



# Biomechanical Comparison of Knotted Transosseous Equivalent Versus Knotless Transosseous Equivalent Rotator Cuff Repair Techniques: A Systematic Review

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## 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.

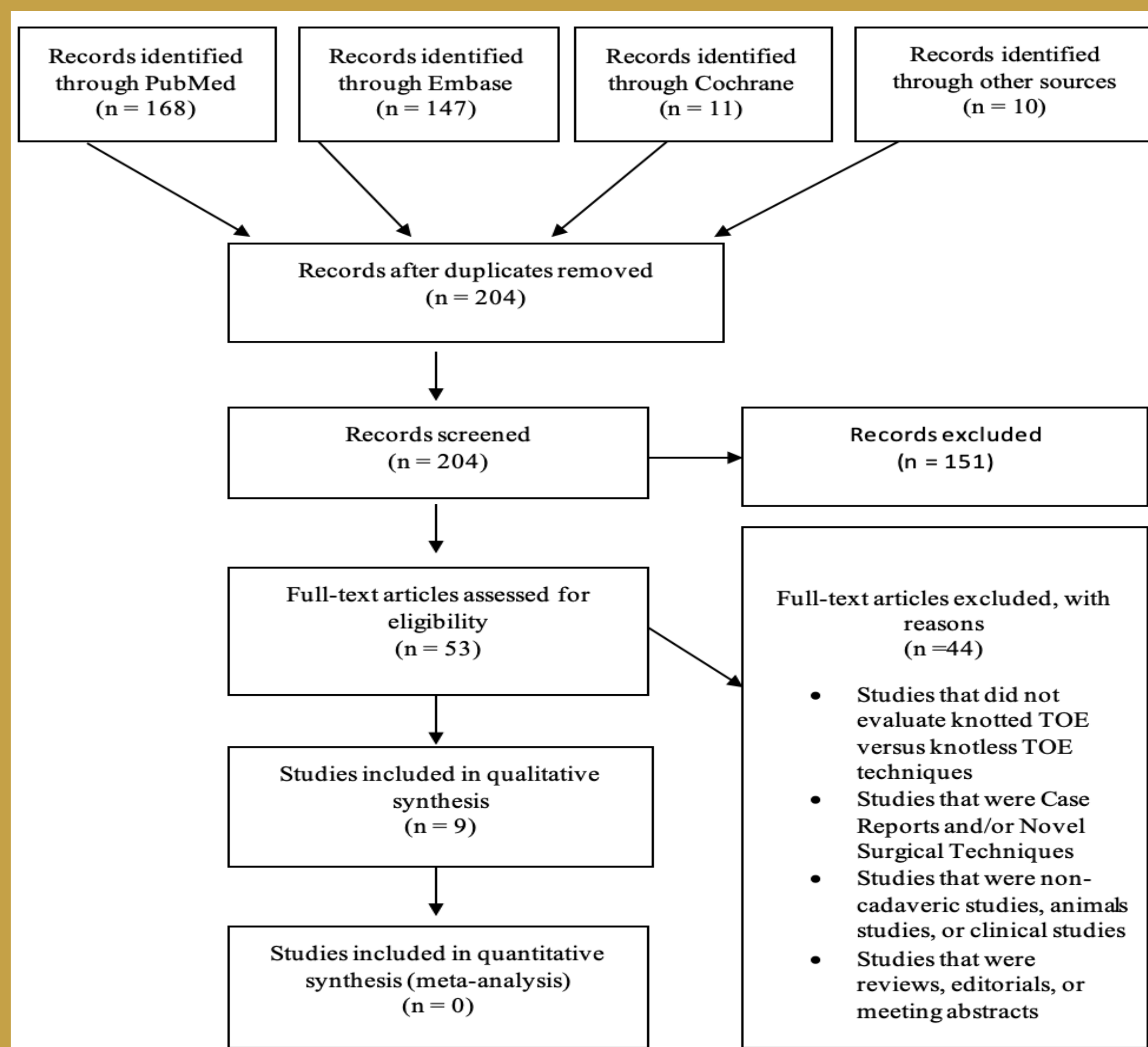
## Purpose

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, yield load, ultimate load, footprint contact area, and footprint pressure.

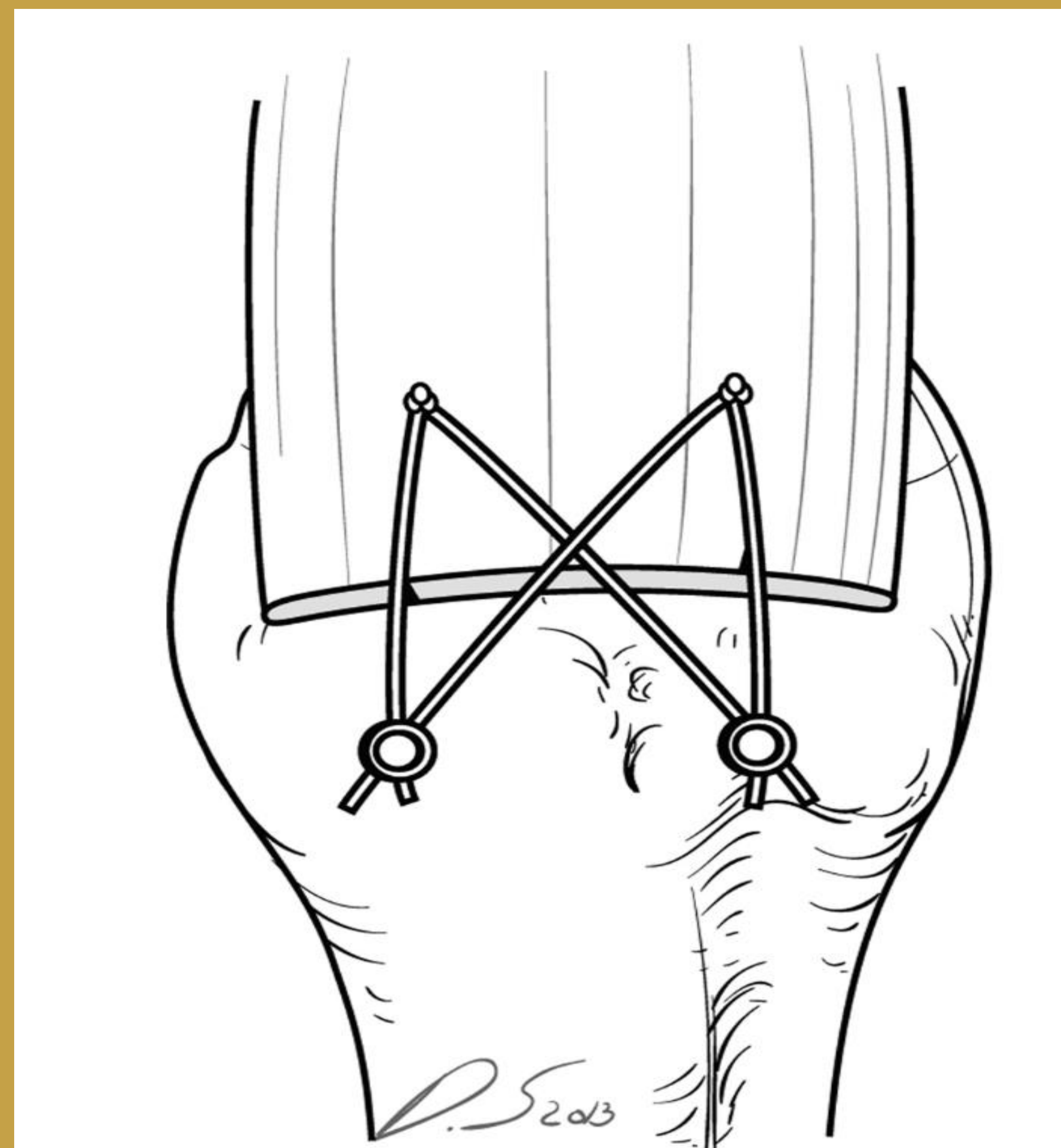
## Methods

A systematic review was performed according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines using PubMed, Embase, and the Cochrane Library to identify studies that compared the biomechanical outcomes of knotted TOE and KL-TOE (Speed-bridge) rotator cuff repair techniques. The search phrase used was (Double Row) AND (rotator cuff) AND (repair) AND (biomechanical). Data pertaining to the biomechanical properties of each surgical technique were extracted from each study.

**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 technique<sup>4</sup>



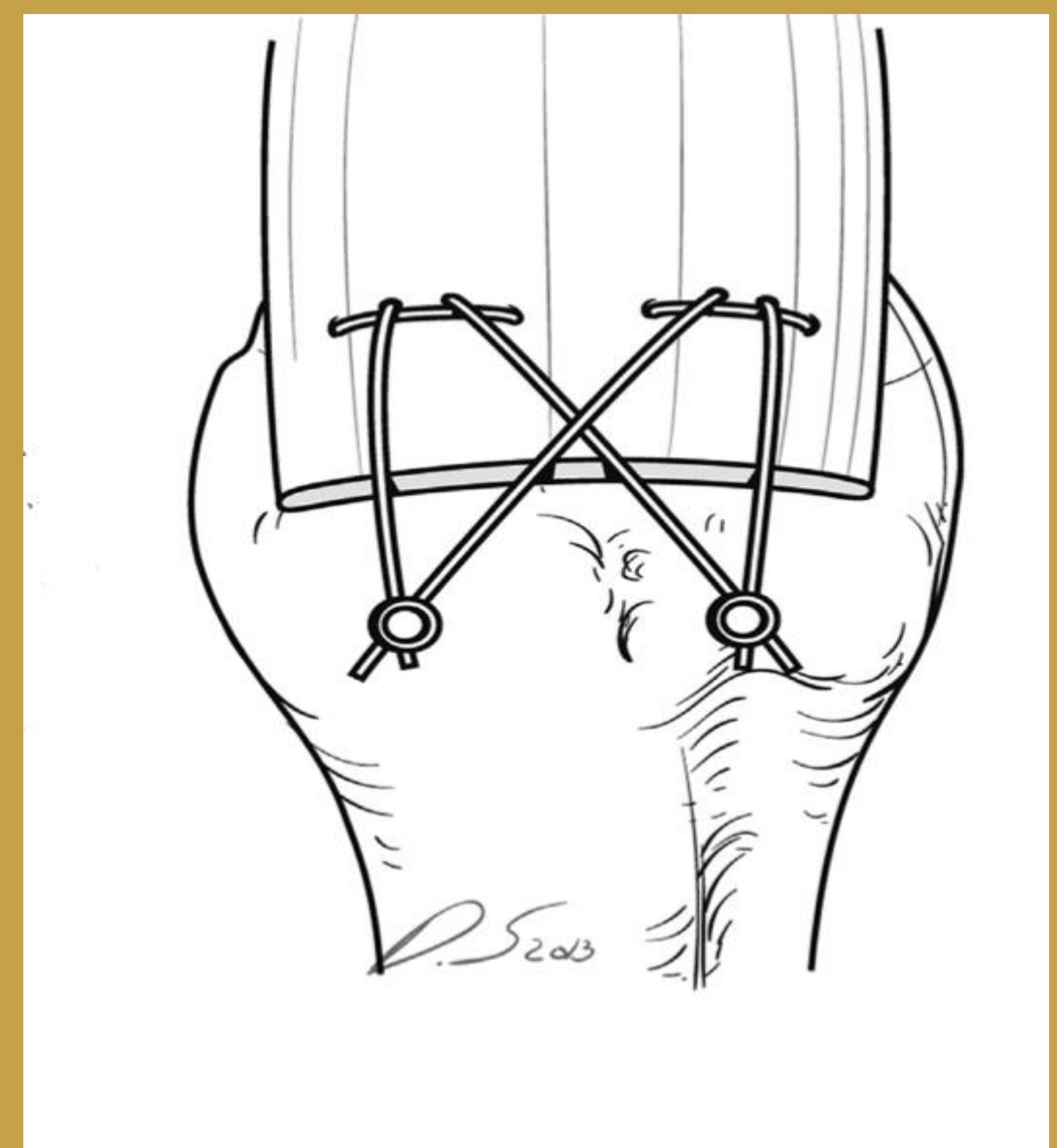
## Results

A total of 9 studies (150 cadaveric shoulders) met the inclusion criteria. Of the 9 studies, 6 showed improved biomechanical properties using the knotted TOE method compared to KL-TOE RCR technique. Ultimate load to failure ranged from  $310 \pm 82$  N to  $549 \pm 163$  N in knotted TOE repairs while ranging from  $166 \pm 87$  N to  $416.8 \pm 120.0$  N in KL-TOE repairs. 1 study found no significant difference in medial row fixation point displacement, construct stiffness, and ultimate load to failure when comparing knotted and knotless medial anchor fiberwire sutures in a transosseous-equivalent double-row rotator cuff repair. Of the remaining 2 studies, 1 indicated that KL-TOE repair shows an improved self-reinforcement effect, without diminishing footprint contact, compared to the same repair with medial knots. The other study suggested that the strain at the medial suture level was significantly greater when the medial sutures were tied compared with those untied. Qualitative and quantitative analyses of the data are still underway, furthermore the data must be evaluated for biases before final conclusions can be drawn.

## Discussion/Conclusions

The preliminary results of this systematic review indicate that the biomechanical properties of yield load, ultimate load, footprint contact area, and footprint pressure are significantly improved with reduced gap formation in knotted TOE rotator cuff repairs compared to KL-TOE repairs. The knotted medial stitch increases the strength of the construct, but some studies found it may also increase tears. 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 technique<sup>4</sup>



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