



Knotted Transosseous-Equivalent Technique for Rotator Cuff Repair Shows Superior Biomechanical Properties Compared With a Knotless Technique: A Systematic Review and Meta-analysis.



Jeremy K Ansah-Twum B.S., Wilson Belk B.A., Connor K Cannizzaro B.S., Andrew G Potyk B.A., Jonathan T Bravman M.D., Eric C McCarty M.D., Armando F Vidal M.D., Department of Orthopedics, University of Colorado School of Medicine, Aurora, CO

Background

Biomechanical studies evaluating rotator cuff repair techniques have shown that double-row and transosseous-equivalent (TOE) repairs are superior to single-row repairs in terms of strength and healing. There are limited studies that compare the biomechanical outcomes of knotted TOE versus knotless TOE rotator cuff repair techniques.

Purpose

The purpose of this study was to systematically review the literature in order to compare the biomechanical outcomes of knotted transosseous equivalent (TOE) and knotless transosseous equivalent (KL-TOE) rotator cuff repair (RCR) techniques. We hypothesized that biomechanical studies would show that knotted TOE rotator cuff repairs produce superior biomechanical outcomes compared to KL-TOE repairs in regard to reduced gap formation and improved stiffness, ultimate load, footprint contact area, and footprint pressure.

Methods

A systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines using PubMed, Embase, and the Cochrane Library to identify studies that compared the biomechanical properties of knotted and knotless TOE RCR techniques. The search phrase used was as follows: (Double Row) AND (rotator cuff) AND (repair) AND (biomechanical). Evaluated properties included ultimate load to failure, cyclic displacement, stiffness, footprint characteristics, and failure mode.

Figure 1. PRISMA Flow Chart. Identifies the number of studies reviewed and the main reasons for exclusion.

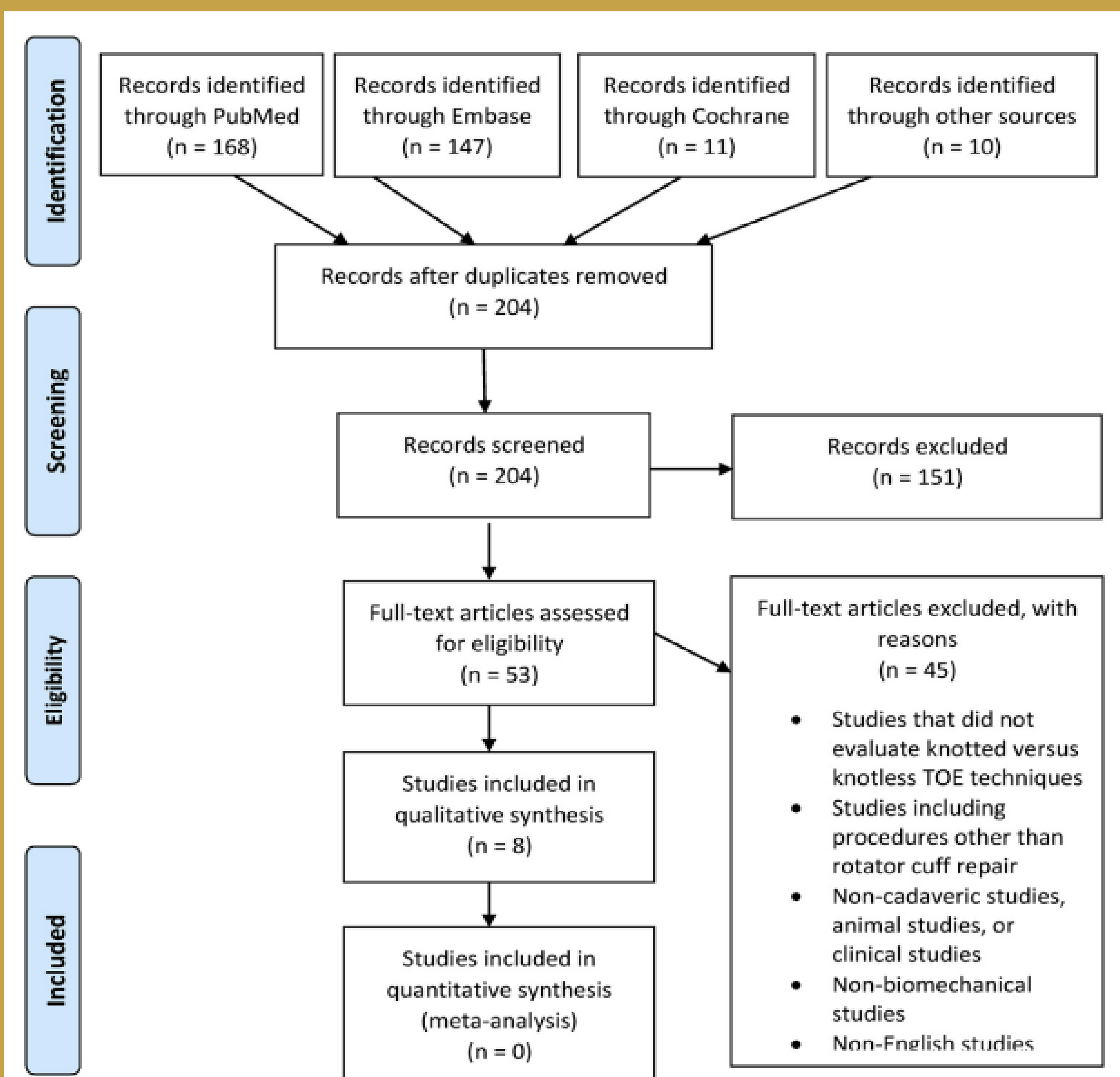
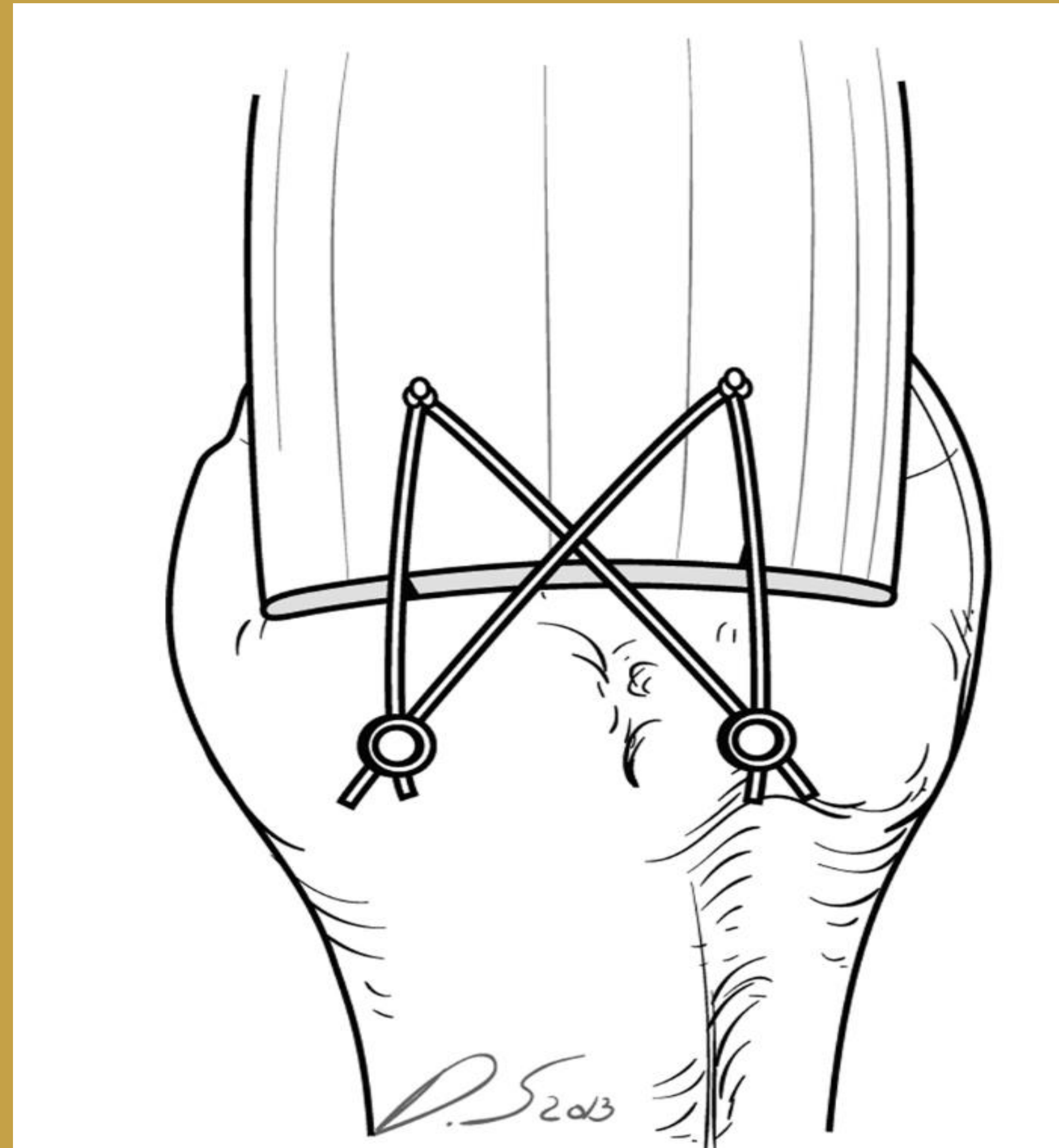


Figure 2. Knotted TOE Surgical Technique. One variation of the knotted medial row technique⁴



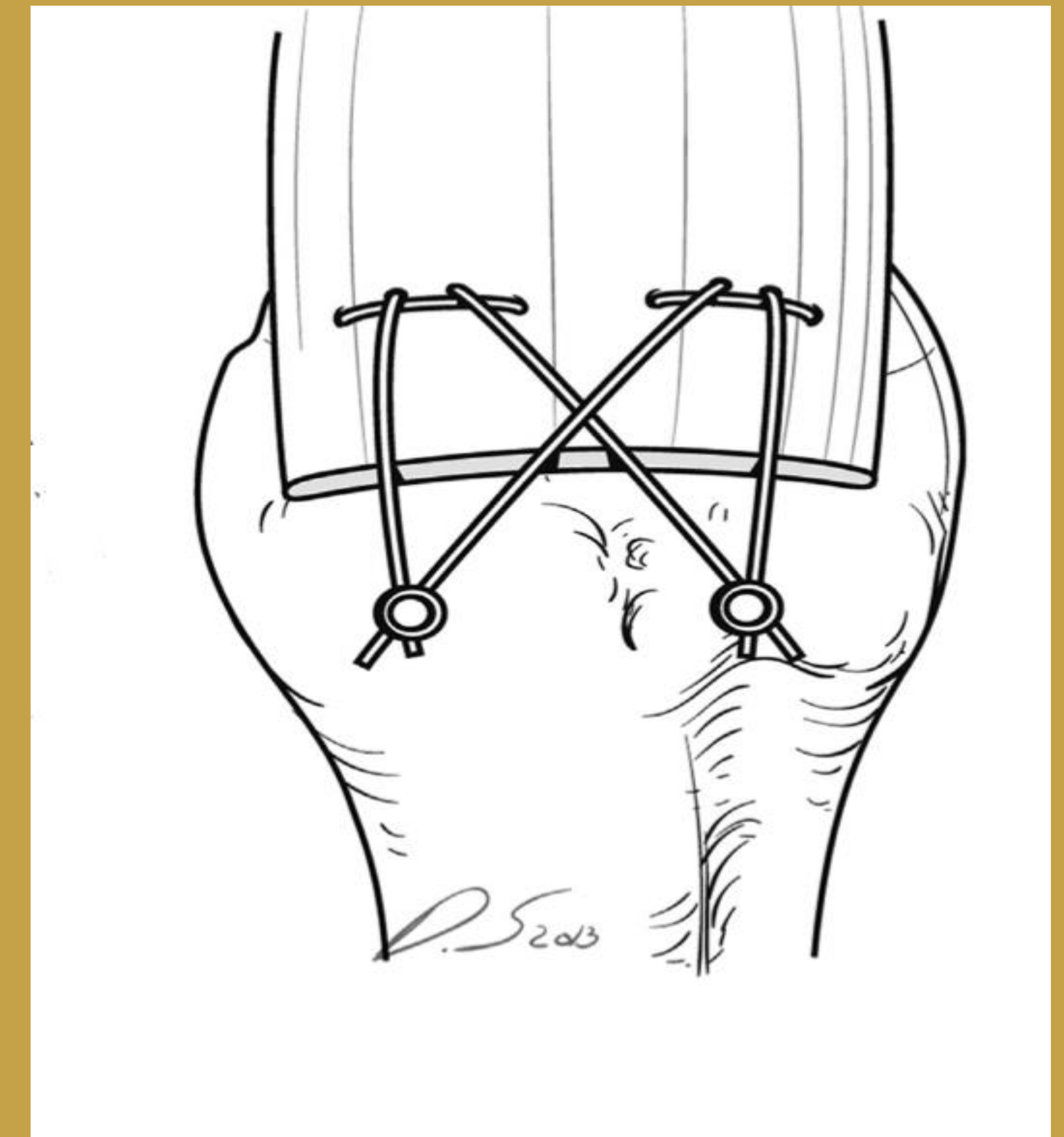
Results

Eight studies met the inclusion criteria, including a total of 67 specimens in each group. Of 6 studies reporting on ultimate load to failure, 4 found tendons repaired with the knotted TOE technique to experience significantly higher ultimate load to failure compared with knotless TOE repairs (knotted range, 323.5-549.0 N; knotless range, 166.0-416.8 N; $P < .05$). Of 6 studies reporting on failure stiffness, 2 found knotted TOE repairs to have significantly higher failure stiffness compared with knotless TOE repairs (knotted range, 30.0-241.8 N/mm; knotless range, 28.0-182.5 N/mm; $P < .05$), whereas 1 study found significantly higher failure stiffness in knotless TOE repairs compared with knotted TOE repairs ($P = .039$). Cyclic gap formation favored the knotted TOE group in 2 of 3 studies (knotted range, 0.6-5.2 mm; knotless range, 0.4-9.1 mm; $P < .05$). The most common mode of failure in both groups was suture tendon tear.

Discussion/Conclusions

On the basis of the included cadaveric studies, rotator cuff tendons repaired via the knotted TOE technique display superior time-zero biomechanical properties, including greater ultimate load to failure, compared with rotator cuffs repaired via the knotless TOE technique. Suture tearing through the tendon remains a common failure method for both techniques. Clinical outcomes with specific indications based upon these findings require further investigation.

Figure 3. Knotless TOE Surgical Technique. One variation of the knotless medial row technique⁴



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