The Orthopaedic Institute at St. Elizabeth: A partnership between OrthoCincy Orthopaedics & Sports Medicine, St. Elizabeth Physicians and St. Elizabeth Healthcare.

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KEEPING RUNNERS ON TRACK

Stacey McConnell, PT

OrthoCincy Orthopaedics & Sports Medicine | St. Elizabeth PHYSICIANS | St. Elizabeth HEALTHCARE

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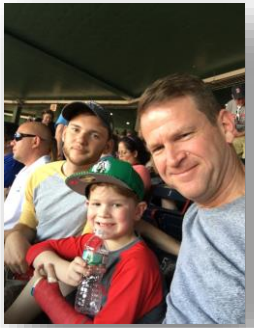
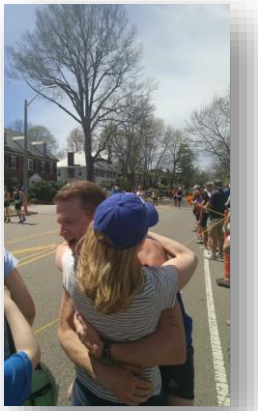
KEEPING RUNNERS ON TRACK

Boston 2017





KEEPING RUNNERS ON TRACK

The Runner

Definition:

Runner noun: **one that runs**

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Rewards and participation

- Stress relief
- Live longer
- Mood and energy level booster
- Weight loss
- Group runs with friends
- Getting better sleep
- Immediate access to fitness
- Alone time
- Meditation time
- Experiencing nature
- Setting goals and reaching them

Awards and competition

- Winning as a team or individual
- Going to State with your school
- Receiving a college scholarship
- Winning a local or national race
- Winning an Olympic event
- Getting sponsorship
- Career as a professional runner

KEEPING RUNNERS ON TRACK

Working with injured runners

- They can be difficult to work with
- They run with pain and don't stop
- They don't want to give up on their rewards and awards
- They don't want to see a clinician
- They can be UNREALISTIC with their return to running timetable
- They don't want to be told . . .

KEEPING RUNNERS ON TRACK

Working with injured runners

If you say, "you need to stop running"

- **May lose your patient**
- **May lose your good outcomes**

If you say, "I understand the benefits you get from running"

- **May help them buy into what you are saying**
- **May help you get them better**

Suggest an active rest and take a break from running and allow for healing (swimming, circuit training, biking, core and upper body)

KEEPING RUNNERS ON TRACK

Runners On Track

- **Means helping them run at a track and helping them reach their own personal goals**
- **Important considerations:**

Running Shoes

Running Schedule

Stretch and Strength

KEEPING RUNNERS ON TRACK

Running Shoes - Research

- No evidence that shoes prevent running injuries
- Some evidence for increased performance with shoes
- Softer landings and decrease loading forces and loading rates

KEEPING RUNNERS ON TRACK

Running Shoes

- **What kind of feet do you have?**
  - ✓ **High Arch – neutral shoe**
  - ✓ **Normal Arch – neutral or stability shoe**
  - ✓ **Low Arch – stability shoe**

- **Credit or blame your parents**
  - ✓ **(apples don't run far from trees)**

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Running Shoes

Questions:

How old are your shoes?

When was the last time you had your feet sized?

Have you ever been to a running store to get best shoe for you?

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Running Shoes – running stores

- Running store personnel are well trained
- Best fit and comfort is valuable
- Runners should stand, walk, and go outside for a run
- Most stores can use video to see if shoes are a best match
- Most stores have trial period and return policy
- If a shoe is just older and worn encourage getting the same shoe
- Good to get shoes and walk during an active rest period

Running Stores in Greater Cincinnati Area:

- Fleet Feet
- Tri-State Running Company
- Queen City Running Store
- Buckeye Running Company

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Using a Running Schedule - Research

- Running only one day per week increases risk of injury
- Running every day of the week increases risk of injury

- Running distances over 40 miles increases risk of injury
- Running year round without time off increases risk of injury

- Runners who follow a schedule have decreased risk of injury
- Runners who follow a schedule have improved performance

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Using a Running Schedule – they will tell you

- Discuss training around the time of injury to detect a training error
- If detected, there may be less need to correct a physical problem
- If undetected, there may be greater need to find a physical problem
- Include in patient education information about a running schedule

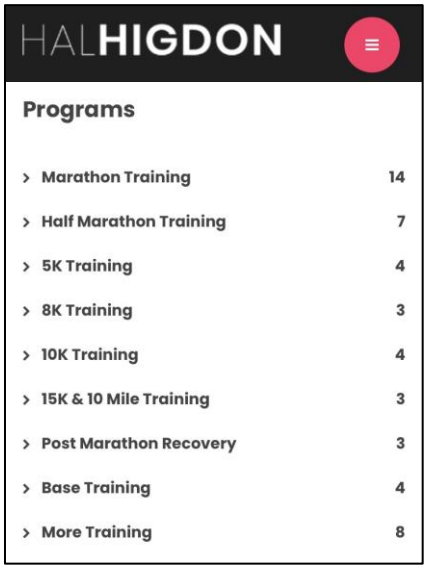
KEEPING RUNNERS ON TRACK

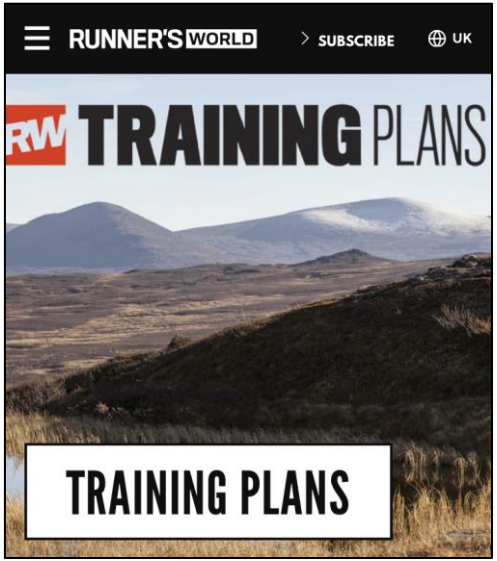
Using a Running Schedule

- Easy to find (running store, on-line program or coach, HS/college coach)
- Program based on running experience (novice, intermediate, advanced)
- Specific distances provided for each day of the week
- Variety of runs (long slow, recovery, tempo, race pace)
- Offers a gradual progression (safer)
- Built in days for cross training (typically once per week)
- Built in days for rest (typically once per week)
- Many programs are free

KEEPING RUNNERS ON TRACK

Using a Running Schedule





Avoid the too frequent, the too far, and the too fast!

KEEPING RUNNERS ON TRACK

Stretch and Strength

Runners Ask, “Isn’t it enough strengthening for my legs just to run?”

NO

Me, “Running is what your legs do for you. What do you do for your legs?”

KEEPING RUNNERS ON TRACK

Stretch - the problem

- Lack of mobility and flexibility that restricts a joint or muscle
- Limitations in joint and muscle will result in micro tears and end with injury
- Compensation patterns can form when a muscle is unable to properly move a joint through a range of motion
- Compensation patterns will eventually break down and result with injury

KEEPING RUNNERS ON TRACK

Stretch - Research

- Dynamic stretching can increase power output
- Dynamic stretching with warm up can improve running performance
- Static stretches with prolonged force should only be done after a performance
- Static stretches after running can improve specific joint mobility and flexibility

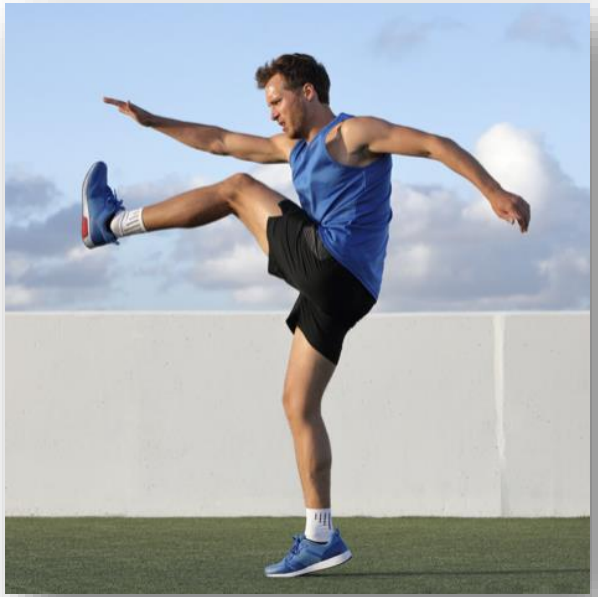
KEEPING RUNNERS ON TRACK

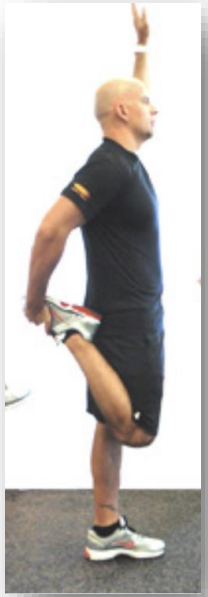
Stretch - dynamic

- Will activate muscle and increase tissue temperature
- Should include movement in all planes. (sagittal, frontal, and transverse)
- Should include upper extremity, core, and lower extremity movements
- Can be done in a group or as an individual with light jog after each stretch
- Should be done 10 repetitions and 2-3 rounds

KEEPING RUNNERS ON TRACK

Stretch – dynamic





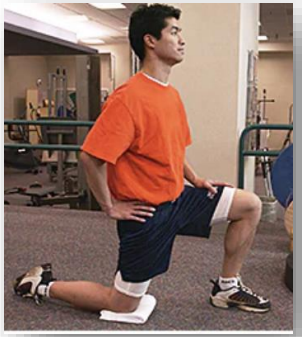
KEEPING RUNNERS ON TRACK

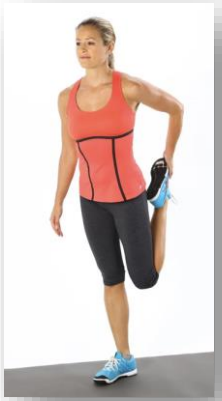
Stretch - static

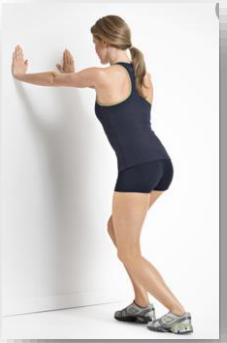
Isolate a joint or muscle
Do after a running performance
Do 3 repetitions and hold 45 seconds
Do gentle and prolonged
Do 3 repetitions and hold 45 seconds
Do in running position when possible

KEEPING RUNNERS ON TRACK

Stretch - static







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Strength – the problem

Lack of strength limits the ability of the joint to create stability resulting in injury

A joint unable to stabilize may require a nearby joint to help resulting in injury

The work of running and landing on one leg is 3 times body weight therefore expect any small deficit found during testing to become worse during a performance

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Strength - Research

- Protects from injury
- Improves running performance by generating greater force and decreasing ground contact time
- Both medium and high resistance strength training improves performance
- Improves sprinting and hill climbing performance

KEEPING RUNNERS ON TRACK

Strength

- Use body weight, Thera band, dumbbells, and weight machines
- Always use good form
- Do in 2 or 3 sets of 10 to 15 repetitions
- Start with lower weight and progress carefully
- Do 1-2 times per week in season and 2-3 times per week in off season
- Do midweek and keep sessions away from longer weekend runs
- Do not do prior to a run
- Do double and single leg and develop symmetry when possible
- Include back and abdominal exercises

KEEPING RUNNERS ON TRACK

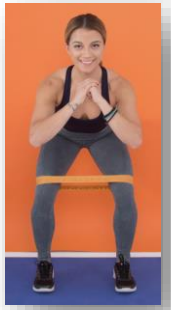
Strength

- **Strength is weakness leaving the body NOT pain is weakness leaving the body**

KEEPING RUNNERS ON TRACK

Strength

Stay consistent, use weight, insist on good form, and progress carefully.



KEEPING RUNNERS ON TRACK

Review

- A runner is anyone who runs
- Running is important to many people for a variety of reasons
- Learning why your patient runs may produce better outcomes

- As healthcare workers we can educate runners
- The importance of good shoes
- The importance of a running schedule
- The importance of stretching and strengthening

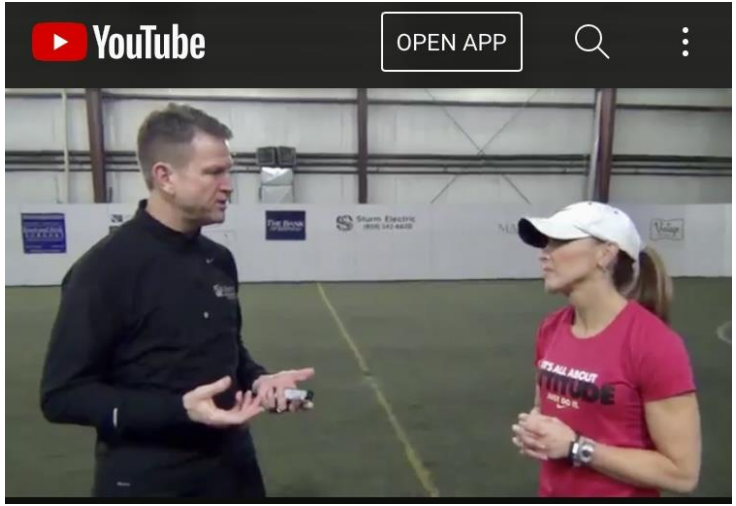
SUMMARY

If we can help runners see the **importance of their choices** we can better keep them on track

KEEPING RUNNERS ON TRACK

In the weeks leading up to the 2015 Flying Pig Marathon, St. Elizabeth Healthcare Physical Therapist Stacey McConnell starred in a YouTube Series entitled "On the Run with Stacey." The series ran for 14 episodes and covered the following topics:

- Introducing Stacey McConnell and *On the Run with Stacey*
- Posture
- The Importance of Flexibility
- Strength Training for Legs
- Treadmill Running
- Recognizing an Injury Early
- Cadence (or Stride)
- Hill Running
- Core Training
- Making it to Mile 13
- Finishing Strong



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References

Behm D.G. and Chaouachi A. 2011. A review of the acute effects of static and dynamic stretching on performance. Eur. J. Apl. Physiol. 111: 2633-2651.

Chaouachi A., Castagna C., Chtara M., Brughelli M., Turki O., Galy O., et al. 2010. Effect of warm-ups involving static or dynamic stretching on agility, sprinting, and jumping performance in trained individuals. J. Strength. Cond. Res. 24: 2001-2011.

Fowles J.R., Sale D.G., and MacDougall J.D. 2000. Reduced strength after passive stretch of the human plantar flexors. J. Apl. Physiol. 89: 1179-1188.

Herda I.J., Cramer J.T., Ryan E.D., McHugh M.P>, and Stout J.R. 2008. Acute effects of static versus dynamic stretching on isometric peak torque, electromyography, and mechanomyography of the biceps femoris muscle. J. Strength Cond. Res. 22: 8098-817.

Manoel M.E., Harris-Love M.O., Danoff J.V., and Miller T.A. 2008. Acute effects of static, dynamic, and proprioceptive neuromuscular facilitation stretching on muscle power in women. J. Strength Cond. Res. 22: 1528-1534.

Paradidis G.P., Pappas P.T., Theodorou A. S., Zacharogiannis E.G., skordilis E.K., and Smirniotou A.S. 2014. Effects of static and dynamic stretching on sprint and jump performance in boys and girls. J. Strength Cond. Res. 28: 154-160.

Robbins J. W. and Scheuermann B.W. 2008. Varying amounts of acute static stretching and its effect on vertical jump performance. J. Strength Cond. Res. 22: 781-786.

Movold J. 2021. why you might benefit from a running plan- even without a race in the diary. Runners World.

Xiaole S., Wing-Kai L., Xini Z., 2020. Systematic Reiew of the Role of Footwear Constructions in Running Biomechanics: Implications for Running-Related Injury and Performance. J. Sports Sci Med. Feb 24; 19 (1):20-37

PASS THE PICKLE JUICE! THE MYTHS AND FACTS OF MUSCLE CRAMPS

Dr. Matthew DesJardins

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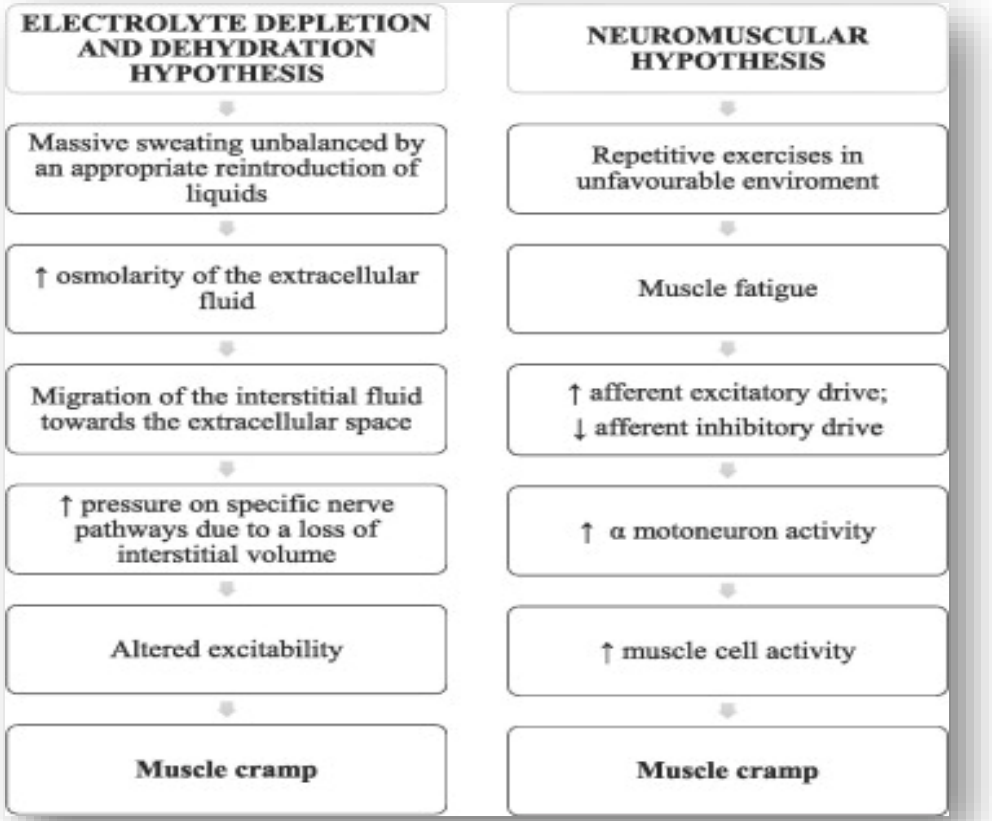
WHAT DO WE KNOW?

“Exercise-Associated Muscle Cramps (EAMC) are a common painful condition of muscle spasms. Despite scientists tried to understand the physiological mechanism that underlies these common phenomena, the etiology is still unclear.”

Muscle cramps: A comparison of the two-leading hypothesis. Giuriato, Gaia; Pedrinolla, Anna; Schena, Federico; Venturelli, Massimo. Journal of Electromyography and Kinesiology, 2018-08-01, Volume 41, Pages 89-95.



Giuriato G et al .*J Electromyography and Kinesiology*. 2018

CONFUSING STUDIES

- **EAMC = exhaustive work in any temp range**
- **Hot environ = ⇓ Na^+ and CL^- Hypohydration+ mod electrolyte ⇓ ≠ altered cramp susceptibility**
- **EAMC ≠ impaired fluid and Na balance**
- **Hyponatremia+severe fluid loss = rest cramps**
- **Altered Serum electrolyte conc + hydration status ≠ EAMC**
- **EAMC ≠ changes in serum electrolytes**

Giuriato G et al .*J Electromyography and Kinesiology*. 2018

SALTY SWEATERS

- In NCAA football, “crampers” lost more salt in sweat than in position-matched noncrampers[1]
- Similar finding in a study of NFL players[2]
- Cystic fibrosis athletes have decreased EAMC their by acclimatizing to heat and increasing salt intake[3]
- NCAA footballers with EAMC had higher sweat rates and sweat salt content than those without EAMC[4]
- Large studies of industrial workers in the 1920s and 1930s showed saline drinks and salt tablets reduced cramping

1. Eichner, *Curr Sports Med*. Rep. 2008 **2**. Eichner, *Curr Sports Med*. Rep. 2018 **3.** Case Reports, published **4.** Miller, *Int. J. Sport Nutr. Exerc. Metab*. 2020

RISK FACTORS FOR CRAMPING

- Previous EAMC
- Exercise at relatively high intensity or duration (compared with normal training)
- Hot humid environment (not exclusive)
- Dehydration (mixed studies)
- Competition vs practice
- Salty sweaters
- Poor fitness
- Inadequate heat acclimatization

Medical Considerations in Cramp-prone Athletes

- DM
- Thyroid Dz
- Vascular
- Radicular
- Metabolic Myopathies
- Mg deficiency
- Drugs (Diuretics, creatine, Beta agonists, others)

RECURRENT CRAMPING

- **Physician Evaluation:**
  - Medical history should focus on cramp characteristics
    - Triggering factors
    - Effect of stretching
    - Family history of cramps
    - Drug use
    - Presence of myoglobinuria
  - A complete physical examination
    - Orthopaedic and neurologic assessments
      - Emphasis on establishing the presence of muscle hypotrophy or weakness
  - Labs
    - CBC
    - Serum electrolytes
    - Serum creatine kinase (CK)
    - TSH
  - Nutritional evaluation should be obtained, and guidelines for diet and training should be provided
  - Recalcitrant cases should consider muscle biopsy/EMG.

Maquirriain, Javier MD, PhD; Merello, Marcelo MD, PhD The Athlete With Muscular Cramps: Clinical Approach, Journal of the American Academy of Orthopaedic Surgeons: July 2007 - Volume 15 - Issue 7 - p 425-431

PREVENTING EAMC

Pre-season

- Heat Acclimatize your athletes – individualize (reduces salt concentration in sweat)
- Condition your athletes - including sport specific training, plyometric loading
- Screen for supplement and drug usage
- Tailor fluid intake on high-risk athletes:
  - Remember: sweat rate, thirst and fluid intake vary greatly amongst normal individuals
  - Consider daily weight measurement on some athletes to manage (approx. 1kg loss of mass = 1L sweat loss)

HOW MUCH SHOULD THEY DRINK?

- Sweat rates vary from 0.3L/hr to 2.4L/hr
- Rate depends on:
  - Exercise Intensity
  - Exercise duration
  - Fitness
  - Heat Acclimatization
  - Altitude
  - Environmental (heat, humidity, wind, clothing)

PREVENTING EAMC

Pre-season or practice

Sodium repletion:

- Monitor salty sweaters
- Supplement cramp prone athletes with sodium if training longer than 1 hour
- Sport drinks are hypotonic and have modest concentrations of salt, but are highly palatable and replete some lytes and carbs
- Can do salty snack breaks
- Can supplement sports drinks with ¼ tsp table salt in 20oz
- All other nutrients should be able to be replenished under normal dietary circumstances between practices

PREVENTING EAMC

Competition

- Prehydration with a liter of water 1 hr leading up to game
- If athlete hasn't eating, consider salty snack pregame (need adequate carbs to prevent premature fatigue)
- Frequent stretching cramp prone muscles
- Some athletes will need their fluid intake monitored to track volume based on preseason sweat rates
- Salt supplement with ¼ tsp (1.5 gm) in 20oz sports drink, consider each half

TREATING EAMC

- **Stretch and massage until relieved** (passive stretching increases the tension in a muscle, thereby increasing the Golgi tendon organ's inhibitory input to the alpha motor neuron)
- **Adequate carbohydrate intake to prevent premature muscle fatigue**
- **Salt tablets (1gm NaCl ea) 2-3 tabs with 1Liter H2O at 1st sign of muscle fatigue/tightness in selected indviduals**
- **Hold out of competition until fluids/lytes ingested and cramp resolved**

TREATING EAMC

What about Pickle Juice?

- Can be used for early treatment of EAMC
- Contains vinegar (acetic acid), salt, water
- A published case report noted pickle juice could alleviate cramps within 35sec
- “pickle juice contains acetic acid that can trigger a reflex, probably in the oropharyngeal region, that acts to increase inhibitory neurotransmitter activity in cramping muscles”

Williams RB, Conway DP (2000) Treatment of acute muscle cramps with pickle juice: a case report. *Journal of Athletic Training* 36: S106

TREATING EAMC

What About:

- Magnesium
- Amino Acids
- Mustard
- Cinnamon, Ginger, pepper extracts
  - “Recent evidence suggests that oral ingestion of TRP channel agonists like cinnamon, peppers, or mustard may attenuate the intensity and/or duration of muscle cramps, presumably by dampening alpha motor neuron excitability”
- Commercial supplements
- Placebo?
- IV fluids

Qiu and Kang. Scientific Pages Sports Med 2017, 1(1):3-14

PROXIMAL HAMSTRING INJURIES

Dr. John Fritch

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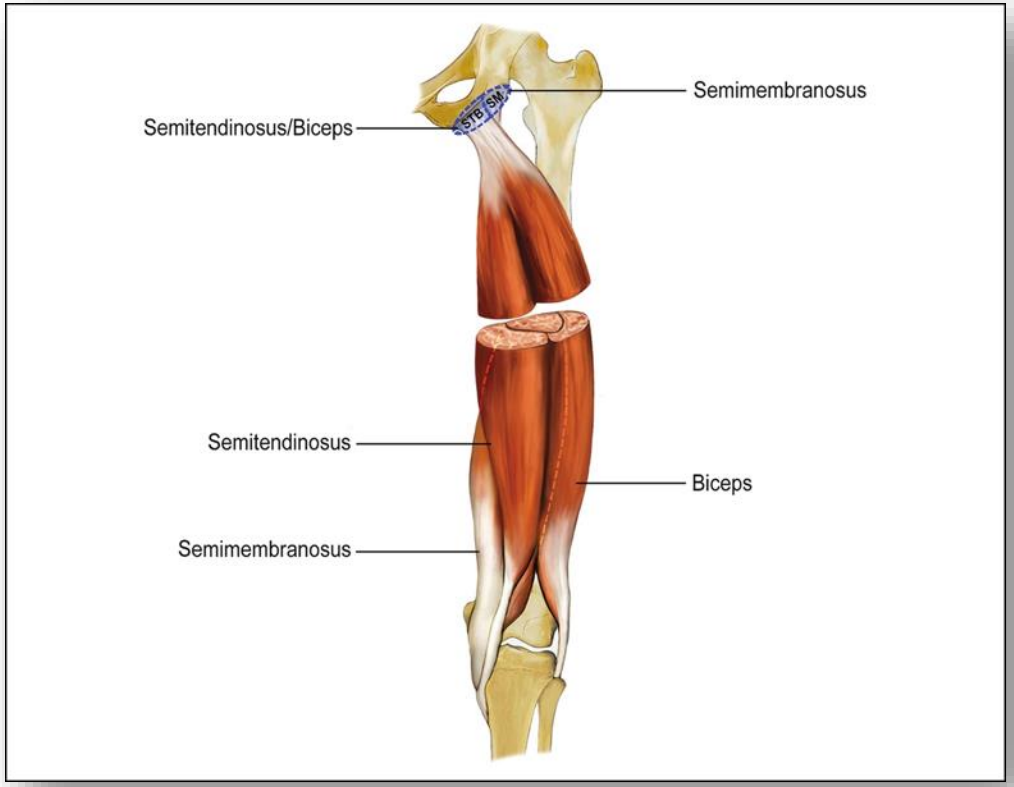
OUTLINE

- Anatomy
- Mechanism of Injury and Risk Factors
- Evaluation
- Treatment
- Outcomes
- What about the rest of the hamstrings?
- Prevention

HAMSTRING ANATOMY

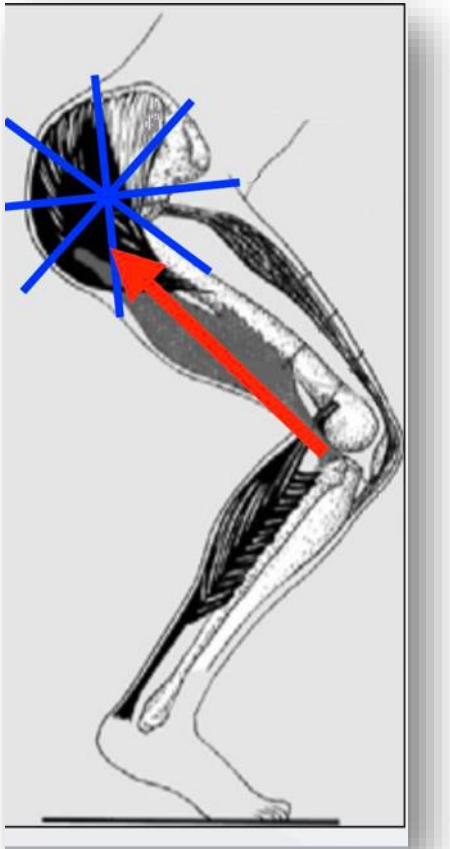


- Biceps femoris
  - Short and Long head
- Semitendinosus
- Semimembranosus
- Conjoint tendon (ST and BF)

Source: Hamstring Injuries in Athletes: Evidence-based Treatment, JAAOS - Journal of the American Academy of Orthopaedic Surgeons27(23):868-877, December 1, 2019.

HAMSTRING FUNCTION

- Concentric
  - Hip extension
  - Knee flexion
- Eccentric
  - Knee and hip control



MECHANISM OF INJURY

- Eccentric contraction
- Intramuscular/ musculotendinous
- Proximal avulsion

RISK FACTORS

TABLE 1 Risk Factors for Hamstring Injury
1. Age
2. Inadequate warm-up
3. Strength imbalance (hamstring to quadriceps ratio < 0.6)
4. Hamstring strength difference with contralateral (> 10-15%)
5. Quadriceps peak torque
6. Biceps femoris fascicle length < 10.6 cm (hamstring length) - 4x risk
7. Poor hamstring & quadriceps flexibility or compliance
8. Reduced hip extension
9. Leg length differences - shorter leg has tighter hamstrings
10. Core stability – poor lumbar erectors coordination - re-injury risk 300%
11. Poor intermuscular recruitment patterns (biceps taking over for the semitendinosus)
12. Fatigue that leads to overexertion
13. Dehydration
14. History of ACL reconstruction or calve strain
15. History of prior injury increases risk 2-6x

2-6x risk

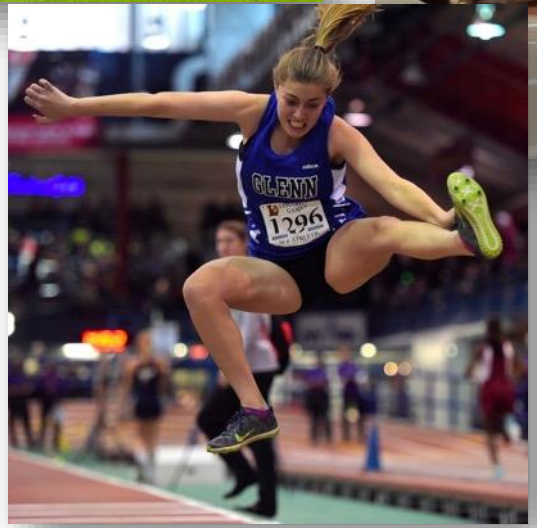
- **Inadequate preparation**
- **Muscular dysfunction/imbalance**
- **Anatomic abnormalities**
- **Previous injury #1**

Source: Ahmad CS, Redler LH, Ciccotti MG, Maffulli N, Longo UG, Bradley J: Evaluation and management of hamstring injuries. Am J Sports Med 2013;41:2933-2947.

Cohen SB, Towers JD, Zoga A, et al.: Hamstring injuries in professional football players: Magnetic resonance imaging correlation with return to play. Sports Health 2011;3:423-430.

Elliott MC, Zarins B, Powell JW, Kenyon CD: Hamstring muscle strains in professional football players: A 10-year review. Am J Sports Med 2011;39:843-850.

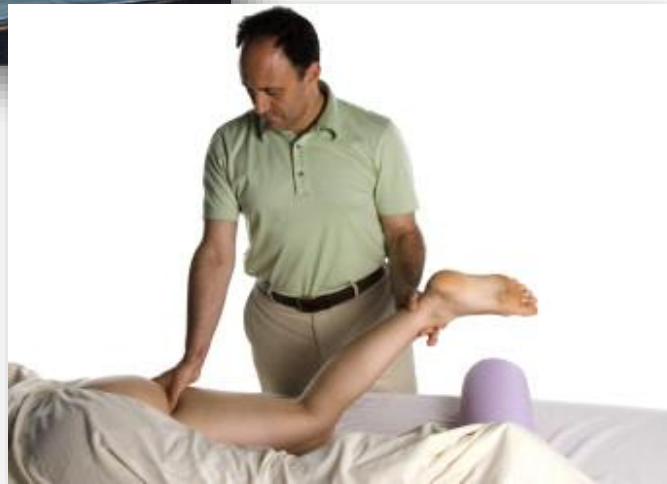
EVALUATION: HISTORY



- Mechanism
- Location
- Previous injury

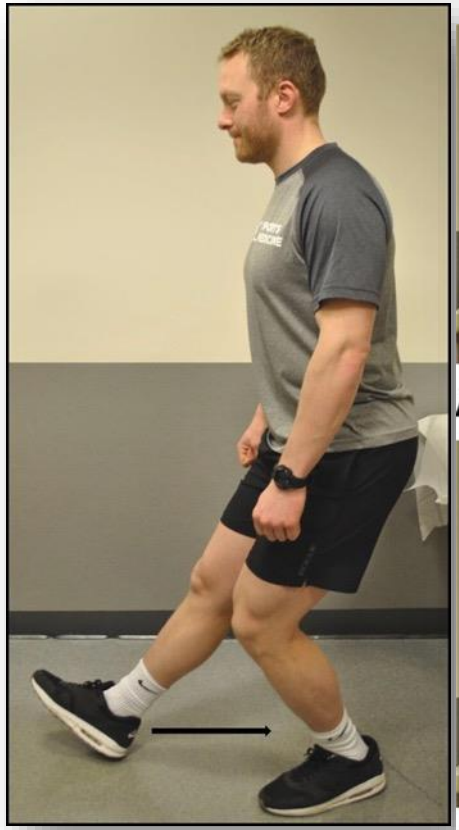
EVALUATION: EXAM

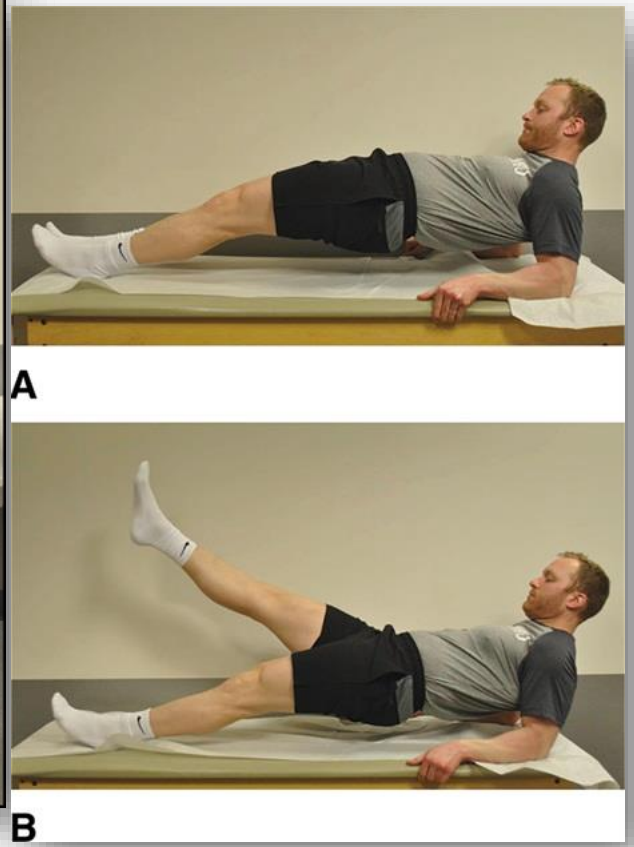
- Visualization
  - Ecchmyosis
- Palpation
  - Proximal, distal, musculotendinous junction
- Motor strength
  - Knee flexion
- Sensation



EVALUATION: SPECIAL TESTS

- Resisted hamstring curl
- Standing heel-drag
- Plank test
- Gait





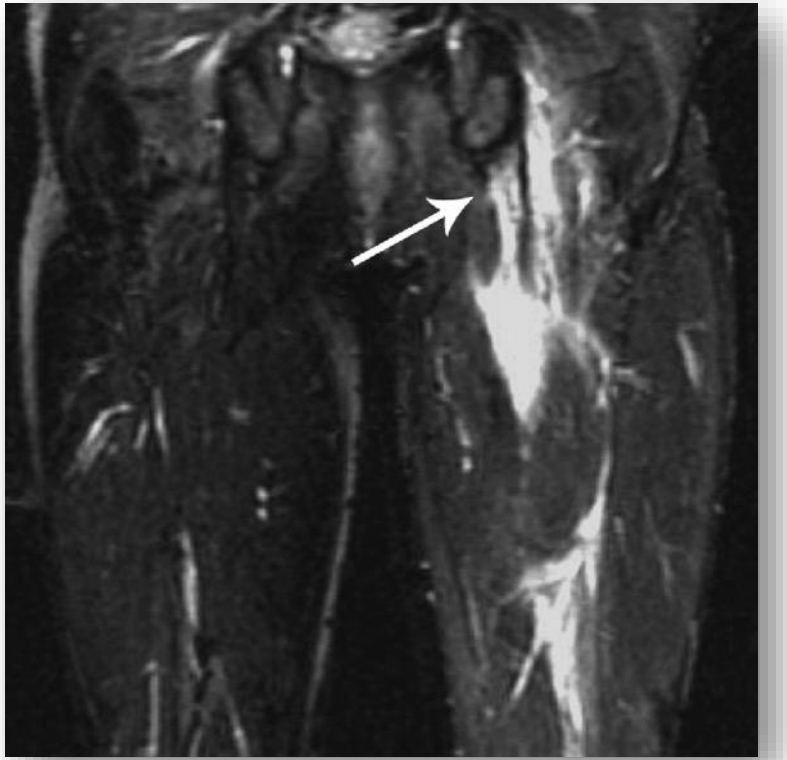
Source: Arner, Justin W. MD; McClincy, Michael P. MD; Bradley, James P. MD Hamstring Injuries in Athletes: Evidence-based Treatment, Journal of the American Academy of Orthopaedic Surgeons: December 1, 2019 - Volume 27 - Issue 23 - p 868-877 doi: 10.5435/JAAOS-D-18-00741

EVALUATION: IMAGING

- XR AP pelvis

EVALUATION: IMAGING

- MRI thigh w/o contrast
  - Proximal or distal
  - Muscle belly failed conservative management



EVALUATION: IMAGING

- MRI thigh w/o contrast
  - Proximal or distal
  - Muscle belly failed conservative management

TREATMENT

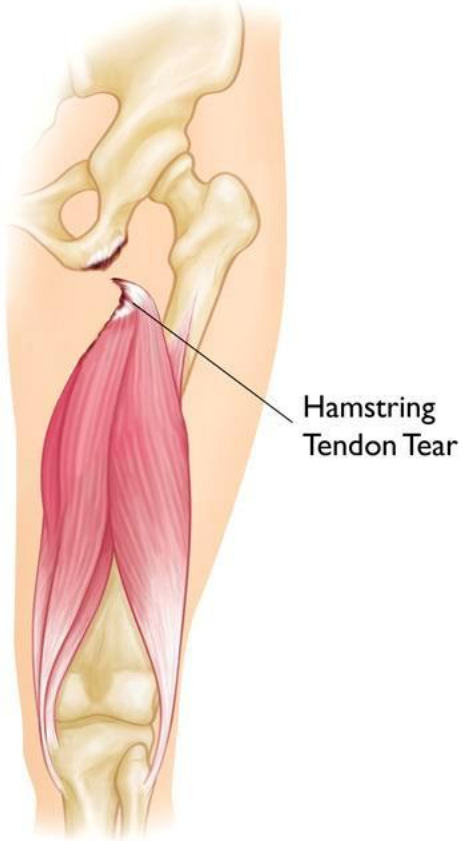
- **Non-operative**
  - Most injuries
  - Single tendon
  - 2 tendons < 2 cm retraction (debatable)
  - Myotendinous junction

NON-OPERATIVE TREATMENT

- Protected weightbearing x 4 weeks
- Physical therapy
  - Massage, US, e-stim
- Stretching and strengthening
  - Abdominal, hip, quad, hamstring
  - Nordic hamstring
- PRP injections
  - Within 24-48 hrs

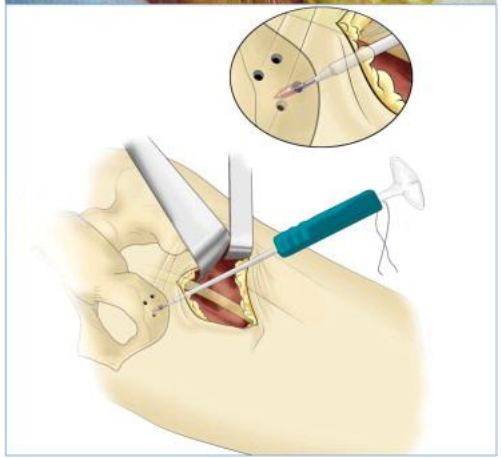
TREATMENT

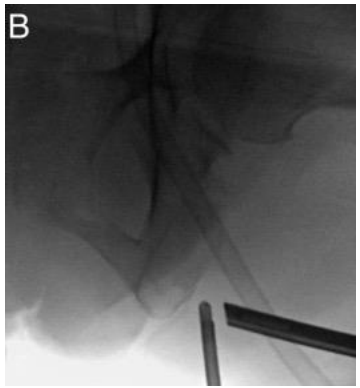
- **Surgical**
  - 3 tendon tear
  - 2 tendons with > 2 cm retraction
  - Avulsion fracture
  - Partial avulsion failed 6 mo nonop



SURGICAL TREATMENT

- Open repair
- Arthroscopic repair
- Open reduction internal fixation





OUTCOMES

- **Surgical**
  - 84% return in strength, 89% return in endurance [1]
  - 80% of chronic complete tears returned to preinjury level at 6 mo postop [1]
  - 100% return to sport in high grade partial [2]
  - 40% of patients treated nonop crossed over to operative [3]

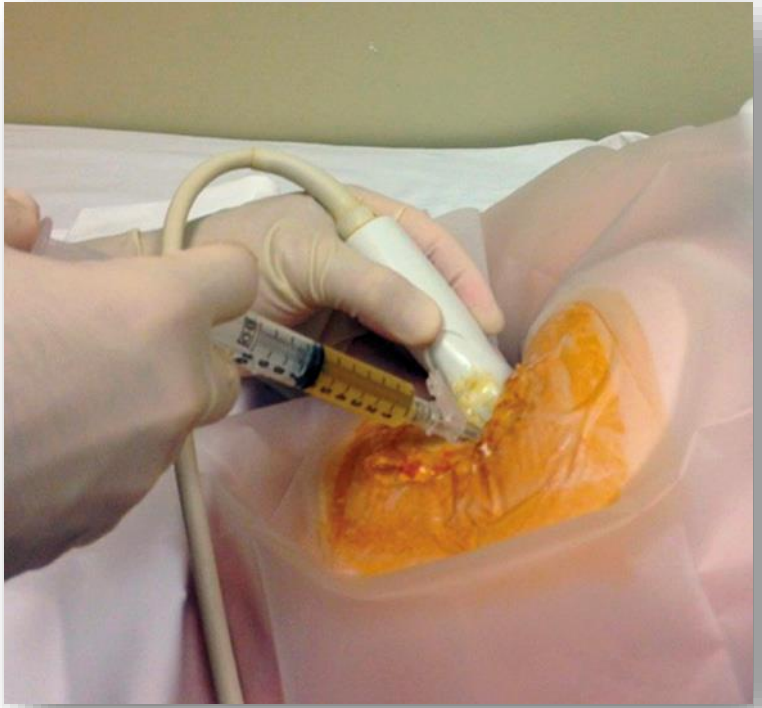
1 Wood DG, Packham I, Trikha SP, Linklater J: Avulsion of the proximal hamstring origin. J Bone Joint Surg Am 2008;90:2365-2374.

2 Bowman KF Jr, Cohen SB, Bradley JP: Operative management of partial-thickness tears of the proximal hamstring muscles in athletes. Am J Sports Med 2013;41:1363-1371.

3 Piposar JR, Vinod AV, Olsen JR, Lacerte E, Miller SL: High-grade partial and retracted (<2 cm) proximal hamstring ruptures: Nonsurgical treatment revisited. Orthop J Sports Med 2017;5:2325967117692507.

OUTCOMES

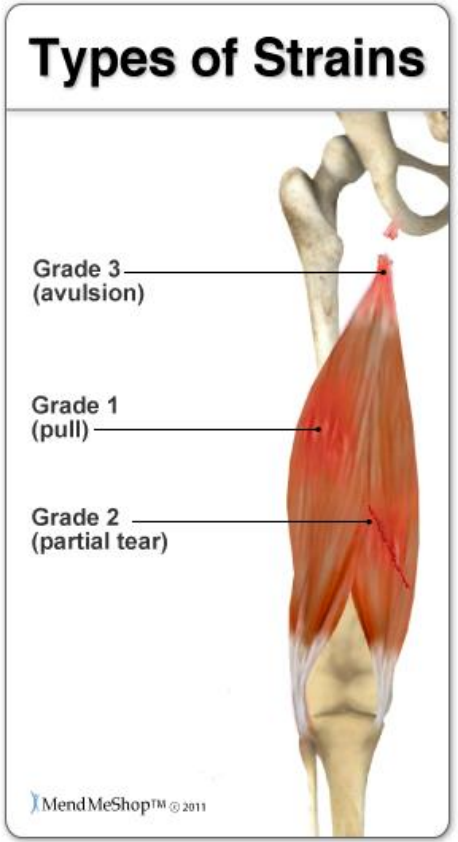
- **PRP**
  - **>80% improvement in VAS after failed PT [1]**
  - **Improved response compared to cortisone [2]**



1. Fader RR, Mitchell JJ, Traub S, et al.: Platelet-rich plasma treatment improves outcomes for chronic proximal hamstring injuries in an athletic population. Muscles, Ligaments Tendons J 2014;4:461-466.
2. 2. Park PYS, Cai C, Bawa P, Kumaravel M: Platelet-rich plasma vs. steroid injections for hamstring injury-is there really a choice? Skeletal Radiol 2019;48:577-582.

MUSCLE BELLY INJURY

- **Conservative management**
  - **Rest, ice, NSAIDs, modalities, compression, gradual return to activity**
  - **MRI grade and tear size useful for predicting return to sport timing**
  - **Eccentric strengthening**
  - **PRP?**



MUSCLE BELLY INJURY

- **Return to sport guidelines**

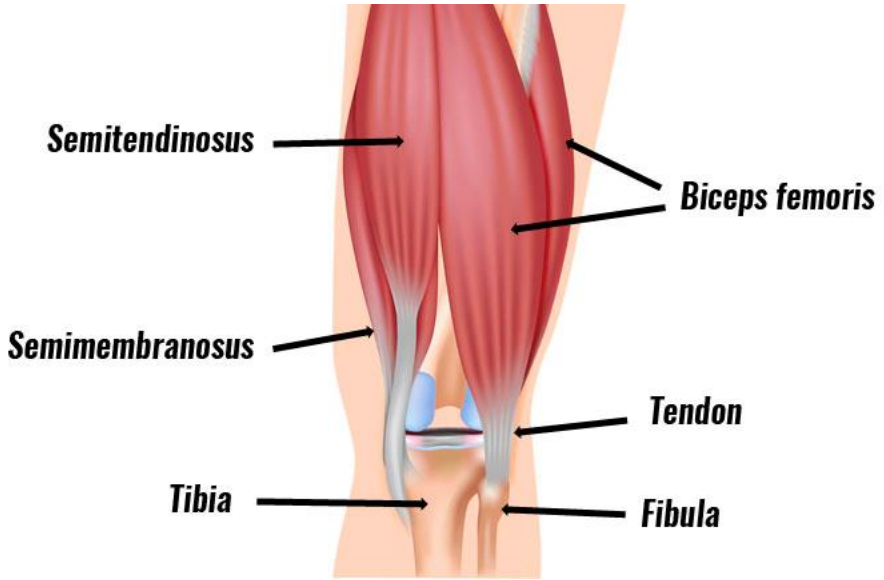
TABLE 2							
Points	**Age, y**	**Muscles Involved, n**	**Location**	**Insertion**	**Muscle Injury, %**	**Retraction, cm**	**Long Axis T2 Signal Length, cm**
0				No	0	None	0
1	≤25	1	Proximal		25	<2	1-5
2	26-31	2	Middle	Yes	50	≥2	6-10
3	≥32	3	Distal		≥75		>10

TABLE 2: MRI scoring system based on age and MRI findings with <10 points correlating with rapid return to play (<1 week) and >15 points indicating prolonged return to play (>3 weeks).

1. Cohen SB, Towers JD, Zoga A, et al.: Hamstring injuries in professional football players: Magnetic resonance imaging correlation with return to play. Sports Health 2011;3:423-430.

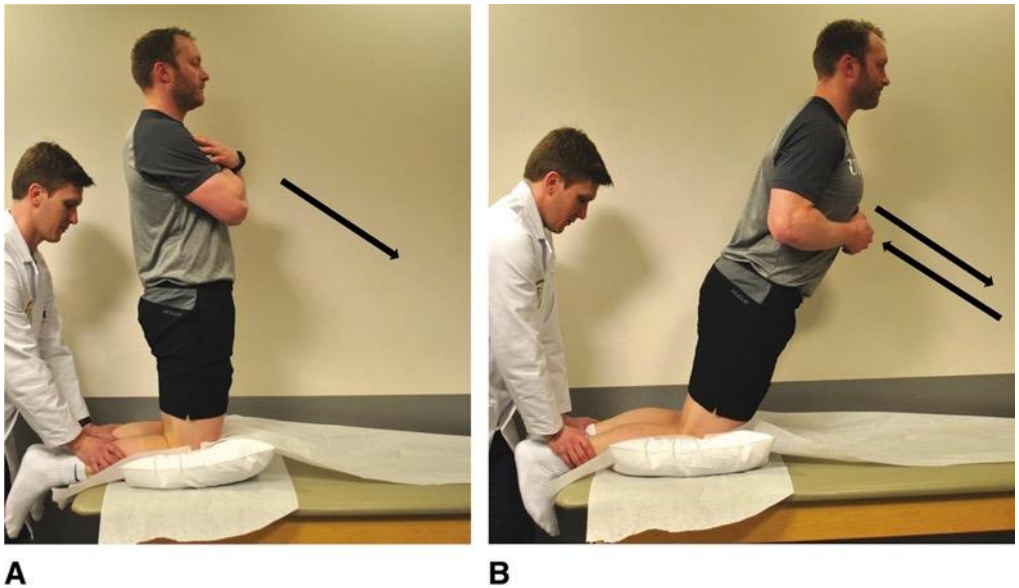
DISTAL HAMSTRING INJURY

- Less common
- In conjunction with multiligamentous injury
- Repair may yield better results- limited data



INJURY PREVENTION

- Improve eccentric knee flexion
- Nordic hamstring exercise may reduce incidence 50-70% [1]



1. Ekstrand J, Walden M, Hagglund M: Hamstring injuries have increased by 4% annually in men's professional football, since 2001: A 13-year longitudinal analysis of the UEFA elite club injury study. Br J Sports Med 2016;50:731-737.

ATHLETES, DEPRESSION AND ANXIETY. WHEN TO REFER?

Dr. Ed Connor

Terry Connor

OrthoCincy Orthopaedics & Sports Medicine | St. Elizabeth PHYSICIANS | St. Elizabeth HEALTHCARE

The Orthopaedic Institute at St. Elizabeth: A partnership between OrthoCincy Orthopaedics & Sports Medicine, St. Elizabeth Physicians and St. Elizabeth Healthcare.

IDENTIFYING THE PROBLEM

- What is depression?
- What is anxiety?
- Agitated depression and anxiety
- The more driven (*not talented*) the athlete the greater the risk for depression and anxiety?
- Conscious vs. Subconscious anxiety
- NCAA in 2020 determined 35 of 477 deaths were suicides

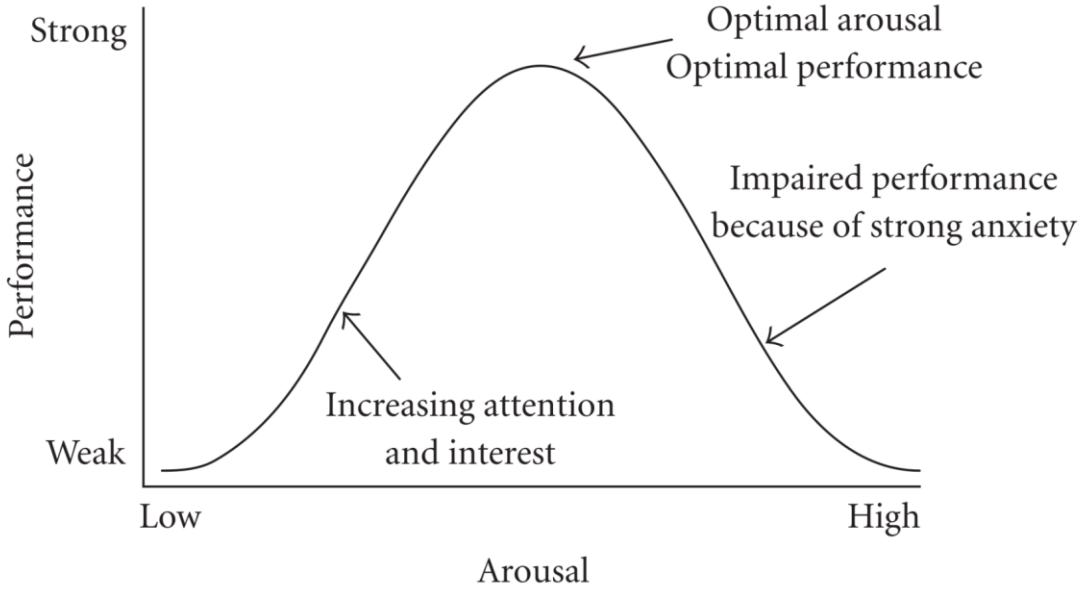
BOUNDARIES

- The space, or lack of space that separates the trainers from the over-involved parents and over-zealous coaches.
- Stand your ground and “sit with complexity” and refer.
- Better to refer and be wrong.
- A random survey of families with children who played sports in 2018 on average paid $3,167 per year for their child to play in various weekend tournaments, AAU leagues, elite teams. This up form $1,976 in 2013: hoping their child will receive and athletic scholarship.
- Only 2% of high school seniors receive an athletic scholarship and only 2% of college athletes make it to the NBA.

ANTIANXIETIES AND ANTIDEPRESSANTS: EVERYBODY IS DIFFERENT

- Impaired reflexes
- Decreased performance
- Dependency
- Cognitive Behavioral Therapy-first line of intervention

YERKES DOTSON – INVERTED U THEORY



PHYSICAL INJURIES AND THE DAMAGED MIND

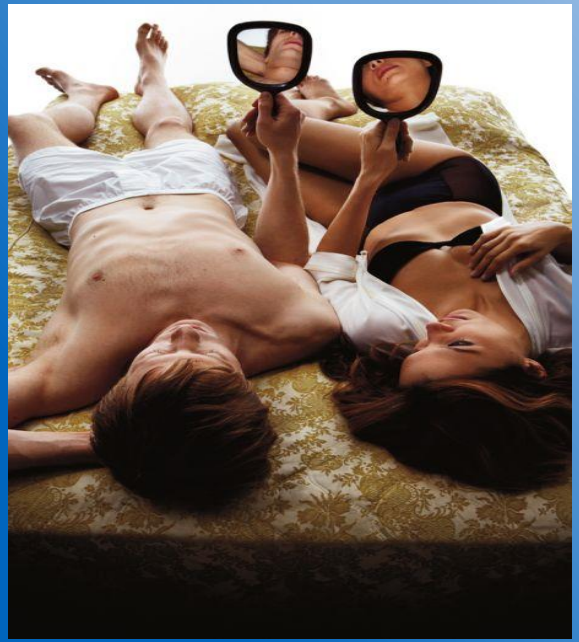
- **Keep perspective**
- **Stick with counseling and the rehab program**
- **Be a better athlete**
- **Broaden your interests – Most athletic participation is time limited**
- **Stay involved in your sport *somehow-* Don't turn away from something that has given you so much**
- **Redefine your role=a supportive role**
- **Mental imagery – connect the mind and body through counseling**

SKIP THE TOUGH GUY/GIRL ATTITUDE

- Sadness
- Isolation and Disengagement
- Self Pity
- Irritation and Anger
- Decreased Motivation
- Frustration
- Change in Appetite
- Sleep Disturbance

ATHLETES WITH MENTAL HEALTH ISSUES

- Bipolar
- Depression
- ADHD
- Anxiety
- Personality Disorders
- i.e. Narcissim
- Eating Disorders



ATHLETIC IDENTITY

- Elite athletes = early sport participation
- Training = 20 plus hours per week
- Strong athletic identify
  - Public & private
- Definition: The degree to which an individual identifies with the athletic role and ***looks to others for acknowledgment*** of that role
- Athletic identity could act as either “Hercules’ muscles’ or an “Achilles’ heel”

PSYCHOLOGICAL IMPACTS

Identity

- Athletes who possess a strong athletic identity may experience a particularly difficult time with adjusting to less playing time or being injured.
- Accustomed to being seen as athletes and the recognition that comes with it.
  - No desire to relinquish this identification.

PSYCHOLOGICAL IMPACTS

Mood

- Experience significantly more tension, depression, anger and decreased vigor.
- Feeling of powerlessness, lack of control, and frustration.
  - Lower psychological affect, lower self-esteem.
  - High levels of depression and more incidences of negative thoughts.
  - Kübler-Ross (1969) stages of grief are also often observed.
    - Denial, anger, bargaining, depression = acceptance.

SPECIAL CONSIDERATIONS

Seeking help?

- 15% of student athletes experience psychological distress that requires ***clinical*** attention
- Athletes underutilize mental health services
  - Only 6% of injured athletes utilize counseling services
- Adjustments to retirement takes an average of 2 years (this was without injury), and only 1 in 7 had identified possible sources of emotional support

SPECIAL CONSIDERATIONS

Social Support

- Athletes often feel a lost of camaraderie
- Fear of being “alienated” from teammates
- Social support has been shown to moderate the effects of life stress and reduce athletes’ likelihood of injury
- Low social support and high life stress has been shown to lead to more injuries and longer recovery periods

SPECIAL CONSIDERATIONS

Substance abuse

Student-athletes are at a great risk for abusing alcohol, drink alcohol in greater quantities, and more frequently than non-athletes

Impulse control and frustration tolerance

The NCAA transfer portal: 1000 athletes' at any time.

TREATMENT

Identify

- **Diversify athletes' identities in terms of something other than only sports**
  - Reestablish athletic identify if needed

Programming

- **Implementing transition networks, programs and career fairs, recreation outlets, career planning services, and expanding of a social network have all been found to be helpful.**

POINTS TO PONDER

- When to refer? Trust your “gut.” Being wrong has fewer consequences than being right and not referring.
- Only 2% of high school athletes receive NCAA sports athletic scholarships. The average scholarship is less than $1000. GET YOUR DEGREE
- Take flattery with a grain of salt.
- A coach might not know whether he wants a particular athlete until they find out what other teenagers might want to sign with their program.
- Nowadays we hear of 7th graders making a verbal commitment.
- Division I athletes may as well be call full-time employees for their school according to a NCAA survey conducted last year:
  - Football: 43.3 hours/week
  - Baseball: 42.1 hours/week
  - Men’s Basketball: 39.2 hours/week
  - Women’s Basketball: 37.6 hours/week

David Klenk: https://www.youtube.com/watch?v=hGb5vpFO0r8

SHOULDER IMAGING: EMPHASIS ON THROWING ATHLETES & THE UNSTABLE SHOULDER

Dr. Amit Rattan

The Orthopaedic Institute at St. Elizabeth: A partnership between OrthoCincy Orthopaedics & Sports Medicine, St. Elizabeth Physicians and St. Elizabeth Healthcare.

OVERVIEW & OBJECTIVES

Overview

How do we do it?

- Modalities overview
- What test to order? –ACR Clinical Imaging Support
- Arthrography utilization recommendations

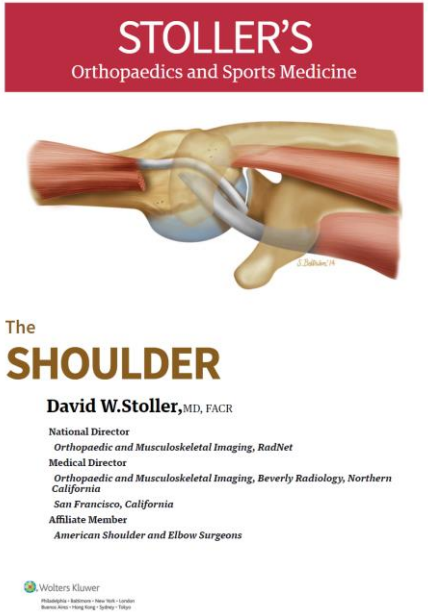
Anatomical considerations

- Throwing Shoulder
- Instability

Imaging of throwing shoulder and glenohumeral instability pathology

KNOWLEDGE IS POWER!

Helpful Resources



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RADIOLOGY
ASSOCIATES
OF NORTHERN KENTUCKY

HOW WE DO IT

Modalities & ACR Appropriateness Criteria

Radiography
- Ionizing radiation
- Low cost
- First look
- Poor for soft tissues

CT
- Ionizing radiation
- Fracture characterization/high bone detail
- Contraindications to MRI
- CT arthrography

MRI
- No ionizing radiation
- NSF, contrast, pregnancy, hardware
- Superior soft tissue assessment
- Arthrography
- Can be challenging for patients, time

Ultrasound
- “Sports medicine doc’s stethoscope”
- Useful tool in skilled hands
- Intervention guidance
- Low risk

Modalities & ACR Appropriateness Criteria

Evidence-based guidelines

Assist referring providers in making the most appropriate imaging or treatment decision for a specific clinical condition

Enhance quality of care and contribute to the most efficacious use of radiology

Developed & reviewed by expert panels

ACR Appropriateness Criteria

The ACR Appropriateness Criteria® (AC) are evidence-based guidelines to assist referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition. Employing these guidelines helps providers enhance quality of care and contribute to the most efficacious use of radiology. Learn more »

The newest ACR AC are listed below.

https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria

Modalities & ACR Appropriateness Criteria

Shoulder Pain-Traumatic

Back

Variants

5 Traumatic shoulder pain. Radiographs show Bankart or Hill-Sachs lesion. Next imaging study.
6 Traumatic shoulder pain. Radiographs normal. Physical examination and history consistent with dislocation event.
7 Traumatic shoulder pain. Radiographs normal. Physical examination findings consistent with labral tear. Next ima..
8 Traumatic shoulder pain. Radiographs normal. Physical examination findings consistent with rotator cuff tear. Ne..
9 Traumatic shoulder pain. Radiographs already performed. Physical examination consistent with vascular compro..

Documents

Narrative
Evidence Table
Lit Search
Appendix

Scenario	Procedure	Adult RRL	Peds RRL	Appropriateness Category	
Shoulder trauma, dislocation suspected, neg xray	MR arthrography shoulder	0 mSv O	0 mSv [ped] O	Usually appropriate	
	MRI shoulder without IV contrast	0 mSv O	0 mSv [ped] O	Usually appropriate	
	CT arthrography shoulder	10-30 mSv ☢☢☢☢	Null	May be appropriate	
	CT shoulder without IV contrast	1-10 mSv ☢☢☢	Null	May be appropriate	
	US shoulder	0 mSv O	0 mSv [ped] O	Usually not appropriate	
	MRI shoulder without and with IV contrast	0 mSv O	0 mSv [ped] O	Usually not appropriate	
	Bone scan shoulder	1-10 mSv ☢☢☢	Null	Usually not appropriate	
	CT shoulder with IV contrast	1-10 mSv ☢☢☢	Null	Usually not appropriate	
	CT shoulder without and with IV contrast	1-10 mSv ☢☢☢	Null	Usually not appropriate	
	FDG-PET/CT skull base to mid-thigh	10-30 mSv ☢☢☢☢	3-10 mSv [ped] ☢☢☢☢	Usually not appropriate	
Shoulder trauma, instability	MR arthrography shoulder	0 mSv O	0 mSv [ped] O	Usually appropriate	

https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria

HOW WE DO IT

Arthrography: Pros & Cons

Pros	Cons
Joint distention	Needle placement
Improved rotator cuff/labral evaluation	Bleeding/Infection/Allergy
Postoperative Shoulder	Synovitis/Pain/Allergy
Abnormal joint communications	Loss of signal

HOW WE DO IT

To inject or not inject?

RadioGraphics 3

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PREVIOUS NEXT

Upper Extremity

Free Access

Imaging the Glenoid Labrum and Labral Tears

Tineke De Coninck, Steven S. Ngai, Monica Tafur[1], Christine B. Chung

Author Affiliations

Published Online: Oct 11 2016 | https://doi.org/10.1148/rg.2016160020

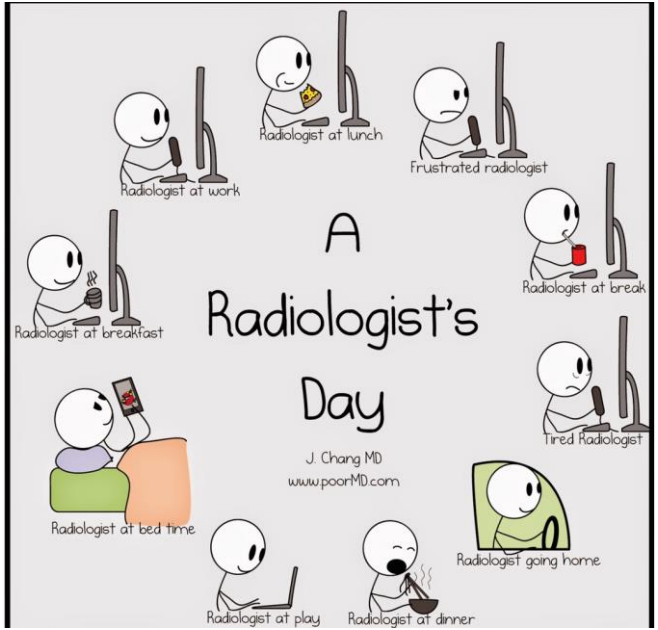
MR Imaging Technique

A large body of literature addresses the roles of MR imaging and MR arthrography as imaging tools for investigation of labral pathologic lesions. While there are a substantial number of reports that MR arthrography is superior to conventional MR imaging for diagnosis of labral lesions (even at 3 T) (15,20–23), results of a meta-analysis of the literature in consideration of the two techniques suggest that MR arthrography is only marginally superior to MR imaging for detection of glenohumeral labral lesions (24).

Teaching Point With regard to the choice of MR imaging versus MR arthrography for evaluation of the glenoid labrum, it seems that patient presentation is an often-neglected but crucial consideration in the choice of imaging tool. Patients with acute symptoms or severe, unstable, pathologic lesions are more likely to have intrinsic image contrast in the form of effusion or soft-tissue changes that allow diagnosis and characterization without an invasive procedure (25). On the contrary, those with chronic symptoms or a pathologic abnormality that is suspected to be more subtle on the basis of clinical assessment more often require MR arthrography. 3

HOW WE DO IT

Call me maybe?



ANATOMICAL CONSIDERATIONS

Joint Considerations

Catch-22

Shoulder joint has greatest range of motion but is thus most vulnerable

Multifaceted stabilization:

- **Static stabilizers- bones/capsule, labrum and glenohumeral ligaments**
- **Dynamic stabilizers- rotator cuff and long bicipital tendon**
- **Mechanical- vacuum of labrum and humeral articular surface**

ANATOMICAL CONSIDERATIONS

Joint Considerations

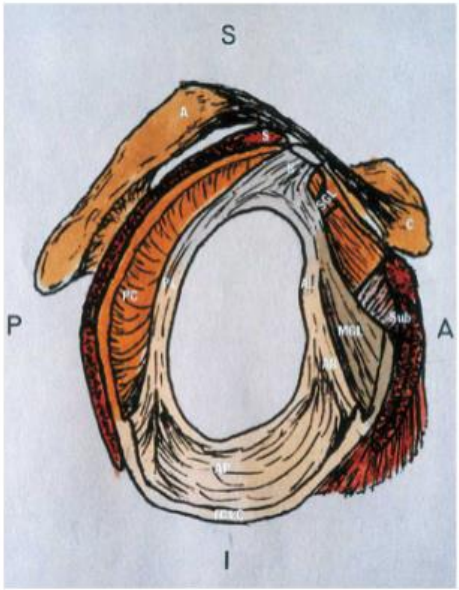


Figure 4.9 Glenohumeral capsular anatomy. A, acromion; AB, anterior band of IGHL; AL, [1]

ANATOMICAL CONSIDERATIONS

Joint Considerations

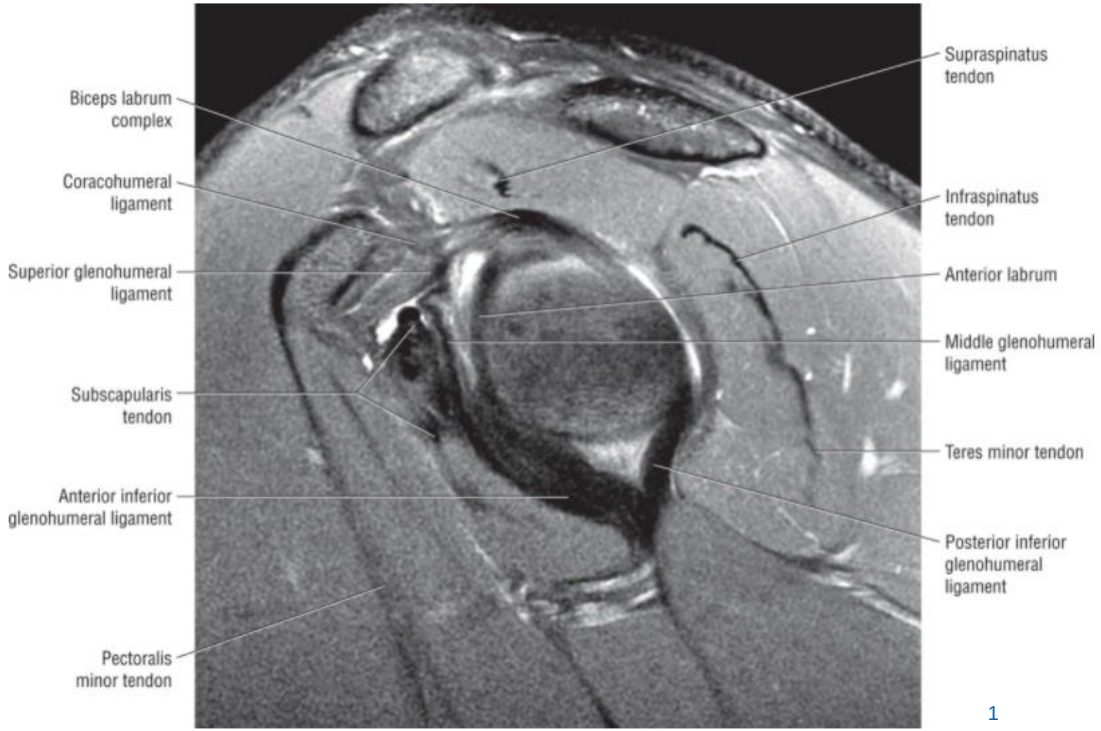


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Figure 2.30

ANATOMICAL CONSIDERATIONS

Joint Considerations

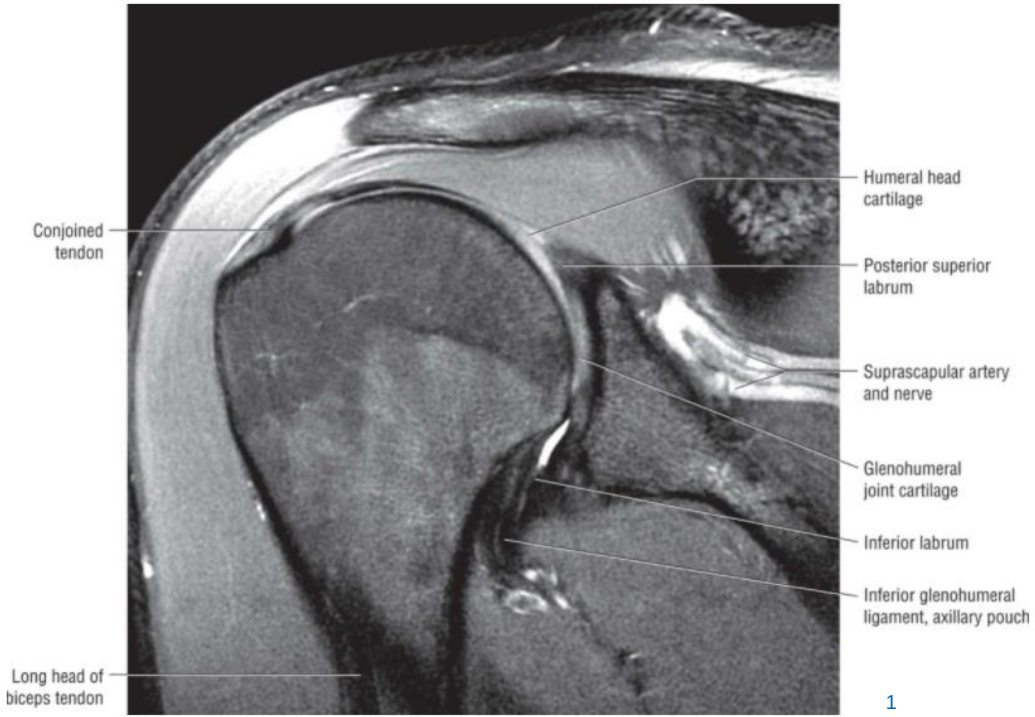

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Figure 2.8

ANATOMICAL CONSIDERATIONS

Joint Considerations

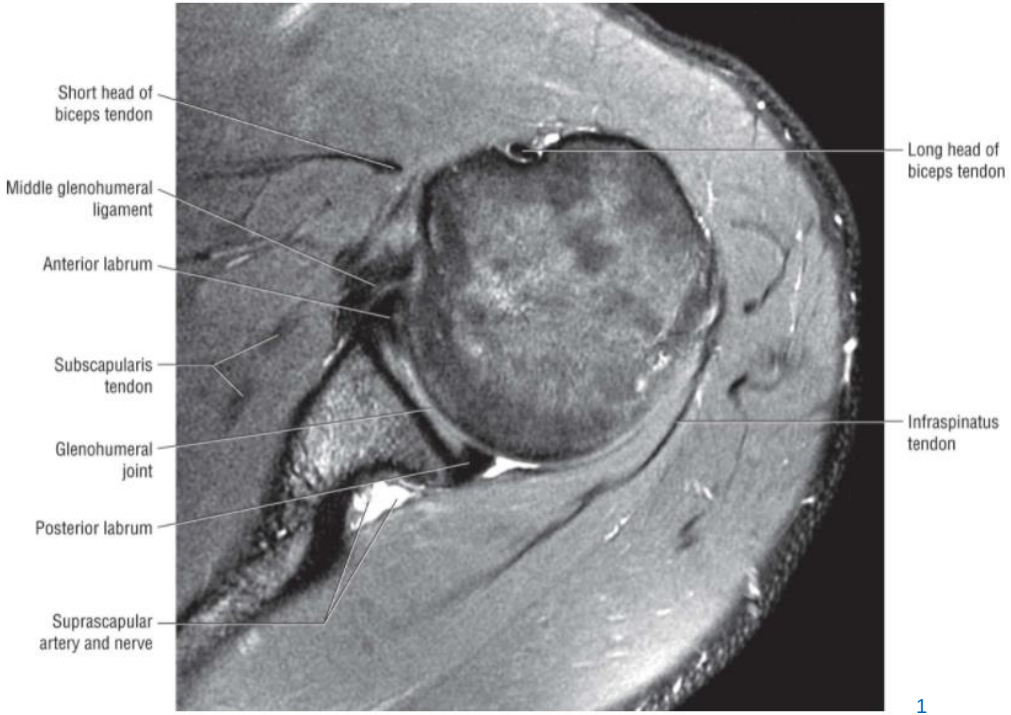

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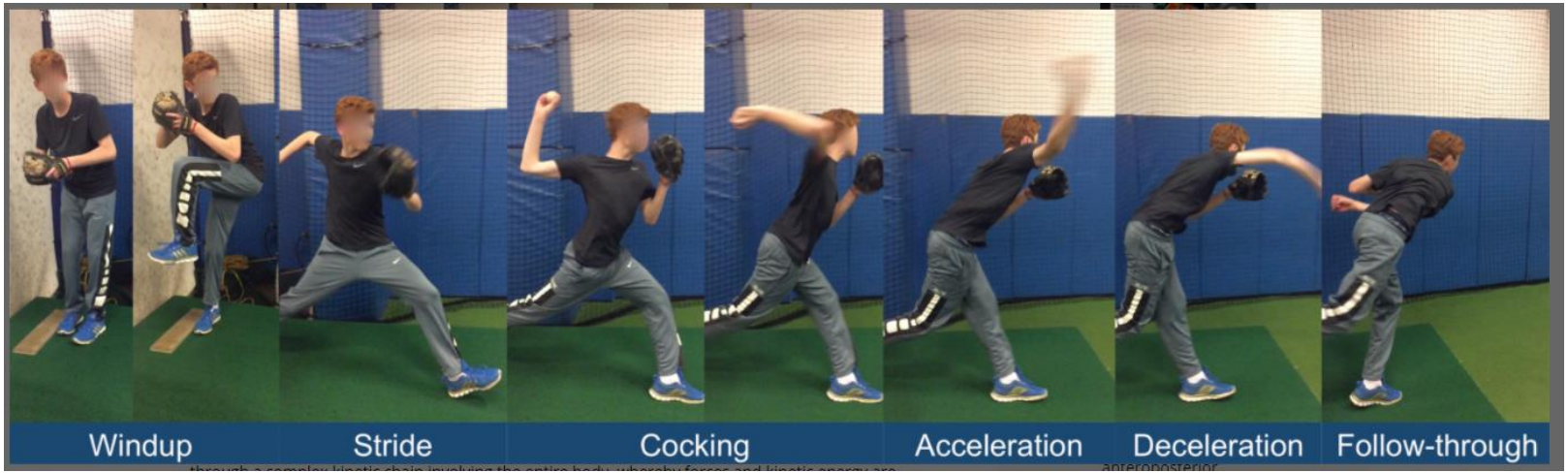
Figure 2.22

THROWING SHOULDER

Kinetic Chain



THROWING SHOULDER

Overview of Pathology

Stress/overuse injury: “Little Leaguer’s Shoulder”

Internal Impingement

Adaptive sequelae/GIRD/ “Dead Arm”

THROWING SHOULDER

“Little Leaguer’s Shoulder”[5]

Overuse injury of skeletally immature overhead athletes

Chronic repetitive shear, torque, and traction forces on proximal humeral physis

Incidence rising

11-16 year-olds

THROWING SHOULDER

“Little Leaguer’s Shoulder”- Imaging Findings[5]

Radiography:	MRI:
Lateral physeal widening	Physeal widening
Metaphyseal calcification	Intraphyseal fluid
Regional demineralization, sclerosis and fragmentation	Regional marrow edema

THROWING SHOULDER

“Little Leaguer’s Shoulder” Imaging [5]

THROWING SHOULDER

Overview of Pathology

Stress/overuse injury: “Little Leaguer’s Shoulder”

Recurrent/chronic

- **Internal Impingement**
- **Adaptive sequelae/GIRD/ “Dead Arm”**

THROWING SHOULDER

Kinetic Chain

Late cocking to early acceleration

External to internal rotation with acceleration and force/angular velocity

Internal impingement/stretching

Biceps tendon contraction w/labral tension

Posterior capsule/cuff contraction

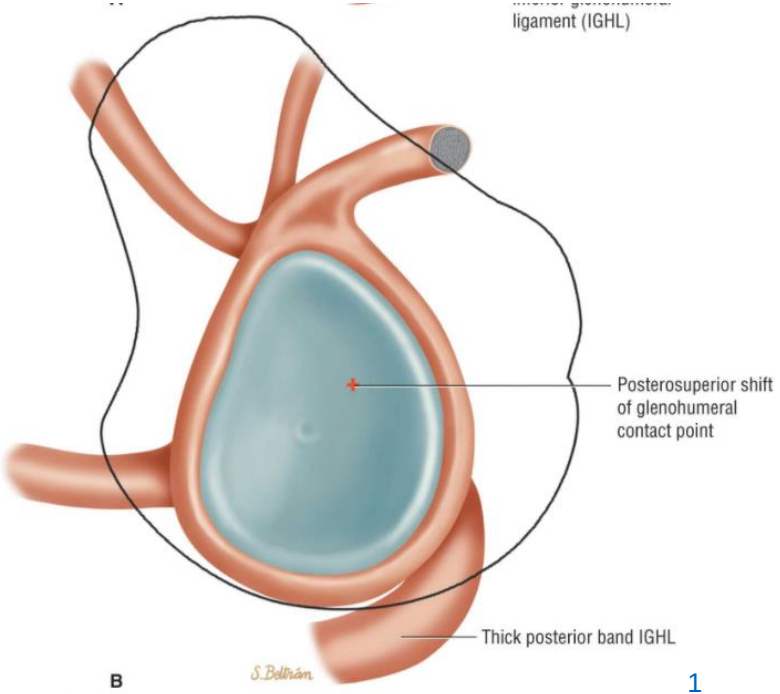


Figure 6.187 Initial steps of the pathologic cascade of changes in the throwing

THROWING SHOULDER

Kinetic Chain

Late cocking to early acceleration

External to internal rotation with acceleration and force/angular velocity

Internal impingement/stretching

Biceps tendon contraction w/labral tension

Posterior capsule/cuff contraction

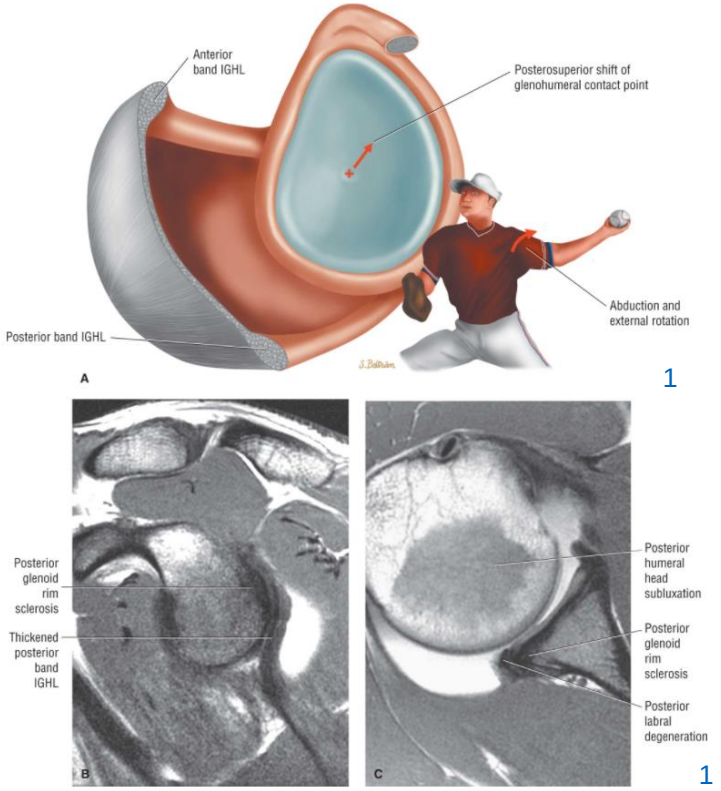


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Figure 6.193 **(A)** A color graphic illustrating hyperabduction and external rotation in

THROWING SHOULDER

Kinetic Chain

Late cocking to early acceleration

External to internal rotation with acceleration and force/angular velocity

Internal impingement/stretching

Biceps tendon contraction w/labral tension

Posterior capsule/cuff contraction

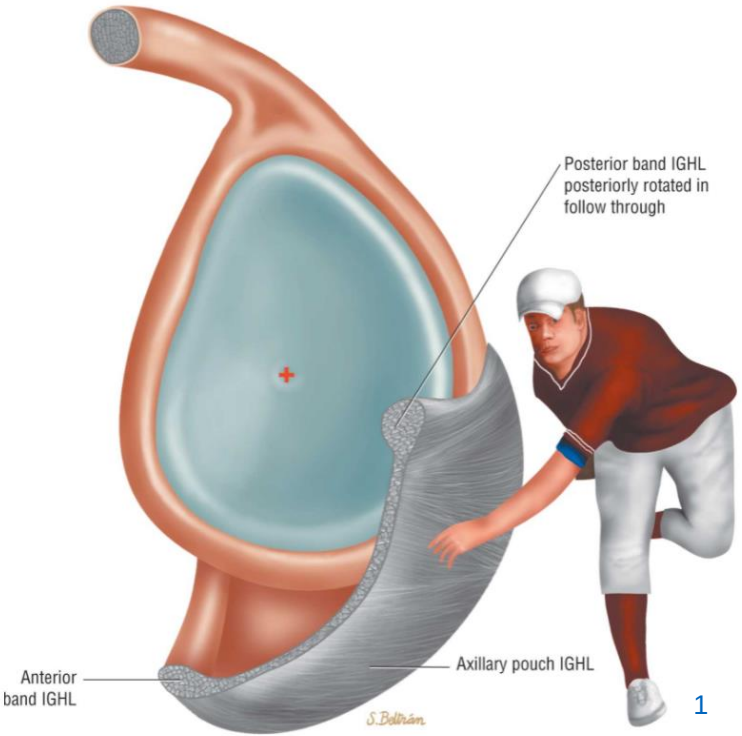


Figure 6.192 Repetitive tensile loading during the follow-through phase of throwing

THROWING SHOULDER

Chronic/Adaptive Changes[5]

Internal (posterosuperior) Impingement

Contact of rotator cuff between posterosuperior glenoid and labrum with abduction/external rotation (late cocking to acceleration)

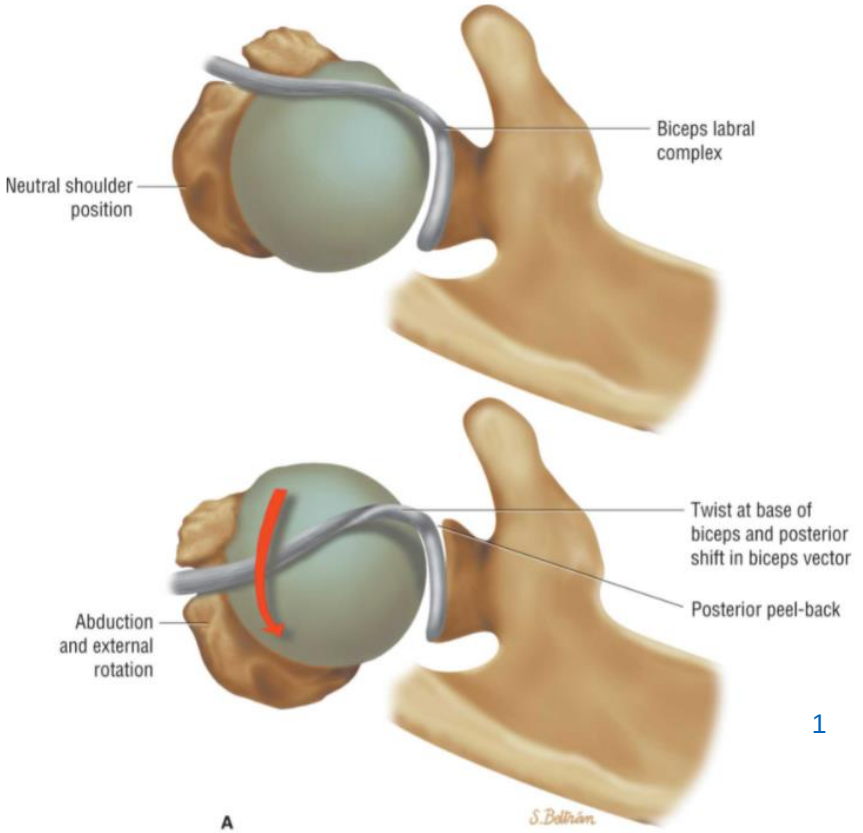
Repetitive compressive microtrauma

THROWING SHOULDER

Chronic/Adaptive Changes

GIRD spectrum

“Dead Arm” and cuff/SLAP tears



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THROWING SHOULDER

Chronic Throwing sequelae [5]

Adaptive sequelae/GIRD/ “Dead Arm”

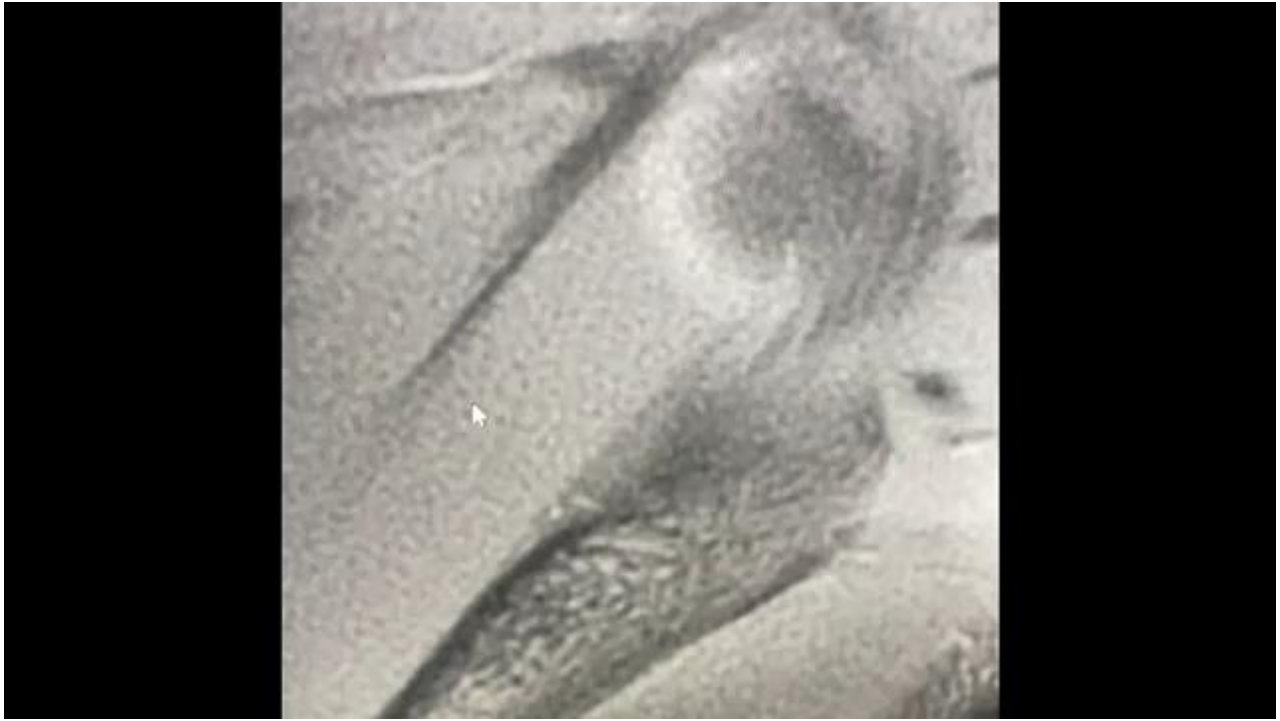
Bennett Lesion

- **Posterior glenoid capsular ossification due to repetitive traction on IGHL**
- **May be asymptomatic or locally irritative**

Peelback lesions- cuff and labral injuries

THROWING SHOULDER

Chronic Throwing sequelae



GLENOHUMERAL INSTABILITY

OVERVIEW [11, 13-15]

Broad spectrum of clinical presentations; suspected and unsuspected

As high as 2% of population, trauma accounts for more than 90%

Variable situations:

- **Acute first-time dislocation, chronic instability with repeated dislocation, chronic instability without dislocation (young vs old)**

At extremes of motion, labroligamentous complex contributes most to stability

GLENOHUMERAL INSTABILITY

OVERVIEW[11, 15-18]

Reciprocating osteochondral injuries of posterosup. humeral head and anteroinf. glenoid

Hard wedge shaped glenoid and softer flatter humeral head

Shear and osteochondral compression forces

First time dislocaters- 25-81% show Hill-Sachs at arthroscopy

Soft tissue injuries of glenoid- anywhere along inferolabroligamentous complex (primary passive stabilizer of joint). Traction of IGHL transmitted to labrum

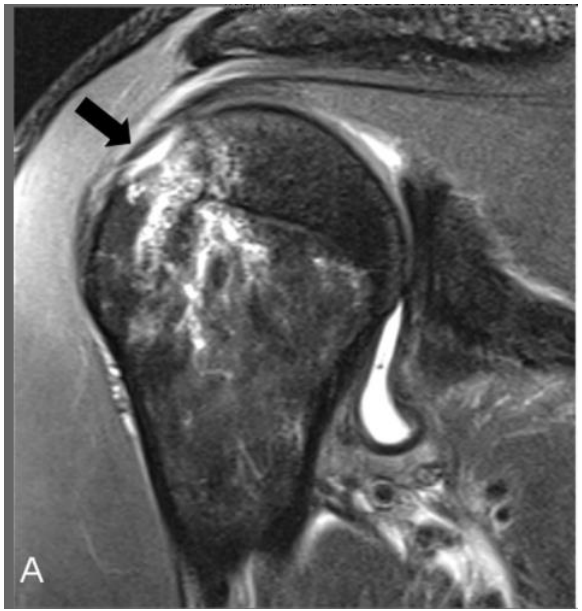
[11]

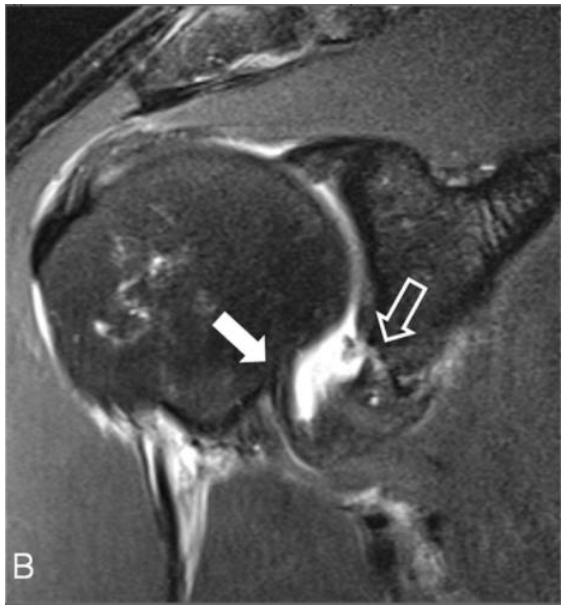
GLENOHUMERAL INSTABILITY

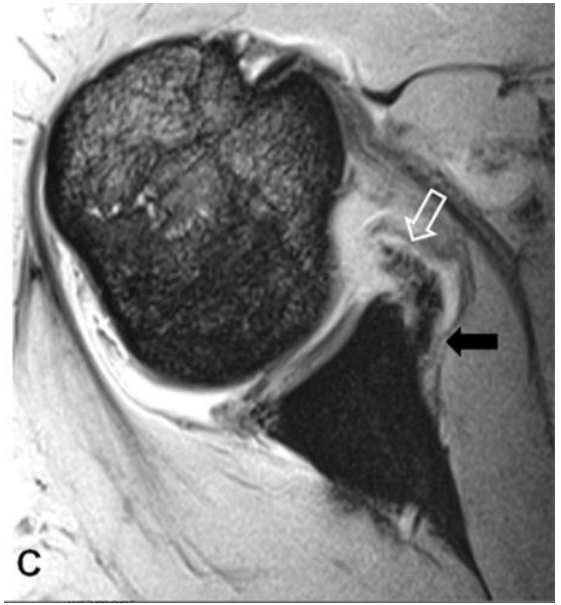
Imaging

GLENOHUMERAL INSTABILITY

Imaging [11]





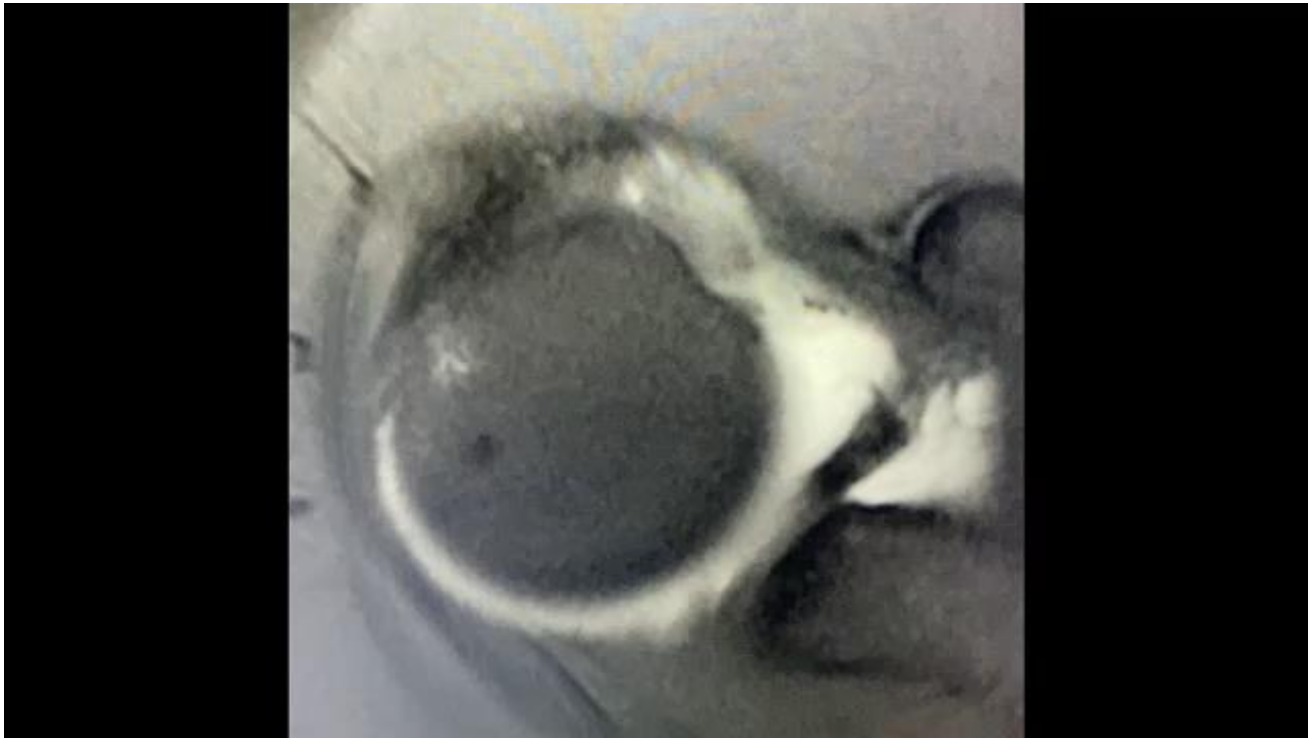


GLENOHUMERAL INSTABILITY

Imaging

GLENOHUMERAL INSTABILITY

Imaging



SLAP TEARS- MICROINSTABILITY

OVERVIEW [19,20]

LGBT inserts on superior labrum

Minor instability and resulting damage of the superior labrum (also MGHL, interval structures, cuff) currently described by the term microinstability

- Incidence of 5% in patients with shoulder pain
- Trauma or overuse

SLAP lesion- tear of superior labrum centered at LHBT attachment

- Can extend along periarticular fiber system into regional structures

SLAP TEARS- MICROINSTABILITY

OVERVIEW[19]

Superior labral tear, anterior to posterior (SLAP)

Term first introduced in 1990- Snyder et al [24]

Can arise from sudden traction on LHBT, sudden fall with superior head subluxation, or repetitive overhead motion [21-23]

Challenging diagnosis- Several normal variants and recesses

10 types! Fraying to tears extending into different locations/regional structures

SLAP TEARS- MICROINSTABILITY

OVERVIEW radiographics deconick chugn (DC)

Type	Clock-face Position	Description
Type I	11 o'clock to 1 o'clock	Fraying
Type II	11 o'clock to 1 o'clock	Tear of biceps labral complex
Type IIa	11 o'clock to 3 o'clock	Primarily anterior
Type IIb	9 o'clock to 11 o'clock	Primarily posterior
Type IIc	9 o'clock to 3 o'clock	Combined anterior and posterior
Type III	11 o'clock to 1 o'clock	Bucket-handle tear with unruptured biceps
Type IV	11 o'clock to 1 o'clock	Bucket-handle tear with biceps extension
Type V	11 o'clock to 5 o'clock	Bankart lesion with superior extension
Type VI	11 o'clock to 1 o'clock	Unstable flap tear
Type VII	11 o'clock to 3 o'clock	Extension into MGHL
Type VIII	7 o'clock to 1 o'clock	Extension into posterior labrum, more extensive than type IIb
Type IX	7 o'clock to 5 o'clock	Labrum circumferentially abnormal
Type X	11 o'clock to at least 1 o'clock	Extension into rotator interval

SLAP TEARS- MICROINSTABILITY

Types [19]

Type	Clock-face Position	Description
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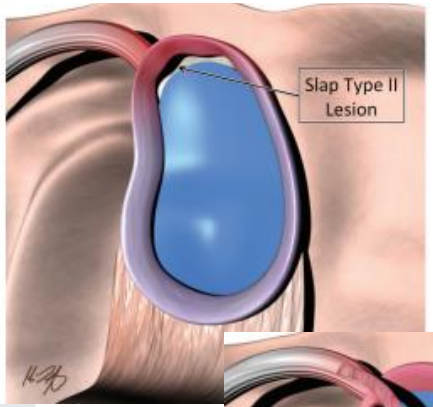
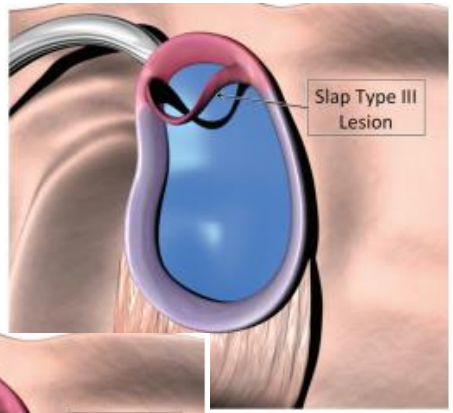
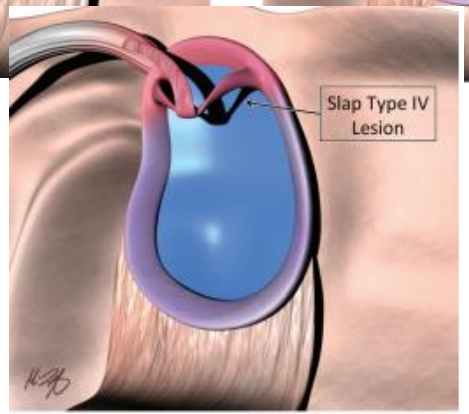
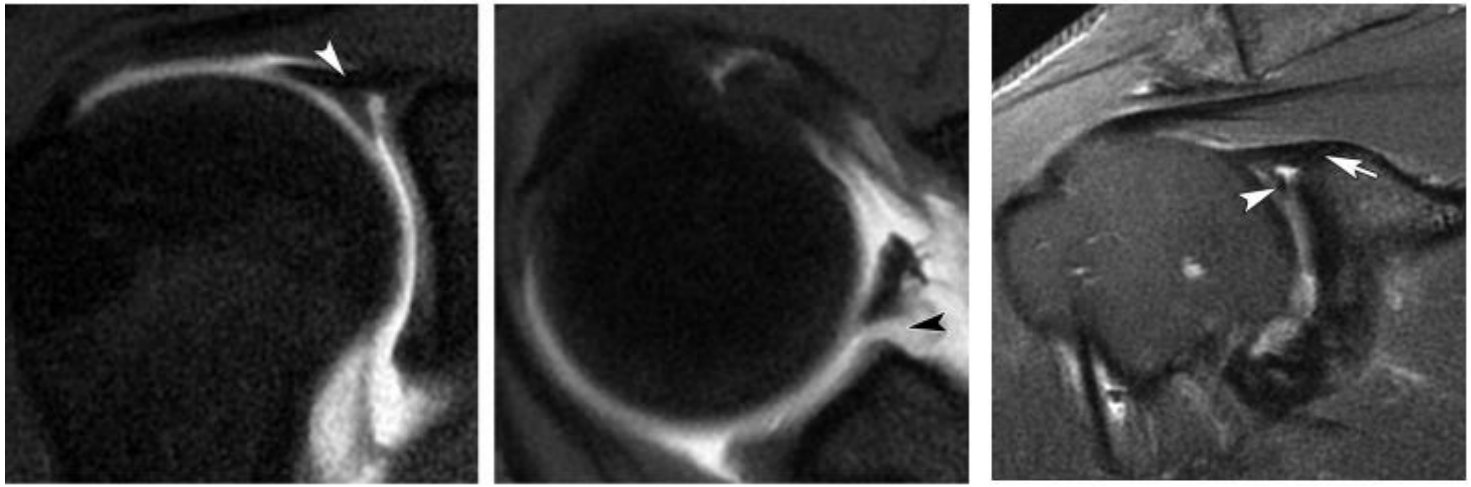






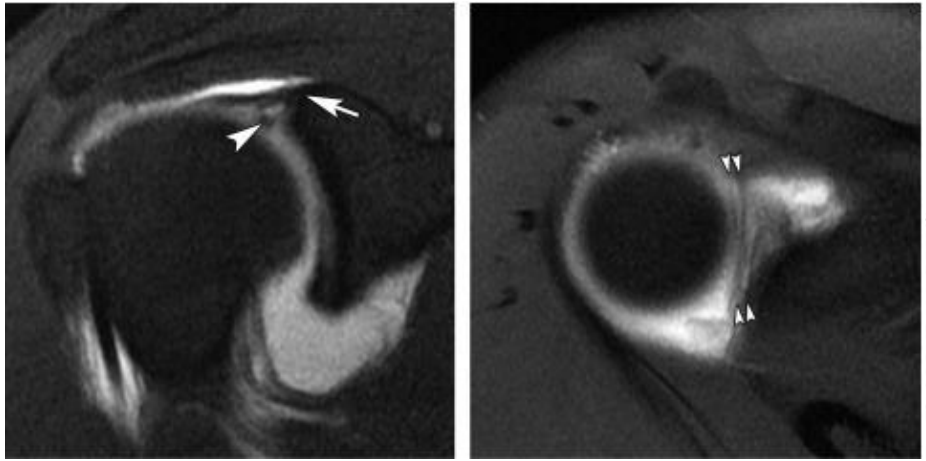
SLAP TEARS- MICROINSTABILITY

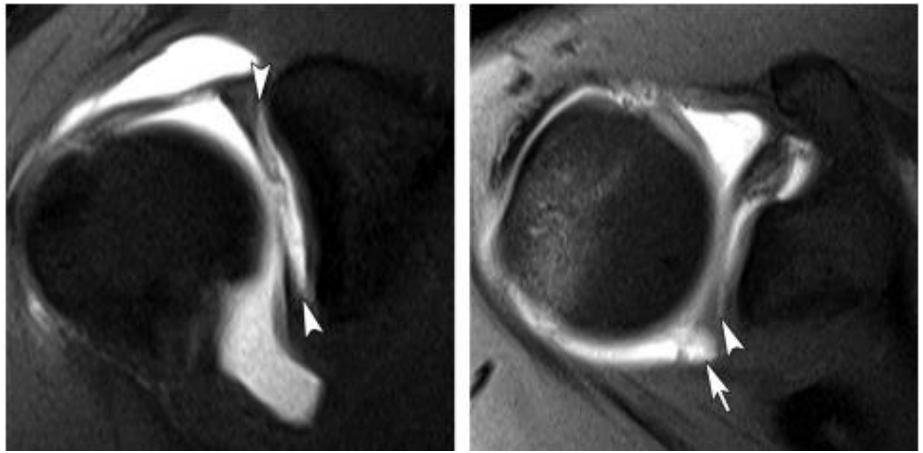
MRI Imaging- Type II [19]



SLAP TEARS- MICROINSTABILITY

MRI Imaging- Type IV and Type V[19]





SLAP TEARS- MICROINSTABILITY

MRI Imaging- Type IV

GRAND FINALE!

MRI Imaging- Type V

SUMMARY

How do we do it?

- Modalities overview
- What test to order? –ACR Clinical Imaging Support
- Arthrography utilization recommendations

Anatomical considerations

- Throwing Shoulder
- Instability

Imaging of throwing shoulder and glenohumeral instability pathology

REFERENCES

1. Stoller, David W. Stoller's Orthopaedics and Sports Medicine: The Shoulder. Available from: VitalSource Bookshelf, Wolters Kluwer Health, 2015.

2. ACR appropriateness criteria. Clinical Decision Support. https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria

3. Imaging the Glenoid Labrum and Labral Tears. Tineke De Coninck, Steven S. Ngai, Monica Tafur, and Christine B. Chung

RadioGraphics 2016 36:6, 1628-1647

4. J. Chang MD. www.poormd.com

5. Shoulder Injuries in the Overhead-Throwing Athlete: Epidemiology, Mechanisms of Injury, and Imaging Findings. Dana J. Lin, Tony T. Wong, and Jonathan K. Kazam

Radiology 2018 286:2, 370-387

6. Heyworth BE, Kramer DE, Martin DJ, Micheli LJ, Kocher MS, Bae DS. Trends in the Presentation, Management, and Outcomes of Little League Shoulder. Am J Sports Med 2016;44(6):1431–1438.

7. Jobe CM. Posterior superior glenoid impingement: expanded spectrum. Arthroscopy 1995;11(5):530–536.

8. Walch G, Liotard JP, Boileau P, Noel E. Postero-superior glenoid impingement. Another shoulder impingement [in French]. Rev Chir Orthop Reparatrice Appar Mot 1991;77(8):571–574.

9. Walch G, Boileau P, Noel E, Donell ST. Impingement of the deep surface of the supraspinatus tendon on the posterosuperior glenoid rim: An arthroscopic study. J Shoulder Elbow Surg 1992;1(5):238–245.

10. Bennett GE. Shoulder and Elbow Lesions Distinctive of Baseball Players. Ann Surg 1947;126(1):107–110.

11. Imaging in Anterior Glenohumeral Instability. Jenny T. Bencardino, Soterios Gyftopoulos, and William E. Palmer

Radiology 2013 269:2, 323-337

12. O'Connell PW, Nuber GW, Mileski RA, Lautenschlager E. The contribution of the glenohumeral ligaments to anterior stability of the shoulder joint. Am J Sports Med 1990;18(6):579–584.

13. Krøner K, Lind T, Jensen J. The epidemiology of shoulder dislocations. Arch Orthop Trauma Surg 1989;108(5):288–290.

REFERENCES

14. Nordqvist A, Petersson CJ. Incidence and causes of shoulder girdle injuries in an urban population. J Shoulder Elbow Surg 1995;4(2):107–112.

15. Milgrom C, Mann G, Finestone A. A prevalence study of recurrent shoulder dislocations in young adults. J Shoulder Elbow Surg 1998;7(6):621–624.

16. Griffith JF, Antonio GE, Yung PS, et al. Prevalence, pattern, and spectrum of glenoid bone loss in anterior shoulder dislocation: CT analysis of 218 patients. AJR Am J Roentgenol 2008;190(5):1247–1254.

17. Taylor DC, Arciero RA. Pathologic changes associated with shoulder dislocations. Arthroscopic and physical examination findings in first-time, traumatic anterior dislocations. Am J Sports Med 1997;25(3):306–311.

18. Antonio GE, Griffith JF, Yu AB, Yung PS, Chan KM, Ahuja AT. First-time shoulder dislocation: High prevalence of labral injury and age-related differences revealed by MR arthrography. J Magn Reson Imaging 2007;26(4):983–991.

19. Imaging the Glenoid Labrum and Labral Tears. Tineke De Coninck, Steven S. Ngai, Monica Tafur, and Christine B. Chung

RadioGraphics 2016 36:6, 1628-1647

20. Neviaser TJ. The GLAD lesion: another cause of anterior shoulder pain. Arthroscopy 1993;9(1):22–23.

21. Beltran J, Rosenberg ZS, Chandnani VP, Cuomo F, Beltran S, Rokito A. Glenohumeral instability: evaluation with MR arthrography. RadioGraphics 1997;17(3):657–673.

22. Chang EY, Fliszar E, Chung CB. Superior labrum anterior and posterior lesions and microinstability. Magn Reson Imaging Clin N Am 2012;20(2):277–294, x–xi.

23. Maffet MW, Gartsman GM, Moseley B. Superior labrumbiceps tendon complex lesions of the shoulder. Am J Sports Med 1995;23(1):93–98.

24. Snyder SJ, Karzel RP, Del Pizzo W, Ferkel RD, Friedman MJ. SLAP lesions of the shoulder. Arthroscopy 1990;6(4): 274–279.

SHOULDER LABRAL TEARS AND REHAB

Dr. Brando Kohrs

Logan Siemer, PT, DPT, OCS

OrthoCincy Orthopaedics & Sports Medicine | St. Elizabeth PHYSICIANS | St. Elizabeth HEALTHCARE

The Orthopaedic Institute at St. Elizabeth: A partnership between OrthoCincy Orthopaedics & Sports Medicine, St. Elizabeth Physicians and St. Elizabeth Healthcare.

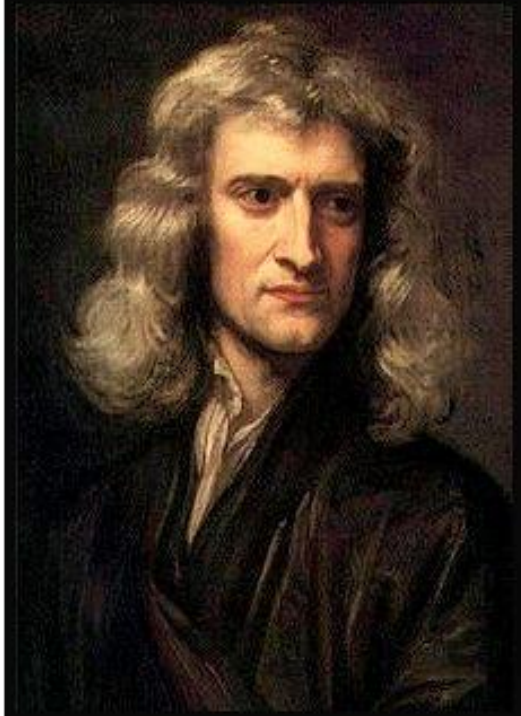
OVERVIEW

Basic Anatomy

Anterior Labral Tears

Posterior Labral Tears

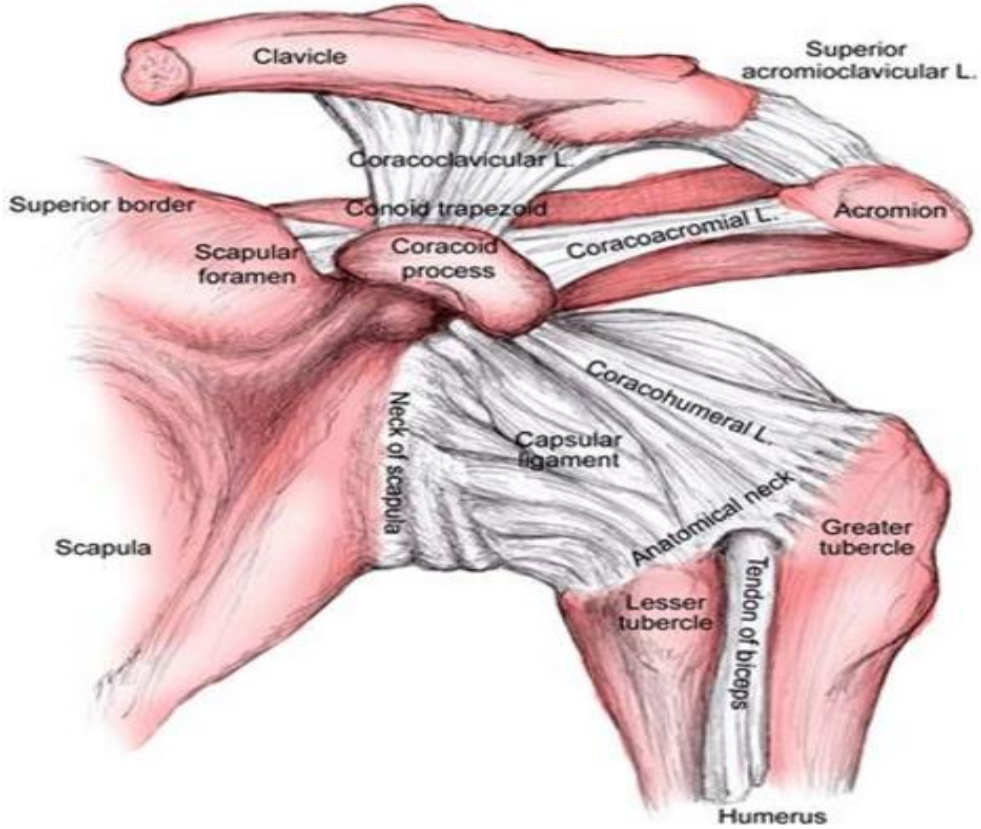
Slap Tears



If I have seen further than others, it is by standing upon the shoulders of giants.

(Isaac Newton)

izquotes.com



https://www.orthobullets.com/shoulder-and-elbow/3050/traumatic-anterior-shoulder-instability-tubs

ANATOMY OF SHOULDER STABILITY

Static restraints

- Glenohumeral ligaments
- Glenoid labrum
- Articular congruity and version
- Negative intraarticular pressure
  - *If release head will sublux inferiorly*

Dynamic Restraints

- Rotator cuff muscles
  - *Stabilizes the GH joint by compressing the humeral head against the glenoid*
- Biceps
- Periscapular muscles

https://www.orthobullets.com/shoulder-and-elbow/3050/traumatic-anterior-shoulder-instability-tubs

ANTERIOR INSTABILITY CASE

This is your typical dislocation event

18 year old male high school football player has a right shoulder dislocation during second football game of the season

- Reduced on the field
- See's PCP for follow up

How common is this?

EPIDEMIOLOGY- ANTERIOR SHOULDER DISLOCATION

Effects approximately 2% of population (anterior dislocation)- due to anterior directed force

Athletic trauma is major cause

Male: Female 9:1

High redislocation rate

- Age is the best predictor
  - 90% under age of 20.
  - 60% of patients 20 to 40
  - <10% of patients >40
- Early surgical intervention reduces recurrence.

http://cdn.fansided.com/wp-content/blogs.dir/229/files/2015/04/kevin-love-nba-playoffs-cleveland-cavaliers-boston-celtics7-850x560.jpg

https://www.orthobullets.com/shoulder-and-elbow/3050/traumatic-anterior-shoulder-instability-tubs

RECURRENT ANTERIOR SHOULDER INSTABILITY- HOW COMMON IS IT?

Operative Treatment- 1st time dislocator?

- Aciero et al: 2 groups
  - Immobilize 4 weeks- 80% recurrence
  - Surgical (arthroscopic) repair- 14% recurrence

WILL I RETURN TO SPORTS?

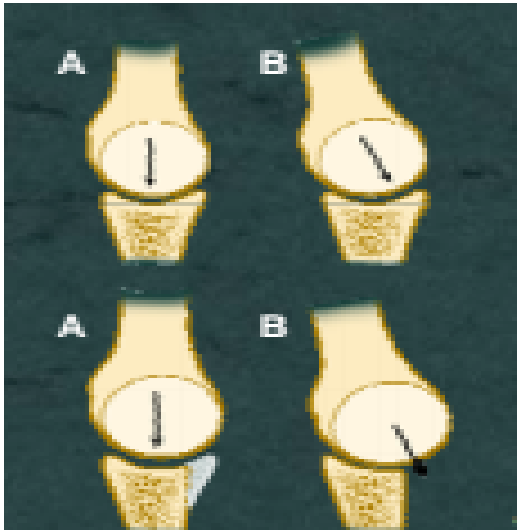
Buss et al. AJSM, 2004 -30 HS/College level athletes

- Tx with rehab and bracing
- 90% returned during season
- 1/3 at at least 1 additional recurrent dislocation
- ½ required off season shoulder surgery

Burkhart, De Beer

Contact/Collision Athletes

- 87% recurrence with bone defect
- 6.5 recurrence if no bone defect



IS IT JUST A LABRAL TEAR?

Rotator cuff tears

30% of anterior dislocation patients > 40 years of age

80% of anterior dislocation patients > 60 years of age

Atef A, El-Tantawy A, Gad H, Hefeda M. Prevalence of associated injuries after anterior shoulder dislocation: a prospective study. Int Orthop. 2016 Mar;40(3):519-24. doi: 10.1007/s00264-015-2862-z. Epub 2015 Jul 2. PMID: 26133290.

INJURY BASED ON AGE

<40 = Labral Tear

>40= Rotator Cuff Tear

SHOULDER LABRAL TEARS AND REHAB

Passive Range of Motion

TABLE 2 STAGED RANGE-OF-MOTION GOALS FOLLOWING ARTHROSCOPIC ANTERIOR CAPSULOLABRAL REPAIR

	PFE	PER at 20° Abd	PER at 90° Abd	AFE
POW 3	90°	10°-30°	Contraindicated	NA
POW 6	135°	35°-50°	45°	115°
POW 9	155°	50°-65°	75°	145°
POW 12	WNL	WNL	WNL	WNL

Abbreviations: Abd, abduction; AFE, active forward elevation in the scapular plane; NA, not applicable; PER, passive external rotation; PFE, passive forward elevation; POW, postoperative week; WNL, within normal limits.

3

Gaunt et al JOSPT 2010

SHOULDER LABRAL TEARS AND REHAB

Table Slides

Educate on ROM Limits

Cane Overhead

Educate on Hand Position

Wall Slides

Ensure to avoid anterior shear forces

Images via Medbridge

SHOULDER LABRAL TEARS AND REHAB

Phase 1: Anterior Labral Repair

Strengthening

- Submax, pain-free isometrics
- Scapular Retraction

Image: MedBridge

Neuromuscular Re-education

- Scapula Clocks
- Graded, Rhythmic Stabilization

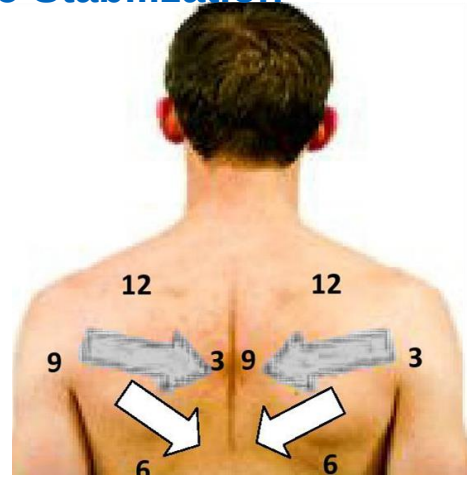


Image: HEP2Go

SHOULDER LABRAL TEARS AND REHAB

Phase 2: Anterior Labral Repair

Strengthening

- **Rotator Cuff Strengthening**
  - An increase of 20% to 25% EMG signal of the infraspinatus & teres minor w/ towel roll
- **Scapular Strengthening (Limited Range)**
  - **Mid Trap: Row,** Scapular Retraction, Limited Range Hz Adduction
  - **Serratus Anterior**: Dynamic Hug, Push Up Plus
  - **Low Trap:** Prone I (to neutral), TB Ext (to neutral), Bilat Scap Retraction

Neuromuscular Education:

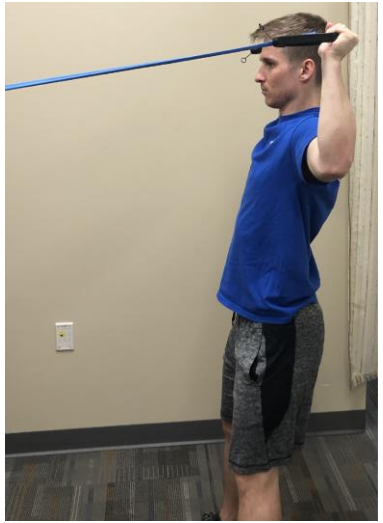
- **Multi-Angle Rhythmic Stabilization**
  - **Eyes Open > Eyes Closed**
  - **Predictable Pattern > Unpredictable**
- **Reduce Shoulder "Hike" with AROM**
  - Progress vs. Gravity
  - Mirror for Biofeedback
  - External cues as possible

SHOULDER LABRAL TEARS AND REHAB

Phase 3: Anterior Labral Repair

Strengthening

- **Progress Rotator Cuff Strengthening to 90/90 position**
- Progress Scapular strengthening
- Diagonal Patterns
- Deltoid Strengthening



Neuromuscular Re-education

- **Plyometrics—force over time**
  - Bilateral vs. Unilateral
  - Open Kinetic Chain vs. Closed Kinetic Chain

ANTERIOR INSTABILITY SUMMARY

- **The *younger* you are the more likely you are to redislocate and need *surgery***
- ***Older* you are the more likely you can succeed with *rehab***

- **Treatment**
  - Sling
  - MRI
  - Rehab vs Surgery

POSTERIOR DISLOCATION- KEY POINT

Posterior Dislocation

- often seen with trauma
- Shoulder pain and SEIZURE/Electrocution
- **OFTEN MISSED**
- Light Bulb Sign on X-Ray

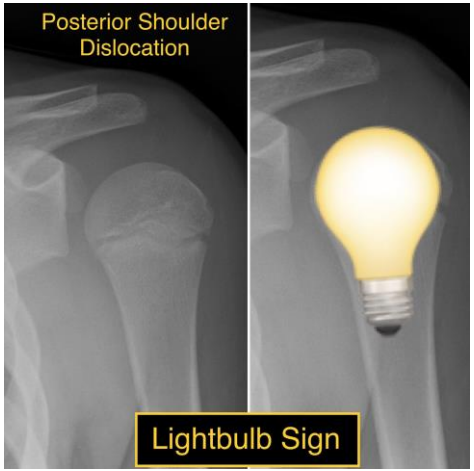


Image: https://img.grepmed.com/uploads/12847/dislocation-sign-radiology-xray-posterior-original.jpeg

https://www.orthobullets.com/shoulder-and-elbow/3051/posterior-shoulder-instability-and-dislocation

POSTERIOR LABRAL INJURY

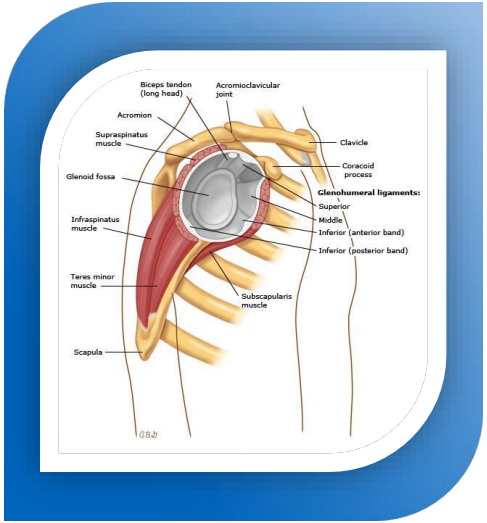
- **Less common (different animal)**
- **Often associated with Pain instead of feelings of instability**
  - can be caused by repetitive trauma
- **Often seen in weight lifters, football players, gymnasts, swimmer**
- **MRI for evaluation—***Can often be missed*

https://www.orthobullets.com/shoulder-and-elbow/3057/posterior-labral-tear

Image: Dayton Daily News

POSTERIOR LABRAL INJURY TREATMENT

- Physical Therapy
- Anti-inflammatories
- Activity modifications (1st line)
- Surgery after failure of non operative- Posterior Labral repair



Shoulder Labrum Tear (rebuildphysiotherapy.com)

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SHOULDER LABRAL TEARS AND REHAB

Posterior Labral Repair: Range of Motion

Phase 1 (*weeks 1-4*)	Phase 2 (*weeks 4-8*)	Phase 3 (*weeks 8-12+*)
NO Internal Rotation (IR)	**No IR x 6-8 wks**	Full ROM
No Hz Adduction/Crossbody	**No Hz Adduction/Crossbody**	
Flexion initiated 90-120 degrees	Flexion 140-165	
External Rotation 20-40 degrees	*Slowly Progress ER to full ROM*	

SHOULDER LABRAL TEARS AND REHAB

Closed Kinetic Chain Stability

Image: Reinold, Mike & Curtis, Alan. (2013). Microinstability of the shoulder in the overhead athlete. International journal of sports physical therapy. 8. 601-16.

Image: Medbridge

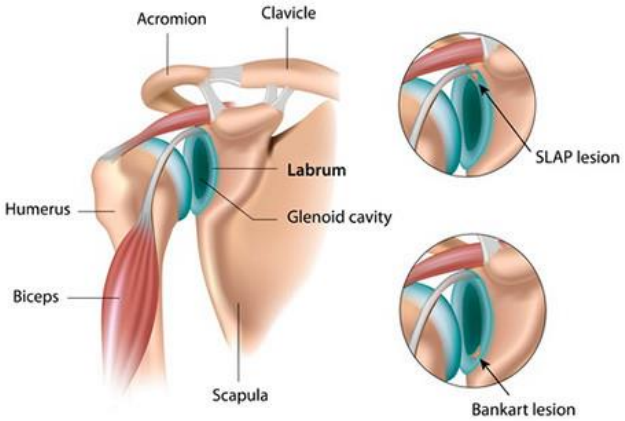
SLAP TEARS

Causes

- Repetitive overuse injury
- Fall with tensed bicep
- Throwers and Overhead Athletes—*tight posterior inferior glenohumeral ligament which can shift the glenohumeral contact posterosuperiorly and increase superior labrum shear force*

Presentation

- Often notice a "pop" with vague shoulder pain deep in shoulder
- No "gold standard" exam maneuver



Shoulder Labrum Tear (rebuildphysiotherapy.com)

https://www.orthobullets.com/shoulder-and-elbow/3053/slap-lesion

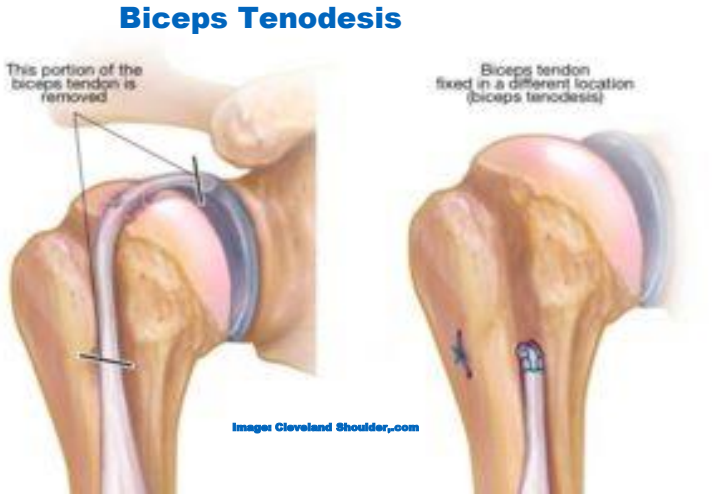
SLAP TEARS

Treatment (1st Line)

- **cessation from sports (rest)**
- **NSAIDs and therapy**

Treatment (If Non op fails)

- **Surgery**
- **Bicep Tenodesis versus SLAP Repai**
  - *Data favors tenodesis especially in individuals >40*



SLAP TEARS

BOTTOM LINE

SLAP tear on MRI in a non-athlete should proceed with non-operative management

SHOULDER LABRAL TEARS AND REHAB

SLAP TEARS

- Restoring glenohumeral internal rotation is thought to be important
- Scapular and Rotator Cuff Strengthening with Limited Biceps
  - Limit Biceps Activity Initially—No loading x 8 post-op week
- Neuromuscular Training
  - PNF Patterns (D2 Flexion)
  - Towel Drills
- Plyometrics
  - 90/90 Ball Drop
  - Wall Slam at 90/90
- Kinetic Chain
  - Core stability
  - Lower Extremity Control—Quad and Glute Strength
  - Hip Mobility
  - Thoracic Spine Mobility
- Interval Throwing Program: use of “soreness rules”

TOTAL ROTATION ROM

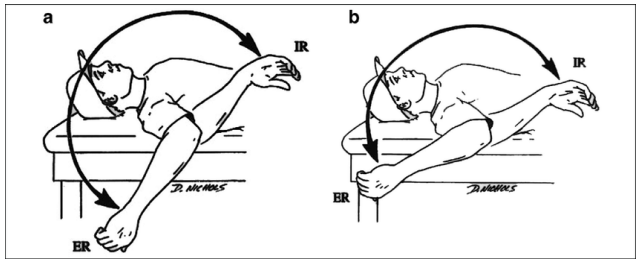


Image: Manske, Robert & Wilk, Kevin & Davies, George & Ellenbecker, Todd & Reinold, Mike. (2013). Glenohumeral motion deficits: friend or foe?. International journal of sports physical therapy. 8. 537-53.

SHOULDER LABRAL TEARS AND REHAB

Take Home Points

- *Anterior instability*
  - athletic population favors surgery labral tear
  - an older population think rotator cuff tear
- *Posterior dislocation-* OFTEN MISSED
- *Posterior labral tear* -op or non op- often presents with pain
- *SLAP tear*
  - often degenerative
  - Favors non operative treatment

REFERENCES

1. O'Connell PW, , Nuber GW, , Mileski RA, , Lautenschlager E. and The contribution of the glenohumeral ligaments to anterior stability of the shoulder joint. **Am J Sports Med**. 1990; 18: 579– 584.
2. Turkel SJ, , Panio MW, , Marshall JL, , Girgis FG. and Stabilizing mechanisms preventing anterior dislocation of the glenohumeral joint. **J Bone Joint Surg Am**. 1981; 63: 1208– 1217.
3. Gaunt, Bryce W., et al. "The American Society of Shoulder and Elbow Therapists' consensus rehabilitation guideline for arthroscopic anterior capsulolabral repair of the shoulder." *journal of orthopaedic & sports physical therapy* 40.3 (2010): 155-168.
4. Reinold, M. M., Escamilla, R., & Wilk, K. E. (2009). Current concepts in the scientific and clinical rationale behind exercises for glenohumeral and scapulothoracic musculature. *journal of orthopaedic & sports physical therapy*, *39*(2), 105-117
5. Reinold, Mike & Curtis, Alan. (2013). Microinstability of the shoulder in the overhead athlete. International journal of sports physical therapy. 8. 601-16.
6. Wilk, K. E., Bagwell, M. S., Davies, G. J., & Arrigo, C. A. (2020). RETURN TO SPORT PARTICIPATION CRITERIA FOLLOWING SHOULDER INJURY: A CLINICAL COMMENTARY. *International journal of sports physical therapy*, *15*(4), 624–642.
7. Manske, Robert & Wilk, Kevin & Davies, George & Ellenbecker, Todd & Reinold, Mike. (2013). Glenohumeral motion deficits: friend or foe?. International journal of sports physical therapy. 8. 537-53.
8. Cools AM et al. *Rehabilitation Exercises for Athletes With Biceps Disorders and SLAP Lesions: A Continuum of Exercises With Increasing Loads on the Biceps.* Am J Sports Med.

CORRELATIVE ANATOMY AND PHYSICAL EXAM OF THE SHOULDER

Dr. Adam Metzler

OrthoCincy Orthopaedics & Sports Medicine | St. Elizabeth PHYSICIANS | St. Elizabeth HEALTHCARE

The Orthopaedic Institute at St. Elizabeth: A partnership between OrthoCincy Orthopaedics & Sports Medicine, St. Elizabeth Physicians and St. Elizabeth Healthcare.

Goals

CORRELATE THE PHYSICAL EXAM FINDINGS WITH THE ARTHROSCOPIC EVALUATION OF THE SHOULDER

PHYSICAL EXAMINATION: SPECIFIC TESTS TO BE COVERED

Labral Testing

- Speeds
- Obrien’s
- Yergason’s
- Crank
- Apprehension
- Jerk

AC Joint testing

- Cross arm/ Scarf

Rotator Cuff Strength Testing

- Belly press and Lift Off
- Drop Arm/Empty can
- Horn Blower sign

Impingement testing

- Neer
- Hawkins

Labral/Long Head of Biceps Testing: Speeds Test

Speeds Test

Starting Position

The arm to be tested should be in about 60 degrees of front flexion with the forearm supinated and the elbow fully extended.

Test Movement

In the starting position the examiner forcefully presses down on the patient's arm at the forearm. The patient attempts to resist the pressure of the examiner. Alternatively, the patient attempts to forward flex the shoulder while the examiner resists.

Positive Test

Speed's Test is considered positive if pain is reported in the bicipital groove. Weakness in maintaining the forward flexion position will also likely be noted.

A positive test is indicative of biceps tendon instability or tendonitis or a superior labral tear is noted.

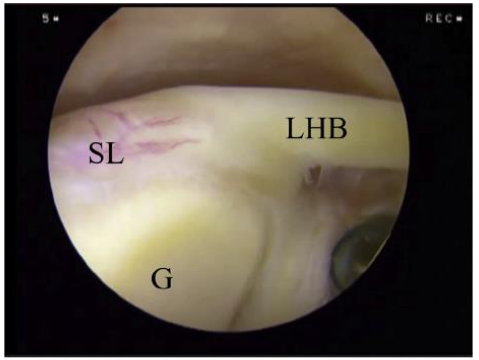


Fig 2. The rotator interval, superior labrum and biceps anchor are visible after entering the joint space (right shoulder in the beach chair position, as viewed from the posterior portal). (SL, superior labrum; G, glenoid; LHB, long head of the biceps tendon.)

Photo credit https://doi.org/10.1016/j.eats.2018.12.003

Labral/Long Head of Biceps Testing: Obrien's Test

Starting Position Obrien's Test

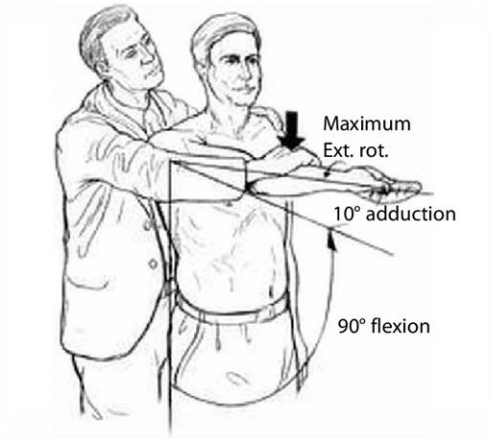
The test is best performed with the patient in a relaxed sitting position but can also be performed in standing. The arm to be tested should be in 90 degrees of flexion and about 10 degrees of adduction. The patient then internally rotates the arm, pronating at the elbow and essentially pointing the thumb to the ground.

Test Movement

The examiner provides a downward force distally on the arm while the patient resists with an upward force. The examiner can also instruct the patient to simultaneously externally rotate the arm while the examiner resists this as well. The test is then repeated but with the arm in neutral rotation.

Positive Test

The test is considered positive if there is pain and/or clicking when the arm is in full internal rotation but not when the arm is in neutral rotation. Pain over the acromioclavicular joint (a-c joint) indicates pathology at that joint while pain felt 'deeper' in the shoulder is more indicative of glenoid labrum pathology. In the event of a-c joint pathology the patient will likely complain of pain in both positions of the test.



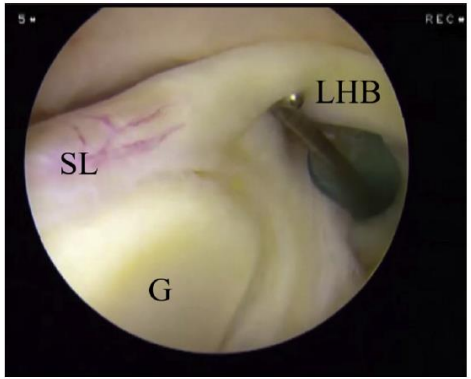


Fig 3. The probe is used to manipulate the long head of the biceps tendon to assess for pathology (right shoulder in the beach chair position, as viewed from the posterior portal). (SL, superior labrum; G, glenoid; LHB, long head of the biceps tendon.)

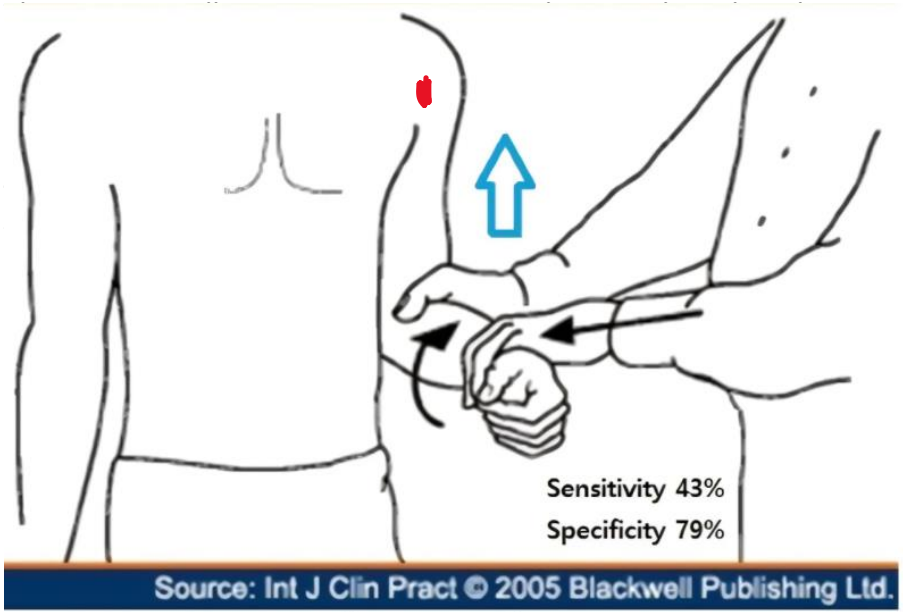
Photo credit https://doi.org/10.1016/j.eats.2018.12.003

Content source: The Prevalence of Chronic Impingement Syndrome and SLAP Lesion and the Sensitivity of O'Brien's Test - PubMed (nih.gov)

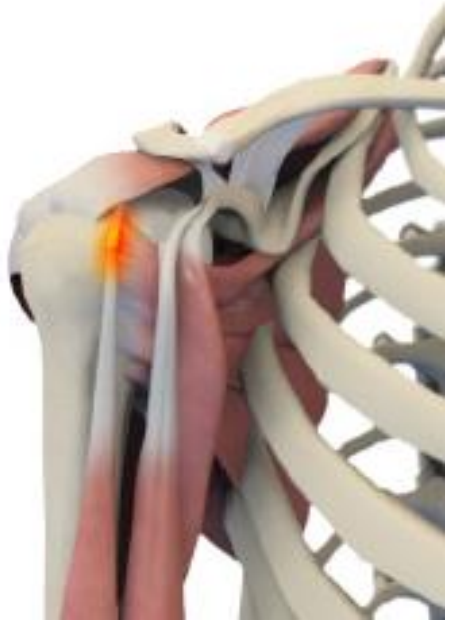
CORRELATIVE ANATOMY: THE SHOULDER
PHYSICAL EXAM AND ARTHROSCOPIC EVALUATION

Long Head of Biceps Testing: Yergason's

Starting Position



Yergason test : Elbow joint flexion + Supination



Courtesy of Your practice online: paying user

Crank Test: Labral tear test

Starting Position

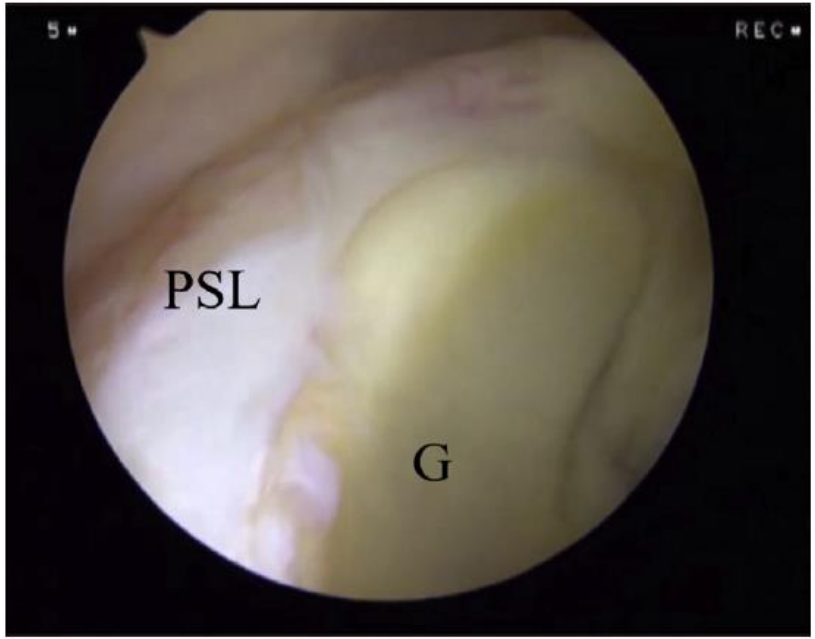
This test is usually performed with the patient in sitting but can also be performed with the patient in supine or standing. The examiner flexes the patients elbow to 90 degrees and elevates the patient's arm to approximately 160 degrees in the scapular plane.

Test Movement

In this position, the examiner applies a gentle compressive force on the glenohumeral joint along the axis of the humerus while simultaneously moving the humerus into internal and external rotation.

Positive Test

The Crank Test is considered positive if the patient's pain is reproduced. The test may also produce an audible or palpable clicking in the glenohumeral joint. This clicking should be repeatable.



CORRELATIVE ANATOMY: THE SHOULDER PHYSICAL EXAM AND ARTHROSCOPIC EVALUATION

Apprehension/ Relocation test

Starting Position

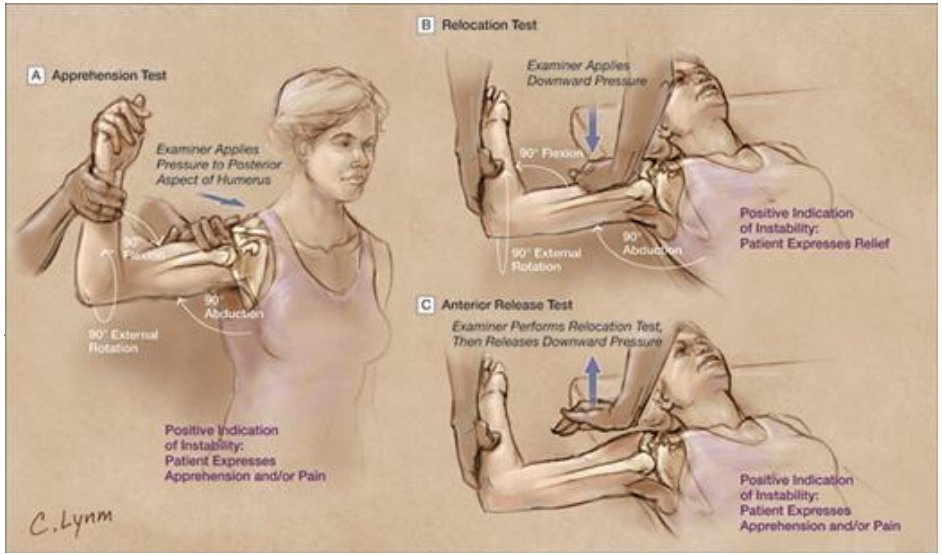


Photo Credit : Does this patient have an instability of the shoulder or a labrum lesion? - PubMed (nih.gov)

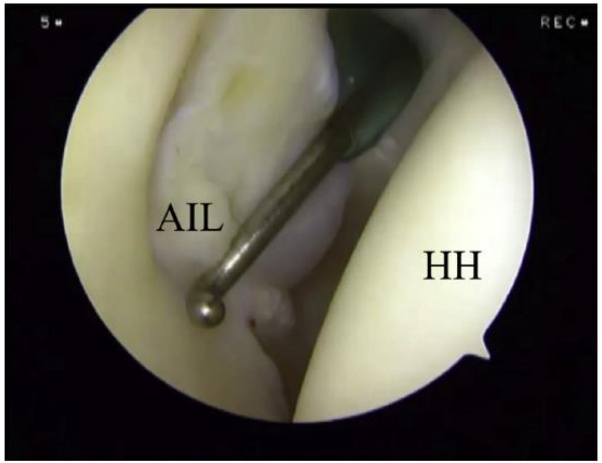


Fig 5. The probe is used to examine the anterior inferior labrum and glenoid cartilage (right shoulder in the beach chair position, as viewed from the posterior portal). (AIL, anterior inferior labrum; HH, humeral head.)

Photo credit https://doi.org/10.1016/j.eats.2018.12.003

Jerk Test- Posterior labral test

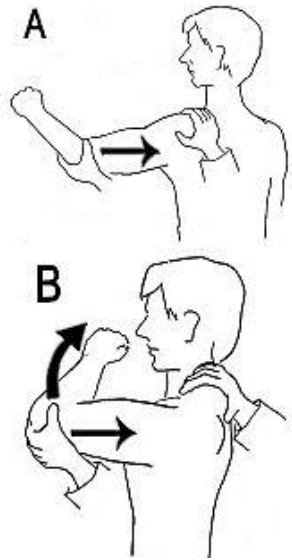
Purpose

This test is used to detect posteroinferior instability of the Glenohumeral joint.

Technique

While stabilizing the patient's scapula with one hand and holding the affected arm at 90° abduction and internal rotation, the examiner grasps the elbow and axially loads the humerus in a proximal direction.

The arm is moved horizontally across the body. A positive result is indicated by a sudden clunk as the humeral head slides off the back of the glenoid. When the arm is returned to the original position, a second jerk may be observed, that of the humeral head returning to the glenoid.



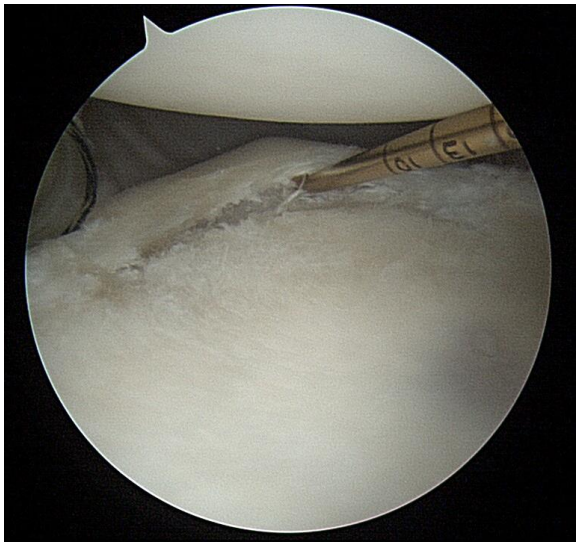


Photo Credit: *Am J Sports Med. 2004;32:1849-55*

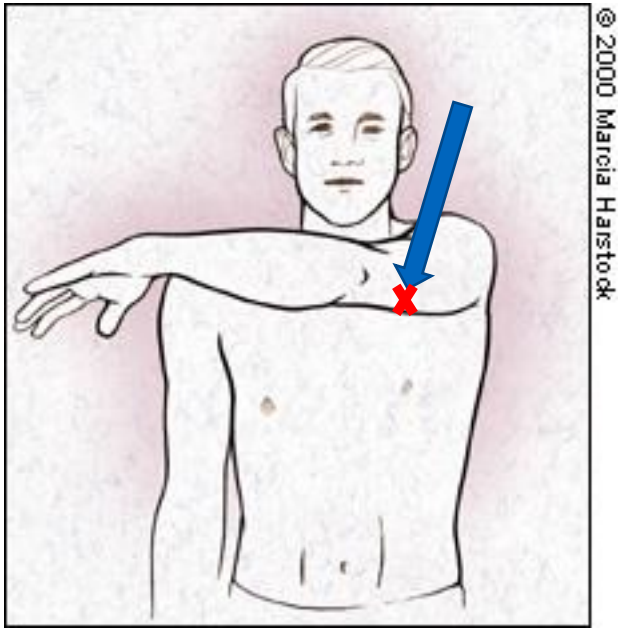
CORRELATIVE ANATOMY: THE SHOULDER PHYSICAL EXAM AND ARTHROSCOPIC EVALUATION

Cross arm/ Scarf- AC Joint

Scarf Test (Cross Arm Adduction Test) for AC Joint

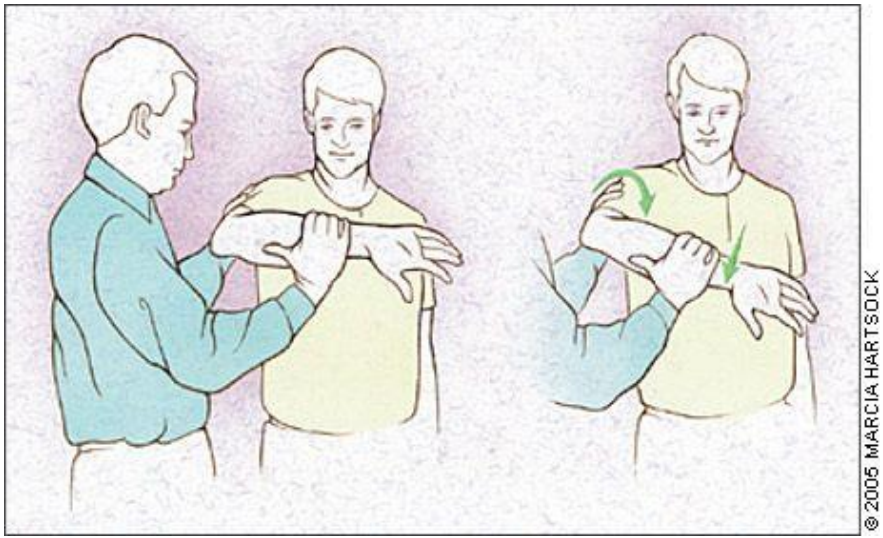
test for acromioclavicular (a-c) joint injury pathology.

A positive test commonly indicates ac joint osteoarthritis or ac joint ligament injuries such as a ligament sprain or joint separation.



CORRELATIVE ANATOMY: THE SHOULDER
PHYSICAL EXAM AND ARTHROSCOPIC EVALUATION

Hawkins Impingement Test:



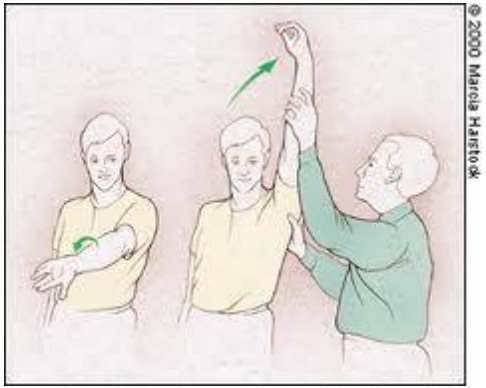
Purpose

This test is commonly used to identify possible subacromial impingement syndrome, and rotator cuff tendonitis.

Technique

The examiner places the patient's arm shoulder in 90 degrees of shoulder flexion with the elbow flexed to 90 degrees and then internally rotates the arm. The test is considered to be positive if the patient experiences pain with internal rotation.

Neer Test



What is the Neer Test?

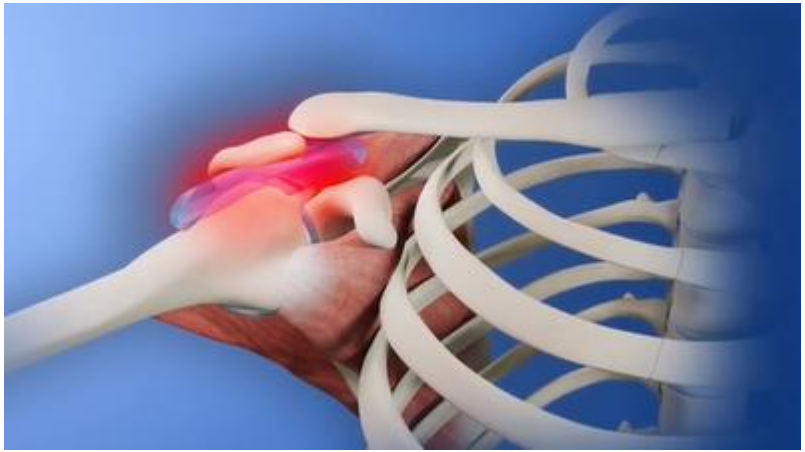
The **Neer Test** (sometimes called Neer's Test) is used to test for subacromial impingement of rotator cuff tendons.

Starting Position

The test is best performed with the patient in a relaxed standing position. The arm to be tested should be moved passively by the examiner. The patient's arm of the shoulder to be tested is positioned such that the arm is relaxed at the side of the body and the elbow is fully extended.

Test Movement

From the starting position, the examiner internally rotates the patient's arm and forcefully moves the arm through the full range of forward flexion or until reports of pain.



Drop Arm Test- Specific for supraspinatus muscle testing

Starting Position

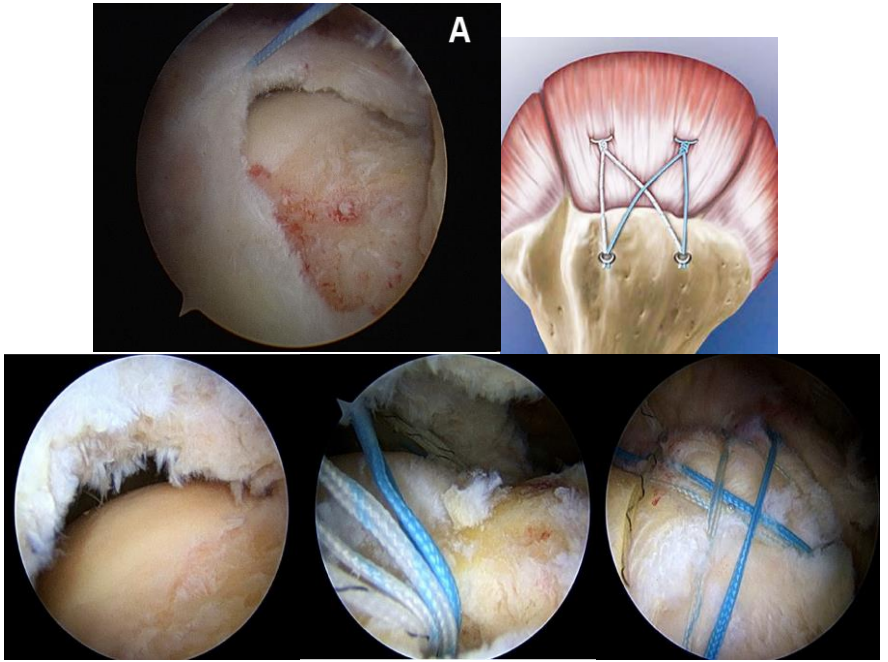
This test can be performed with the patient in standing or sitting. The examiner supports the patient's arm to be tested and abducts it to 90 degrees. Alternatively, the examiner may abduct the arm to above 90 degrees, possibly even to full abduction. Another variation is to have the patient actively abduct their arm to the starting position.

Test Movement

The patient is asked to actively lower their arm from abduction to their side in a slow and controlled manner.

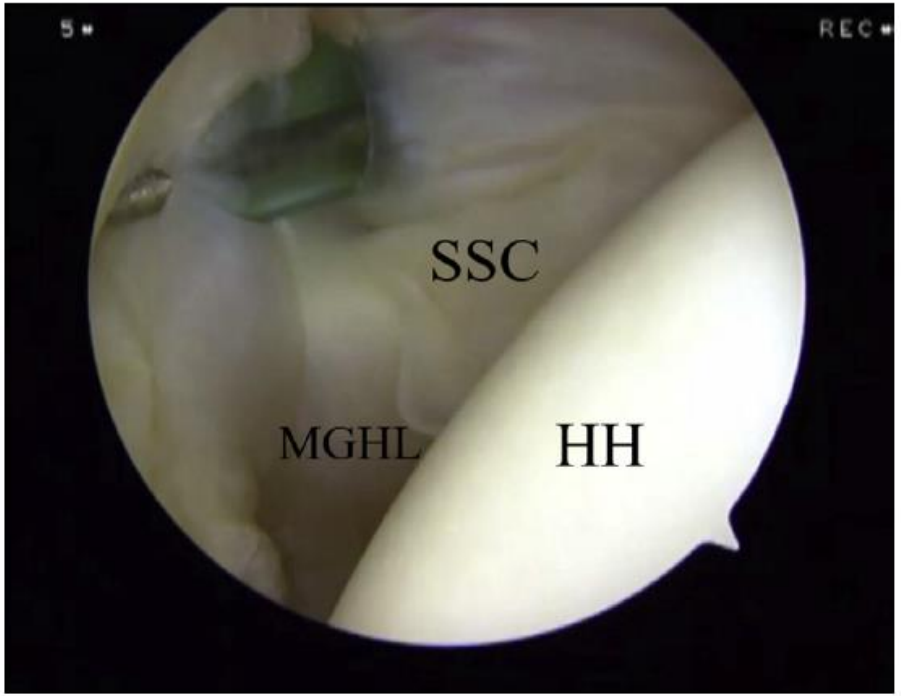
Positive Test

A positive test is determined by the patient's inability to smoothly control the lowering of their arm or the inability to hold the arm in 90 degrees of abduction. In a positive test that starts above 90 degrees of abduction, the patient will tend to have difficulty controlling the movement around 90 degrees of abduction. There may or may not be pain reported. Pain alone is not a positive test.



CORRELATIVE ANATOMY: THE SHOULDER
PHYSICAL EXAM AND ARTHROSCOPIC EVALUATION

Belly Press test



(PDF) Subscapularis tears: hidden and forgotten no more (researchgate.net) Photo Credit

CORRELATIVE ANATOMY: THE SHOULDER
PHYSICAL EXAM AND ARTHROSCOPIC EVALUATION

Lift off Test

The **Lift Off Test** (also knows as Gerber's Test) is commonly used in orthopedic examinations to test for a tear in subscapularis tendon or subscapularis tendonitis.

Starting Position

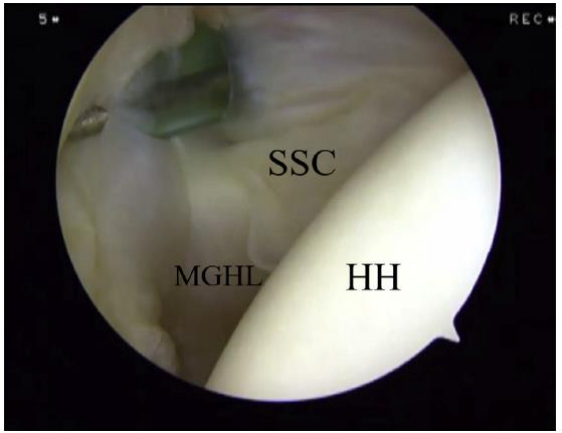
This test is usually performed with the patient in standing but can also be performed with the patient in sitting. The patient's arm is placed in internal rotation with the hand behind the small of the back/mid-lumbar spine. The dorsum of the hand (back of the hand) is against the patient's lumbar spine.

Test Movement

In this position, the patient attempts to move the hand away from the lower back by extending and further internally rotating the arm. The examiner can also provide resistance to this movement if the patient is able to complete the movement.

Positive Test

The Lift-Off Test is considered positive if the patient is unable to move the hand away from the back or is very weak in doing so. The test is also positive if pain is reported. The degree of weakness and pain are indicative of the degree of the lesion. Complete inability to move the hand away from the back is a strong sign of full subscapularis tendon rupture. Pain with movement or resistance can be indicative of a partial tear or of subscapularis tendonitis.



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CORRELATIVE ANATOMY: THE SHOULDER
PHYSICAL EXAM AND ARTHROSCOPIC EVALUATION

Hornblower Sign:

Starting Position

The test is usually performed with the patient in standing but can also be performed with the patient in sitting. The arm to be tested is elevated to 90 degrees of shoulder abduction in the scapular plane. The elbow is to be in 90 degrees of flexion and is externally rotated.

Test Movement

In the starting position the examiner applies an internal rotation force to the forearm or wrist. The patient is asked to resist movement, thereby attempting to externally rotate (laterally rotate) the shoulder.

Positive Test

The Hornblower's test is considered positive if pain is reported by the patient and/or significant weakness is noted by the examiner.

When referred to as the Hornblower's Sign, it is generally considered positive if the patient is unable to hold the arm themselves in the text position; holding the arm up with the hand to the mouth as if blowing a horn.

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