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Postoperative Range of Motion Following Anterior Cruciate Ligament Reconstruction Using Autograft Hamstrings

A Prospective, Randomized Clinical Trial of Early Versus Delayed Reconstructions

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Background: There is a common belief that surgical reconstruction of an acutely torn anterior cruciate ligament (ACL) should be delayed for at least 3 weeks because of the increased incidence of postoperative motion loss (arthrofibrosis) and suboptimal clinical results.

Hypothesis: There is no difference in postoperative range of motion or stability after ACL reconstructions performed either acutely or delayed.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: Patients with an acute ACL tear were prospectively randomized to either early (within 21days) or delayed (beyond 6 weeks) reconstruction using autograft hamstring tendon. Previous knee surgery on the index extremity and a multiligamentous injury were exclusionary criteria. Surgical technique and postoperative rehabilitation were identical for all patients. Postoperative assessments included range of motion and KT-1000 arthrometer measurements compared with the contralateral knee. Standardized outcome measures were used including single assessment numeric evaluation (SANE), Lysholm, and Tegner Activity Score.

Results: Seventy consecutive patients were enrolled, and 1 patient was dropped after a postoperative infection. Sixty-nine patients (34 acute, 35 delayed) with an average age of 27 years composed the study cohort. The mean time from injury to surgery was 9 days (range, 2-17 days) for patients in the early group and 85 days (range, 42-192) for those in the delayed group. The average follow-up from surgery was 366 days (range, 185-869). Articular cartilage and meniscal injuries were comparable between the 2 groups. There were no significant differences between the 2 treatment groups in degrees of extension or flexion lost relative to the nonoperative side, operative time, KT-1000 arthrometer differences, or subjective knee evaluations.

Conclusion: Excellent clinical results can be achieved after ACL reconstructions performed soon after injury using autograft hamstrings. Although the authors do not advocate that all reconstructions should be performed acutely, they found that early ACL reconstructions do not result in loss of motion or suboptimal clinical results as long as a rehabilitation protocol emphasizing extension and early range of motion is employed.

Keywords: ACL; timing; hamstring; acute

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The anterior cruciate ligament (ACL) is the most common completely torn ligament injury in the knee.[17] The typical treatment for a young athlete with a complete ACL tear is a surgical reconstruction. More than 100 000 ACL reconstructions are performed in the United States annually.[18] More ACL reconstructions are performed on young male athletes than female athletes because males participate in sports that are at high risk for ACL injuries in greater numbers. However, female athletes have a 2.4 to almost 10 times greater risk to tear their ACL than males when

competing in the same sport.[18] An ACL injury in most cases prevents an athlete from returning to sports requiring pivoting or cutting maneuvers. Although many factors can contribute to the timing of an athlete's return to sports after an ACL reconstruction, most surgeons prohibit their patients from returning to at-risk activities for 4 to 6 months.[1,3,4,8]

The timing of an ACL reconstruction after an acute injury is an issue of considerable debate. In a landmark study, Shelbourne and Patel[19] recommended waiting at least 3 weeks from injury before proceeding with an ACL reconstruction because of the risk of arthrofibrosis and suboptimal clinical results. Several studies subsequently corroborated this recommendation.[10,20,24] In contradistinction, a few studies have found no loss of motion with surgery performed proximate to injury.[2,12,15,16] Patellar tendon autografts were used for the ACL reconstructions in nearly all of these studies. There have been no studies that we have identified that prospectively evaluated patients with an acute ACL tear who have been randomized to either early or late reconstructions using hamstring autografts.

The purpose of this study was to prospectively compare the postoperative range of motion, stability, and early clinical results in a similar group of young athletes with an acute ACL tear after randomization to either acute or delayed surgical reconstruction. Because the primary outcome measure was restoration of normal range of motion, a minimum of 6 months of follow-up was determined to be adequate. Although in some patients, some improvement may still be gained at 6 months, if a patient has regained their preinjury range of motion, they should be at minimal risk to lose motion thereafter.

METHODS

The study was approved by our Institutional Review Board, and all participants consented to randomization. Only military patients or their family members were eligible for treatment at our hospital. Patients of at least 18 years of age who were seen with an acute ACL tear were given the option of participating in the study. An MRI was obtained on all knees to confirm the diagnosis and provide additional information regarding meniscal and concomitant ligamentous injuries. Exclusion criteria included any prior ligamentous surgery on the index knee or a concomitant posterior cruciate, fibular collateral, or posterolateral corner ligamentous knee injury. Concomitant medial collateral ligament (MCL) injuries of any grade were not exclusionary in either group.

Once an acute ACL tear was diagnosed and the patient consented to study participation, the patients were randomized to either the early (group 1) or delayed (group 2) surgery group. Randomization was performed via study design using sealed envelopes that identified the timing of surgery to be employed. The patients randomized to group 1 were scheduled for surgery at the earliest possible date. No exceptions were made for swelling, limitations in range of knee motion, or pain. Patients randomized to group 2 were enrolled in our physical therapy program, where they began a supervised rehabilitation protocol that emphasized quadriceps muscle strengthening and restoration of a full range of motion. Their surgery was scheduled at a minimum of 6 weeks from the date of injury. The patients in group 2 were not permitted to return to full active duty or recreational sports during their rehabilitation before surgery. If a concomitant MCL injury was present, a hinged knee brace was prescribed that allowed sagittal plane motion but limited valgus motion and protected the medial ligament.

Preoperative Assessments

A thorough history was obtained and a physical examination performed on all patients at their initial evaluation. Information collected included date and mechanism of injury, prior knee injuries, and surgery on either knee. A maximum manual side-to-side KT-1000 arthrometer (MEDmetric, San Diego, Calif) assessment was conducted to quantify and to compare the anterior translation in the injured knee to that of the contralateral knee. A battery of subjective knee evaluation instruments were completed by all patients preoperatively and then at 6-month intervals postoperatively. Specifically the single assessment numeric evaluation (SANE), Tegner Activity Score, and Lysholm evaluation were used. The SANE score consists of a single subjective evaluation score from 1 to 100, where 100 is considered "normal function."[25] The Lysholm score was originally designed to assess ligament injuries of the knee.[14] The Lysholm score is a condition-specific instrument that consists of 8 domains: limp, locking, pain, stair climbing, use of supports, instability, swelling, and squatting. An overall score of 100 is possible and indicates the highest possible function. The tabulated scores correspond with the following outcomes: 95 to 100, excellent; 84 to 94, good; 65 to 83, fair; and <65, poor. The Tegner Activity Score is a numerical score from 1 to 10 that subjectively assesses a patient's current level of activity, with each number corresponding to participation in sporting activities at various levels.[23] The highest score of 10 corresponds to participation in sports such as football, soccer, or rugby at an elite level. A score of 6 corresponds with participation in sports at a recreational level, and a score of 0 would represent an individual on sick leave or disability due to his or her knee.

Operative Technique

General anesthesia via endotracheal or laryngeal mask was used in all patients. All knees were examined under anesthesia to assess and to grade ligamentous injuries. All patients received prophylactic intravenous antibiotics. The operative time was calculated from the first incision to the closure of all wounds. An arthroscopic evaluation was first performed in all patients to assess intra-articular pathoanatomy, to confirm the ACL tear, and to assess meniscal and chondral injuries as well as reparability of these injuries.

Meniscal tears were repaired or debrided based on well-established criteria,[9,13,21] the primary determinants being residual rim width and configuration of the tear. Using an inside-out technique as described by Bottoni and Arciero,[6] all meniscal repairs were performed using double-armed nonabsorbable meniscal sutures (0-Ethibond, Ethicon Inc,

Somerville, NJ) in a vertical mattress configuration. Meniscal debridement, when repair was not feasible, was performed with a disposable shaver (4.0-mm Tomcat, Stryker Endoscopy, San Jose, Calif).

Chondral injuries were graded according to the modified Outerbridge classification[7] and documented. The depth and size of the articular cartilage injury determined its classification. The more superficial injuries (grades I and II) and the more extensive lesions (grades IIII and IV) were combined for study evaluations. Any loose chondral flaps were debrided.

ACL Reconstruction Technique

All knees were reconstructed using a quadrupled hamstrings autograft. The technique used was described by Bottoni.[5] The gracilis and semitendinosus tendons were harvested through a vertical incision over the pes anserinus. The tendons were released from the tibia together, secured with a heavy-gauge nonabsorbable suture (#5 Ethibond, Ethicon Inc), and then stripped to the musculotendinous junctions with an open-ended tendon stripper (Tendon Harvester, Linvatec Corporation, Largo, Fla). All remaining muscle was removed from the tendons, and then the free ends were secured with a locking Krackow stitch of #5 Ethibond. The quadrupled tendons were sized and placed on 15 lb of tension (GraftMaster, Smith & Nephew, Andover, Mass) until needed for the ACL reconstruction.

Soft tissue was debrided using a disposable shaver (5.5-mm Tomcat, Stryker Endoscopy) and bipolar electrocautery device (TurboVac 90, Arthrocare Corporation, Sunnyvale, Calif) to allow for visualization of the over-the-top position. The posterior aspect of the tibial footprint of the ACL was used to determine the proper position for the tibial tunnel. A tibial guide set at 65° (Arthrex Inc, Naples, Fla) was used to ensure proper orientation of the femoral tunnel as described by Howell et al.[11] A femoral tunnel was created using a 5-mm over-the-top guide (Arthrex Inc) using a transtibial technique. The graft was secured on the femoral side with a 50-mm metallic cross pin (TransFix, Arthrex Inc). The graft was secured with a resorbable interference screw (Full Thread Bio-Interference Screw, Arthrex Inc) that was the same diameter as the tibial tunnel. The knee was placed at 20° to 30° of flexion and a posterior force applied to the tibia while securing the graft on the tibial side. In all cases, the tibial fixation was augmented by a 6.5-mm screw and spiked washer. The knee was then examined to ensure elimination of the anterior tibial laxity. All incisions were closed with subcutaneous interrupted absorbable sutures and a subcuticular skin closure (2-0 Vicryl and 4-0 Monocryl, Ethicon Inc). Cryotherapy via a compression sleeve (Cryo/Cuff, Aircast/DJO, Vista, Calif) was applied over a thigh-high compressive stocking (TED hose, Kendall-LTP, Chicopee, Mass). The knee was immobilized in a brace locked in extension (Telescoping Cool ELS, DJO).

Postoperative Rehabilitation

Postoperatively, patients from both groups followed the same closely supervised rehabilitation protocol. All patients were admitted overnight and then initiated their rehabilitation closely supervised within our military physical therapy system. Our rehabilitation protocol emphasizes early mobilization and maintenance of extension. Slight modifications by the therapists were permitted based on each patient's individual progress. For patients with meniscal repair or microfracture, partial weightbearing with crutches for 4 weeks was mandated. The drop-lock brace applied in the operating room was used continuously for 4 to 6 weeks until good quadriceps control was restored. Subsequently, no functional bracing was used for any patient. Return to sports or full active military duty was permitted at 4 to 6 months depending on individual progress.

Postoperative Evaluations

All patients were evaluated at 3 days, 2 weeks, and then monthly during the first 6 months postoperatively. Thereafter, patients were evaluated every 6 months. Passive range of motion knee measurements were recorded using a goniometer and compared with the patient's nonoperative side. A physical therapist who was not part of the surgical team performed all range of motion and stability measurements. Allowing gravity as the only force, passive extension was recorded while the patient was prone. The measurements were then compared with those of the uninvolved knee. Subjective evaluations were made using established outcome measures at the postoperative visits. SANE, Tegner Activity Score, and Lysholm evaluation scores were used.

Statistical Analysis

Descriptive statistics were summarized for subject demographic data. The SANE scores were analyzed with a 2×2 (group $\times$ time) analysis of variance with repeated measures for time. The Lysholm and Tegner Activity scores were analyzed with separate independent t tests. Differences between groups regarding postoperative range of motion were also analyzed with separate independent t tests. Alpha level for all statistical tests was set at .05. Microsoft Excel (Office 2000, Microsoft, Redmond, Wash) and SPSS for Windows (version 11.5) software (SPSS Science Inc, Chicago, Ill) were used for statistical analysis.

RESULTS

Seventy consecutive patients with an acute ACL tear were enrolled in our study (Figure 1). By study design, they were evenly split between the acute and delayed surgery groups. Fifty-eight were men, and the average age was 27 years (range, 18-43). Noncontact, pivoting injuries during sports participation accounted for the majority (70%) of the ACL tears. There were no statistically significant differences between groups for all demographic characteristics (Table 1). The mean time from injury to surgery was 9 days (range, 2-18) in the early group and 85 days (range, 42-192) in the delayed group. Based on the established criteria, no patients were excluded for prior knee surgery on the index knee, a multiligamentous knee injury, or locked knee due to an entrapped meniscal tear. One patient who met all

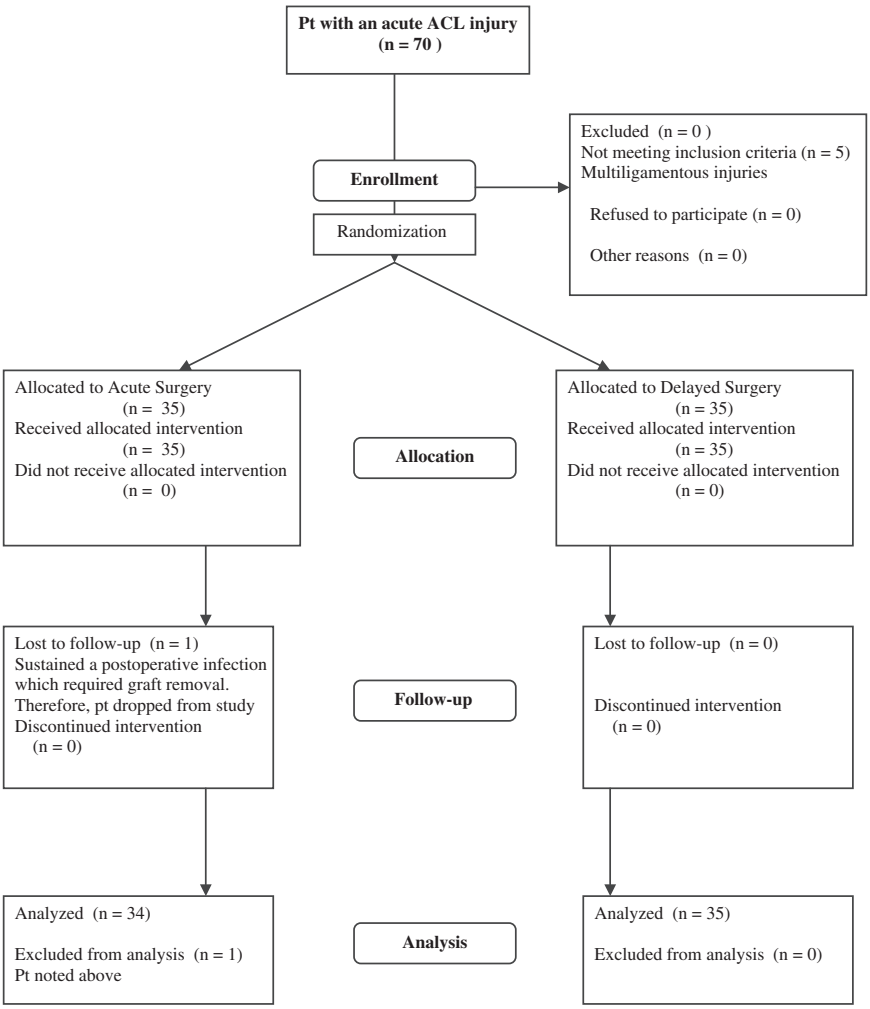

Figure 1. The consort flowchart, showing the timing of anterior cruciate ligament (ACL) surgery. Pt, patient.

study criteria and underwent an acute ACL reconstruction (group 1) was dropped after he sustained a postoperative intra-articular infection that necessitated graft removal. There were no other perioperative complications. Two patients (2.9%), 1 from each group, sustained a traumatic retear of their ACL graft. One patient sustained a reinjury at 8 months playing basketball and the other at 11 months during military training. Both of these patients had returned to full military duty and recreational sports before their reinjuries. As these patients were available for follow-up evaluations for a minimum of 6 months, their range of motion and clinical scores are included until they sustained their reinjury. Follow-up for all patients averaged 1 year (range, 180-708 days).

Chondral injuries were found in a minority of the patients. Nine of the knees in group 1 (25%) and 5 of the knees in group 2 (14%) had chondral injuries. None of these injuries required microfracture. The specific locations and classification of these lesions are listed in Table 2.

Meniscal tears were found in 32 of the knees in group 1 (91%) and 24 of the knees in group 2 (69%). Of the 32 tears in the acute group, 18 (56%) were found in the lateral meniscus and none were reparable. Most of these were small radial posterior horn injuries. Of the 14 tears in the medial meniscus in knees of group 1, 8 (57%) were reparable. In contrast, of the 15 medial meniscal tears in the knees from group 2, only 4 (27%) were reparable. These data are shown in Table 3.

The average postoperative range of motion loss as measured by the deficits in flexion and extension compared with the contralateral knee is shown in Table 4. There was only 1 patient in the delayed group and none in the early group with >10° loss of extension. If that outlier was dropped, the extension deficit would be 0.8° compared with 0.6° average loss in the acute group. There were 2 patients in the delayed group and 1 patient in the early surgery group who had 5° to 10° loss of extension. There were only 2 patients in the delayed group and 1 in the early group with >10° loss of flexion. There were 5 patients in the delayed group and 5 patients in the early surgery group who had 5° to 10° loss of flexion. There were no statistically significant differences in extension or flexion deficits

TABLE 1
Demographics of the Patient Population[a]

Variable	All Patients	Group 1 (Early)	Group 2 (Delayed)
No. of patients	70	35	35
Gender			
Male	58	29	29
Female	12	6	6
Mean age (y)	27.3	26.4	27.5
Range (SD)	18-43 (6.4)	18-40 (6.8)	19-43 (6.0)
Days from injury to surgery		9.0	84.8
Range (SD)		2-8 (4.4)	42-192 (38.2)
Total operative time ± SD (min)		64.0 ± 25.5	61.5 ± 23.9
Mechanisms of injury			
Sports participation	49		
Fall, trip, or awkward landing from a jump	13		
Military training accident	4		
Motocross/ATV accident	4		

[a]SD, standard deviation; ATV, all-terrain vehicle.

TABLE 2
Chondral Injuries

	Medial Femoral Condyle	Lateral Femoral Condyle	Patella	Trochlea
Acute				
Outerbridge I & II/III & IV	0	3 (0/3)	5 (2/3)	1 (0/1)
Delayed				
Outerbridge I & II/III & IV	4 (1/3)	0	0	1 (1/0)
P value	.11	.11	.023	1.0

TABLE 3
Meniscal Injuries

	Medial	Lateral
Acute		
Debridement/repair	14 (6/8)	18 (18/0)
Delayed		
Debridement/repair	15 (11/4)	9 (7/2)
P value	1.0	.025 (.005/.49)

between knees in groups 1 or 2 when compared with the contralateral knee. Similarly, there was no statistically significant difference in stability as measured by the average maximum manual KT-1000 arthrometer between knees in groups 1 or 2.

Clinical outcome scores were comparable for both groups (Table 5). The patients in the acute group rated their knees with the SANE score slightly better, on average, than those in the delayed group. However, using the Lysholm scores, the average for the patients in the delayed group was slightly better. Using the Tegner Activity Score, the patients in the acute group rated their activity level at the latest follow-up on average higher by almost a full level than the patients in the delayed group.

TABLE 4
Range of Motion Deficit and Stability (Compared With Contralateral Side)[a]

	Extension Deficit	Flexion Deficit	Stability (KT-1000)
Acute	0.6°	2.1°	1.2 mm
Range (SD)	0-7° (1.6)	0-10° (3.9)	0-7 mm (1.8)
Delayed	1.5°	2.6°	0.88 mm
Range (SD)	0-22° (4.2)	0-15° (4.8)	0-3 mm (1.1)
P value	.27	.19	.17

[a]SD, standard deviation.

TABLE 5
Average Clinical Outcome Scores

	Acute	Delayed	*P* Value
SANE[a]	83.1	81.4	.66
Lysholm	80.6	83.4	.61
Tegner	5.8	4.9	.34

[a]SANE, single assessment numeric evaluation.

DISCUSSION

In this study, our primary objective was to compare the postoperative knee motion and stability after reconstruction in 2 groups of young athletic patients with an acute tear of the ACL. Half the patients were randomized to receive their surgery acutely and the others delayed. We purposefully did not exclude patients based on clinical criteria such as limited preoperative range of motion or persistent hemarthrosis, both of which, if present, have been identified as criteria to delay surgery. By not preselecting those patients with an optimal condition for knee surgery and thus biasing our results, we sought to determine whether reconstructing the ACL in an acutely injured knee, irrespective of its preoperative status, would be problematic with regard to postoperative

motion or clinical outcome. To the contrary, we found those patients reconstructed early quickly regained their preinjury range of motion and, subjectively, felt better faster. We believe that the reason for this is the theory of a "second hit." If the surgery is performed proximate to the injury, the body has just one "trauma" from which to heal. In contradistinction, when the surgery is delayed, the knee recovers from the first injury. The hemarthrosis resolves, and motion is restored. However, the subsequent surgery is then perceived by the body as a "second hit" from which healing must again commence.

The concept of a cyclops lesion as a cause of arthrofibrosis is also, in our opinion, flawed. As long as any residual stump of the torn ACL is adequately resected, no tissue should remain that blocks extension. In our experience, any loss of active extension noted preoperatively was due to a limitation secondary to pain. In nearly all cases, on initiation of anesthesia, full knee motion was demonstrated. Our emphasis on extension immediately postoperatively prevented loss of terminal hyperextension in either the early or delayed surgical group in the vast majority of our patients. The 1 patient with the greatest loss of motion postoperatively was randomized to the delayed group. Preoperatively, she had difficulty regaining her full motion. Despite regaining full extension and flexion at surgery, she had a difficult time in maintaining her full range of motion postoperatively. Despite aggressive physical therapy, she ended up with a significant loss of extension and a suboptimal clinical result. This patient may have had a fibrotic diathesis and experienced difficulty with postoperative range of motion irrespective of when she underwent reconstruction.

The landmark study by Shelbourne et al[22] is the primary source for the recommendation to delay an ACL reconstruction by at least 3 weeks. This work was a retrospective review of 169 ACL reconstructions followed for 13 weeks. They stratified the patients based on the time from injury to surgery. Group I was less than 8 days; group II, 8 to 21 days; and group III, >21 days. The authors reported a significantly increased incidence of arthrofibrosis in patients reconstructed acutely (group I) when compared with those reconstructed at 21 days or longer (group III). The authors also reported that an accelerated rehabilitation program resulted in significantly less arthrofibrosis in group II patients than when a slower rehabilitation protocol was employed. In designing our protocol, we used their study as our model. However, several salient differences are apparent. Shelbourne et al used an ipsilateral bone-tendon-bone autograft inserted via a mini-open, 2-incision technique. The graft was secured on both the femoral and tibial sides with heavy sutures tied over a polypropylene ligament button. In contrast, we used an autograft hamstring via a single-incision arthroscopic technique. Theoretically, the additional trauma from the arthrotomy in the mini-open technique could have contributed to the increased arthrofibrosis reported in their study. Shelbourne et al did not perform any concomitant meniscal repairs in any of their patients requiring ACL reconstructions. Additionally, only some of their patients were rehabilitated with an accelerated protocol with an emphasis on extension and early restoration of motion. The patients reconstructed between 8 and 21 days (group II) fared significantly better when this "more accelerated" protocol was employed.

Our early group was defined as a reconstruction within 21 days of injury (Shelbourne et al's groups I and II), but our goal was to perform the surgery as soon as possible. Our average time from injury to surgery in our early group was 9 days. Moreover, nearly half (15 of 34) of the patients in this early group had their reconstruction within a week of their injury (equivalent to group I in Shelbourne et al's study). Only a few of these patients demonstrated any loss of flexion or extension.

One theoretical advantage of early surgery is a faster return to full activities. Patients in group 1, whose surgery was performed acutely, were able to return to sports earlier because there was no initial delay in beginning their rehabilitation. Another theoretical advantage of an early reconstruction is the avoidance of further meniscal or chondral injuries that may occur if an athlete returns to some level of activities with an ACL-deficient knee. Wasilewski et al[24] reported a significantly higher incidence of chondral injuries (44% vs 17%) in knees that underwent delayed ACL reconstruction compared with those performed acutely. However, they reported a higher incidence of meniscal tears in their acute group. This correlates with our findings of a high incidence of posterior horn lateral meniscal tears noted in our acute group (18 vs 9). However, most of these were small radial tears that required minimal debridement. None of the knees in the acute group required lateral meniscal repairs, compared with 2 that required repairs in the delayed group. Although the incidence of medial meniscal tears was comparable (14 vs 15), twice as many (8 vs 4) of these medial meniscal tears were reparable in the acute group. The delay in surgery and probable increased trauma sustained by the meniscus could account for the inability to repair these meniscal tears.

Relatively low subjective outcome scores were found for patients in both the acute and delayed groups. The average Lysholm scores for both groups categorize the results as fair. The scores are consistent across different outcome instruments. We believe the reason for the relatively low scores is the relatively short clinical follow-up (<2 years, as is standard for clinical outcome studies) and possibly the expectations of the servicemen and servicewomen that make up our study population. The high demands placed on these patients and the activities required magnify any limitation in function. The subjective evaluation scores obtained for comparison are considered inadequate for clinical comparisons and thus should not be used as such. Our primary objective was to ascertain the patients' assessment of their progress.

One limitation of our study is the fact that none of the patients in our acute group were given the chance to demonstrate that they could have functioned without an ACL reconstruction. Our justification, however, is that the activities required of active duty servicemen and servicewomen, in the vast majority of cases, preclude functioning with an ACL-deficient knee. In addition, the inability of junior enlisted personnel to make autonomous decisions as to their activity level precludes a "wait and see" approach. They are expected to participate in training and unit sporting activities unless given specific limitations defined in a "medical profile" written by a physician or physician's assistant. Anecdotally, we

have found that those who continue to attempt to perform at the high level required of an active duty service member with an ACL-deficient knee often do considerably more damage to their knees before their reconstruction.

The results from this study in a military population may not be applicable to a community orthopaedic practice. The captive population and relatively quick referrals allowed us to perform surgery acutely. Additionally, the military population allowed us to adequately protect those patients in the delayed group from resuming activities that may have resulted in further injury to their ACL-deficient knees.

Another limitation is the relatively short postoperative follow-up. However, unlike clinical outcome studies, our primary outcome measure was postoperative range of motion. We chose 6 months as a minimum period of follow-up. Because most patients return to sports at or before this time, any postoperative motion gained by this point should not be lost unless another injury occurs. Although some improvement in range of motion could be feasible after 6 months, it is not likely in most cases. Shelbourne et al reported their results at 3 months (13 weeks) postoperatively when it was conceivable that additional improvement could still be achieved. Using similar logic, laxity assessments using KT-1000 arthrometer side-to-side measurements taken at 6 months should not change unless reinjury occurs.

Another difference of our study from the study of Shelbourne et al was that we used autograft hamstring tendons and they used autograft bone–patellar tendon–bone grafts. The fixation techniques were also different. However, all patients in both studies were treated with the same graft. Therefore, the dependent variable was the timing of the surgery.

Our study demonstrated that comparable knee flexion and extension can be achieved with either early or delayed surgical reconstruction of a torn ACL. Our early results do not demonstrate any clinical differences in postoperative range of motion, stability, or early subjective outcome measures between knees reconstructed acutely or those that are delayed. Although we do not recommend that the ACL should be reconstructed acutely, our study demonstrates that surgery need not be delayed to obtain satisfactory clinical results. We believe that it is permissible to proceed with an ACL reconstruction soon after injury and delaying the surgery for some arbitrary period of time is not necessary.

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