening avoiding active reaching

Rotator Cuff Repair Protocol

Week 9-10

- › Continue all exercise listed above
- › If physician permits, may initiate Light functional activities
- › Progress IR strengthening using exercise tubing at 0 degrees of abduction (use towel roll)
- › Week 9 start on **AAROM to AROM** Flexion exercises with no resistance then to light resistance.
- › ER to 90 degrees
- › Week 10 start on Abd. or Lateral Raises with ER strengthening*
- › Prone Rowing
- › Prone Horizontal Abduction

Week 11 to 12

- › Continue all exercise listed above
- › Progress to Fundamental Shoulder Exercises
- › Therapist may initiate isotonic resistance (1 lb wt.) (increase 1 lb/10 days *non-painful) for flexion and abduction*
- › ER Sidelying may be initiated
- › Add Wall presses on week 12
- › *If non-painful normal motion is exhibited!



Rotator Cuff Repair Protocol

IV. Phase IV – Advanced Strengthening Phase (Weeks 15 - 22)

- › Goals: Maintain Full Non-Painful ROM
- › Enhance Functional Use of UE
- › Improve Muscular Strengthen & Power
- › Gradual Return to Functional Activities

Week 15

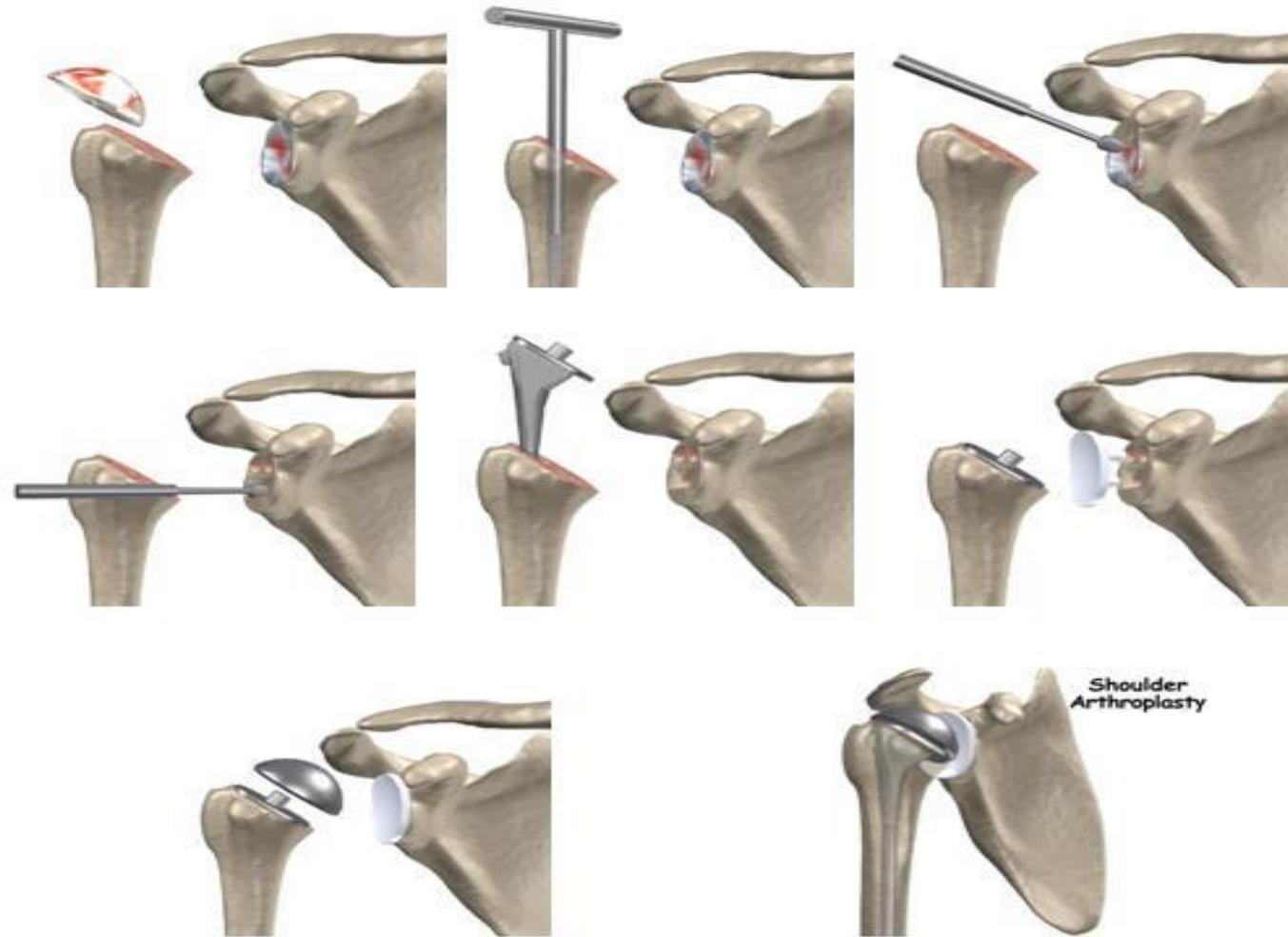
- › Continue ROM & Stretching to maintain full ROM
- › Self Capsular Stretches
- › Progress Shoulder Strengthening Exercises
- › Fundamental Shoulder Exercises
- › Work on incorporating PNF and rhythmic stabilization exercises (if appropriate)

Question #3

How many weeks post surgery is it safe to initiate AROM for most RTC repairs?

- A.) 4 weeks
- B.) 16 weeks
- C.) 9-10 weeks
- D.) Never

Total Shoulder Replacement



Reverse Shoulder Replacement



Bio-inductive Implants

- › Bio-inductive implants are not solid, but rather, chemical properties that allow your body to grow new tissue and heal
- › A scaffold using woven, electrochemically aligned collagen (ELAC) threads. The addition of mesenchymal stem cells (MSC) to increase stiffness and to regenerate new tissue.
- › In vivo pilot investigation showed these repairs were comparably stiffer and stronger. The scaffold with MSCs may also halt fatty infiltration of the attached muscles.





Stem Cell Scaffolding Technique

- › This is performed by combining the patient's blood with a collagen scaffold
- › The fibrin in the blood plasma and the added collagen could form a copolymer that cannot be broken down quickly by the normal enzymes in the synovial fluid
- › Collagen also activates platelets, which early in wound healing release growth factors that engage the healing process, allowing for mending of both torn ends



It's All About The Options!

- › Posture and Biomechanics Correction
- › Heat / Ice
- › Ultrasound
- › Dry Needling
- › Proper protocols
- › Massage
- › Myofascial Release
- › Medication / Diet
- › Electric Stimulation
(TENS) (Interferential) (Microcurrent)
- › Manipulation
- › Mobilization
- › Exercise (stretching / strengthening / stabilizing)
- › Nonspecific Manual / Mechanical Traction



It's All About The Options!

- › Treatment approach is determined through a thorough examination
- › Treatment can be in any combination best suited for the individual
- › A collaboration of medical colleagues may prove beneficial
- › The presence of hypermobility or instability may present challenges...



Work Site or Training Modification

- › New ex's, job or sport based on things we can't change
- › Allow for active rest and healing with meds
- › Work on core strengthening and address footwear
- › Bracing or taping
- › Allow for adequate warm up, and stretching of restricted areas prior to strengthening exercise



Job / Exercise Program Re-Design

- › Job enlargement and rotation should be considered
- › Modify height of work stations
- › Perform all work as close to the body as possible
- › Provide adequate space for activities
- › Provide proper exercise routines with active rest
- › Work on regaining mobility before stability
- › Allow or provide ability to use a step stool to avoid repetitive overhead reaching

Physical Fitness

- › Encourage employees and clients to maintain an acceptable level of physical fitness
- › Encourage stretching and change of position throughout the work day
- › Fit individuals recover faster
- › Emphasize stability and endurance for some and strength and flexibility for others depending on the job or sport





Employer and Employee Communication

- › Educate employees about prevention of shoulder injuries
- › Establish company policy regarding safe body mechanics
- › Supervise employees for correct body mechanics
- › Encourage teamwork



Doctor, PT, Case Worker and Client Communication

- › Require the use of proper equipment and clothing
- › Design all workouts and exercises with safety in mind
- › Attempt to keep employees at some form of work while undergoing treatment
- › Communication among all as to what activities should be modified or eliminated

Questions



Therapeutic Rehab Specialist Clinic Locations

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Brandon, FL 33511

Phone: (813) 876-8771 | Fax: (813) 333-5414

Pinellas Park, FL 33781

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