MANAGEMENT OF ROTATOR CUFF PATHOLOGY:

THE ART OF TREATING ASIAN-AMERICAN PATIENTS

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10/8/16

Shoulder and Elbow Surgery

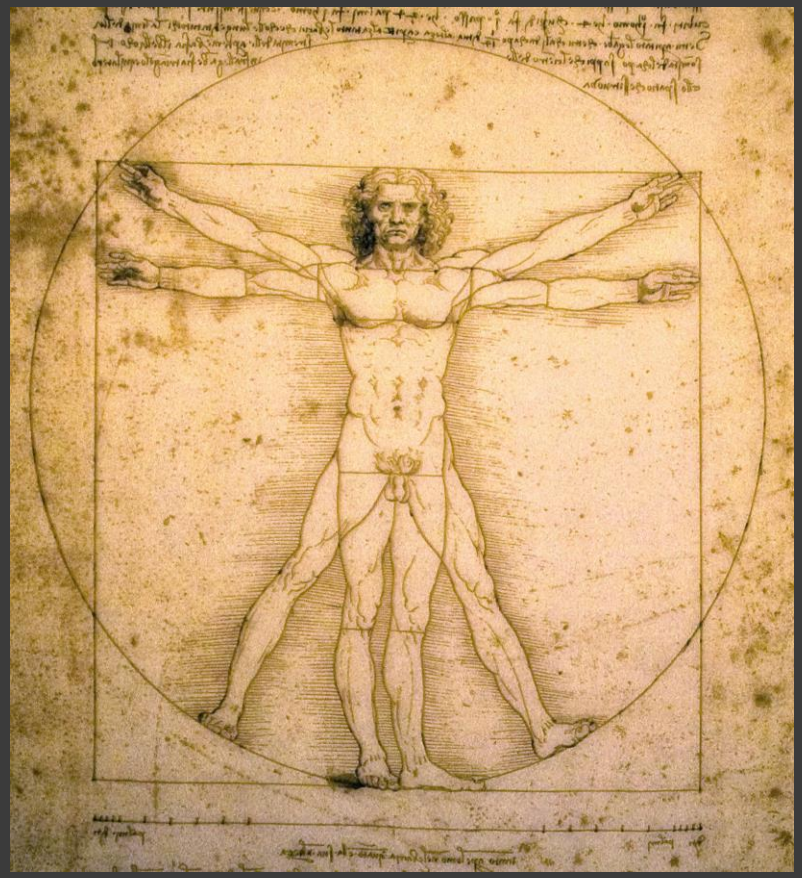
18th Conference on Healthcare of the Chinese in North America

Disclosure:

- Consultant: None
- Royalties: None
- Financial Investment: None

- No Pertinent Disclosures

Why was this painting so well know?



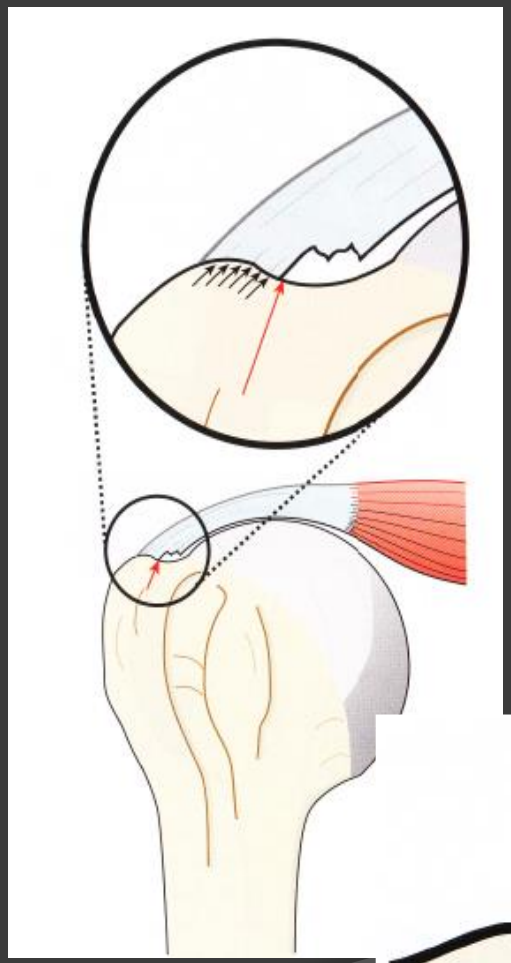
- Leonard Da Vinci- Vitruvian Man
- Golden Ratio:
  - Ideal human proportions
  - Symmetry
- Where Art Meets the Science!

Contemporary Rotator Cuff Treatment 2016

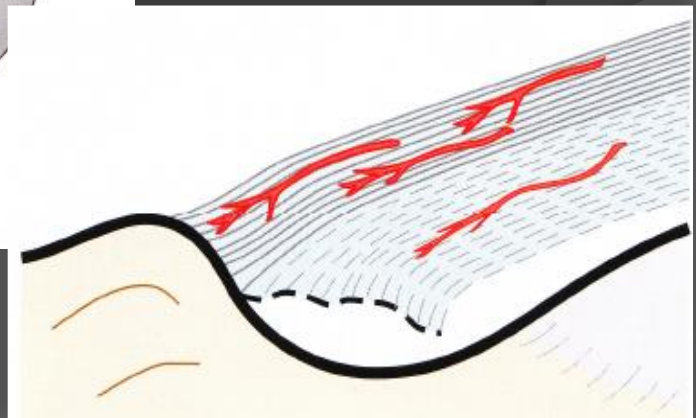
- Science:
  - Evolution of Concept
  - RCT: Biology problem
  - Treatment:
    - How to Maximize the Biology
    - Improve Mechanical Stability of Repair
- Art:
  - Complexity of Asian Culture
  - Difficulty Implementing Treatment

Science: What Is a Rotator Cuff Tear?

- Detachment of the tendon from bone
- INTRINSIC: Tendon/soft tissue pathology
  - Tendon degeneration
  - Tendonitis/bursitis
  - Vascularity
  - Calcification
- EXTRINSIC: Bony structure/anomalies
  - Structural – Bone spur
  - Traumatic



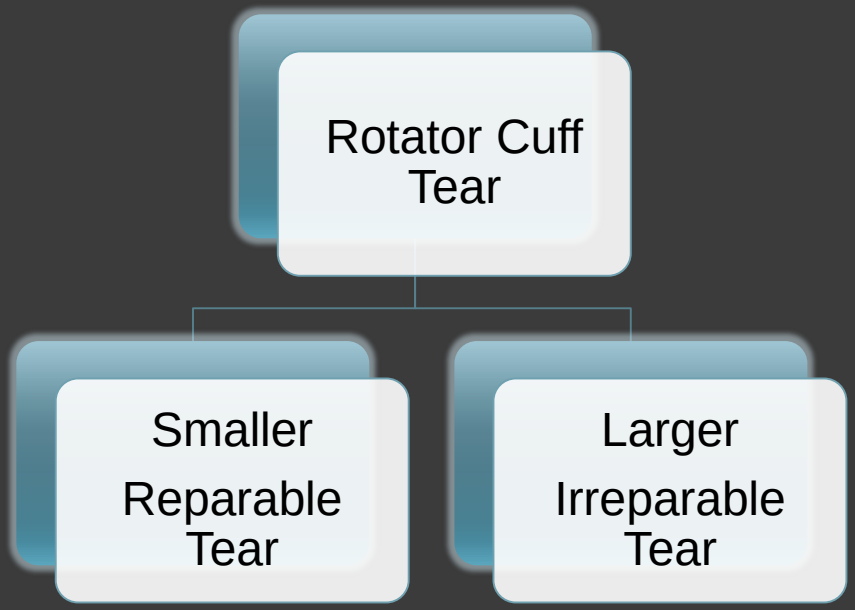
Gohlke et al.



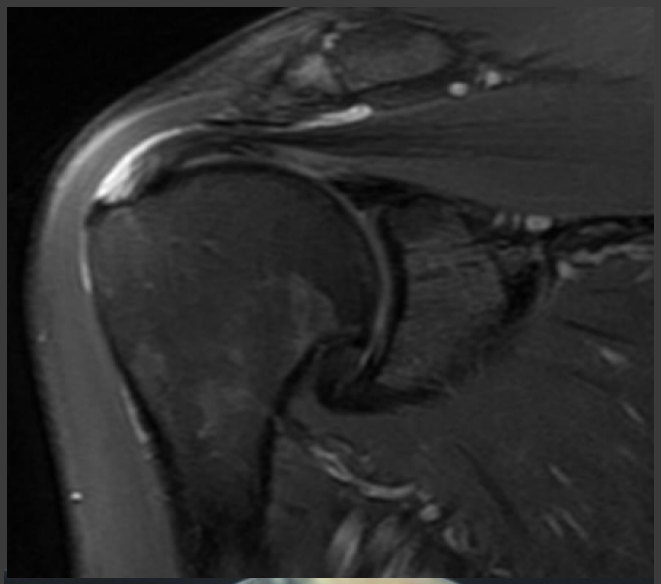
Who Gets Rotator Cuff Tears

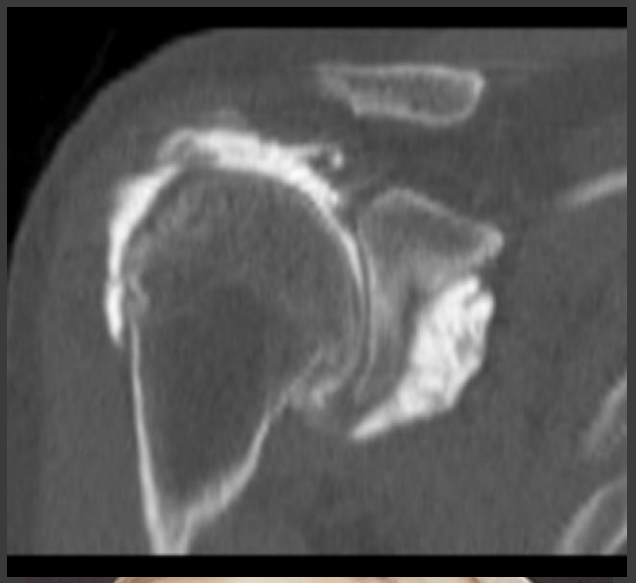
- Partial thickness tears about twice as common as full thickness lesions
- Increased incidence of disease with age
  - Yamaguchi 2006
  - Age 48.7 yo – no tear
    58.7 yo– unilateral tear
    67.8 yo – bilateral tear

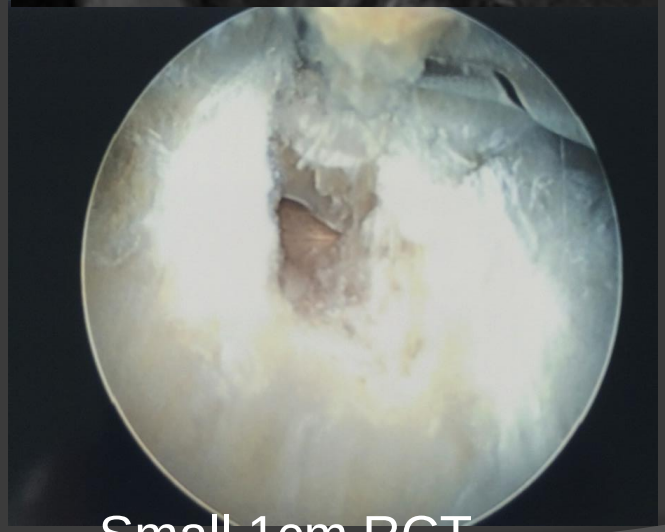
Types of RCT


Rotator Cuff Tear
Smaller Reparable Tear
Larger Irreparable Tear

RC: Varietal of flavors





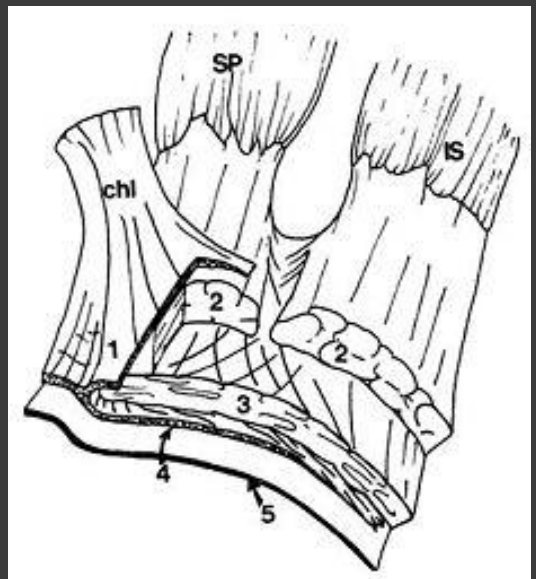


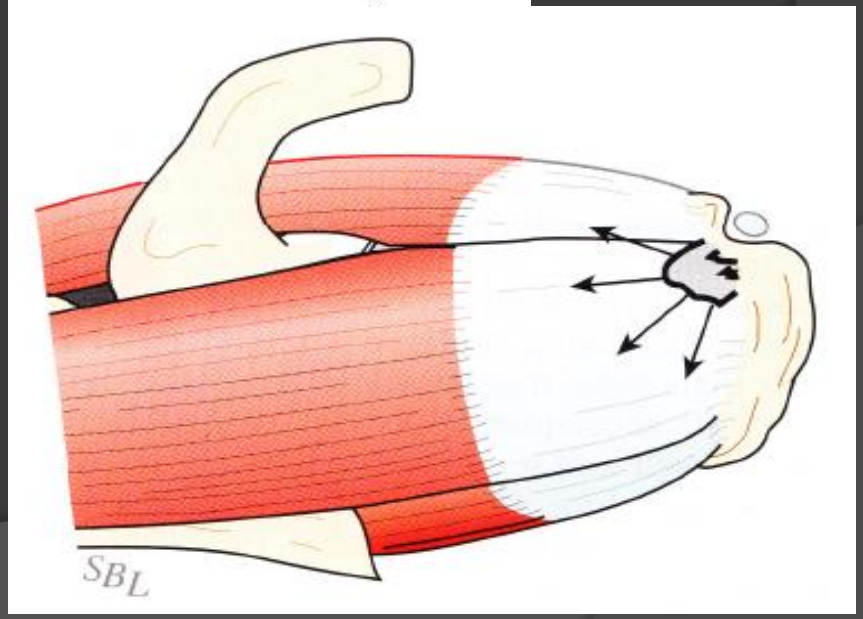
Small 1cm RCT

Large degenerative tear with retraction

What Happens to the Tear Over Time?

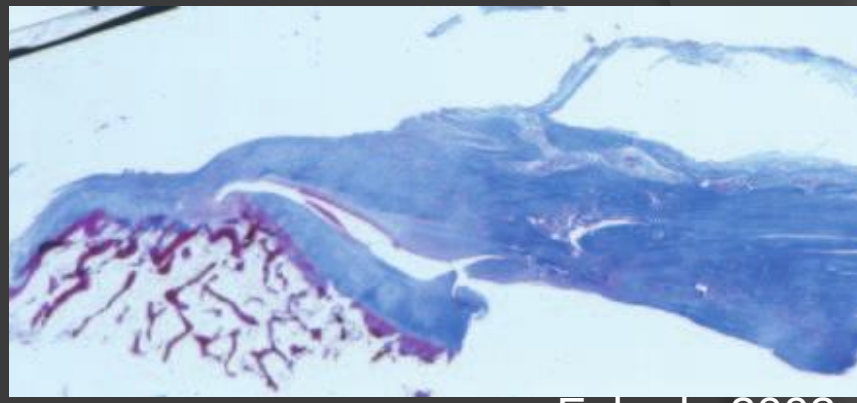
- Partial Articular Lesions
  - typically start at deep surface of anterior supraspinatus
  - ? Vascularity
- Weakened/abnormal tendon fibers continue to fail in response to applied loads
  - Increased load on adjacent fibers
  - Partial tears are more painful!





Natural history of cuff tears

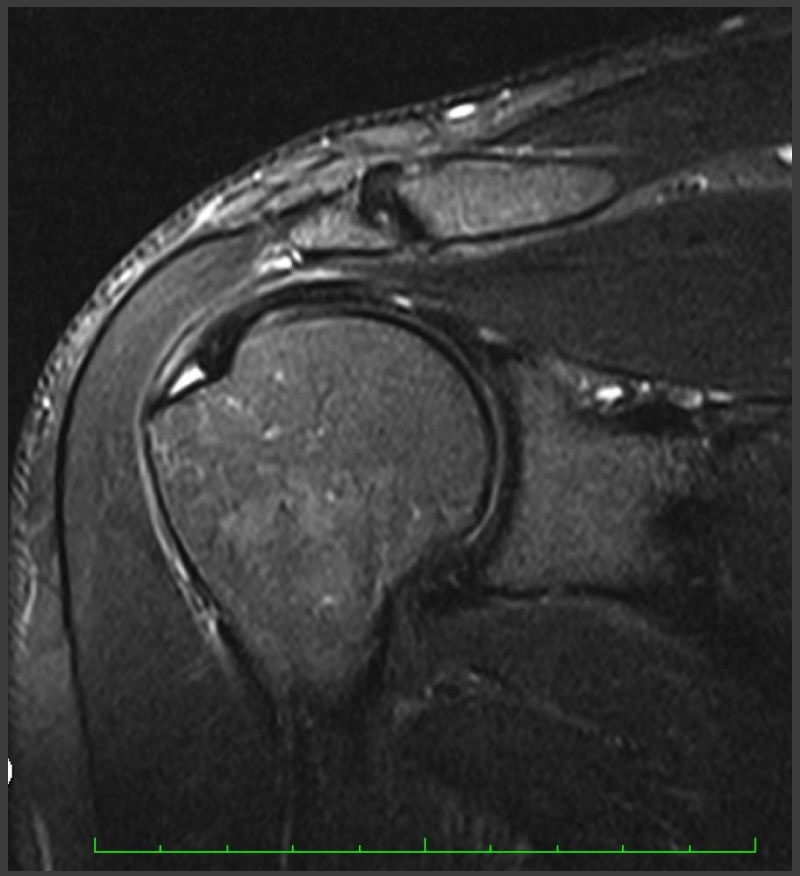
- Pain = larger tear?
  - Moosmayer 2013
    - 36% newly symptomatic → increased tear size, degeneration over 3 yrs
  - Yamaguchi 2001
    - Nonpainful tear: 20% had change in tear size.
    - Painful tear: 50% of had enlarged tear size



Fukuda 2003

Gerber, 2007

Types of RCT: Small



Nonoperative: Physical Therapy

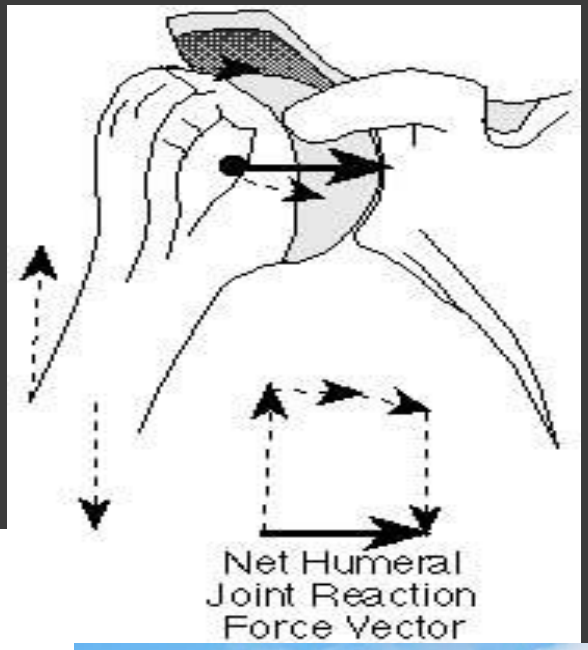
Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study

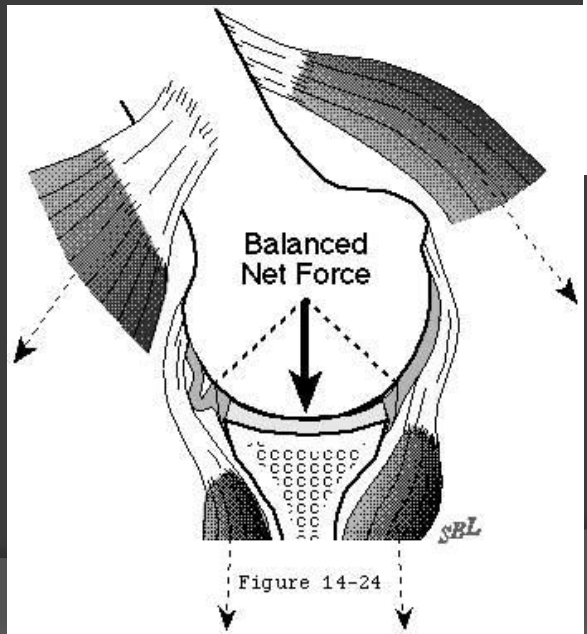
John E. Kuhn, MD, MS*, Warren R. Dunn, MD, MPH, Rosemary Sanders, BA, Qi An, MS, Keith M. Baumgarten, MD, Julie Y. Bishop, MD, Robert H. Brophy, MD, James L. Carey, MD, MPH, Brian G. Holloway, MD, Grant L. Jones, MD, C. Benjamin Ma, MD, Robert G. Marx, MD, MS, Eric C. McCarty, MD, Sourav K. Poddar, MD, Matthew V. Smith, MD, Edwin E. Spencer, MD, Armando F. Vidal, MD, Brian R. Wolf, MD, MS, Rick W. Wright, MD, for the MOON Shoulder Group

Conclusion: Nonoperative treatment using this physical therapy protocol is effective for treating atraumatic full-thickness rotator cuff tears in approximately 75% of patients followed up for 2 years.

Nonoperative: Physical Therapy

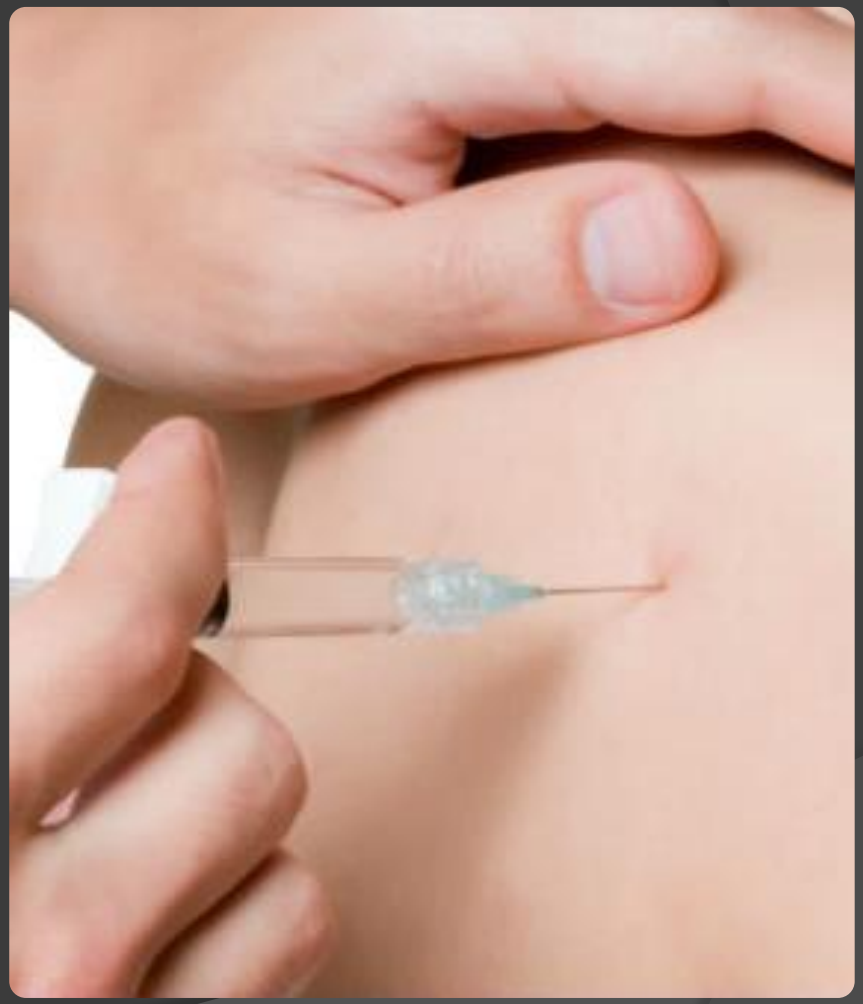
- Stabilization of the joint compression
  - External Rotator
  - Internal Rotator





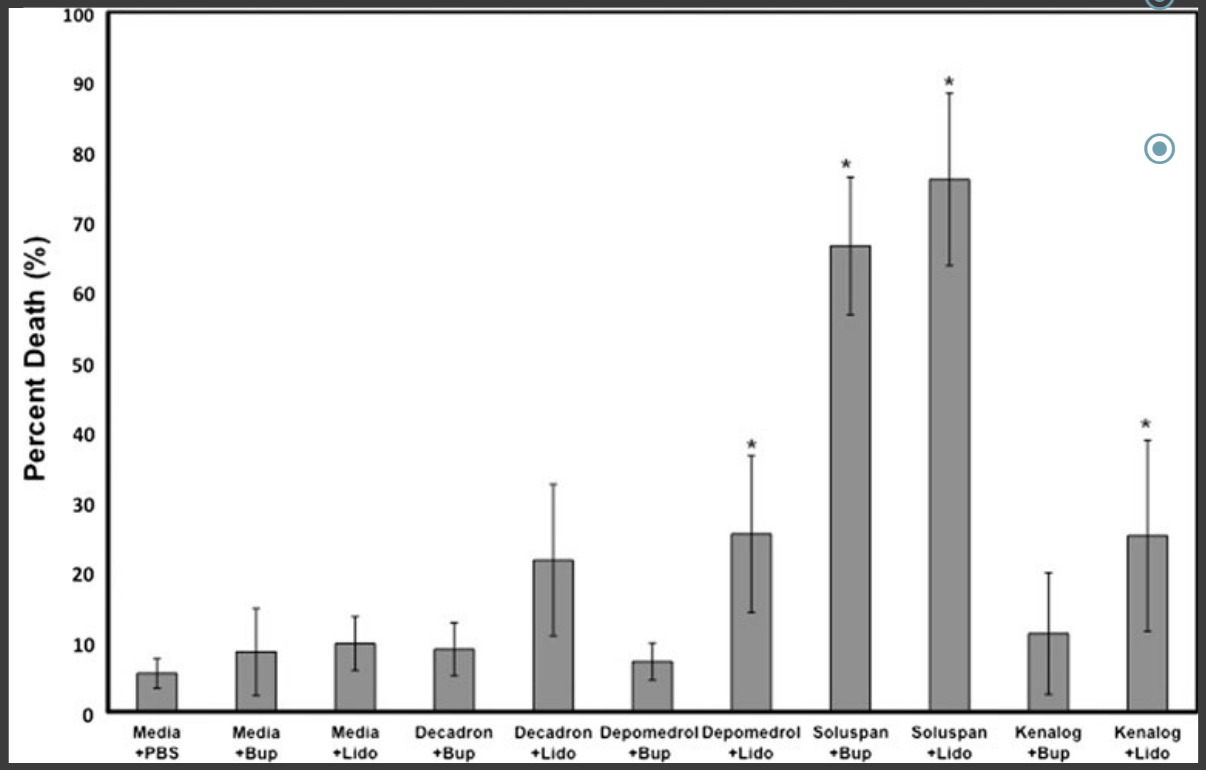
Nonoperative: Injections

- Corticosteroids
  - Originally for rheumatoid arthritis
  - Goal: anti-inflammatory
  - How effective is it?



Nonoperative: Injections

Chondrocyte



- ?Tendon tears
- Cortisone Effect to cartilage
  - "1st do no harm"
  - How often are we doing this?

Dragoo, KSSTA 2012- 80% Chondrotoxicity with lido + steroid

Nonoperative: Injections

- How about PRP injections?

[Intervention Review]

Citation: Moraes VY, Lenza M, Tamaoki MJ, Faloppa F, Belloti JC. Platelet-rich therapies for musculoskeletal soft tissue injuries. *Cochrane Database of Systematic Reviews* 2014, Issue 4. Art. No.: CD010071. DOI: 10.1002/14651858.CD010071.pub3.

Platelet-rich therapies for musculoskeletal soft tissue injuries

Vinícius Y Moraes[1], Mário Lenza[2], Marcel Jun Tamaoki[1], Flávio Faloppa[1], João Carlos Belloti[1]

[1]Department of Orthopaedics and Traumatology, Universidade Federal de São Paulo, São Paulo, Brazil. [2]Orthopaedic and Trauma Department, Hospital Israelita Albert Einstein, São Paulo, Brazil

Authors' conclusions

Overall, and for the individual clinical conditions, there is currently insufficient evidence to support the use of PRT for treating musculoskeletal soft tissue injuries. Researchers contemplating RCTs should consider the coverage of currently ongoing trials when assessing the need for future RCTs on specific conditions. There is need for standardisation of PRP preparation methods.

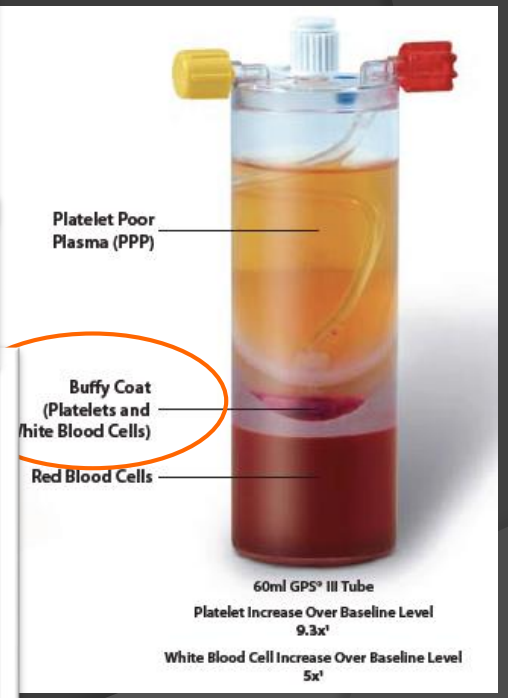
Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 32, No 5 (May), 2016: pp 906-918

Systematic Review

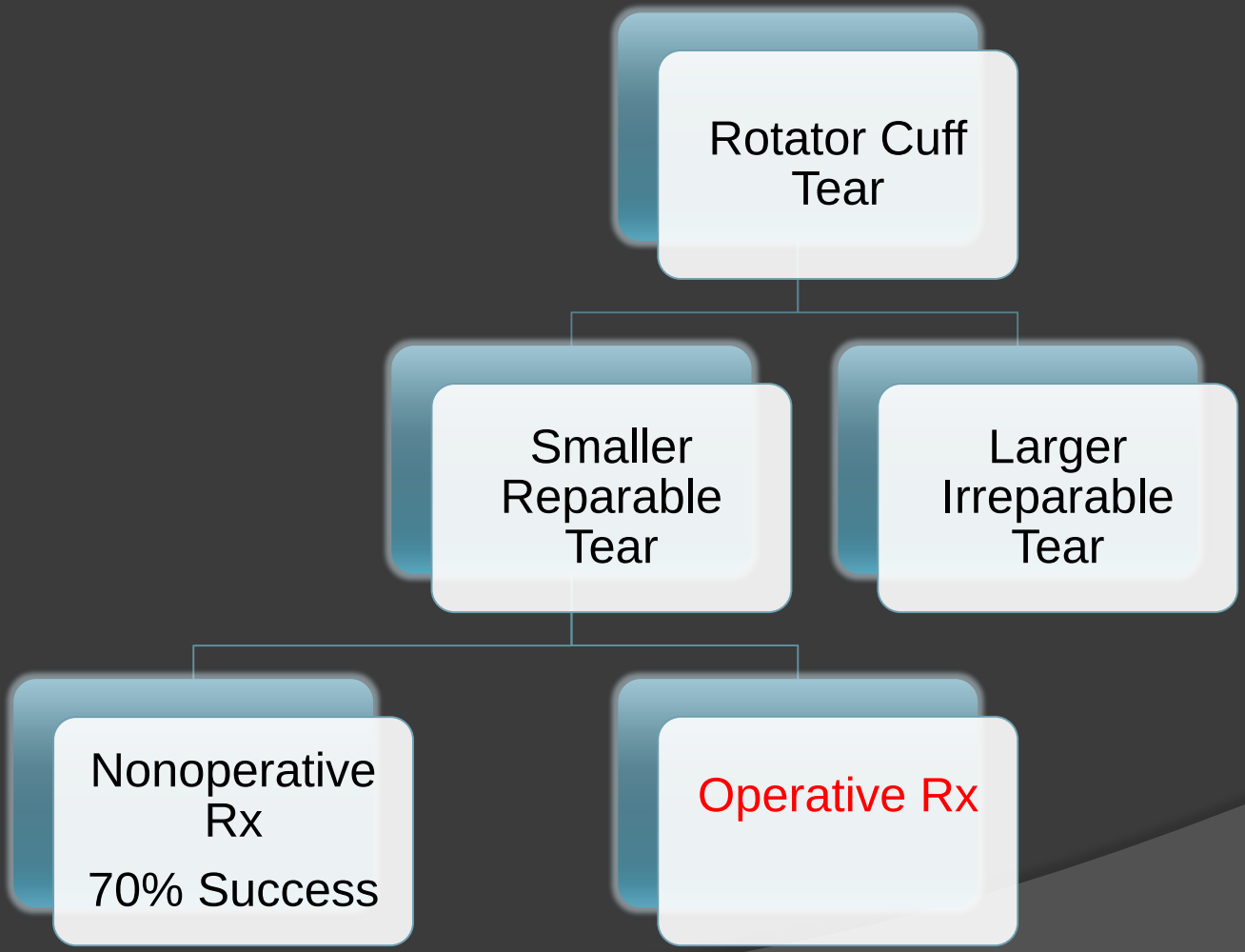
Does the Use of Platelet-Rich Plasma at the Time of Surgery Improve Clinical Outcomes in Arthroscopic Rotator Cuff Repair When Compared With Control Cohorts? A Systematic Review of Meta-analyses

Bryan M. Saltzman, M.D., Akshay Jain, B.S., Kirk A. Campbell, M.D., Randy Mascarenhas, M.D., F.R.C.S.C., Anthony A. Romeo, M.D., Nikhil N. Verma, M.D., and Brian J. Cole, M.D., M.B.A.

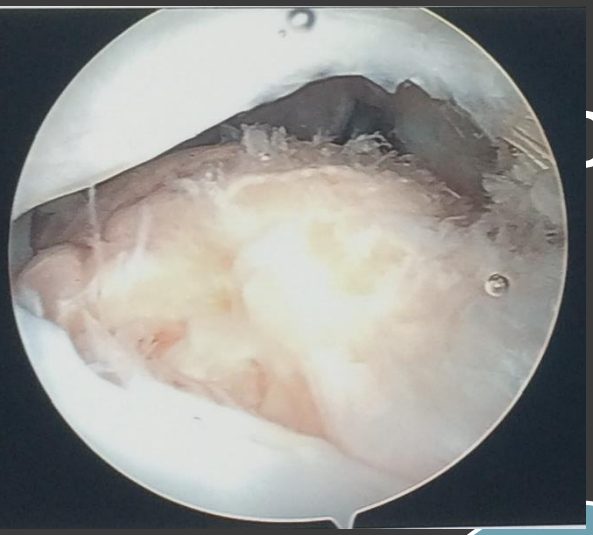
and in the setting of double-row versus single-row rotator cuff. **Conclusions:** The current highest level of evidence suggests that PRP use at the time of arthroscopic rotator cuff repair does not universally improve retear rates or affect clinical outcome scores. However, the effects of PRP use on retear rates trend toward beneficial outcomes if evaluated in

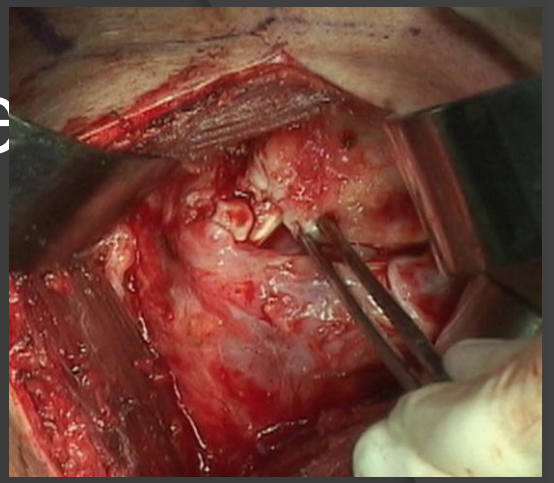


Types of RCT


Rotator Cuff Tear
Smaller Reparable Tear
Larger Irreparable Tear
Nonoperative Rx
70% Success
Operative Rx

# of Rotator Cuff Re





Open Transosseous

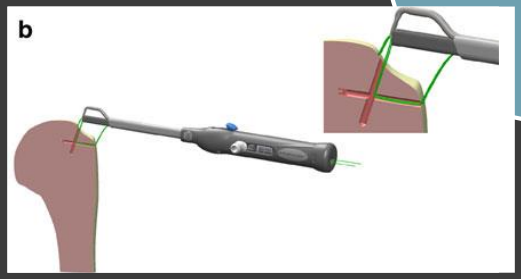
Mini-Open Transosseou

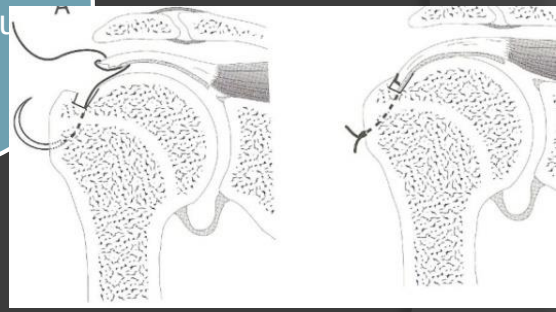
Mini-Open with Anchors

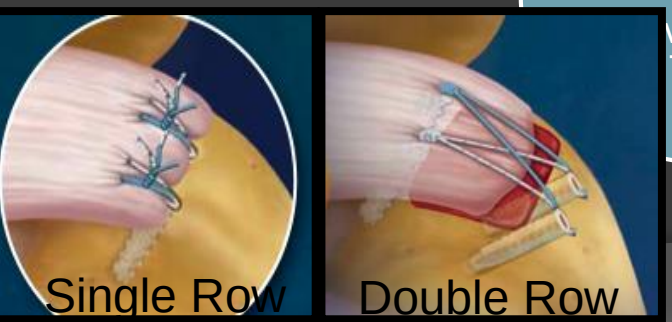
Arthroscopic with Anchors

vs DR vs TOE

Arthroscopic Transosseous







MIDTERM CLINICAL OUTCOMES FOLLOWING ARTHROSCOPIC TRANSOSSEOUS ROTATOR CUFF REPAIR

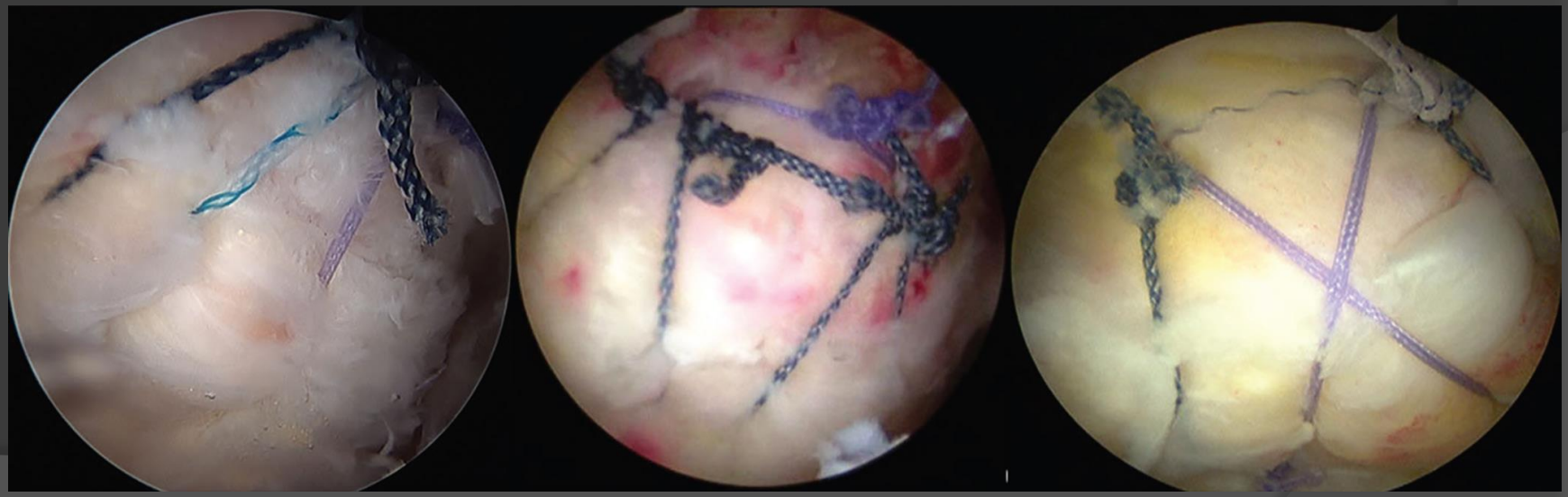
Eddie Y. Lo MD[1], Brody A. Flanagin MD[2], Raffaele Garofalo MD[3], Sumant Krishnan MD[2]

International Congress of Shoulder and Elbow Surgery,
Jeju Korea, 2016

[1]St Francis Memorial Hospital, San Francisco
[2]Baylor University Medical Center at Dallas
[3]F Miulli Hospital Acquaviva delle fonti-BA Italy

Results

- Avg 11.9 mo FU
  - ROM improvement
    - FE 143.3→ 155
    - ER 36.4 → 49.3
    - IR L4 → L2
- Revision in 4/109 (3.6%)
- Postop Functional scores:
  - ASES 94.6 (26.7-100)
  - SST 11.6 (1-12)
  - SSV 93.7 (5-100)
- 92.7% with ASES >70



Art:
How is the Asian-American community?

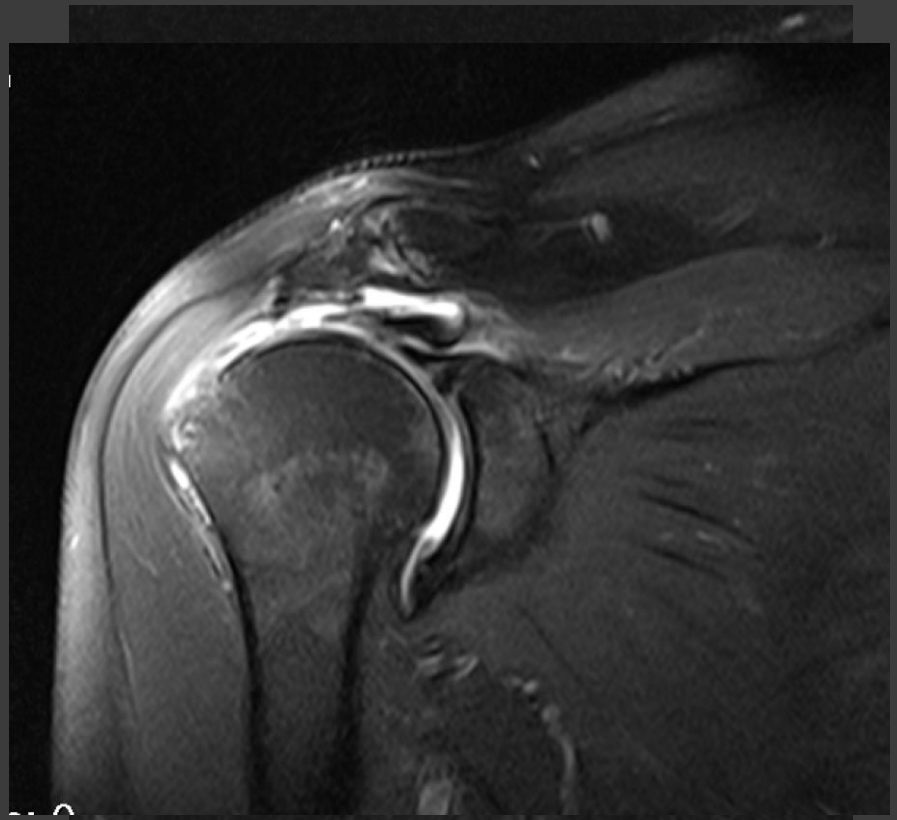
- SF Chinatown

- High proportion of
  - 70-80 yo
  - Smokers
  - Non- English speaking

The challenges of treating Asian-American Community

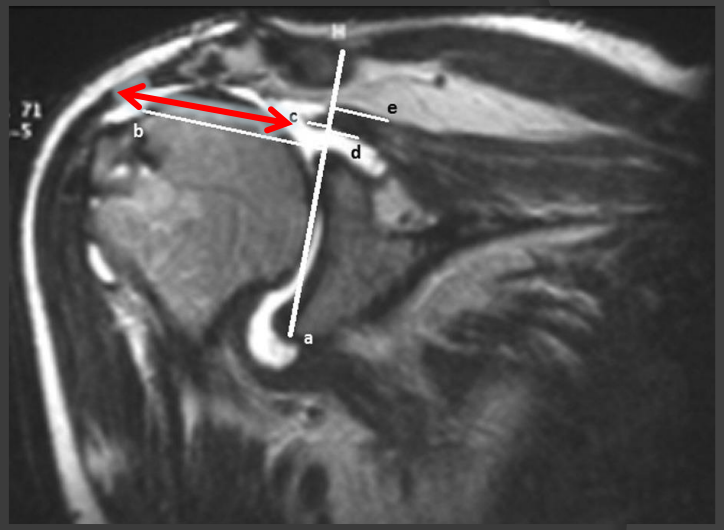
- Noncompliant to therapy
- Preference with herbal meds / acupuncture / chiropractor
- Years and years of pain symptoms…
  - Degenerative > Traumatic

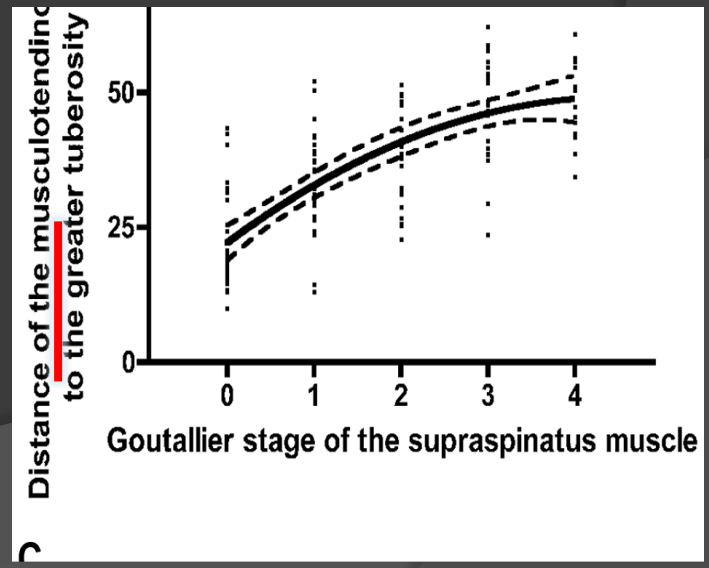
Types of RCT: Large/Irreparable



With time, Tear enlarges, and tendon degenerates

- Rotator Cuff Tear
  - → muscle retraction
  - → Shortened tendons
- Harder to surgically repair!!





Gerber, 2007

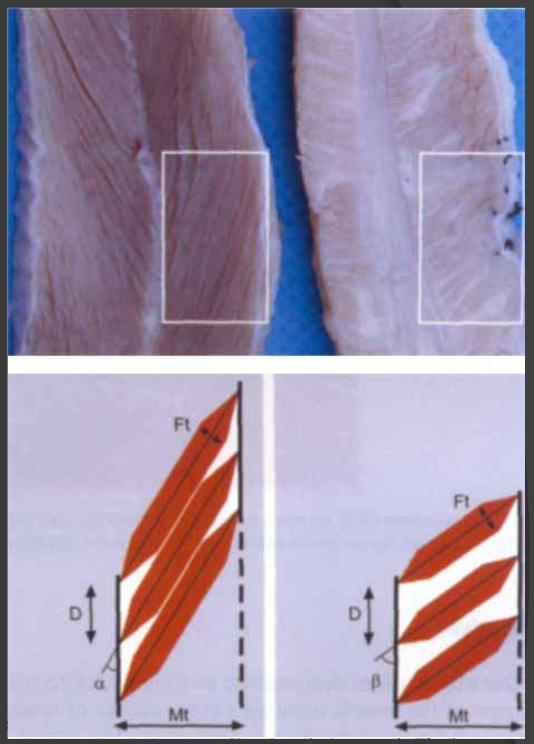
As tendon tear enlarges, tendon degenerates

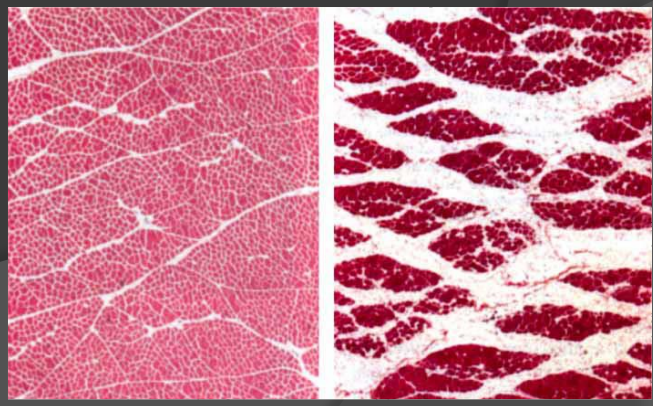
- Rotator Cuff Tear

  → Increase pennation angle

  → Fatty Infiltration

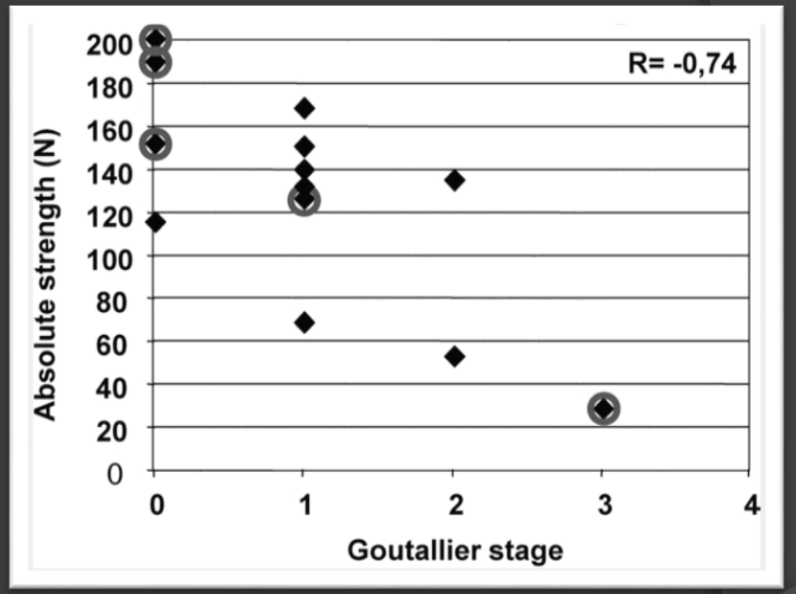
- Irreversible Structural Change
  - Fatty Infiltration!!





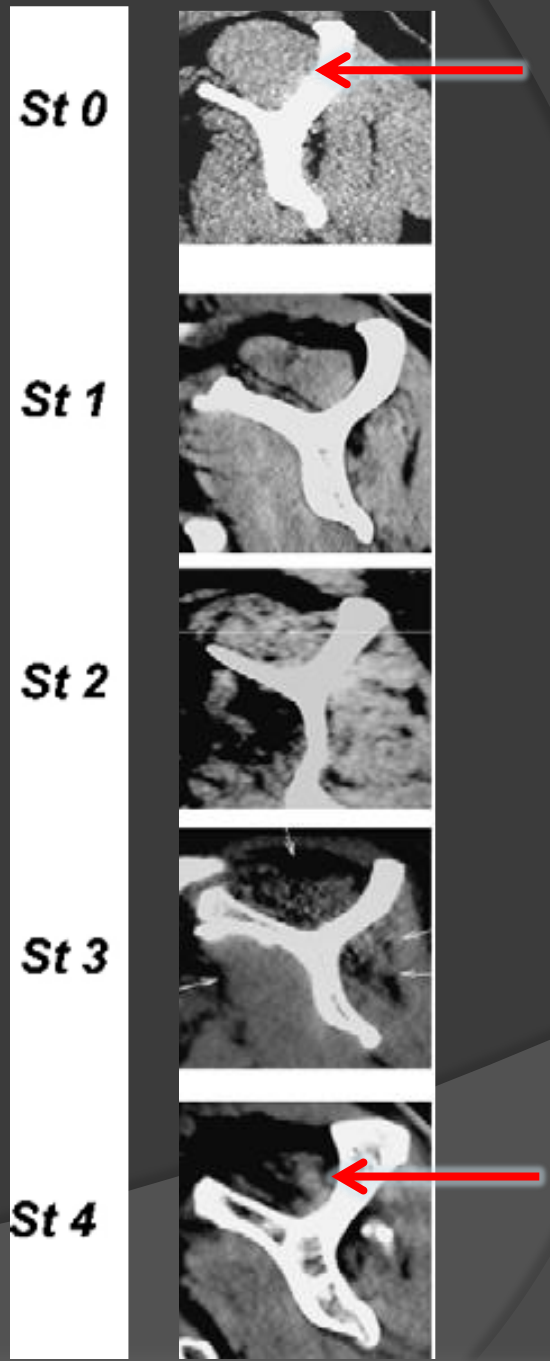
Fatty Infiltration

- Weakens the rotator cuff muscle
  - Goutallier 0: 200N
  - Goutallier 3: 28N



Biology of the tendon itself

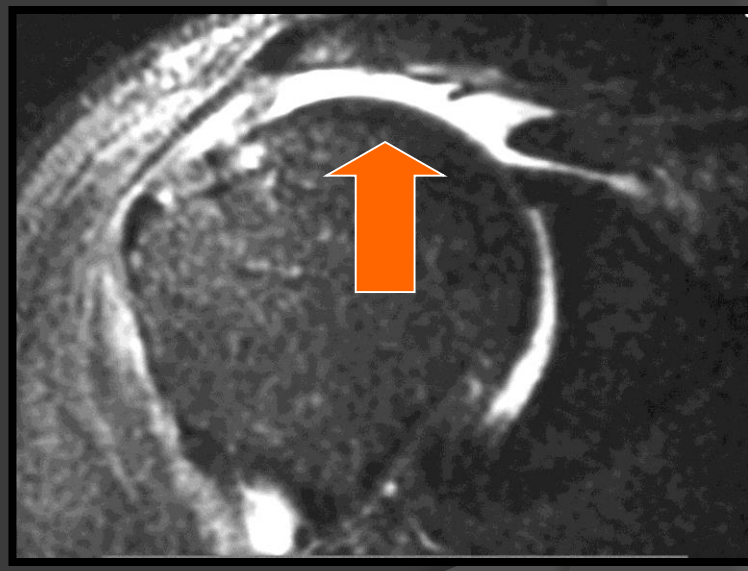
- Goutallier Stage of Fatty Infiltration
- Chronicity
  - Modest FI ~3 yrs
  - Severe FI ~5 yrs



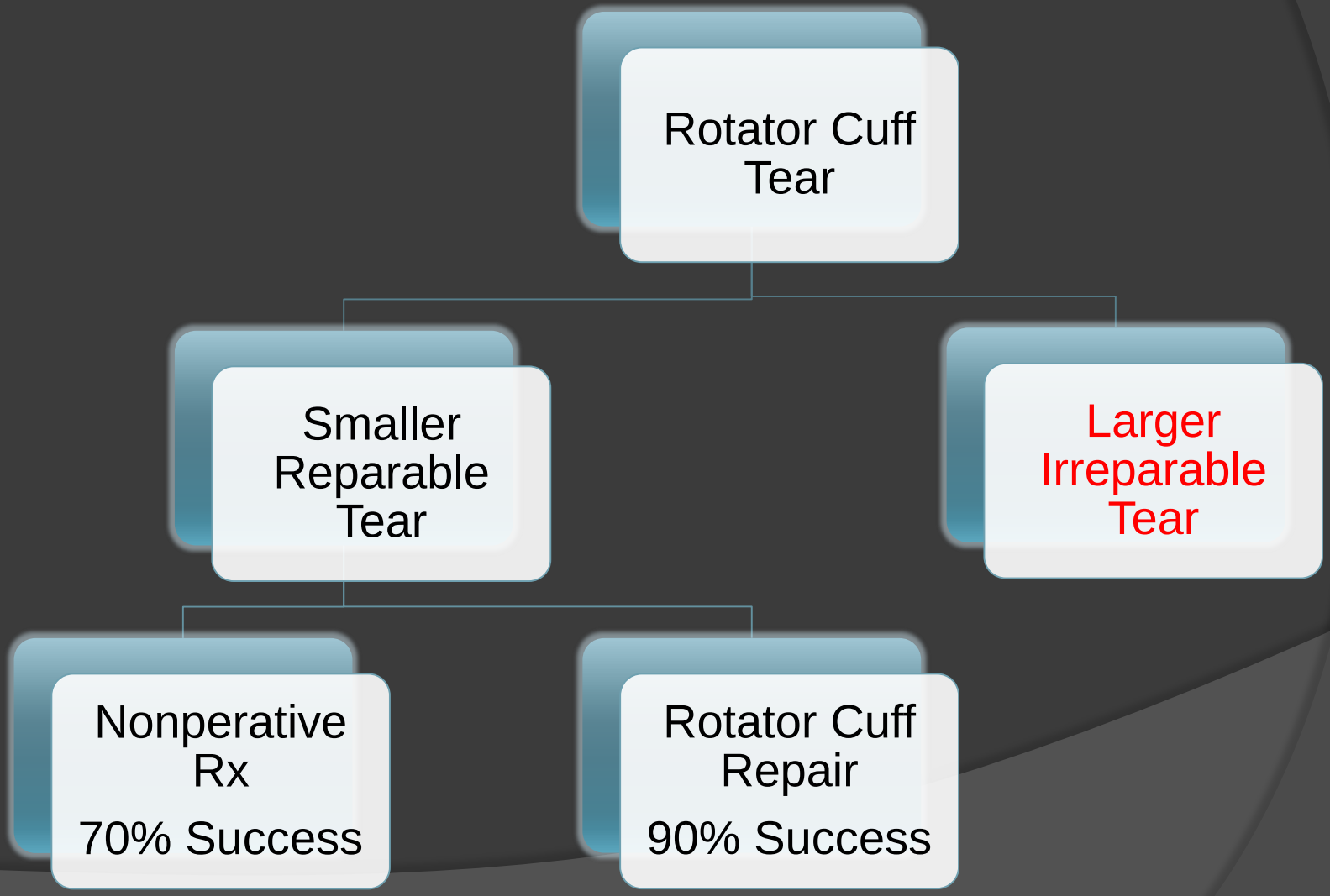
Melis, CORR, 2010
Gerber JSES 2007
Duquin AJSM 2010

Rotator cuff repair- large/massive

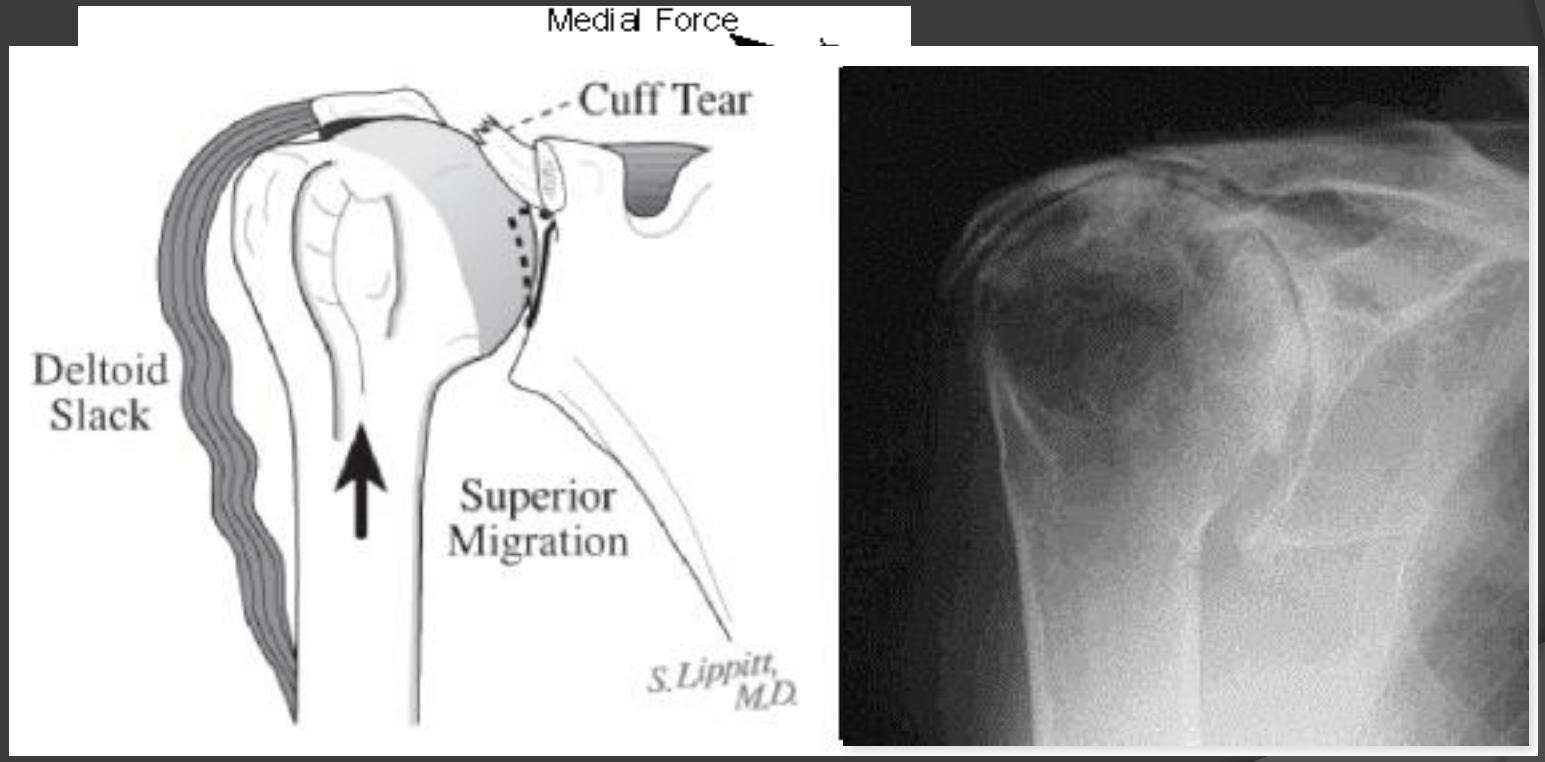
- Numerous studies have reported recurrent cuff tears following RCR surgery
  - Boileau JBJS 2005 – 29% failure rate
  - Sugaya Arthroscopy 2005- 40% failure (large and massive tear)
  - Galatz JBJS 2004- 94% failure
  - Harryman JBJS 1991- 43% failure of 2 tendon tears



Types of RCT

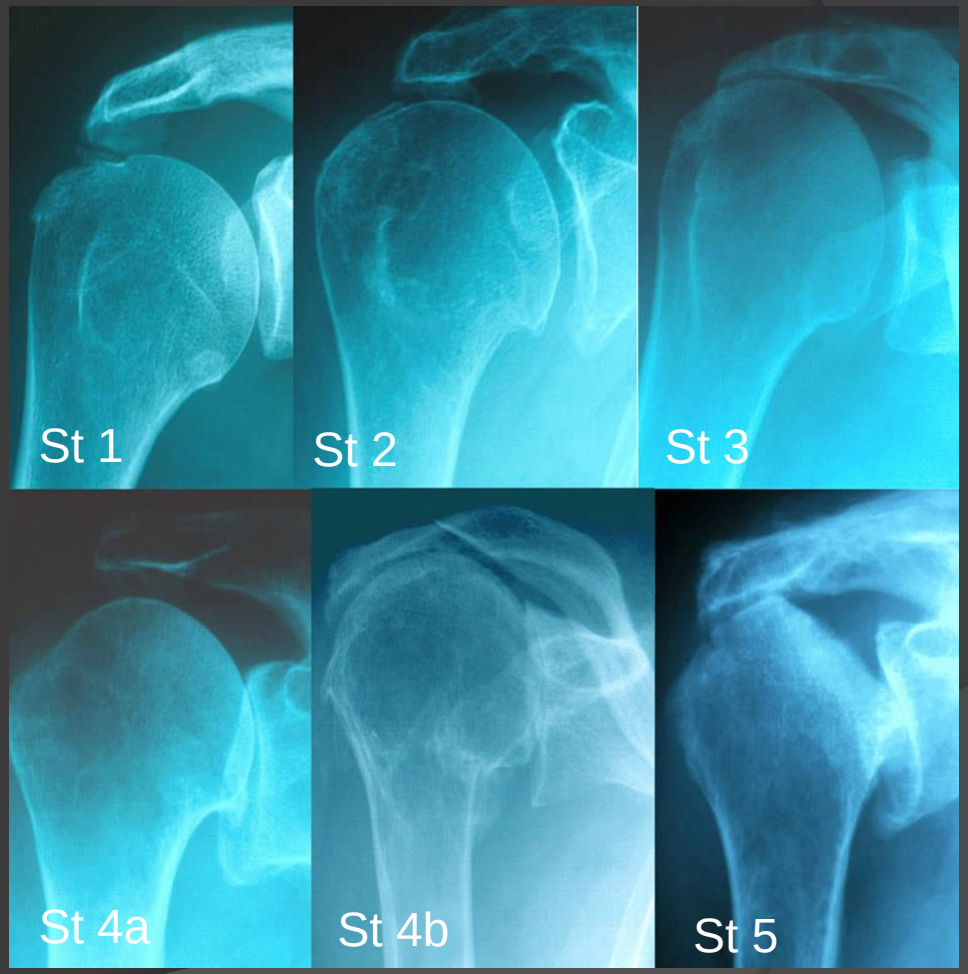

Rotator Cuff Tear
Smaller Reparable Tear
Larger Irreparable Tear
Nonperative Rx
70% Success
Rotator Cuff Repair
90% Success

The Pathology:
Cuff Tear Arthropathy



Cuff Tear Arthropathy

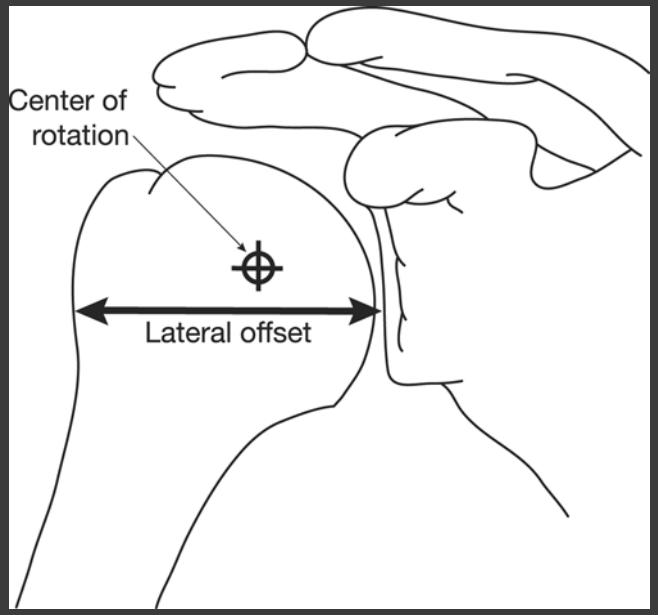
- Humeral migration
- Secondary arthritis

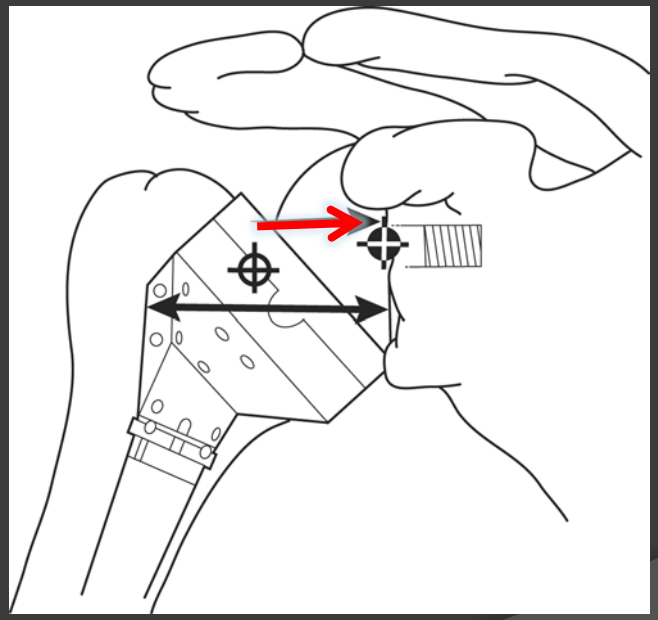


Hamada and Fukuda, CORR 1990

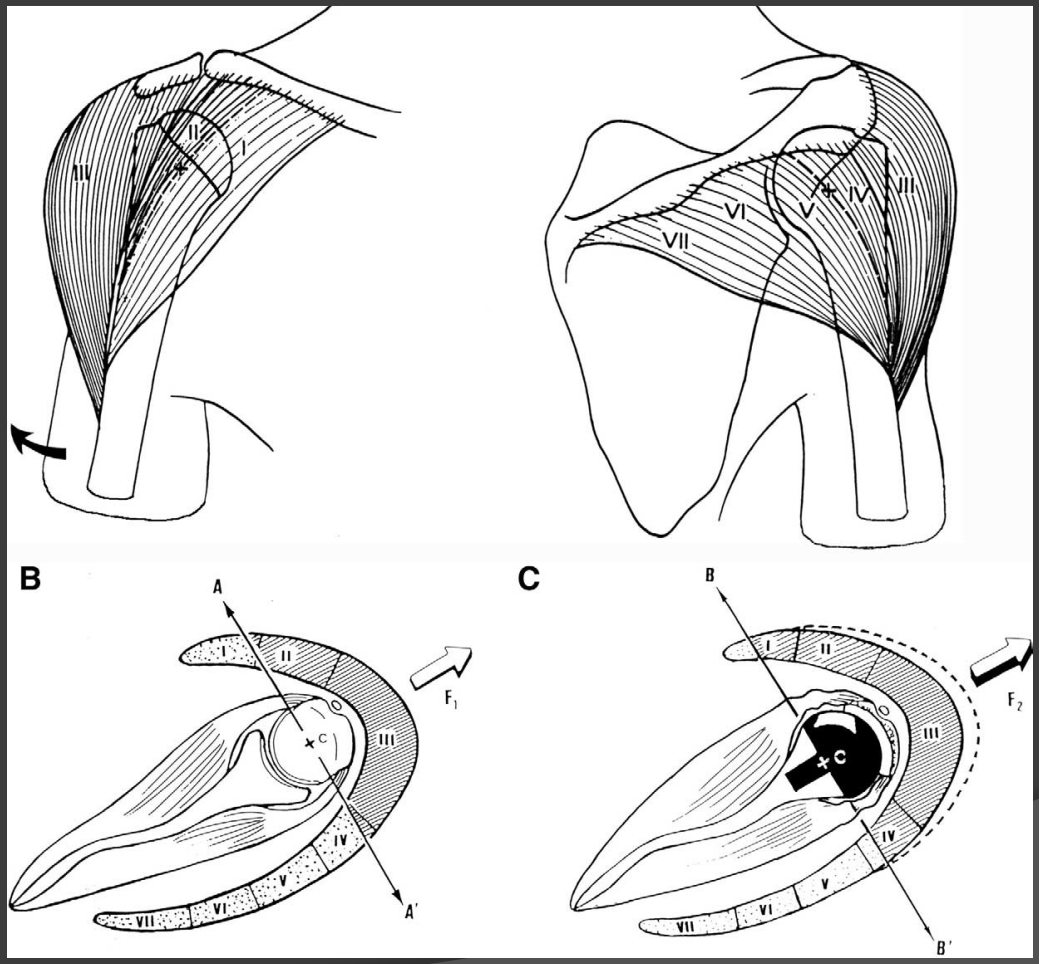
Not just a tendon tear…

The Treatment:
Reverse Total Shoulder Arthroplasty (RTSA)

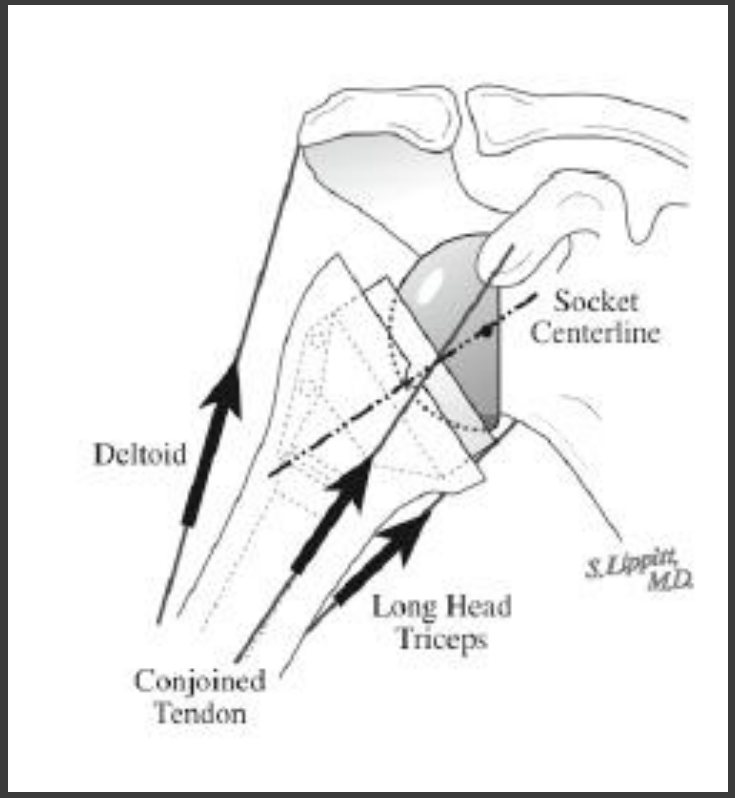


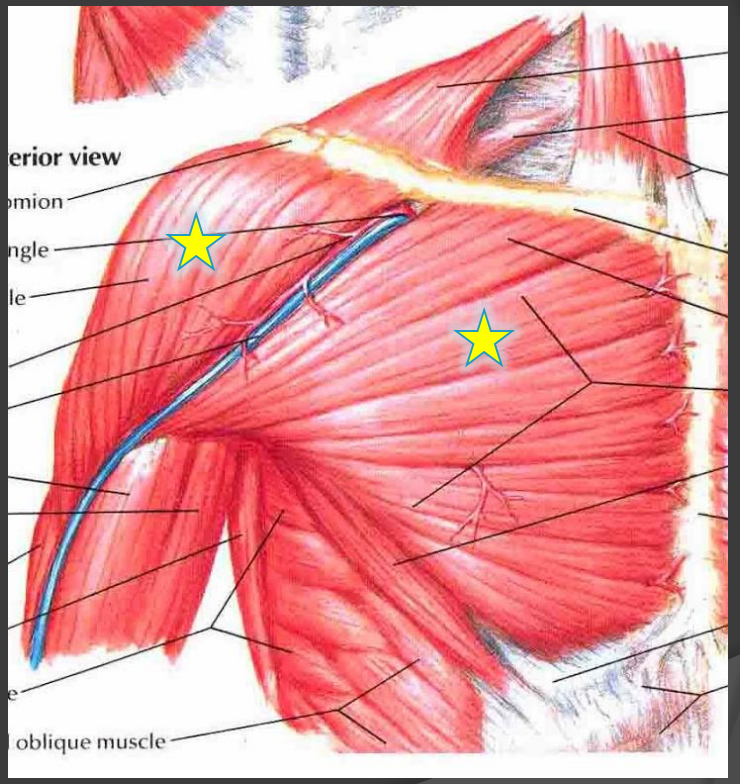


The Treatment:
Reverse Total Shoulder Arthroplasty (RTSA)



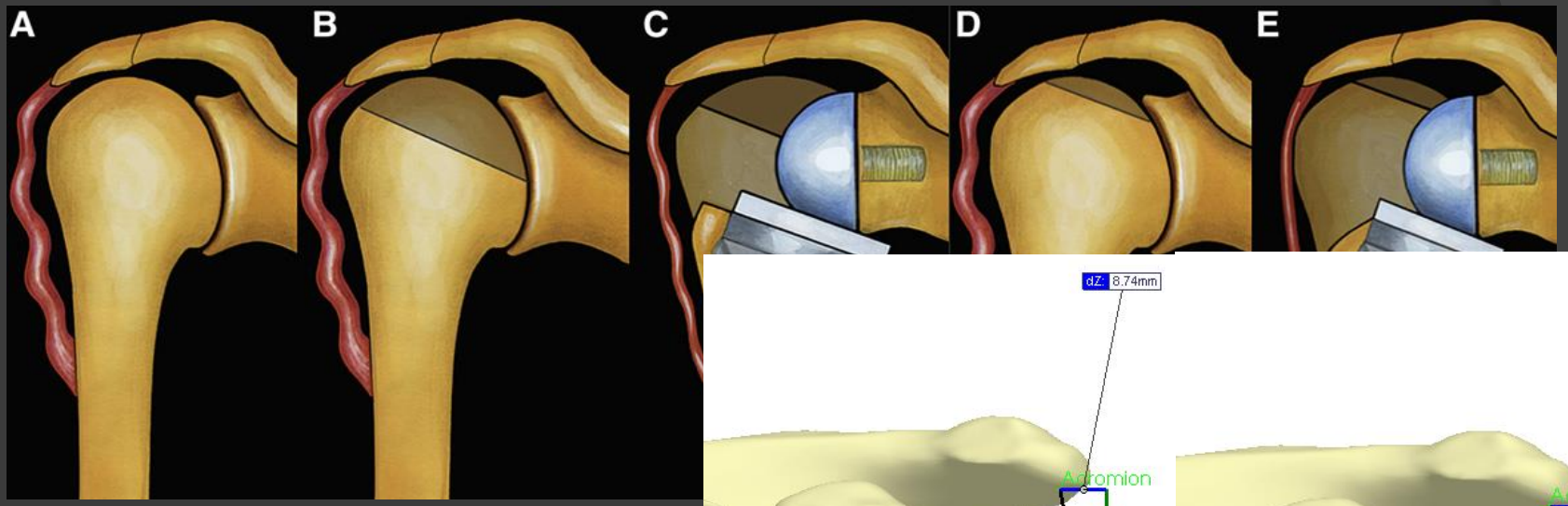
The Treatment:
Reverse Total Shoulder Arthroplasty (RTSA)

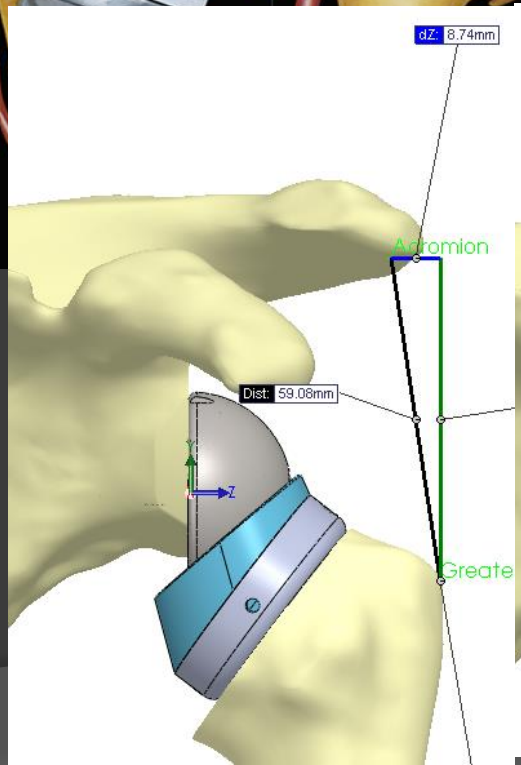


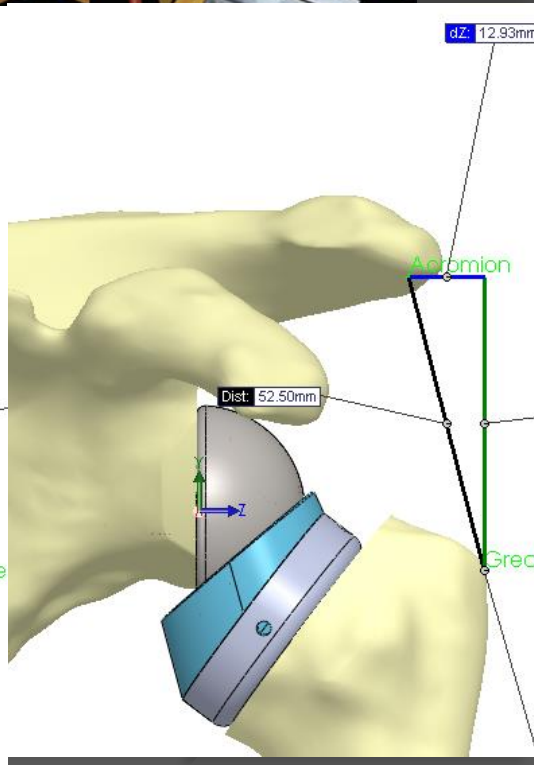


4th Generation Shoulder Replacements

Evolution of RTSA





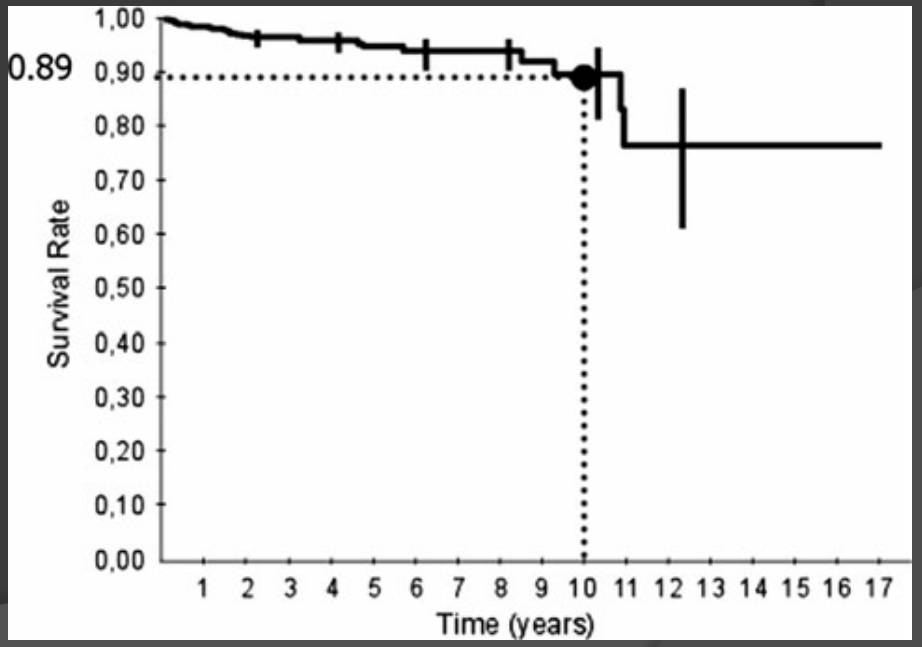


Clinical Outcome of RTSA

- For irreparable cuff
  - Mulieri and Frankle, 2010: ASES 33.3 → 75.4
  - Boileau, 2009: Constant 35.8 → 78.8
  - Gerber, 2013: Constant 34 → 74

Long term survivorship RTSA

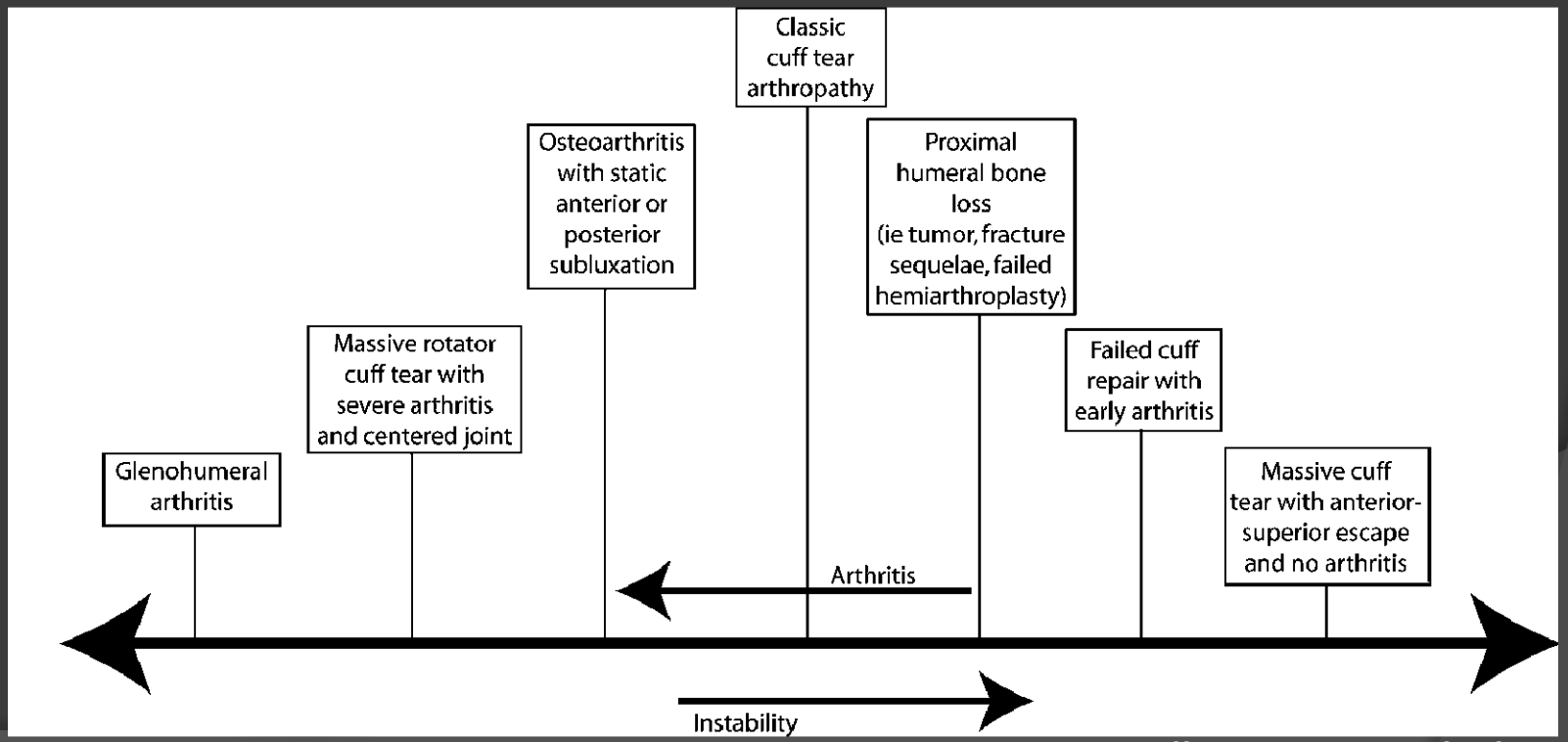
- Mulieri and Frankle 2010
  - 90.7% at 4.5 years
- Gerber 2013
  - 88% at 10 years
- Favard 2011
  - 89% at 10 years



Increasing Utilization

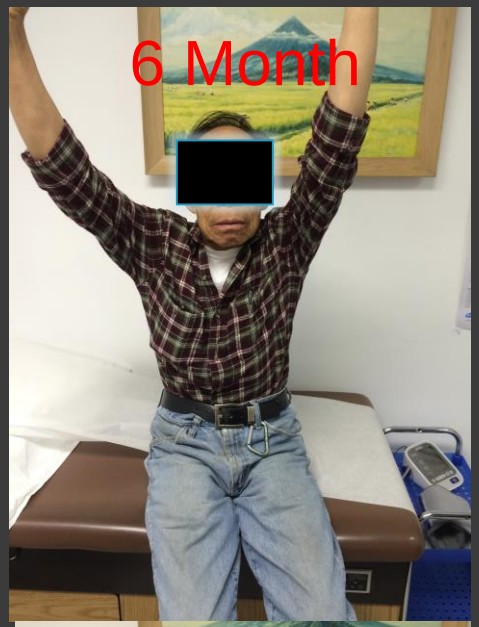
Table I National estimate of total shoulder arthroplasty—patient characteristics

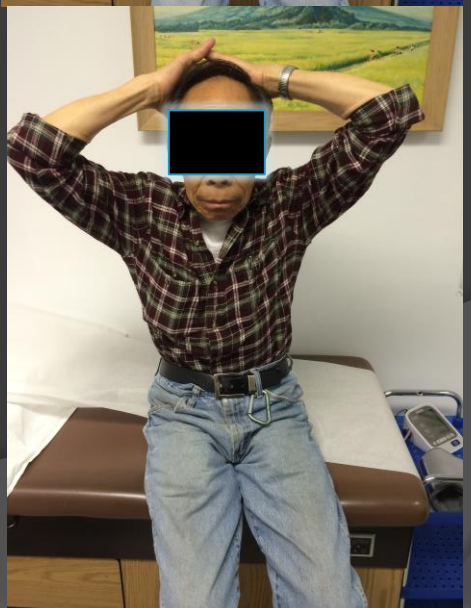
	Reverse shoulder arthroplasty	Total shoulder arthroplasty	Hemiarthroplasty
Total procedures in sample	4495	6129	3186
Weighted estimate	21,692	29,359	15,434
Age (years)	72.7 ± 16.1	67.4 ± 15.1	66.8 ± 28.1
Age < 64	18.4%	35.7%	40.7%
Age 65-74	35.1%	39.3%	27.4%
Age ≥ 75	46.5%	25.0%	31.8%



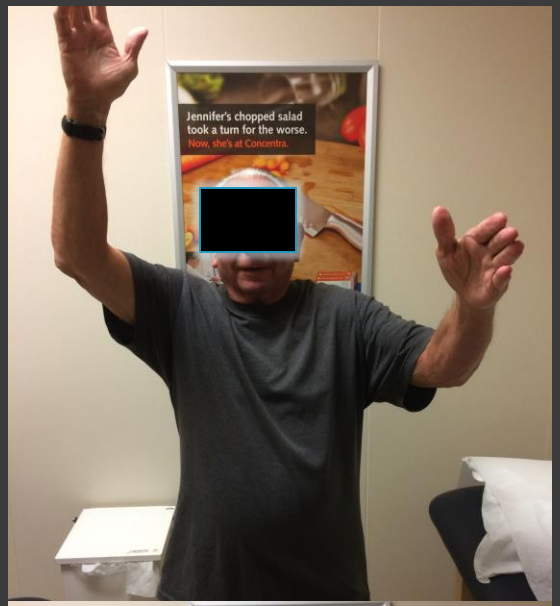
Walker 2011; Schairer, 2015

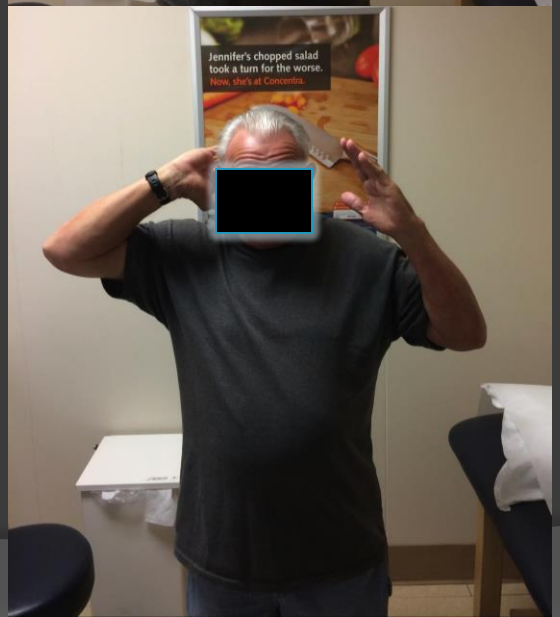
Personal clinical series





1 Month

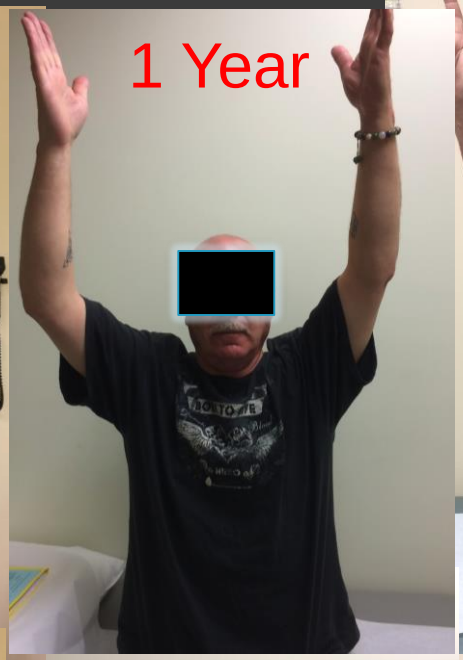


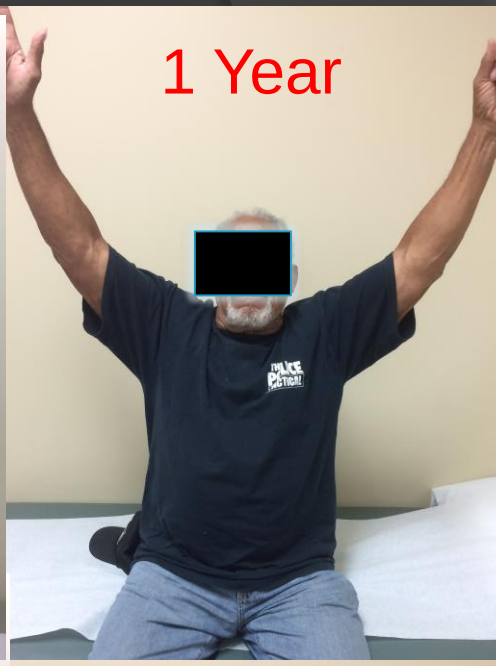


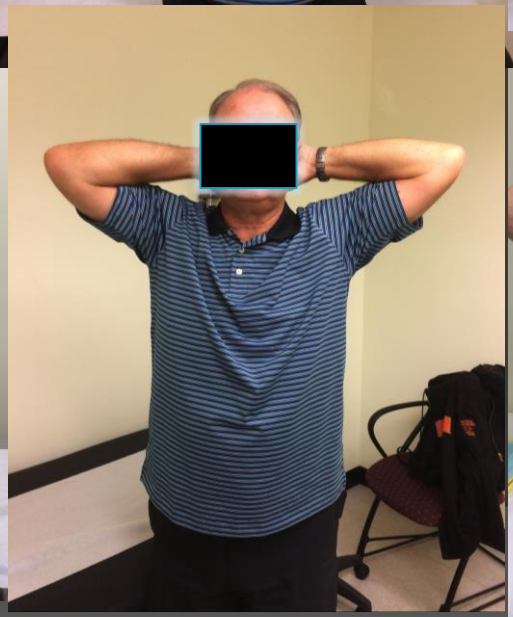
2 Month

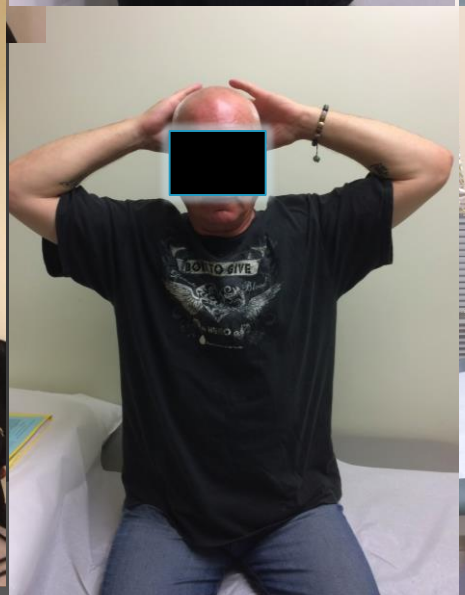

4 Month


6 Month


1 Year


1 Year





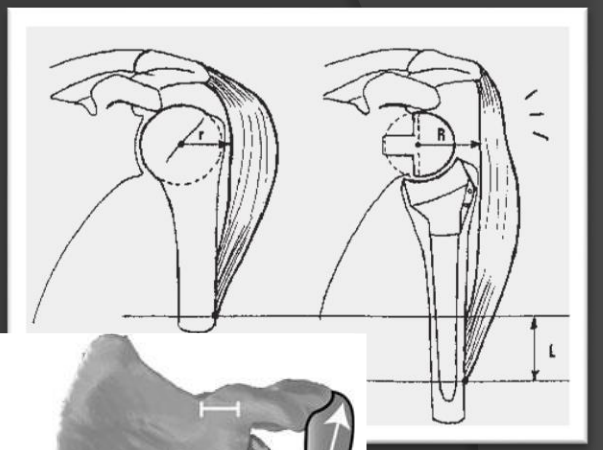
However...

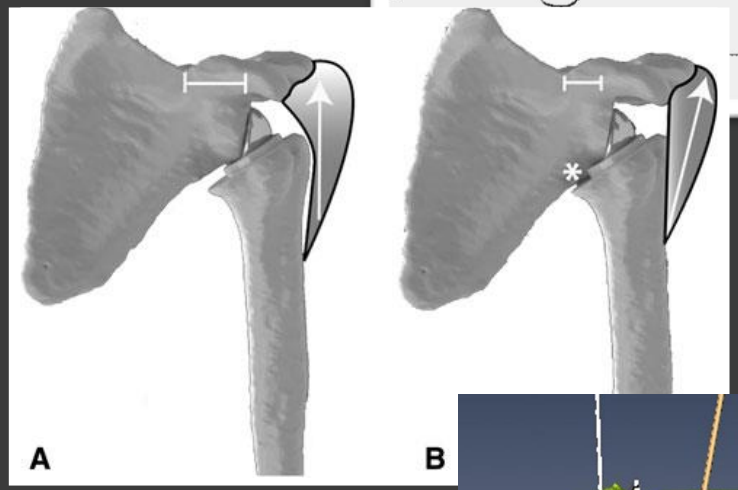
- How well does this surgery work in the Asian Community?
  - Paucity of clinical data
  - Anatomic studies?

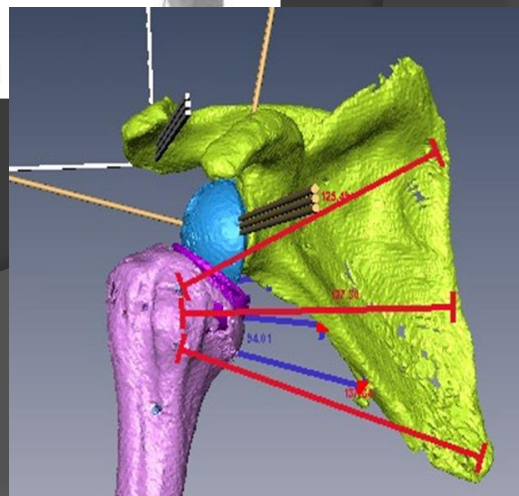
Biomechanics of the Reverse

- Medializes COR
  - Improves Deltoid Force Vector

    (Gagey CORR 2000; Frankle, CORR, 2011)
  - Improve Compression/shear Force Ratio (Ackland, JOR, 2011; Kwon, Bull NYU, 2010)
- Tensioning of the deltoid





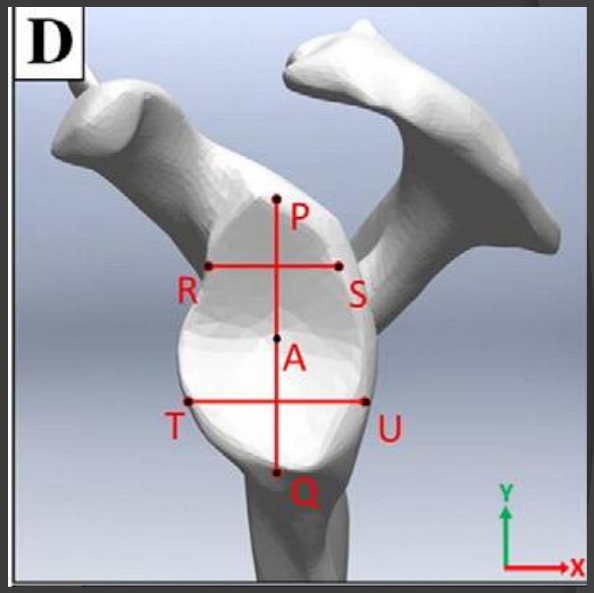


How does this apply for Asian patients

3. There is a “golden ratio” of glenohumeral relationships

- Average height: 5’9’’ (M) 5’3’’ (W)

- Humeral head diam: 52mm (M) 45mm (W)
- Inferior glenoid width: 31mm (M) 26mm (W)
- GT-glenoid distance: 58mm (M) 51mm (W)
- Vertical GT-Acromio: 31mm (M) 27mm (W)
- Horizontal GT-Acromio: 28mm(M) 24mm (W)



Cabeza Clin Biomech 2014

How does this apply for Asian patients

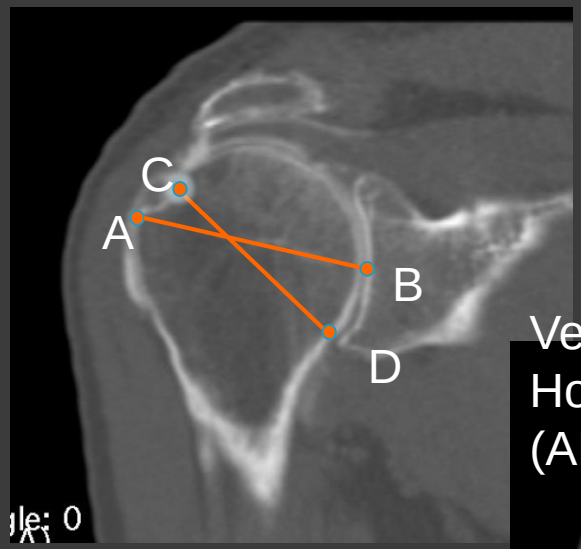
- Asian-American patients, who are smaller stature, should have smaller the anatomic measurements.
- The glenohumeral relationships may be proportional to height and gender

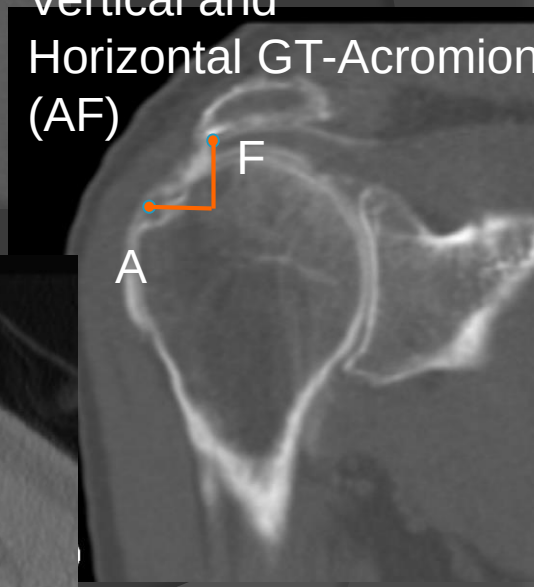
Anatomic CT scan Study

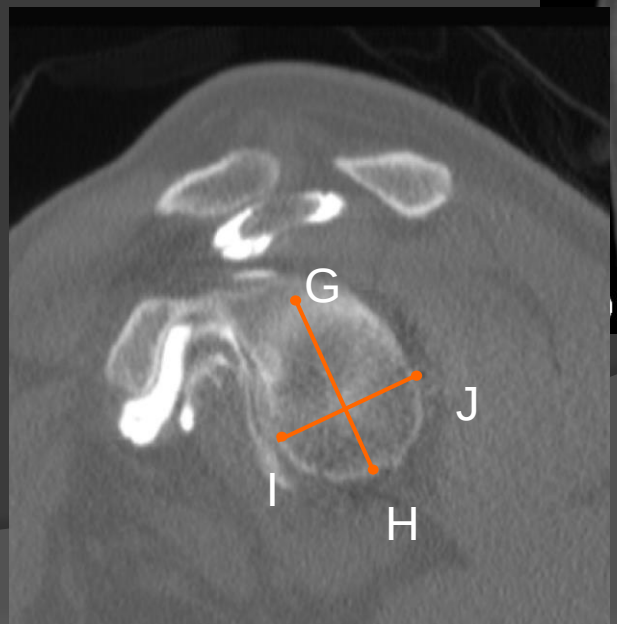
- Chinese Hospital San Francisco.
  - Approved by IRB and hospital ethics committee.
- Inclusion Criteria:
  - 34 Asian-American patients who underwent CT scans of the shoulder.
  - 2007-2015
- Exclusionary criteria:
  - significant glenohumeral wear, osseous defects, deformity, or fracture

Outcome Measurement

- Demographics:
  - Age
  - Gender
  - Height
- Radiographic measurements:
  - Humeral head diameter (CD)
  - Glenoid height (GH)
  - Inferior glenoid width (IJ)
  - Distance from GT to glenoid (AB)
  - Horizontal Distance from acromion to GT (AF)
  - Vertical Distance from acromion to GT (AF)

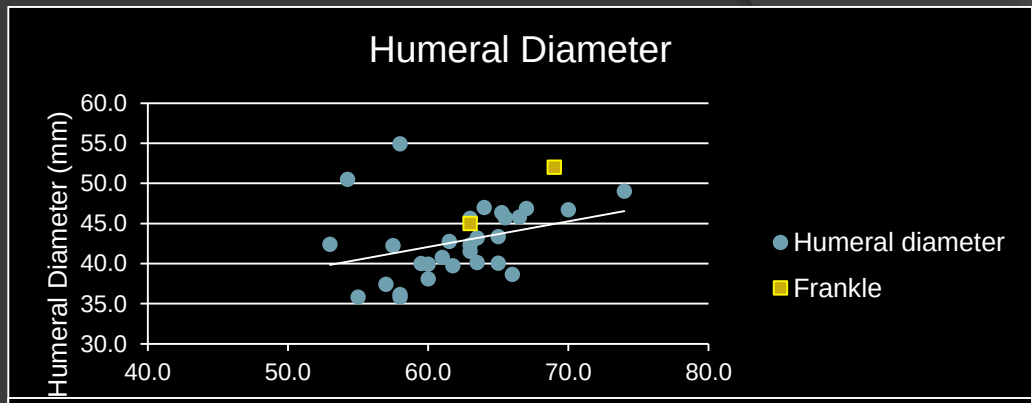


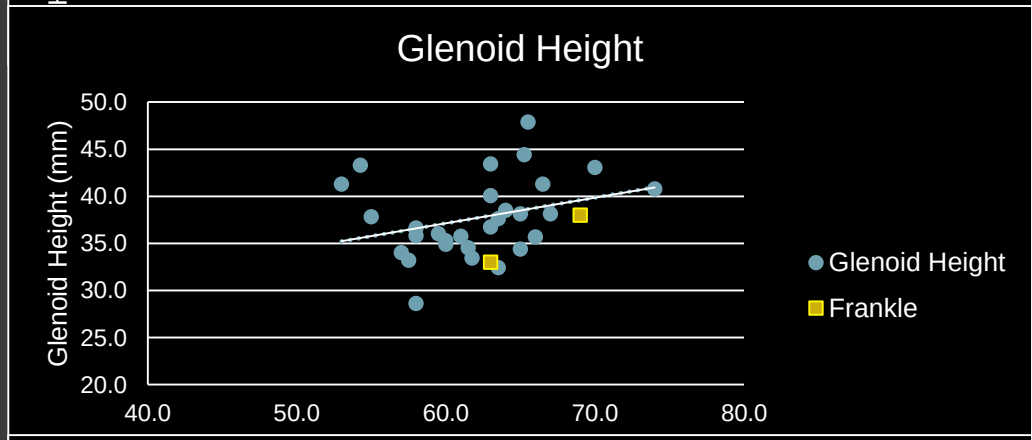


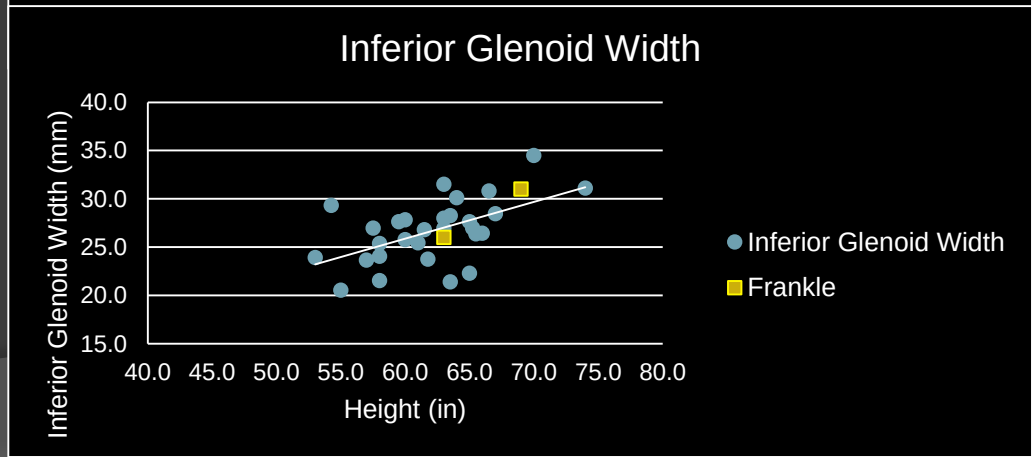


Results

- N=29
  - Average age: 72 ± 15 years old
  - 14 M, 15 W
  - Height: 5’4” (M) 5’ (W)
- Coronal humeral diameter:
  47 ± 2mm (M) 41 ± 2mm (W)
- Glenoid height:
  46 ± 2mm (M) 38 ± 2mm (W)
- Inferior glenoid diameter:
  26 ± 2mm (M) 23 ± 2mm (W)

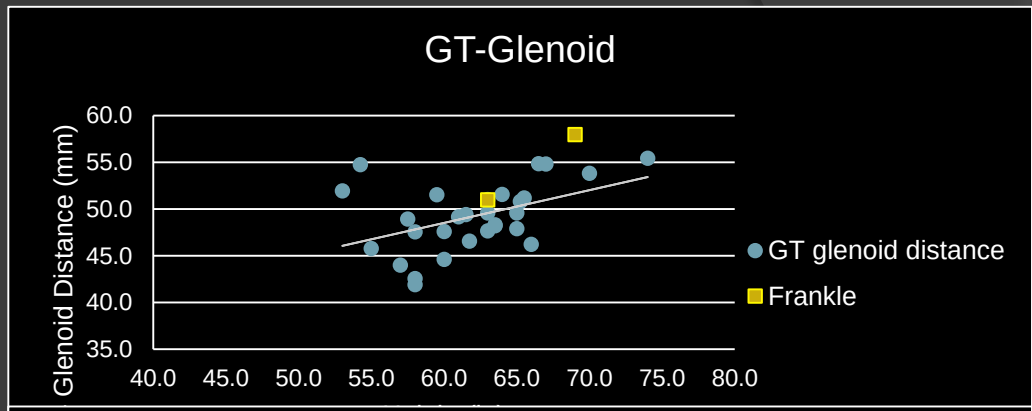


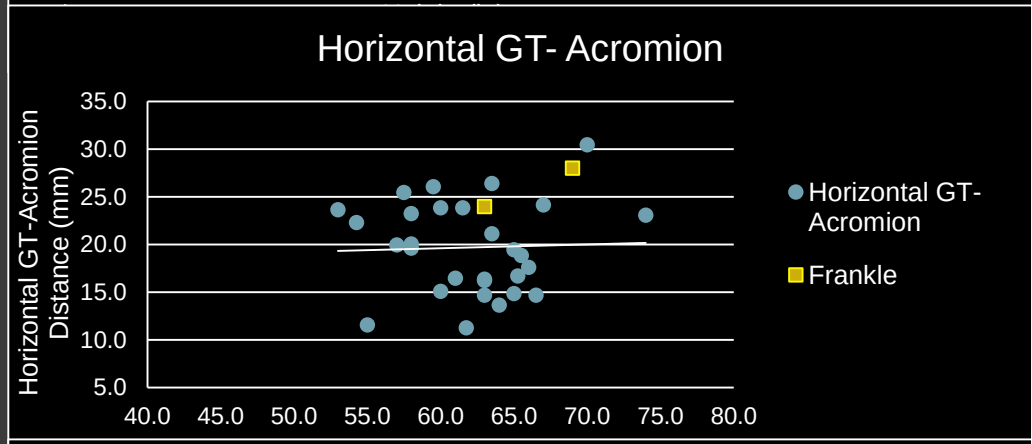


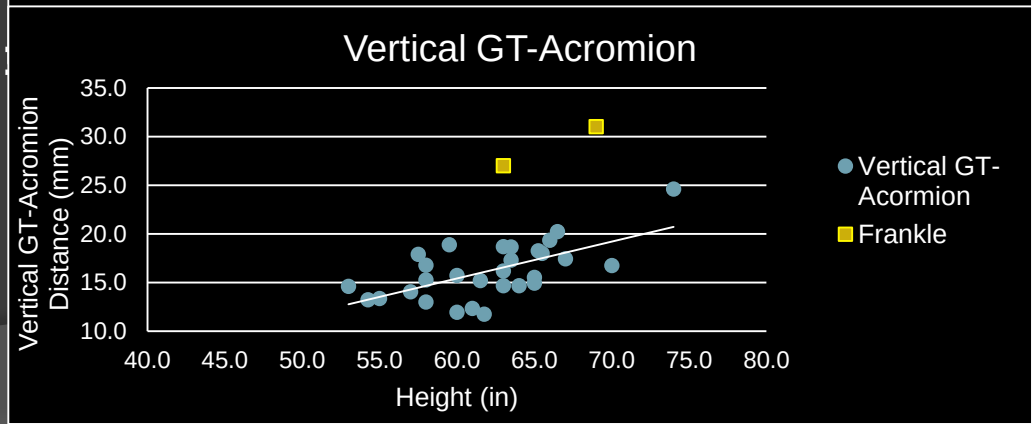


Results

- N=29
  - 14 M, 15 W
  - Height: 5'4" (M) 5' (W)
- GT-Glenoid distance:
  22.7 ±1mm (M) 20 ± 2mm (W)
- Vertical Acromio-GT distance:
  15 ±3mm (M) 13 ±2mm (W)
- Horizontal Acromio-GT distance:
  19 ±4mm (M) 17 ±5mm (W)







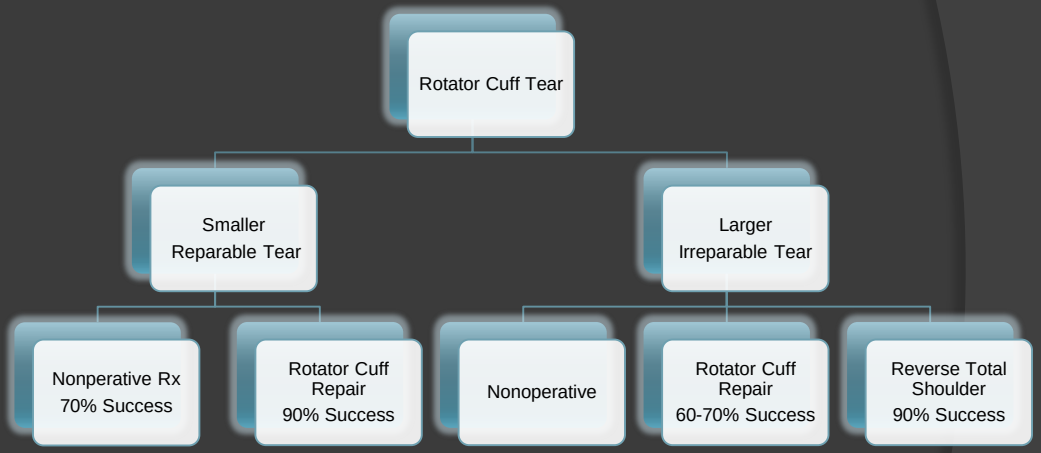
Results

- Patient height and gender correlates with humeral, glenoid size and glenohumeral offset.

- Asian-Americans have smaller anatomic glenohumeral measurements.
  - This can have huge clinical consequences when applying shoulder arthroplasty.
  - Deltoid lengthening of ~20mm may be excessive in Asian patients.

Contemporary Rotator Cuff Treatment: 2016

- Evolution of Concept
- Cause of RCT:
  - Biology problem
- Treatment:
  - How to maximize the biology
  - Improve mechanical stability of the repair



Be sensitive to the effect of the culture

- Treat the symptoms vs problems?
- Clinical exam + Diagnostic exam
- An ounce of prevention > A pound of cure
  - Problems of today may be bigger problem of tomorrow

To leave you with a parting thought…

Thank You

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