SPOTLIGHT ON sports medicine

Age and ACL Reconstruction Revisited

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abstract

To determine the age limitations for indicating ACL reconstructions in patients with functional instability, this article reviews the results of anterior cruciate ligament (ACL) reconstructions in 23 patients with an average age of 54 years (range: 49-64 years). Patients were evaluated with the Lysholm and Gillquist knee questionairre, visual analog scale, satisfaction rating, physical examination, KT-1000 testing, and radiographs. Nineteen of the 23 patients were available for follow-up at an average of 24 months after the index procedure. Sixteen patients returned for physical examination and 3 agreed to telephone interviews. The mean Lysholm score was 92, visual analog score 0.5, satisfaction rating 100%, KT-1000 testing 2mm, range of motion 0° to 135°. Sixteen of the 19 patients returned to acceptable activity levels. Fifteen patients had excellent or good results, while 4 patients had fair or poor results. Three of the 4 fair or poor results had significant moderate or severe knee arthrosis. Anterior cruciate ligament reconstruction with allograft in 49-64 year-old patients with minimal arthrosis is a safe, minimally invasive procedure that allows for return to a desired level of activity.

Treatment of the anterior cruciate ligament (ACL)-deficient knee in recreational athletes with functional instability is ACL reconstruction either with an autograft or allograft. Kannus and Jarvinen[1] in 1987 reported on conservatively treated ACL tears in patients with a mean age of 32 years and a mean follow-up of 8 years. Multidimensional analysis found poor results in patients with complete ACL tears treated nonoperatively. In 1994, Ciccotti et al[2] reported an 83% satisfactory outcome in patients with a mean age of 46 years who were treated non-surgically. These patients had formal rehabilitation but were required to modify their activity level. Treatment options are complicated when patient age is considered. Concerns about ACL reconstruction in the older population include wound healing problems, stiffness, underlying arthritis, and realistic activity demands.

In 1900, the national average life expectancy was 47 years. The current life expectancy has increased to 74 years for men and 80 years for women. By 2030, >20% of the population is predicted to be aged >65 years.[3] As a society, we have recognized the importance of physical fitness in maintaining good health. As the "baby-boomer" population has aged they have been unwilling to decrease their activity level. The older population is no exception and also has increased their physical activity level. A nationwide lifestyle change has occurred in people aged 45-70 years. These patients need to be evaluated unlike the "younger" patient when analyzing indications and outcome data because their activity levels, knee demands, and lifestyles will define success differently.

Instability may be described infrequently because of lifestyle modifications; however, partial giving-way may be the primary cause of their symptoms. Surgery that does not correct abnormal knee kinematics only will provide short-term benefits and limit patients' activity levels.

The largest investigation of ACL reconstructions in the "older" population was by Heier et al[4] who reported on 45 patients with an average age of 44 years. This article reports our experience with ACL reconstruction using allograft in patients aged >49 years. We believe that an "older" patient who is carefully selected will have a successful ACL reconstruction.

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Materials and Methods

A review of records revealed that 23 patients aged >49 years underwent ACL reconstruction with allograft. Indications for the procedure were episodes of recurrent instability despite nonoperative rehabilitation. All patients had at least 3 months of rehabilitation prior to deciding on operative treatment. All patients reported instability with class I, II, and III functional level according to the International Knee Documentation Committee.

All surgeries were performed using a single-incision arthroscopic ACL reconstruction using patella tendon or achilles allograft. Initially, meniscal pathology was addressed with partial or sub-total meniscetomies. No meniscal repairs were performed. Chondromalacia then was recorded in each compartment (patellofemoral, medial, lateral). After the notchplasty, roofplasty, and drilling of the tunnels, the allograft was prepared on the back table. The graft was passed through the tunnels and secured using bioabsorbable screws.

All patients followed the same postoperative rehabilitation protocol. On postoperative day 1, patients were weight bearing as tolerated. They used a continuous passive motion machine 4-6 hours per day for up to 7 days. On postoperative day 2, patients started quadricep sets, straight leg raises, and patella mobilizations. Physical therapy began 7 days after surgery. Therapy consists of wall slides, heel slides, and 4-way leg raises with weight. Modalities were used to control inflammation. Full range of motion (ROM) was attained by the end of the third or fourth week. Closed chain exercises and aerobic exercises then were begun in therapy. Isotonic exercises were started, but were limited for quadriceps between 90° to 30°. At 6 weeks, full extension isotonic exercises were allowed. Patients could begin jogging with a functional knee brace at 6 weeks. At 4 months, sport-specific functional training could be started.

Each patient was evaluated with a physical examination, radiographs, Lysholm knee questionairre, visual analog scale, and a satisfaction rating. Physical examinations included KT-1000 measurements of both knees, ROM measurements, an assessment of knee effusion, Lachman test, anterior drawer test, varus or valgus instability, and patellofemoral pain. Radiographic evaluation included assessment of degenerative changes compared to the opposite knee.

Results

Twenty-four knees in 23 patients were reviewed. Of the 23 patients, there were 12 men and 11 women. Nineteen (83%) patients were available for follow-up. The average duration of follow-up was 24 months (range: 9-48 months). Sixteen patients returned for examination, while 3 agreed to telephone interviews. Four patients were not located for follow-up. Review of these 4 patients' charts after surgery showed no evidence of graft failure or instability. The study group consisted of 9 women and 10 men. Average patient age was 54 years (range: 49-64 years). There were 10 right knees and 9 left knees. None of the patients were involved in workers' compensation cases. Five patients injured their knees while skiing. Two were injured after a fall from a ladder. Two sustained injuries while playing volleyball. One was injured while dancing and one while walking a dog. Eight patients could not recall the event that caused the injury. All injuries were non-contact events. All patients had arthroscopically diagnosed ACL tears, but 8 patients had associated pathology consisting of 7 partial medial menisectomies, 1 partial lateral menisectomy, 2 medial collateral ligament injuries, and 1 patella chondroplasty with grade III changes. There were no reparable meniscal tears.

Chondral wear was based on the International Cartilage Repair Society classification system. Nine patients had no chondral wear at the time of surgery. Eight patients had Grade I or II chondral changes in one compartment. Four patients had Grade I or II chondral changes in at least one compartment. Two patients had Grade III chondral changes, 1 in the medial compartment, and 1 in the patellofemoral compartment.

The mean Lysholm and Gillquist score for the 19 patients was 92 (range: 61-100) at follow-up. Fourteen patients had a score >95 (in the "excellent" range). One patient had a score between 84-94 (in the "good" range). Three patients had a score between 65-83 (in the "fair" range). One patient had a score <64 (in the "poor" range). The four patients rated as fair or poor reported problems squatting as well as instability either with daily activities or, frequently, during athletics.

A visual analog scale was used to assess postoperative knee pain. The average score on the visual analog scale was 0.5 (range: 0-4). Fourteen of the 19 patients had scores of zero. None of the patients had increased pain postoperatively compared to their preoperative state. When asked about their overall satisfaction with the result of the treatment, 100% stated they were satisfied with the operation.

KT-1000 (MEDMetric, San Diego, Calif) testing during the follow-up examination was performed by a single examiner at 30° of knee flexion. The average difference between the operative knee and the control knee was 2 mm (range: 0-4 mm). Only 1 patient had a KT-1000 difference >3 mm.

The average knee ROM measured by goniometer was 0° to 135°. One patient did not reach full extension compared with the opposite knee. None of the patients reported decreased knee motion. Two patients had recurrent knee effusions that were graded as minimal. All of the patients examined had a negative Lachman test, anterior drawer test, and varus/valgus instability test.

Sixteen of the 19 patients returned to a recreational activity level that was acceptable. Five patients returned to tennis, 4 to skiing, 3 to running or jogging, 3 to golf, and 1 to soccer.

Anterioposterior, lateral, and sunrise radiographs of the knees were graded as normal, minimal, moderate, or severe

changes compared with the opposite knee. Twelve of the 19 patients had postoperative radiographs. Radiographs revealed minimum or no degenerative changes in 9 patients and moderate changes in 2 patients. One patient had severe degenerative changes. Three of the 4 Lysholm and Gillquist scores of fair or poor had radiographs with moderate or severe degenerative changes. One patient had progressive changes after the initial radiographs.

There were no postoperative incision complications.

DISCUSSION

Anterior cruciate ligament reconstruction is recommended for patients with functional instability either with sporting activity or activities of daily living. As the average age and life expectancy of the population in the United States increases, the level of activity in the 50-70 year age group also increases. Physical fitness for recreation or health issues causes this age group to continue to participate in pivoting and high-demand athletics. The majority of the literature on ACL outcomes does not specifically address patients aged >50 years. In the past, it had been thought that the "older" population did not require operative treatment. Ciccotti et al[2] reported satisfactory outcomes in patients with an average age of 46 years with a mean follow-up of 7 years. However, a group of patients (>40%) with increased activity levels or demands were unsatisfied with their outcome because of activity modification.

Because nonoperative treatment provided inadequate results, studies on surgical treatment in the "older" population were necessary. Advances in surgical techniques and postoperative rehabilitation protocols have made ACL reconstruction appealing in this population. Isolated case reports exist in the literature on elderly patients undergoing ACL reconstruction.[5] Heier et al[4] reported on patients with an average age of 44 years. They concluded results of ACL reconstruction in the middle-aged patient can be as successful and satisfying as those of the younger population. Barber et al[6] asked the question, "Is an ACL reconstruction outcome age-dependent?" They reported on 2 groups of patients, group 1 with an average age of 44 years and group 2 with an average age of 27 years. The average follow-up was 21 months. Group 1 had 89% excellent or good results and group 2 had 91% excellent or good results. They concluded results were statistically equal in the 2 groups. The average age of our group of patients is the oldest recorded in the literature. The average age of this group is 54 years, a decade older than that previously documented.

We believe that using an allograft is a safe and minimally invasive method to perform ACL reconstructions in this population.

Our series had 15 (79%) of 19 patients with good or excellent results on the Lysholm scoring scale. This number is comparable to the 83% satisfactory outcome reported by Ciccotti et al[2] with patients treated nonoperatively; however, a portion of these patients had successful outcomes at the cost of lifestyle changes to decrease their desired activity levels. Heier et al[4] reported an average Lysholm score of 91 in patients with an average age of 44 years. This number also is comparable to the average Lysholm score of 92 in our series. Noyes and Barber-Westin[7] reported on 40 patients who underwent ACL reconstruction with advanced arthrosis found at the time of arthroscopy. They found significant improvements with pain and instability; however, only 55% were able to return to light athletics. Our results parallel this data; three of the four patients rated as fair or poor had moderate to severe arthritis on radiographic evaluation.

It has been hypothesized that increasing stability with ACL reconstruction in a knee with underlying arthrosis will do so at the expense of increasing arthritic knee pain. Our patients with fair to poor results described more instability than pain. This may be a product of the allograft progressing through ligamentization in an arthritic synovial milieu.

When the primary etiology of the patient's symptoms is difficult to diagnose because of instability superimposed on underlying degenerative joint changes, preoperative knee bracing may be prudent. Shelbourne and Wilckens[8] reported on ACL reconstruction in 33 patients with mild to severe joint arthritis on radiographs. They advocated a trial of functional knee bracing preoperatively to assess the benefits from ACL reconstruction in reducing pain and symptomatic instability. Our study did not use preoperative bracing.

The results of our study show that patients aged 49-64 years with ACL tears and functional instability can have ACL reconstruction with good to excellent outcomes. Selection criteria for these patients must be strict. The patients must fail nonoperative rehabilitative therapy. We did not use functional knee bracing as an indicator of success after operative intervention. In addition, the injured knee must not have more than minimal arthritic changes on radiographs. We believe that using an allograft is a safe and minimally invasive method to perform ACL reconstructions in this population. Using allograft decreases morbidity to the ipsilateral knee. This group of patients, with minimal arthrosis, had both successful and satisfying ACL reconstructions similar to a younger cohort.

Siebold et al[9] reported a series of 251 ACL reconstructions comparing both fresh-frozen nonirradiated patellar tendon allografts and Achilles tendon allografts. There were 183 patients and 42 patients, respectively. Outcome measures included

What is already known on this topic

- Less than 40% of patients with an average age of 46 years were unsatisfied with nonoperative anterior cruciate ligament (ACL) treatment because of activity limitations.
- Anterior cruciate ligament reconstruction outcome is not age dependent in groups of patients with an average age of 44 years and 27 years.
- The national average life expectancy is 74 years for men and 80 years for women.

What this article adds

- Patients aged 49-64 years (average: 54 years) with ACL instability can have good to excellent results with ACL reconstruction in knees with mild to moderate arthritis.

KT-1000 measurements, International Knee Documentation Committee rating system, Cincinnati Knee Score, and Cincinnati Sports Activity Scale. Eighty-nine percent of patients were followed for a mean of 37.7 months with an average patient age of 39 years. KT-1000 measurements were 2.1 mm in the patellar tendon group versus 2.0 mm in the Achilles group. Indelli et al[10] reported similar KT-1000 values of 2.3 mm in 50 patients with primary ACL reconstruction using Achilles tendon allografts.

Using bioabsorbable interference screws has been shown to be equal to using metal interference screws in a prospective randomized study.[11,12] Tibial screw fixation for Achilles and bone-patella tendon-bone grafts has been well studied. Aune et al[13] investigated soft-tissue grafts versus bone grafts within the tibial tunnel in 5 pairs of human cadaveric knees. The mean failure load of the bone-patellar tendon-bone graft was 110% stronger than that of the soft-tissue graft. Additionally, pullout strength of bioabsorbable interference screws with soft-tissue tibial tunnel fixation have been shown to be related to insertion torque and bone mineral density.[14] Therefore, older patients with osteoporosis may not be ideal candidates for this type of graft or fixation option.

Cost analysis of allograft versus autograft ACL reconstruction shows allograft reconstruction to be less expensive than autograft.[15]

The potential weakness of this study is the lack of a control group that was treated non-surgically over the same time period. There also were no preoperative Lysholm or visual analog scale scores, and there was limited radiographic follow-up (12/19 patients). Outcome measurements and radiographic arthritic changes were not correlated with meniscal pathology or chondral pathology documented at the time of surgery. In addition, the small number of patients involved in the series prevents statistically significant conclusions.

Conclusion

This study should expand the indications for ACL reconstructions to 49-64 years of age (average: 54 years). We believe that ACL reconstruction with allograft in patients aged 49-64 years with minimal knee arthrosis is a safe, successful, and satisfying operation for both the patient and surgeon, and allows this group of patients to resume their desired level of activity.

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