



Anterior Cruciate Ligament Preservation: Early Results of a Novel Arthroscopic Technique for Suture Anchor Primary Anterior Cruciate Ligament Repair

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Purpose: To propose a technique of arthroscopic suture anchor primary anterior cruciate ligament (ACL) preservation for patients with proximal avulsion ACL tears that maintain excellent tissue quality. **Methods:** We performed a retrospective review and early follow-up of 11 consecutive cases of ACL preservation. Patients were included if they had a proximal avulsion tear and excellent tissue quality confirmed to be adequate for repair during arthroscopy. Patients were excluded if these criteria were not met or if patients had multiligamentous injury patterns or significant arthrosis. The ACL was reinforced with a No. 2 FiberWire (Arthrex, Naples, FL) and a No. 2 TigerWire (Arthrex) and was anchored to the femoral footprint by two 4.75-mm BioComposite SwiveLock suture anchors (Arthrex). The surgical procedures were performed at 3 different hospitals by a single surgeon. Anterior stability was determined with a KT-1000 arthrometer (MEDmetric, San Diego, CA). Clinical outcomes were measured using the Lysholm score, modified Cincinnati score, Tegner activity score, Single Assessment Numeric Evaluation, and subjective and objective International Knee Documentation Committee (IKDC) scores. **Results:** Ten of eleven patients had good subjective and clinical outcomes after ACL preservation surgery at a minimum of 2 years' and mean of 3.5 years' follow-up. The mean Lysholm score was 93.2; the mean modified Cincinnati score was 91.5; the preoperative Tegner activity score was maintained postoperatively in 8 of 10 patients; the mean Single Assessment Numeric Evaluation score was 91.5; the mean subjective IKDC score was 86.4; and the objective IKDC score was A in 9 of 11 patients, B in 1 patient, and C in 1 patient. KT-1000 measurements were available in 8 of 11 patients, with 7 of 8 showing a side-to-side difference of less than 3 mm on maximum manual testing and 1 showing a 6-mm difference. **Conclusions:** Preservation of the native ACL using the described arthroscopic primary repair technique can achieve short-term clinical success in a carefully selected subset of patients with proximal avulsion-type tears and excellent tissue quality. **Level of Evidence:** Level IV, therapeutic case series.

See commentary on page 2172

Robson,¹ Palmer,² and Campbell³ were some of the earliest recorded surgeons to describe primary repair of the anterior cruciate ligament (ACL). In the 1950s and 1960s, work by O'Donoghue et al.⁴⁻⁶ was instrumental in further defining the interest in this technique. The discussion of primary repair of the ACL

became more mainstream in the 1970s with the figure-of-8 technique of Feagin and Curl⁷ and the multiple-loop suture technique of Marshall et al.^{8,9} Although the results of ACL repairs were initially promising, inconsistent midterm results of such repairs^{7,10-14} steered the field in the direction of augmentation and, eventually, reconstruction.^{11,15-18} Through the years, these techniques yielded more predictably successful results. However, risks associated with reconstruction such as loss of native tissue proprioceptive properties, physeal disruption, donor-site morbidity, and graft-associated infections exist. Currently, objective outcomes^{19,20} and return-to-play data^{21,22} suggest that the problem has not been completely resolved and that there is, in fact, room for improvement.

In light of the limitations of our current reconstructive techniques and their associated morbidity, we aimed to revisit the discussion regarding primary repair for certain carefully selected ACL injuries. We believe that

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the inconsistent results reported for primary ACL repair were influenced by multiple variables including limitations in knowledge and the diagnostic and technologic standards of the time. For example, repairs were performed acutely, by arthrotomy, and on “all comers,” regardless of concomitant injuries or ACL injury pattern. Historically, the procedure was essentially abandoned, and no further refinement was pursued.

In their landmark study on primary ACL repair, Sherman et al.¹³ categorized patients extensively, including by ACL tear type (Fig 1) and tissue quality. They strongly suggested that more consistent results could be obtained through careful patient selection, specifically taking into account tissue injury type (type 1, proximal avulsion tears) and tissue quality.¹³ Today, advanced imaging, surgical techniques, instrumentation, and hardware make it possible to identify ACL injury patterns preoperatively with magnetic resonance

imaging (MRI), confirm diagnoses arthroscopically, and repair some ligaments primarily with biomechanically sound constructs. It has been noted in past literature that if good stability and functional results can be accomplished by arthroscopy, “primary repair might reduce the number of patients needing later reconstructions.”²³

The purpose of this study was to propose a technique of arthroscopic suture anchor primary ACL preservation for patients with proximal avulsion ACL tears that maintain excellent tissue quality. We hypothesized that ACL preservation, when its application is limited to patients with proximal avulsion tears and excellent tissue quality, will yield successful outcomes as defined by good to excellent patient-reported outcomes scores, stable objective laxity measurements, and no need for revision surgery. We report on the clinical outcomes of 11 of these patients with at least 2 years’ follow-up postoperatively.

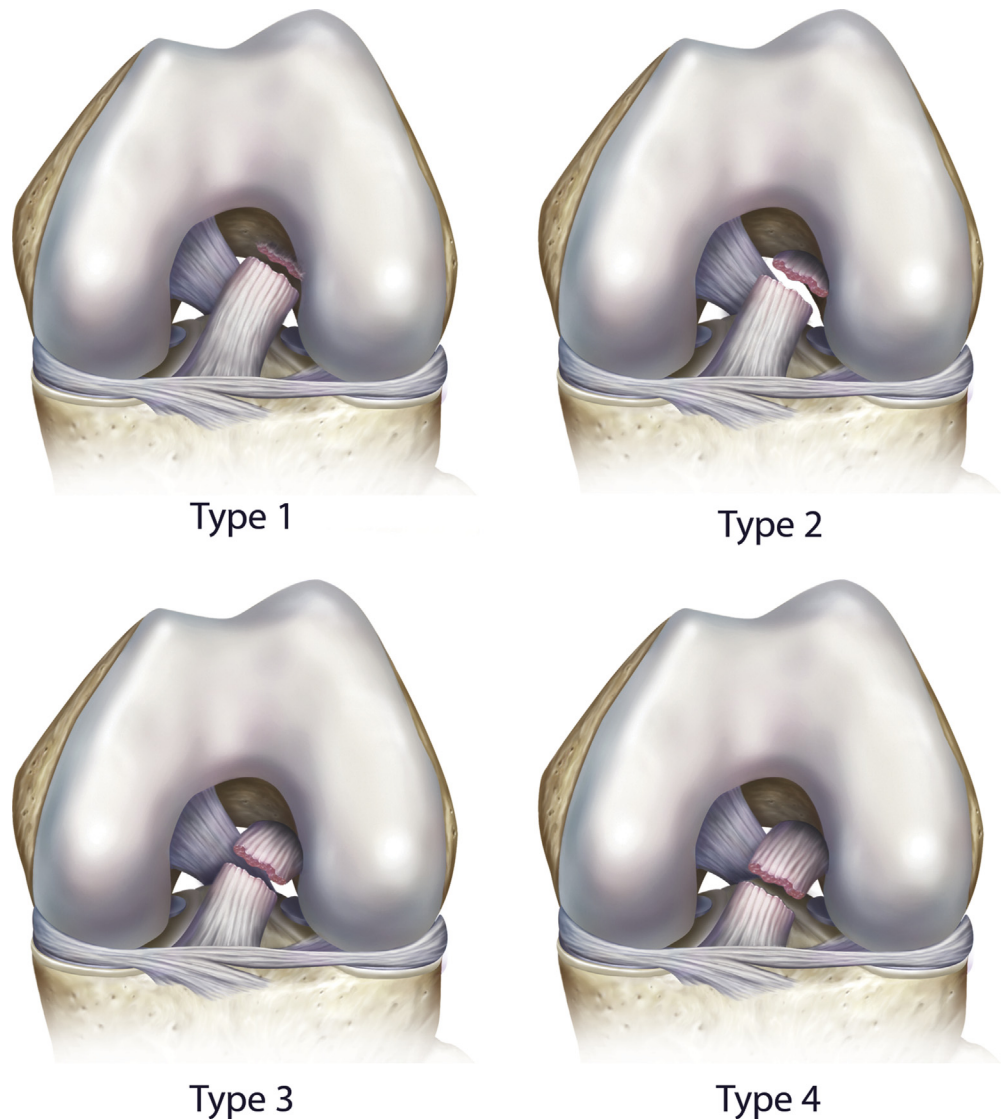


Fig 1. Original anterior cruciate ligament tear type classification of Sherman et al.¹³ Type 1 tears were true soft-tissue avulsions with minimal ligament tissue left on the femur. Type 2 tears had up to 20% of the tissue left on the femur. Type 3 tears had up to 33% of the ligament tissue left on the femur. Type 4 tears were true midsubstance tears with up to 50% of the ligament tissue left on the femur. Modified with permission of SAGE Publications.¹³

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