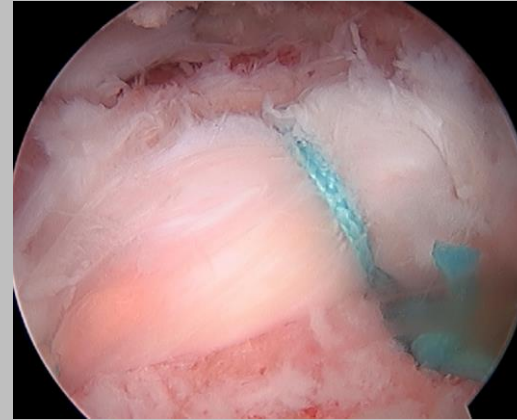
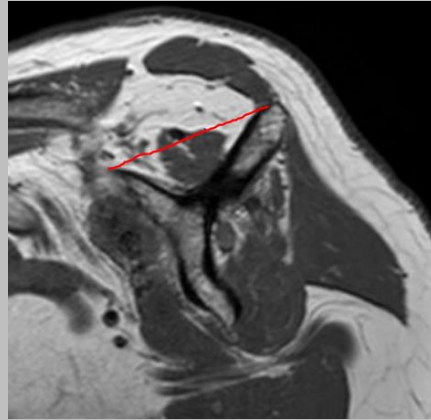


Massive Rotator Cuff Tear: Debridement and Partial Repair



Michael T. Freehill, M.D., F.A.O.A., F.A.A.O.S.

Associate Professor

Sports Medicine and Shoulder Surgery

Stanford University School of Medicine

Team Physician, Stanford Athletics

Assistant Team Physician, Oakland A's

Disclosures

Consultant: Smith and Nephew, Tornier/Stryker, Integra, Sparta Biopharma

Research support: National Institutes of Health, Major League Baseball,
Smith & Nephew, RTI, Arthrex

Board of Trustees: Medical Publishing AOSSM

Committee member : ASES, AOSSM, AAOS, AANA, ISAKOS



Natural History of Rotator Cuff Disease and Implications on Management

Jason Hsu, MD and

Assistant Professor, Department of Orthopaedic Surgery, University of Washington, Seattle, WA

Jay D Keener, MD

Associate Professor, Washington University, Department of Orthopaedic Surgery, CB 8233, 660 S Euclid Ave., St. Louis, MO 63110, 314 747-2639, Fx: 314-747-2499

Rotator cuff tears:

- Progression of tear enlargement
- Muscle degeneration over time

Operative Techniques in
Orthopaedics

2015



One Size Does Not Fit All

Individualizing Treatment

Pre-operative Factors

- Age
- Medical comorbidities
- Social factors (smoking)
- Demand
 - Job requirements
 - Recreational activities
- Fatty infiltration of rotator cuff
- Previous shoulder surgeries

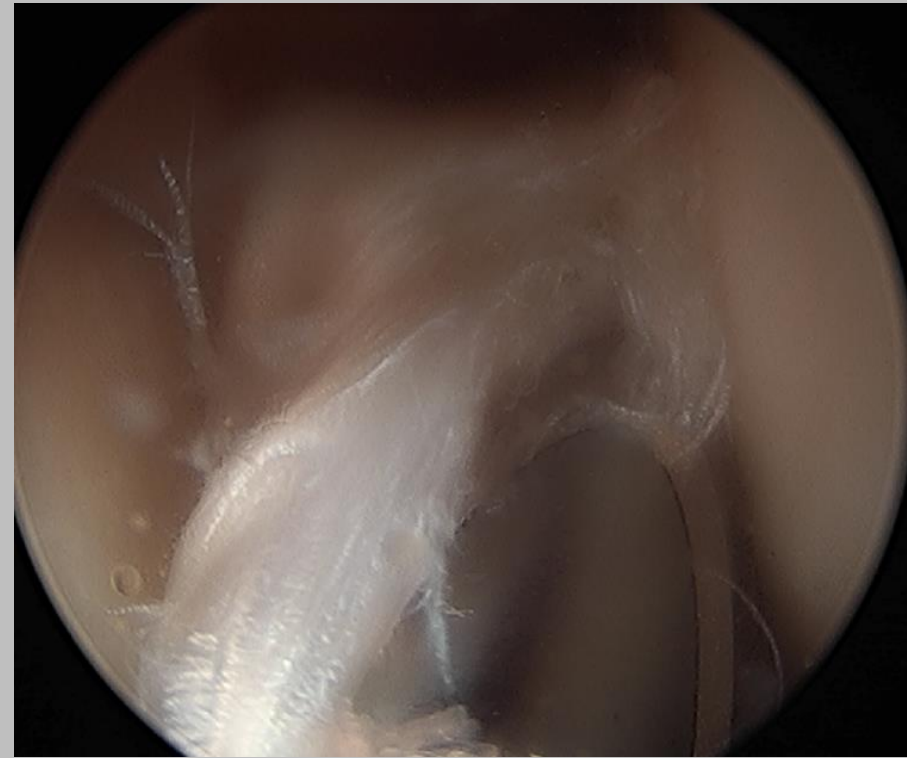
Intra-operative Factors

- Mobilization of tendon
 - Releases
- Amount of tendon lateral to musculotendinous junction
- Bone quality
 - Anchor placement



What “could” help: Debridement:

- Inflammatory factors
- Substance P
- Incarcerating debris/structure



What “could” help: Biceps Tenotomy:

Sports Med Arthrosc. 2008 Sep;16(3):180-6. doi: 10.1097/JSA.0b013e3181824f1e.

The proximal biceps as a pain generator and results of tenotomy.

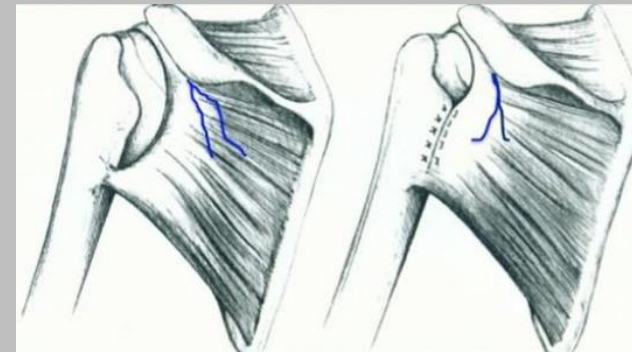
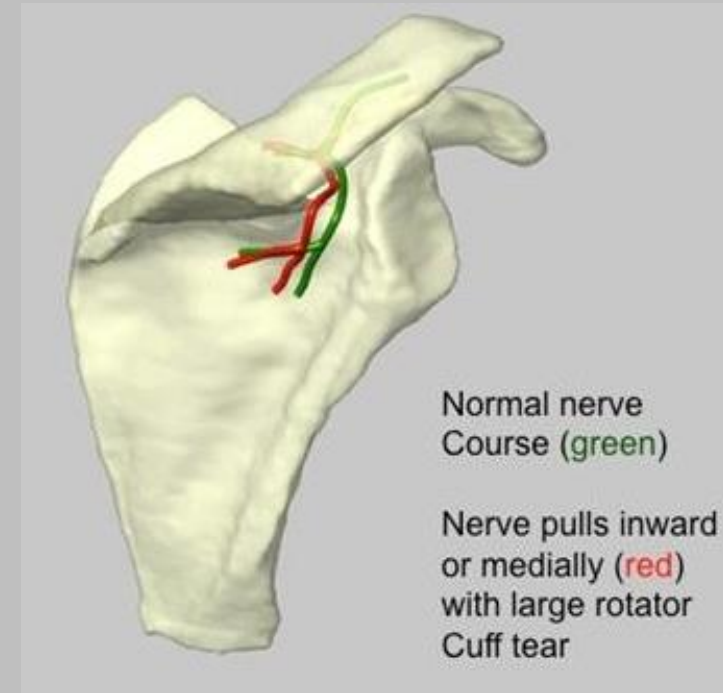
Szabó J., Boileau P., Walch G.

Department of Orthopedic Surgery, Medical School, University of Pécs, Pécs, Hungary.

- RTC repairs not feasible
 - Fatty infiltration
 - Proximal HH migration
- Tenodesis or tenotomy
 - Reduces pain
 - Improves functional ROM
 - High degree pt satisfaction



What “could” help: Suprascapular nerve release



Suprascapular Nerve: Is It Important in Cuff Pathology?

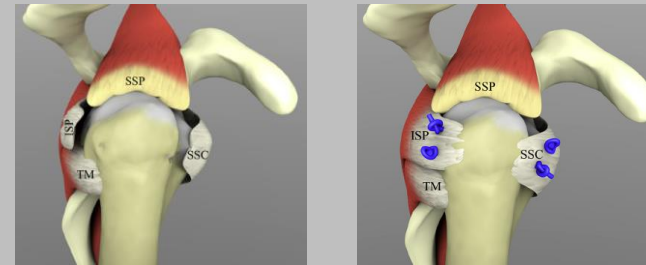
Lewis L. Shi,¹ Michael T. Freehill,² Paul Yannopoulos,³ and Jon J. P. Warner³

Advances in
Orthopedics 2012

The Case for the Partial Repair

Force couple:

- Subscap <> Infra/Teres minor
- Centralizes HH
 - Slow superior migration
 - Improved biomechanics
 - Improved compensation

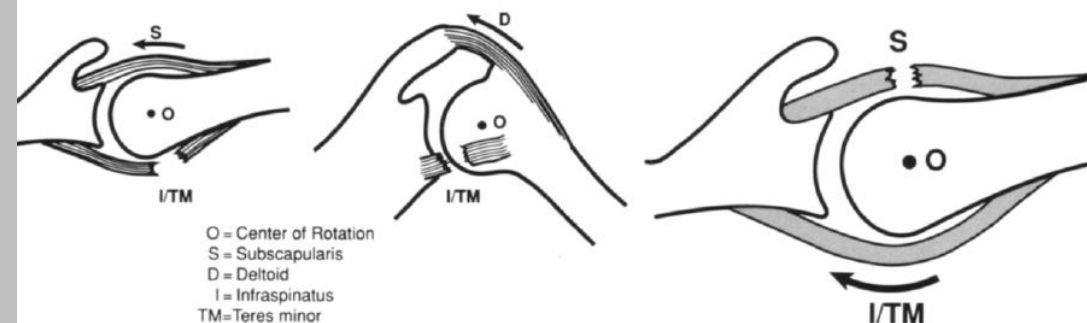


Castricini et al. Arth Tech 2017

Partial Repair of Irreparable Rotator Cuff Tears

Stephen S. Burkhart, M.D., Wesley M. Nottage, M.D., Darrell J. Ogilvie-Harris, M.D.,
Harvey S. Kohn, M.D., and Anthony Pachelli, M.D.

Uncoupling of Essential Forces



Massive rotator cuff tears: The result of partial rotator cuff repair

Xavier A. Duralde, MD,^a and Brant Bair, MD,^b Atlanta, GA, Santa Fe, NM

- Excellent/Good= 67%
- Satisfactory pain relief= 83%
- Active elevation 114° > 154°

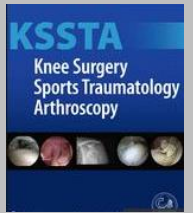


2005

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

Arnaud Godenèche¹ · Benjamin Freychet¹ · Riccardo Maria Lanzetti¹ · Julien Clechet¹ · Yannick Carrillon¹ · Mo Saffarini^{2,3}

Both partial & complete repairs:
equivalent improvements in CS
(Constant Score)

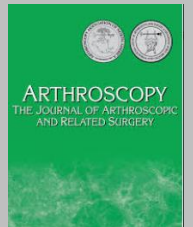


2017

Quality of Life and Functional Results of Arthroscopic Partial Repair of Irreparable Rotator Cuff Tears

Olimpio Galasso, M.D., Daria Anna Riccelli, M.D., Marco De Gori, M.D., Massimo De Benedetto, M.D., Nicola Orlando, M.D., Giorgio Gasparini, M.D., and Roberto Castricini, M.D.

- Irreparable supraspinatus, repair infraspinatus & subscap
- Significant clinical improvement
- Regardless of RCT pattern



2017



Partial Repair vs Debridement Alone

Arthroscopic debridement versus open repair for rotator cuff tears. A prospective cohort study.

Ogilvie-Harris DJ¹, Demazière A.



1993

Massive, Irreparable Tears of the Rotator Cuff. Results of Operative Debridement and Subacromial Decompression*

Gary M. Gartsman



1997

Massive rotator cuff tears: functional outcome after debridement or arthroscopic partial repair

Alexander Berth • Wolfram Neumann •
Friedemann Awiszus • Géza Pap



2010

Surgical management of irreparable rotator cuff tears

Francesco Franceschi • Rocco Papalia •
Sebastiano Vasta • Francesco Leonardi •
Nicola Maffulli • Vincenzo Denaro



2015

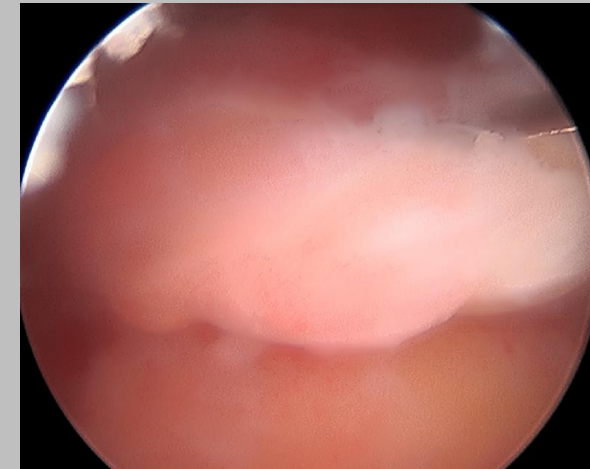


Tricks to the Partial Repair



Rule 1: Medializing the Medial Row

- Avoids undue tension



Biomechanical Effect of Medial Advancement of the Supraspinatus Tendon

A STUDY IN CADAVERA*

BY JAIN LIU, M.D.†, RICHARD E. HUGHES, PH.D.‡, SHAWN W. O'DRISCOLL, M.D., PH.D.‡,
AND KAI-NAN AN, PH.D.‡, ROCHESTER, MINNESOTA

Investigation performed at the Division of Orthopedic Research, Mayo Clinic and Mayo Foundation, Rochester



1998

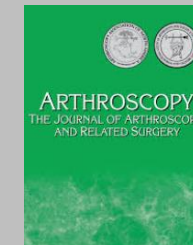


- Up to **10mm** medial advancement acceptable
 - From a biomechanical point of view
 - Although clinical maximum dictated by other clinical factors

Clinical and Radiologic Outcomes After Medializing and Not Medializing Rotator Cuff Tendon Attachment Site on Chronic Retracted Rotator Cuff Tears

Kwang Won Lee, M.D., Kyung Ho Moon, M.D., Chang Hyun Ma, M.D., Gyu Sang Lee, M.D., Dae Suk Yang, M.D., and Won Sik Choy, M.D.

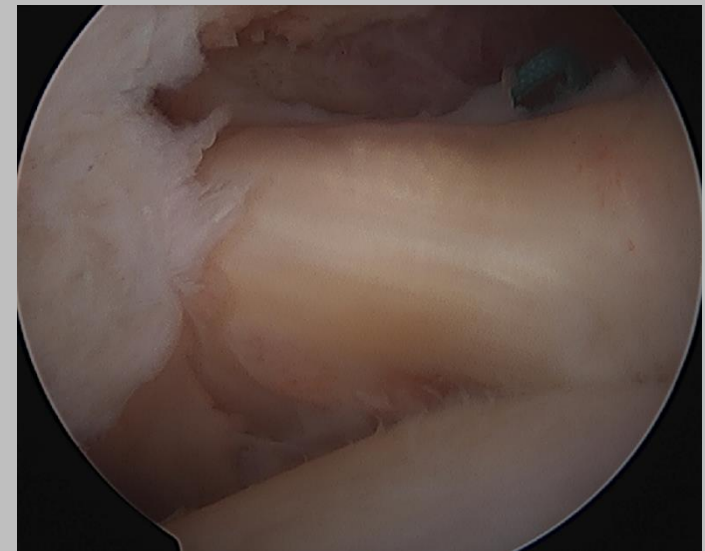
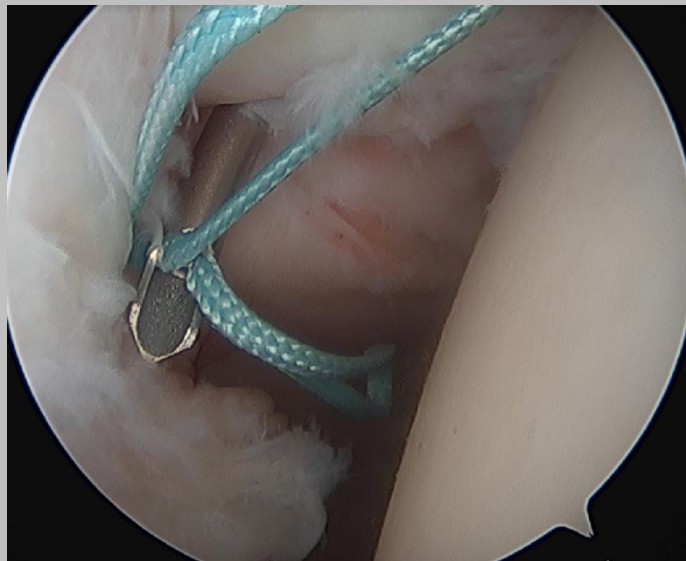
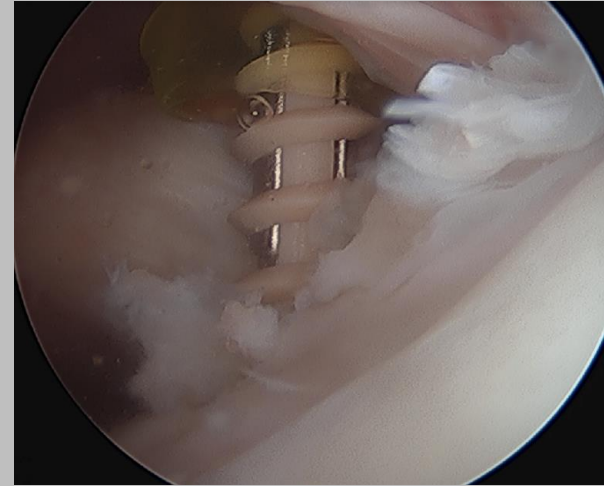
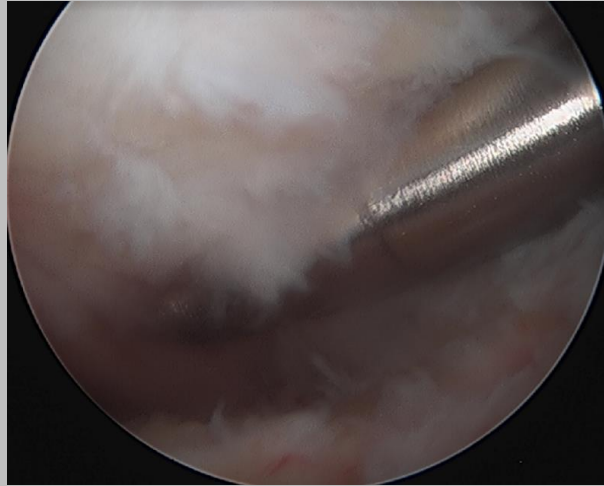
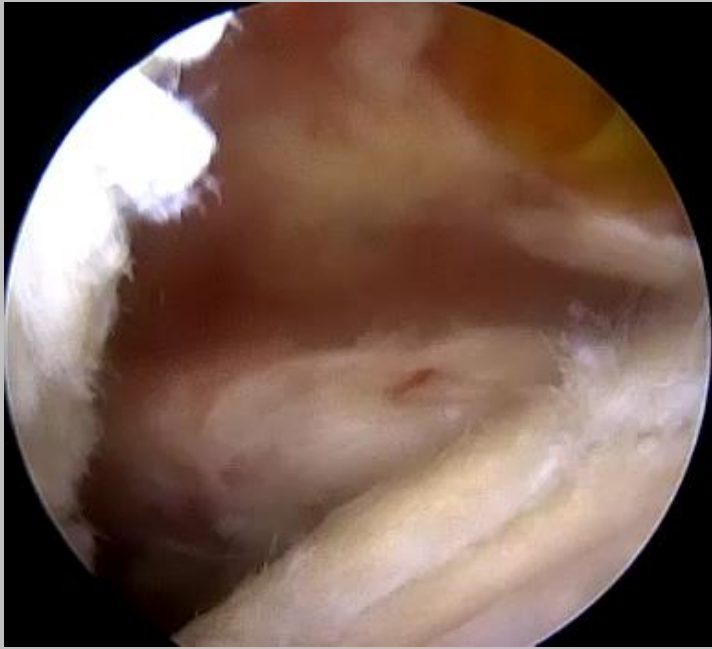
- Large full-thickness tears
- 24 medialized vs 36 not medialized
- Re-tear 8.3% vs 31% (MRI)
- Clinical outcomes equivocal
- Mean medialization **10.5mm**



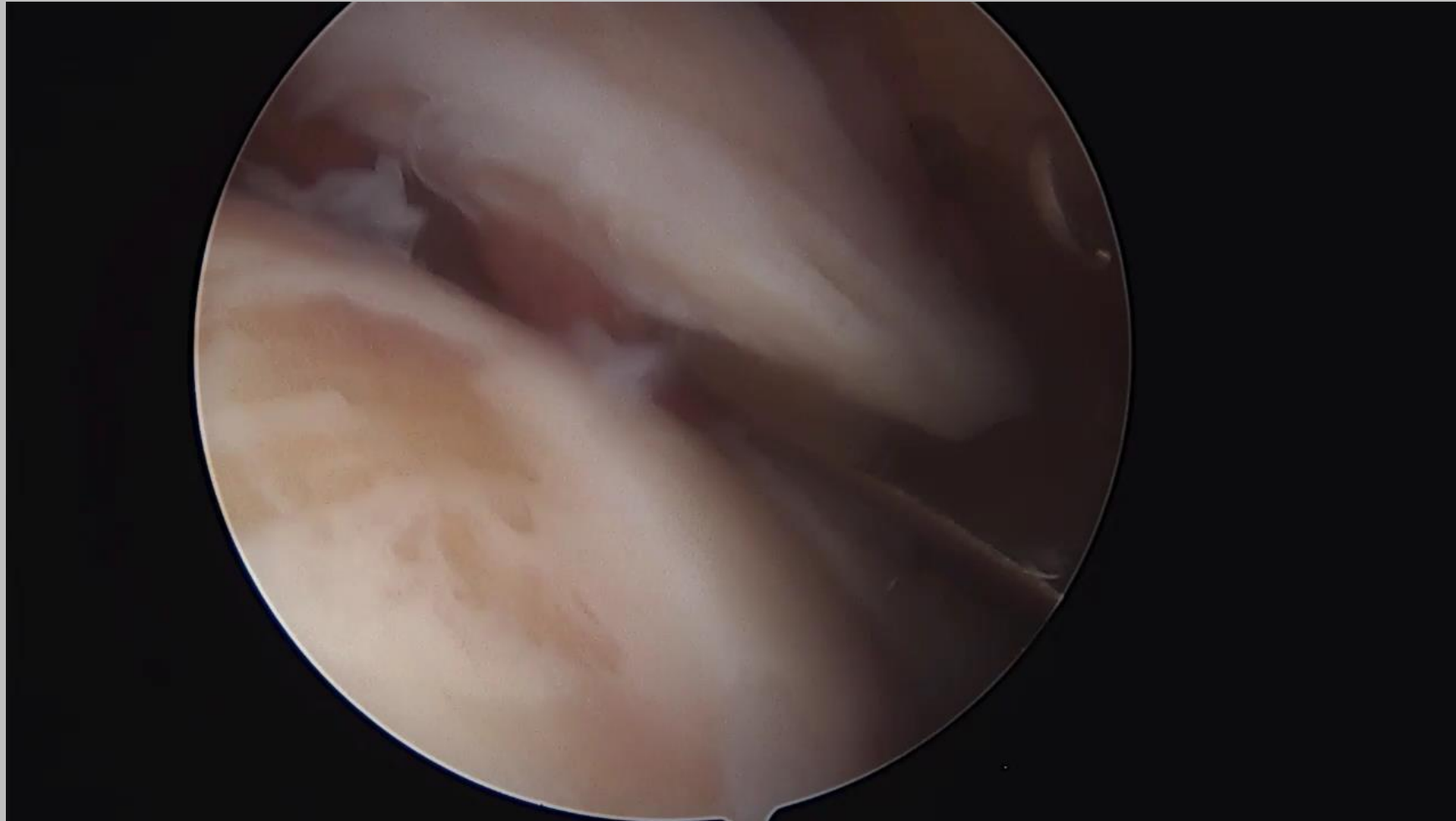
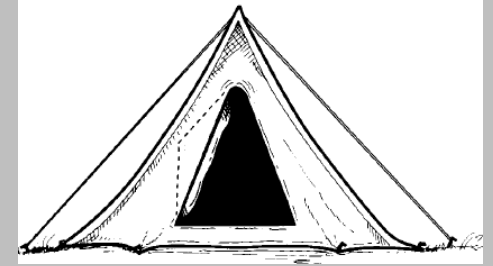
2018



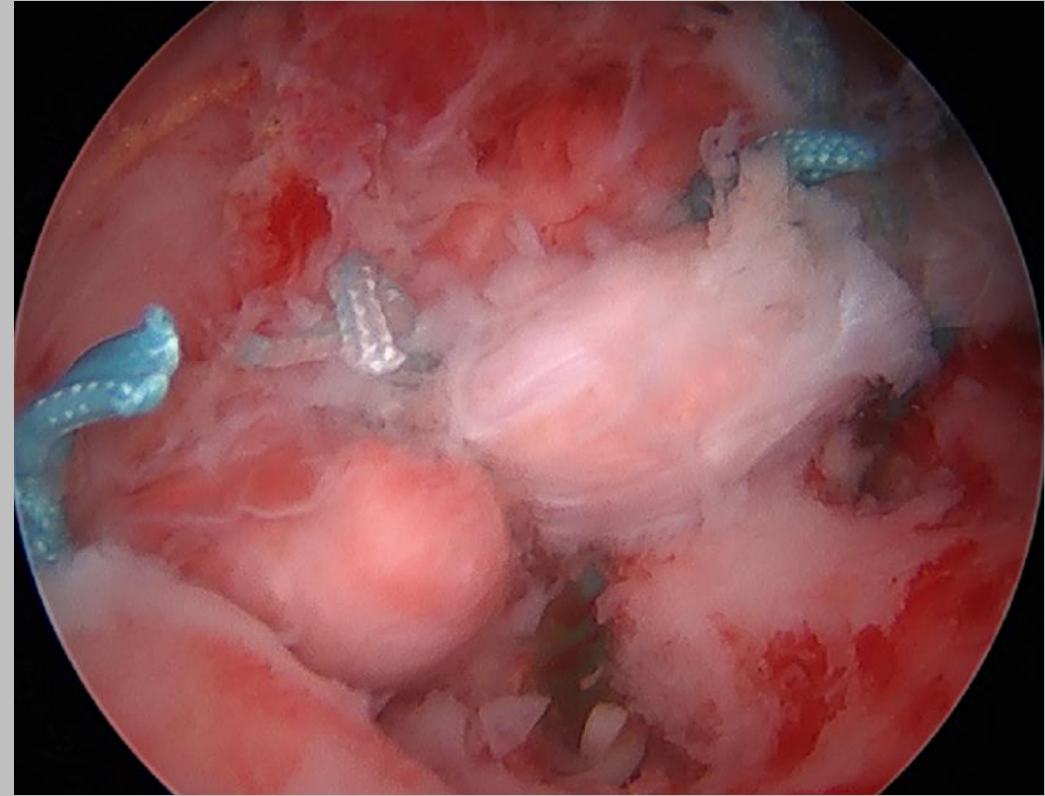
Rule 2: Don't miss a subscap tear



Rule 3: Convergence sutures



Rule 4: Improved tendon fixation “Luggage Tag”



What would you do?

- Right shoulder pain
- 72 y/o M, RHD
- Fall 1 year prior
- Ongoing limited ROM/weakness w/ AROM
- Pain anterior and deep
- Wakes from sleep
- Slight improvement with PT
- Reports h/o “rotator cuff injury”
 - Treated successfully with PT



What would you do?

Physical Examination

FF= 60/145 (160/165)

ER= 15/20 (45/50)

ABD= 30/145 (155/160)

IR= Lumbosacral (T12)

Jobes= 3lbs (16lbs)

ER= 3/5 (5/5)

Subscap x 3= all +

Outcome Measures

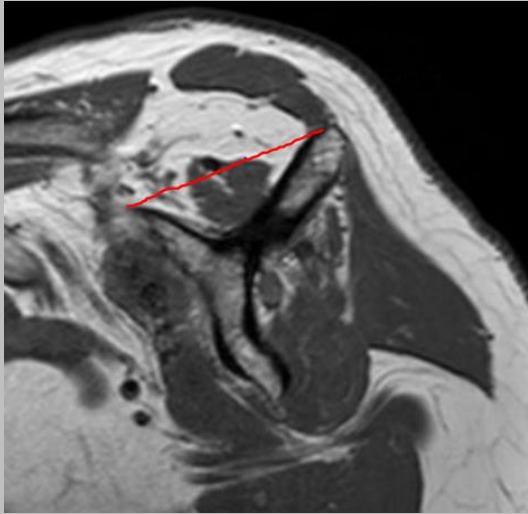
SSV= 50%

ASES= 31

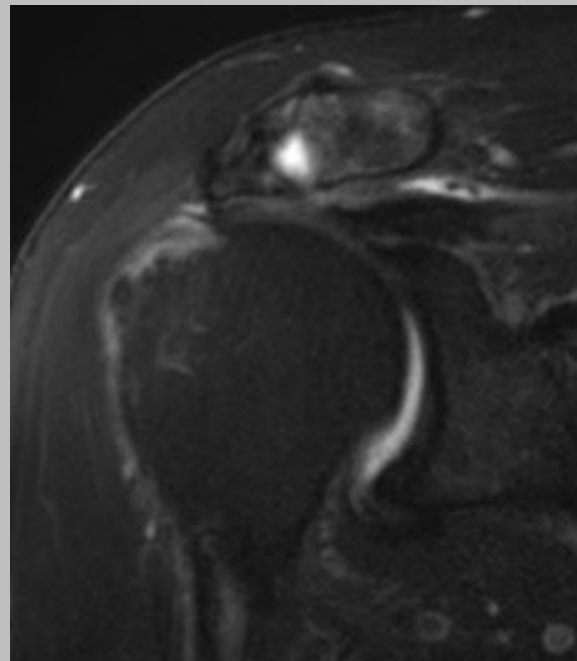
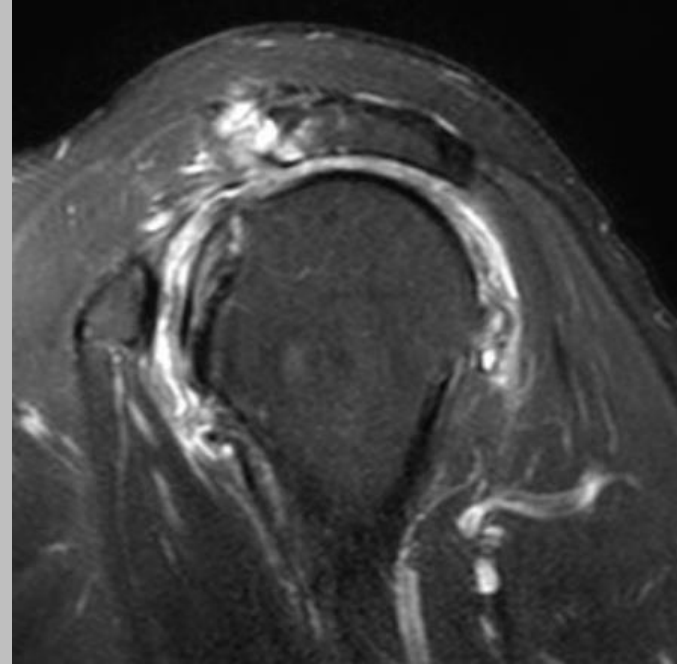
Constant= 23



Hamada 2

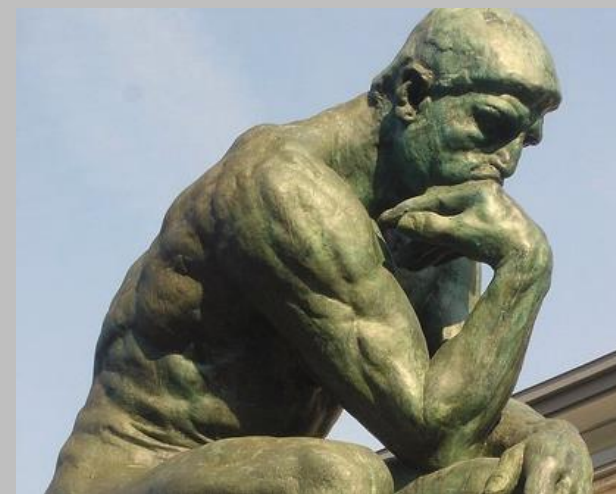


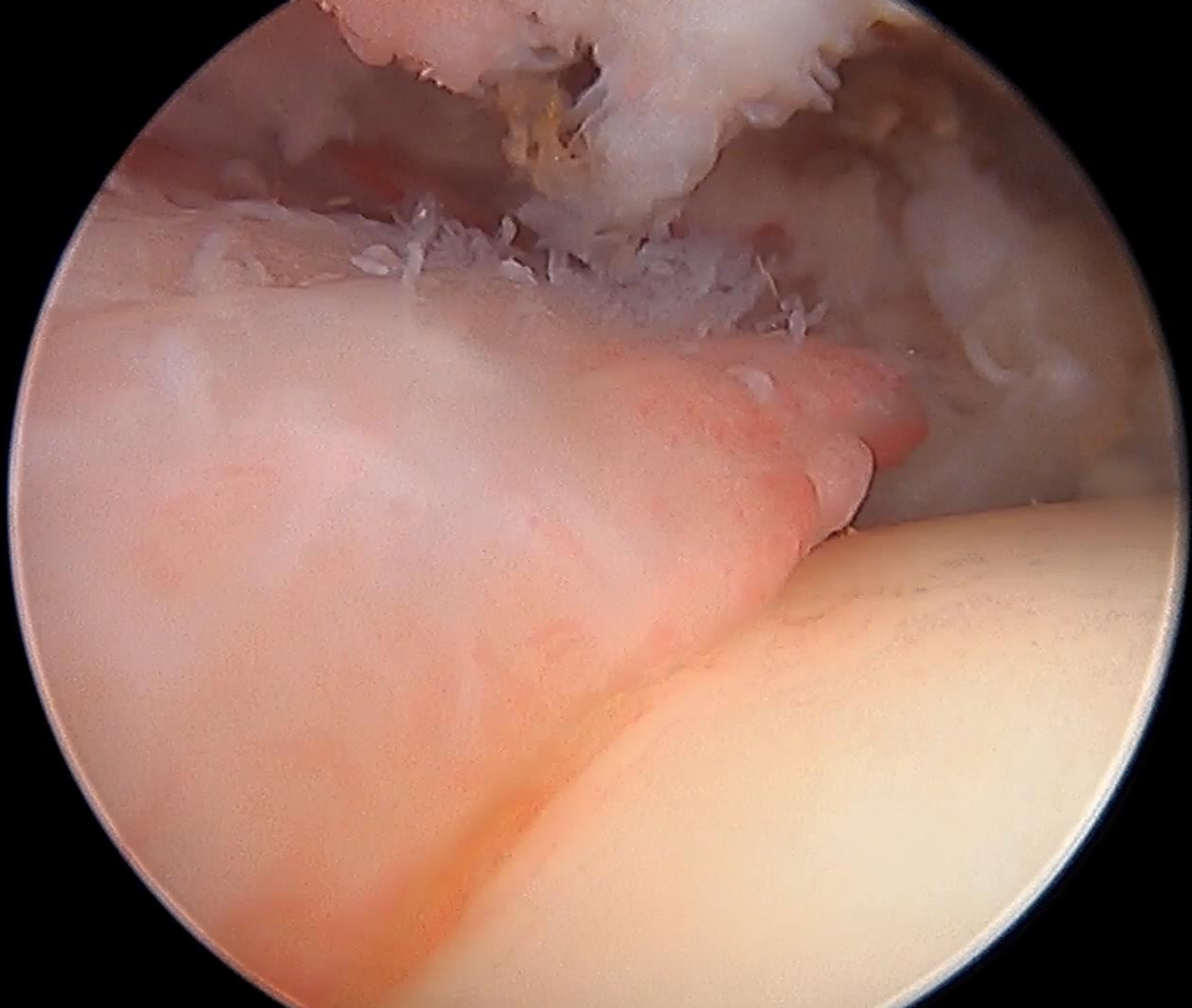
Atrophy vs Fatty Infiltration?



Options

- Debridement
 - Biceps tenotomy/tenodesis
 - Suprascapular nerve release
- Partial repair
- Augmentation
 - Scaffold
 - allograft, xenograft, synthetic
 - Biceps
- Superior capsular reconstruction
- Bursal Acromial Reconstruction (BAR)
- Tendon transfer
 - Latissimus, lower trapezius
- Reverse total shoulder arthroplasty



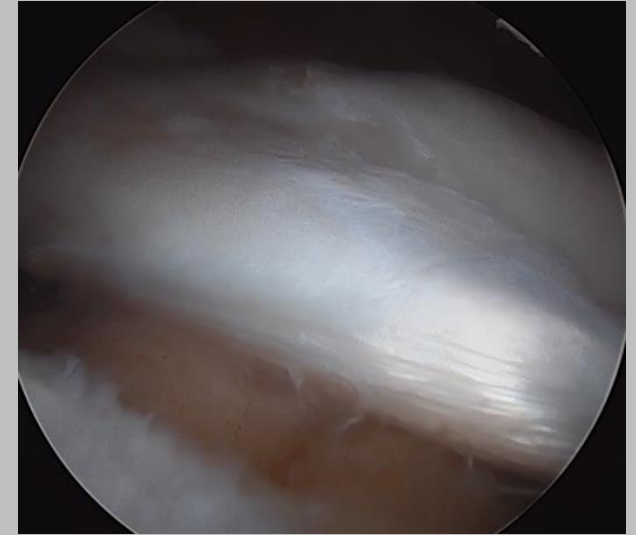


Luggage Tag Technique



Rule 5: Augmentation Options (Biceps- if possible)

- Cost considerations
- Autologous tissue
- More studies needed:
 - Biomechanics
 - Cuff healing



Long Head of Biceps as Augment

Original article

Superior capsular reconstruction for irreparable supraspinatus tendon tears using the long head of biceps: A biomechanical study on cadavers

Fucaï Han^{a,*}, Chee Hoe Kong^b, Muhammad Yaser Hasan^b, Amit K. Ramruttun^c, V. Prem Kumar^{b,c}

^a Department of Orthopaedic Surgery, Ng Teng Fong General Hospital (National University Health Service Group), National University Health System, 1 Jurong East Street 21, 609606 Singapore, Singapore

^b Department of Orthopaedic Surgery, University Orthopaedics, Hand & Reconstructive Microsurgery Cluster, National University Hospital, National University Health System, Singapore, Singapore

^c Department of Orthopaedic Surgery, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, Singapore



2019

Technical note

An arthroscopic technique for full-thickness rotator cuff repair by transposition of the long head of biceps

Jian Lin^{a,b}, Weihui Qi^{a,b}, Zhongtang Liu^c, Kai Chen^{a,b}, Xiaobin Li^{a,b}, Yingzhao Yan^{a,b}, Xinxian Xu^{a,b}, Xinghe Xue^{a,b}, Yang Yang^{a,b}, Xiaoyun Pan^{a,b,*}

^a Department of Orthopaedic Surgery, the Second Affiliated Hospital of Wenzhou Medical University, Wenzhou 325000, China

^b Zhejiang Provincial Key Laboratory of Orthopaedics, Wenzhou 325000, Zhejiang Province, China

^c The Osteopathy Department, Changhai Hospital, Second Military Medical University, Shanghai, China



2019

Technical Note

Using the Long Head of Biceps Tendon Autograft as an Anatomical Reconstruction of the Rotator Cable: An Arthroscopic Technique for Patients With Massive Rotator Cuff Tears

Egbert J. D. Veen, M.D., Cornelis T. Koorevaar, M.D., Ph.D., and Ronald L. Diercks, M.D., Ph.D.

Arthroscopy
Techniques

2018

Is augmentation with the long head of the biceps tendon helpful in arthroscopic treatment of irreparable rotator cuff tears?



Sung-Ryeoll Park, MD, Dong-Hyuk Sun, MD, Jinhong Kim, MD, Hyo-Jin Lee, MD, Jong-Bin Kim, MD, Yang-Soo Kim, MD, PhD*

Department of Orthopedic Surgery, Seoul St. Mary's Hospital, The Catholic University of Korea, Seoul, Republic of Korea



2018

Long Head Biceps Tendon—Natural Patch for Massive Irreparable Rotator Cuff Tears



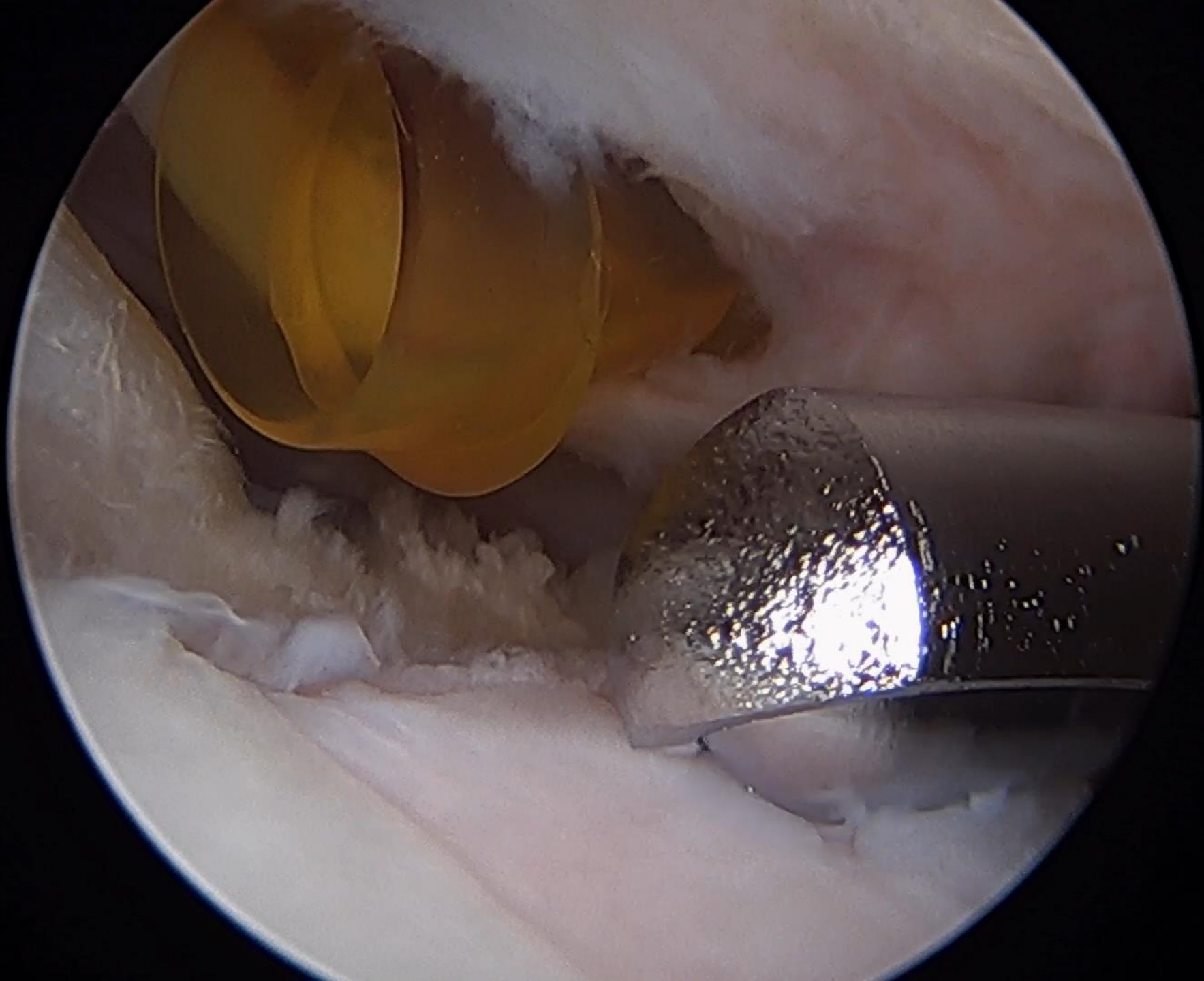
Krzysztof Hermanowicz M.D., Adrian Góralczyk, Konrad Malinowski M.D., Piotr Jancewicz M.D. and Marcin E. Domzalski M.D.

Arthroscopy Techniques, 2018-05-01, Volume 7, Issue 5, Pages e473-e478, Copyright © 2017 Arthroscopy Association of North America

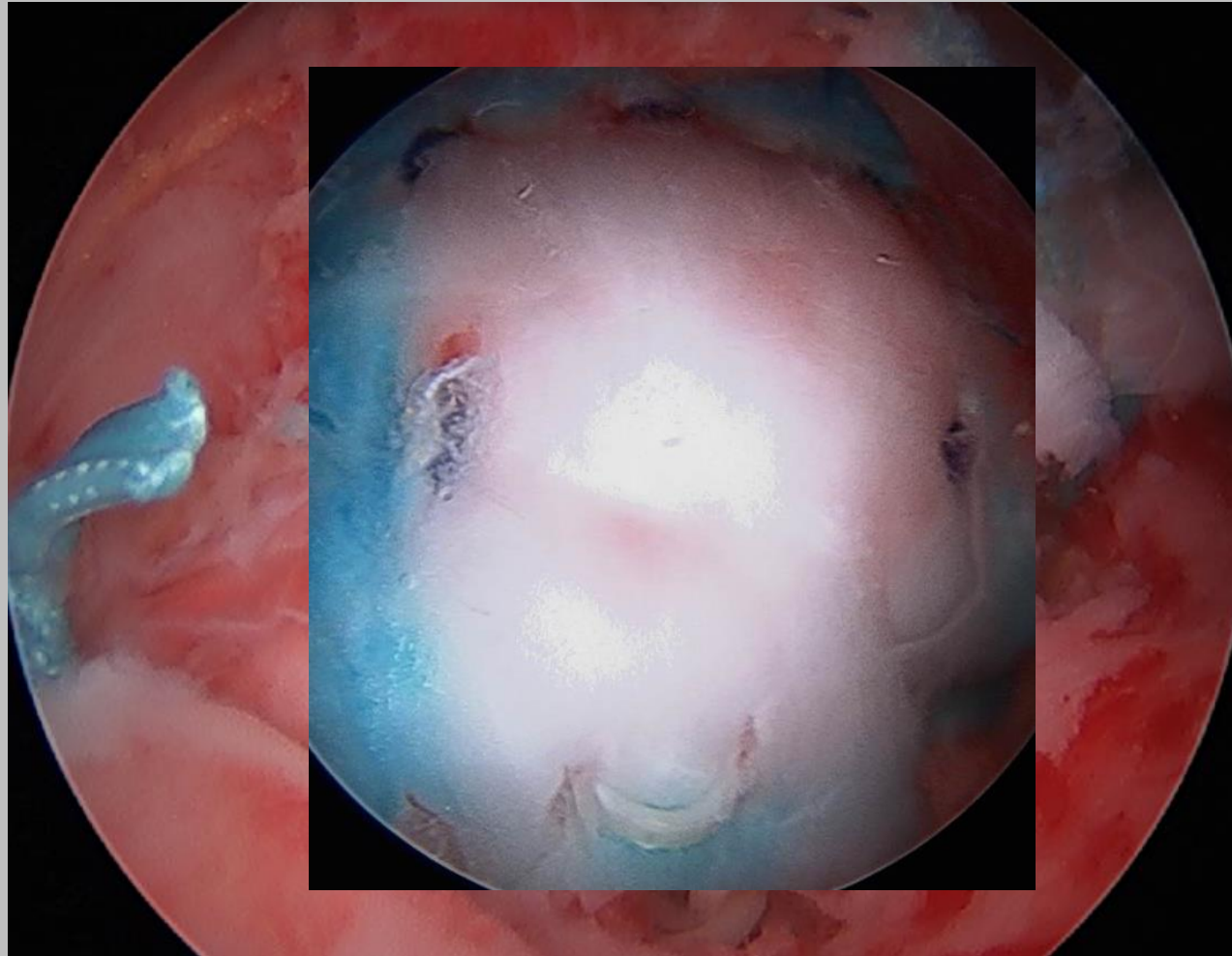
Arthroscopy
Techniques

2018





Collagen Scaffold Augmentation



Rule 5: Augmentation Options

Collagen Scaffold

Tissue-engineered augmentation of a rotator cuff tendon using a reconstituted collagen scaffold: a histological evaluation in sheep

Craig Van Kampen¹
Steven Arnoczky²
Patrick Parks³
Eileen Hackett⁴
Dana Ruehlman⁴
Anthony Turner⁴
Theodore Schlegel⁵

KEY WORDS: tendon, collagen scaffold, rotator cuff, histology, sheep.

Introduction

Partial-thickness tears of the supraspinatus tendon comprise a complex and significant pathological



2013

Desmond John Bokor¹
David Sonnabend²
Luke Deady³
Ben Cass⁴
Allan Young⁴
Craig Van Kampen⁵
Steven Arnoczky⁶



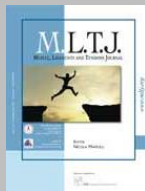
V2015

Preliminary investigation of a biological augmentation of rotator cuff repairs using a collagen implant: a 2-year MRI follow-up

Desmond John Bokor¹
David Sonnabend²
Luke Deady³
Ben Cass⁴
Allan Young⁴
Craig Van Kampen⁵
Steven Arnoczky⁶

Original article

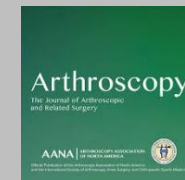
Evidence of healing of partial-thickness rotator cuff tears following arthroscopic augmentation with a collagen implant: a 2-year MRI follow-up



2015

Histologic Evaluation of Biopsy Specimens Obtained After Rotator Cuff Repair Augmented With a Highly Porous Collagen Implant

Steven P. Arnoczky, D.V.M., Shariff K. Bishai, D.O., M.S., F.A.O.A.O.,
Brian Schofield, M.D., Scott Sigman, M.D., Brad D. Bushnell, M.D., M.B.A.,
Jan Pieter Hommen, M.D., and Craig Van Kampen, Ph.D.



2017

Radiologic and clinical evaluation of a bioabsorbable collagen implant to treat partial-thickness tears: a prospective multicenter study



Theodore F. Schlegel, MD^{a,*}, Jeffrey S. Abrams, MD^b, Brandon D. Bushnell, MD, MBA^c,
J. Logan Brock^d, Charles P. Ho, MD, PhD^e



2018



Evaluation of Healing Rates and Safety With a Bioinductive Collagen Patch for Large and Massive Rotator Cuff Tears

2-Year Safety and Clinical Outcomes

Stephen G. Thon,* MD, Larry O'Malley II,† MD, Michael J. O'Brien,* MD,
and Felix H. Savoie III,*‡ MD

Investigation performed at Tulane University Medical Center, New Orleans, Louisiana, USA

Herodichus Award



2019

96% healing rate (22/23) – healed on post-operative US + MRI

91% (21/23) – successful outcome

No adverse reactions to patch seen at 2 years

Large vs. Massive tears

No diff. healing or success rates ($p > 0.05$)

Primary vs. Revisions

No diff. healing rate or success rates ($p > 0.05$)





Conclusion

Benefits of Partial Repair

- The “Force Couple”
 - Reconstitution
- Improved outcomes to debridement alone
- Possible decreased time for repair
- Possible decreased chance for Cho Type II tear
- Cost savings
 - Anchor number
 - Possible case time

Pearls for Partial Repair

- Thorough releases
- Convergence sutures
 - Picasso
- Medialization of medial row
 - Decrease tension on repair
- “Luggage tag” configuration
 - Improved soft tissue security
- Possible Augmentation
 - Biceps
 - Collagen Scaffold





Stanford
MEDICINE