The Rotator Cuff: Management of Irreparable Tears

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Banner Sports Medicine | Banner University Medicine

Disclosures

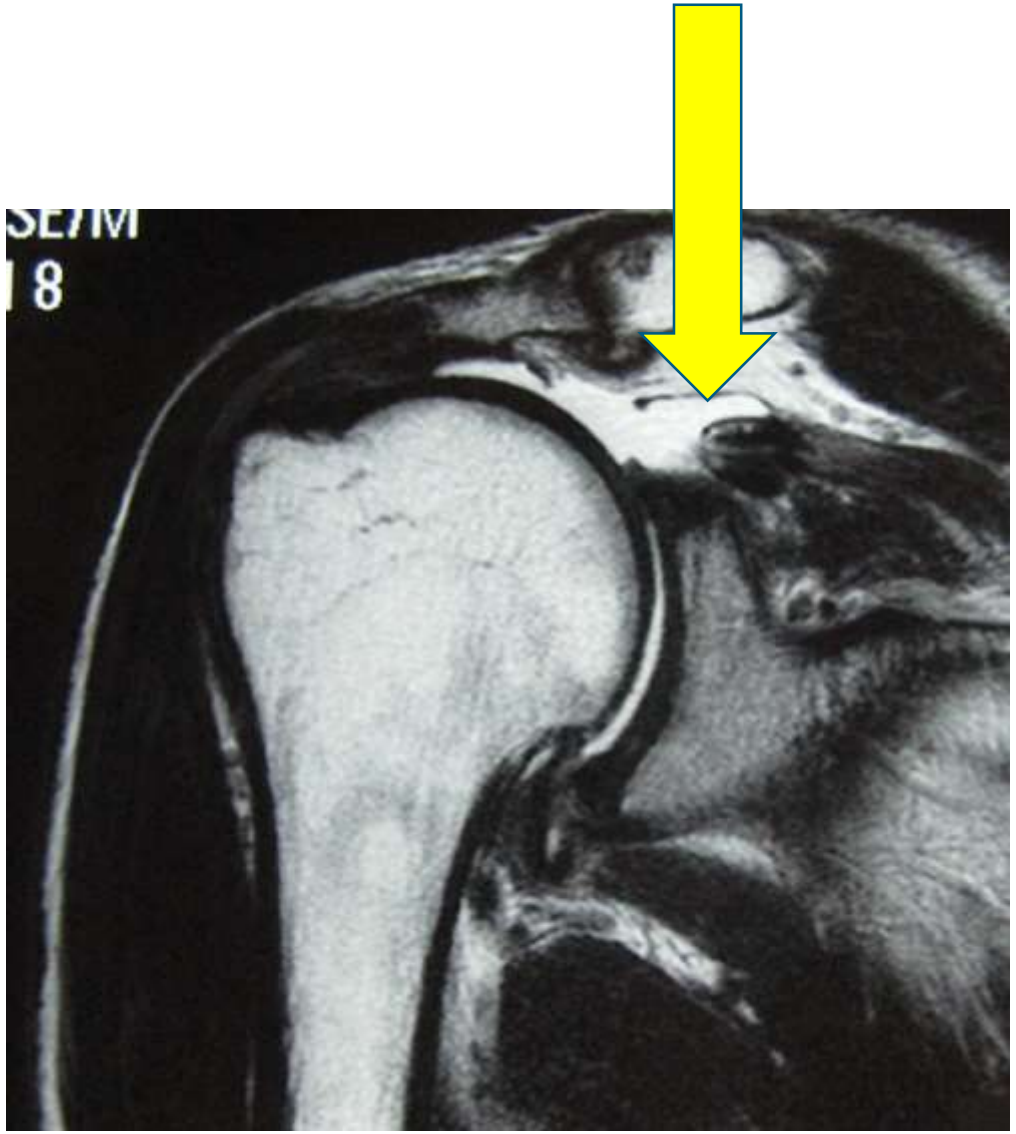
- Consultant: Arthrex
- Paid Speaker: Arthrex
- Royalties: Arthrex
- Research Support: Arthrex

Goals

1. Discuss irreparable rotator cuff tear diagnosis and evaluation.
2. Review options for management of irreparable tears.
3. Discuss outcome of treatment options.

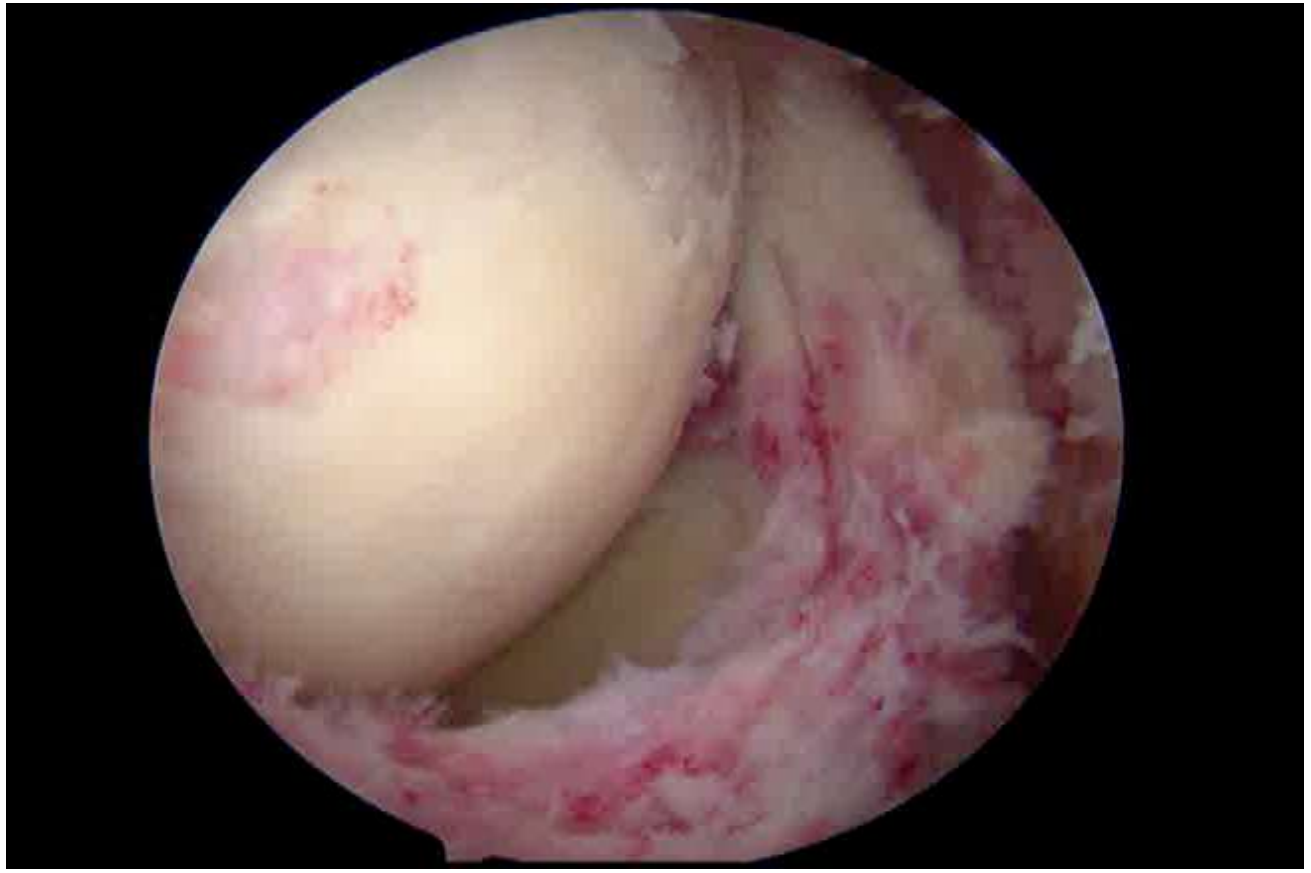
What are we talking about… Massive RTCT without Arthritis

- Massive Rotator cuff tear = 5cm AP
  - DeOrio JBJS 1984
  - Posterior/Superior = SST/IST/TM
  - Anterior Superior = SUB/SST/IST
- 2+ tendons
- Hamada Stage 1, 2, 3=No Arthritis



Does Age Matter?

- 80
- 70
- 60
- 50
- 40

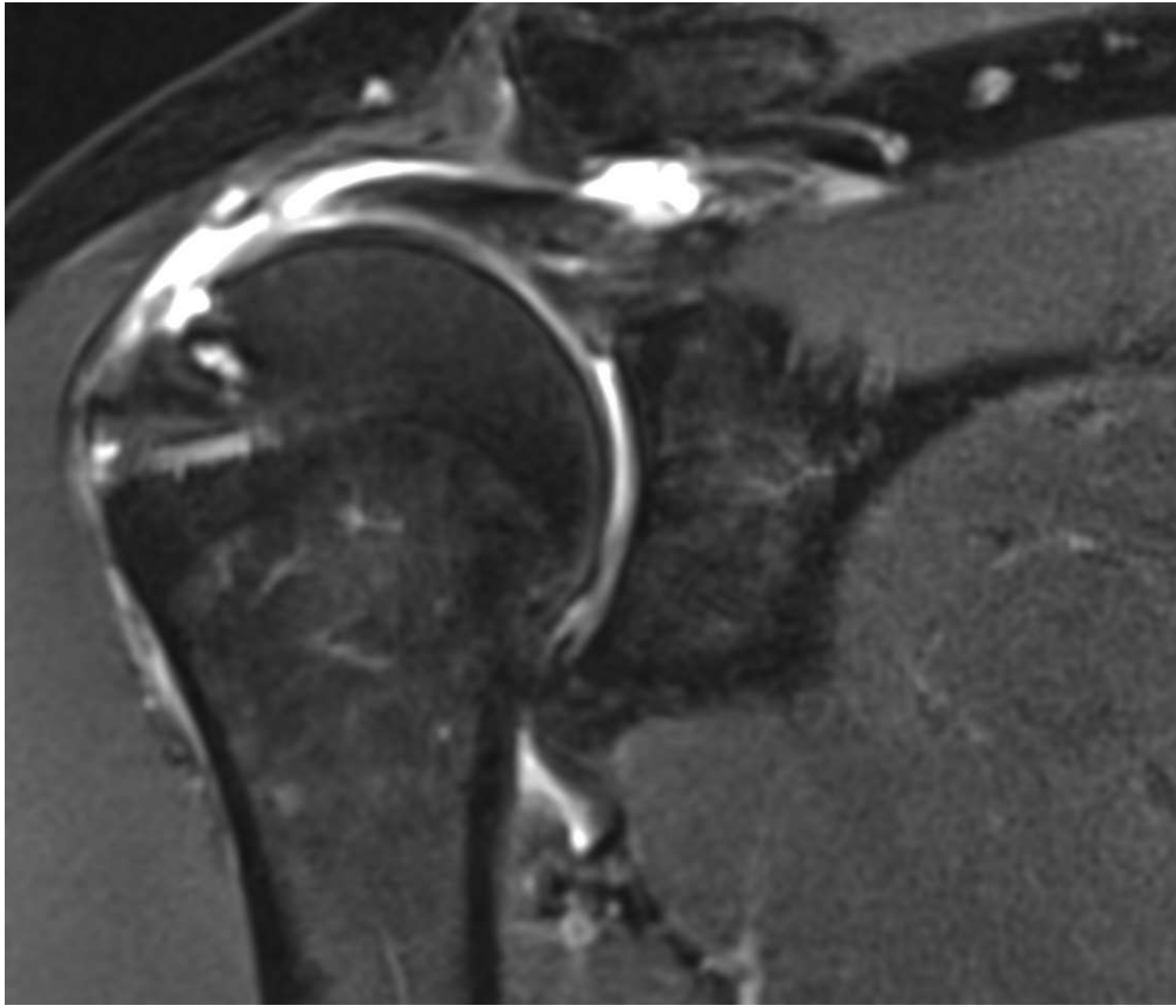


Outcome repair of Massive RCR

Failures 34-94%

- Gerber JBJS 2000
- Galatz JBJS 2004
- Bishop JSES 2006
- Tashjian AJSM 2010
- Bartl IJSS 2012

Worse with:
- Age
- Tear size
- Chronicity
- Medical Comorbidities
- Smoking
- Diabetes



Prevalence of symptomatic and asymptomatic rotator cuff tears in the general population: From mass-screening in one village

Hiroshi Minagawa [a], *Nobuyuki Yamamoto* [b], *Hidekazu Abe* [c], *Masashi Fukuda* [d], *Nobutoshi Seki* [c], *Kazuma Kikuchi* [c], *Hiroaki Kijima* [c], *Eiji Itoi* [b], JOURNAL OF ORTHOPAEDICS 10 (2013) 8–12

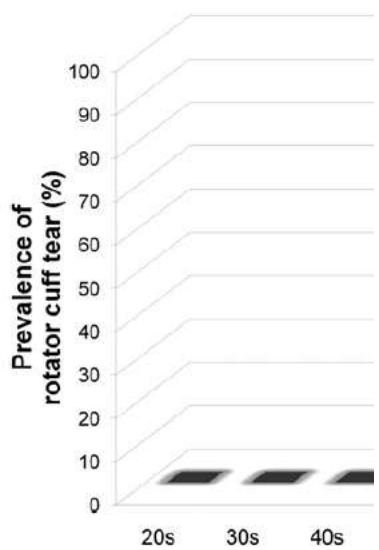


Fig. 1 – Prevalence of rotato prevalence of full-thickness was 0% in the 20s to 40s, 10. 26.5% in the 70s, and 36.6%

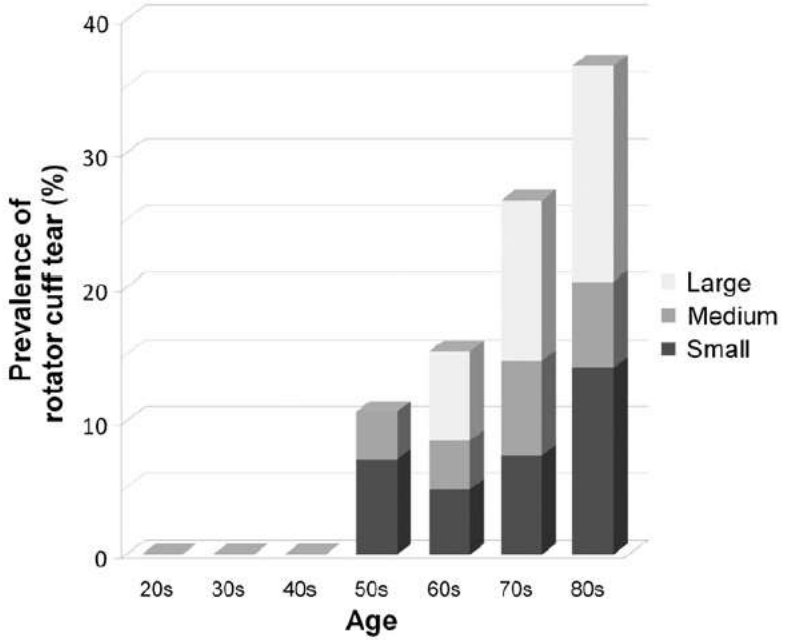
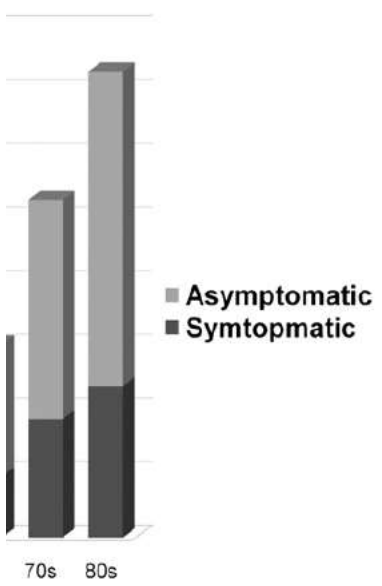


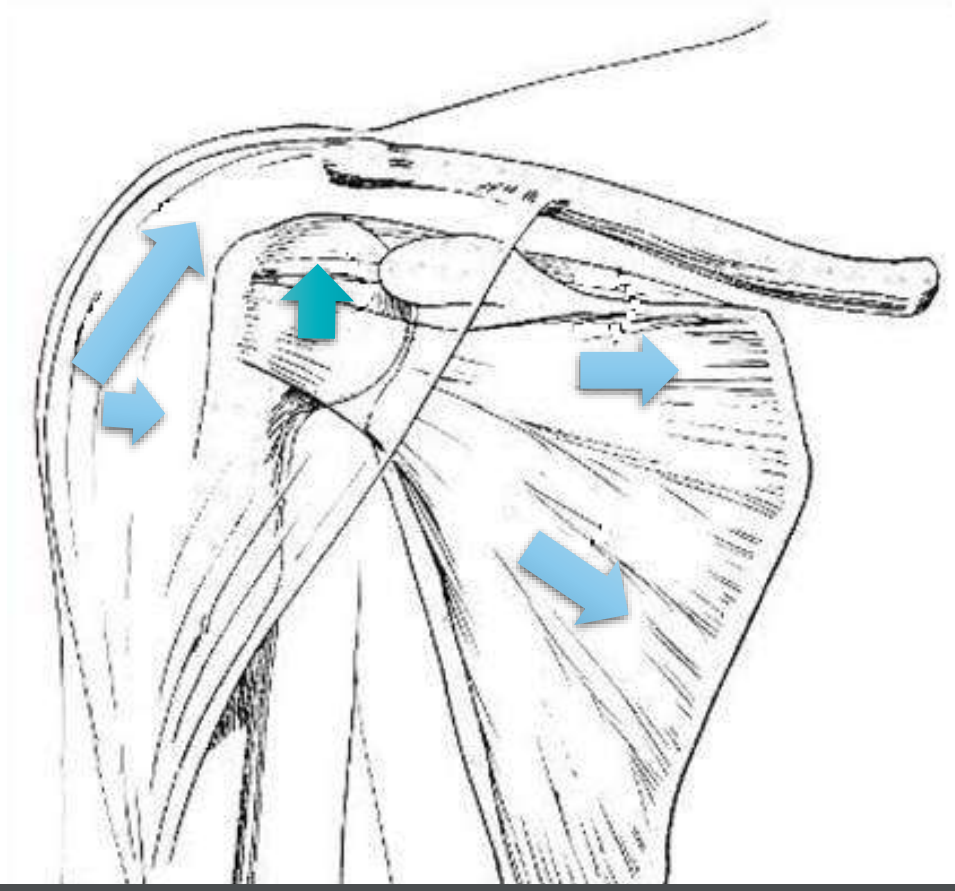
Fig. 4 – Prevalence of tear according to tear size. The small-sized tear was most commonly seen (66.3%) in the 50s. However, the large-sized tear accounted for a substantial fraction of tear in the 60s, 70s and 80s (43.8%, 45.1%, 43.9%, respectively).



atic and asymptomatic
nted for 50% of all tears in
d over, the percentage of
antly greater than that of

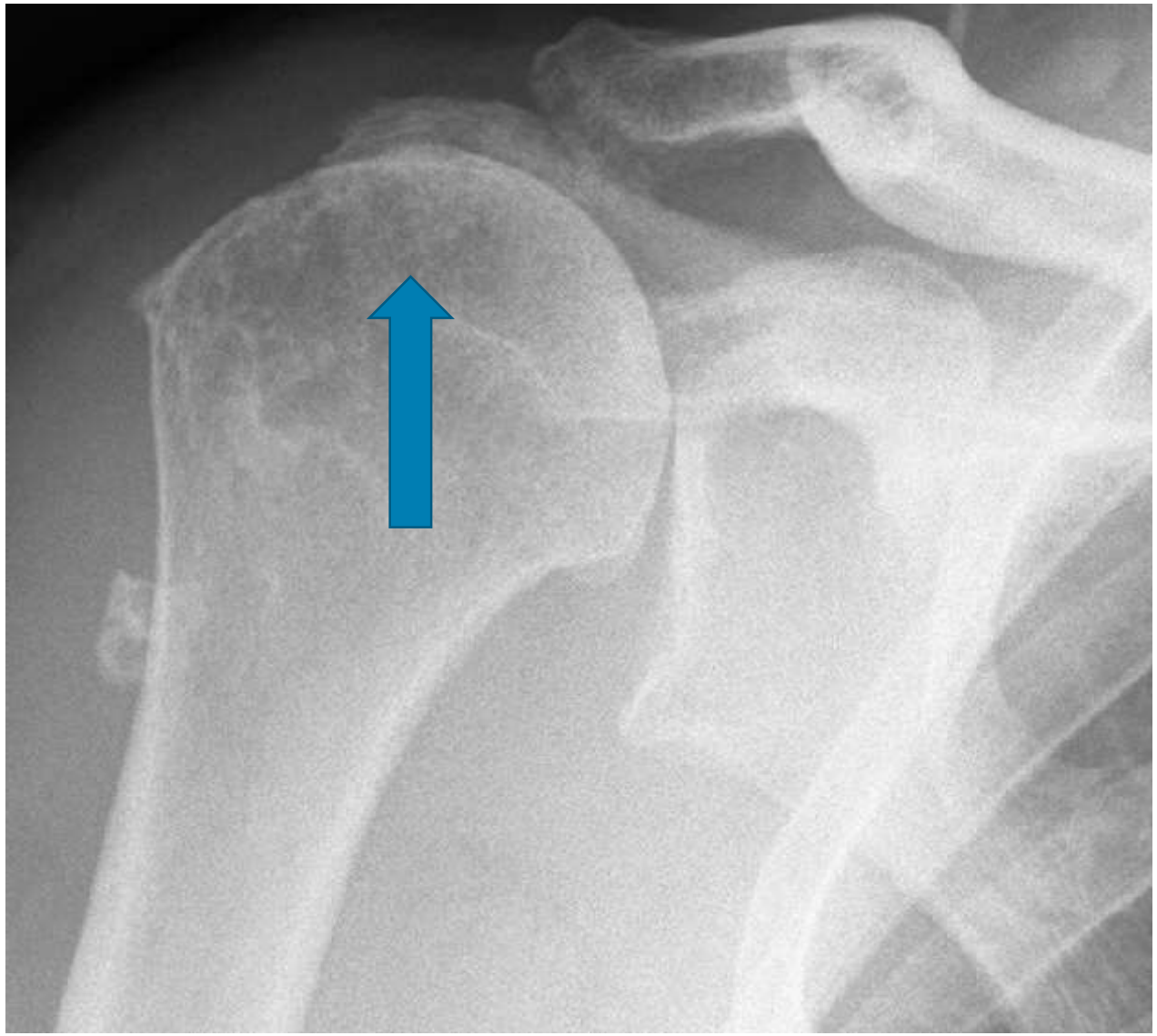
Normal Anatomic Shoulder

- Glenohumeral motion 120°
- Glenohumeral and scapular-thoracic motion is lost



The deltoid moment leads to glenohumeral instability

Humeral Dissociation From Glenoid



The Dysfunctional Rotator Cuff

- Supraspinatus
  - Passive: Mid abduction arc impingement tests → Extrinsic Impingement
    - Neer, Jobe, Hawkins, Rotation
  - Active
    - Empty/Full can, Champagne Toast/Pour
    - Drop Arm

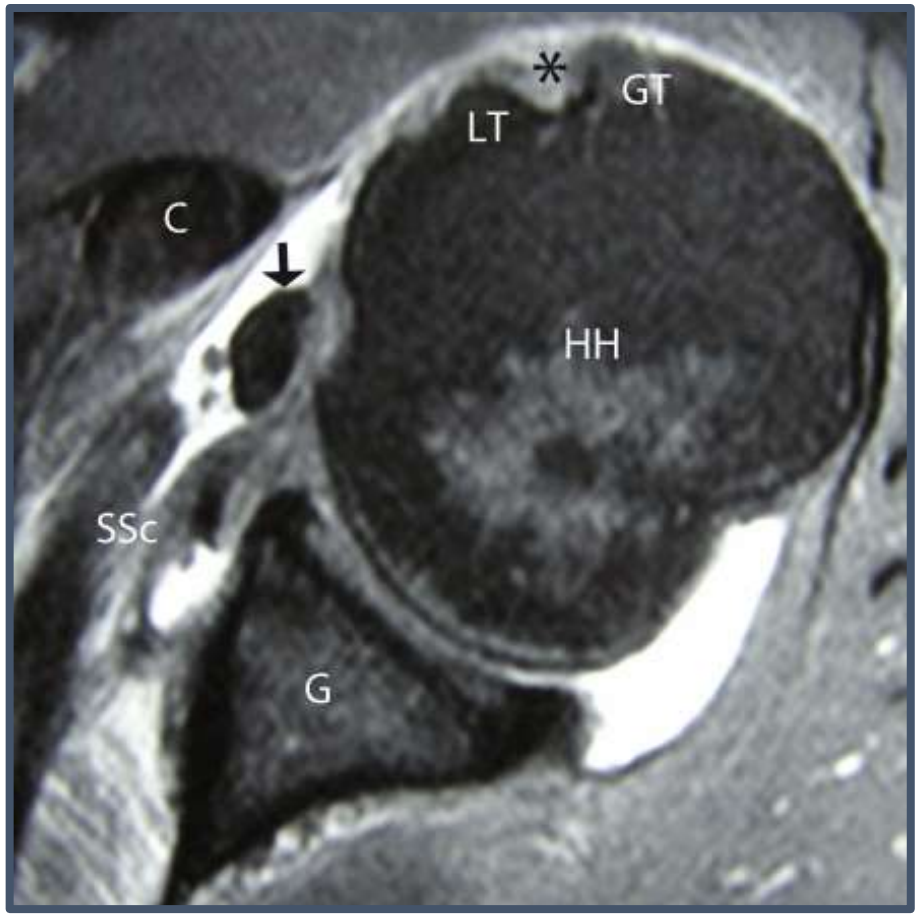
Pseudoparalysis

The Dysfunctional Rotator Cuff

- Infraspintus
  - Passive: ER Lag Sign
  - Active
    - ER strength at 0º
- Teres Minor
  - Passive: Hornblowers
  - Active: ER at 90º

The Dysfunctional Rotator Cuff

- Subscapularis
  - Passive
    - Increased ER
    - Internal Rotation Lag sign
  - Active
    - Belly Press Test
    - Bear Hugger Test
    - Lift Off Test
  - Subcoracoid Impingement



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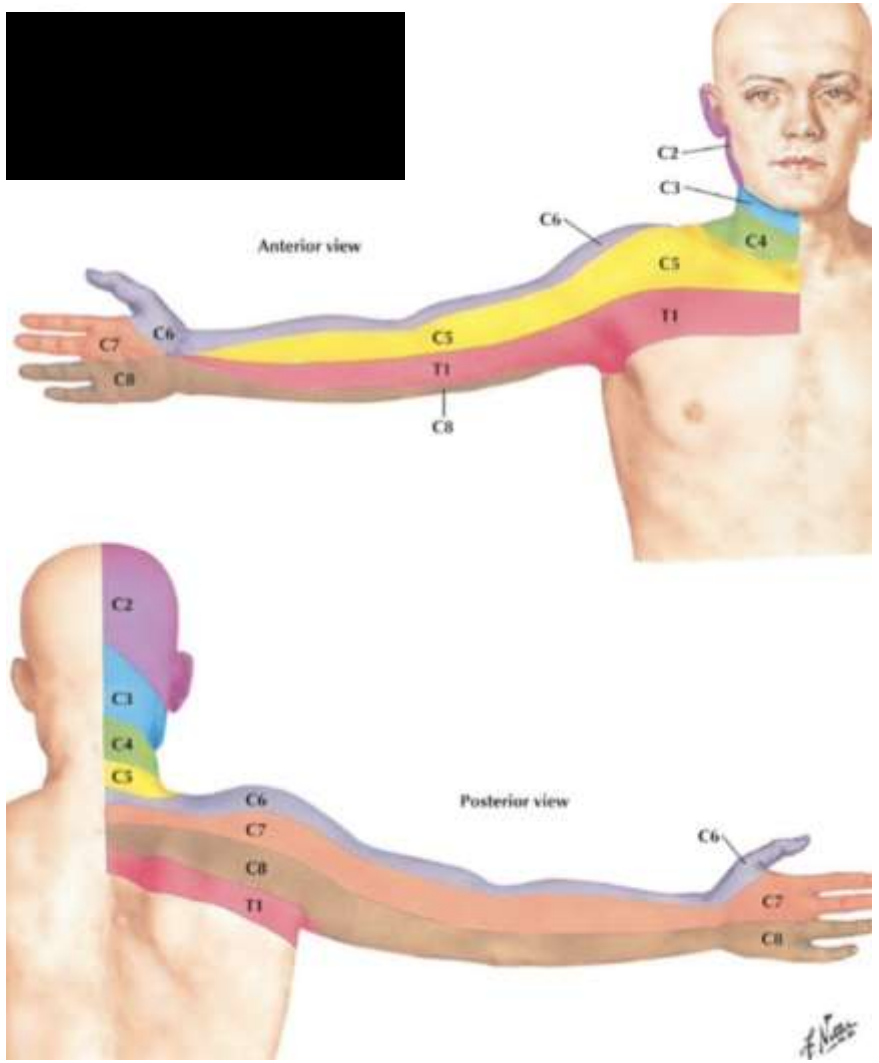
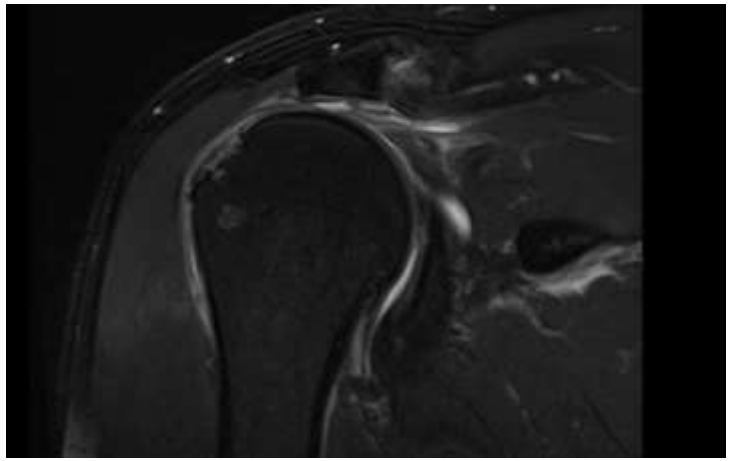
Don’t Forget the Cervical Spine

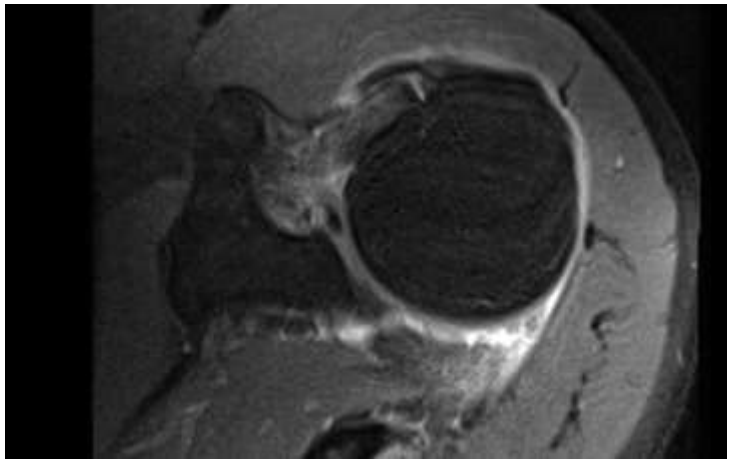
- Medial Scapular Pain
- Diffuse pain
- Pain at rest
- Trapezius
- ROM
- Spurlings

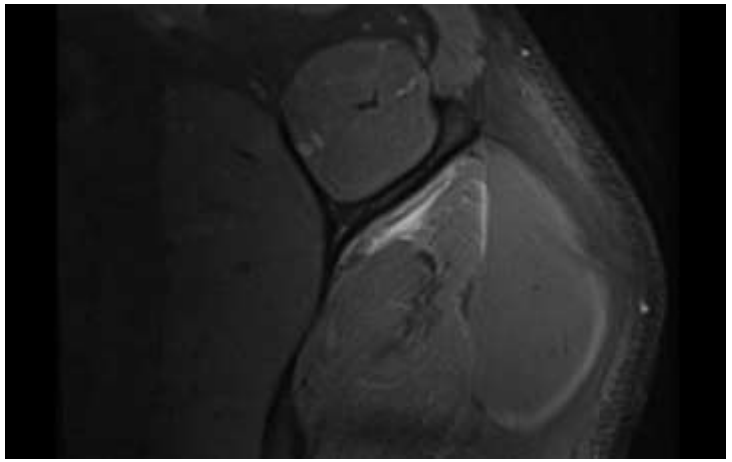


Imaging-Xray

- My Standard series

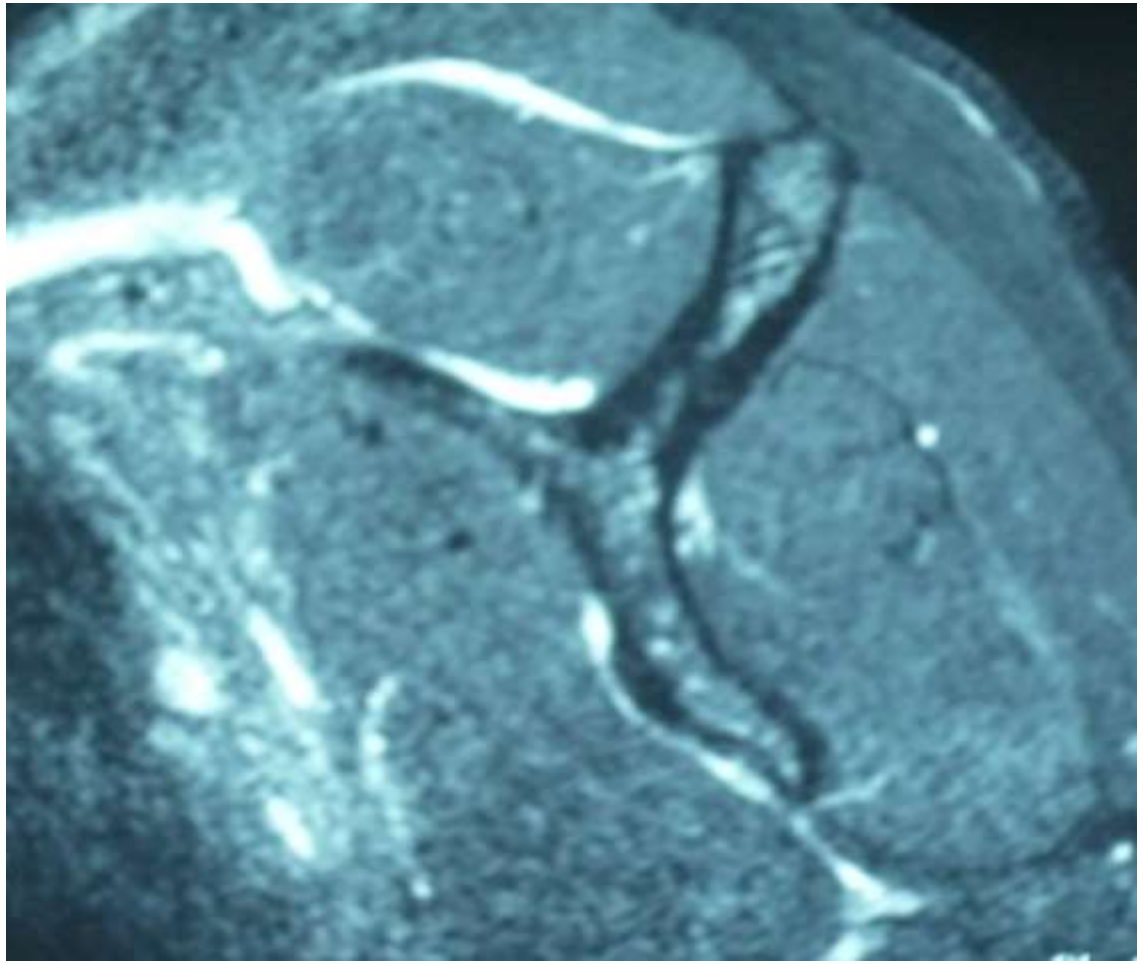




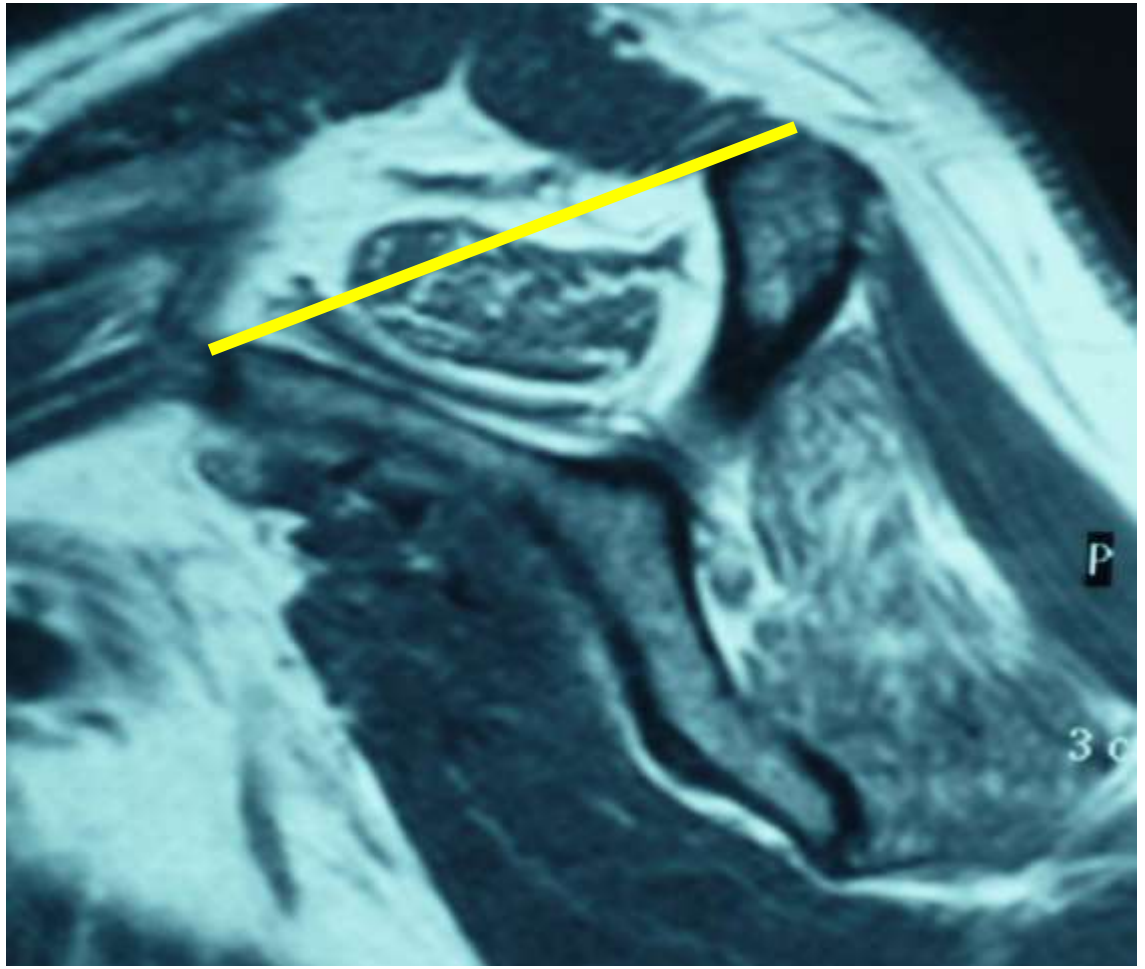


MRI

Definition-Fatty Muscle Degeneration Goutallier CORR 1994



Tangent Sign



Natural History of Fatty Infiltration and Atrophy of the Supraspinatus Muscle in Rotator Cuff Tears

Barbara Melis MD, Michael J. DeFranco MD, Christopher Chuinard MD, Gilles Walch MD

Published online: 22 January 2010

Abstract

Background In some patients nonoperative treatment of a rotator cuff tear is sufficient, while in others it is only the first stage of treatment prior to surgery. Fatty infiltration progresses throughout the nonoperative treatment although it is not known at what point fatty infiltration contributes to poor functional outcomes, absence of healing, or increased rerupture rates.

Questions/purposes We therefore identified factors related to the appearance of supraspinatus muscle fatty infiltration, determined the speed of appearance and progression of this phenomenon, and correlated fatty infiltration with muscular atrophy.

Methods We retrospectively reviewed 1688 patients with rotator cuff tears and recorded the following: number of tendons torn, etiology of the tear, time between onset of shoulder symptoms and diagnosis of rotator cuff tear. Fatty infiltration of the supraspinatus was graded using either CT or MRI classification. Muscular atrophy was measured indirectly using the tangent sign.

Results Moderate supraspinatus fatty infiltration appeared an average of 3 years after onset of symptoms and severe fatty infiltration at an average of 5 years after the onset of symptoms. A positive tangent sign appeared at an average of 4.5 years after the onset of symptoms.

Conclusions Our results suggest that rotator cuff repair should be performed before the appearance of fatty infiltration (Stage 2) and atrophy (positive tangent sign)—especially when the tear involves multiple tendons.

Level of Evidence Level IV, prognostic study. See Guidelines for Authors for a complete description of levels of evidence.

Fat Infiltration SST

Moderate > 3yrs

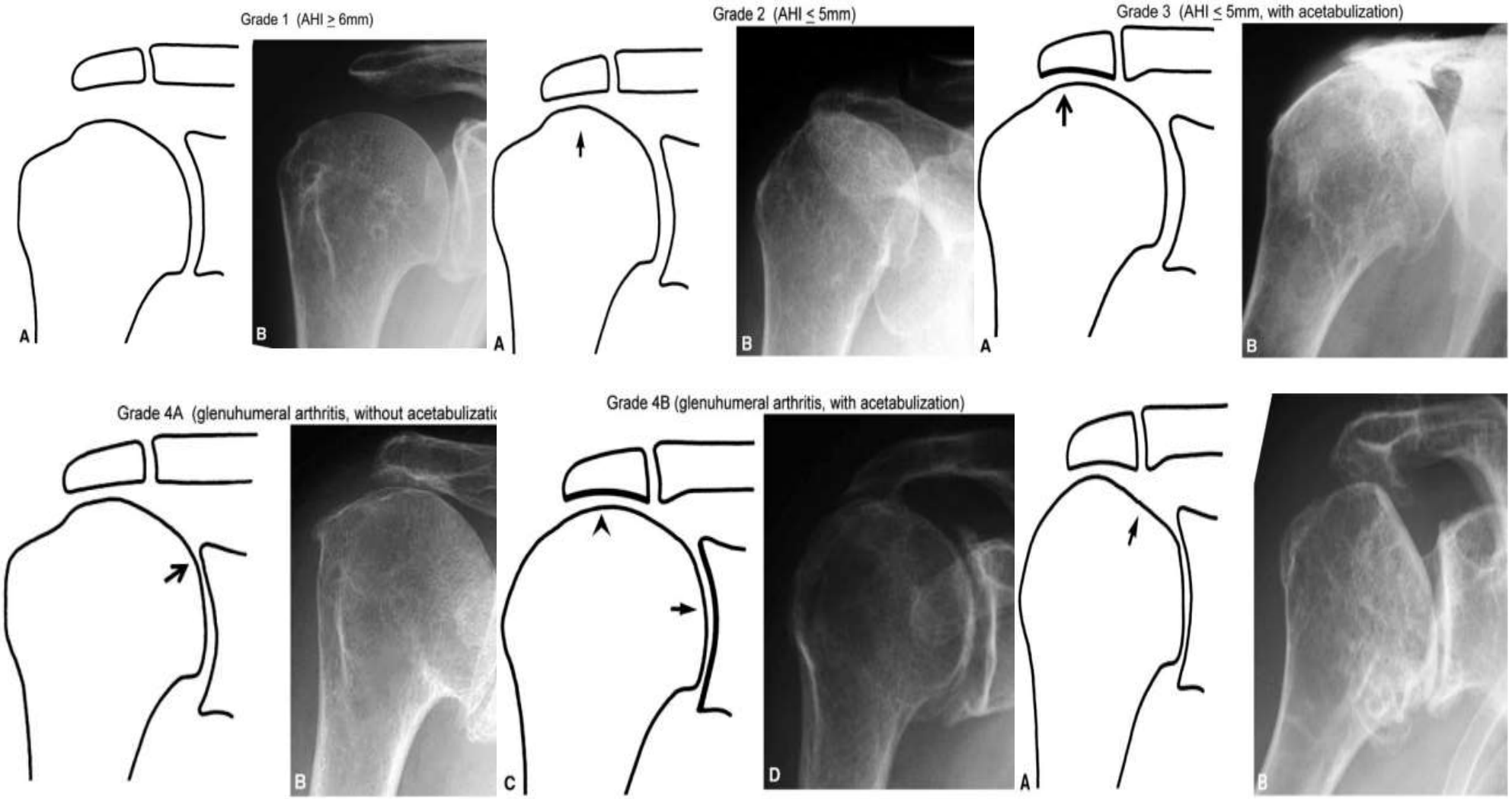
Severe >5 yrs

Tangent sign SST

4 years

Natural history of the rotator cuff tears

Hamada et al classification

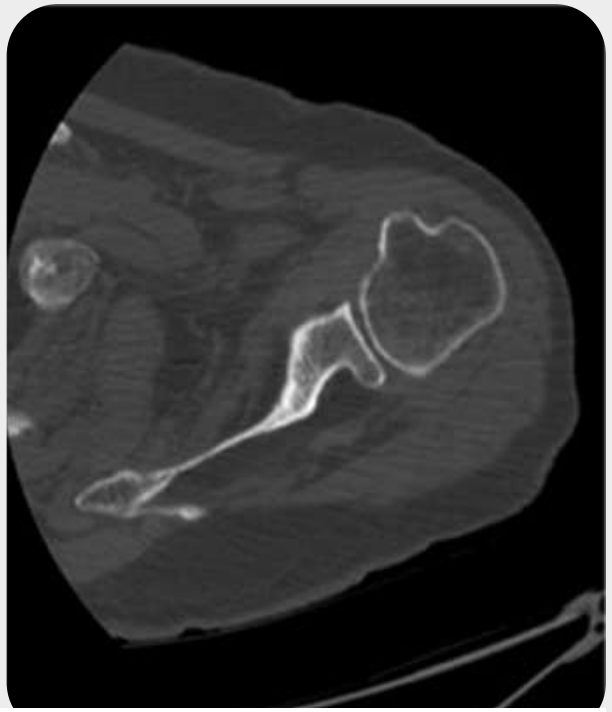


Why would a Rotator Cuff Tear be Irreparable?

- Chronic
  - Loss of Tendon
  - Loss of Excursion
- Tear mid-tendon
  - Watershed Tear
  - Medial to Repair
  - Tendon Still on Tuberosity
- Insufficiency
  - Tendon
  - Bone

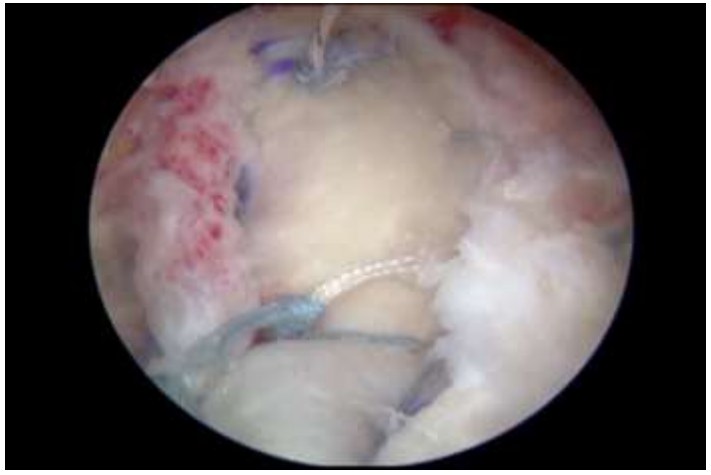
Glenoid Morphology is Unaltered

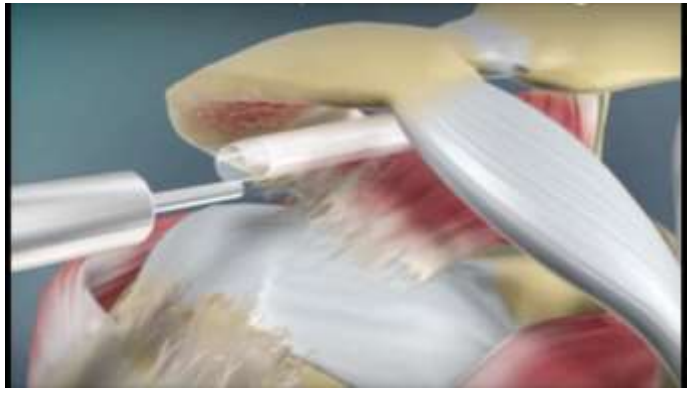
1. Deltoid forces pull humerus away from glenoid
   - Dissociation of humerus from glenoid
2. No glenoid bone loss
3. Glenoid shape is normal



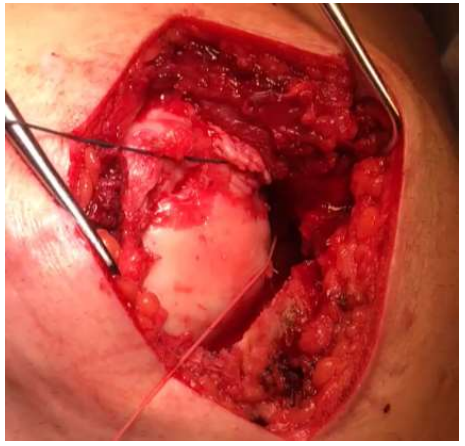
60% of RSA patients

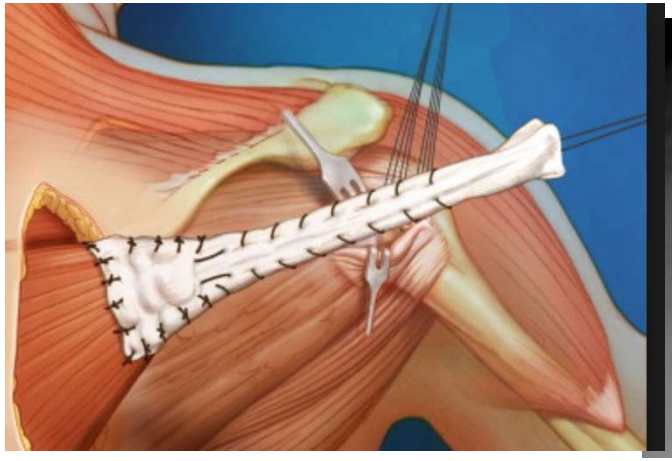
Irreparable RTC-Options



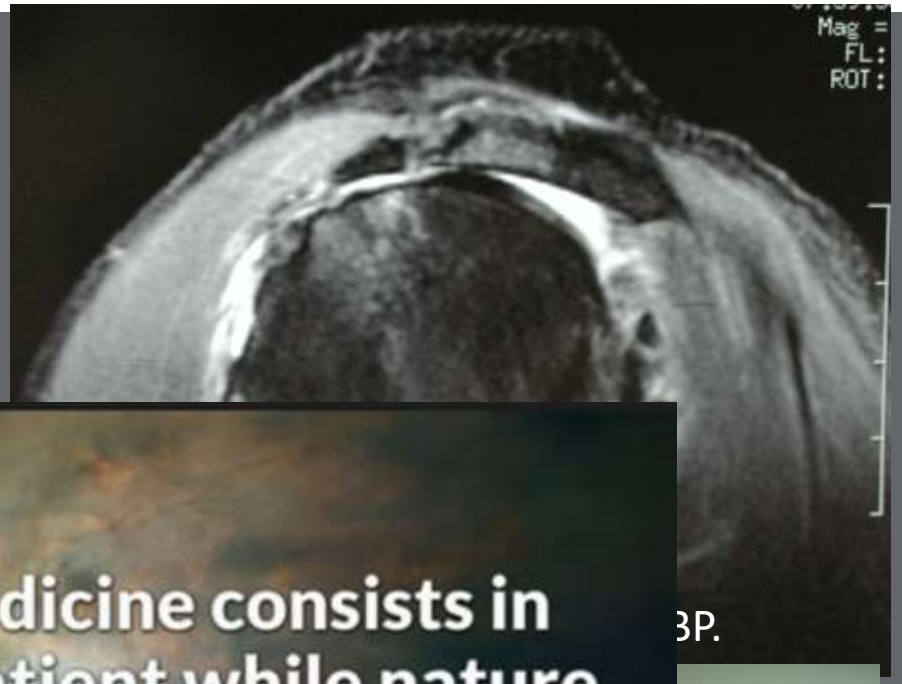


- Rehabilitation
- Arthroscopic debridement/Tenotomy
- Tendon Transfers
- Superior Capsular Reconstruction
- Biodegradable Balloon Spacer
- Humeral head replacement/CTA
- Reverse TSA



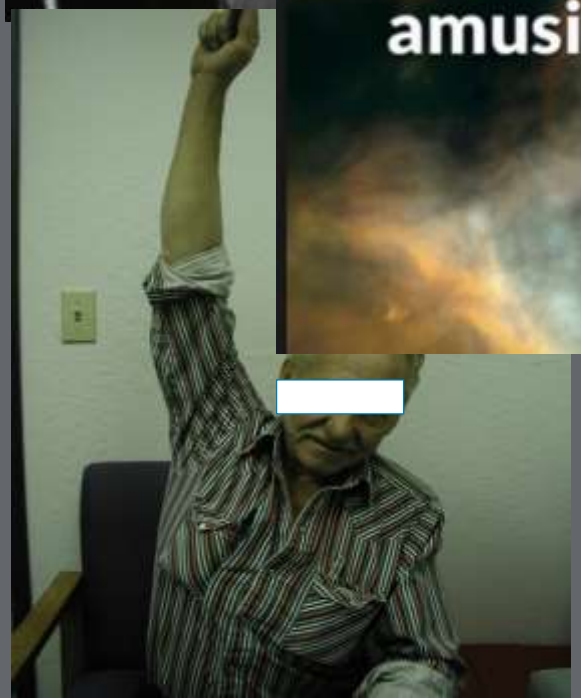


Banner Health

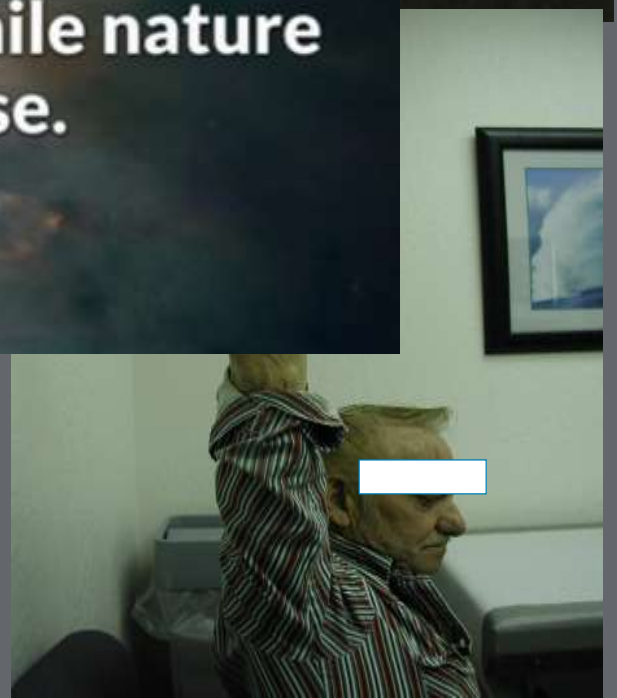


60 yo m

BP.



REHAB



The Rotator Cuff Quality-of-Life Index Predicts the Outcome of Nonoperative Treatment of Patients with a Chronic Rotator Cuff Tear

Richard S. Boorman, MD, MSc, FRCSC, Kristie D. More, MSc, Robert M. Hollinshead, MD, FRCSC, J. Preston Wiley, MD, Kelly Brett, MD, Nicholas G. Mohtadi, MD, FRCSC, Atiba A. Nelson, MPH, Ian K.Y. Lo, MD, FRCSC, and Dianne Bryant, PhD

J Bone Joint Surg Am. 2014;96:1883-8

75% successfully treated/ 104 patients

Non-Operative Rotator Cuff Home Program

UNIVERSITY OF CALGARY

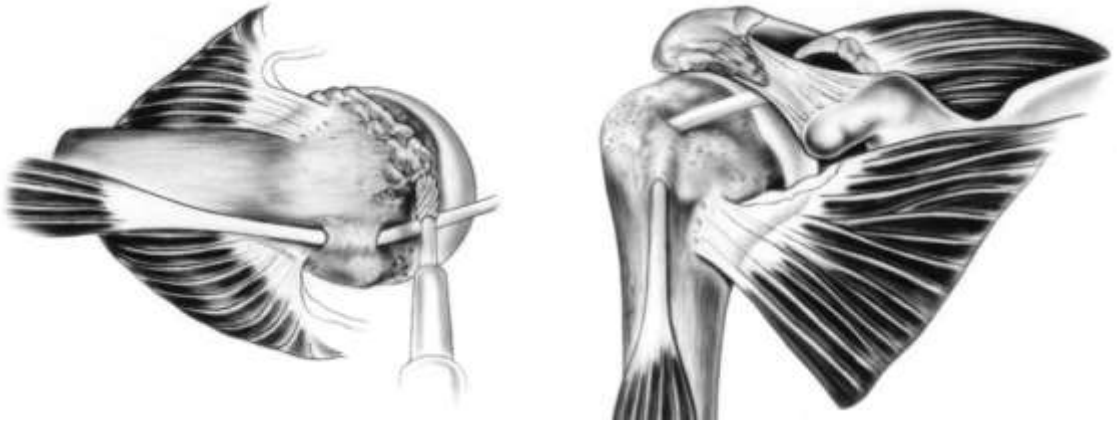
SPORT MEDICINE CENTRE
FACULTY OF KINESIOLOGY

This program is intended to be used as a home exercise rehabilitation **guide** that will help you to achieve a functional shoulder. A physiotherapist can be consulted throughout to teach and individually modify the exercises listed.

Tuberoplasty: Creation of an acromiohumeral articulation—A treatment option for massive, irreparable rotator cuff tears

John M. Fenlin Jr, MD, Jeffrey M. Chase, MD, Scott A. Rushton, MD, and Barbara G. Frieman, MD,
Philadelphia, Pa, and St. Thomas, Virgin Islands

J Shoulder Elbow Surg
March/April 2002



20 patients-68% pain free at 27 months

Arthroscopic tenotomy of the long head of the biceps in the treatment of rotator cuff tears: Clinical and radiographic results of 307 cases

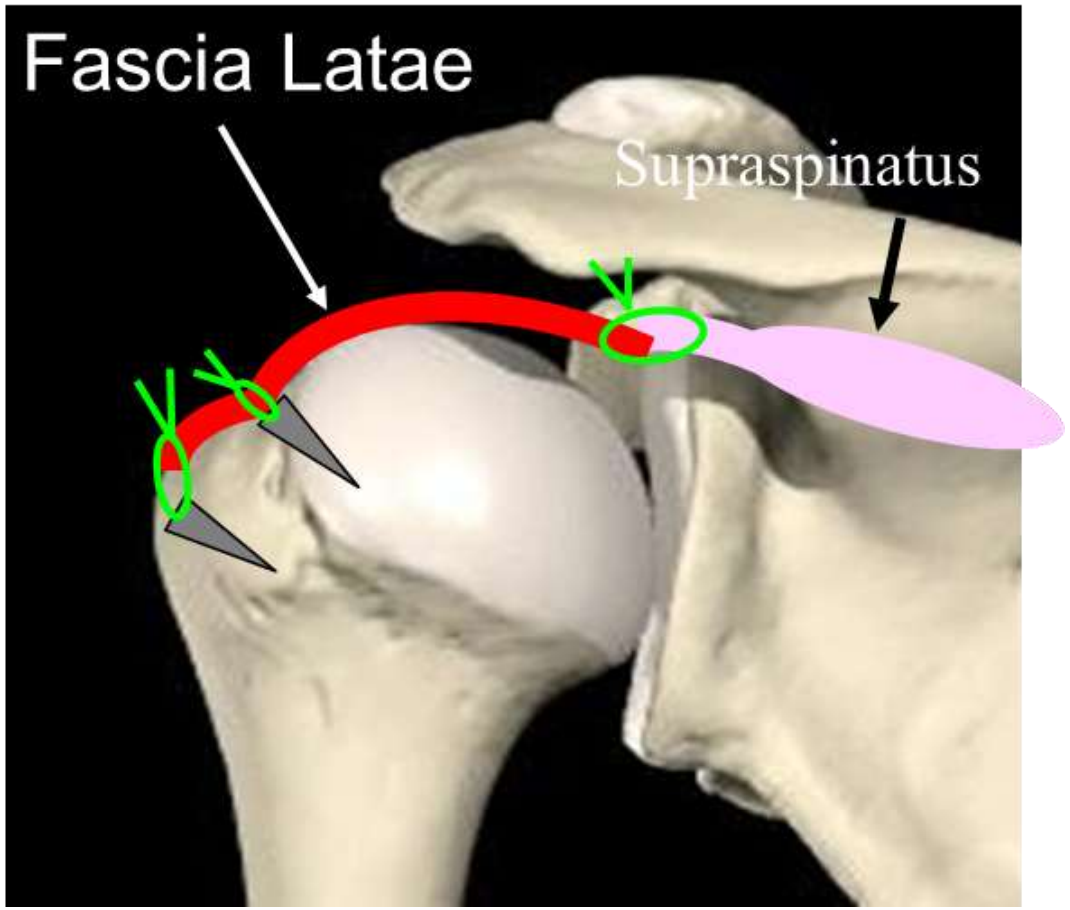
Gilles Walch, MD,[a] T. Bradley Edwards, MD,[b] Aziz Boulahia, MD,[a] Laurent Nové-Josserand, MD,[a]
Lionel Neyton, MD,[a] and Istvan Szabo, MD,[a] *Lyon, France, and Houston, TX*

J Shoulder Elbow Surg
May/June 2005

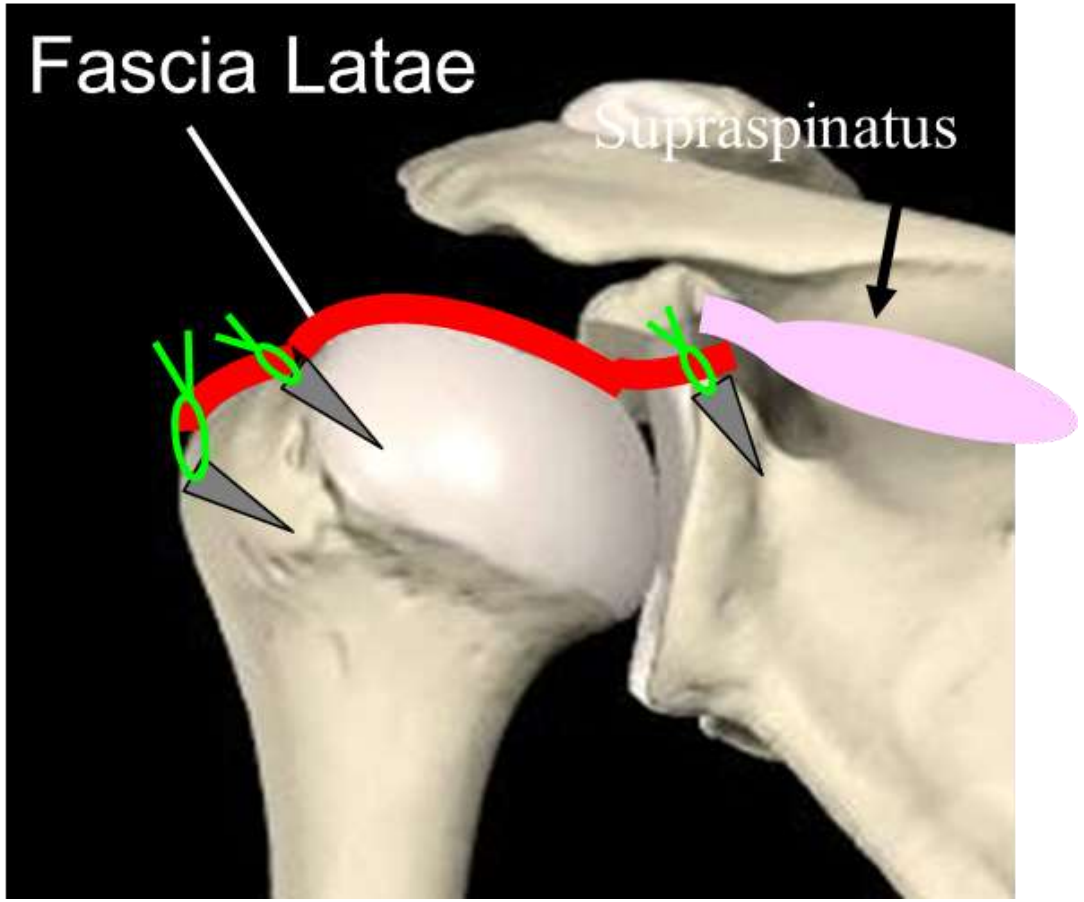
Constant 48 – 67
Acromioplasty 35%
DCE-Only3 patients
87% Satisfied
Arthritis progressed

Superior Capsular Reconstruction

Bridging Patch Graft



Superior Capsular Reconstruction



Clinical Outcomes of ASCR

ARTICLE IN PRESS

Original Article With Video Illustration

Clinical Results of Arthroscopic Superior Capsule Reconstruction for Irreparable Rotator Cuff Tears

Teruhisa Mihata, M.D., Ph.D., Thay Q. Lee, Ph.D., Chisato Watanabe, M.D., Ph.D., Kunimoto Fukunishi, M.D., Mutsumi Ohue, M.D., Tomoyuki Tsujimura, M.D., and Mitsuo Kinoshita, M.D., Ph.D.

Purpose: The objective of this study was to investigate the clinical outcome and radiographic findings after arthroscopic superior capsule reconstruction (ASCR) for symptomatic irreparable rotator cuff tears. **Methods:** From 2007 to 2009, 24 shoulders in 23 consecutive patients (mean, 65.1 years) with irreparable rotator cuff tears (11 large, 13 massive) underwent ASCR using fascia lata. We used suture anchors to attach the graft medially to the glenoid superior tubercle and laterally to the greater tuberosity. We added side-to-side sutures between the graft and infraspinatus tendon and between the graft and residual anterior supraspinatus/subscapularis tendon to improve force coupling. Physical examination, radiography, and magnetic resonance imaging (MRI) were performed before surgery; at 3, 6, and 12 months after surgery; and yearly thereafter. Average follow-up was 34.1 months (24 to 51 months) after surgery. **Results:** Mean active elevation increased significantly from 84° to 148° ($P < .001$) and external rotation increased from 26° to 40° ($P < .01$). Acromiohumeral distance (AHD) increased from 4.6 ± 2.2 mm preoperatively to 8.7 ± 2.6 mm postoperatively ($P < .0001$). There were no cases of progression of osteoarthritis or rotator cuff muscle atrophy. Twenty patients (83.3%) had no graft tear or tendon retear during follow-up (24 to 51 months). The American Shoulder and Elbow Surgeons (ASES) score improved from 23.5 to 92.9 points ($P < .0001$). **Conclusions:** ASCR restored superior glenohumeral stability and function of the shoulder joint with irreparable rotator cuff tears. Our results suggest that this reconstruction technique is a reliable and useful alternative treatment for irreparable rotator cuff tears. **Level of Evidence:** Level IV, therapeutic case series.

Chronic large to massive rotator cuff tears are challenging to repair completely because of the development of tendon retraction with inelasticity,[1,2] muscle atrophy,[1,3-6] and fatty infiltration.[1,6] Various surgical treatments have been developed, including debridement and subacromial decompression,[7,8] partial repair,[9-11] transposition of the subscapularis tendon,[12,13] transplantation of the teres major muscle,[14] supraspinatus muscle advancement,[15] deltoid flap reconstruction,[16] latissimus dorsi transfer,[17-19] pectoralis major transfer,[20] grafting to the torn tendon,[21-25] and reverse total shoulder arthroplasty.[26-28] However, none of these approaches is considered optimal for irreparable rotator cuff tears because any alternative to complete repair has proved inferior in terms of clinical outcome and postoperative complications.[1]

The most common signs of irreparable rotator cuff tears are pain from subacromial impingement,[11,19] muscle weakness in the shoulder joint,[11,19] and as a result, limitation of arm elevation.[11,19] These signs result mainly from a loss of the superior stability of the glenohumeral joint because of dysfunction of the rotator cuff muscles. Patients with irreparable rotator cuff tears have a defect of the superior capsule, which is located on the inferior surface of the supraspinatus and infraspinatus tendons. Therefore, we developed a new surgical treatment, arthroscopic superior capsule reconstruction (ASCR) (Figs 1 and 2, and Video 1 [available at www.arthroscopyjournal.org]) to restore superior stability of the shoulder joint because the shoulder capsule plays a role in stabilizing the glenohumeral joint.

From the Department of Orthopaedic Surgery, Osaka Medical College (T.M., C.W., K.F., M.K.), Takatsuki, Osaka; Katsuragi Hospital (M.O.), Osaka; and Wintec Hospital (T.T.), Hyogo, Japan; and the Orthopaedic Biomechanics Laboratory, VA Healthcare System, Long Beach, and the University of California (T.M., T.Q.L.), Irvine, CA, U.S.A.

The authors report that they have no conflicts of interest in the authorship and publication of this article.

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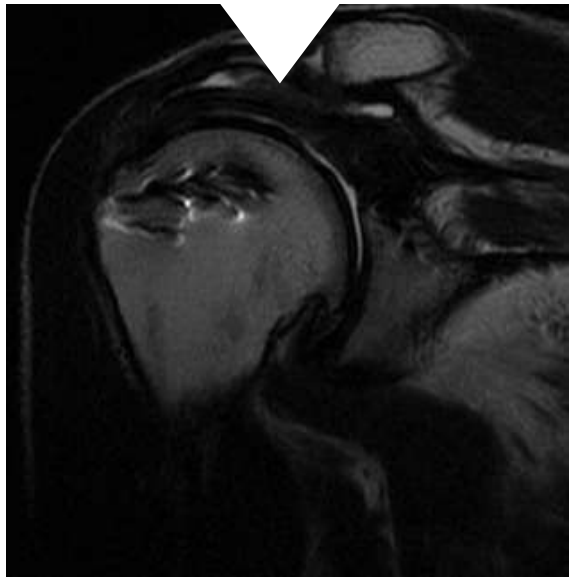
0749-8063/11811/$36.00
http://dx.doi.org/10.1016/j.arthro.2012.10.022



*24 patients (f/u 2.8 yrs.)

*A-H distance: 4.6±2.2 mm to 8.7±2.6 mm ($p < 0.0001$)

*ASES Score: 23.5 to 92.9 points ($p < 0.0001$)

*Twenty patients (83.3%) had no graft tear or tendon re-tear

Banner Health

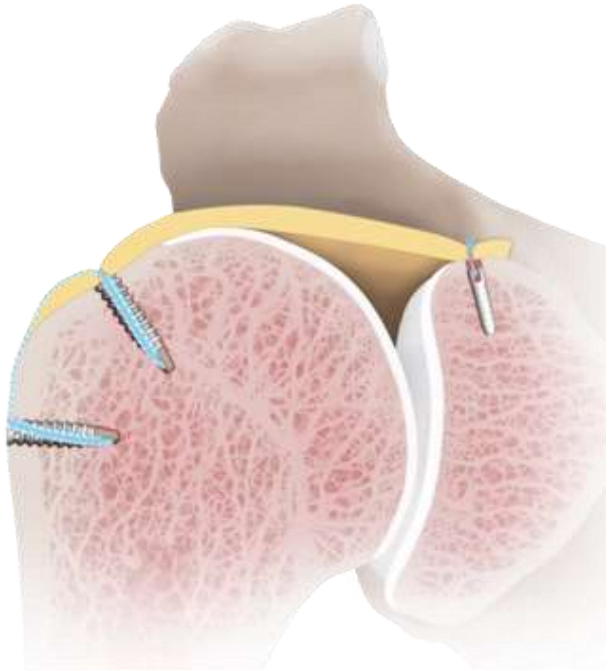
Why Consider SCR?

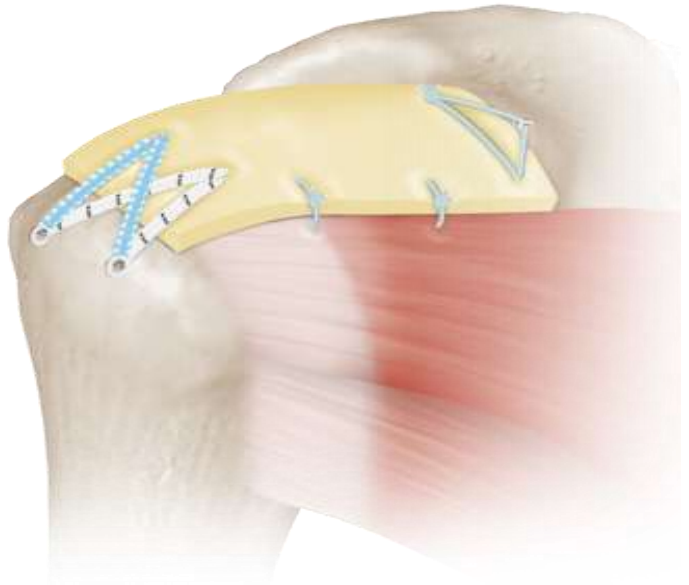
RSA may have higher complication rate in young patients

Preserve Anatomy

Biomechanically sound

Joint Preserving





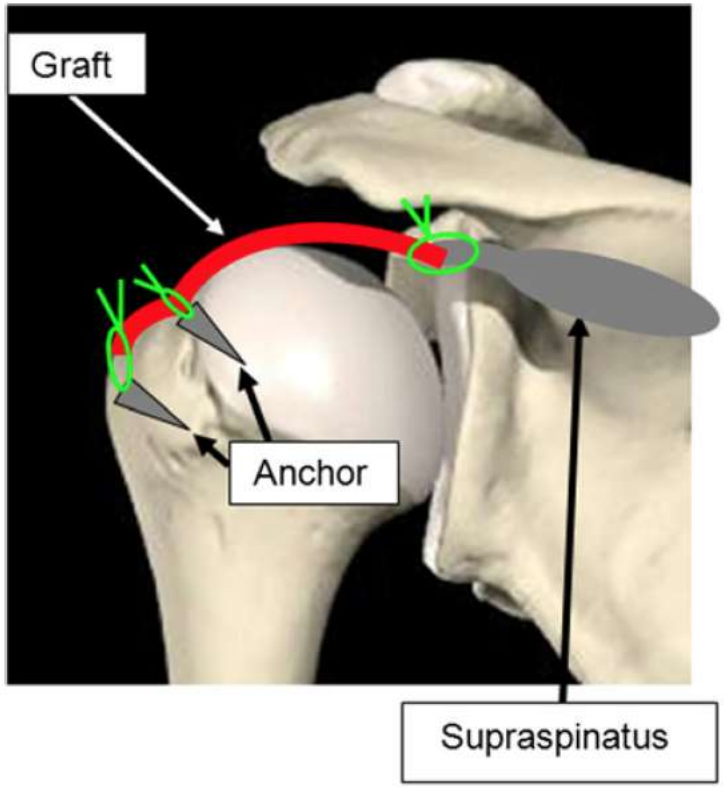
Superior Capsule Reconstruction to Restore Superior Stability in Irreparable Rotator Cuff Tears

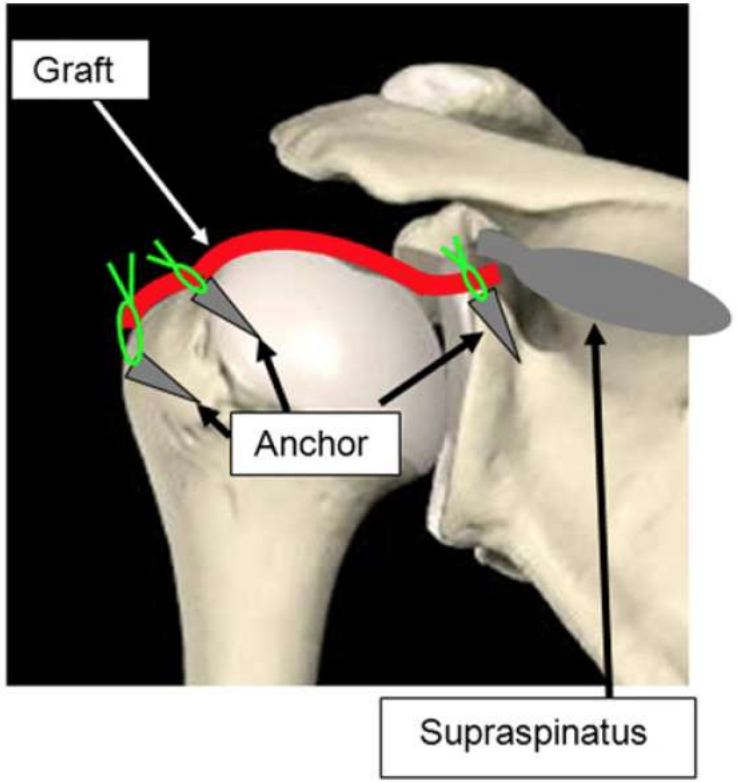
Am J Sports Med 2012 40: 2248

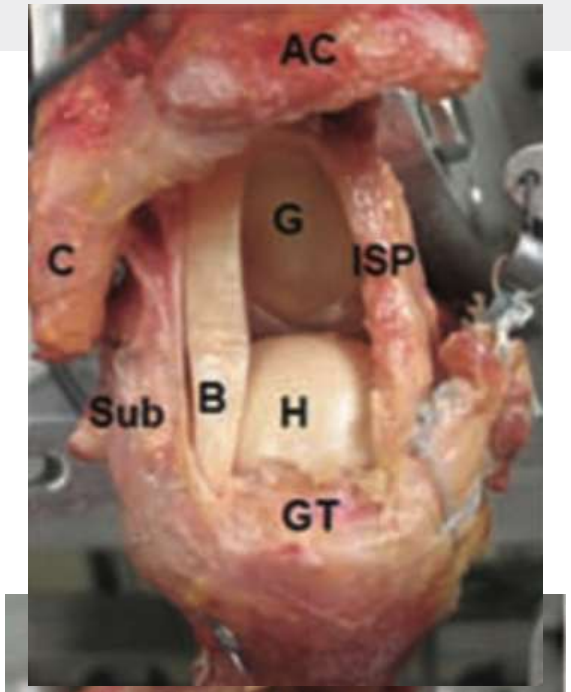
A Biomechanical Cadaveric Study

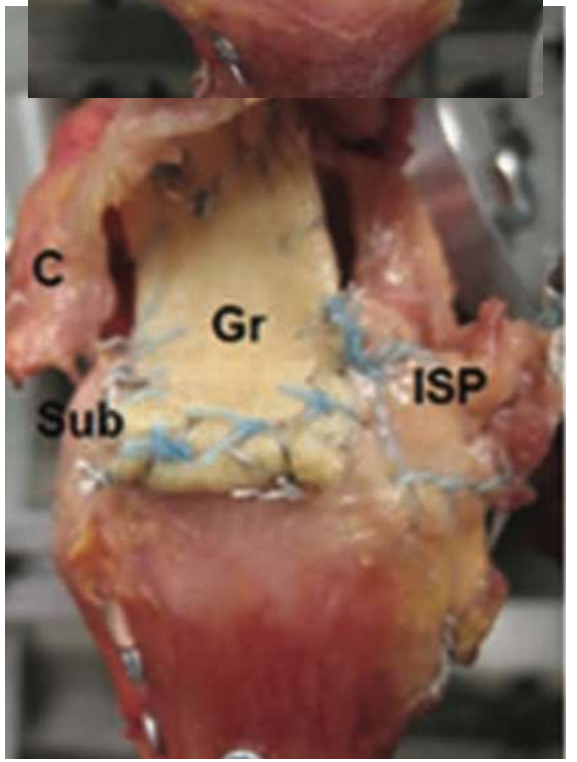
Teruhisa Mihata,[*†‡§] MD, PhD, Michelle H. McGarry,[†‡] MS, Joseph M. Pirolo,[†‡] MD, Mitsuo Kinoshita,[§] MD, PhD, and Thay Q. Lee,[†‡] PhD

Investigation performed at the Orthopaedic Biomechanics Laboratory, VA Healthcare System, Long Beach, California





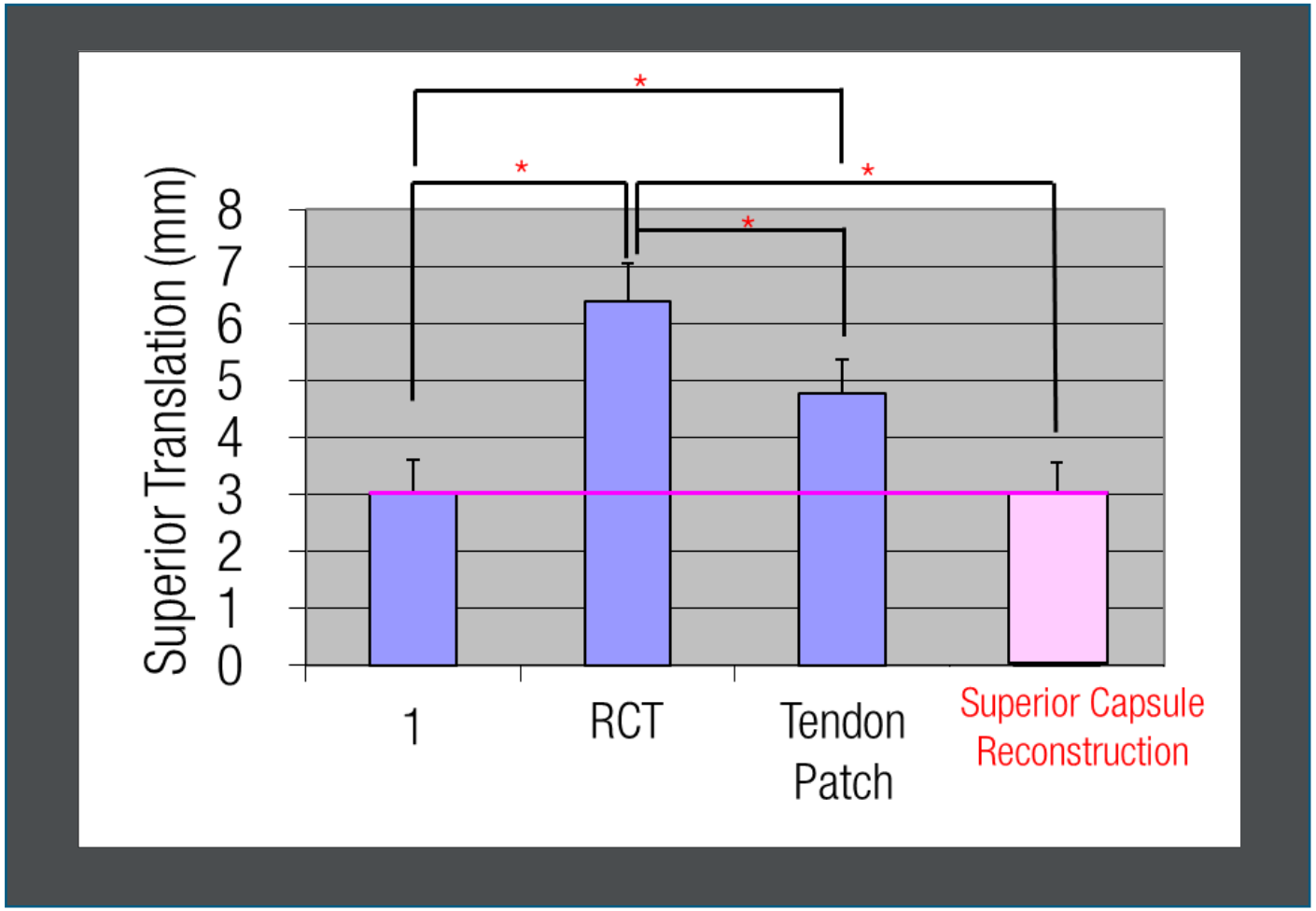




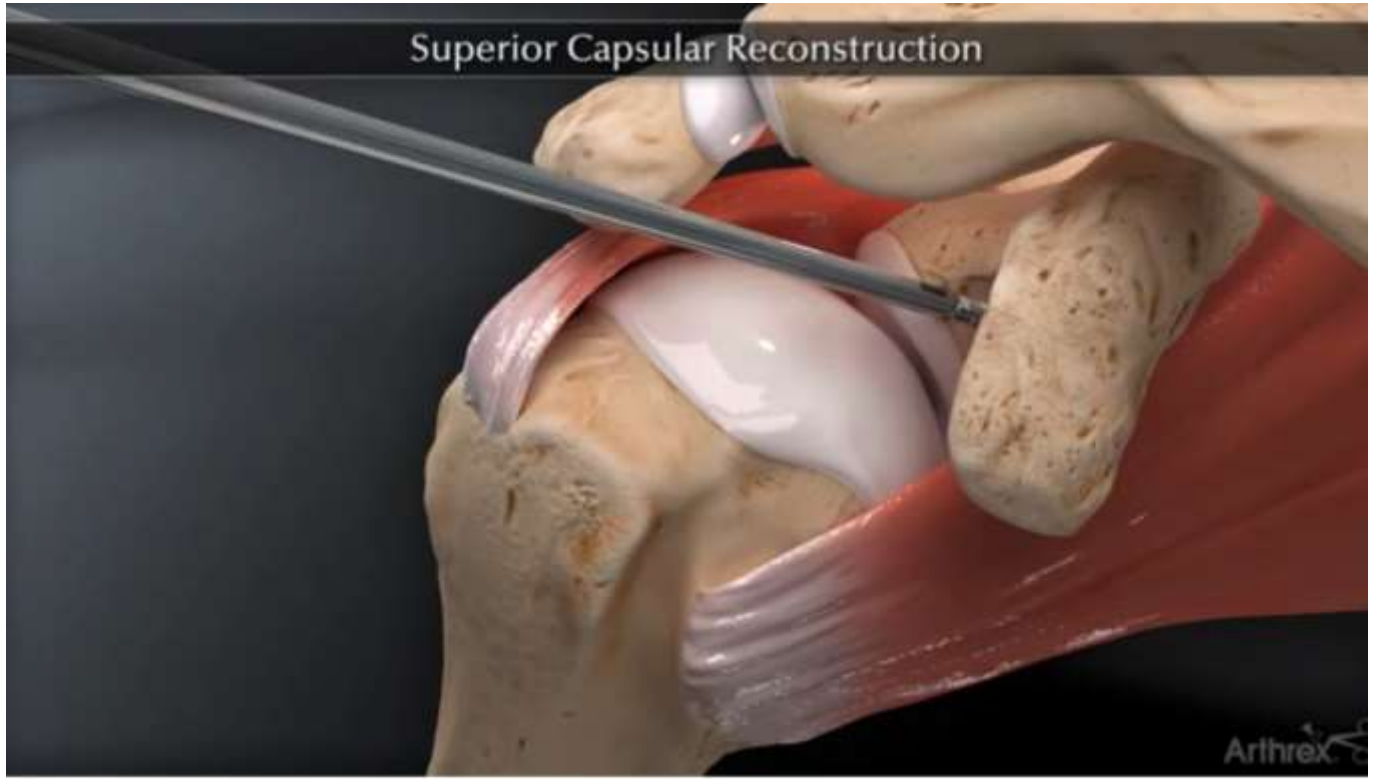
Translation

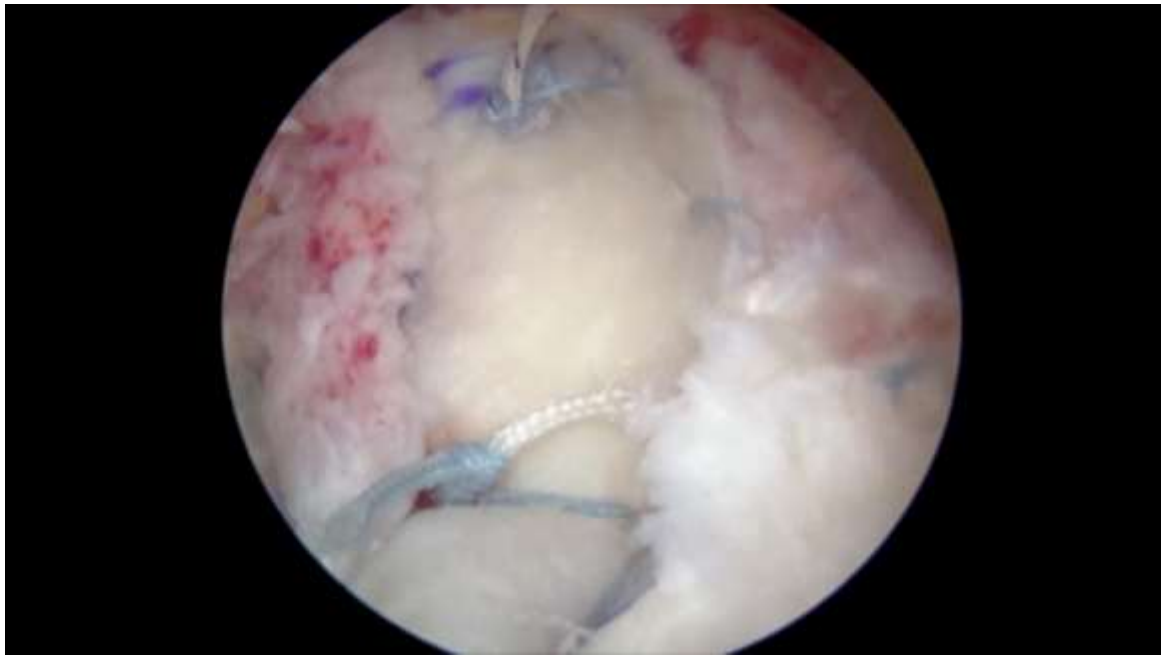
Clinical relevance:

- SCR is an effective method of restoring the native superior restraints of the humerus.
- Full-thickness supraspinatus tear increases humeral superior translation and subacromial contact pressure and decreased glenohumeral compression force compared with an intact rotator cuff.
- The SCR was found to fully restore the superior translation and subacromial contact pressure.



SCR





Technique available in Arthroscopy Techniques: Hirahara and Adams 2015

Superior Capsular Reconstruction for the Operatively Irreparable Rotator Cuff Tear: Clinical Outcomes Are Maintained 2 Years After Surgery

Stephen S. Burkhart, M.D., Joel J. Pranckun, D.O., and Robert U. Hartzler, M.D., M.S.

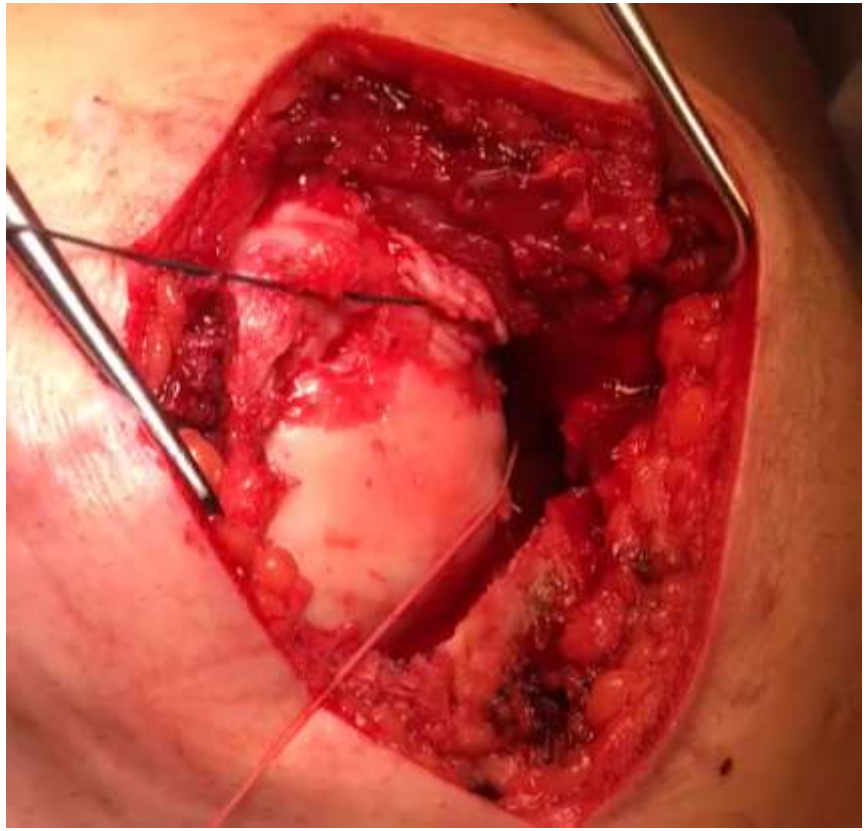
Table 2. Pre- and 1-Year Postoperative Radiographic Data for the 41 Study Patients

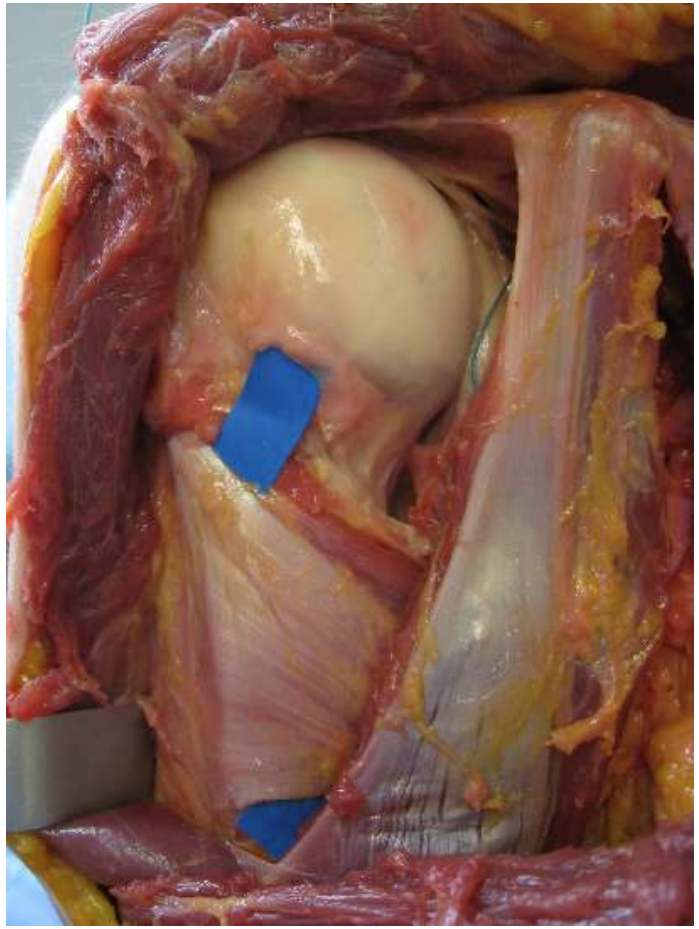
Number of patients (shoulders)	41
Postoperative MRI	26 (63%)
MRI complete healing	22 (85%)
MRI partial healing	1 (4%)
MRI complete graft disruption	3 (11%)
Postoperative radiographs	32 (78%)
Preoperative AHI, mm	7 ± 0.4 [6-8]
Postoperative AHI, mm	8 ± 0.4 [7-9]
Δ AHI	1 ± 0.5 [−0.2 to 2]

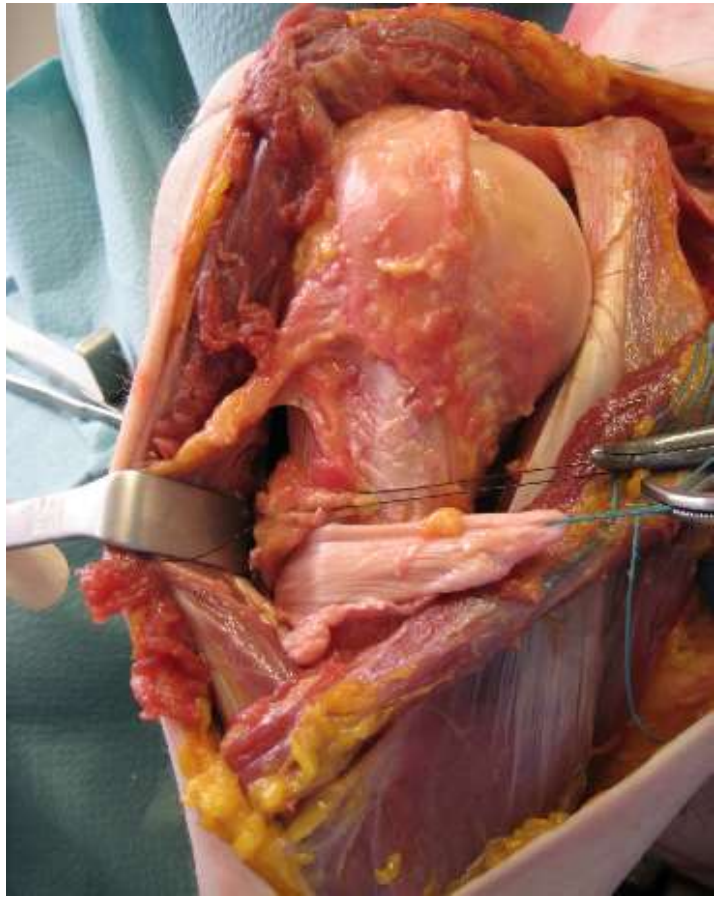
Table 3. Clinical Results of 41 Patients Undergoing SCR at Minimum 2-Year Follow-Up

Outcome Measures	Preoperative	1-Year Postoperative	P^*	2-Year Postoperative	$P^\dagger$	$P^\ddagger$
ASES score (0-100)	52 [46-57]	90 [87-92]	<.0001	89 [86-92]	.9	<.0001
VAS pain (0-10)	4.6 [3.8-5.4]	0.5 [0.2-0.7]	<.0001	0.7 [0.4-1]	.2	<.0001
SSV (0-100)	39 [33-44]	88 [85-92]	<.0001	83 [79-87]	.03	<.0001
Active FE, °	140 [120-159]	172 [168-176]	.002	167 [159-176]	.5	.006
Active ER, °	37 [29-44]	48 [42-53]	.002	59 [51-67]	.02	<.0001

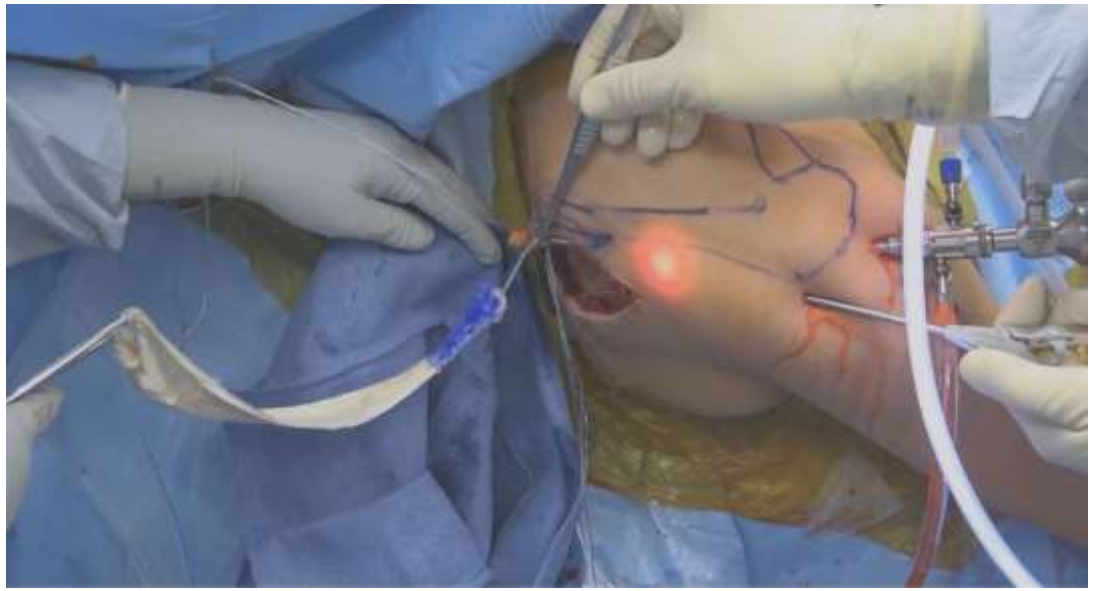
Latissimus Dorsi Transfer

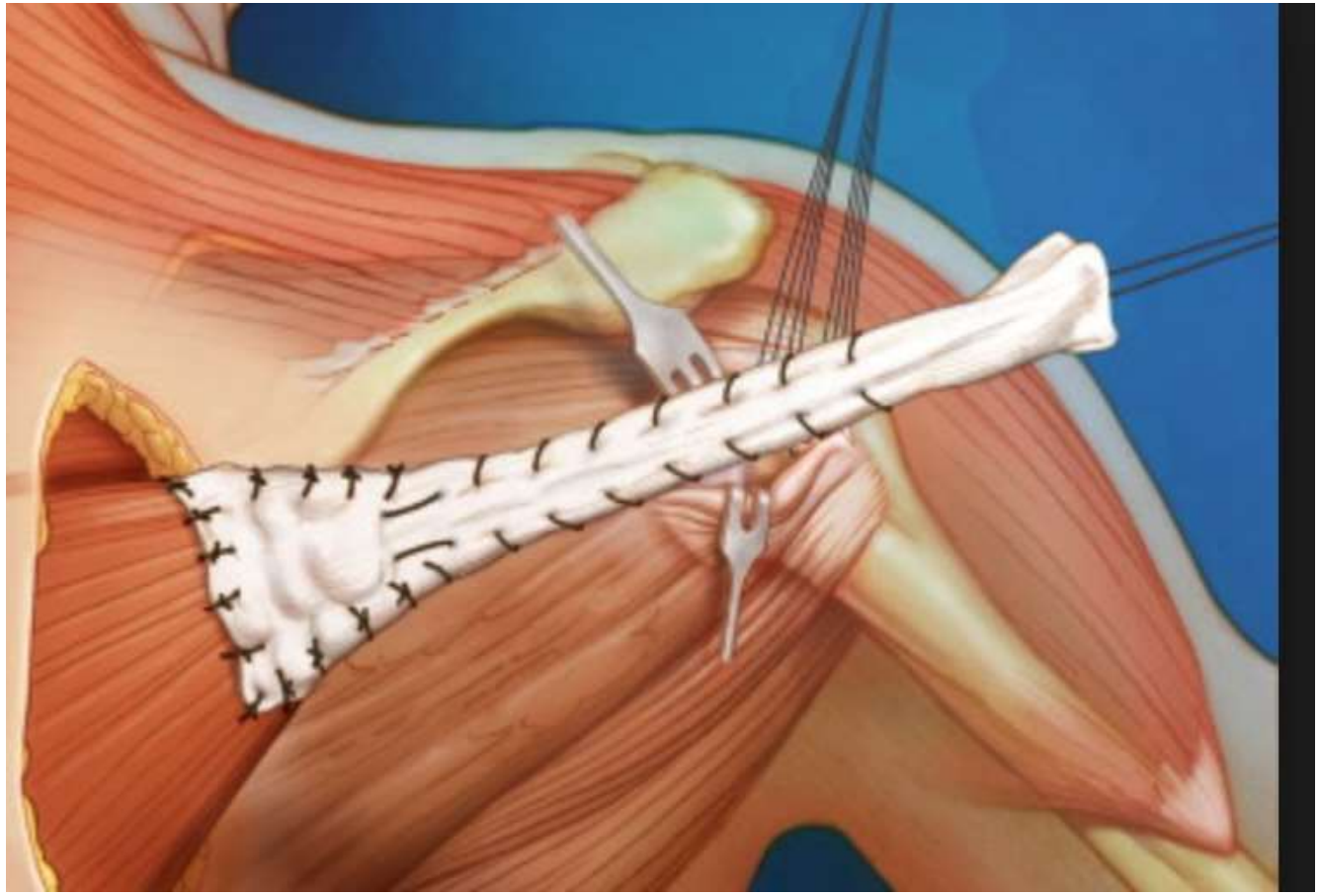






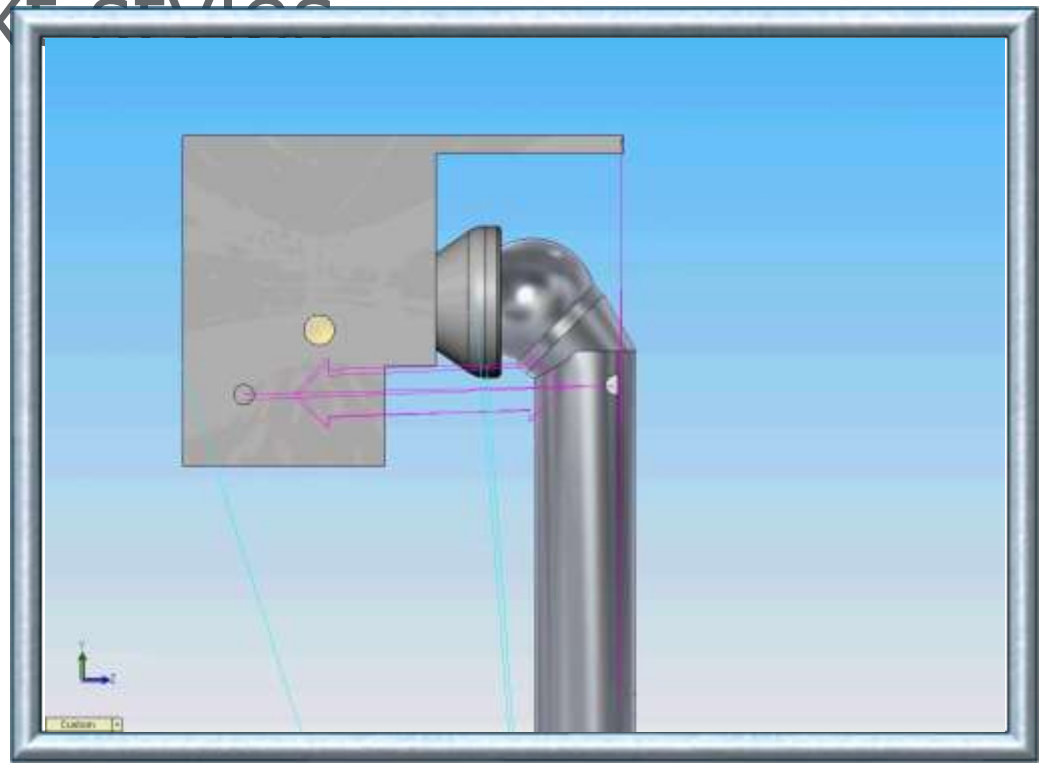
Lower Trapezius Transfer





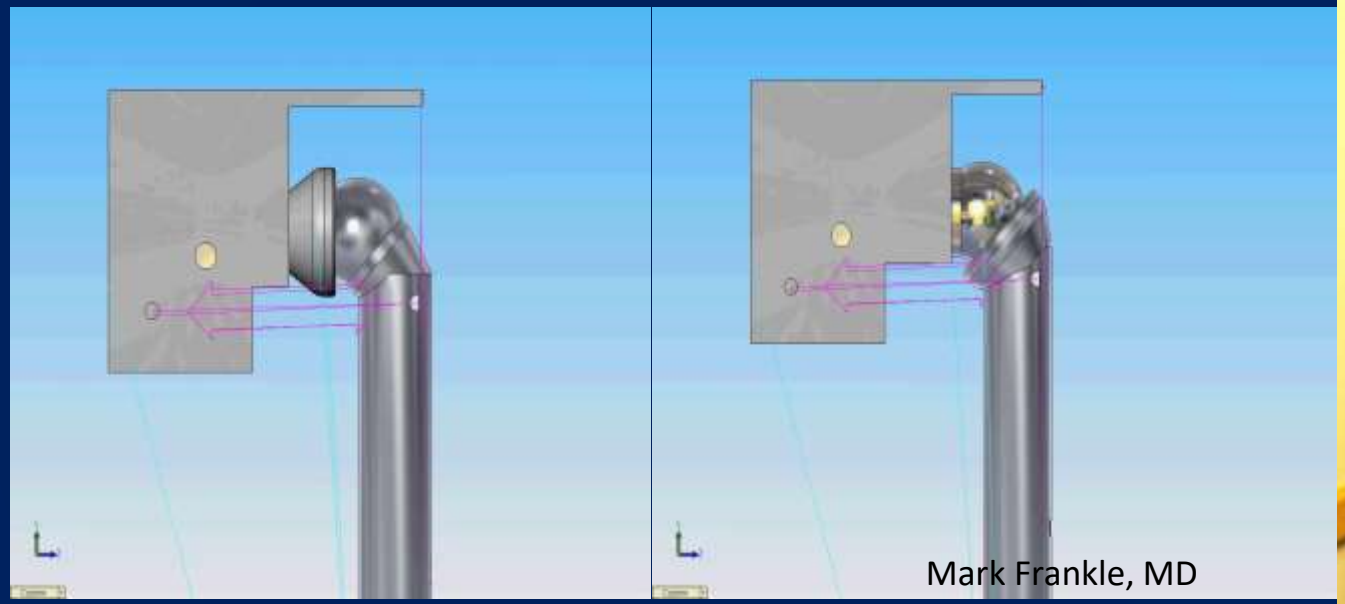
Why does the Reverse TSA work in Rotator cuff deficient shoulder?

- Click to edit Master text styles
  - Second level
    - Third level
      - Fourth level
        - » Fifth level



Mark Frankle, MD

Demonstration of Neutralization of Deltoid Deforming Force



74 y.o.-MRCT-Pseudoparalysis for 1 yr. No DJD
rTSA Grammont type - 8 week post op

Hemiarthroplasty for the Rotator Cuff-Deficient Shoulder

By Steven S. Goldberg, MD, John-Erik Bell, MD, Han Jo Kim, MD, Sean F. Bak, MD, William N. Levine, MD, and Louis U. Bigliani, MD

Functional outcome of hemiarthroplasty compared with reverse total shoulder arthroplasty in the treatment of rotator cuff tear arthropathy

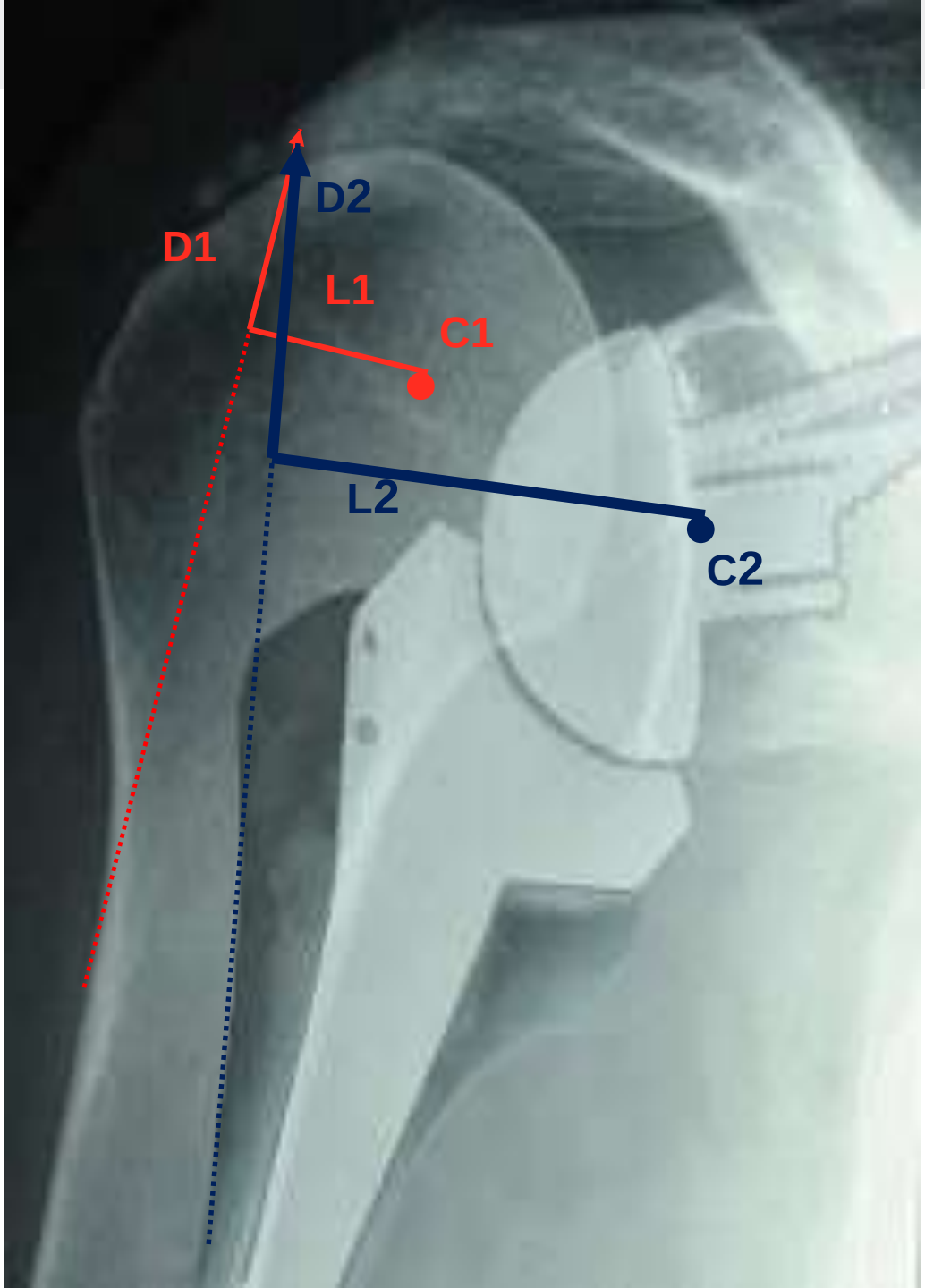
Brian Leung, MD, MaryBeth Horodyski, EdD, ATC, LAT, Aimee M. Struk, MEd, ATC, LA Thomas W. Wright, MD*

Comparison of Functional Outcomes of Reverse Shoulder Arthroplasty with Those of Hemiarthroplasty in the Treatment of Cuff-Tear Arthropathy

A Matched-Pair Analysis

Simon W. Young, FRACS, Mark Zhu, MBChB, Cameron G. Walker, PhD, and Peter C. Poon, FRACS

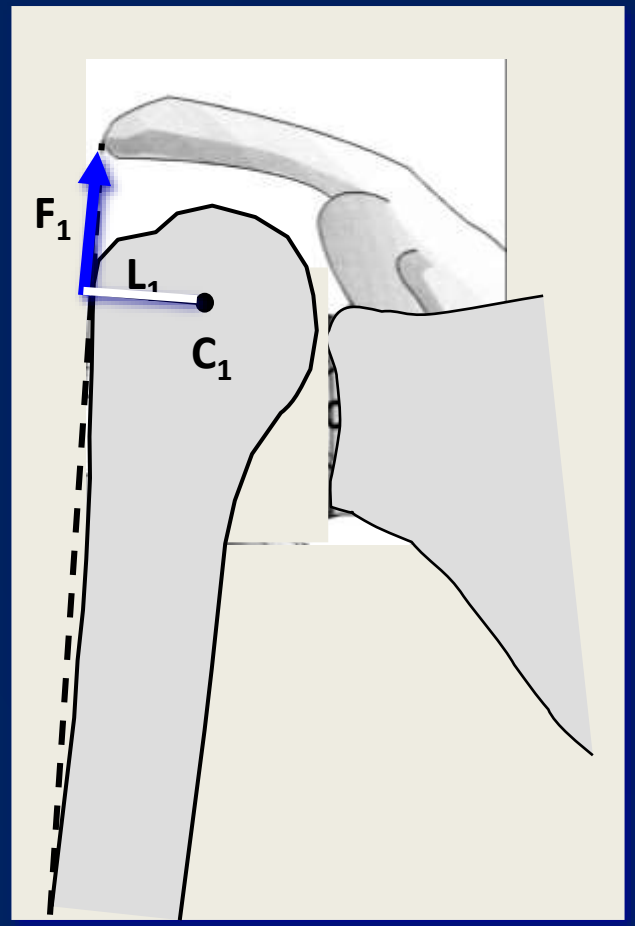
Reverse TSA and Rotator Cuff Insuffciency



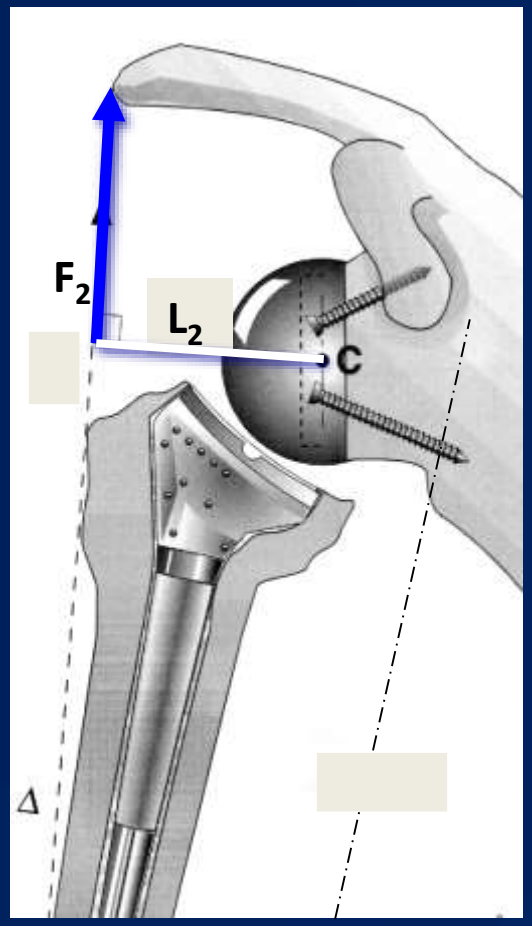
Grammont: Deltoid Torque is the Key

(Torque = Lever Arm x Force)

Increased Lever Arm: L2 > L1

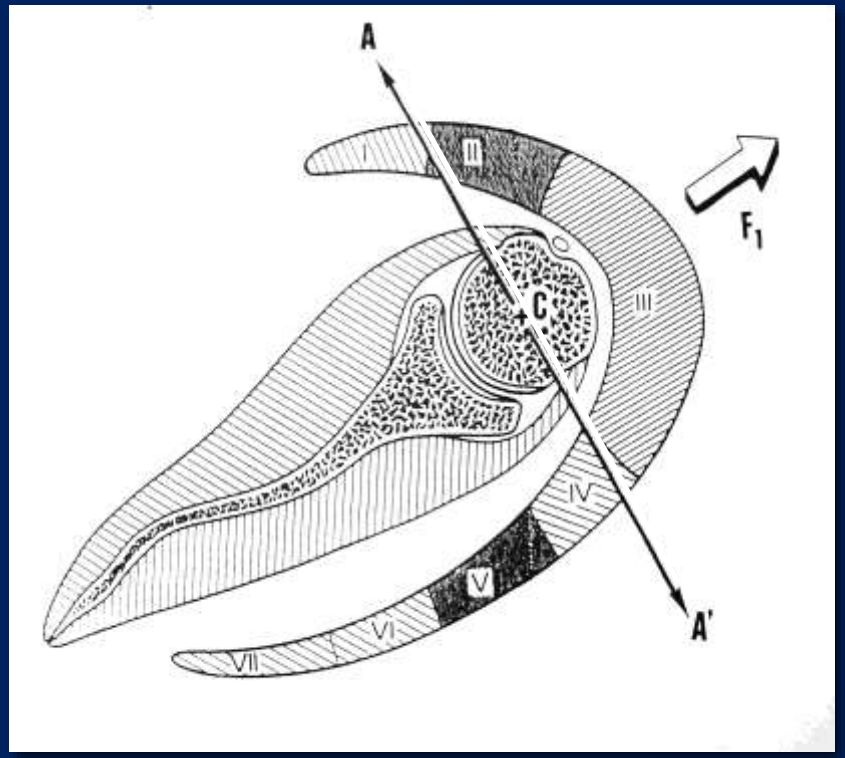


Increased Deltoid Force: F2 > F1

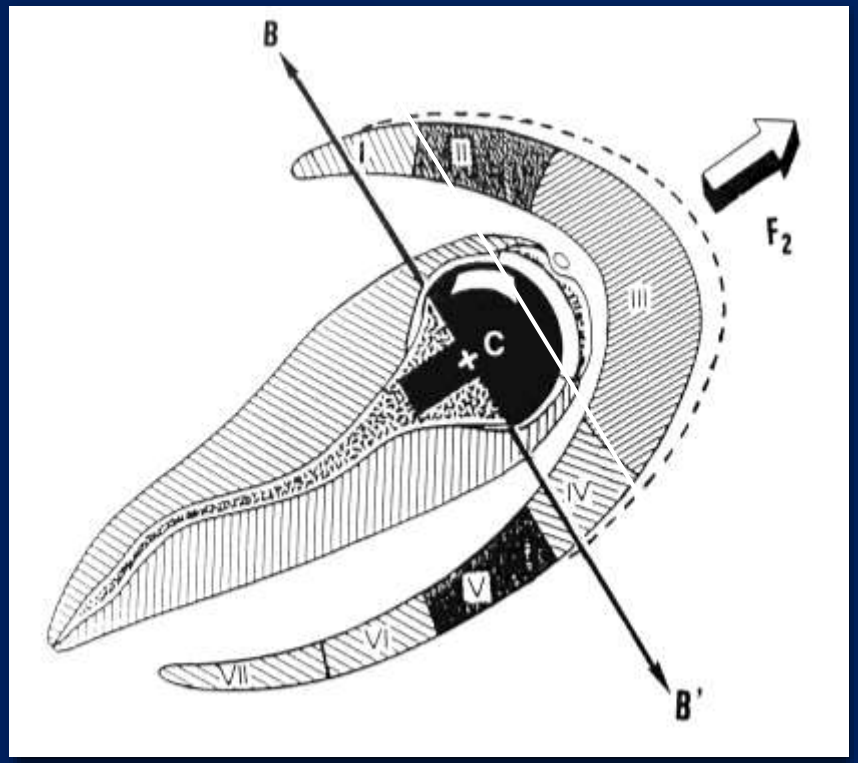


Original Concepts-rTSA

Deltoid recruitment



Mid Deltoid



+Ant & Post Deltoid

The ‘Lateralized’ Reverse….

Concept:

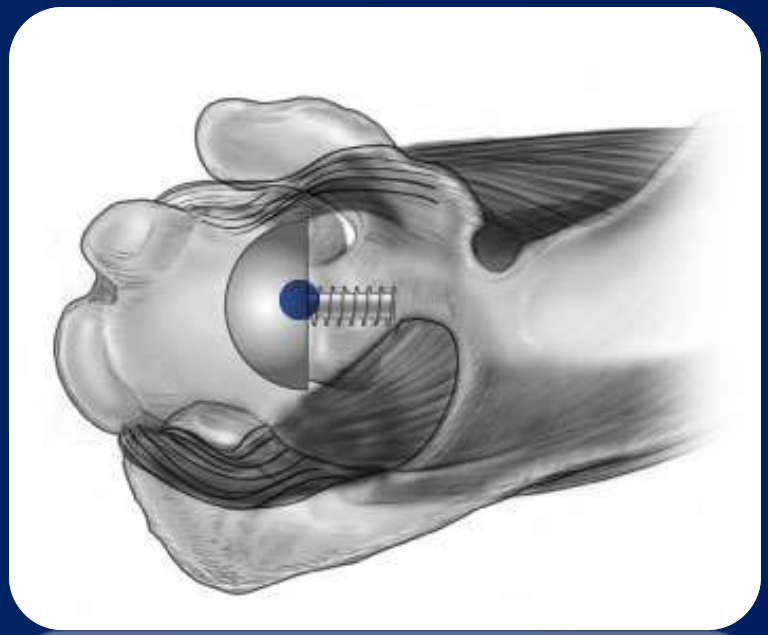
“Any implant that stabilizes the fulcrum of the GH joint in RC Arthropathy will work….the question is for ‘how long’ and ‘how well’”

Mark Frankle

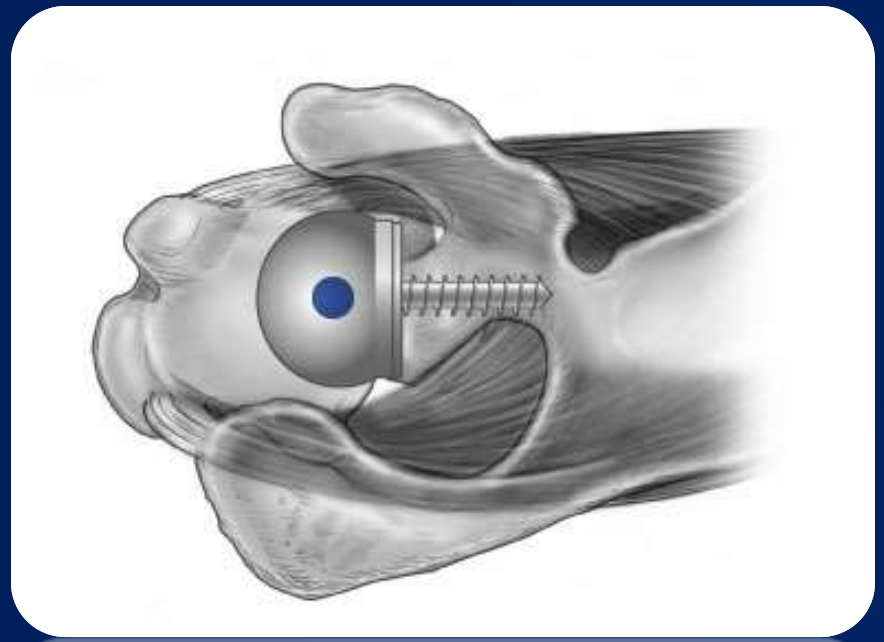
Anatomic COR May Effect Rotator Cuff Tension

Prosthetic design

– Anatomic center of rotation – Frankle JBJS 2006



Medial center of rotation with slackening of residual cuff muscles

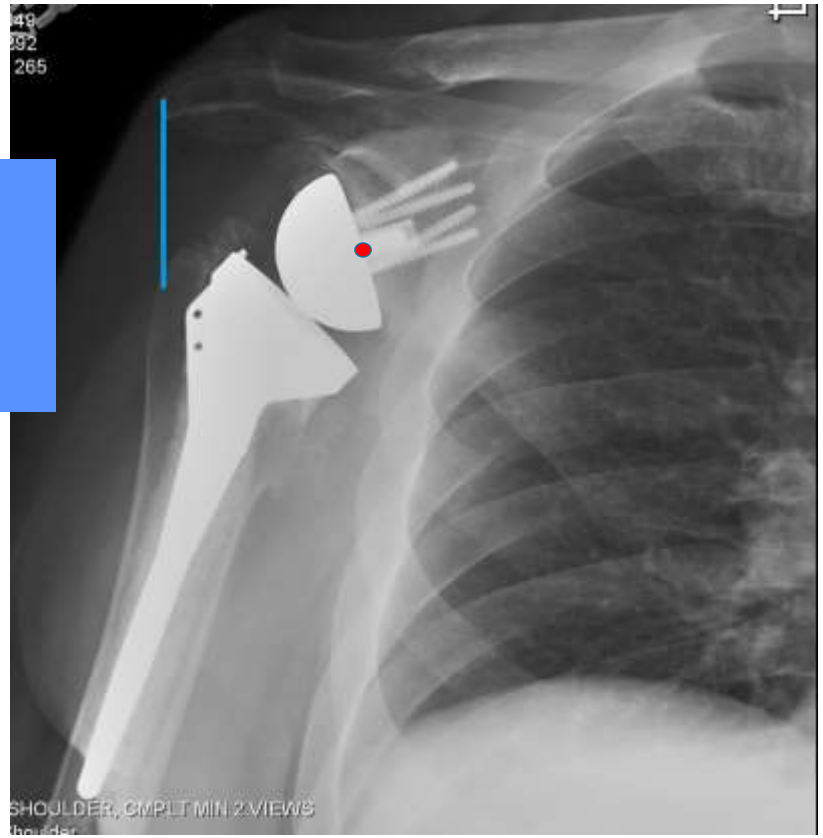


Anatomic center of rotation with tensioning of residual cuff muscles

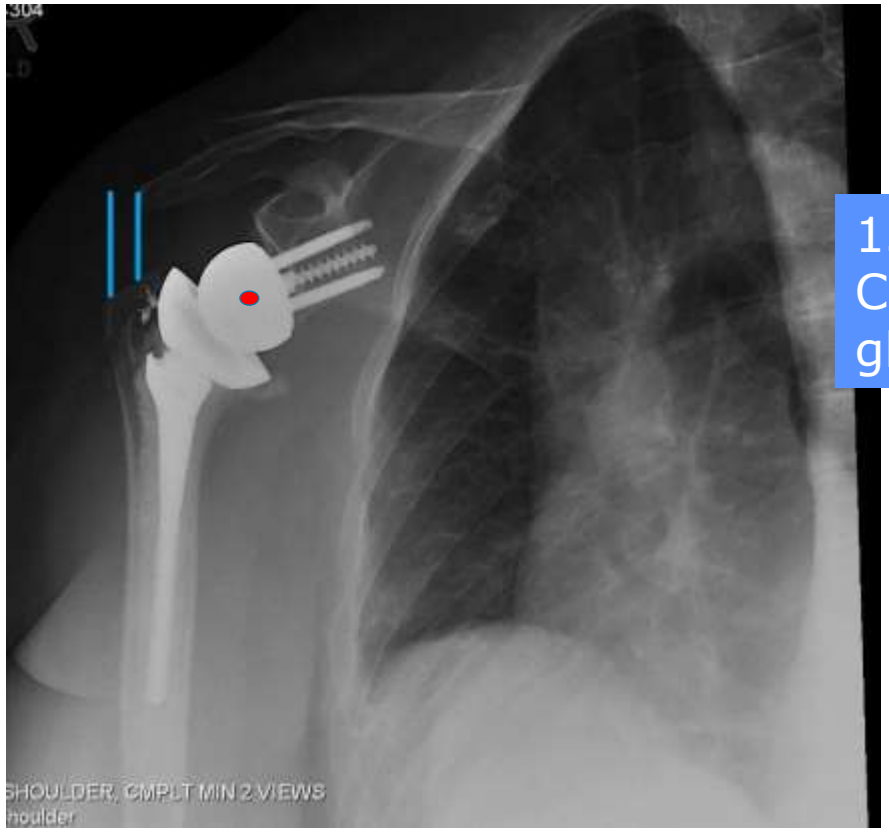
2 Classes of RSA

- Tornier/Grammont

155
COR near glenoid

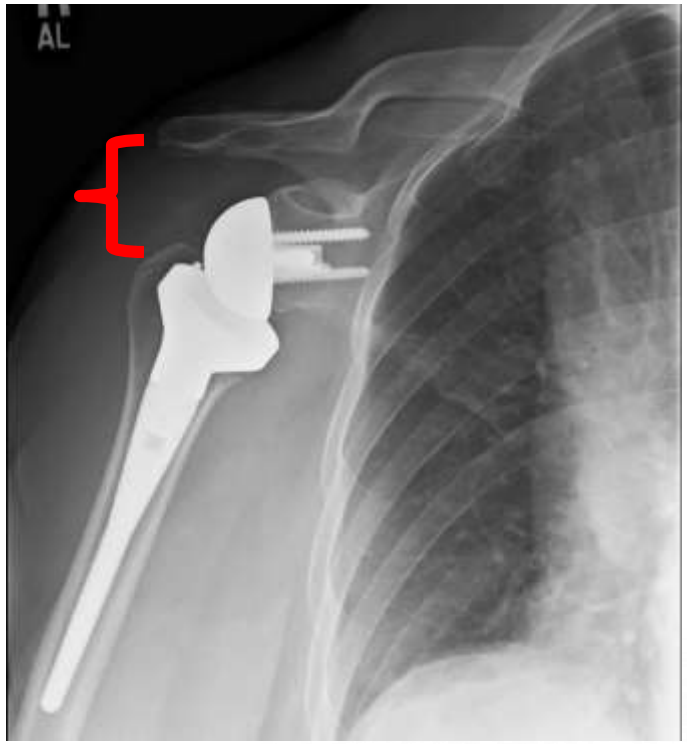


- Encore/DJO



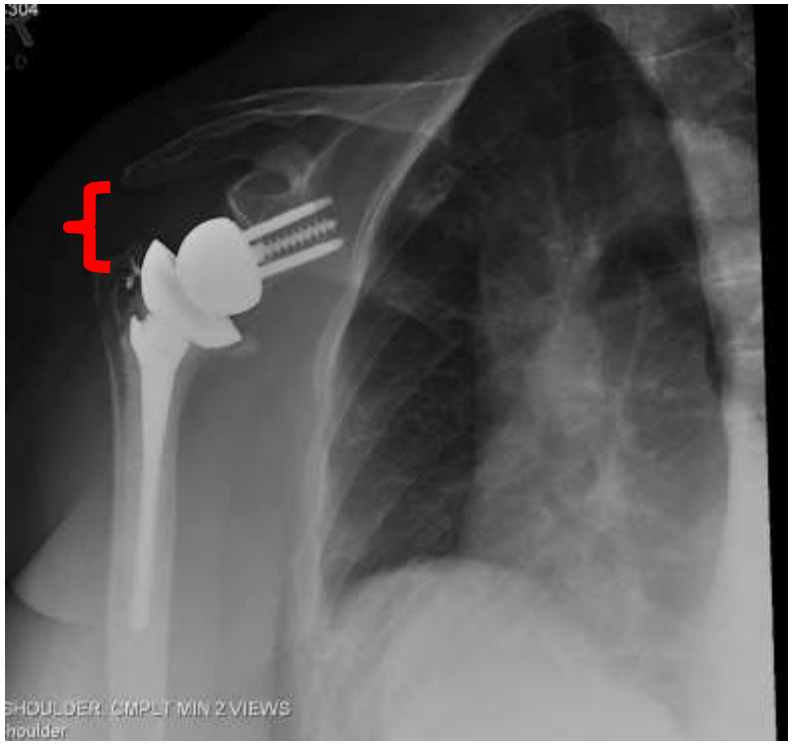
135
COR lateral to glenoid

- Tornier



Average distalization 32.26 mm

- Encore/DJO



Average distalization 17.68 mm

Reverse shoulder arthroplasty for irreparable massive rotator cuff tears: a systematic review with meta-analysis and meta-regression

Nuno Sevivas, MD[a,b,c,d,*], Nuno Ferreira, MD[c,d], Renato Andrade, MSc[d], Pedro Moreira, MSc, Ricardo Alves, MD[a,b], Manuel Vieira da Silva, MD[a,b,c,d], Nuno Sousa, MD, PhD[a,b], António J. Salgado, PhD[a,b], João Espregueira-Mendes, MD, PhD[a,b,d,f]

J Shoulder Elbow Surg (2017) 26, e265–e277

Table I Summary of the results analysis in the 6 different included studies

Author	Region of origin	LOE	No.	Mean FU (mo)	Mean age (y)	Male (%)	Clinical score gain	Forward flexion gain	External rotation gain	Internal rotation gain	Function gain	Pain evolution	Revision rates
Favard et al[18] (2009)	France (Europe)	III	49	61.4	58.8	NR	35.9†	NR	NR	NR	NR	NR	NR
Boile et al[7] (2009)	(Europe)												
Wall et al[62] (2007)*	France (Europe)	II	41	34	NR	NR	35.6†	49	−6	−1	NR	−8.4§	NR
Mulieri et al[51] (2010)	USA (America)	III	60	52	71	29%	42.1‡	81	24	4	3.9	−4.4‖	5 (8.3%)
Hartzler et al[38] (2015)	USA (America)	III	74	43	72	50%	30.8‡	−0.9	12	NR	4.1	−3.3‖	1 (1.4%)
Valenti et al[59] (2011)*	France (Europe)	III	17	44	NR	NR	NR	80.5	13.3	0.56	NR	NR	NR

Conclusion: Patients with irreparable MRCT without presence of osteoarthritis have a high likelihood of achieving a painless shoulder and functional improvements after RSA.

Total number of patients = 266

Reverse shoulder arthroplasty for irreparable massive rotator cuff tears: a systematic review with meta-analysis and meta-regression

Nuno Sevivas, MD[a,b,c,d,*], Nuno Ferreira, MD[c,d], Renato Andrade, MSc[d], Pedro Moreira, MSc[a,b], Raquel Portugal, MD[e], Diogo Alves, MD[a,b], Manuel Vieira da Silva, MD[a,b,c,d], Nuno Sousa, MD, PhD[a,b], António J. Salgado, PhD[a,b], João Espregueira-Mendes, MD, PhD[a,b,d,f]

Reverse Total Shoulder Arthroplasty: A Review of Results According to Etiology

By Bryan Wall, MD, Laurent Nové-Josserand, MD, Daniel P. O'Connor, PhD, T. Bradley Edwards, MD, and Gilles Walch, MD

J Bone Joint Surg Am. 2007;89:1476-85

TABLE I Number of Cases According to Etiology for Reverse Total Shoulder Arthroplasty

Indication	Total Number of Shoulders (N = 240)	Number of Shoulders with Two-Year Follow-Up (N = 196)
Rota		
Revi		
Mas		
Prim		
Post		
Tum		
Acut		
Rheu		

TABLE IV Changes in Range of Motion According to Diagnosis*

Diagnosis	Elevation		External Rotation at 0° of Abduction		External Rotation at 90° of Abduction		Internal Rotation	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
Rotator cuff tear arthropathy	76°	142°	5°	7°	29°	43°	L5	L3
Revision arthroplasty	58°	118°	5°	9°	24°	26°	Sacrum	L5
Massive rotator cuff tear	94°	143°	14°	8°	40°	41°	L2	L3
Posttraumatic arthritis	77°	115°	4°	6°	22°	35°	Sacrum	L4
Primary osteoarthritis	77°	115°	7°	9°	31°	39°	Sacrum	L3
Other	107°	131°	17°	20°	40°	63°	L3	L2
All patients	86°	137°	8°	6°	34°	40°	L5	L4

Reverse total shoulder arthroplasty after failed rotator cuff surgery

Pascal Boileau, MD[a], Jean-François Gonzalez, MD[a], Christopher Chuinard, MD[b], Ryan Bicknell, MD, MSc, FRCS(C)[c,*], Gilles Walch, MD[d]

J Shoulder Elbow Surg (2009) 18, 600-606

Retrospective review of 42 shoulder
30 Pseudoparalytic/12 Painful

Table IV Comparison of results between patients with pseudoparalysis shoulders (PPS) and painful shoulders (PFS)

Functional Results	PPS (N = 30)		PFS (N = 12)		P Value	
	Score	Change	Score	Change	Score	Change
Pain (15 points)	11.4	+ 8.1	10.3	+ 7.2	NS	NS
Activity (20 points)	14.9	+ 9.8	13.3	+ 4.8	NS	0.01
Mobility (40 points)	24.7	+ 13.7	24.1	− 0.7	NS	0.0003
Strength (25 points)	5.7	+ 5.3	6.7	+ 3.2	NS	NS
Constant score (100 points)	55.8	+ 37.1	56.7	+ 14.5	NS	0.002
Adjusted constant score (%)	79.3	+ 52.6	77.8	+ 26.8	NS	0.002
Anterior Active Elevation (deg)	123°	+ 67°	122°	− 24°	NS	<0.0001

NS, nonsignificant.

Inferior result of FF > 90

Discussion: RSA can improve function in patients with cuff deficient shoulders after failure of previous cuff surgery. However, results are inferior to primary RSA. RSA when the patient maintains greater than 90° of preoperative AAE risks loss of AAE and lower patient satisfaction.

Reverse Shoulder Arthroplasty for the Treatment of Irreparable Rotator Cuff Tear without Glenohumeral Arthritis

By Philip Mulieri, MD, PhD, Page Dunning, BA, Steven Klein, MD, Derek Pupello, MBA, and Mark Frankle, MD

J Bone Joint Surg Am. 2010;92:2544-56

Good outcome can be achieved with RSA in RTC deficient shoulder with/out prior RCR

Survivorship of 93.8% if no prior surgery and 87.4% if prior surgery(ave 52 mo. 24-101)

Reverse shoulder arthroplasty for massive rotator cuff tear: risk factors for poor functional improvement

Robert U. Hartzler, MD, MS[a], Brandon M. Steen, MD[b], Michael M. Hussey, MD[b], Michael C. Cusick, MD[b], Benjamin J. Cottrell, BS[c], Rachel E. Clark, BA, CC[c], Mark A. Frankle, MD[b,*]

JSES 2015

FF 53 to 134

ER 27 to 51

Complications 20%

individual patient. Given the inherent risks of reverse arthroplasty vs. joint-preserving operations, continued work in refining the indications for RSA for rotator cuff deficiency without arthritis is warranted.

Risk of poor outcome

- **Young <60**
- **Good preop function SST > 7**
- **FF > 90**
- **Neuro issues**

Normal ROM?

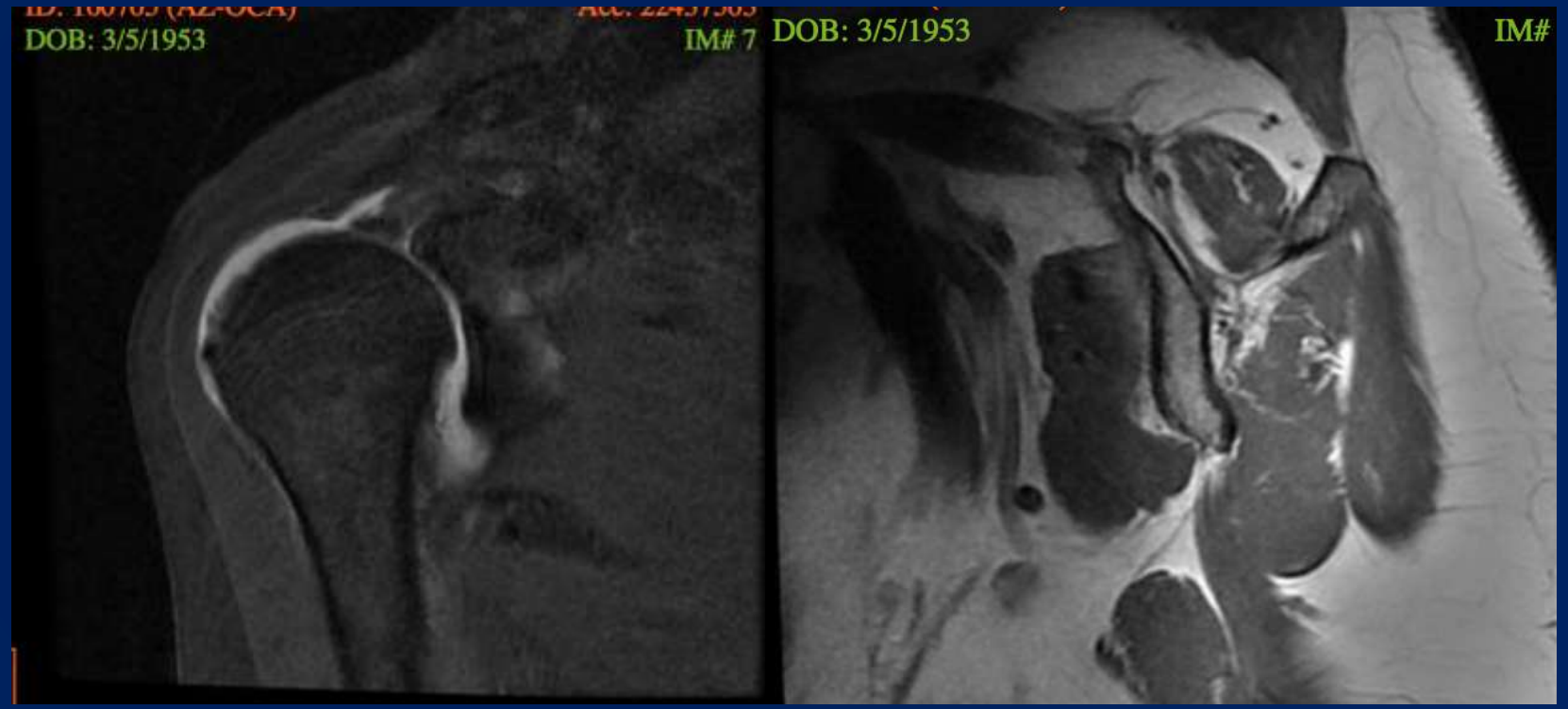


TABLE I Preoperative and Postoperative Functional Parameters for 87 RTSAs

Parameter	Preoperative*	Medium-Term Follow-up*	Long-Term Follow-up*	P Value†
Follow-up *(mo)*	—	39 (24 to 116)	150 (121 to 241)	—
Absolute Constant score‡ *(points)*				
All patients				
Overall score	23 ± 12	63 ± 14	55 ± 16	<0.001
Pain	4 ± 4	12 ± 3	11 ± 4	0.051
Activity	6 ± 3	16 ± 3	15 ± 4	<0.001
Mobility	12 ± 8	27 ± 8	25 ± 8	<0.001
Strength	1 ± 4	8 ± 4	5 ± 3	<0.001
According to etiology				
Cuff tear arthropathy	22 ± 11	70 ± 11	63 ± 13	0.005
Revision arthroplasty	21 ± 13	55 ± 16	45 ± 17	<0.001
Massive cuff tear	24 ± 14	63 ± 11	55 ± 12	0.004
Posttraumatic arthritis	27 ± 8	55 ± 20	45 ± 22	0.016
Primary osteoarthritis	26 ± 11	70 ± 6	62 ± 8	0.014
Relative Constant score‡ *(points)*	33 ± 17	90 ± 21	86 ± 26	0.025
Range of motion§				
AAE‡ *(deg)*	81 ± 43	138 ± 26	131 ± 29	<0.001
AER1 *(deg)*	9 ± 14	10 ± 16	9 ± 14	0.490
AER2 *(deg)*	39 ± 21	44 ± 25	43 ± 30	0.987
AIR	L5	L3	Sacrum	0.850

*The values are given as the average and standard deviation except for follow-up, which is given as the average and the range. †For comparisons between medium and long-term follow-up values performed with the Wilcoxon signed rank test. ‡The changes between preoperative and medium-term or long-term postoperative values were significant ($p < 0.05$, Wilcoxon signed rank test). §AAE = active anterior elevation, AER1 = active external rotation with the elbow at the side, AER2 = active external rotation at 90° of abduction, and AIR = active internal rotation.

Long-Term Outcomes of Reverse Total Shoulder Arthroplasty

A Follow-up of a Previous Study

Guillaume Bacle, MD, Laurent Nové-Josserand, MD, Pascal Garaud, PhD, and Gilles Walch, MD

Revision for a failed reverse: a 12-year review of a lateralized implant

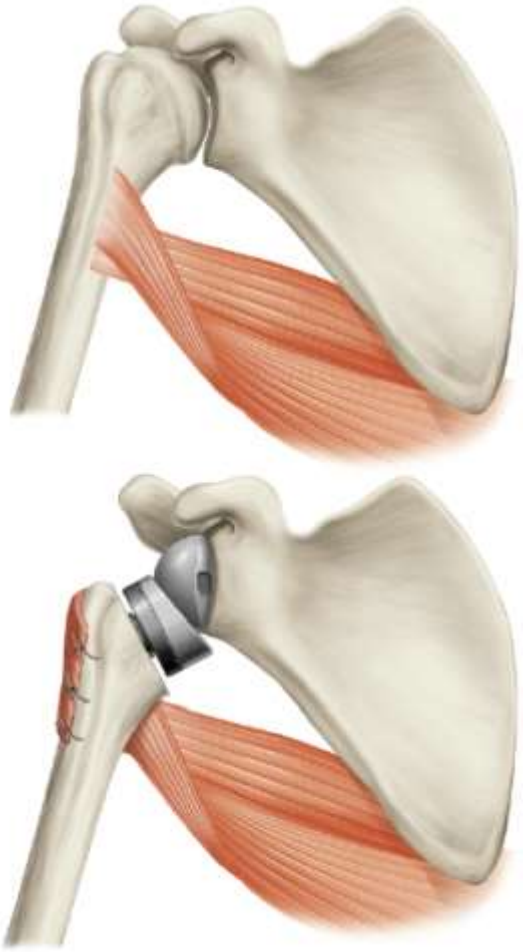
Brent C. Stephens, MD[a], Peter Simon, PhD[b], Rachel E. Clark, BA, CCRC[b], Kaitlyn N. Christmas, BS[b], Geoffrey P. Stone, MD[a], Adam J. Lorenzetti, MD[a], Mark A. Frankle, MD[a,*]

J Shoulder Elbow Surg (2016) 25, e115-e124

Table I Description of study population and indications for RSA revision performed by the senior author

	Total (2000-2012)	Failed (2000-2012)
Count	1418	85
Gender		
Female	854 (60.2%)	48 (56.5%)
Male	564 (39.7%)	37 (43.5%)
Age	69.8 ± 10.3	66.7 ± 10.7
Primary diagnosis		
Primary CTA*	649 (45.8%)	26 (4%)
Failed rotator cuff surgery	294 (20.7%)	18 (6.1%)
Failed HA†	251 (17.7%)	26 (10.4%)
Failed TSA	105 (7.4%)	8 (7.6%)
Proximal humerus fracture	79 (3.8%)	3 (3.8%)
Failed ORIF	14 (1%)	0 (0%)
Other‡	26 (1.8%)	4 (15.4%)

Posterior Rotator Cuff Deficient Shoulder-Lat Transfer and RSA



Clinical outcome of reverse total shoulder arthroplasty combined with latissimus dorsi transfer for the treatment of chronic combined pseudoparesis of elevation and external rotation of the shoulder

Gabor J. Puskas, MD, Sabrina Catanzaro, RRN, Christian Gerber, MD, FRCSEd(hon)*

J Shoulder Elbow Surg (2014) 23, 49-57

41 Shoulders/32 follow-up
9 reoperations
Active ER 4 – 27
ER lag sign corrected 25/32

Constant 45-89
SSV 33-75

Table ST6 Cumulative Percent Revision of Primary Total Shoulder Replacement by Class (excluding SMR)

Shoulder Class	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
Total Conventional	256	7423	1.7 (1.4, 2.1)	3.4 (3.0, 3.9)	4.2 (3.7, 4.7)	5.4 (4.7, 6.3)	7.2 (4.9, 10.7)
Total Reverse	255	8402	2.2 (1.9, 2.5)	3.4 (3.0, 3.9)	4.1 (3.6, 4.7)	4.7 (4.0, 5.5)	
TOTAL	**511**	**15825**					

Table ST44 Cumulative Percent Revision of Primary Total Reverse Shoulder Replacement by Age (Primary Diagnosis Rotator Cuff Arthropathy)

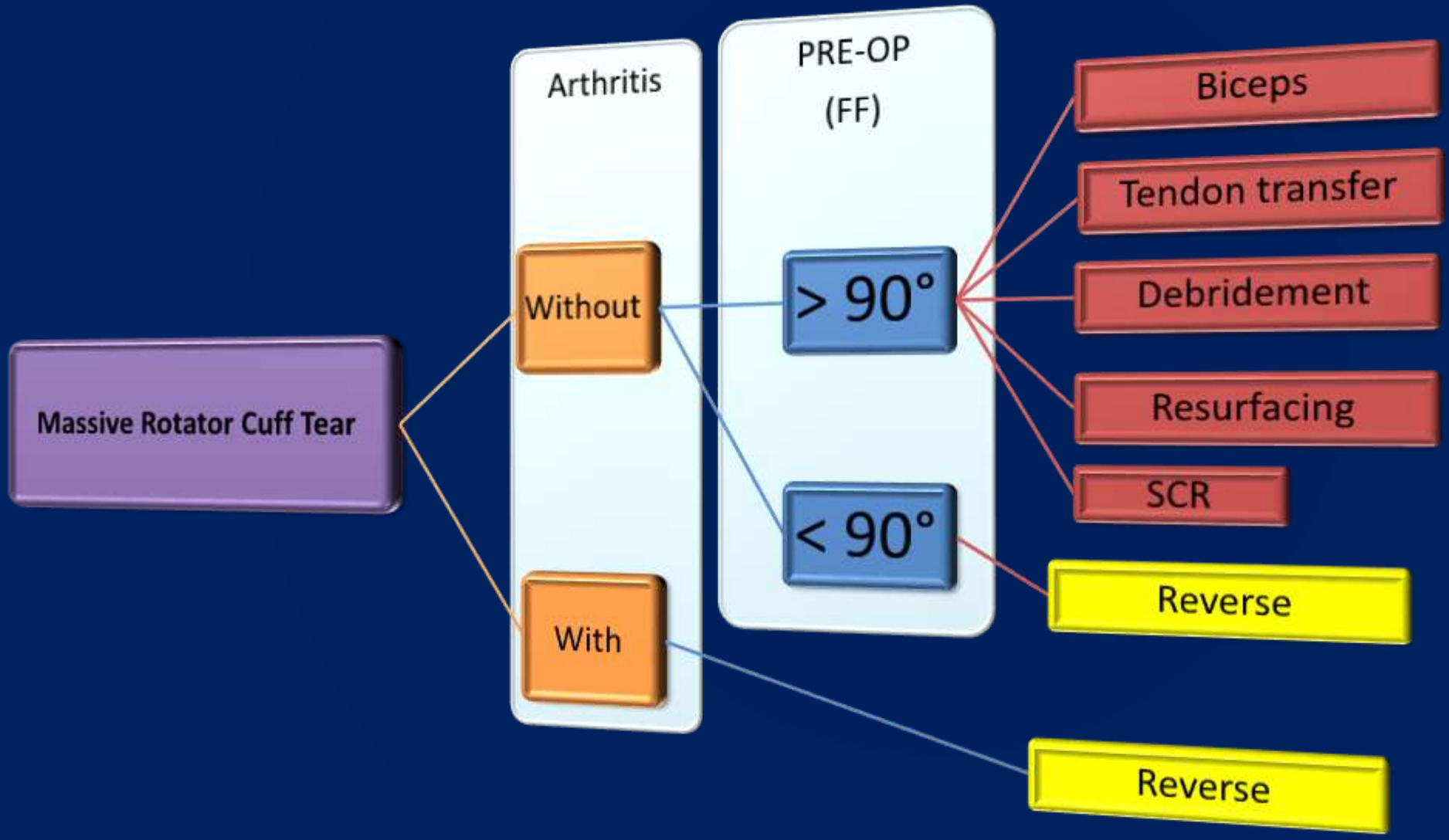
Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	7 Yrs	9 Yrs
<55	0	28	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)			
55-64	14	278	3.3 (1.6, 6.5)	7.0 (4.1, 11.7)			
65-74	53	1503	2.4 (1.7, 3.4)	3.7 (2.7, 4.9)	5.6 (4.0, 7.9)	6.1 (4.3, 8.6)	
≥75	85	2402	3.0 (2.3, 3.7)	3.7 (2.9, 4.6)	4.5 (3.5, 5.7)	4.5 (3.5, 5.7)	
TOTAL	**152**	**4211**					

AOA AUSTRALIAN ORTHOPAEDIC ASSOCIATION

Evolution of RSA

- Reduce scapular notching
- Uncemented
- Shorter stem
- Approaching anatomic
- Lateralized glenoid
- 155 to 135
- Revisable

Massive Cuff Tear without Arthritis



2015

2011(xray 5y)


Thank You
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