UNIVERSITY OF BRESCIA

Centro R.I.T.M.O.
Ricerca e Innovazione in Traumatologia, chirurgia della Mano e Ortopedia
«Giorgio Brunelli»

Sistema Socio Sanitario
Regione Lombardia
ASST Spedali Civili

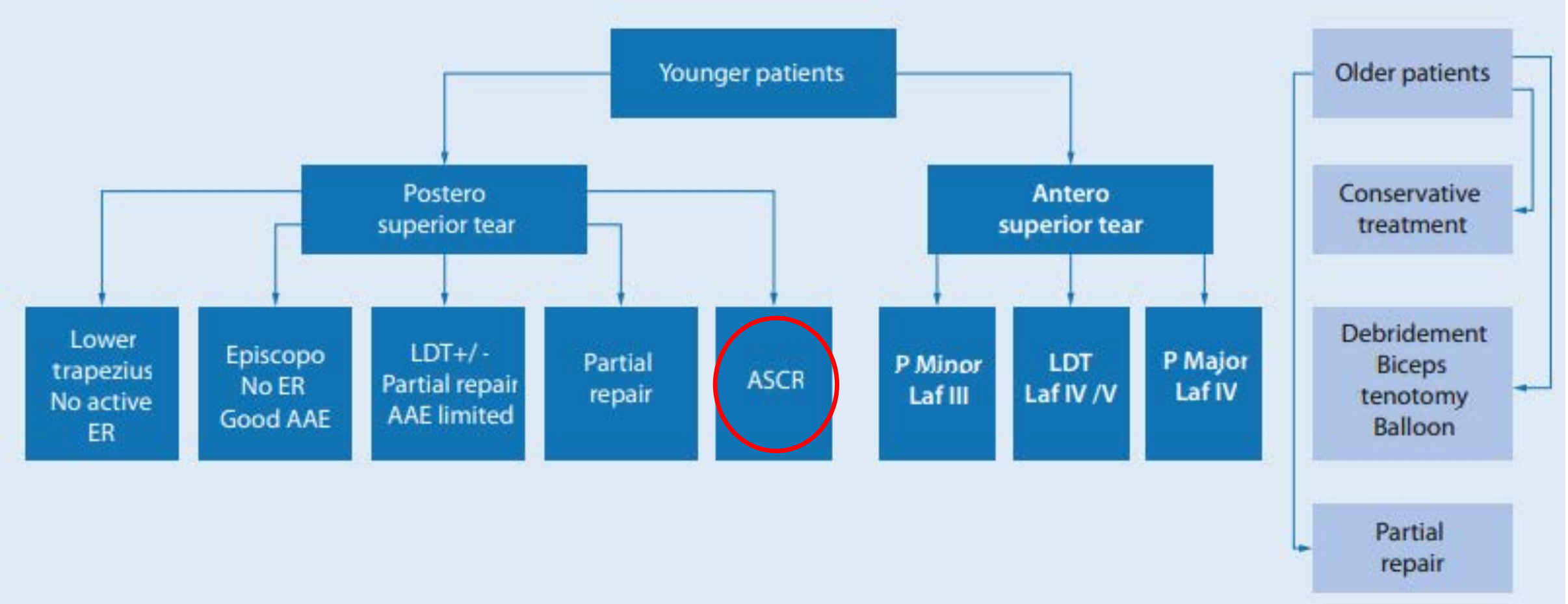
Is biceps tendon a valid option for SCR?

Giuseppe Milano

COI disclosure

- *Arthrex: consultant, research*
- *CONMED: consultant*
- *Stryker: consultant*
- *GreenBone: research*
- *Medacta: research*
- *FGP: research*

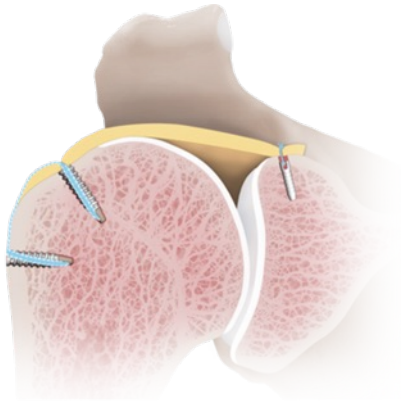
MIRCTs: joint-preserving options



Valenti 2018

Superior capsule reconstruction (SCR)

- Massive contracted tear of the superior cuff (SS)
- Superior migration of the HH
- SSC intact / repairable
- TM intact
- No severe RCT arthropathy
- Revision cuff repair
- Pseudoparalysis *(Mihata 2018, Burkhart 2019, Lee 2021)*



Get the motion back!

Technique modifications

- Graft choice
- Addition of microfractures of the GT
- N of anchors (medial and lateral fixation)
- Suture configurations
- Use of tapes

Biomechanical and

RCTs

are still missing!

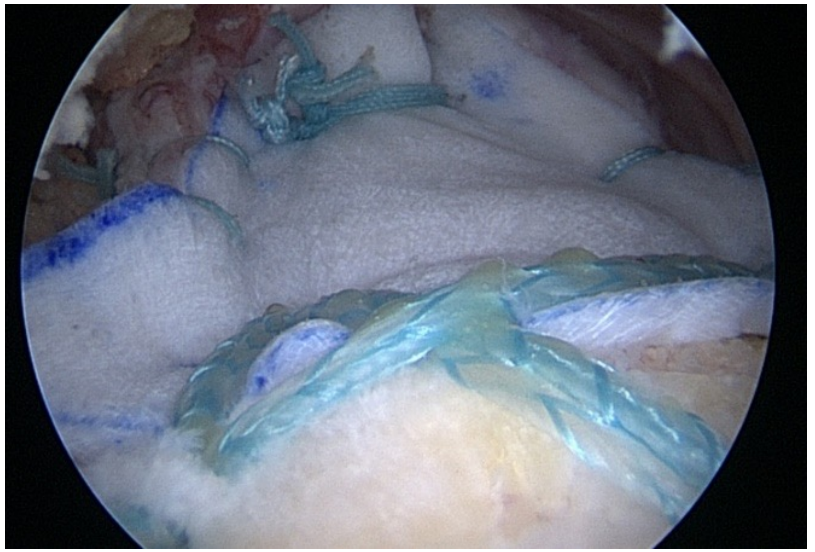
The rationale of the technique remains unmodified!

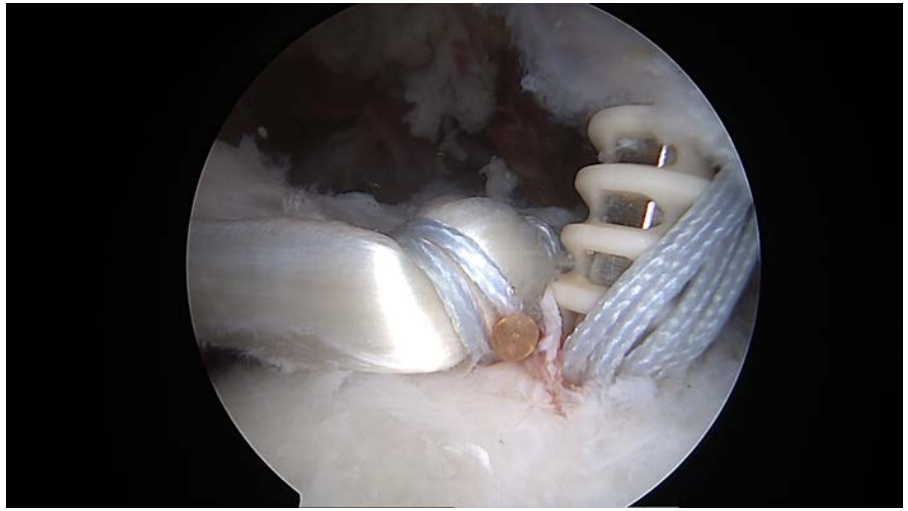
Hirarara 2015, Tokish 2015, Petri 2015, Sanchez 2017, Sutter 2017, Sethi 2017,

Milano 2020, Llanos-Rodríguez 2022, Callegari 2022

Graft options

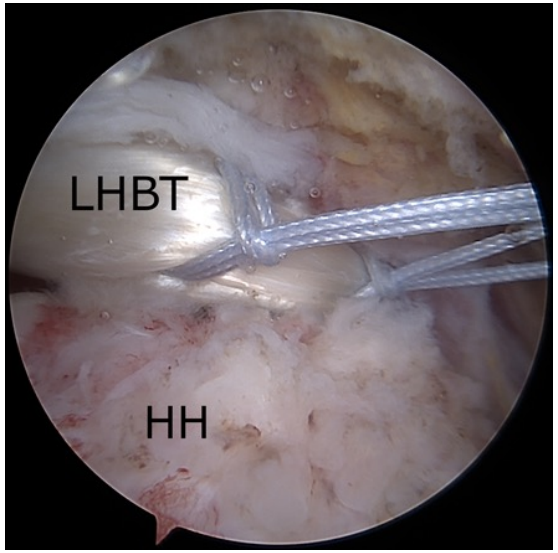
- Fascia lata autograft
- Extracellular dermal matrix
- **Long head of the biceps tendon**
- Hamstring tendon autograft
- Achilles tendon allograft

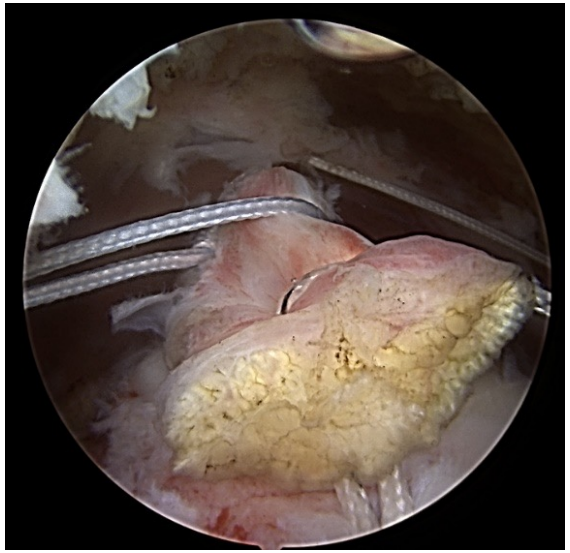




Cable reconstruction: LHBT

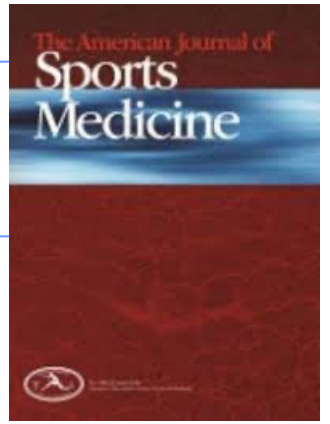
- No donor-site morbidity
- Low operative time and cost
- Easy to manage during arthroscopy
- Adequate mechanical strength (vs FL)





Park, 2018, El-Shaar 2018, Han 2019, Berthold 2020

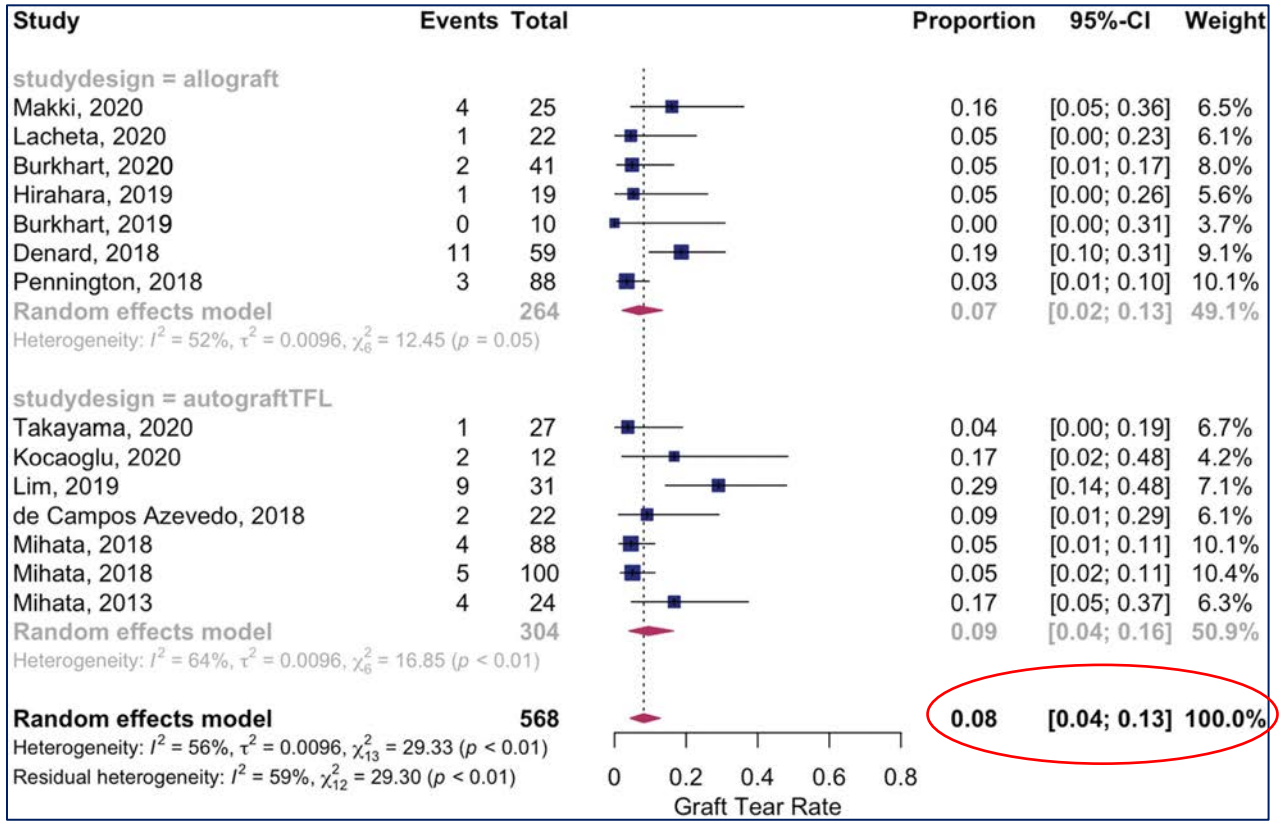
Lee A, Farooqi AS, Novikov D, Li X, Kelly JD 4th, Parisien RL.
Clinical and Functional Outcomes by Graft Type in Superior Capsular Reconstruction
Am J Sports Med. 2021 Oct 11:3635465211040440.



Clinical and Functional Outcomes by Graft Type[a]

	Dermal Allograft	TFL Autograft	LHBT Autograft	Porcine Xenograft
Studies	7	7	2	1
Shoulders	263	304	38	20
Mean follow-up, mo	23.2	43.2	27.2	12.0
ASES				
Preoperative	52 (43.6-54)	38.8 (23.5-54.4)	45.6 (45-46.2)	
Postoperative	85.3 (77.5-89)	88.6 (73.7-94.3)	82.7 (80-85.4)	
Clinically significant	6 of 6	5 of 6	2 of 2	
Postoperative change	34.6 (29.9-37)	49.7 (19.3-69.4)	37.1 (35-39.2)	
Pain-VAS				
Preoperative	4.6 (4-5.8)	6	5.2	
Postoperative	0.8 (0-1.7)	2.5	1.4	
Clinically significant	6 of 6	1 of 1	1 of 1	
Postoperative change	4.1 (2.8-4.4)	3.5	3.8	
SSV				
Preoperative	36 (35-39)	33.0	41.0	
Postoperative	83 (76.3-91)	70.0	75.0	
Postoperative change	44 (41.3-55)	37.0	34.0	
Constant				
Preoperative			34.6 (17.5-51.7)	50.0
Postoperative			64.3 (63.7-64.9)	77.0
Clinically significant			2 of 2	1 of 1
Postoperative change			29.7 (12-47.4)	27.0
Forward elevation				
Preoperative	121 (27-140)	91 (67.5-136.2)	139 (135-143)	68.6
Postoperative	159 (118-167)	147 (141.4-160)	164 (162.5-165)	151.4
Clinically significant	5 of 5	6 of 7	2 of 2	1 of 1
Postoperative change	38 (27-132)	59.4 (13.0-74.0)	24.8 (22-27.5)	82.8
External rotation				
Preoperative	30 (24-37)	27.2 (13.2-38)	42 (35-49)	
Postoperative	43 (37-59)	40 (30-50.3)	51.4 (50-52.8)	
Clinically significant	2 of 3	3 of 7	1 of 2	
Postoperative change	19 (7-22)	14.0 (2-22.4)	9.4 (1-17.8)	
Abduction				
Preoperative	86.5 (70-103)	58.2 (53.2-63.1)		65.4
Postoperative	133.5 (107-160)	127 (120.7-132.9)		149.3
Postoperative change	47 (37-57)	68.7 (67.5-69.8)		83.9
Internal rotation				
Preoperative	L3	Sacrum-T11	Sacrum-T11	
Postoperative	L1	L2-T10	T12-T10	
Postoperative change	2 vertebrae	2.5 (1-6) vertebrae	3.5 (1-6) vertebrae	

Graft re-tear: allograft vs TFL

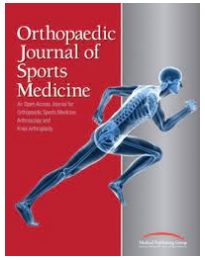


Dermal allograft, TFL autograft, and LHBT autograft are all suitable options

Park SR, Sun DH, Kim J, Lee HJ, Kim JB, Kim YS.
Is augmentation with the long head of the biceps tendon helpful in arthroscopic treatment of irreparable rotator cuff tears?
J Shoulder Elbow Surg. 2018 Nov;27(11):1969-1977

Barth J, Olmos MI, Swan J, Barthelemy R, Delsol P, Boutsiadis A
Superior Capsular Reconstruction With the Long Head of the Biceps Autograft Prevents Infraspinatus Retear in Massive Posterosuperior Retracted Rotator Cuff Tears.
Am J Sports Med. 2020 May;48(6):1430-1438

Kocaoglu B, Firatli G, Ulku TK
Partial Rotator Cuff Repair With Superior Capsular Reconstruction Using the Biceps Tendon Is as Effective as Superior Capsular Reconstruction Using a Tensor Fasciae Latae Autograft in the Treatment of Irreparable Massive Rotator Cuff Tears.
Orthop J Sports Med. 2020 Jun 3;8(6):2325967120922526

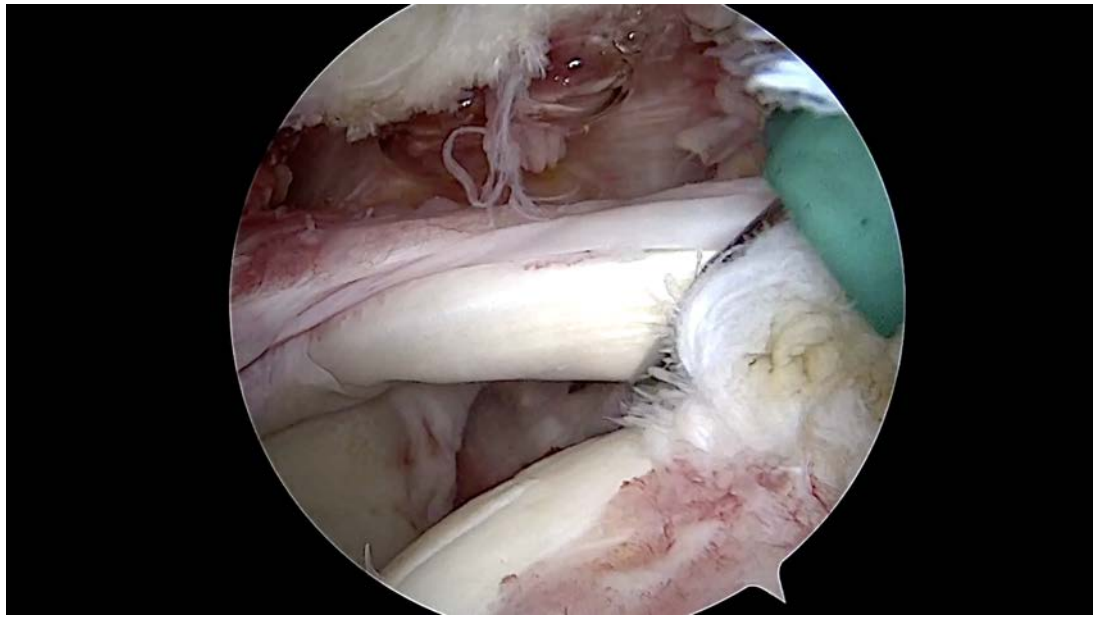


Seo JB, Kwak KY, Park B, Yoo JS
Anterior cable reconstruction using the proximal biceps tendon for reinforcement of arthroscopic rotator cuff repair prevent retear and increase acromiohumeral distance.
J Orthop. 2021 Feb 9;23:246-249

Kim JH, Lee HJ, Park TY, Lee JU, Kim YS
Preliminary outcomes of arthroscopic biceps rerouting for the treatment of large to massive rotator cuff tears.
J Shoulder Elbow Surg. 2021 Jun;30(6):1384-1392

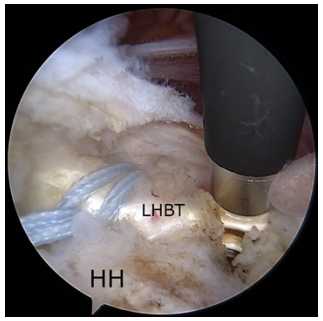
SCR with LHBT

- 19 patients (M:F=12:7)
- Mean age: 61.7 ± 6.1 yrs
- Mean follow-up: 26.6 ± 5.7 mo



	Baseline	Follow-up	p value
Quick-DASH	57.1 ± 18.2	26.5 ± 29.1	<0.0001
WORC	32.3 ± 14.7	72.3 ± 29.9	<0.0001
ASES	29.6 ± 15	77.9 ± 23.4	<0.0001

LHBT: augmentation in RCR



Does Additional Biceps Augmentation Improve Rotator Cuff Healing and Clinical Outcomes in Anterior L-Shaped Rotator Cuff Tears?

Clinical Comparisons With Arthroscopic Partial Repair

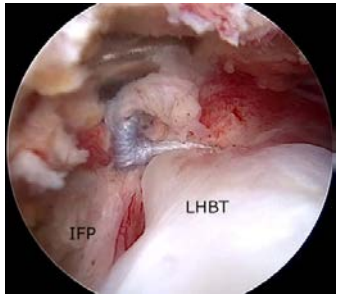
Yoon Sang Jeon,* MD, Juyeob Lee,* MD, Rag Gyu Kim,* MD, Young-Won Ko,* MD, and Sang-Jin Shin,*† MD

2017

Rotator Cuff Anterior Cable Reconstruction With Long Head of Biceps Tendon Autograft

Raymond E. Chen, M.D., Wajeeh R. Bakhsh, M.D., Jason S. Lipof, M.D., Zachary G. McVicker, M.D., and Ilya Voloshin, M.D.

2020



2020

Arthroscopic Rotator Cuff Repair Combined With Modified Superior Capsule Reconstruction as Reinforcement by the Long Head of the Biceps

Chen Hao Chiang, M.D., Leo Shaw, M.D., Wei Hsing Chih, M.D., Ming Long Yeh, Ph.D., and Wei Ren Su, M.D., M.Sc.

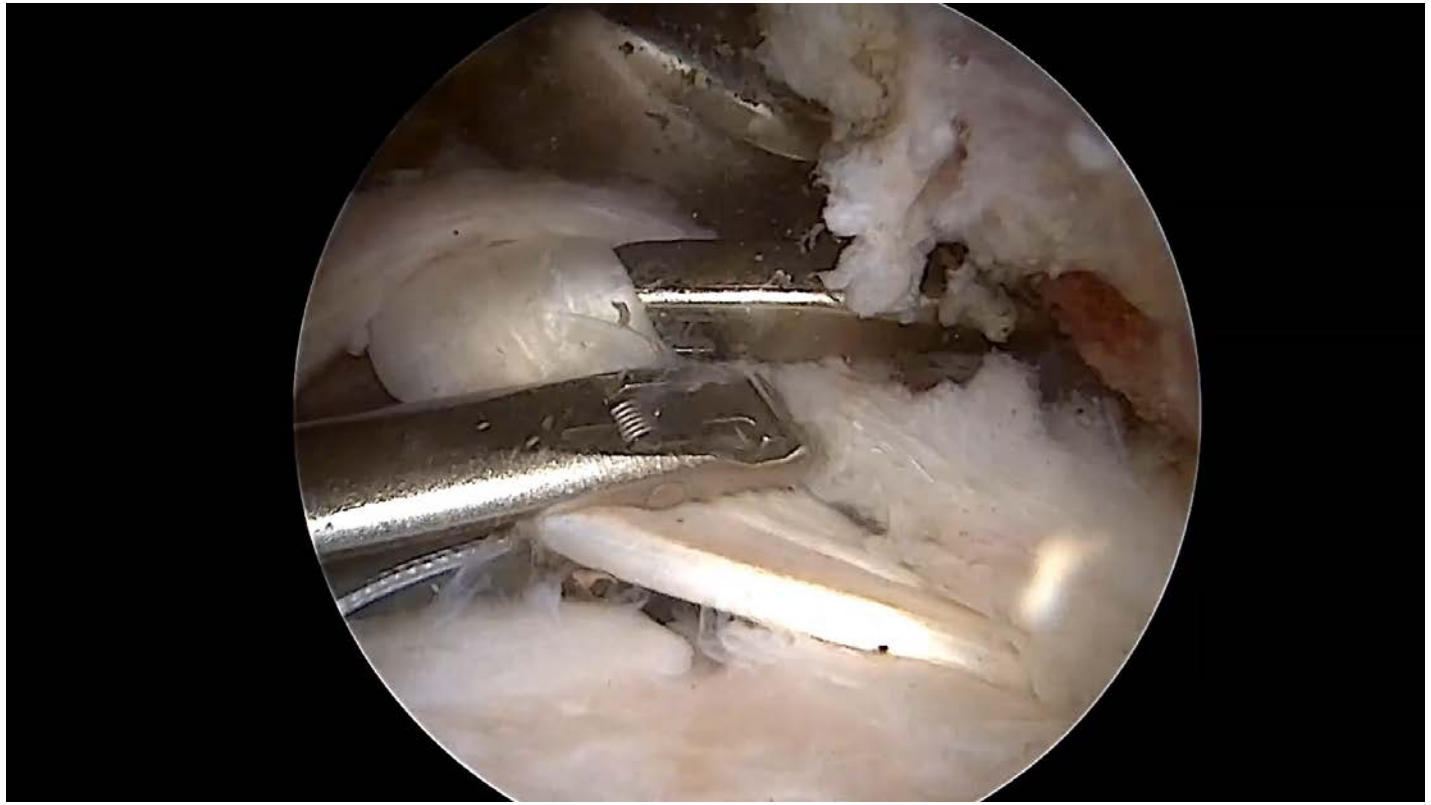
Augmented Repair of Large to Massive Delaminated Rotator Cuff Tears With Autologous Long Head of the Biceps Tendon Graft: The Arthroscopic "Cuff-Plus" Technique

Giuseppe Milano, M.D., Giacomo Marchi, M.D., Giuseppe Bertoni, M.D., Niccolò Vaisitti, M.D., Stefano Galli, M.D., Alessandra Scaini, M.D., and Maristella F. Saccomanno, M.D., Ph.D.

2020

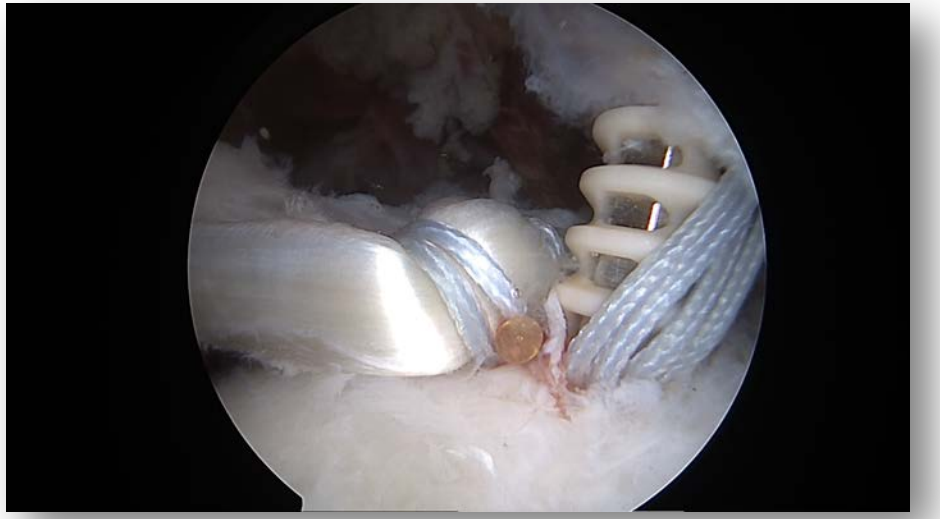
Indications:

- Reparable MRCTs
- Improving healing potential



«Cuff plus»

- 15 patients (M:F=11:4)
- Mean age: 63.3 ± 7.8 yrs
- Mean follow-up: 28.4 ± 5.7 mo



	Baseline	Follow-up	p value
Quick-DASH	60 ± 22.2	22.3 ± 20.2	<0.0001
WORC	39.3 ± 23.4	75.2 ± 20.7	<0.0001
ASES	31.8 ± 21.3	79.5 ± 22.7	<0.0001

2020

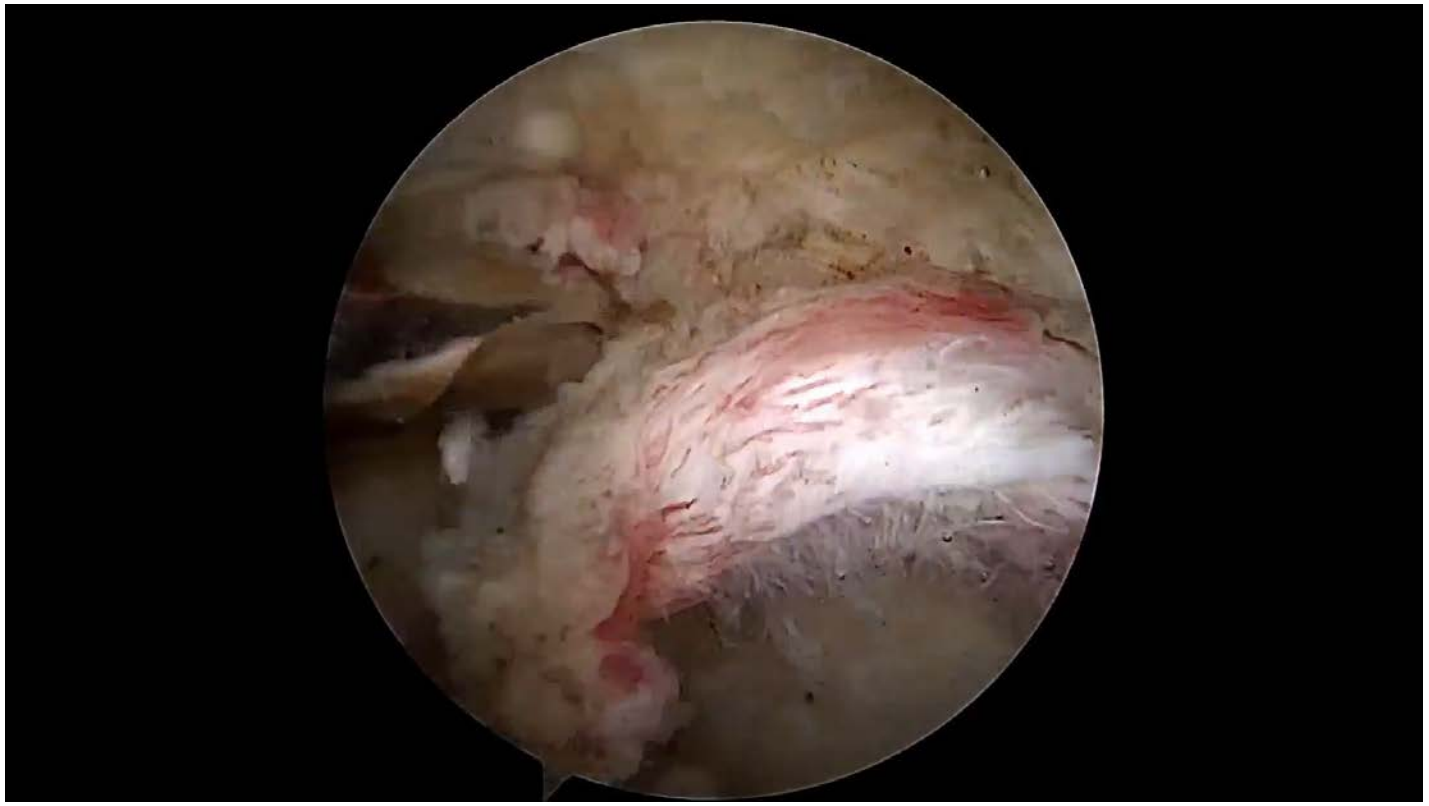
Technical Note

Arthroscopic Superior Capsule Reconstruction With Doubled Autologous Semitendinosus Tendon Graft

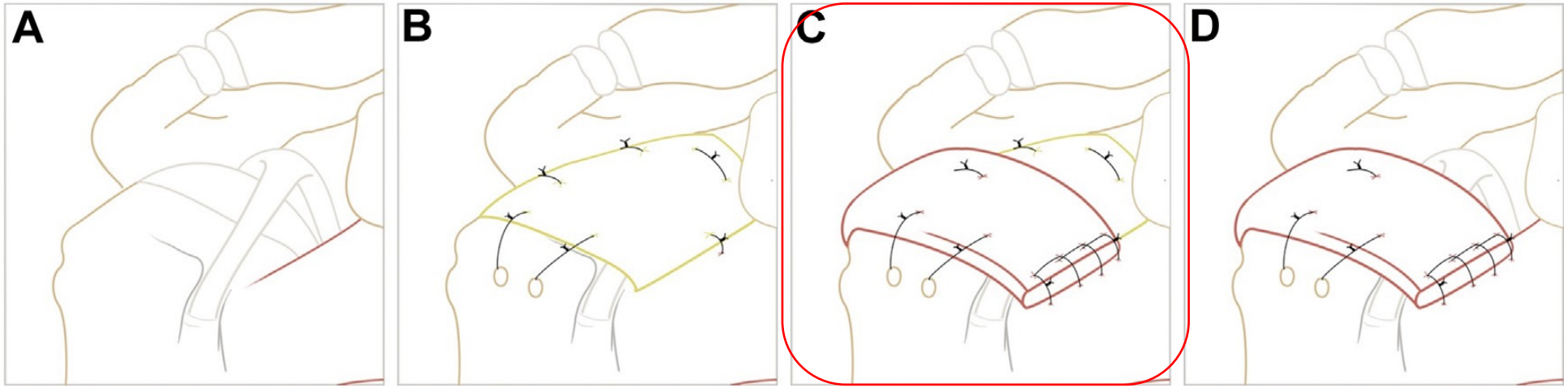
Giuseppe Milano, M.D., Maristella F. Saccomanno, M.D., Ph.D., Alessandro Colosio, M.D., Marco Adriani, M.D., Stefano Galli, M.D., Alessandra Scaini, M.D., and Giacomo Marchi, M.D.

Indications:

- Unsuitable LHBT
- Revision cases



Omid R, Stone MA, Lin CC, Patel NA, Itami Y, McGarry MH, Lee TQ.
Biomechanical analysis of latissimus dorsi tendon transfer with and without superior capsule reconstruction using dermal allograft.
J Shoulder Elbow Surg. 2019 Aug;28(8):1523-1530.



Adding SCR to LDT adds static stabilization to a dynamic stabilizer

Tendon transfer

Lower trapezius vs Latissimus dorsi

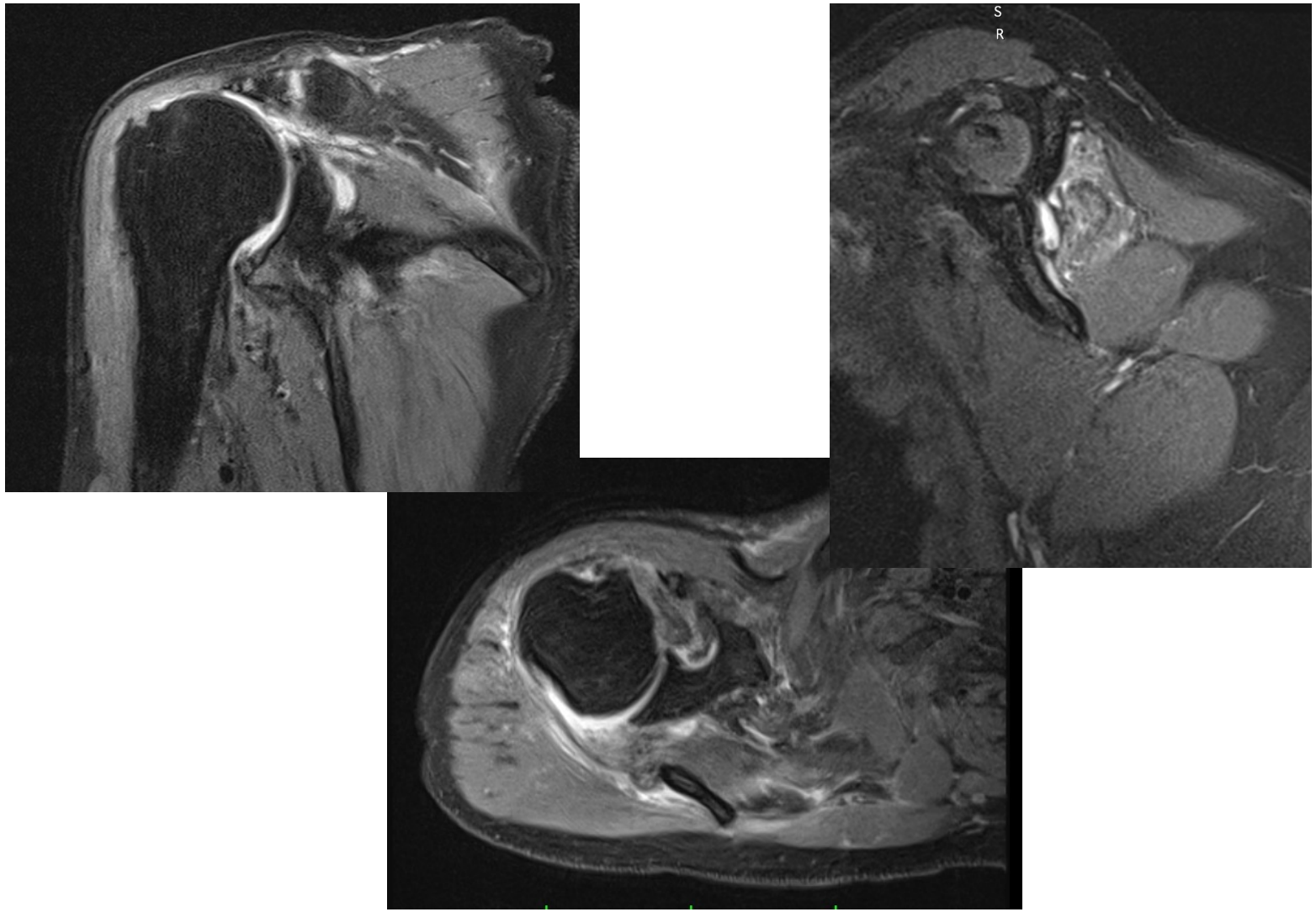
- LT fibres replicate the infraspinatus fibers better than LDT
- Technically easier
- Lenght extension:
  - ✓ Achilles tendon allograft *(Elhassan 2016)*
  - ✓ Semitendinosus autograft *(Valenti 2018)*
- **Stronger ER and abduction moment arm** compared LDT
- Failure: 3%

Get the strength back!

Hartzelr 2012, Omid 2015, Reddy 2019, Elhassan 2020

Clinical case

- Male, 67 yo,
- Right handed
- Anterior dislocation
  - Massive cuff tear
- Clinical examination
  - AFE < 90°
  - Loss of strenght



SCR & LTT

- SCR + Lower trap
- LHB + semitendinosus

Get motion & strength back!

Conclusions

- ***Superior capsule reconstruction with biceps***
  - Easy
  - Fast
  - Low cost (autograft)

- ***SCR + LTT: restore coronal and horizontal force couples***

Maximize treatment options!

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Thank you!!