


Superior Capsular Reconstruction How do we decide and get it done?



**Midwest
ORTHOPAEDICS
at RUSH**
SPORTS MEDICINE & SHOULDER

Brian J. Cole, MD, MBA
Professor, Vice-Chairman, and Managing Partner
Department of Orthopedics
Chairman of Surgery, Rush OPH
Section Head, Rush Cartilage Restoration Center
Team Physician, Chicago White Sox and Bulls

1

I (and/or my co-authors) have something to disclose.

Detailed disclosure information is available via:

Printed Final Agenda

Meeting App

or


AAOS Orthopaedic Disclosure Program on the AAOS website at
<http://www.aaos.org/disclosure>

2

Patient Preference Before and After Arthroscopic Rotator Cuff Repair: Which Is More Important, Pain Relief or Strength Return?

David M. Levy, MD, Mandeeep S. Vira, MD, Benjamin D. Kuhns, MD, MS, Stephen S. Burkhardt, MD, Anthony A. Romeo, MD, Nikhil N. Verma, MD, and Brian J. Cole, MD, MBA
AJO, 2017

What do they want?



**Less Pain
More Function**

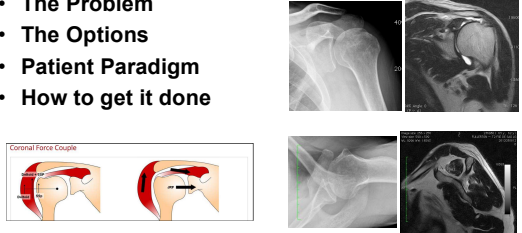
Occupation

Occupation	Prefer Strong Shoulder/Mild Pain	Prefer Weak Shoulder/No Pain
Labor	93.9%	6.1%
Non-Labor Class	82.7%	17.3%

3

Overview

- The Problem
- The Options
- Patient Paradigm
- How to get it done



4

Source of the Problem

- 62 M fall onto shoulder
- C/O weakness and pain



5

Massive RCT Options

- ❖ Non-Surgical
- ❖ Debride/Repair
- ❖ Bridge ECM
- ❖ SCR
- ❖ SA Balloon
- ❖ Tendon Transfer
- ❖ Reverse TSA

Should massive rotator cuff tears be reconstructed even when only partially repairable?

Amund-Gabreels*, Brughel-Froeder*, Riccio-Maria-Lanzetta*, Allen-Chubb*, Yasuki-Camargo*, No-Matsuda*

Interposition Dermal Matrix Xenografts

A Successful Alternative to Traditional Treatment of Massive Rotator Cuff Tears

John A. Theissen, MD, Christopher J. Giza, MD, Andrew D. Brown, MD, Ronald E. Grooms, MD, Thomas J. Anderson, MD, Brian P. Higgins, MD, FAAP, and David J. Cook, MD

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

Yoshiaki Mihata, M.D., Ph.D., Toshiro Ito, Ph.D., Chisato Watanabe, M.D., Ph.D., Ritsumasa Fukumoto, M.D., Masahiro Ohno, M.D., Tomoyuki Tadokoro, M.D., and Masao Kikuchi, M.D., Ph.D.

The biodegradable spacer as a novel treatment modality for massive rotator cuff tears: a prospective study with 5-year follow-up

Yoshitaka Nakano*, Ryoji Horiuchi*, Yoshitaka Nakano*, Naoki Nishida*, Etsuko Arai*, Hiroyuki Nakano*, Eiji Nishida*, Toshiaki Nakano*

Arthroscopic-Assisted Latissimus Dorsi Transfer for the Management of Irreparable Rotator Cuff Tears

Short-Term Results

Roberto Carrillon, MD, David Geisler, MD, MS, MS, PhD, Robert D. Brodsky, MD, Mark English, MD, Paul J. Kim, MD, Nadeem Malik, MD, MS, PhD, FRCS(Orth), and Vincent Ferrone, MD

6

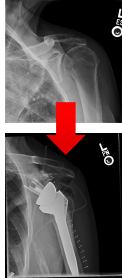
What if it looks like this?



7

Why not RTSA for all?

- Irreparable RCT without arthritis?
- Prior RCR without arthritis?
- What if AFE > 90°?
- What if they have pain with normal function?
- What about patients less than 65?
- What are the complications?
- What does it cost?

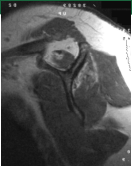


8

MRI Based Algorithm

Interobserver and Intraobserver Reliability of the Goutallier Classification Using Magnetic Resonance Imaging
Proposed of a Simplified Classification System to Increase Reliability

Massive Cuff Tear
≥ 5 cm²
≥ 2 tendons
(≥ Grade 3 Fatty deg.)



Repair ± Augmentation ± Bridge Graft

Tendon Transfer (Latissimus) (Pectoralis)

Reverse Prosthesis ± Latissimus

Superior Capsule Reconstruction
Mihata T, Arthroscopy 2013

Adapted from A Romeo

9



SCR RTSA

10

What is SCR?



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

A Biomechanical Cadaveric Study

Teruhisa Mihata,^{1,2} PhD, Michelle H. McGarry,^{1,2} MS, Joseph M. Pirolo,^{1,2} MD, Mitsuo Konishi,² PhD, PhD, and Tracy Q. Lee,^{1,2} PhD.

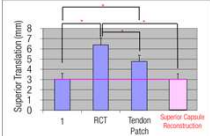
Cadaveric Study

- SCR to evaluate superior translation and GH compression forces

Proposed Mechanism


- Prevents superior escape
- Decreased bony impingement of GT on acromion
- No change in GH force
- Improved deltoid function



11

SCR Indications

- Symptomatic Irreparable SS or SS/IS
- Intact or Repairable Subscapularis
- Minimal to No Glenohumeral Arthritis



12

Preliminary Results of Arthroscopic Superior Capsule Reconstruction with Dermal Allograft
 Patrick J. Denard, M.D., Paul C. Brady, M.D., Christopher R. Adams, M.D., John M. Tokish, M.D., and Stephen S. Burkhart, M.D.

Arthroscopy 2018

Hamada Stage 4 → 0% Success		
Hamada Stage 3 → 33% Success		
Hamada Stage 2 → 69% Success		
Hamada Stage 1 → 82% Success		

13

MD and Patient Expectations

<p>What SCR can do</p> <ul style="list-style-type: none"> Reverse pseudoparalysis Reduced pain Improve function 	<p>What SCR cannot do</p> <ul style="list-style-type: none"> Treat advanced RCA Improve lost PROM Improve dramatic strength unrelated to pain
---	---

14

Black and White

“When one operation works and the other does not”

<p>RTSA</p> <ul style="list-style-type: none"> Irreparable RCT w arthropathy Hamada > 3 Physiologically old Desire for low demand Subscap/Teres out 	<p>SCR</p> <ul style="list-style-type: none"> Irreparable RCT w/o arthropathy Hamada < 3 Physiologically young Desire for high demand Intact/repairable Subscap/Teres
--	--

15

Black and White

“When one operation works and the other does not”

<p>RTSA</p>	<p>SCR</p>
--------------------	-------------------

16

Black and White

“When one operation works and the other does not”

<p>RTSA</p>	<p>SCR</p>
--------------------	-------------------

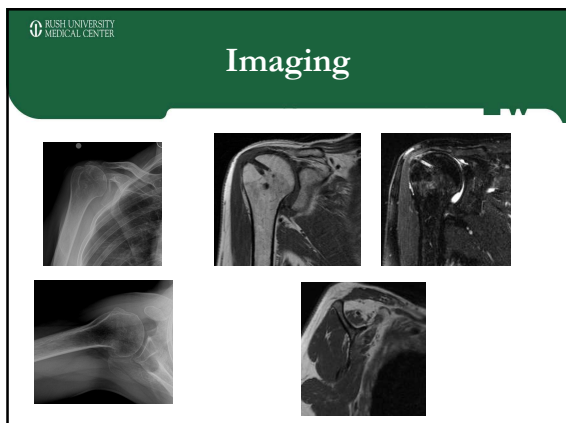
17

Option 1 Superior Capsular Reconstruction

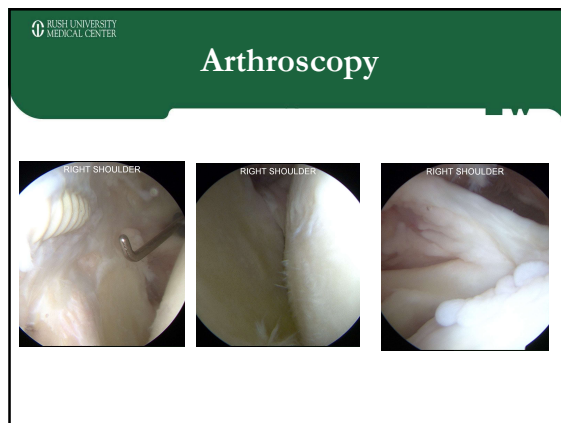
History

- 58 yo R Shoulder pain
- Prior massive RCR and “never got better”
- Continued pain and weakness
- Unresponsive to additional non surgical care
- FE 140, ER 50, Strength 3/5 SS, IS

18



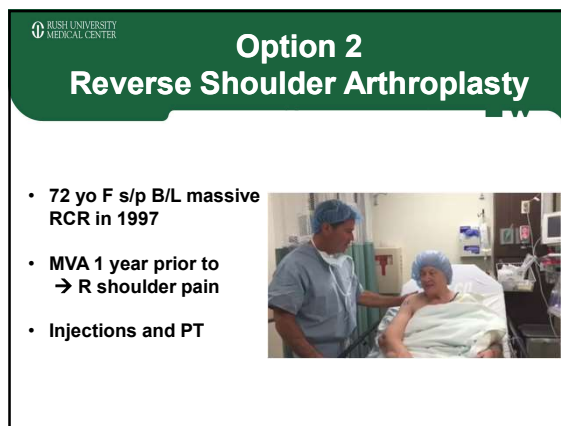
19



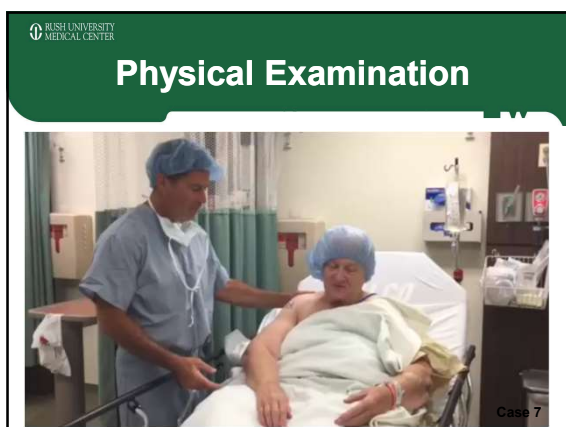
20



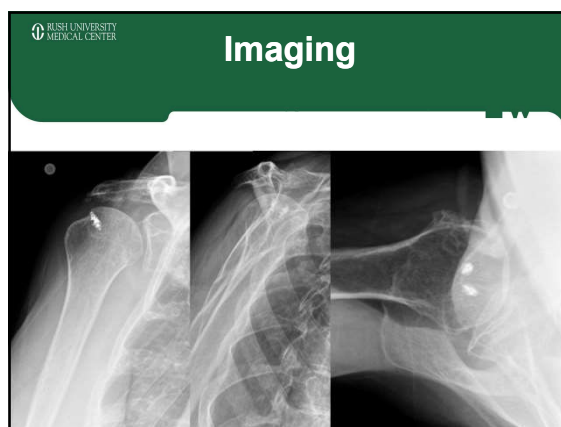
21



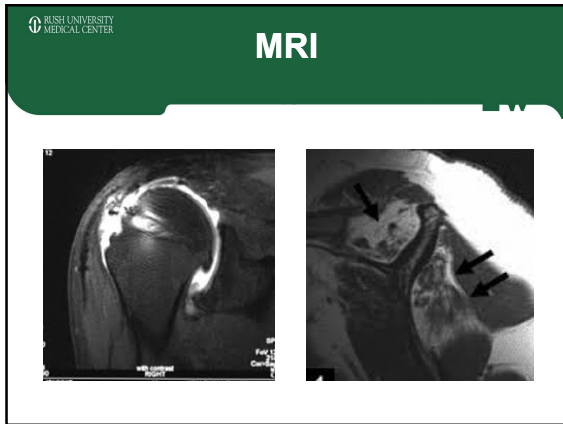
22



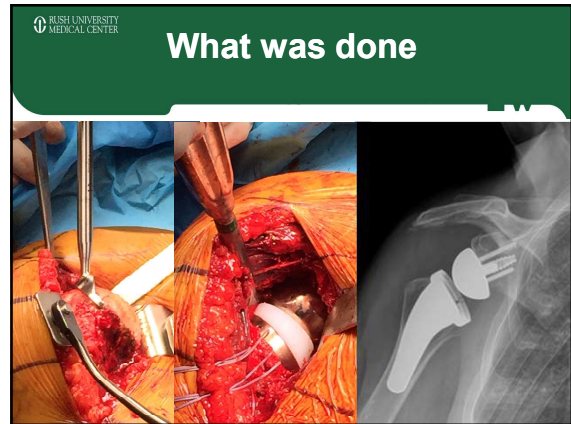
23



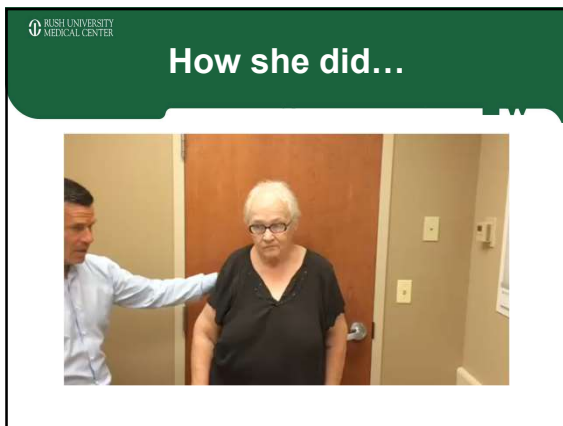
24



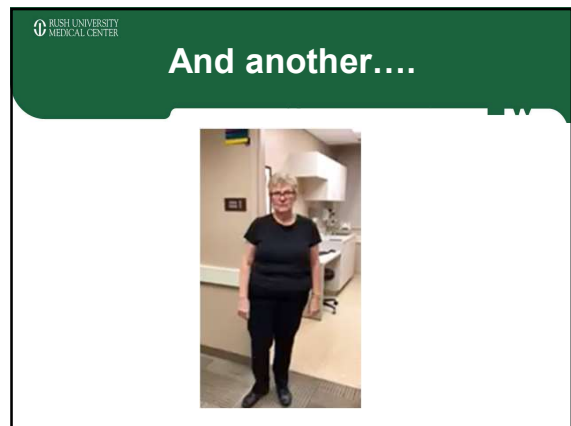
25



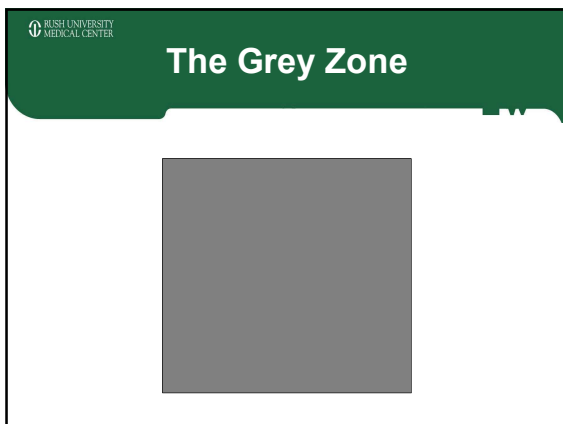
26



27



28



29

Three Grey Areas

<p>Reverse Shoulder Arthroplasty for the Treatment of Irreparable Rotator Cuff Tear without Glenohumeral Arthritis</p> <p><small>By Philip Mallory, MD, PhD, Paul Dunning, BS, Steven Klein, MD, Derek Popello, MBA, and Mark Frankle, MD</small></p>	<p>Massive RCT W/O OA</p> <p>JBJS 2010</p>
<p>Previous Rotator Cuff Repair Is Associated With Inferior Clinical Outcomes After Reverse Total Shoulder Arthroplasty</p> <p><small>Edward J.W. Shuck, MD, Denise M. Kouabe, MS, Tristan Maerz, PhD, Adam Schwach, BS, and J. Michael Walter, MD</small></p> <p><small>Investigator performed at Beaumont Health, Department of Orthopaedic Surgery, Royal Oak, Michigan, USA</small></p>	<p>Failed RCR W/O OA</p> <p>OJSM 2017</p>
<p>Reverse Total Shoulder Arthroplasty for Massive, Irreparable Rotator Cuff Tears Before the Age of 60 Years</p> <p><small>Long-Term Results</small></p> <p><small>Edwin Bredemeyer, MD, Alan Yee, MD, Anthony Caronzo, PhD, Kelly Miller, MD and Christal Griffin, MD</small></p>	<p>Age < 65</p> <p>JBJS 2017</p>

30

RTSA Massive RCT W/O OA

Reverse Shoulder Arthroplasty for the Treatment of Irreparable Rotator Cuff Tear without Glenohumeral Arthritis
JBJS 2010

By Philip Mallory, MD, PhD, Page Dunning, BA, Steven Klein, MD, Derek Papadakis, MBA, and Mark Frankle, MD

- Indications: 2 tendon RCT, Hamada <= 3, no OA
- 20% Complications
- Survivorship 92% w/o prior RCR and 87% w prior RCR

31

RTSA Failed RCR w/o OA

Previous Rotator Cuff Repair Is Associated With Inferior Clinical Outcomes After Reverse Total Shoulder Arthroplasty
OJSM 2017

Ethanoff J.W. Shieling, MD, Denise M. Kowalec, MS, Tristan Mason, PhD, Adam Schwach, BS, and J. Michael Wilton, MD
Investigator performed at Beaumont Health, Department of Orthopedic Surgery, Royal Oak, Michigan, USA

- Worse ASES, SST, Pain, FE

Reverse total shoulder arthroplasty after failed rotator cuff surgery
JSES 2019

Pascal Boileau, MD, Jean-François Gonzalez, MD, Christopher Chalmard, MD, Ryan Bicknell, MD, MSc, FRC(C)P, Gilles Walch, MD

- 12% Complication
- AFE 146° → 122° (LOSS OF FE)
- 27% dissatisfied

32

RTSA Age < 65 Poor Px

Reverse total shoulder arthroplasty for massive irreparable rotator cuff tears in patients younger than 65 years old: results after five to fifteen years
JSES 2013

Eugene T.R. Ek, MBBS, PhD, FRACS, Lisa Neukom, MD, Sabrina Catanzaro, RN, Christian Gerber, MD, FRCSEd (Hon)*

- No improvement in AER
- 38% Complication
- 15% Failure

Reverse Total Shoulder Arthroplasty for Massive, Irreparable Rotator Cuff Tears Before the Age of 60 Years
JBJS 2017

Lidia Frazzetta, MD, Alvin Nain, MD, Adam Catanzaro, RN, Stefan Eder, MD, and Christian Gerber, MD

- 39% complications
- 10% failure

Reverse shoulder arthroplasty for massive rotator cuff tears: risk factors for poor functional improvement
JSES 2015

Robert D. Hartzler, MD, MS, Brandon W. Steen, MD, Michael R. Hozay, MD, Michael C. Cantel, MD, Benjamin J. Cottrell, BS, Rachel L. Glass, MD, Mark A. Frankle, MD

- Poor SST

33

Complications

20-50% Complication Rate

- Infected arthroscopy → easily treated
- Infected TSR → life-changing

34

Implant Cost*

SCR	RTSA
\$6,700	\$10,400

*Estimated that total cost for RTSA is 15-22K more than SCR

35

SCR Technique Evolution

- Thicker grafts
- TOE Laterally
- 3 Independent Anchors Medially

36

3 Glenoid Anchors
Safe and Effective

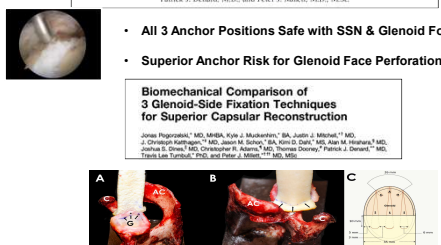
Quantitative and Computed Tomography Anatomic Analysis of Glenoid Fixation for Superior Capsular Reconstruction: A Cadaveric Study

Jason M. Schon, B.S., J. Christopher Karthagen, M.D., Cameron N. Dupre, B.S., Justin J. Mitchell, M.D., Travis Lee Turnbull, Ph.D., Christopher R. Adams, M.D., Patrick J. Denard, M.D., and Peter J. Millett, M.D., M.Sc.

- All 3 Anchor Positions Safe with SSN & Glenoid Fossa
- Superior Anchor Risk for Glenoid Face Perforation

Biomechanical Comparison of 3 Glenoid-Side Fixation Techniques for Superior Capsular Reconstruction

Jonas Pogorzelski, MD, MChB, Kyle J. Markolf, BA, Justin J. Mitchell, MD, J. Christopher Karthagen, MD, Jason M. Schon, BA, Kim D. Cole, MS, Alan M. Hershay, FRCR, Jonathan B. Coyle, MD, Christopher R. Adams, M.D., Thomas Dierker, Patrick J. Denard, MD, Francis Lee Turnbull, PhD, and Peter J. Millett, MD, MSc



37

3.0 mm Knotless SutureTaks for the glenoid




38

PC Medial humeral SpeedBridge SwiveLock Anchors



39

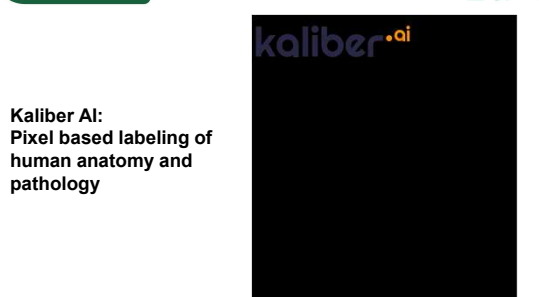
Proper graft measurement and arm position



40


Innovation

Kaliber AI:
Pixel based labeling of human anatomy and pathology



41

Prepare the ArthroFLEX



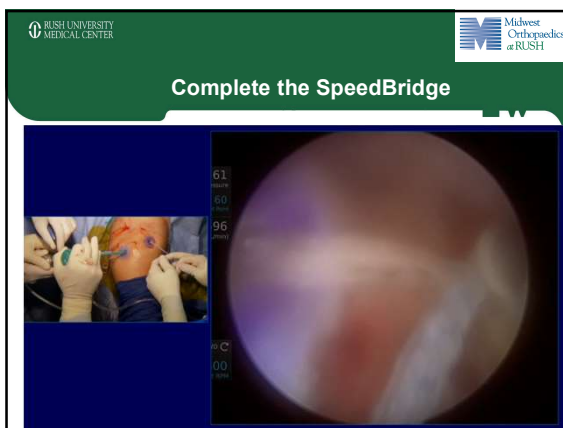
42



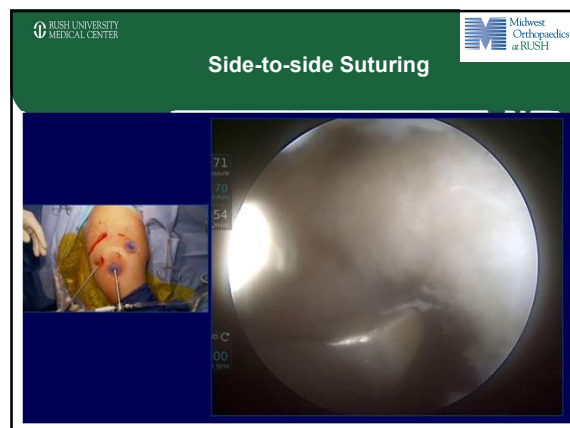
43



44



45



46

Outcomes

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., Mussumi Ohue, M.D., Tomoyuki Tsujimura, M.D., and Mitsuo Kinoshita, M.D., Ph.D.

Arthroscopy 2013

- 24 Shoulder at 2.8 yrs
- Ave 65 yo
- Irreparable RCT w Fascia Lata
- Outcomes
 - ❖ Increased AHI 4.1 mm
 - ❖ Active FE: 84 → 148
 - ❖ Active ER: 26 → 40
 - ❖ ASES 23 → 92
 - ❖ 4 Re-tears

47

Outcomes

Arthroscopic Superior Capsule Reconstruction With Acellular Dermal Allograft for the Treatment of Massive Irreparable Rotator Cuff Tears: Short-Term Clinical Outcomes and the Radiographic Parameter of Superior Capsular Distance
 William T. Pridgen, M.D., Brian A. Rahn, P.A.-C., Joseph M. Puskas, P.A.-C., Karl E. Wilton, B.A., and William Schmitt, B.S.

Return to Sports and Physical Work After Arthroscopic Superior Capsule Reconstruction Among Patients With Irreparable Rotator Cuff Tears
 Benjamin Knapik, MD, PhD, Tracy D. Lee, PhD, Alexander Papanicolaou, MD, Joseph Harris, MD, William Pridgen, MD, PhD, Tobias Kraschad, MD, PhD, Michael Olson, MD, and Robert Harter, MD, PhD

Arthroscopy, 2018 | **AJSM 2018**

Superior Capsular Reconstruction: Clinical Outcomes
 Am J Ortho. 2017

- Improved VAS, SST, SANE, ASES
- Reverse pseudoparalysis
- RTS possible
- Improved AFE, AER, AHI
- 75-90% Satisfaction
- 15-20% Revision

Arthroscopic Superior Capsule Reconstruction: Comparison of Early
 Jonas Pogorelec, MD, Goran Med, Peter J. Hill

Superior Capsular Reconstruction Reverses Profound Pseudoparalysis in Patients With Irreparable Rotator Cuff Tears and Minimal or No Glenohumeral Arthritis
 Stephen S. Burkhart, M.D., and Robert U. Hartzler, M.D., M.S.

Arthroscopy, 2019

48

History

60-Year-Old
Female Flight
Attendant


8 Mo Post SCR



49

Radiographs AHI

Pre SCR 8 mo post SCR



50

History

53 F with R shoulder weakness and pain

- 53 RHD Female
- Hx of multiple surgeries
- 1st surgery 2007: Supra Repair
- 2nd surgery May 2015: Subscap Repair
- 3rd surgery Dec 2015: Revision Supra Repair
- Injury in Dec 2017 with continued pain and weakness
- Limited motion and pain
- Night Pain
- Active: Teaches Group Fitness Classes




MIDWEST ORTHOPAEDICS at RUSH SPORTS MEDICINE & SHOULDER

51

Exam

53 F with R shoulder weakness and pain

- R Shoulder Exam:
- Forward Flexion 160
- External Rotation 80
- IR is T7
- Infra and Teres 5/5
- Supra Strength 5-/5
- Subscap 5/5
- Positive Impingement
- Visible Proximal Humeral Migration
- NO TTP biceps or AC



MIDWEST ORTHOPAEDICS at RUSH SPORTS MEDICINE & SHOULDER


52

Postoperative Interview



53

Postoperative Physical Exam



54

History

- 55 RHD Male
- Hx of L RCR 9 years prior
- Reinjury 2 years prior after a backwards fall onto L shoulder
- C/o L shoulder pain, weakness since
- Completed PT w/ no relief
- Night Pain

55 y/o M w/ Full Thickness RC Tear




55

Physical Exam

- L Shoulder Exam:
- FF – 170 degrees w/ pain
- ER – 30 degrees
- IR – T12
- Scaption strength 4/5
- ER strength 4/5
- IR strength 5/5
- TTP over AC joint, bicipital groove

55 y/o M w/ Full Thickness RC Tear




56

Physical Exam

3 Months Post SCR

55 y/o M w/ Full Thickness RC Tear



57

RUSH UNIVERSITY MEDICAL CENTER | Midwest Orthopaedics at RUSH

Billing

CCR Committee Approved AAOS Recommendations

- 29823 IAD
- 29826 SAD
- 29827 RCR
- 29806 Labral repair
- 23430 Biceps
- 29824 DCE

*AANA Position Statement on Line

58

RUSH UNIVERSITY MEDICAL CENTER | Midwest Orthopaedics at RUSH

Conclusions

- Pain, AROM, weakness, pseudoparalysis can be effectively treated by SCR
- Avoid RTSA if possible for "young", no OA and prior RCR
- Can go younger w RTSA w no subscap, escape, > grade 3 change
- SCR increasing evidence but needs L-T f/u

59



MIDWEST ORTHOPAEDICS at RUSH

SPORTS MEDICINE & SHOULDER

21st Annual AAOS/AOSSM/AANA Sports Medicine Course
PARK CITY, UTAH
Feb 5-9, 2020

AANA World Series of Live Surgery
September 13-14, 2019
Chicago, IL



AANA/FORE World Series Conference
September 13-14, 2019 | Chicago, IL
aana.org/worldseries



60