

TECHNIQUE

Double-Row Rotator Cuff Repairs: Biomechanical Rationale and Surgical Techniques

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ABSTRACT

Advances in surgical technique and implants for arthroscopic rotator cuff repair have generated an interest in the indications and application of double- and single-row repairs. Recently, a variation of the double-row technique, known as the transosseous equivalent repair, has also been described. Previous reports of unacceptably high failure rates after arthroscopic repair of large and massive rotator cuff tears have led to the scrutiny of both this technique and the implants used. Biomechanically, double-row techniques are superior to single-row with respect to restoring the anatomic footprint, minimizing gap formation, and providing a greater load to failure at time equals zero. Furthermore, the recently described transosseous equivalent fixation technique provides improved footprint restoration, greater contact pressure across the bone-tendon interface, and an increased load to failure when compared to double-row repair. Although the biomechanical data are encouraging, clinical studies are still in progress to assess the efficacy of double-row versus single-row techniques, particularly with regard to tendon healing. The potential advantages may be offset by the added surgical time, required technical expertise, and potential increase in cost. The purpose of this study is to review the biomechanical, histological, and in vivo results of double-row and transosseous equivalent arthroscopic rotator cuff repairs while also discussing our indications and technique for double-row repairs.

Keywords: rotator cuff, double-row, transosseous equivalent, technique, arthroscopic, biomechanics

The goal of rotator cuff repair is to decrease pain, improve function, and restore strength through restoration of a stable bone-tendon construct. Previous literature has shown that improved outcomes, particularly with regard to restoration of strength, are present when the rotator cuff repair is intact.[1–4] Gerber and colleagues[5] suggested that the ideal repair should provide high initial fixation strength, minimize gap formation, and maintain mechanical stability until sufficient healing has occurred. Historically, open techniques have generally employed the use of bone tunnels to provide transosseous fixation. With the advent of arthroscopic techniques for rotator cuff repair, suture anchors have replaced the transosseous tunnel as the primary mode of fixation. As proficiency in arthroscopic rotator cuff repair has improved, so have the fixation techniques. Various methods of arthroscopic rotator cuff footprint restoration have been described, including a double-row repair, which simulates the type of fixation achieved with open and mini-open techniques. For the purposes of this article, a double-row construct consists of 2 rows of suture anchors, all placed within the rotator cuff footprint. A transosseous equivalent construct (TOE) is similar to a double-row anchor repair except that the lateral row fixation integrates the medial sutures to provide compression of the rotator cuff to the tuberosity, similar to an open transosseous suture technique (Fig. 1).

Recent studies have demonstrated that double-row fixation is superior to single-row fixation with regard to contact area and pressures, minimizing gap formation, and increasing load to failure.[6–10] Demirhan et al[11] showed that the strongest biomechanical construct is the combination of medial suture anchors and lateral transosseous bone tunnels, a double-row repair pattern that requires open surgery. However, many surgeons have shifted from open to arthroscopic surgery in order to gain better visualization of the tear pattern, less deltoid disruption, less postoperative morbidity, and an earlier return of motion.[4] Improvement in anchor and suture technology has led to a reduction in implant failures. Currently, with better understanding of optimal techniques for repair based on tear pattern for large and massive tears,[12] the mechanism of failure has shifted to the suture-tendon interface.[13] The arthroscopic TOE repair does not rely on the lateral aspect of the tendon for fixation but rather

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