



Baseball Specific Shoulder Injuries: Non- surgical management

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Objectives



Explain the stages of the baseball throwing motion



Understand common diagnostic approaches to shoulder pain in throwers



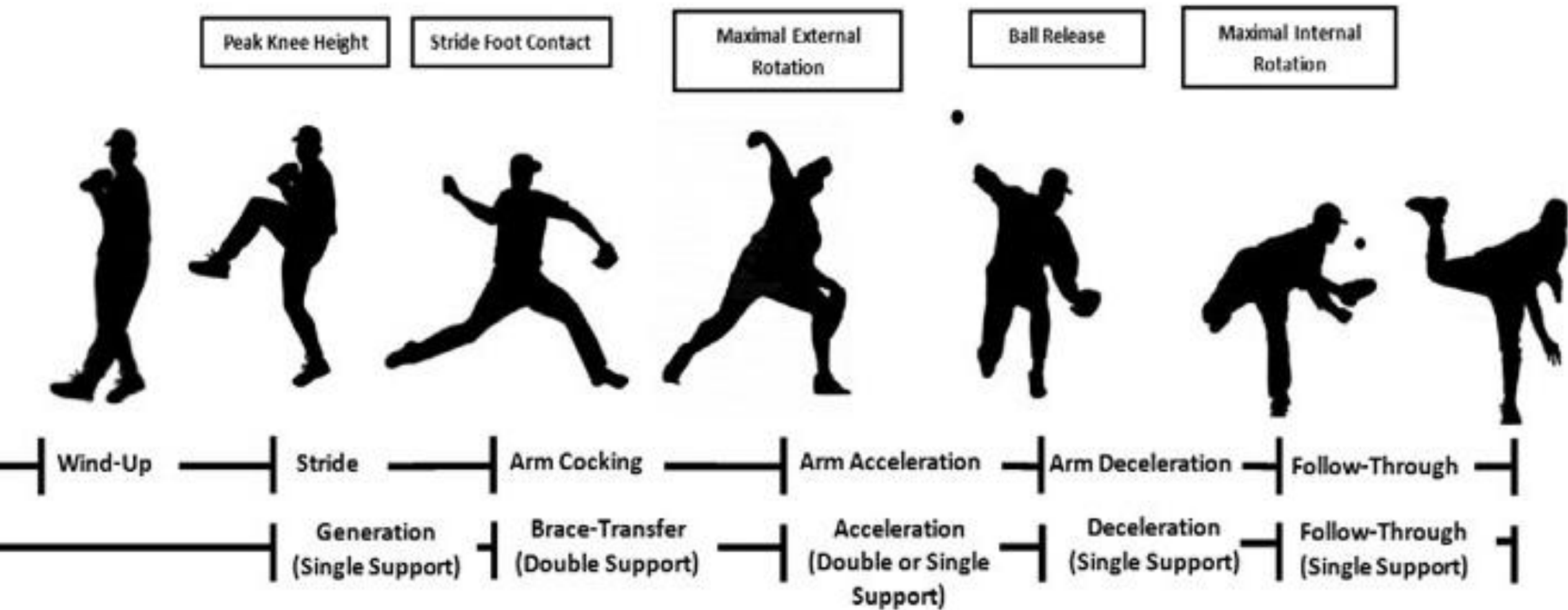
Appreciate unique syndromes that can affect the throwing athlete



Learn the role of injections, orthobiologics, rehab and other modalities in treating shoulder pain



Implement advanced therapy measures and screening for throwing athletes

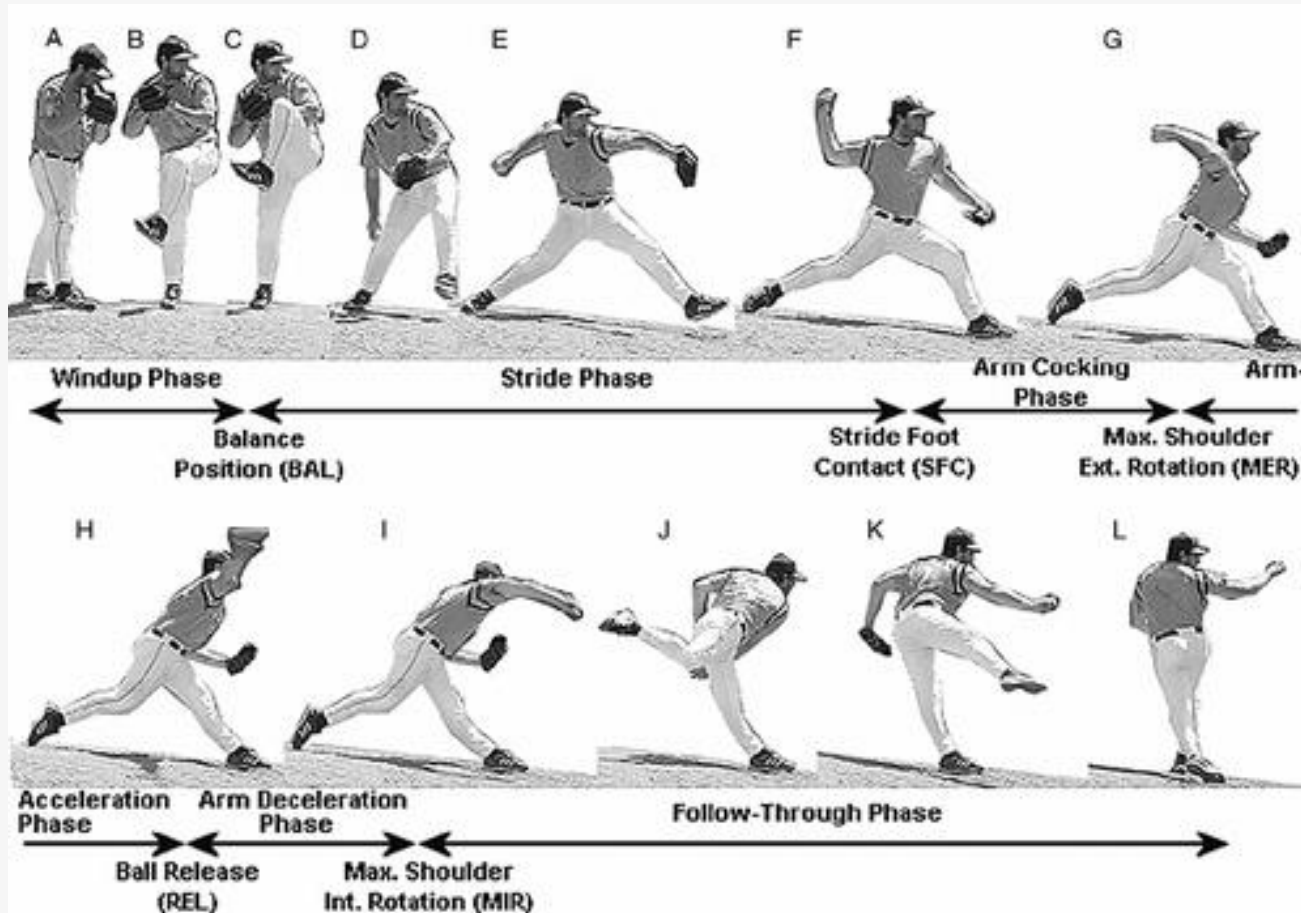


Phases of the Throwing Motion



Wind up

- Initiation of throwing motion
- Hands are together
- Ends when lead leg has reached max height
- Very little activation of UE musculature



Stride

- From max lead leg height to lead foot contact
- Hand separates from glove
- 90° ABD & 60° ER



Cocking Phase

- Front foot contact to max shoulder ER
- **Early Cocking**
 - Initiation of external rotation
 - Usually between 60-90° at time of foot strike
- **Late Cocking**
 - Characterized by max ER of the shoulder
 - HIGH levels of torque on shoulder & elbow
 - Late cocking to acceleration is the fastest recorded human movement at 7000 °/s at the GHJ

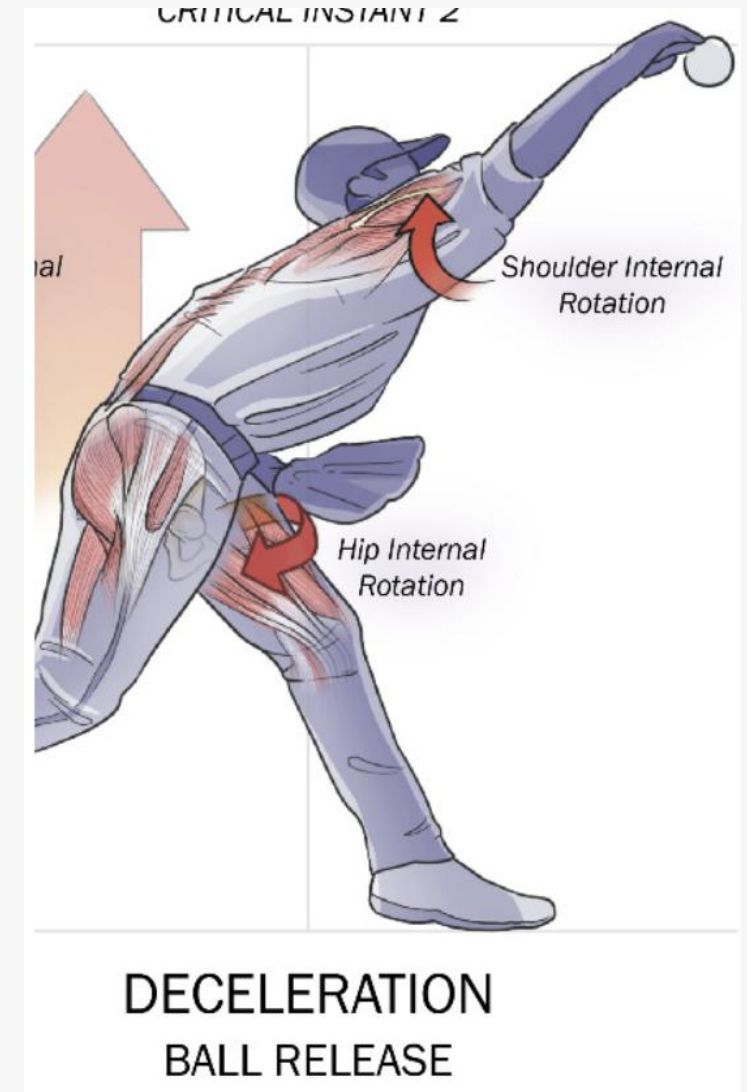


Acceleration Phase

- From max ER until ball release
- Internal rotation torque at shoulder
- Varus torque on elbow
- Significant anterior force on humeral head

Deceleration

- Ball release until max internal rotation
- High stress on posterior shoulder (1.5x BW)
- Has to slow the arm down & counteract distraction forces



Follow Through

- Continuation of deceleration phase
- Terminal extension of the elbow
- Slower with reduced forces present
- Ends when forward momentum of the player subsides and balance is achieved (ready to field position)



“Critical Instants”

1. Max shoulder ER

- Bicep torsion which could affect its attachment to labrum
- Anterior shearing of humerus in glenoid stressing capsule
 - Stressing posterior cuff → internal impingement
- $>90^\circ$ shoulder ABD could lead to impingement of RTC
- If shoulder ER restricted could lead to stress on capsule or increased elbow stress

2. Ball release

- Eccentric forces on posterior shoulder
- High valgus stress on elbow

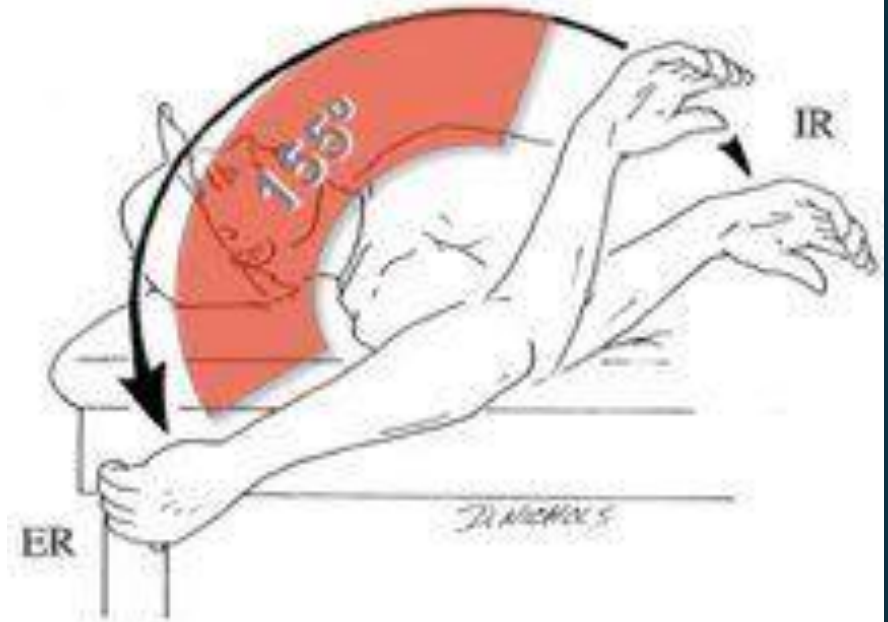
Thrower-specific pathology

- GIRD
- SLAP Tear
- Proximal Humeral Apophysitis
- Thrower's Exostosis



GIRD (Total Arc of Motion Deficit)

- General loss of kinematics related to muscular tightness, anterior capsular laxity, and some posterior capsular tightening
- Pitchers with Total motion deficit were 2.2x more likely to experience injury
- Routine stretching protocol can maintain ROM of the shoulder throughout the season and reduce injury
- Unsupervised weightlifting during season can potentiate this soft-tissue imbalance





GIRD History and Physical

- History
 - Often generalized, vague shoulder pain and/or elbow pain
 - Decrease in velocity, accuracy, typically experience arm-side run of their pitches
- Physical
 - +/- impingement symptoms
 - Supraspinatus weakness
 - + sulcus sign
 - Measure in supine position!
 - >25° deficit in total arc of motion compared to contralateral side
 - OR loss of IR compared to contralateral is greater than the gain in ER compared to the contralateral shoulder

PT Assessment of Throwing Athlete (ROM)

1. Shoulder ER
 - Supine, 90° ABD, 10-15° horizontal add (elbow off table)
 - Take arm to end feel & measure
2. Shoulder IR
 - Same position as ER measurement
 - Stabilize coracoid process with thumb, rest of fingers are on posterior scap
 - Move into IR until coracoid process “pops up” into thumb
3. Shoulder Flex
 - Supine, take arm overhead for initial assessment
 - Supine, block lateral border of scapula, take arm overhead to assess soft tissue limitation
 - Expect 175-180°
 - Check lats, pec & other internal rotators for limiting ROM



PT Assessment of Throwing Athletes (UE Strength)

- ER- Supine 90/90
- IR- Supine 90/90
- Scaption- Seated 90° elevation
- ABD- Seated 90° elevation
- Prone Y
- Prone T
- Grip strength

PT Assessment of Throwing Athletes (LE Eval)

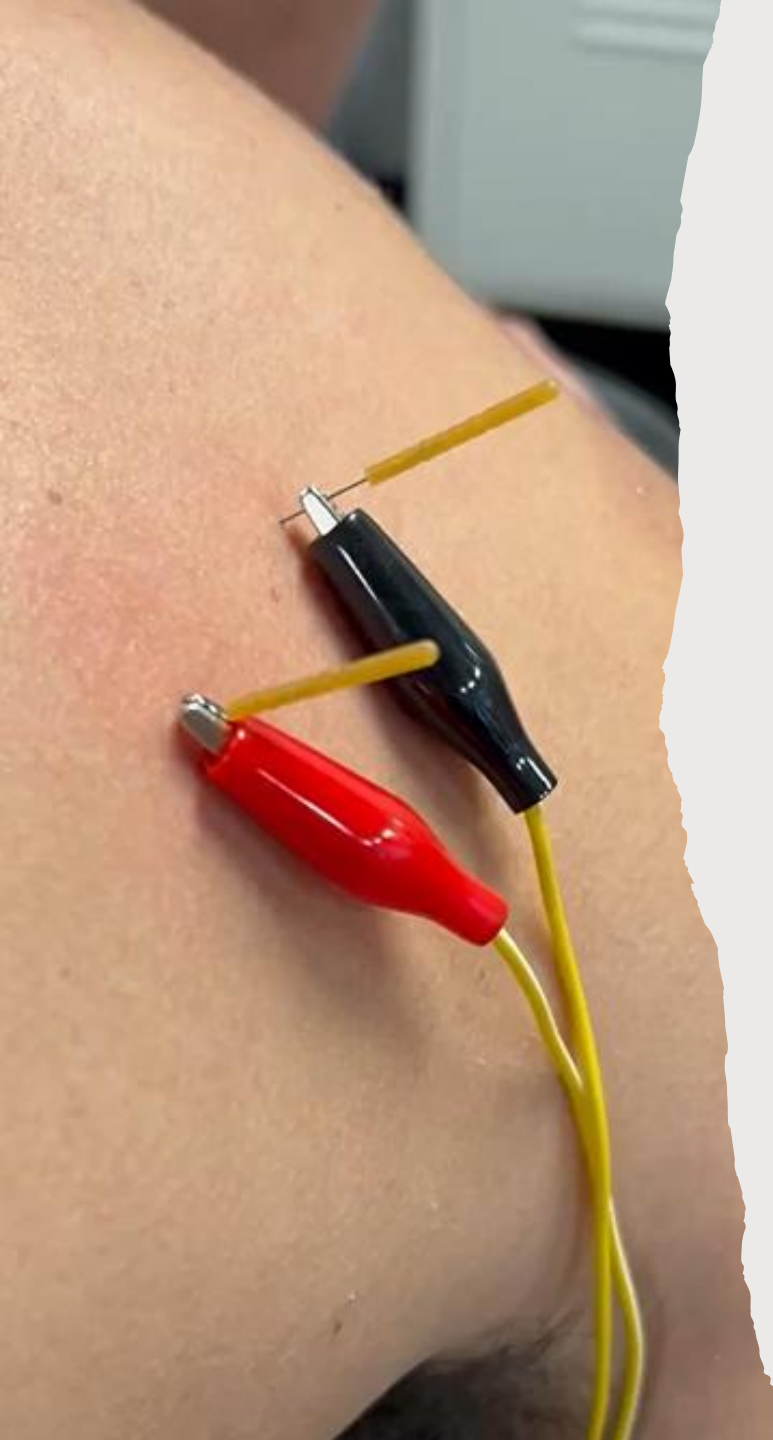
- **Don't forget the role that core and LE's play!**
- Hip Abduction: Can the athlete generate power from lateral push off
- Core: can the player separate pelvic from core and stabilize for transfer of power
- Knee Extension: can the player post on the lead leg at foot contact & decelerate momentum
- Balance: slight loss of balance in wind up → 1-2" lateral deviation from "correct" initial foot contact → ball 4 instead of strike 3



General Treatment

Overhead athletes are complicated. Don't over complicate their treatment

1. Know your numbers: what is expected for a healthy OH Athlete
2. Assess well
 - Take the time to make a standard testing battery that you do on all OH athletes
3. Make a plan to address where assessment numbers don't match expected numbers
 - For manual treatment, pick what you are good at.
 - I have a lot of luck with FDN & pin and stretch
 - Don't change for changes sake
 - If it's working stick to it, progress it as tolerated



Superior Labrum Anterior- Posterior (SLAP) Tear

- Biceps anchor at the superior labrum
- “Peel-back” mechanism?
 - Kuhn shows higher failure in cocking than deceleration
 - Clavert shows higher tear with shearing forces
- Varied return to play rates
 - SLAP repair rates are great for non-overhead throwing athletes

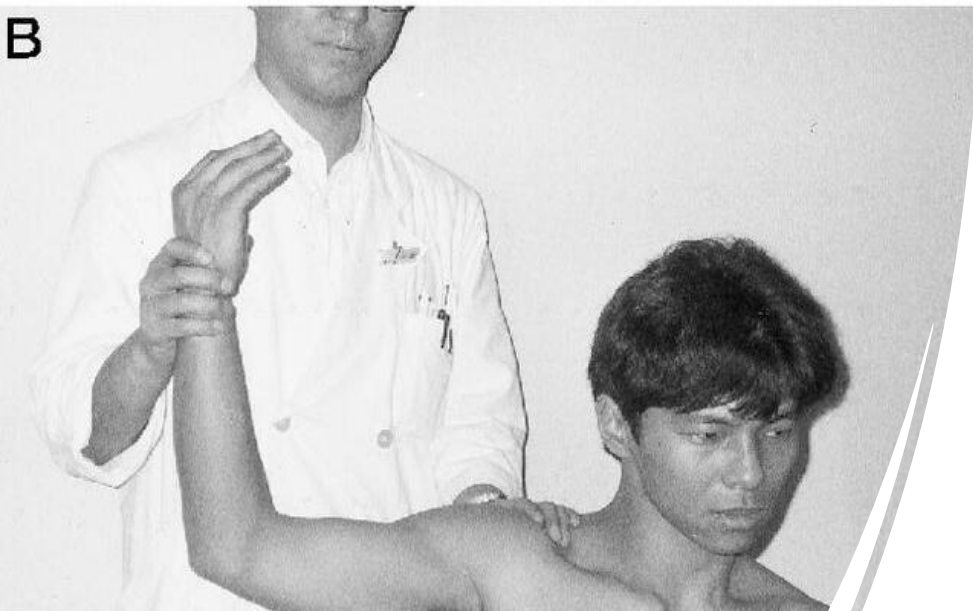
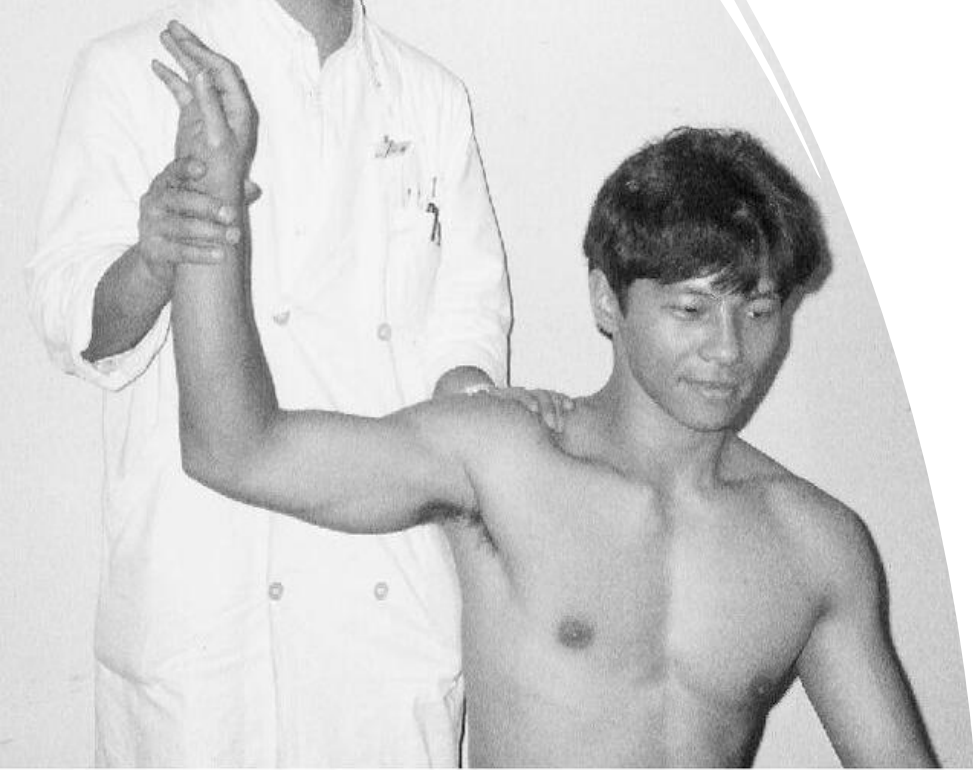




SLAP History and Physical

- Deep, aching shoulder pain
 - Often sensation of clicking or popping during lay-back
 - Typically, gradual in onset
 - Loss of velocity
 - Sensation of heavy arm or lack of control with deceleration/follow-through

SLAP History and Physical



- Physical Exam:
 - ROM!!
 - RTC Strength
 - Scapular winging/scapular dyskinesia
 - Latissimus and pectoralis strength (imbalance)
 - O'brien Test
 - Mimori Test

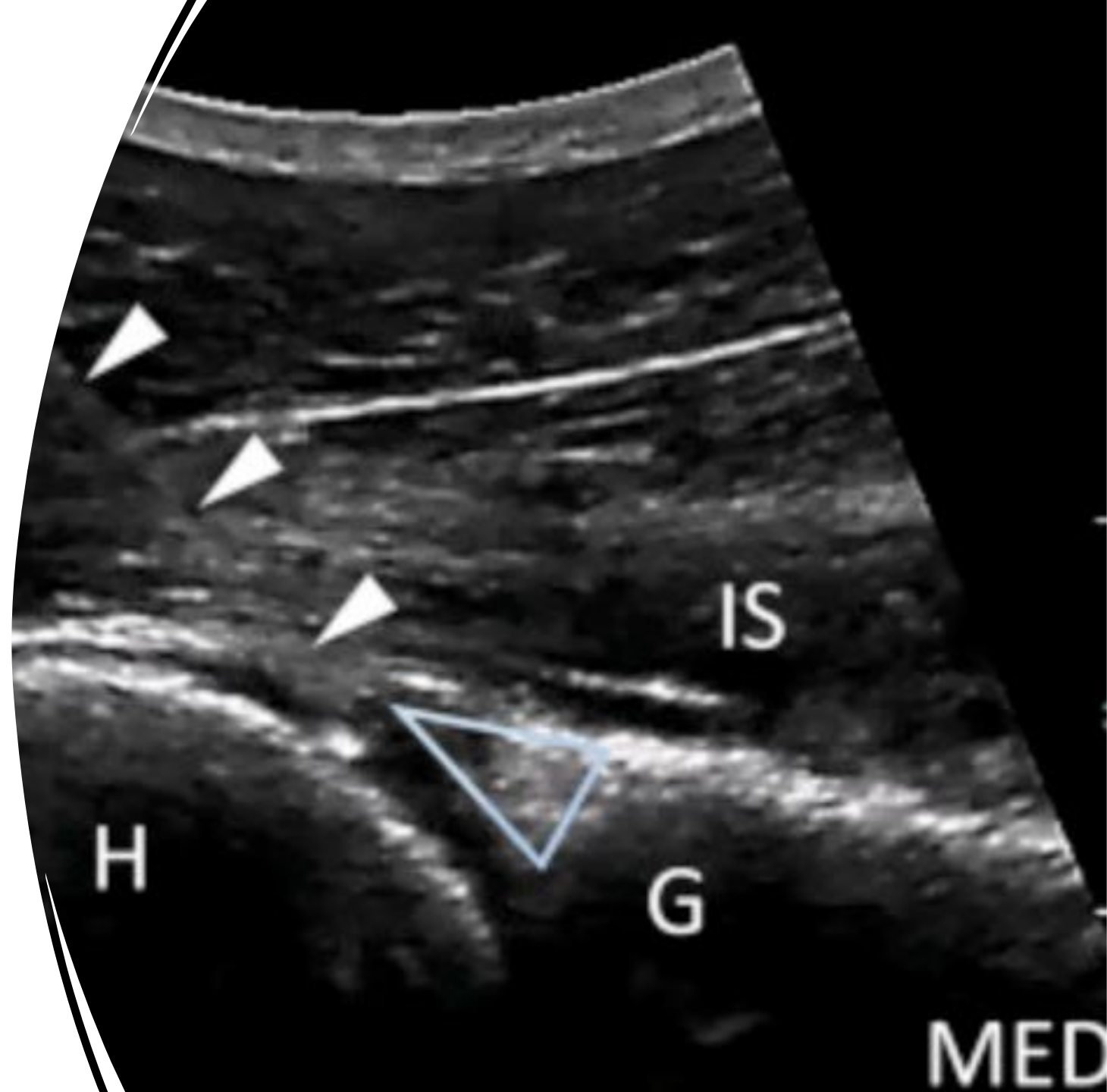
An MRI scan of a shoulder joint in a sagittal view. A white arrow points to a hyperintense (bright) area at the superior labrum, indicating a SLAP tear. The humeral head is visible below the labrum.

SLAP Imaging Findings

- Little clinical role for x-rays
- MRI without arthrogram commonly miss SLAP tears
- Many normal anatomical variants such as labral sulcus can be seen on MRI
 - PPV as low as 24%
- Arthroscopy is the only definitive diagnostic measure

SLAP: Role of Injections

- Therapeutic and diagnostic
- Glenohumeral Corticosteroid injection
 - 75% symptom resolution after 1 shot
 - 85% after 2 shots
- Biceps Tendon Sheath CSI
- PRP
 - Limited evidence for SLAP specifically but promising for biceps tendinitis and RTC tears





SLAP RTP Statistics

- Steinmetz meta-analysis: 76.6% after completion of full rehab program vs 42.6% in surgical group
- Fedoriw MLB analysis: 40% RTP and 22% RPP with rehab protocol vs 48% RTP and <7% RPP for surgical group in the pitcher cohort
 - Position player cohort: RTP 49% and RPP 26% vs 85% and 54% for non-surgical vs surgical respectively
- Park: 76% RTP after SLAP repair for all overhead athletes but only 38% for baseball players
- Gorantla meta-analysis: RTP rates vary between 40-94% while RPP range between 20-94%. Isolating baseball players: 22-64% RTP.

SLAP: PT considerations

- Establish pain-free/stable full ROM
- Reduce bicep load at beginning phases of treatment
- Dynamic stabilization of the GHJ & scapula
 - Limit translation of GH (most likely what got us here in the first place)
- Keep you athlete conditioned during entire rehab process
- Strong legs and core keep your athletes out of your clinic



SLAP: PT considerations

- **Early Phase (weeks 1-4)**
 - Symptom management
 - Activity modification: How can we keep them in shape?
 - Bike, elliptical (arm stabilized), incline walking, etc
 - Begin restoring painfree/stable ROM
 - PROM/AAROM as tolerated
 - Isometrics (not forward flexion) & scapular stabilization exercises
 - Soft tissue as needed to maintain/improve flexibility
 - Core & Lower Body training



SLAP: PT considerations



- **Intermediate Phase (weeks 4-8)**
 - Strength progression
 - Serratus anterior & LT are main stabilizers when shoulder is ABD 90° or more. If neglected UT & Lev scap can create impingement in the shoulder
 - Progress RTC isotonics such as Thrower's 10
 - Increased difficulty of scapular stabilization exercises
 - Begin light CKC exercises (pain free)
 - Progress/Maintain Full ROM
 - CORE & LEGS
 - Conditioning

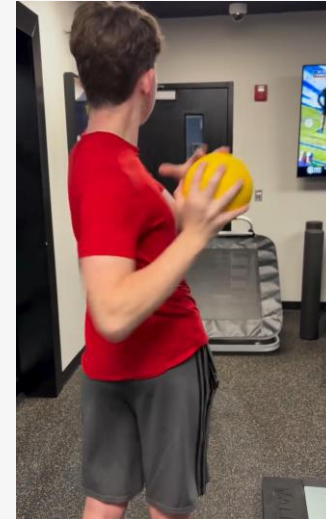
SLAP: PT considerations

- **Advanced Strengthening Phase (weeks 8-14)**
 - Continued progression of RTC strength & dynamic stability
 - Begin bicep strengthening
 - Plyometrics at week 10-12
 - Constant assessment of ROM
 - If ROM declines must reduce volume of strengthening or increase volume of ROM/manual treatment to reestablish ROM
 - Full strength + Lacking ROM = reinjury
- Core & Legs
- Conditioning



SLAP: PT Considerations

- Return to Activity Phase (weeks 14-26)
 - High level strength & dynamic stability exercises
 - Single arm plyometrics
 - Maintain full ROM
 - Build endurance
 - Pitchers may need to throw 90+ pitches



SLAP: Recovery Timeline

- Operative
 - AROM week 3-4
 - Strengthening week 4-6
 - Plyo's week 10-12
 - Throwing week 16-18
 - **RTP 8-12 months** (8 month is absolute earliest)
 - Return to prior level of play for surgical repair of SLAP is around **7%**
- Non-operative
 - Extremely variable but expect 4-6 months
 - Return to prior level of play for **42%**



Proximal Humeral Apophysitis

- Seen in skeletally immature patients
- Results in stress fracture or Salter-Harris I fracture of the proximal humeral physis
- >10% of all shoulder pain in pediatric patients



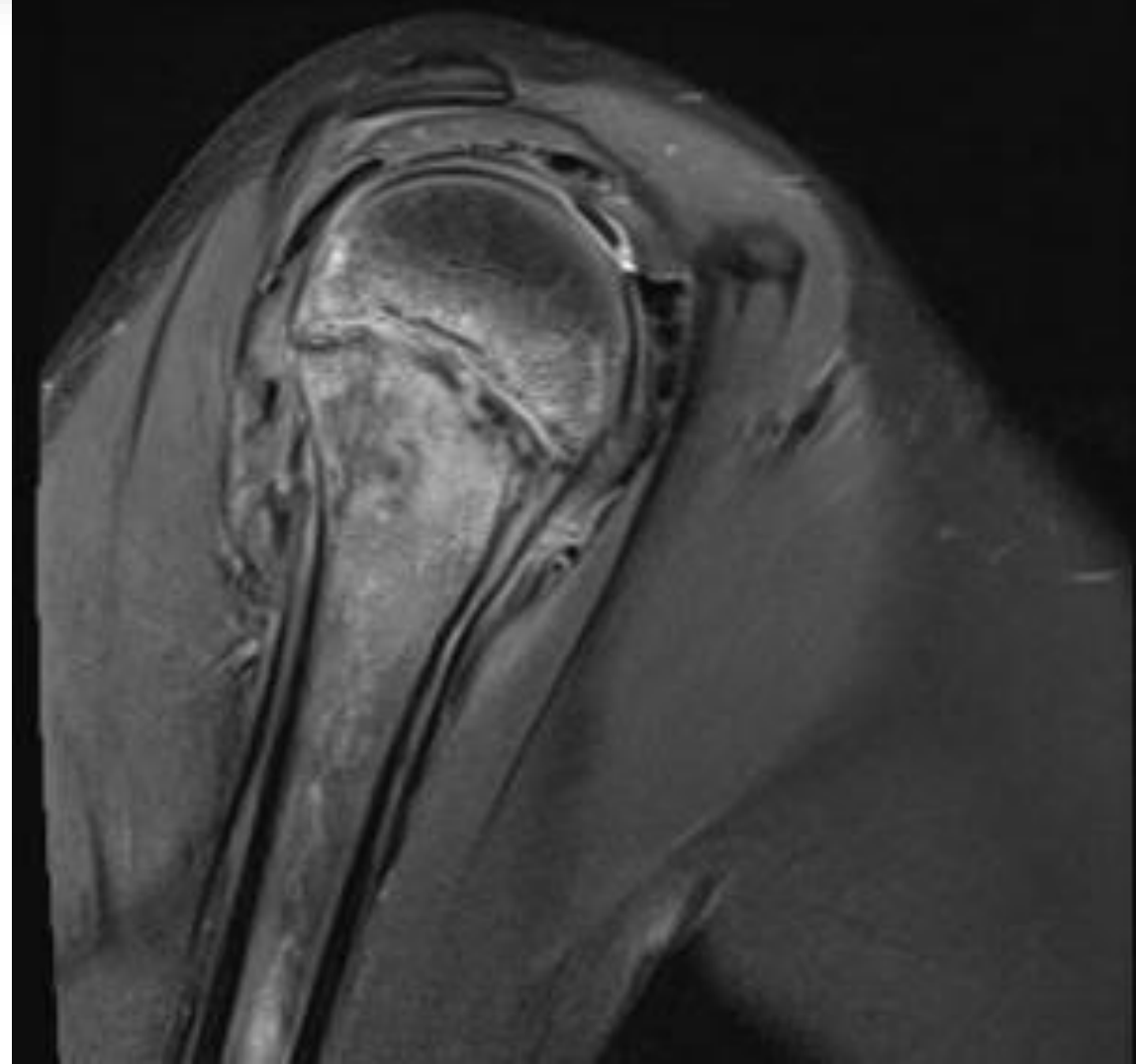
Proximal Humeral Apophysitis History and Physical

- History
 - Shoulder pain along lateral aspects typically
 - Cocking phase and deceleration
 - Multiple positions
 - Little to no rest from throwing throughout the year
 - Too wide a repertoire of pitches at too young an age
- Physical
 - ROM normally intact
 - RTC weakness
 - Tenderness along proximal humerus



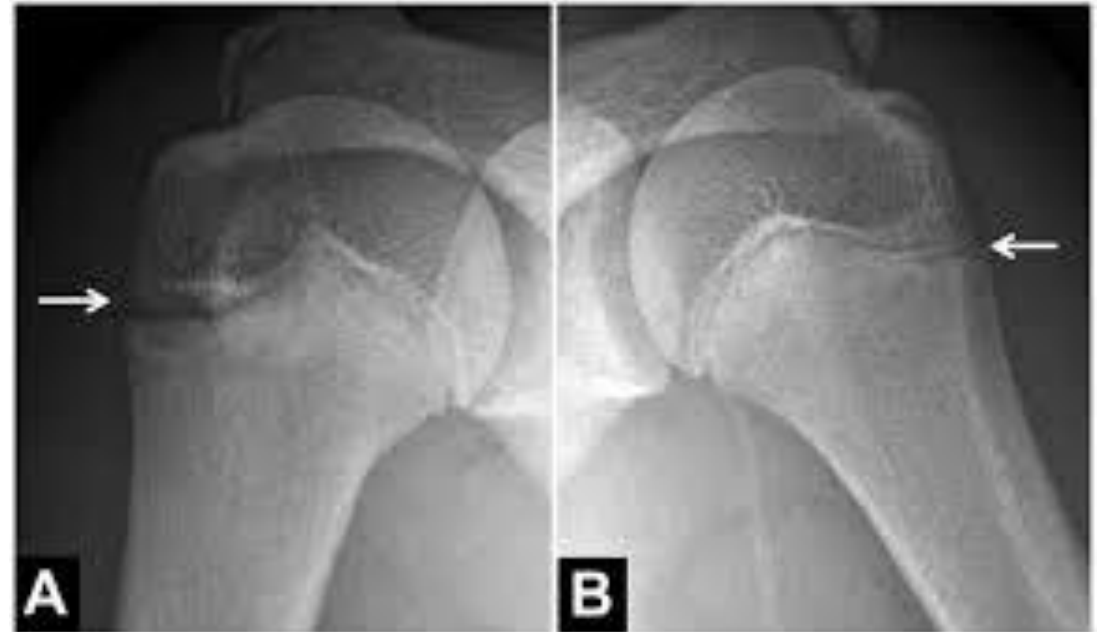
Proximal Humeral Apophysitis Imaging

- X-rays
 - Often all that is necessary
 - Widening of proximal humeral physis compared to contralateral side
- MRI
 - Edema around the physis
 - May be helpful to rule out cuff or labral pathology



Proximal Humeral Apophysitis Treatment

- **Appropriate rest is key**
- Must be pain-free for 6 weeks (ideally 3 months off from throwing)
- Successfully complete ITP without pain
- PT Recovery timeline:
 - 8-12 weeks of rest from throwing is recommended to allow healing from the stress on the physis
 - Once the following are completed begin throwing program
 - 8+ weeks has passed since eliminating all throwing activities
 - ROM meets requirements (no pain reported)
 - Strength > non throwing arm (no pain reported)



Proximal Humeral Apophysitis Prevention



- Must have 3-4 months of arm rest throughout the year (cross-training!)
- Follow Pitch Smart pitch counts
- Discourage use of curveball until skeletal maturity has been reached
- Encourage all pitchers to follow Thrower's 10 for routine arm maintenance
- Avoid heavy throwing combos like pitcher-catcher

Thrower's Exostosis

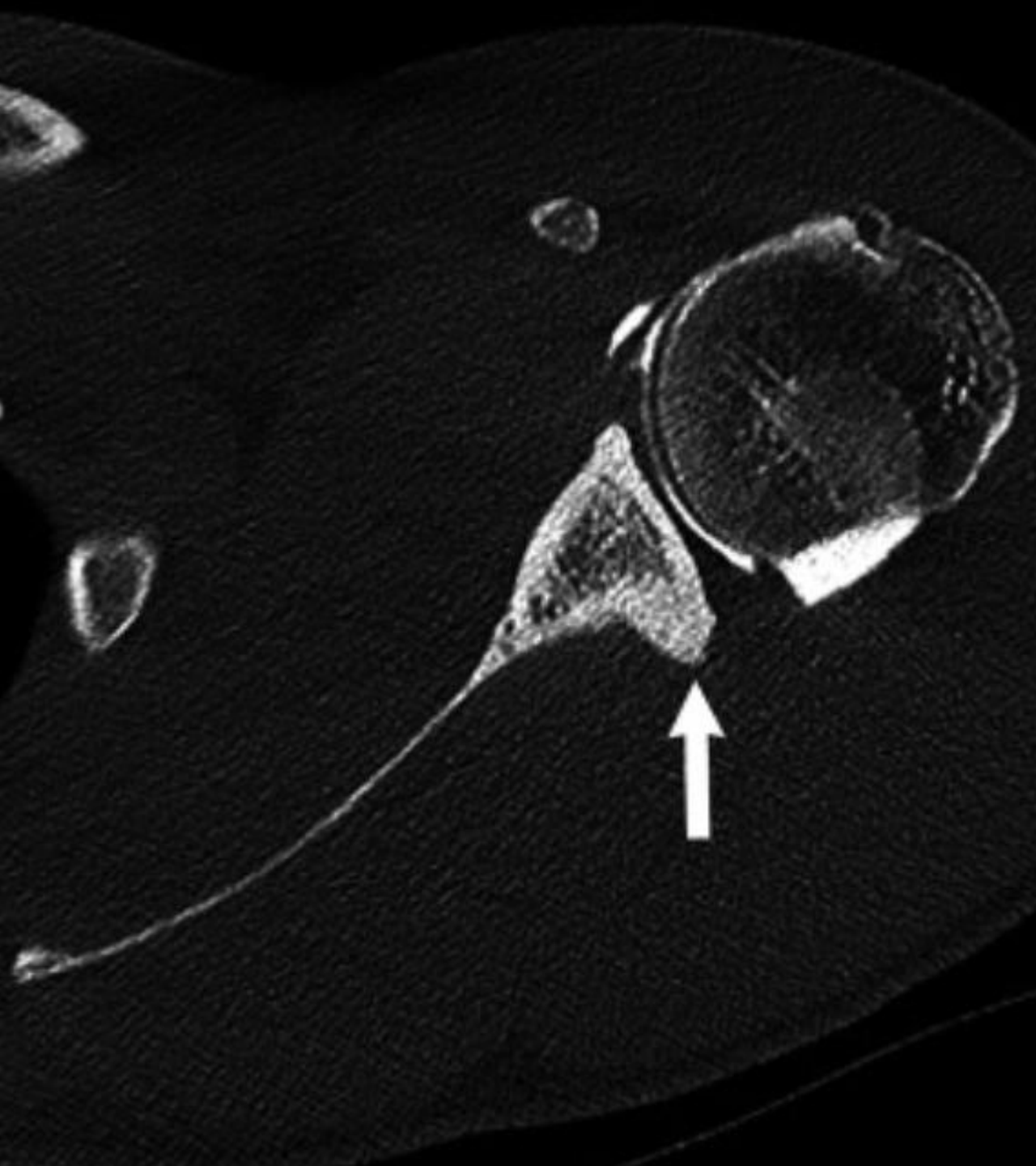
- Lesions of the posterior inferior glenoid
- 22% of all pitchers have radiographic lesion
- Often asymptomatic
- Thought to be a traction injury from the triceps insertion onto glenoid
- Often causes internal impingement



Thrower's Exostosis History and Physical

- History:
 - Posterior shoulder pain
 - Typically pain with follow-through
 - Bothersome only with high velocity pitches
- Physical:
 - Often tender over posterior glenoid
 - Positive hornblower test
 - Pain with full passive ER
 - GIRD





Thrower's Exostosis Imaging

- X-rays
 - Often require special views such as the Stryker view to isolate the posterior glenoid
- MRI
 - Necessary for evaluation of labral pathology
- CT
 - Can show extent of bony abnormalities

Thrower's Exostosis

Treatment Considerations

- May respond well to non-operative management
- Majority of cases undergo arthroscopic debridement
 - Detached exostosis are risk factor for non-operative failure
- Corticosteroid injections at the exostosis site or subacromial bursa
- PT
 - Focus on pectoralis:latissimus imbalance
 - Triceps function and strengthening



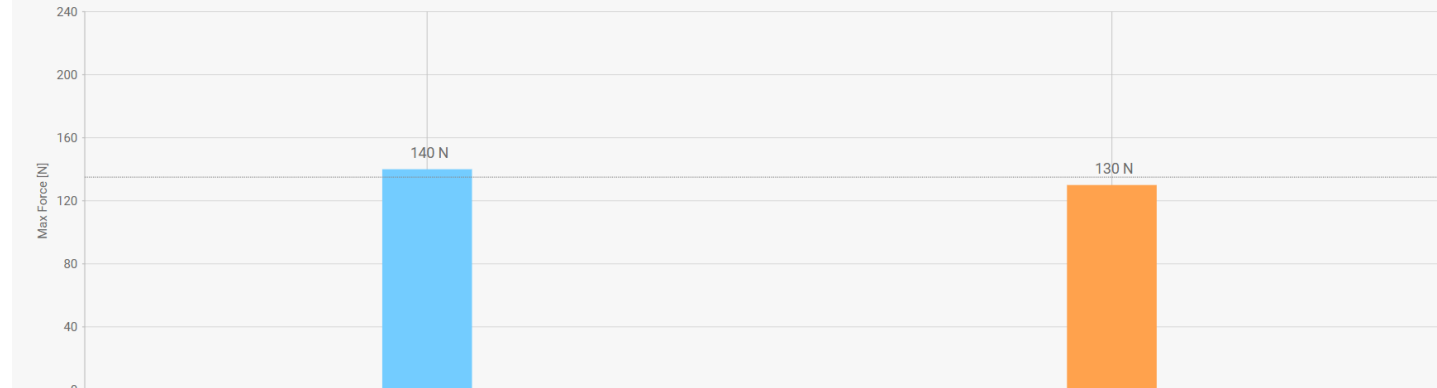
Return to Play Criteria

Throwing

- Full Functional ROM
 - 180* flexion & ABD, 185* of ER+IR
- No signs & symptoms of instability
- Pain free
- Adequate strength & dynamic stability
 - ER/IR Ratio 75%
 - ER/ABD Ratio 70%
 - ER/BW ratio 20%
 - IR/BS ratio 30%
- Completion of appropriate throwing program based on time off & position

MAX FORCE [N]

Range Average Asymmetry
130 - 140 135 6.8% L



AX FORCE [N]

Average Asymmetry
110 104 11.8% L



Preseason Screening

- Importance
 - Alert us to any movement faults prior to extreme stressors on the shoulder
 - ROM limitation, weakness, pain with movement, instability
 - Across time we can compare year to year to make necessary adjustments to offseason programming
 - Performance regression without pain
 - Can rescreen and compare to when Performance was at a higher level to find the fault
 - If we catch/correct prior to pain could reduce downtime/injury



Resources

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Questions?