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Anterior cruciate ligament-medial collateral ligament injury: Nonoperative management of medial collateral ligament tears with anterior cruciate ligament reconstruction

A preliminary report

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ABSTRACT

We present the results of a series of patients who had nonoperative management of the medial collateral ligament with anterior cruciate ligament reconstruction. From February 1983 through December 1989, 84 of 90 consecutive patients were available for followup (minimum, 1 year; mean, 3.1 years) with a combined anterior cruciate ligament-medial collateral ligament injury (anterior cruciate ligament rupture and medial collateral ligament tear) received surgical management by the same physician. The last 68 of these 84 patients who met the inclusion criteria underwent patellar tendon graft for anterior cruciate ligament reconstruction, with concomitant nonoperative management of medial collateral ligament tears.

Follow-up evaluation consisted of physical examination for medial laxity, range of motion, and isokinetic and KT-1000 testing. Brace use and postoperative level of competition were also recorded. In addition, the patients completed a subjective assessment questionnaire rating pain, swelling, and stability. They also rated overall activity level, and any changes in their ability to do the activities tested: walk, climb stairs, run, jump, or twist. Our results indicate that proper reconstruction of the anterior cruciate ligament, in conjunction with nonoperative management of tears of the medial collateral ligament in combined anterior cruciate ligament-medial collateral ligament injuries, can give excellent stability and good to excellent functional outcome in patients with combined anterior cruciate ligament-medial collateral ligament injuries.

An isolated medial collateral ligament (MCL) injury heals satisfactorily without surgical repair; therefore, reconstruction of the ACL alone seems a reasonable and possibly advantageous treatment for patients with combined MCL injuries. The success of this approach, however, has yet to be documented.[1] In a report on the treatment of combined ACL-MCL injuries from our center,[12] the short-term (3-month followup) results indicated that patients who had ACL reconstruction and conservative treatment of the MCL achieved a greater range of motion (ROM) and quicker strength gains (measured by isokinetic testing) than the patients treated with surgical repair of both ligaments. The current study seeks to determine if the patients with only the ACL reconstructed in combined ACL-MCL injuries can regain knee stability and functional competence at clinical followup of 1 year or greater.

MATERIALS AND METHODS

Between February 1983 and December 1989, 90 consecutive patients with combined acute ACL-MCL injuries (ACL rupture and MCL tear) received surgical management by the same physician (KDS) at our institution. Eighty-four patients were available for followup evaluation at a minimum of 12 months. The patients (70 men, 14 women) ranged in age from 15 to 45 years (mean, 22.9), and their activity at the time of injury is listed in Table 1. The first 16 patients underwent patellar tendon graft for ACL reconstruction with concomitant open surgical repair of the MCL tear

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TABLE 1
Patient activity at time of injury

Event	*N*	% of total
Football	32	38
Basketball	17	20
Snow skiing	5	6
Soccer	4	5
Wrestling	4	5
Baseball	3	3.5
Volleyball	3	3.5
Other[a]	16	19

[a] Includes judo, cheerleading, and unknown (2 each); dance, fall, motor vehicle accident, frisbee, bull riding, rugby, ice hockey, track, water skiing, and karate (1 each).

(direct suturing of torn ligament ends or stapling of avulsed end of ligament to bone). Since September 1985, 68 patients have undergone patellar tendon graft for ACL reconstruction (36 left and 32 right knees) with concomitant nonoperative management of the MCL tear. These 68 patients are the focus of this report.

Surgical technique

Meniscal abnormality was identified and treated at arthroscopy. Meniscal tears were either repaired or had partial meniscectomy; stable lateral meniscal tears were left alone. The ACL reconstruction was performed as an open procedure as previously described.[14] The MCL injury was treated nonoperatively.

Postoperative rehabilitation

The same rehabilitation protocol designed for patients who underwent ACL reconstruction[13] was prescribed for the study group with combined ACL-MCL injuries.

Clinical followup

Clinical followup for the 68 patients ranged from 1 to 5 years (mean, 2.3). It consisted of a physical examination for medial laxity, KT-1000 evaluation, ROM, and isokinetic testing. We recorded each patient's use of a functional brace and return to full activity, including the postoperative level of competition. In addition, patients completed a subjective assessment questionnaire rating pain, swelling, and stability. They also rated overall activity level, noting any changes in their ability to walk, climb stairs, run, jump, or twist.

To test for medial laxity, the same surgeon (KDS) applied manual valgus stress at 30° of flexion and full extension at each clinical followup. The KT-1000 assessment was obtained periodically in the postoperative course after full ROM was achieved. Range of motion was assessed by an independent observer (physical therapist) using the standard goniometric analysis at the same intervals as isokinetic testing.

Isokinetic testing (60, 180, and 240 deg/sec) was performed on the Cybex (Lumex Inc, Ronkonkoma, NY) at 5 and 10 weeks; 4 to 6, 12, 18, and 24 months; and yearly thereafter as patients were able to return for evaluation. The scores were reported as percentage of injured to uninjured knees.

Statistical analysis

Statistical analyses were performed on the data collected at the most recent (final) clinical evaluation. The Fischer's exact test (chi-square) was used to determine statistical significance regarding the use of a brace and whether or not any additional surgery was required. Nonparametric analysis of the subjective questionnaire was performed using the Mann-Whitney Rank Sum test to determine differences in subjective stability and activity level. The Mann-Whitney Rank Sum test was also used to analyze the KT-1000 categories (number of patients ≤ 3, 4 to 5, and >5 mm). The unpaired *t*-test was used to determine differences between means for KT-1000, ROM, isokinetic testing, and total score on the questionnaire.

RESULTS

Each of the 68 patients in this study had a firm end point as determined by valgus stress tests at 30° of flexion at the most recent clinical followup. The KT-1000 scores showed a mean difference of approximately 2 mm between the injured and the uninjured knees at the maximal manual force. Further analysis revealed that 93% of mean differences in the KT-1000 scores were ≤ 3 mm in the study group. Only one patient's score was ≥ 5 mm, and the others had 4 to 5 mm differences between the injured and uninjured knees.

In the study group, full extension and terminal flexion (4.5°, 0°, and 137°) at the final followup approached normal. Nine patients required manipulation under anesthesia to improve maximal flexion, and five patients required surgical scar resection to obtain full extension.

The isokinetic testing revealed a near-normal return of strength. Thirty patients continued to wear a functional brace during strenuous activity and the other 38 patients had resumed full activity without the use of a brace at the time of final followup.

More than two-thirds of the patients either increased their level of competition or returned to their preinjury level of competition. The other patients returned to their preinjury sport or work activity, but competed at a lower level, and three patients no longer participated in the preinjury activity. The patients who competed at a lower level of competition (or did not participate) cited a reason *other* than instability or physical limitations due to their surgery as the cause for limiting or ceasing their participation, e.g., graduation without advancement to the next level of competition, a desire to decrease the wear and tear on their knee, or a lack of desire to compete at the same level.

Subjective evaluation revealed that 96% of the patients indicated that they had not had an episode of "giving way" or instability since the reconstructive surgery. One patient stated the knee might give way if pushed hard enough, and one patient stated that instability limited his ability to

participate in vigorous sports and activities. The total score on the subjective questionnaire was 92.2 (uninjured athletes' scores = 93.5).[14]

During a regular clinical followup, we detected that one patient had developed a medial meniscus tear after returning to activity, and we performed a medial meniscus repair. No patient in the study group has sustained recurrence of the MCL sprain.

DISCUSSION

We believe our data demonstrate that nonoperative management of MCL tears may document the statement by the "Orthopedic Knowledge Update"[1] that reconstruction of the ACL alone seems reasonable in a combined ACL-MCL injury. Our patient population, who had ACL reconstruction and nonoperative treatment of the MCL in combined ACL-MCL injuries, regained ROM (4.5°, 0°, and 137°), strength equal to the uninjured leg, and ligamentous stability (firm end point to valgus stress).

The mean KT-1000 difference indicated that the nonoperative management of the MCL tear did not compromise the stabilizing effects of the ACL reconstruction. None of the five patients with KT-1000 values >3 mm have had symptomatic meniscal abnormalities.

In patients with ACL reconstructions, we have seen increases in strength up to 2 years after surgery. Therefore, to assess return of strength in the study group, we looked at the isokinetic data for those patients who were at least 2 years postoperative (total, 34 patients). We found a mean return of 95.2% strength compared to the uninjured leg.

Nonoperative management of the MCL did not compromise the functional or subjective outcome of surgery. At least 95% of the patients were able to resume their preinjury activity. The total score on the subjective questionnaire was similar to the score of patients who had an isolated ACL injury, and to "uninjured" athletic knees.

From our clinical experience, we still wonder if we really attained the conditions stated in our hypothesis, i.e., converting to an isolated ACL injury. Also, we wondered how these patients with nonoperated MCL knees compared in stability with the 16 patients whom we had treated in the early 1980s by repairing both ligaments concomitantly. In addition, our minds are open to analyzing the sequelae as we reevaluate our patients over longer periods of time. For example, what protective function does the MCL provide the meniscus? Will we see more meniscal injuries or reinjuries to knees if the MCL is completely torn rather than partially torn? Also, we recognize the need for being cognizant about the relationship of the site and extent of the MCL tear in subsequent years as we follow these patients and treat others.

Some published works[2-11] provide us with a basis for treating the MCL nonoperatively; however, because no historical data are available for comparison, we used the results of a similar group of patients as a reference. Like our study group, these patients had isolated ACL ruptures (MCL not injured) and underwent ACL reconstruction by the same surgical procedure performed by the same surgeon. We could identify these two groups with our hypothesis, i.e., *isolated ACL reconstruction.* In addition, this reference group participated in the same rehabilitation program during the same time period as the study group, and incorporated the same period of "evolution" for our current postoperative ACL rehabilitation regimen.[13] In this analysis, we found that the objective and subjective stability results, as well as the total subjective evaluation score for the study group, compared favorably to the isolated ACL group. There was a slightly higher occurrence of postoperative manipulations for flexion in the ACL-MCL group compared to the isolated ACL group.

Of the 16 patients who had open surgical repair of their ACL and MCL tear, but were not in the accelerated rehabilitation program, 13 had a final ROM less than the study group ($P < 0.05$). The strength, stability, and occurrence of postoperative surgeries were equal in both groups ($P > 0.05$). The operative group used their knee braces less frequently than the nonoperative group. Although there was a significant difference ($P < 0.05$) in the percentage of patients in the nonoperative MCL group still using the knee brace, we could not objectively determine the reasons for this difference. Time was a major factor in followup since the surgical procedure with the 16 operative patients was 5 to 7 years, as compared to only 1 to 5 years for the nonoperative group. With time, the patients gained increased confidence in their knees, and brace use decreased. Medial laxity was similar in both groups, but the operative MCL group had less total range of motion and on average a slight residual flexion contracture.

We are confident that, for our highly motivated athletic population, our surgical procedure is the best we have to offer the combined ACL-MCL injured patient. With this treatment, the patient will obtain sufficient stability, minimal stiffness, and near full ROM and strength and restoration of his or her own self-confidence for participation in sports at the preinjury level if desired. A support system is built-in with the followups at regular intervals.

The results of this study indicate that the nonoperative management of MCL injuries in conjunction with adequate reconstruction of the ACL is a reasonable and possibly advantageous management approach for the patient with a combined ACL-MCL injury.

CONCLUSIONS

The *nonoperative* management of MCL tears in conjunction with autogenous bone-patellar tendon-bone intraarticular ACL reconstruction of combined ACL-MCL injuries can give excellent stability and good to excellent functional outcome. Any mild residual medial laxity appears to be asymptomatic and, if the ACL graft is stable, there will be a low risk for subsequent meniscal damage after return to full activity. Most patients are able to return to their preinjury sport or activity. The subjective assessment scores within our study population were within the normal range,

but we emphasize that a subjective evaluation does not tell the whole story. The evidence shows, as our study documents, that stability and functional outcome in the ACL-MCL patients who receive appropriate ACL reconstruction and *nonoperative* management of MCL tears can be equal to the success achieved after an "isolated" ACL reconstruction.

REFERENCES

1. American Academy of Orthopedic Surgeons: Management of MCL injury. *Orthopedic Knowledge Update 3:* Ch. 42, 1990, p 569
2. Ballmer PM, Jakob RP: The non-operative treatment of isolated complete tears of the medial collateral ligament of the knee. A prospective study. *Arch Orthop Trauma Surg 107:* 273–276, 1988
3. Fetto JF, Marshall JL: Medial collateral ligament injuries of the knee: A rationale for treatment. *Clin Orthop 132:* 206–218, 1978
4. Indelicato PA: Nonoperative management of complete tears of the medial collateral ligament. *Orthop Rev 18:* 947–952, 1989
5. Indelicato PA: Injury to the medial capsuloligamentous complex, in Feagin JA Jr (ed): *The Crucial Ligaments.* Ch. 5. New York, Churchill Livingstone, 1988, pp 197–206
6. Indelicato PA: Non-operative treatment of complete tears of the medial collateral ligament of the knee. *J Bone Joint Surg 65A:* 323–329, 1983
7. Inoue M, McGurk-Burleson E, Hollis JM, et al: Treatment of the medial collateral ligament injury. I. The importance of anterior cruciate ligament on the varus-valgus knee laxity. *Am J Sports Med 15:* 15–21, 1987
8. Jokl P, Kaplan N, Stovell P, et al: Non-operative treatment of severe injuries to the medial and anterior cruciate ligaments of the knee. *J Bone Joint Surg 66A:* 741–744, 1984
9. Kannus P: Long-term results of conservatively treated medial collateral ligament injuries of the knee joint. *Clin Orthop 226:* 103–112, 1988
10. Mok DW, Good C: Non-operative management of acute grade III medial collateral ligament injury of the knee: A prospective study. *Injury 20:* 277–280, 1989
11. Sandberg R, Balkfors B, Nilsson B, et al: Operative versus non-operative treatment of recent injuries to the ligaments of the knee. *J Bone Joint Surg 69A:* 1120–1126, 1987
12. Shelbourne KD, Baele J: Treatment of combined anterior cruciate ligament and medial collateral ligament injuries. *Am J Knee Surg 1:* 56–58, 1988
13. Shelbourne KD, Nitz P: Accelerated rehabilitation after anterior cruciate ligament reconstruction. *Am J Sports Med 18:* 292–299, 1990
14. Shelbourne KD, Whitaker HJ, McCarroll JR, et al: Anterior cruciate ligament injury: Evaluation of intraarticular reconstruction of acute tears without repair. Two to seven year followup of 155 athletes. *Am J Sports Med 18:* 484–489, 1990