

The Prevalence of Meniscal Tears in Young Athletes Undergoing Revision Anterior Cruciate Ligament Reconstruction



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Purpose: The purpose of this study was to determine the incidence of meniscal injury, specifically medial meniscal injury, in US Army soldiers undergoing revision anterior cruciate ligament (ACL) reconstruction. **Methods:** A retrospective review was performed of all patients who underwent revision ACL reconstruction from 2002 to 2011 at our institution. A complete chart review was performed to identify the prevalence of meniscal pathology identified at the time of revision ACL surgery. Patient demographic data and meniscal injury patterns were analyzed. **Results:** Sixty-seven patients were identified, with a mean age of 28 years. The mean time to revision reconstruction was 67 months. Most patients (64.1%) reported a distinct reinjury. Reinjury was reported as the cause for revision ACL reconstruction in 43 patients. In this subgroup the mean time from reinjury to revision surgery was 13.9 months. Meniscal pathology was identified in 50 patients (74.6%). Medial meniscal tears were noted in 38 patients (56.7%), a rate significantly greater than that previously described ($P = .008$). Lateral meniscal tears were noted in 26 patients (38.8%), which was similar to previously published data ($P = .52$). **Conclusions:** The prevalence of meniscal injury at the time of revision ACL reconstruction in active-duty US Army soldiers is nearly identical to that of previously published data looking at a civilian population (74.6% v 74%) in the Multicenter ACL Revision Study (MARS) cohort. However, the incidence of medial meniscal injury was greater in the active-duty population than in the civilian population (56.7% v 40%). The observed increase in the prevalence of medial meniscal pathology is likely multifactorial, relating to the unique demands on young military athletes in both combat and training environments, rate of reinjury, and various delays to treatment after reinjury. **Level of Evidence:** Level IV, therapeutic case series.

This study seeks to describe the association of meniscal pathology identified at the time of revision anterior cruciate ligament (ACL) reconstruction in a population of young, high-demand, active-duty military athletes. ACL reconstruction is one of the most common and most successful orthopaedic procedures.

It is estimated that 100,000 to 175,000 of these procedures are performed each year, with a success rate of up to 97%.¹⁻⁴ Though very successful, a failure rate of 3% translates to 5,250 failures per year. Patients who continue to have symptomatic mechanical instability after failed ACL reconstruction commonly require revision reconstruction.

Several mechanisms of failure have been described. One reported cause of failure is technical error, commonly through improper tunnel placement. Several authors have cited anterior femoral tunnel placement as the most common technical error associated with the need for revision ACL reconstruction.^{5,6} Late failure is commonly attributed to repeat traumatic events. Other causes include hardware failure, overly aggressive rehabilitation, and biological failure of the graft to incorporate.⁵

Meniscal injuries are closely associated with ACL rupture. Lateral meniscal tears are more common in the acute setting, whereas medial meniscal tears are

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more common in the setting of a knee with chronic ACL deficiency.⁷ One explanation for this difference is that the medial meniscus acts as a secondary stabilizer, preventing anterior translation of the tibia.^{8,9} In an ACL-deficient knee, the medial meniscus sees more stress, leading to tears over time.¹⁰ Jomha et al.¹¹ showed that knees with meniscal tears at the time of ACL reconstruction had more severe overall degenerative changes than knees with intact menisci.

Outcomes of revision ACL reconstruction are less favorable than those of primary ACL reconstruction.¹²⁻¹⁶ The reason for this discrepancy is unclear but may be related to the presence of any associated intra-articular injuries. These injuries include chondral damage, meniscal tears, and persistent laxity and instability that have not been previously addressed.^{12,14-17} The literature reports that as many as 15% of patients undergoing revision ACL reconstruction will require additional surgery.¹⁴ Data from the Multicenter ACL Revision Study (MARS) cohort have shown a 74% incidence of meniscal injury at the time of revision ACL reconstruction.¹⁵ This is comparable with the incidence of meniscal injury after primary ACL injury. Several authors have reported rates of meniscal injury as high as 85% in patients undergoing primary ACL reconstruction.^{7,18}

There are few data regarding the incidence of meniscal injury in ACL-deficient knees among active military members. Data from the Turkish military showed that there was an 81% incidence of meniscal tear at the time of primary ACL reconstruction among patients with both acute and chronic ACL injuries.¹⁹ Medial meniscal tears were found in 60% of these patients. To our knowledge, there are no studies on the incidence of meniscal injuries in US soldiers undergoing revision ACL reconstruction.

The purpose of this study was to determine the incidence of meniscal injury, specifically medial meniscal injury, in a population of young athletes undergoing revision ACL reconstruction. The hypothesis was that the incidence of medial meniscal injury would be higher in our population than in the general civilian population, given the high activity level required of active-duty soldiers.

Methods

Approval from the institutional review board was obtained. All active-duty patients who underwent revision ACL reconstruction at our institution between January 1, 2002, and March 1, 2011, were included in the study. Patients who underwent previous ACL reconstruction with symptoms of persistent mechanical instability and clinical findings of laxity confirming ACL insufficiency during the study window were included in the study. The exclusion criteria were limited to a history of septic arthritis that complicated initial

ACL reconstruction. All identified patients were included in the study.

A comprehensive review of all operative notes, intraoperative arthroscopy photographs, and clinical records was performed. ACL failure was defined by symptoms of instability, clinical examination findings, and findings at arthroscopy. Traumatic rupture of the graft was differentiated from other causes of graft failure. A single traumatic reinjury was determined as the cause for ACL rerupture if the patient had no instability leading up to a specific event, after which instability was noted and was the patient's chief complaint. The prevalence of meniscal tears, both medial and lateral, was determined. The χ^2 test was used to compare our data with accepted rates of meniscal tears from the MARS study.

The technique of revision ACL reconstruction was either a transtibial technique or independent tunnel technique, based on the attending surgeon's preference. If there was tunnel widening greater than 12 mm on preoperative computed tomography scan, a 2-stage procedure was performed. The first stage consisted of bone grafting of the tunnels with either allograft cancellous chips or bone substitute. Meniscal tears were identified. Visual inspection and probing by the attending surgeon were used to determine the type of tear and suitability for repair. Irreparable meniscal tears were debrided in this stage. The second stage was performed 3 to 7 months later, after there was adequate incorporation of graft on plain radiographs. This stage consisted of ACL reconstruction and other indicated procedures, such as meniscal repair or microfracture. The choice of graft for the ACL reconstruction was made by the attending surgeon after an informed conversation with the patient, taking into consideration previous graft choice. Grafts included hamstring autograft, bone-tendon-bone autograft, bone-tendon-bone allograft, Achilles allograft, and anterior tibial tendon allograft. Graft fixation was achieved by a variety of interference, suspension, and transfixation techniques.

Results

We identified 67 patients meeting the inclusion criteria. Our cohort was primarily male ($n = 59$), with a mean age of 28 years (range, 20 to 54 years). The mean time from primary reconstruction to revision surgery was 67 months. A single traumatic reinjury was reported as the cause for failure of ACL reconstruction in 43 patients (64.1%). The mean time from primary reconstruction to repeat injury was 46.3 months. The mean time from reinjury to revision surgery was 13.9 months.

Fifty-seven patients (85.1%) had associated chondral and/or meniscal pathology at the time of revision ACL reconstruction. Meniscal pathology was identified in 50 patients (74.6%), which was equivalent to the rate of

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