Rotator Cuff Injuries

Understanding Outcomes and Return to Work

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Rotator Cuff Injuries

Why are we concerned?

- A leading cause of shoulder related disability
- In US, 4.5 million annual doctor visits for rotator cuff trauma
- 2/3 of rotator cuff repair patients are working age
- Common injury in the workers compensation population
- High costs in compensation claims
- Reduces work productivity

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Societal Cost

- Direct costs
  - Associated with diagnosis and treatment
- Indirect costs
  - Lost income
    - Inability to work or lower wages
    - Missed workdays
    - Disability payments

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Societal Cost

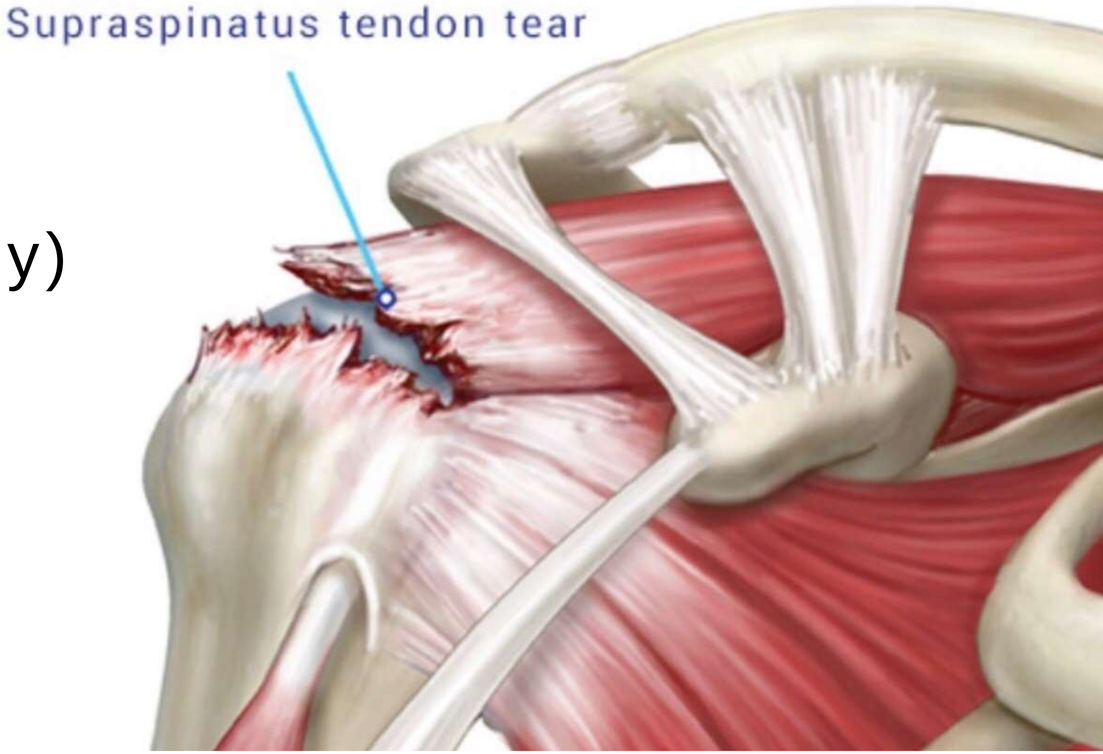
- 250,000 rotator cuff repairs annually in US
  - $6,367 per patient
- Majority achieve excellent outcomes and return to work (RTW)
- Rotator cuff repair creates an increase in quality-adjusted life-years for all patients, irrespective of age
- Estimated $3,442,750,000 lifetime societal savings per annum (for the 250,000 yearly rotator cuff repairs done in the US)

Rotator Cuff Injuries

Prevalence

Prevalence increases with age (AAOS)

- 54% of people over the age 60 - asymptomatic PRCT or FTT (MRI study)
- Age <50: 13% FTT
- Age <60: 20%
- Age <70: 31%



Rotator Cuff

What is it?

- 4 muscles that form a broad tendon that covers the head of the humerus in the shoulder
- Attaches the humerus to the shoulder blade
- Helps stabilize, lift and rotate the arm

Anterior View

Posterior View

Rotator Cuff Injuries

Who is predisposed?

Risk Factors

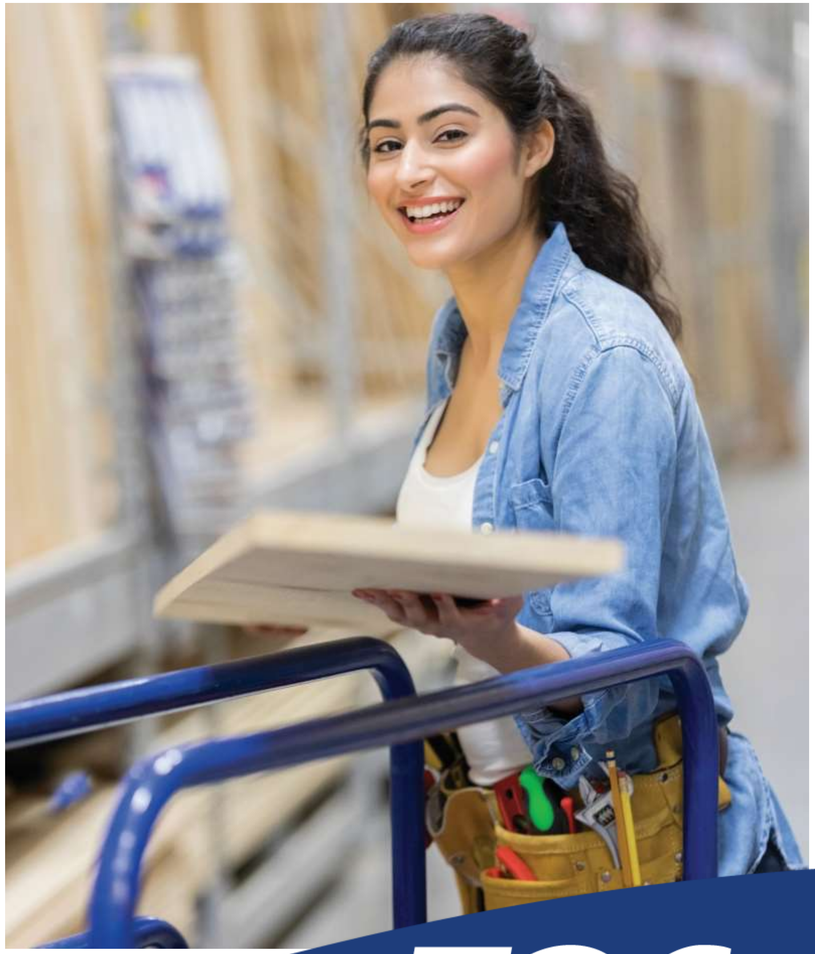
- Age - Normal wear and tear
  - >40yo at greater risk
- Smoking
- Hypercholesterolemia
- Family history

Rotator Cuff Injuries

Predisposed Employees

Repetitive/prolonged overhead activity

- Athletes, painters, carpenters, etc.
  - Athletes vulnerable to overuse tears/repetitive microtrauma
    - Baseball pitchers, tennis players, etc.
  - Shorter stature



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Predisposed Employees

Traumatic injury to shoulder

- Younger people - most tears caused by traumatic injury (fall, heavy lift, shoulder dislocation)
- Older people (>40)
  - Shoulder dislocation think RCR (60%)

How do RC tears happen?

Mechanism of tear

Chronic degenerative (intrinsic) - a continuum of disease

- Starts bursitis/tendonitis to partial and full thickness tears
- Older patients - wear and tear
- SIT muscles (Supra-, Infra-, Teres minor)
- Acute on chronic injury or “aggravation of underlying problem”
- PRCT heal with fibrocartilage and weaker tendon-bone attachment
  - poor healing potential may contribute to tear progression
  - 44% progress median 5 yrs

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How do RC tears happen?

Mechanism of tear

Subacromial impingement

- Starts *bursal* surface or inter-substance
- Progression likely
  - Increased time of symptoms
  - Increased Intensity or frequency of pain


Acromion


Acromion

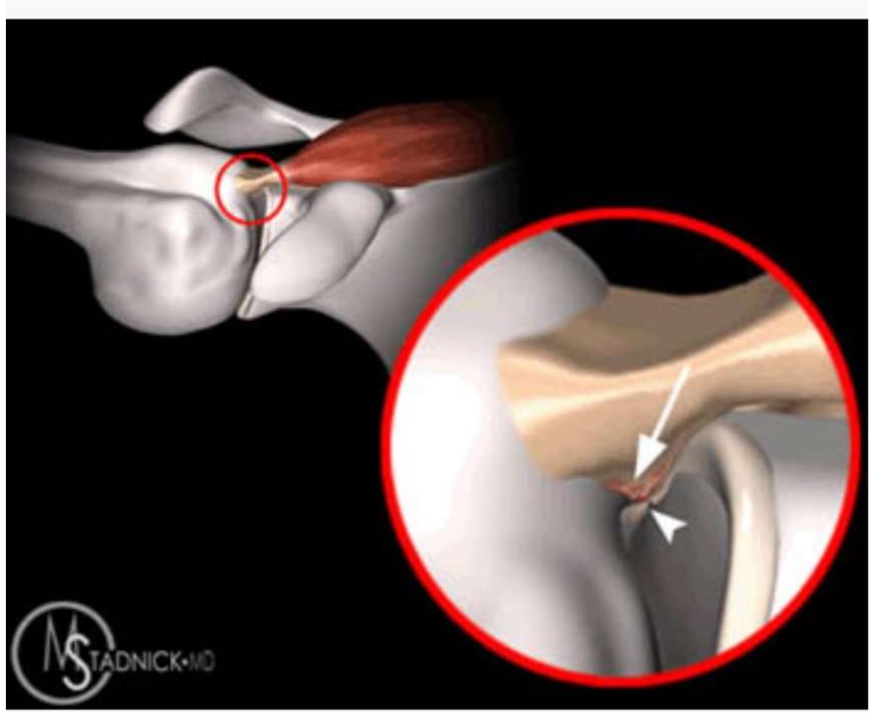

Acromion

How do RC tears happen?

Mechanism of tear

Internal Impingement - starts *articular* surface (OJSM 2021)

- *Overhead lifting/reaching* increases risk of shoulder pain and injury
- supraspinatus contacts glenoid with overhead reaching
- 123° (range 105 - 145°)
- Repetitive or prolonged overhead activities increase risk
- Taught mitigating strategies, consider height of potential employee or provide step stool to reduce overhead work



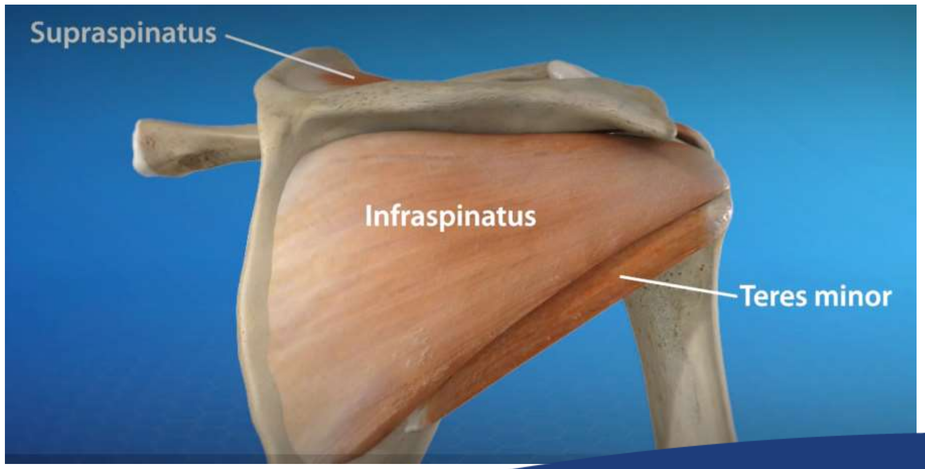
How do RC tears happen?

Mechanism of tear

Acute avulsion injuries

- Younger patients (<40) with falls/dislocation - subscapularis

- Age >40 shoulder dislocation
  - SIT muscles (Supra-, Infra-, Teres minor) - 60%



Why can shoulder pain get worse?

**New onset shoulder pain in a previously asymptomatic PRCT or an increase in pain in an already symptomatic worker may indicate tear enlargement. Most likely in tears >50% thickness

- Keener et al
  - Tear *progression* was risk factor for new onset pain
- Mall et al
  - 40% symptomatic PRCT *progressed* to FTT
- Matthewson et al
  - 55% high-grade (>50%) PRCT *progressed* vs 14% low-grade (<50%) PRCT

Tear Progression

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Understanding Outcomes

WC enigma

Meta-analysis (all studies published from 1980-2007 shoulder surgery in workers compensation population)

- All but 1 of 28 articles: correlation between WC shoulder injury and poor outcomes
- Difference in outcome thought to be not physiological
  - Psychosocial factors - fear of re-injury
  - Secondary gains - salary while not at work
  - Takes *longer to RTW* after occupational injury - may give *perception* of poorer outcome
  - Outcomes are generally good

Outcomes or perception?

Holtby el al 2009: examined the impact of a workers comp (WC) claim on reporting disability following shoulder injury

- 220 patients: 50% WC, 50% non-WC
- 41% RCR, 59% SAD ± ACJR
- Injured workers - higher level of reported disability before and after rotator cuff surgery
- *Both groups improved regardless of claim status* at 1 yr

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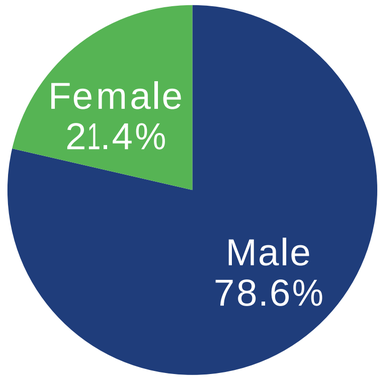
Predictors for Improved Outcomes and RTW

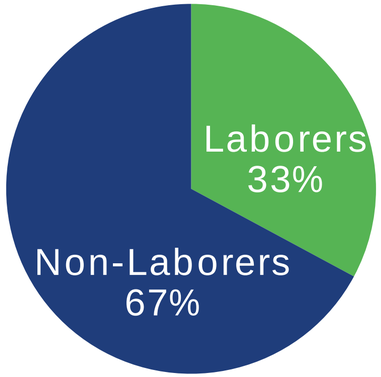
Gutman et al: 1/26/2022 Understanding Outcomes and the Ability to Return to Work After Rotator Cuff Repair in Workers Compensation Population

- 70 WC patients
- Ave 5.4 yr follow up (range 2.1- 8.8yrs)

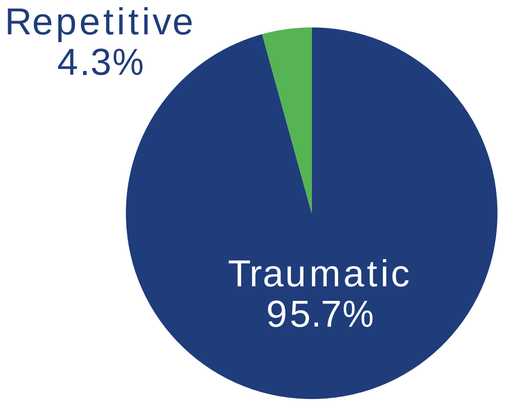
Gender



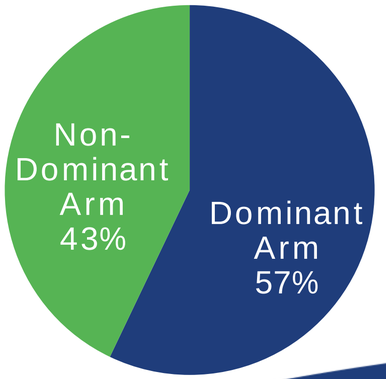
Labor Status



Injury Type



Arm Dominance



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Gutman et al

Ability to RTW

- 84.2% returned to work
- The sole predictor of RTW was surgery on non-dominant (96.5%) vs dominant (75.6%)
- Laborers showed decreased ability RTW (69.6%)
  - Laborers non-dominant (90%) vs dominant (53.8%)
- Worst RTW - laborers who had a dominant shoulder injury

Gutman et al

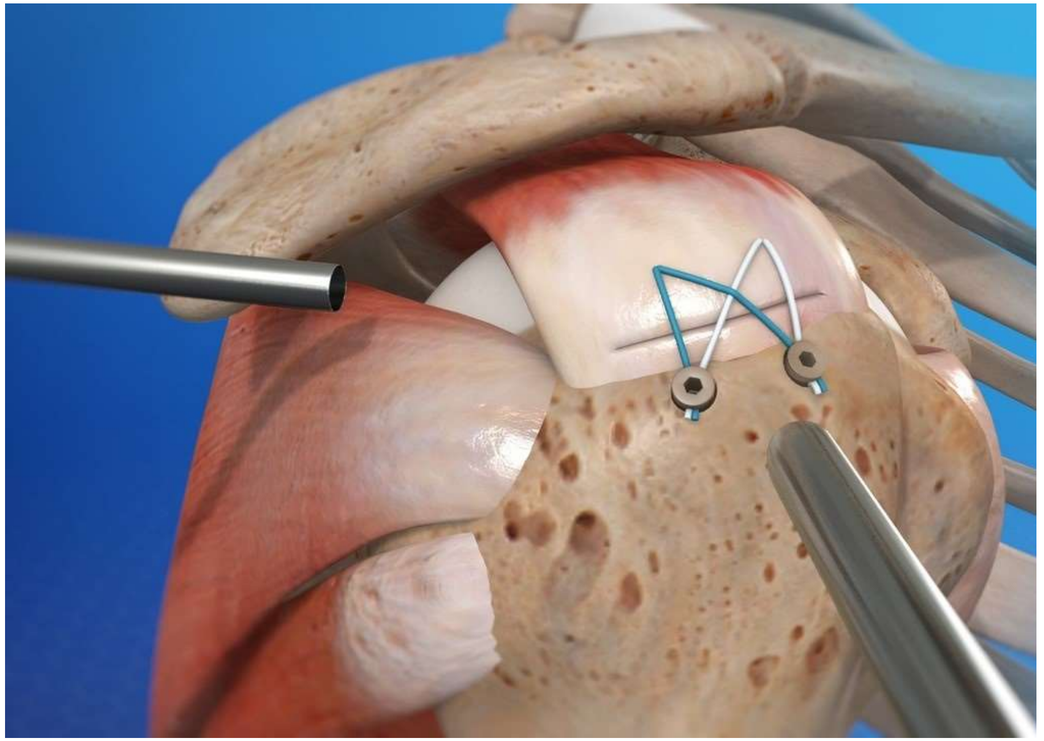
Predictors of RTW

- Shoulder function and pain scores - highly predictive of RTW
  - Higher shoulder satisfaction and shoulder function
    - assessed via ASES and SST surveys
  - Lower pain scores
    - via VAS survey
- >90% positive for ability to RTW
  - ASES of 54.2
  - SST of 6.0
  - Monitoring postop functional progression via these scores can be an effective means to evaluate how close a patient is to RTW

Gutman et al

Anticipated Outcomes

- Majority with WC claims achieve excellent outcomes and RTW from rotator cuff repair
  - Improved shoulder pain, functional scores and surgical satisfaction
- 3 tendon tear repairs (large-to-massive repairs) - worse functional outcomes and highest retear rate
- Recommend repair regardless of size to prevent tear progression and muscle atrophy



Return to Work

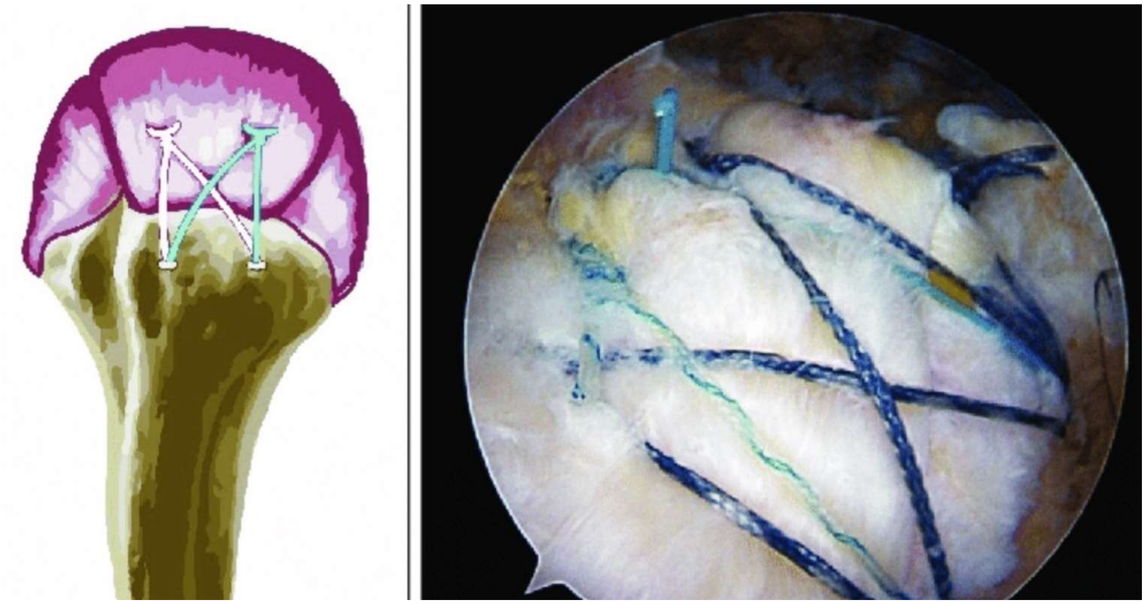
Other predictors?

- No statistical significance with RTW
  - Age, gender, BMI
- Medical comorbidities analyzed
  - Assoc: Increased CHLS (<RTW)
  - No association with RTW:
    - Heart disease
    - HTN
    - Diabetes
    - Mental illness
    - Smoking
    - ETOH use

DAVIS Postop Rehab

Initial Phase (pain down, PROM up)

- Protect repair and pain control
- Exception: massive tear may hold rehab 3-4 weeks



DAVIS Postop Rehab

Initial Phase (pain down, PROM up)

- Weeks 1-4:
  - Abduction pillow - minimize muscle activation and strain
  - Passive ROM - maintains motion, reduces pain
  - HEP - Scapular elevation, scapular retraction, elbow flexion and pendulums
  - Wean off narcotics within 7-10 days, use NSAIDS and topicals
  - First appt 7-10 days post-op to review surgical pics and help patient understand findings and outline recovery timeline

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Postop Rehab

Intermediate

Restore motion

- Weeks 4 - 8:
  - Sling without abduction pillow (outside home and in bed)
  - Let arm swing at side, lift nothing heavier than glass of water, keep arm close to body
  - PROM and AAROM (hold pulleys until painless motion), Isometrics
  - Office appointment weeks 4 and 8 - affirm progress and timeline

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Postop Rehab

Intermediate

- Weeks 8 – 12:
- Tendon healed, less pain, better motion
  - Strengthening and resistance exercises
  - Begins when motion pain-free

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Postop Rehab

Final

Improve shoulder function, patient satisfaction, and lower pain scores

- 4 - 6 months - Return to sports and manual labor
- Healing matures, able to tolerate greater stress
- Takes *longer to RTW* after occupational injury
  - May give *perception* of poorer outcome
  - Psychogenic factors - Fear of re-injury
  - Incorporate Work-hardening program
  - Employer expectations
  - Consider utilizing ASES, SST, and VAS surveys

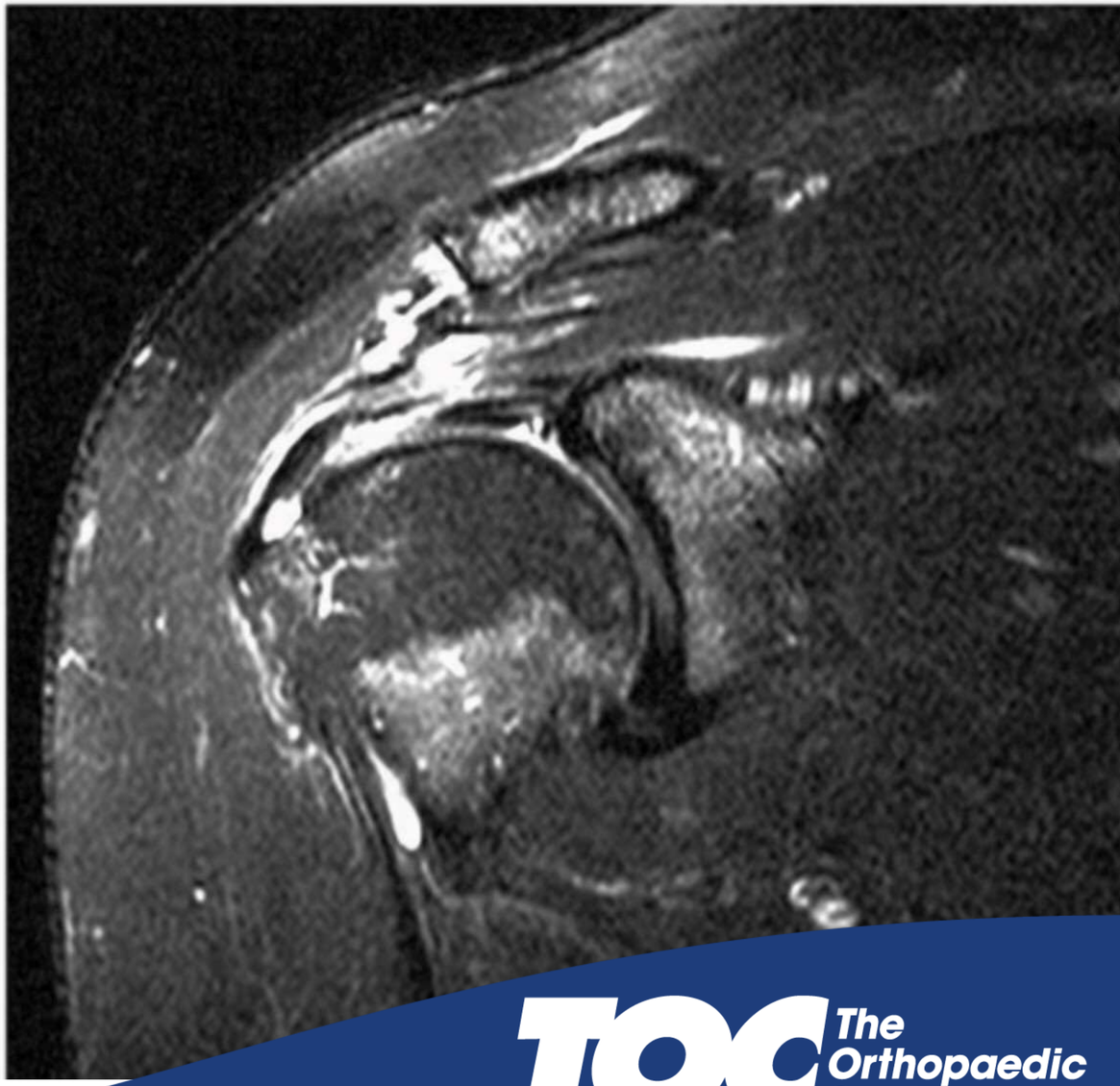
Arthroscopic Repairs

Gold standard?

- Partial thickness (PRCT) - biomechanical studies
  - >50% - increased strain on remaining tendon, progression
  - Strong evidence for conversion vs trans-tendinous repair
- Full thickness tear (FTT)
  - Recommend repair regardless of size to prevent tear progression and muscle atrophy
  - 3 tendon tear repairs - worse functional outcomes and highest retear rate
  - Biologics and/or scaffolds

Associated Conditions

- AC joint arthropathy
- Proximal biceps injury
- Instability
- SLAP tears



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Biologic Augments

The New Frontier

- Platelet rich plasma (PRP)
  - Animal models - higher strain to failure with more linear collagen fibers at 21 days
  - Han et al - (Meta-analysis) addition of PRP to repair of PRCT and FTT decreases retear rate and improves healing and clinical outcomes
- Mesenchymal stem cells - More evidence needed
- Biologic Scaffolds (synthetic, xenograft, autograft, allograft patches)

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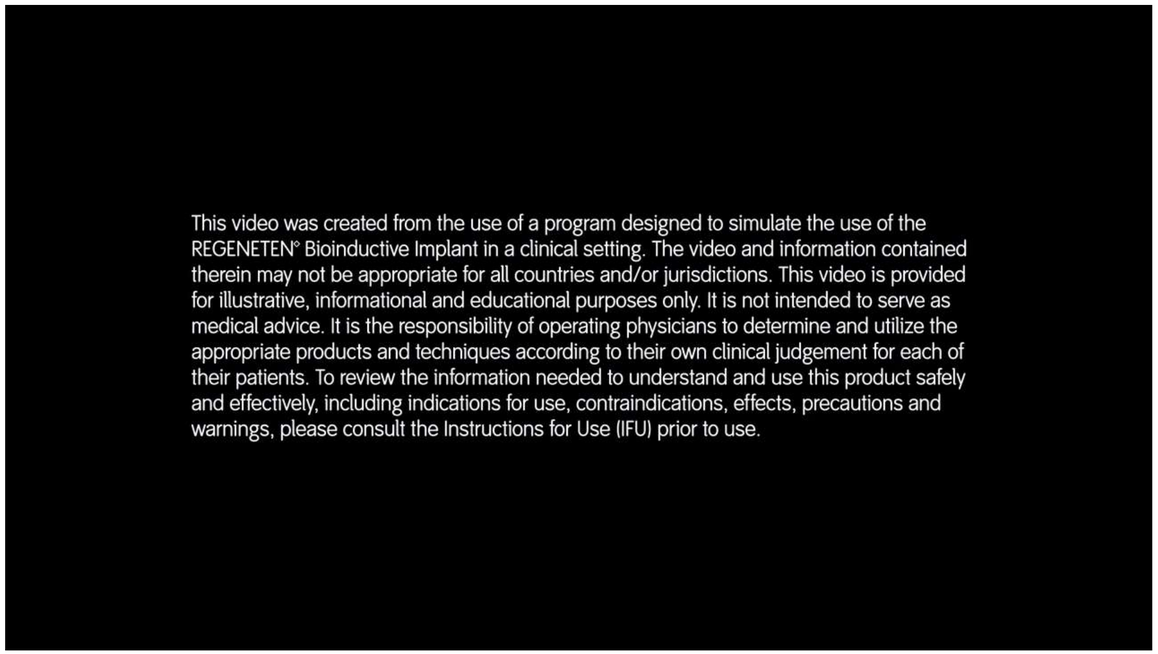
Regeneten

One option

- A bioinductive collagen patch
  - Thon et al - large and massive RCTs
    - Cellular incorporation, new tissue formation, maturation, implant resorption and biocompatibility
  - Schlegel et al - improved clinical scores at 1 yr, increased mean tendon thickness of 2mm



Questions?