Intra-articular Mechanical Blocks and Full Extension in Patients Undergoing Anterior Cruciate Ligament Reconstruction

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Summary: Patients with acute anterior cruciate ligament (ACL) rupture frequently present with a lack of full extension. Current literature is unclear whether arthroscopic debridement is necessary before reconstruction to achieve full extension postoperatively. This study examined the postoperative extension achieved in 153 knees that underwent ACL reconstruction within 12 weeks of index injury. All patients performed preoperative physical therapy to increase range of motion and control pain/swelling, regardless of presenting range of motion without prior aspiration or arthroscopy. Of the 153 knees, 103 had meniscal pathology, of which 73 were peripheral vertical tears; 96 of the 153 knees lacked $\geq 3°$ extension preoperatively. Five of 96 knees had an intra-articular mechanical block to extension and all regained full extension after ACL reconstruction. This study documented that a true intra-articular mechanical block is unusual in primary ACL ruptures. Lack of full extension can be adequately dealt with during surgical reconstruction without a detrimental effect on knee extension postoperatively. **Key Words:** Arthroscopy—Extension loss—Ligament reconstruction—Rehabilitation.

Anterior cruciate ligament (ACL) rupture is a relatively common injury and patients frequently present with a knee that lacks full extension. Meniscal injuries[1] and torn cruciate stumps[2,3] are frequently thought of as the cause of the lack of full extension in these patients. This may lead some surgeons to arthroscopically intervene to achieve a full range of motion (ROM) before ACL reconstruction. Full ROM and restoration of muscle strength are commonly believed to be the best predictors of a good result for ACL reconstruction.[2,4-6]

The diagnosis of ACL rupture in an acutely painful, swollen knee may be difficult. Although knee effusion and pain can produce quadriceps inhibition and decreased quadriceps strength,[7-9] this does not necessarily preclude an initial program of knee mobilization with pain and swelling control using physical therapy.[10] This can then be followed by a repeat clinical examination that may clarify the diagnosis. Refinement of current clinical examination techniques,[11] such as the Lachman and pivot shift tests, should limit the use of arthroscopy as a diagnostic tool for ACL ruptures. Even though arthroscopy may identify unsuspected intra-articular pathology such as partial thickness meniscal tears and partial ligament injuries,[12,13] the clinical significance of these are dubious because the majority heal and pose no further problem, or can be satisfactorily dealt with at the time of ACL reconstruction. If doubt still exists after repeat examination of a pain-free mobile joint, then magnetic resonance imaging can be utilized. Others, such as Cosgarea et al.[14] propose that clinical evidence of a displaced meniscal tear or impinging ligament stump may be a ''strong argument for earlier intervention.''

This study reviewed knees that underwent ACL reconstruction within 12 weeks of injury to document the evolution of knee extension loss in patients with ACL ruptures treated by an initial conservative program of physical therapy independent of their presenting ROM. It also documented the percentage of knees lacking full extension that had an intra-articular mechanical block. This study also attempted to determine

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whether treating all knees with initial physiotherapy before surgical intervention had a detrimental effect on knee extension after ACL reconstruction.

PATIENTS AND METHODS

One hundred fifty-three patients presented to the clinic with ACL injured knee joints and underwent reconstruction within 12 weeks of their index knee injury between February 4 and December 15, 1994 by the senior author (L.A.P.). Diagnosis was made using history and physical examination. In severely swollen joints, RICE (rest, ice, compression, and elevation) was applied with repeat physical examination once the acute symptoms had settled. No patient had an aspiration or arthroscopy for hemarthrosis for lack of knee extension before surgical ligament reconstruction. Plain radiography with anteroposterior weightbearing, posteroanterior 30° weightbearing, lateral, and skyline views were taken to exclude fractures. All patients were seen by an independent examiner (clinical researcher) who recorded ROM at presentation using a goniometer on standardized anatomic surface locations (from the lateral malleolus to knee joint line just superior to the head of the fibula, then to the greater trochanter). Independent examiners (clinical researcher and physiotherapists) performed follow-up measurements.

Patients were excluded if they had multiple ligamentous injuries (except grade 1-2 medial collateral ligament strains, which were braced and included), they underwent reconstruction more than 12 weeks after injury, they had prior invasive intervention (aspiration or arthroscopy), or had a bony injury. Surgical reconstruction had been recommended based on significant meniscal injury risk factors as recommended by Daniel et al.[15] after discussions of the risks of surgery with the patient. Although the data were prospectively gathered, the results were retrospectively reviewed.

All patients underwent initial physical therapy to decrease swelling and increase knee ROM and strength. Once ROM and strength had improved, a general anesthetic was provided and an arthroscopic examination was routinely performed at the beginning of the procedure to document and treat meniscal and articular cartilage pathology. This was followed immediately by arthroscopic ACL reconstruction using a multiple-strand hamstring tendon autograft and RCI Screw fixation (Smith & Nephew Dyonics, Boston, MA) in both femoral and tibial tunnels.[16] Once femoral fixation was achieved, the graft was tensioned and tibial interference screw fixation was completed with the leg in full hyperextension. Postoperatively, patients underwent accelerated rehabilitation[17-20] with full weightbearing without bracing.

RESULTS

There were 96 male and 57 female patients with an average age of 29 years (range, 14 to 56 years). There were 74 right knees and 79 left knees. Sport-related activities and mechanisms of injury are presented in Table 1.

There were 103 knees with meniscal pathology, 73 of which had peripheral vertical tears and 30 had other types of tears, such as cleavage, beak, or posterior horn tears. The remaining 50 patients had normal menisci. Forty-two of the 103 meniscal lesions were considered stable and left to heal after joint stabilization; 54 of 103 cases required meniscectomy for unstable lesions not amenable to suture repair; 7 of 110 meniscal lesions (7 of 73 peripheral tears) were repaired using an inside-out technique; 3 of 73 patients with peripheral tears had bucket-handle tears subluxed into the joint. Two of these tears mechanically blocked full knee extension under direct arthroscopic visualization, whereas none of the other types of meniscal lesions resulted in mechanical blocking of the joint as viewed under direct vision.

Ninety-six of 153 patients had loss of knee extension on presentation when compared with the unaffected leg using ≥3° discrepancy between knees. The average difference in extension was 7° (range, 3°to 30°). Arthroscopy revealed that only 5 of these 96 patients had an intra-articular mechanical block to extension. These 5 patients had an average of 13° of extension loss on presentation (4°, 5°, 10°, 15°, and 30°). Three knees lacked ≥3° of extension because of the folded position of the ACL stump and 2 knees because of displaced meniscal tears. Postoperatively,

TABLE 1. *Sporting Activity and Mechanism of Injury of the ACL Ruptures*

Sporting Activity	Percent	Mechanism of Injury	Percent
Football (Rugby and Australian Rules Football)	23.8	Twisting/pivoting	28.8
Skiing	17.9	Sidestepping	19.7
Soccer	13.7	Landing	15.7
Netball	12.5	Tackling	8.5
Touch football	8.9	During a fall	7.8
Basketball	7.7	Giving way	5.9
Others	15		

all 5 patients obtained full extension by 3 to 6 months as measured by independent examiners. These 5 patients had ACL reconstruction an average of 6 weeks (range, 4 to 11 weeks) after their index injuries.

DISCUSSION

Arguments could be made that an acutely painful knee with a lack of extension is due to intra-articular pathology that may be best treated with early intervention.[14] In this study, 63% of patients with acute ACL rupture presented with a locked knee but only 5% of these were attributable to intra-articular pathology. This low incidence of intra-articular mechanical block indicated that a lack of extension on presentation in knees with ACL injuries is most likely the result of other factors such as pain, swelling, hemarthrosis, muscle spasm, reflex inhibition, or other unknown external derangements. In all cases with an intra-articular mechanical block, full extension was obtained postoperativley, indicating that the rehabilitation program did not have a detrimental effect on final knee extension by 3 to 6 months, consistent with Majors and Woodfin,[21] but contrary to others.[10,14]

This conservative presurgical rehabilitative approach did not hinder meniscal repair in suitable lesions because only 1 of the 7 repaired menisci required further surgical intervention and the other 6 menisci (86%) were asymptomatic 3 years after reconstruction. These results are consistent with previous meniscal suture literature.[22-25]

Although reflex inhibition of the quadriceps muscle has been documented with acute and chronic knee effusions,[7-9] the literature does not document that surgical arthroscopy produces a healthier knee quicker than rehabilitation alone. Unfortunately, this study cannot answer this specific question; a prospective randomized study would be required. What this study does provide is information that supports an alternative to the expense and risk of a surgical procedure with respect to the specific parameter of knee extension following ACL rupture.

A patient with a pain-free mobile knee is the most appropriate candidate for arthroscopy and ACL reconstruction,[2,4-6] although Hunter et al.[26] have shown that early reconstruction in acutely injured knees in a highly specialized subpopulation of lesser traumatized ski injuries can be successful. The patients in this study were a more heterogenous group suffering cruciate rupture by multiple mechanisms, most commonly with pivoting or sidestepping as in rugby, and a more conservative approach of presurgical rehabilitation was employed. The 5 patients with knees that lacked full extension resulting from an intra-articular mechanical block seen arthroscopically at the time of reconstruction underwent reconstruction 6 weeks after injury, on average, with an 11-week maximum. This study verified that patients who had a mechanical block at the times of surgical ACL reconstruction were able to obtain full extension after reconstruction and that a preliminary arthroscopy was not required.

In conclusion, it has been shown that physical therapy without prereconstruction knee arthroscopy in the treatment of acute and subacute ACL ruptures, even with a knee that lacks full extension on presentation because of an intra-articular mechanical block, can obtain full extension after reconstruction. In this study, 63% of patients presented with a loss of knee extension and only 5% of these patients had intra-articular pathology mechanically blocking the joint (2% due to a displaced bucket handle meniscal tear and 3% due to the ACL stump). The vast majority of patients presenting with an ACL rupture and a loss of knee extension did not have difficulty obtaining full extension after reconstruction even with surgery performed weeks after the original injury. If the diagnosis is not readily apparent after a careful history and initial examination, repeat examination after appropriate physiotherapy is indicated and will clarify the diagnosis. If the diagnosis remains unclear, repeat physical examination may be followed by magnetic resonance imaging. The delay in surgery to obtain a pain-free mobile joint does not compromise postoperative knee extension. This information may enable some patients to avoid unnecessary arthroscopy to deal with hemarthrosis or meniscal pathology that can be satisfactorily dealt with at time of ACL reconstruction.

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