Arthroscopic Repair of Triangular Fibrocartilage Tears: A Biomechanical Comparison of a Knotless Suture Anchor and the Traditional Outside-In Repairs

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Purpose To compare the biomechanical strength of a knotless suture anchor repair and the traditional outside-in repair of peripheral triangular fibrocartilage complex (TFCC) tears in a cadaveric model.

Methods We dissected the distal ulna and TFCC from 6 matched cadaveric wrist pairs and made iatrogenic complete peripheral TFCC tears in each wrist. In 6 wrists, the TFCC tears were repaired using the standard outside-in technique using 2 2-0 polydioxane sutures placed in a vertical mattress fashion. In the other 6 wrists, we repaired the TFCC tears using mini-pushlock suture anchors to the fovea. The strength of the repairs was then determined using a materials testing machine with the load placed across the repair site. We loaded the repairs until a gap of 2 mm formed across the repair site, and then subsequently loaded them to failure. Thus, for each repair we obtained the load at 2-mm gap formation, load to failure, and mode of failure.

Results At the 2-mm gap formation, the suture anchor repairs were statistically stronger than the outside-in repairs. For load to failure, the suture anchor repairs were also statistically stronger than the outside-in repairs. Failure in both techniques occurred most commonly as suture pull-out from the soft tissues.

Conclusions The all-arthroscopic suture anchor TFCC repair was biomechanically stronger than an outside-in repair.

Clinical relevance The suture anchor technique allows for repair of both the superficial and deep layers of the articular disk directly to bone, restoring the native TFCC anatomy. By being knotless, the suture anchor repair avoids irritation to the surrounding soft tissues by suture knots. *(J Hand Surg 2013;38A:2193–2197. Copyright © 2013 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Repair, suture anchor, triangular fibrocartilage complex tears, wrist.

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THE TRIANGULAR FIBROCARTILAGE complex (TFCC) is an important stabilizer of the distal radioulnar joint. It also acts as a cushion for load transfers across the distal ulna–carpus articulation.[1] The critical stabilizing component of the TFCC inserts directly into the ulna either deep into the fovea (ligamentum subcruentum) or at the base of the styloid.

Palmer and Werner[1] classified TFCC injuries based on the location and chronicity of the tear. Acute

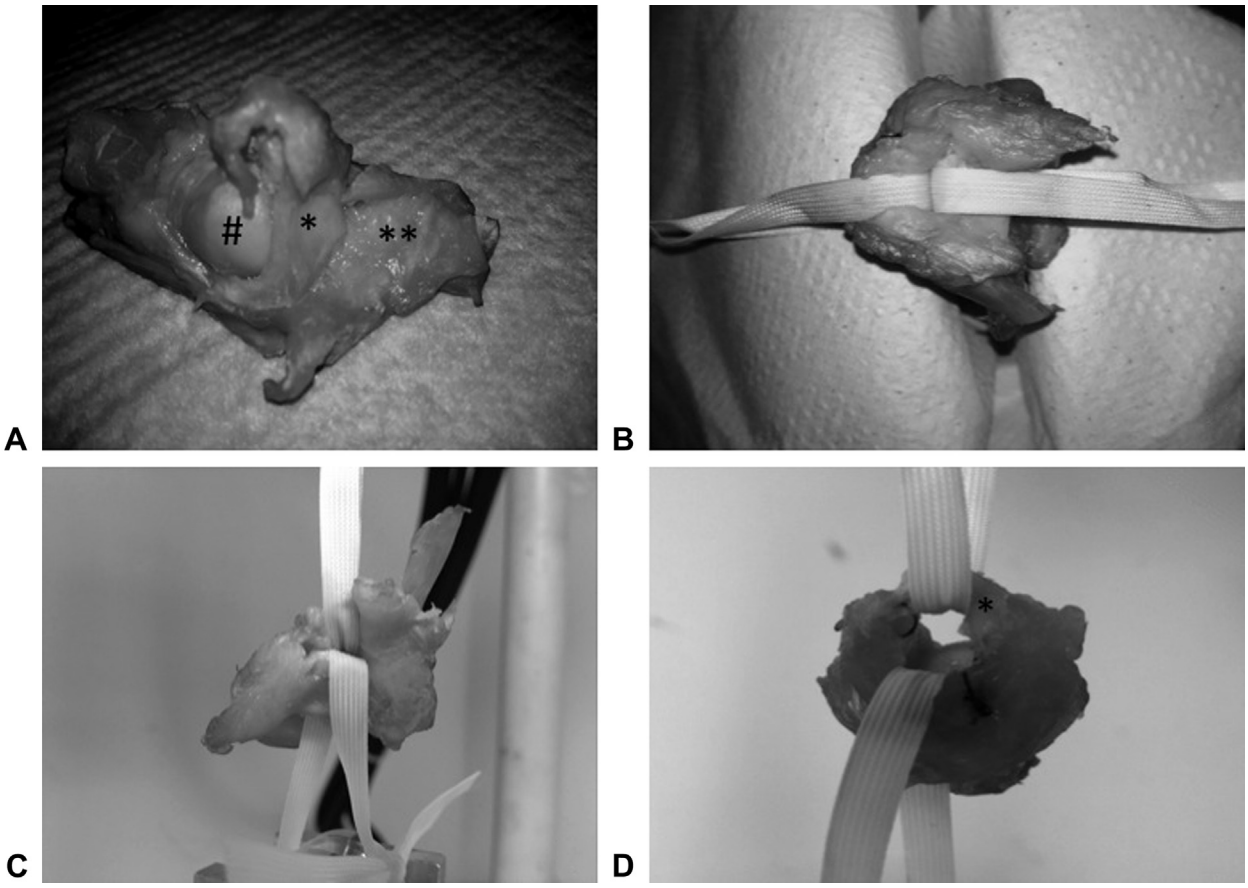

FIGURE 1: The TFCC with the distal ulna. **A** The hash sign shows the distal ulna articular surface, the asterisk shows the TFCC, and the double asterisk shows the extensor carpi ulnaris subsheath with tendon. **B** Polyester fiber tape is looped through the repair. The articular disk is to the right. Simulated TFCC tear after knotless suture anchor repair is positioned for testing. **C** Simulated TFCC tear after outside-in repair loaded to failure. **D** The specimen is seen after testing with suture pullout from the soft tissues. The asterisk denotes the articular disc. Polydioxane sutures have pulled from the disc and the soft tissue repair.

peripheral tears (type IB) tend to be the most amenable to surgical repair in patients who fail conservative treatment.[2,3] Furthermore, operative treatment may be elected in a special subset of patients, such as athletes. Several open and arthroscopic techniques for the repair of peripheral tears have been described.[4] Current arthroscopic repairs are either inside-out, outside-in, or all-arthroscopic.[5–8]

Inside-out and outside-in repair techniques rely mostly on soft tissue fixation of the superficial TFCC fibers. A prolonged period of above-elbow immobilization is then required. In addition, both techniques place patients at risk for pain resulting from prominent subcutaneous suture knots, skin problems, nerve or tendon injury, and even septic arthritis.[9–12]

Several all-arthroscopic peripheral TFCC repairs have been described using techniques largely borrowed from meniscal repairs in the knee.[7,11] These techniques also rely on soft tissue fixation and tend to require a protracted period of immobilization. Recently, suture anchors have been used to allow all-arthroscopic repairs with the potential benefits of providing an improved anatomic, biologic, and mechanical repair.[13,14] The purpose of this biomechanical study, using a cadaveric model, was to compare a knotless suture anchor repair with the traditional outside-in repair. We hypothesized that the suture anchor fixation would be stronger than the traditional outside-in soft tissue repair.

MATERIALS AND METHODS

We used 6 matched pairs of fresh-frozen cadaveric wrists in this study. All specimens were evaluated and found to be free of any prior wrist pathology. The distal ulna and TFCC were dissected from each wrist (Fig. 1A), and complete Palmer IB peripheral TFCC tears were created in all of the specimens using a scalpel. One wrist in each pair was randomly assigned to the control group and underwent an outside-in TFCC repair. This was done using two