University of Toronto
Orthopaedic Sports Medicine

ROTATOR CUFF TEARS – HOW MANY ROWS?

2015 Chicago Sports Medicine Symposium

Jas Chahal MD FRCSC MSc MBA(c)
Women's College Hospital and University Health Network
University of Toronto

University of Toronto
Orthopaedic Sports Medicine

CONFLICTS OF INTEREST

I have no conflicts to report.

Objective

Determine the ideal construct for arthroscopic rotator cuff repair as determined by biomechanical studies, clinical outcomes, and cost-effectiveness research

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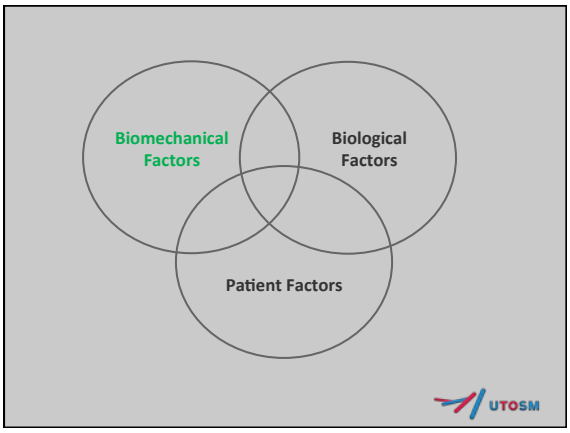
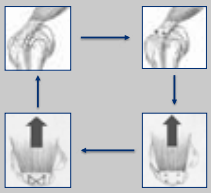


Evolution of Repair Techniques

Evolution of RCR repair techniques over the last 2-3 decades

From a BIOMECHANICAL perspective,

- Gerber has proposed that an ideal rotator cuff tear would have high initial fixation strength, permit minimal gap formation and sustain mechanical stability until healing has occurred



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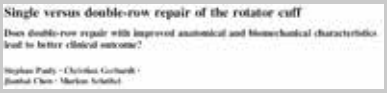
Single Row vs. Double Row

Gerber's Principles


Single versus double-row repair of the rotator cuff

Does double-row repair with improved anatomical and biomechanical characteristics lead to better clinical outcome?

- Tendon to bone contact area is 60% greater with DR techniques
- Improvement in contact pressures with DR repair
- Less gap formation, higher initial fixation strength, and increased number of cycles to failure with DR techniques

KSSTA 2010

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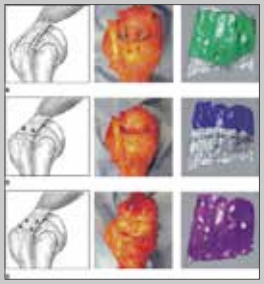
Single Row vs. Double Row
Contact Area

- **Meier et al.**
  - 3D mapping study
  - Anatomic footprint restoration superior with double row compared with single row and transosseous repairs

JSES 2006



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Double Row > Single Row

Conclusion 1

Suture Number Determines Strength of Rotator Cuff Repair

Patrick W. Jost, MD, M. Michael Khair, MD, Dan X. Chen, MS, Timothy M. Wright, PhD, Anne M. Kelly, MD, and Scott A. Rodeo, MD

Investigation performed at the Sports Medicine and Shoulder Service, Hospital for Special Surgery, New York, NY

Conclusions: In an ovine rotator cuff tendon repair model, increasing the number of sutures decreased cyclic gap formation and increased load to failure. Single and double-row repairs are biomechanically equivalent when the number of sutures is kept constant.

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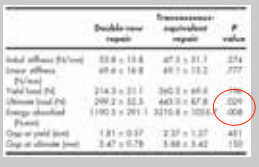
DR versus TOE
Strength of Repair

Part II: Biomechanical assessment for a footprint-restoring transosseous-equivalent rotator cuff repair technique compared with a double-row repair technique

- **TOE repair had greater ultimate load to failure (p<0.05)**
- **No difference in gap formation or stiffness of the constructs**



J Shoulder Elbow Surg July/August 2007

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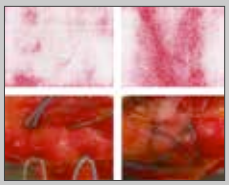
DR versus TOE
Contact Area and Pressure

Part I: Footprint contact characteristics for a transosseous-equivalent rotator cuff repair technique compared with a double-row repair technique



- Higher contact pressures achieved with TOE technique compared with standard double row technique with suture anchors

Double Row | TOE

J Shoulder Elbow Surg July/August 2007

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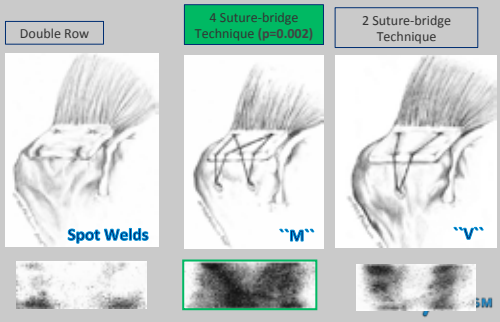
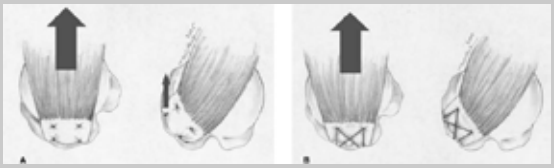
DR versus TOE
Contact Area and Pressure

J Shoulder Elbow Surg July/August 2007



Load Sharing Benefit of TOE Repairs



J Am Acad Orthop Surg 2010;18:83-93

Dines, Bedi, El Attrache, Dines

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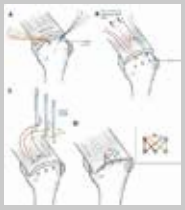
Comparing TOE Constructs

KSSTA 2011

Optimizing Pressurized Contact Area in Rotator Cuff Repair: The Diamond-Back Repair



Arthroscopy 2012

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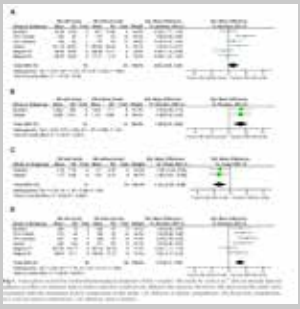
Transosseous-Equivalent Rotator Cuff Repair: A Systematic Review on the Biomechanical Importance of Tying the Medial Row



- **Biomechanical effects are improved when tying the medial row**

(Arthroscopy 2013)

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Double Row ≠ Trans-osseous Equivalent

Conclusion 2

TOE repair result in in stronger constructs

TOE repair leads to more anatomic restoration of the footprint, higher pressurized contact area compared with SR/DR repairs

Tie the medial row

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Clinical and structural outcomes after arthroscopic single-row versus double-row rotator cuff repair: a systematic review and meta-analysis of level I randomized clinical trials

Peter J. Millett, MD, MSc*, Ryan J. Warth, MD, Grant J. Dornan, MSc, Jared T. Lee, MD, Ulrich J. Spiegl, MD

- Seven level I studies, n=524
- Most studies look at tears < 3cm
- No difference in Constant, UCLA, ASES change scores
- Higher UCLA post-op scores in DR group
  - Improved clinical outcomes when stratified by tear size (Carbonel et al, 2012)
- Re-tear rates higher in SR RCR (p=0.001)
  - SR: 25.9%
  - DR: 14.2%
  - RR = 1.76

J Shoulder Elbow Surg (20 n 2): 290-299

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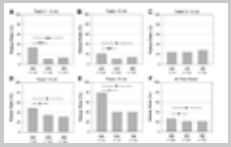
Retear Rates After Arthroscopic Single-Row, Double-Row, and Suture Bridge Rotator Cuff Repair at a Minimum of 1 Year of Imaging Follow-up: A Systematic Review

Joel Heinz, M.D., Jordan M. Reilly, M.S., Jonathan Chae, M.D., Tristan Maerz, Ph.D., and Kyle Anderson, M.D.

- 32 studies, 2048 repairs
- LOE 1-IV
- Minimum 1 year follow-up with MRI/US
- DR AND SB had lower retear rates than SR in all tear size categories (small, medium, large)



Arthroscopy, 2015

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Is Double-Row Rotator Cuff Repair Clinically Superior to Single-Row Rotator Cuff Repair: A Systematic Review of Overlapping Meta-analyses

Randy Mascarenhas, M.D., F.R.C.S.C., Peter N. Chalmers, M.D., Eli T. Sayegh, B.S., Mufit Bhandari, M.D., M.Sc., Ph.D., Nikhil N. Verma, M.D., Brian J. Cole, M.D., M.B.A., and Anthony A. Romeo, M.D.

- Using a quality algorithm, 3 systematic reviews were selected:
  - Improved structural healing
  - Statistically significant improvement in clinical outcomes; however not clinically significant

Arthroscopy, 2014

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Summary

Evidence Would Suggest

2 row – TOE SB - repairs are biomechanically superior. How much strength is actually needed?

There are lower re-tear rates in patients treated with 2 rows vs. 1 row

There are no differences in clinical outcomes for small to medium tears

Using 2 rows is not cost-effective

The standard of care in 2015 for small to medium rotator cuff tears should be one row. An argument can be made for 2 rows for large tears.

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Summary

Future Directions

Stratification by initial tear size to elucidate role of anchor/suture configuration for massive tears

Factorial Randomized Trial
- Biologics
- # Sutures
- # Rows

Use of appropriate outcome measures

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Thank You

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