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Biomechanical comparison of new technique transosseous repair versus transosseous equivalent repair

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Introduction and Background

Arthroscopic rotator cuff repair is the standard treatment for symptomatic rotator cuff tears. Among available techniques, double-row, suture-bridge, and transosseous-equivalent (TOE) repair provide the strongest time-zero fixation but may be cost-prohibitive due to multiple implants. Conventional transosseous repair (CTO) is a lower-cost alternative and may be useful in revision cases with poor bone stock, although it requires specialized tunnel-drilling equipment. Simple suture repair is widely performed but demonstrates inferior biomechanical strength compared with TOE. Footprint contact area also influences biological healing, with greater suture-bridge coverage considered beneficial.

Material and Method

We developed a new transosseous repair (NTO) technique that combines advantages of CTO and TOE. This study compared NTO, CTO, and TOE using 27 porcine shoulders randomized into three groups. All repairs were performed by experienced surgeons. CTO used three bone tunnels with Hi-Fi® sutures; TOE employed a medial-row anchor with lateral PopLok® fixation; and NTO used two bone tunnels with a suture-loop construct. Biomechanical testing included preload, cyclic loading, and load to failure using a universal testing machine.

Results

The NTO group demonstrated the highest mean failure load (296.98 N), followed by CTO (264.75 N) and TOE (260.52 N), though without significant difference ($P = 0.524$). Cyclic elongation for partial and complete failures showed no significant differences among groups. Failure modes varied: CTO demonstrated Type 2 and 3 failures; NTO demonstrated primarily Type 2 and 3; and TOE uniquely exhibited 55.6% Type 4 failures (suture slippage).

Conclusions

NTO achieved fixation strength comparable to CTO and TOE while requiring fewer bone tunnels and lower implant cost. Limitations include the use of porcine rather than human specimens, small sample size, open repair technique, and evaluation limited to time-zero biomechanics. Nevertheless, NTO appears to be a promising, cost-effective alternative for rotator cuff repair.



Figure & Table 1.

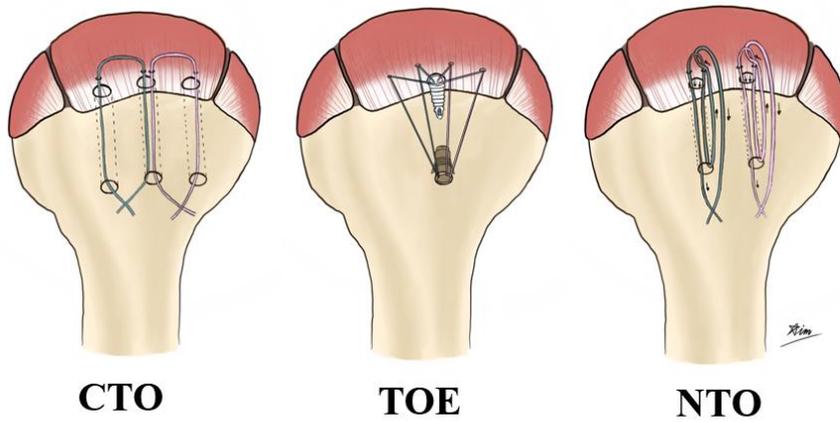


Fig.1 Rotator cuff
repair techniques

Figure & Table 2.

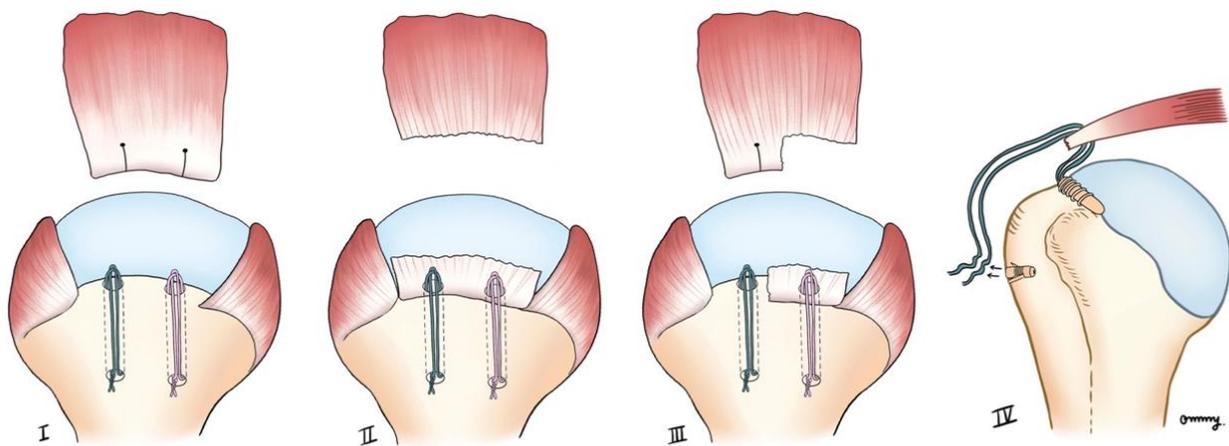


Fig.2 Mode of failure after RC repair