MedFit Classroom
Orthopedic Fitness Specialist Course

Module 10: The Shoulder

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Learning Objectives

- Lesson 1
  - Functional anatomy
    - Skeletal
    - Non-contractile
    - Muscular
- Lesson 2
  - Clinical tests of instability
- Lesson 3
  - Joint mechanics
  - Interview with Dr. Timothy Uhl, PT
- Lesson 4
  - Common issues
  - Interview with Dr. James Johnson, MD
- Lesson 5
  - Basic exercises
- Lesson 6

The Shoulder

Image: core concepts.com.sg

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Lesson 1: Functional Anatomy

Shoulder Girdle Components

Glenohumeral (Scapulohumeral)
Scapulothoracic
Scapuloclavicular (A-C)
Sternoclavicular

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Skeletal Structures

- Thoracic Ribcage
- Scapula
  - Acromion
  - Glenoid process
  - Corocoid process
  - Spine

Image: sportsmedalabama.com

Skeletal Structures

- Humerus
  - Humeral head
    - Greater tubercle
    - Lesser tubercle
- Clavicle
- Sternum

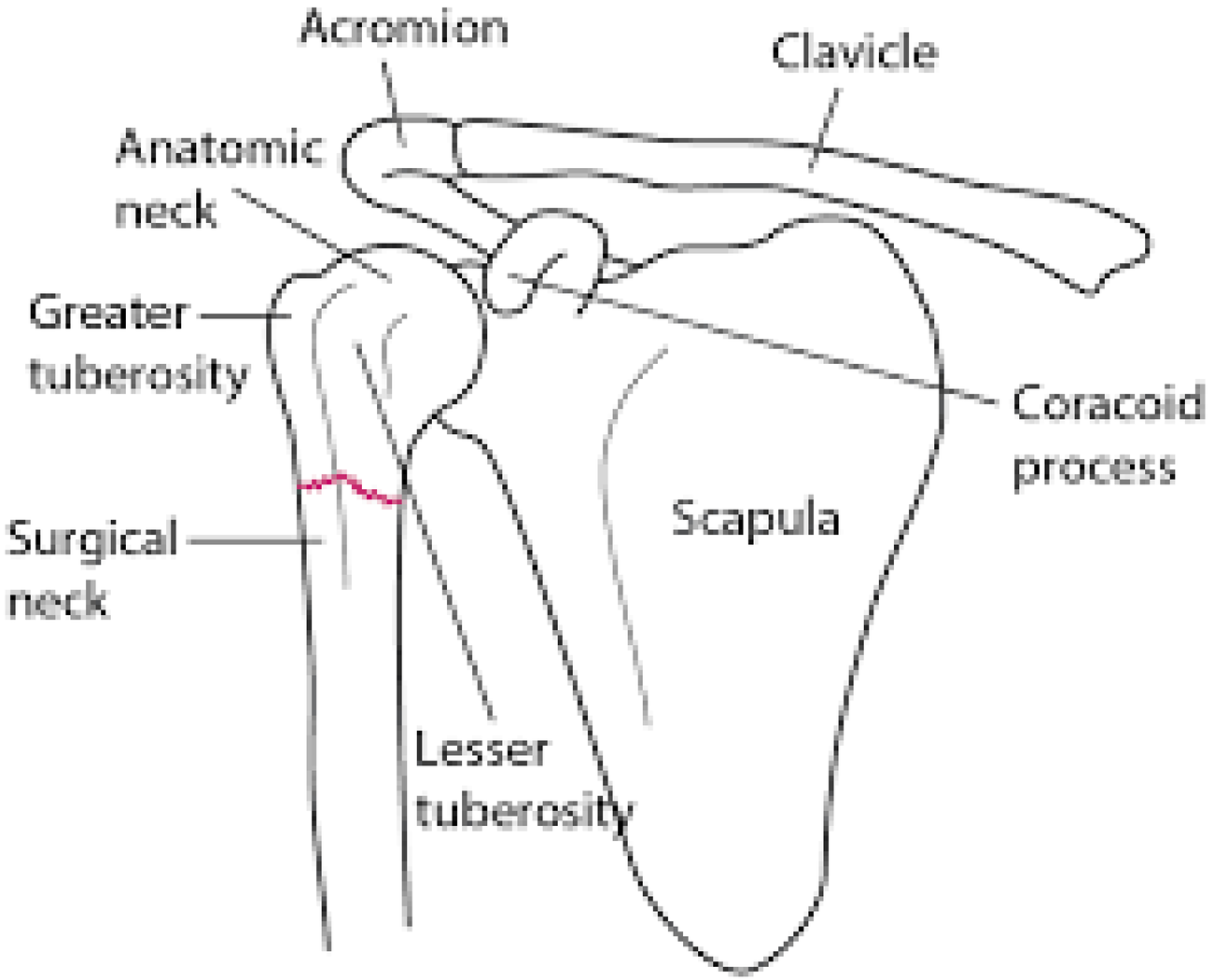

Image: merckmanuals.com

Non-Contractile Structures

- Glenoid rim
- Glenohumeral (capsule) ligaments
  - Superior, inferior, middle glenohumeral
- Acromioclavicular joint
- Coraco-acromial, coraco-clavicular ligaments
- Transverse humeral ligament - keeps long head of biceps in place

Non-Contractile Structures

Image: shoulder elbow.org

musculoskeletalkey.com

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Contractile Structures

- **Rotator cuff**
  - **Supraspinatus**
  - **Infraspinatus**
  - **Teres minor**
  - **Subscapularis**
- **Biceps - long head**
- **Triceps**

Image: kentorthopaedicpractice.co.uk

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Periscapular Muscles

- Pectoralis minor
- Serrates anterior
- Trapezius - upper, lower, middle
- Rhomboid major (and minor)
- Levator scapula
- Scalenes - neck flexors, extensors, lateral flexors

Periscapular Muscles

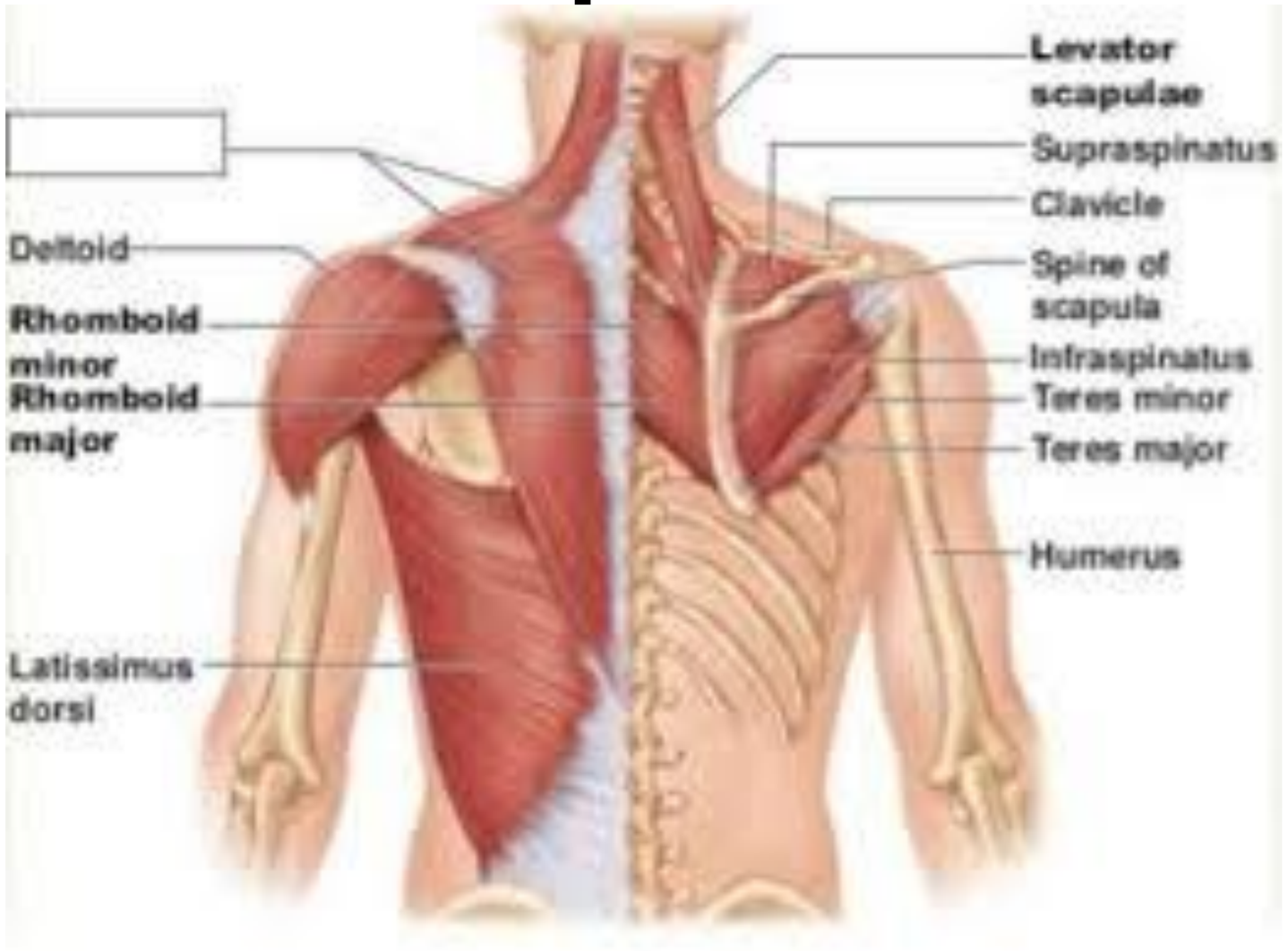

Image: boundbobskryptis.blogspot.com

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Lesson 2: Clinical Tests of Instability

- **Apley scratch**
  - Overhead upper back stretch of internal rotators and adductors
- **Apprehension***
  - Manual test of fear of subluxation/dislocation
- **Anterior instability**
  - Manual test of GH anterior instability due to IGHL tear
- **Sulcus**
  - Downward distraction > finger's breadth between acromion and humeral head

Clinical Tests of Cuff Impingement

- **Full flexion**
  - Apprehension due to supraspinatus pathology during full flexion
- **Empty Can**
  - Resistance against pressure in scapular plane, internally-rotated
- **Internal Rotation**
  - Manual resistance to external rotation, at side or against belly
- **External Rotation**
  - Manual resistance against internal rotation, at side

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Additional Common Tests

- **Cross-chest/horizontal adduction**
  - **Of AC impingement**
- **Speed's**
  - **Resisted shoulder extension with extended-elbow for biceps strain**
- **Ferguson**
  - **Resisted elbow extension with bent elbow for biceps strain**
- **Adson maneuver**
  - **Head turned, shoulder extended and externally rotated for TOS**

Lesson 3: Joint Mechanics

- **Ball-and-socket**
- **Cuff muscles have medial and inferior lines of pull**
  - **Keeps ball in socket and downward away from the acromion process = Centration or Centralization**
- **Scapulohumeral rhythm maintains length-tension relationships of cuff muscles and prevents impingement against the acromion**

Physiopedia.com. https://www.physio-pedia.com/Scapulohumeral_Rhythm

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Images: golf.com

https://www.youtube.com/watch?v=qhao2gPZfCA

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Scapulohumeral Rhythm

- From 0-60 degrees abduction or flexion, the scapula doesn't have to move much (unless rotator cuff is dysfunctional)
- After 60 degrees, scapula rotates upward and elevates about 1 degrees (scapulothoracic) per 2 degrees of humeral (glenohumeral) motion to position the GH joint upward

Scapular Dyskinesis = delayed reaction to GH movement creating impingement

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Dr. Ben Kibler's "Phantom Throw"

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Timothy Uhl, Ph.D., PT, ATC, FNATA

- Got doctorate in sports medicine from the University of Virginia in 1998
- Professor of PT at UK, assisted in securing over $5,000,000 at UK
- Practicing physical therapy and athletic training since 1985
- Physical therapist at the Lexington Clinic Sports Medicine Center
- Former Head Athletic Trainer at Transylvania University
- Former director of outpatient physical therapy at the Human Performance and Rehabilitation Centers in Columbus, GA

https://www.ncbi.nlm.nih.gov/sites/myncbi/1TywvgnOhMKkv/bibliography/48571273/public/?sort=date&direction=ascending

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Interview with Dr. Timothy Uhl

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Lesson 4: Common Issues

- GIRD
- Rotator cuff impingement
- Subacromial bursitis
- Biceps tendinopathy
- A-C joint pathology
- Thoracic outlet syndrome
- Adhesive capsulitis
- Labral pathology
- Arthritis

Image: jaffesportsmedicine.com

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Glenohumeral Internal Rotation Deficit (GIRD)

Impingement - of soft tissue against the undersurface of the acromion (subacromial impingement)

- **Greater tubercle doesn't align in such a way as to avoid bumping up against acromion**
- **Subacromial space narrows with age, use, posture/positioning of scapula**
- **Scapula protraction and elevation (a la rounded shoulders)**
- **Tight internal rotators**
- **Overly elongated external rotators**

GIRD

Pitchers have similar total ROM but less IR, more ER

Minimum = 30 degrees in Sleeper Stretch position

Image: sciencedirect.com

Sleeper Stretch

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Rotator Cuff Pathology (Rotator cuff impingement)

- **“…mechanical friction (and compression) among rotator cuff tendons during elevation”**
- **Impingement affects 40% of adults worldwide**
- **Symptoms include:**
  - **Pain, especially in abduction**
  - **Restricted pain-free motion, especially between 60 and 120 degrees abduction**
  - **Loss of strength**
    - **Empty can test**

Kim, J-H, Kwon, O-Y, Hwang, U-J, Jung, S-H, Ahn, S-H, and Kim, H-A. Comparison of shoulder external rotator strength and the asymmetry ratio between workers with and without shoulder impingement syndrome. JSCR 35(12): 3364–3369, 2021

Subacromial Bursitis

- SAB implicated as “primary pain-producing tissue”
  - Leads to reduced motion and function
- Serves as proprioceptor and lubricator of RC
- Increased nerve density in those who had RC pain
  - Theory: extra mechanoreceptors protect shoulder from movement-related compression, impingement damage
- Presence of necrosis (vs hypertrophy, inflammation and edema) highly related to SAB pain vs RC pain

Lanham, Swindell, Levine. The Subacromial Bursa. JBJS Reviews. Nov. 2021: e21.00110

Common Causes of Cuff Pathology

- Age
- Overuse
- Weakness
- Imbalances
- Improper or inappropriate technique
  - Throwing, lifting, serving, grabbing purse
- Scapular dyskinesis - Swimmer’s shoulder
- Kinetic chain dysfunctions

Wuelker N, Korell M, Thren K. Dynamic glenohumeral joint stability. J Shoulder Elbow Surg 7: 43–52, 1998.

RC Surgery - Predicting Benefits?

Lucy Hicks. Shear Wave Elastography Predicts Unsuccessful Rotator Cuff Repair. Medscape. March 2022.

Pre-surgery elastography - a new form of ultrasound - that describes a ratio of the supraspinatus relative to the trapezius, was found to predict surgical outcome. High levels of atrophy yield low probability of benefits.

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Hi-Rep, Lo-Load Protocols

- N = 21 with chronic subacromial pain syndrome, 8 wks
- Control: regular PT
- Experimental: PT plus high-intensity aerobic interval training
  - 4 x 4 minutes of thumbs-up raises in scapular plane (scaption) with 3 minute rest periods (workload RPE <5)
- Results: “the participants in the HIIT group reported a larger reduction in pain and disability.”

OK Berg, F Paulsberg, C Brabant, K Arabasolghar, S Ronglan, N Bjornsen, T Torhaug, F Granviken, S Gismervik, J Hoff. High-Intensity Shoulder Abduction Exercise in Subacromial Pain Syndrome. MSSE. 53(1):1-9, January 2021

When to Start RC PT

Q Stillson et al. Effect of Physical Therapy and Rehabilitation Timing on Rotator Cuff Repair Revisions and Capsulitis. Medscape. March 2022.

"Although many studies have demonstrated decreased stiffness with beginning PT early [week 1], studies have also demonstrated that early PT increases repair failure…compared with starting PT in weeks two to five, six to nine, or 10 to 13… [and] calls into question the use of an early passive range of motion protocol for older patient cohort"

Dr. James Johnson, FAAFP, CAQSM

- Board-Certified in Family and Sports Medicine
- Certified ImPACT Concussion Consultant
- Specializes in sports medicine, OA, tendinopathies, repetitive stress injuries
- Graduate of Vanderbilt University and Vanderbilt University's School of Medicine
- residency at the Mayo Clinic in Jacksonville, FL
- Sports Medicine Fellowship at Stanford University and San Jose Medical Center in California
- Clinical instructor at Vanderbilt University School of Medicine's department of family medicine, and clinical assistant professor at Meharry Medical College
- Team physician for the U.S. Olympic Swim Team, the USA National Swim Team, Nashville Ballet, the Nashville Aquatic Club (NAC), and Lipscomb University.

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Interview with Dr. James Johnson

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Biceps Tendinopathy

- Long-head strain often due to poor mechanics and rotator cuff insufficiency
  - Could involve transverse ligament
- Pain directly over tendon
- Similar causes as cuff dysfunction and scapular dyskinesia
- Often due to excess strain under stretch such as during bench press, chest fly, behind-the-neck lat pulls, extreme flexion as in swimming

Treatment Options for Biceps Tendinopathy

- PRICE
- Alter technique - prevent upper arm from horizontal hyper-extension; improve sporting techniques
- Low-resistance eccentrics (curls, shoulder flexion)
- Scapula letters (YTWI)
- Tenotomy (release tendon so it retracts and attaches to upper humerus - Popeye Arm)
- Tenodesis (surgical repositioning of tendon onto upper humerus)

A-C Joint Pathology

- OA or inflammation due to impact or chronic horizontal adduction (as in bench press/push ups, chest flyes, punching, work-related)
- Claviclectomy - shaves off distal ends of clavicle and acromion to create space between them

Thoracic Outlet Syndrome

- Vascular or neural impingement off the neck or brachial plexus that creates aches, pains, weakness in shoulder (all the way to wrist)
- Causes vary but poor posture is major
- Generally treated with ROM and postural therapies

Adhesive Capsulitis

- Adhesions of GH ligaments, especially IGHL, that restrict motion and create pain and strength symptoms similar to cuff pathologies
- Primary: idiopathic
- Secondary: result from injury or insult (fall, surgery, accident, cuff pathology)
- Treated with PT for ROM, cuff strength
- Passive manipulation under anesthesia

Labral Tears

- Bankart lesion - anterior damage
  - Often due to repetitive subluxation or cuff weakness; improper lifting technique
- Hill-Sachs lesion - posterolateral tear
  - “compression fracture or "dent" of the posterosuperolateral humeral head that occurs in association with anterior instability or dislocation of the glenohumeral joint.” (Physiopedia)
  - Often accompanies a Bankart lesion

SLAP Tear

- **Superior Labrum Anterior-Posterior tear - distraction injury of long head of biceps tendon pulling its anchor on labrum**
- **Overhead athletes and acute injuries due to falling while holding/grabbing onto something**

Total Shoulder Arthroplasty

- For OA of the GH joint
- Traditional: replace ball onto humerus, put socket onto scapula
  - If cuff is intact; yields better ROM
- Reverse: put socket on humeral head, ball
  - If cuff is damaged beyond repair or OA is severe

TSA

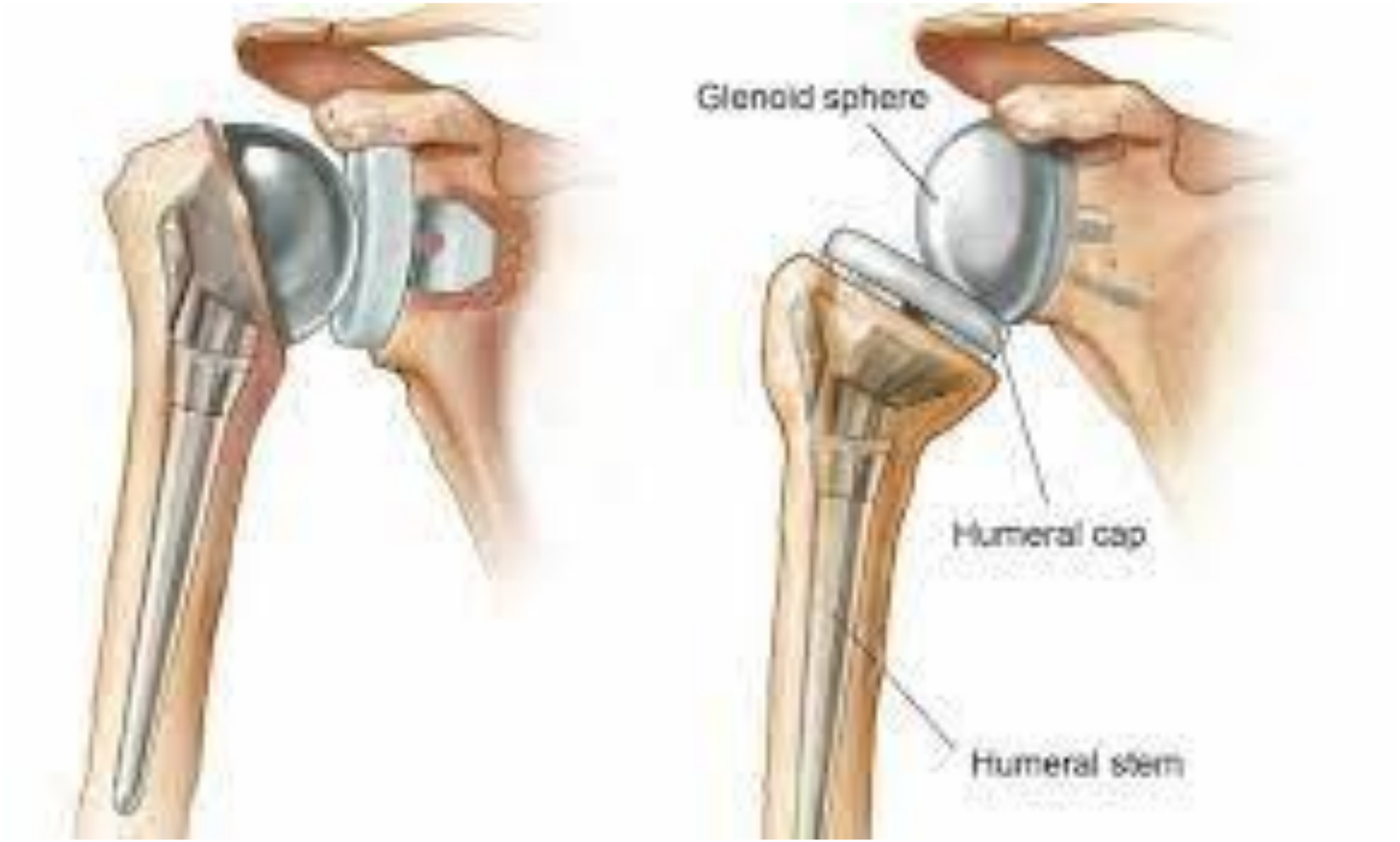

Image: drcarofino.com

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TSA

- Basic therapy
  - Sling for 6 wks
  - ADLs by 12 wks
  - Recreational or heavier lifting by 6 months
- 90% survive 10 years, can be revised
- Avoid heavy chest/bench presses, especially into horizontal hyperabduction, and overhead lifting

Lesson 5: Basic Shoulder Exercises

- External/Internal rotation with arm by side - side lying or standing
- Open-can supraspinatus
- YTWI (or A)
- Rowing, especially from high to low
- Serratus anterior punches - supine or wall
- Biceps curls

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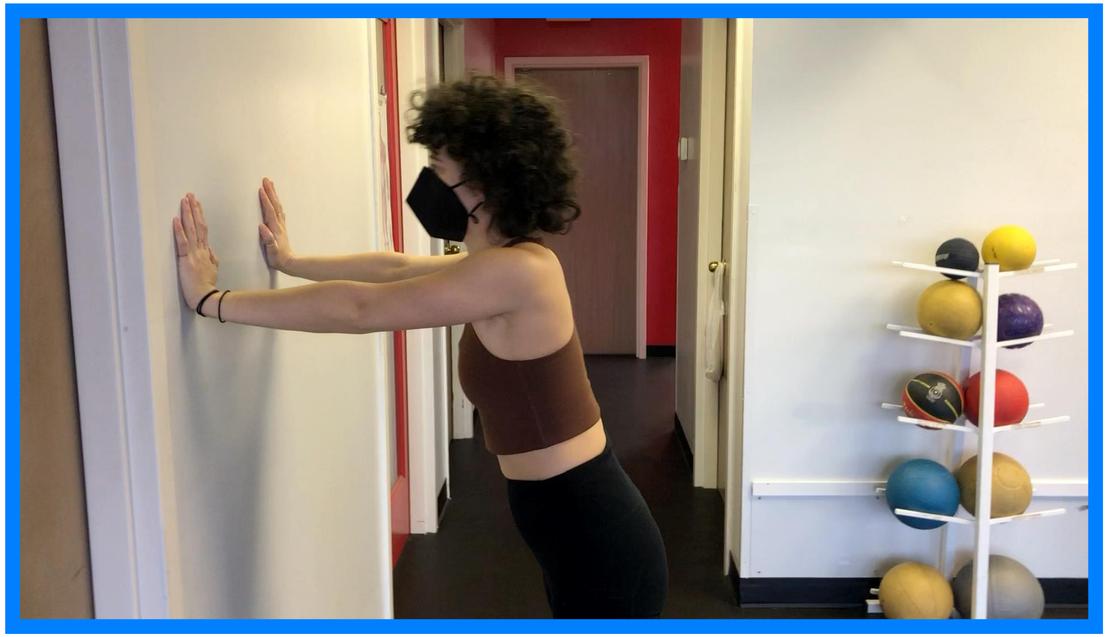

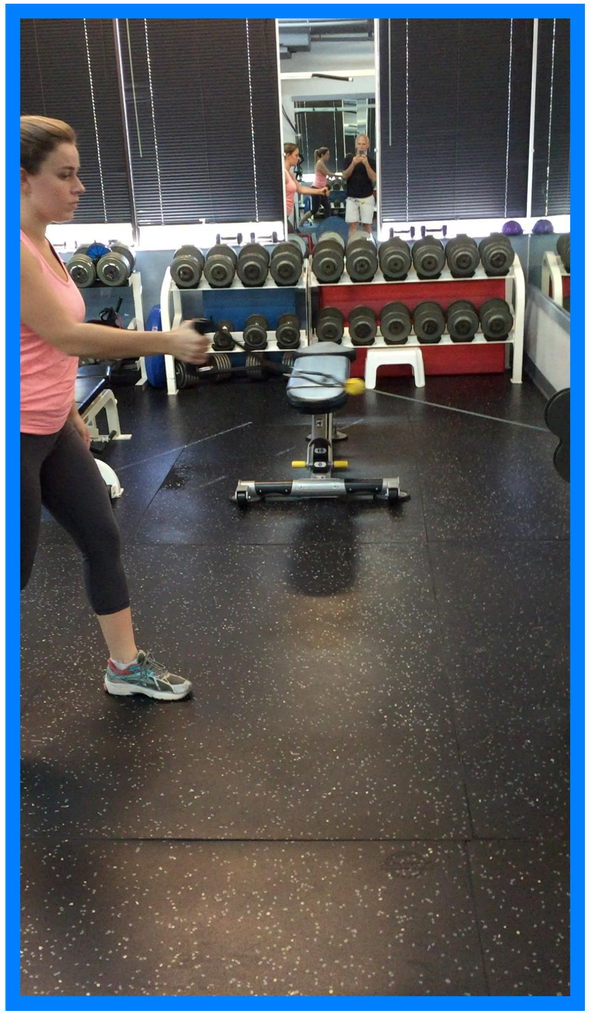

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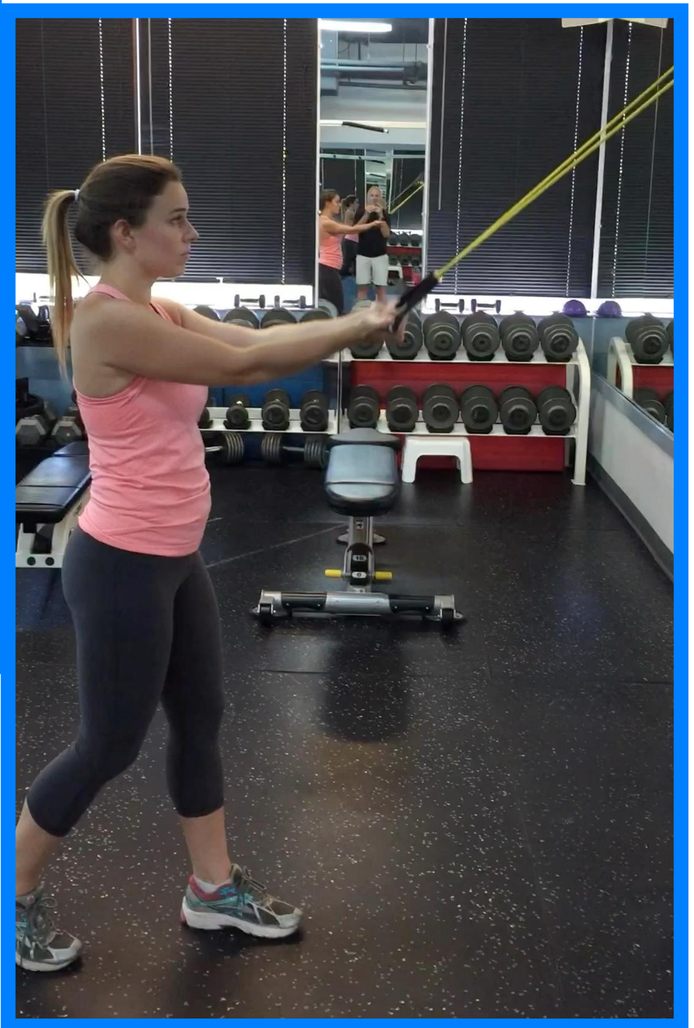

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The Throwers 10

- D2 Extension & Flexion
- External & Internal Rotation at 0 degrees abduction (on ribs)
- External & Internal Rotation at 90 degrees abduction
- Shoulder Abduction to 90 degrees
- Scaption, internal rotation (30 degrees forward, thumb up)
- Prone Horizontal abduction (neutral - T)
- Prone Horizontal abduction (thumb up, abducted to 100 degrees - Y)
- Seated Press Ups
- Prone rowing
- Prone rowing into external rotation

Wilk KE, Yenchak AJ, Arrigo CA, Andrews JR. Phys Sportsmed 39: 90–97, 2011.

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Seated Press Ups

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Lesson 6: Novel or Advanced Shoulder Exercises

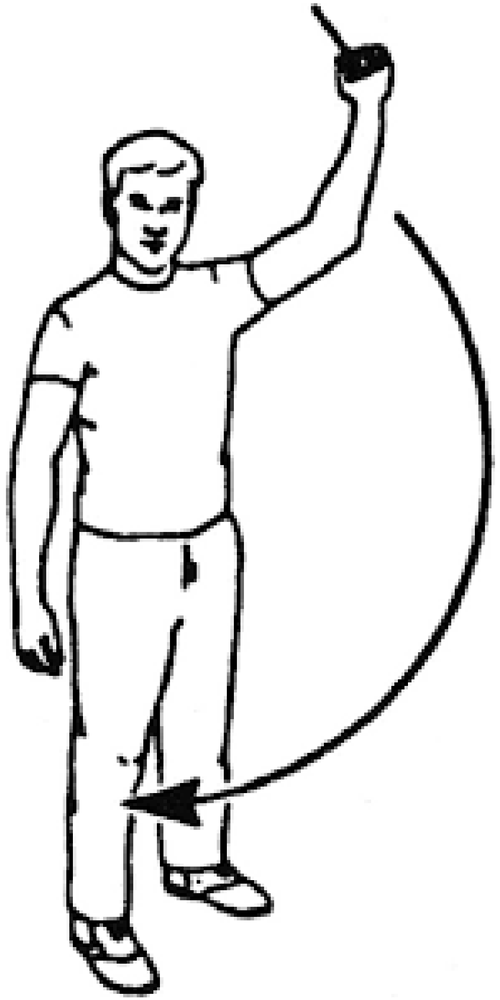

Image: tcomn.com

Specialized External Rotation Exercises

- 0-90+ - step out or assisted eccentrics
- 90-90 - assisted
- 90-90 - med ball toss
- 90-90 in adduction, resistance from below
- Arm slides up wall with band, or band-pull-aparts (Dr. Evan Osar)

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External Rotation

0 Degrees Abduction

90 Degrees Abduction

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Serratus Anterior Glides

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Specialized Internal Rotation Exercises

- 0-90+ - step out or assisted eccentrics
- 90-90 - assisted
- 90-90 - med ball toss
- 90-90 in adduction, resistance from below

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Internal Rotation

0 Degrees Abduction

90 Degrees Abduction

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Diagonals - D2X, D1X

- Highly-functional, sport-appropriate, neuromuscularly demanding, scapulohumerally sound, adjustable to provide resistance through the full ROM
- Law of Irradiation - more inputs, greater output
- Pitching/Throwing
  - Unassisted
  - Assisted with Dynamic Cam

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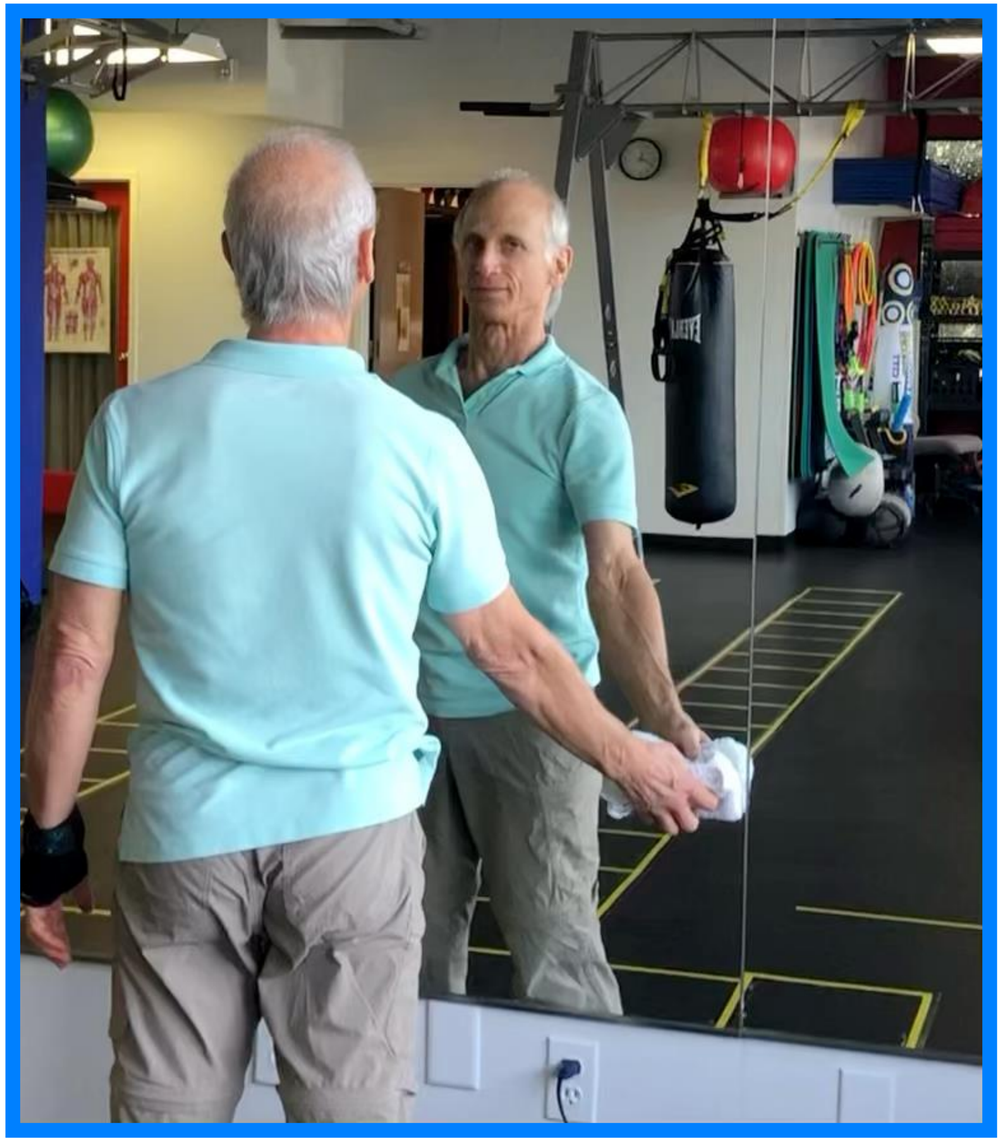
“Karate Kid” Shoulder Exercises



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Diagonals - D2X, D1X

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Diagonals - D2F, D1F

- Arm cocking and Underhand throwing
  - Unassisted
  - Assisted

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Diagonals - D2F, D1F

Bodyblade

- Basic ER/IR
- 90-90 ER/IR
- Supraspinatus at multiple levels
- Diagonals
  - Add balance component

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Do the BodyBlade and Other Oscillatory Devices Work?

“studies did **not** show that oscillatory devices (body blade) were more effective than traditional methods for strengthening the shoulder ... which cause a rapid, rhythmic pattern of alternating contractions between the agonists/ antagonists of shoulder musculature.”

Savitzky, JA, Abrams, LR, Galluzzo, NA, Ostrow, SP, Protosow, TJ, Liu, SA, Handrakis, JP, and Friel, K. Effects of a novel rotator cuff rehabilitation device on shoulder strength and function. JSCR 35(12): 3355–3363, 2021

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BodyBlade Drills

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One-Arm Plank

Basic Shoulder Stretches

Wall, Door, Stick, Golf Club:

- Flexion
- Abduction
- External Rotation
- Posterior Cuff Cross-body - neutral, supinated
- Baseball, 90-90
- Internal Rotation

Door Stretches

Stick Stretches

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Shoulder QUIZ

At this time, please complete and successfully pass the "Shoulder Quiz" before continuing to the next section.

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