✚ Evidence in focus
Publication summary

Smith+Nephew

The Tendon Seam Construct addressing early rotator cuff repair (RCR) failure: a biomechanical evaluation of gap formation, strength and durability under cyclic loading[1]

Background

- RCR has unique clinical challenges, including repair failure in 20–40% of repairs (up to 90% in some studies) and a prolonged period of immobilization and rehabilitation[2]
- Despite advances such as transosseous-equivalent (TOE) repair, mechanical failure at the tendon-bone interface remains a key driver of failure and contributes to the need for lengthy immobilization[3–5]
- The Tendon Seam Construct uses a transtendinous technique with multiple independent fixation points, designed to distribute compressive forces across the footprint to reduce stress at the tendon suture interface[6]

Scan or click to learn more about the Tendon Seam Construct

Key points

When results of biomechanical testing in human cadavers were benchmarked against knotted TOE, the Tendon Seam Construct demonstrated:

10x **less** gap formation[1,3,5]

2x **stronger** repair (measured by yield strength)[1,7]

Ability to maintain integrity under loads estimated to be experienced during healing*[1]

Study overview

- A cadaveric model was used to simulate surgical repair of full-thickness supraspinatus tears (approximate 2–3cm) and evaluate the biomechanical performance of the Tendon Seam Construct[1]
- **Tendon Seam Construct:**[4]
  – The Tendon Seam Construct was comprised of a medial seam perpendicular to the direction of load; interconnected to a 'zig-zag' pattern laterally, created with individually tensioned 2 x 10mm toggling PEEK anchors (Image 1)
- Previously published TOE repair data was used as the comparator[2,3,5]

Image 1. Tendon Seam Construct

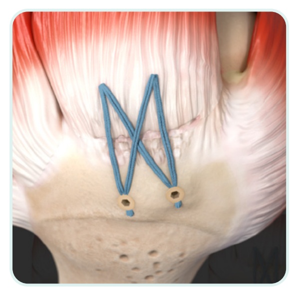


Image 2. Comparator TOE

The Tendon Seam Construct biomechanical testing protocol[1]

The repaired tissue (n=11) underwent cyclic loading:

- 30 cycles from 10N to 180N to align with historical testing protocols
- 500 cycles from 4N to 302N to further challenge the construct at the high end of functional loads experienced during activities of daily living

Endpoints

- Gap formation (mm): displacement between lateral edge of tendon and bone after loading
- Yield load (N): force where permanent deformation begins

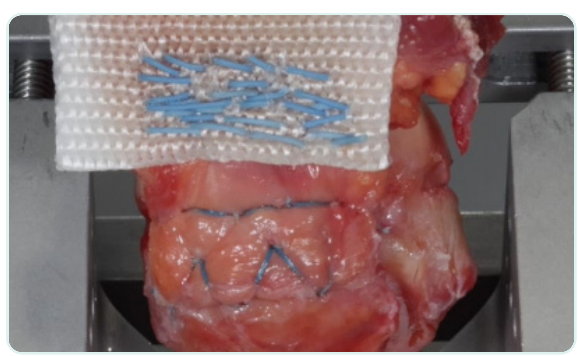


Image 3. Biomechanical testing example image

*As measured by gap formation, 500 cycles from 4N to 302N to further challenge the construct at the high end of functional loads estimated to be experienced during healing period and activities of daily living.[1,7]

Results: comparative summary

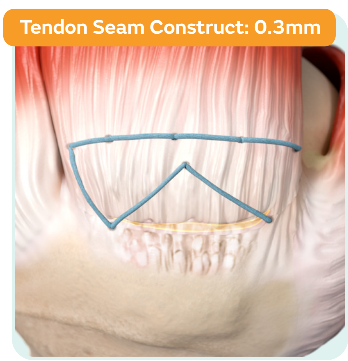
Table. The Tendon Seam Construct demonstrated lower gap formation, higher load tolerance, and maintained integrity under cyclic loading versus TOE techniques[1,3,5]

Measure	Tendon Seam Construct[1]	Knotted TOE[1,3†]	Knotless TOE[5†]
Gap formation, 1 cycle @180N (mm ± SD)	0.30 ± 0.47	2.38 ± 0.84	5.05 ± 1.93
Gap formation, 30 cycles @180N (mm ± SD)	0.33 ± 0.55	3.74 ± 1.51	8.10 ± 3.76
Gap formation 500 cycles @302N (mm ± SD)	0.90 ± 1.03	DNS	DNS
Gap formation at yield (mm ± SD)	1.21 ± 1.26	6.11 ± 1.97	9.91 ± 3.34
Yield strength (N)	600.70 ± 93.60	260.30 ± 69.50	183.00 ± 41.00

DNS = did not study; SD = standard deviation.
†TOE data from published literature.

Key results

Reduced gap formation under cyclic loading, at least ten times less gap formation with Tendon Seam versus TOE knotted repair



Gap formation

Gap formation

Image 4. Illustrative comparison of gap formation for Tendon Seam Construct and TOE after 30 cycles at 180N

Tendon Seam demonstrated over twice the strength of knotted TOE in biomechanical testing

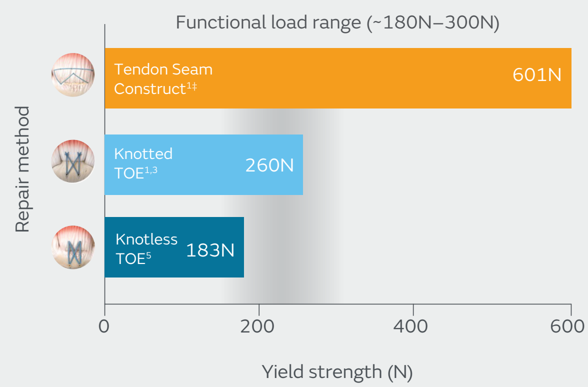


Image 5. Repair with the Tendon Seam Construct is stronger than both TOE techniques

‡Biomechanical testing in human cadavers.

Conclusions

In this biomechanical model, the Tendon Seam Construct demonstrated lower gap formation, higher load tolerance, and maintained integrity throughout cyclic loading compared with published transosseous-equivalent repair data, supporting its potential to aid recovery and support early mobility.

Abbreviations: DNS = did not study; N = newton (SI unit of force); PEEK = polyether ether ketone; RCR = rotator cuff repair; SD = standard deviation; TOE = transosseous-equivalent.

References: **1.** Integrity Orthopaedics§ 2025 Internal report DN-00664 Revision:E **2.** Young BL, Bitzer A, Odum S, Hamid N, Shiffern S, Connor PM. Healthcare costs of failed rotator cuff repairs. *JSES Rev Rep Tech.* 2023;3(3):318–323. **3.** Park MC, Tibone JE, ElAttrache NS, Ahmad CS, Jun BJ, Lee TQ. Part II: biomechanical assessment for a footprint-restoring transosseous-equivalent rotator cuff repair technique compared with a double-row repair technique. *J Shoulder Elbow Surg.* 2007;16(4):469–476. **4.** Rossi LA, Rodeo SA, Chahla J, Ranalletta M. Current concepts in rotator cuff repair techniques: biomechanical, functional, and structural outcomes. *Orthop J Sports Med.* 2019;7(9):2325967119868674. **5.** Busfield BT, Glousman RE, McGarry MH, Tibone JE, Lee TQ. A biomechanical comparison of 2 technical variations of double-row rotator cuff fixation: the importance of medial row knots. *Am J Sports Med.* 2008;36(5):901–906. **6.** Frix JT, Serbin R, Harris HW, Labbe MR, Connor PM. The tendon-to-bone seam: a transtendinous approach to rotator cuff repair. *Arthrosc Tech.* 2026;00:e70093. **7.** Burkhart SS. A stepwise approach to arthroscopic rotator cuff repair based on biomechanical principles. *Arthroscopy.* 2000;16(1):82–90.
§Integrity Orthopaedics; now part of Smith+Nephew.

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