

# Long-term Outcomes After Anterior Cruciate Ligament Reconstruction in Patients 60 Years and Older

Champ L. Baker Jr,<sup>\*†</sup> MD, Jaclyn C. Jones,<sup>†</sup> DO, and Jeff Zhang,<sup>†</sup> MD, PhD  
*Investigation performed at The Hughston Clinic, Columbus, Georgia, USA*

**Background:** Studies evaluating the benefit of surgical reconstruction of the anterior cruciate ligament (ACL) in middle-aged patients have shown promising results, but study populations were limited primarily to patients who were 40 to 60 years old. Some authors have suggested that surgery may benefit these older patients.

**Hypothesis:** Patients aged  $\geq 60$  years with functional instability after ACL injury would benefit from ACL reconstruction.

**Study Design:** Case series; Level of evidence, 4.

**Methods:** Medical records from 1984 through 2010 were searched for patients aged  $\geq 60$  years who had undergone primary arthroscopic ACL reconstruction at a single institution. Fifteen patients (15 knees) were identified as meeting the above criteria. All patients were contacted for a telephone interview, and they completed Short Form-36 and modified Cincinnati Knee Score forms. One patient was deceased, and 1 had undergone revision to total knee arthroplasty. Among the remaining 13 patients, the mean age at surgery was 63.5 years (range, 60-73 years), and the mean patient age at the time of follow-up was 73 years (range, 65-85 years). Preoperative radiographs showed no obvious evidence of arthritis in 10 (77%) of the 13 patients; small osteophytes without loss of joint space were seen in 3 (23%) patients. The mean length of follow up was 115.7 months (range, 53-193 months).

**Results:** At their last clinic visits, all 13 patients had regained full range of motion and returned to sports or exercise, such as tennis, golf, gym exercise, and yoga. Twelve patients reported no joint laxity.

**Conclusion:** Patients aged  $\geq 60$  years with symptomatic instability from ACL injury can have good to excellent subjective outcomes with surgical reconstruction.

**Clinical Relevance:** Physicians who treat active patients older than 60 years should not exclude ACL reconstruction based on the patient's age alone.

**Keywords:** knee; anterior cruciate ligament (ACL); aging athlete; arthroscopic ACL reconstruction

Recent data predict that the population of individuals older than 65 years will increase from 39 million in 2008 to a projected 80 million plus in the year 2050.<sup>12</sup> Because many individuals remain physically active into their later years, the age of the sport-injured and ligament-deficient patient has increased. This trend has spawned several studies evaluating the benefit of surgical reconstruction of the anterior cruciate ligament (ACL) in so-called middle-aged or older patients.<sup>3,6,8,10,18,19,23</sup> Investigators looked at the procedure in 40- to 60-year-old patients and reported results in

patients 50 years and older in a few studies.<sup>6,14,19</sup> These studies have shown promising results. Although some authors have suggested that surgery be withheld from older patients because of concerns of a higher rate of arthrofibrosis and decreased range of motion, no clinical studies have supported that hypothesis.<sup>7,10,15,17,22</sup>

In our review of the literature on ACL reconstruction in older patients, we did not find any studies of long-term outcomes of ACL reconstruction in patients older than 60 years. We hypothesized that these patients could benefit from the procedure. Our purpose was to determine outcomes after primary ACL reconstruction in our small series of patients 60 years and older.

## MATERIALS AND METHODS

### Patient Selection

We searched medical records for patients aged 60 years and older who had undergone primary arthroscopic

\*Address correspondence to Champ L. Baker Jr, MD, The Hughston Clinic, PC, 6262 Veterans Parkway, PO Box 9517, Columbus, GA 31908-9517, USA (e-mail: cbaker@hughston.com).

<sup>†</sup>The Hughston Clinic, Columbus, Georgia, USA.

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TABLE 1  
Patient Data

Patient	Age, y	Sex	Mechanism of Injury	Surgical Indication	Injury to Surgery, mo	Length of Follow-up, y	Cincinnati Knee Score
1	60	Female	Fall	Instability	0.27	8.81	86
2	62	Female	Ice skating	Instability	21.87	11.3	89
3	60	Male	Four-wheeler injury	Weakness, decreased motion	1.3	5.47	90
4	61	Male	Unknown	Instability, pain	Unknown	8.84	77
5	61	Female	Skiing	Instability	3.23	4.88	88
6	60	Female	Fall	Instability	4.73	12.53	90
7	60	Male	Fall	Instability	0.77	5.13	91
8 <sup>a</sup>	73	Female	Fall	Instability	11.9	4.35	72
9	63	Female	Twist injury	Instability	1.57	10.55	71
10	68	Female	Twist injury	Instability	Unknown	15.84	46
11	66	Male	Twist injury	Instability	3.87	14.87	59
12	67	Female	Unknown	Instability	Unknown	11.48	73
13	60	Female	Twist injury	Instability, pain	10.53	9.59	83
14 <sup>b</sup>	66	Female	Unknown	Pain	3.4	NA	NA
15 <sup>c</sup>	65	Female	Skiing	Instability	Unknown	NA	NA

<sup>a</sup>After a fall, patient had a revision anterior cruciate ligament reconstruction that was successful.

<sup>b</sup>Patient had a total knee arthroplasty.

<sup>c</sup>Patient deceased.

reconstruction of the ACL at our institution from 1984 through 2010 and who had at least 2 years of follow-up. Fifteen patients (15 knees) met the above criteria, and their charts were reviewed (Table 1). All patients had active lifestyles that included activities such as tennis, skiing, or running. At the time of our review, 1 patient was deceased and 1 had undergone revision to total knee arthroplasty, leaving 13 patients available for follow-up. All 13 (100%) patients were contacted and interviewed by telephone.

The mean age of patients at the time of surgery was 63.5 years (range, 60-73 years). Eight (62%) patients were women. The main indication for surgical reconstruction was instability in 12 (92%) of 13 patients and weakness with loss of motion in the remaining patient (Table 1). Preoperative radiographs showed no obvious evidence of arthritis in 10 (77%) patients; small osteophytes without loss of joint space were seen in 3 (23%) patients. Three patients had an acute injury (surgery within 6 weeks of injury); the remaining patients had chronic injuries. Those with chronic injuries had recalcitrant symptoms after nonoperative treatment with rehabilitation and bracing for 1 to 6 months.

### Surgical Procedure

Each patient had a single-incision arthroscopic ACL reconstruction procedure, as described by Arciero et al.<sup>1</sup> Graft choices were as follows: 4 bone-patellar tendon-bone autografts, 6 hamstring autografts, and 3 tibialis tendon or Achilles tendon allografts. In addition to the ACL reconstruction, 6 patients had a partial medial meniscectomy, 2 had a partial lateral meniscectomy, 2 had a medial meniscectomy, 1 had a lateral meniscectomy, 1 had a medial and lateral meniscectomy, 4 had chondroplasty, and 1 had a

repair of the medial collateral ligament. In the postoperative notes for these patients, some procedures were simply listed as "meniscectomy," without qualifying them as partial or total, however it can be assumed they were partial because we only perform a partial meniscectomy or ACL reconstruction. Postoperative rehabilitation programs were standardized among patients. The protocol began with protected partial weightbearing and focused on early range of motion and quadriceps function.

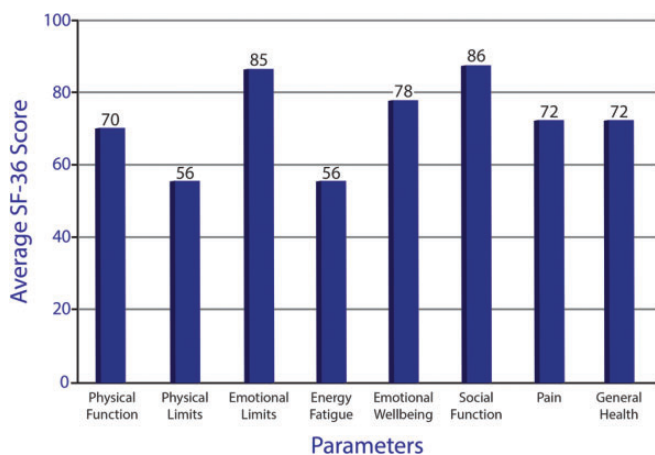
When dismissed from rehabilitation, 12 of 13 knees were reported to be stable, with full range of motion. The remaining patient had an initial flexion contracture that improved over time, and her last documented note reported full motion.

### Evaluation

All patients were contacted for a phone interview, and they completed the modified Cincinnati Knee Score forms and the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36). The mean patient age at follow-up was 73 years (range, 65-85 years). Mean length of follow-up was 116 months (range, 53-193 months).

The SF-36 is a questionnaire that is designed for self-administration. It measures overall health by 8 parameters to provide scores for a person's functional status, well-being, and overall evaluation of health.<sup>9,26</sup> These scores can be compared with those of the total population by predetermined averages and can be broken down by age range and sex for more specific comparisons.

The modified Cincinnati Knee Score is the subjective portion of the Cincinnati Knee Rating System.<sup>2,21</sup> On a 0- to 100-point scale (<30, poor; 30-54, fair; 55-79, good; >80, excellent), it calculates a score using questions regarding



**Figure 1.** The 36-Item Short Form Health Survey (SF-36) includes 1 multi-item scale that assesses 8 health concepts: (1) physical functioning, (2) role limitations due to physical health, (3) role limitations due to emotional problems, (4) energy/fatigue, (5) emotional well-being, (6) social functioning, (7) pain, and (8) general health. All patient responses from the SF-36 form were scored, and individual totals for each of the 8 parameters were averaged. The group averages for each parameter are shown.

a patient's symptoms and functional variables. This system is a commonly used tool to measure outcomes of knee ligament reconstruction.

## RESULTS

All patient responses from the SF-36 form were scored, and individual totals for each of the 8 parameters were averaged. The group averages for each parameter are shown in Figure 1. The averaged scores exceeded the population averages in each scale. When evaluated on an individual basis, each patient had 8 calculated outcomes, and for 13 patients, that equaled 104 total outcomes. When each score was compared with age- and sex-matched means, our population had 88 outcomes (85%) that were greater than or equal to their age- and sex-matched means and 16 (15%) that were less than their age- and sex-matched means.

Modified Cincinnati Knee Scores calculated for each individual resulted in 7 excellent, 5 good, and 1 fair result (Table 1).

All patients reported that they were happy with their surgeries and, given the same injury, all would choose to have the surgery again.

## Complications

One patient developed a superficial wound infection over the distal portion of his autograft site 2 weeks after surgery. It was successfully treated with superficial irrigation and debridement and oral antibiotics. He did not require any further intra-articular procedures. One patient treated with allograft fell on the operated knee 6 months after the

index procedure. She was noted to have increased laxity after the fall that did not improve with therapy and time. She underwent a revision reconstruction with allograft 14 months after the index procedure and has done well since.

## DISCUSSION

Surgical reconstruction of the ACL-deficient knee, regardless of the patient's age, has been solidly endorsed in the scientific and clinical literature,<sup>4,5,11,13,18,20,24,25</sup> although some authors advocate conservative treatment.<sup>7,10,16,17,22</sup> In a 2003 prospective study, Blyth et al<sup>6</sup> followed 30 patients who had undergone ACL reconstruction at greater than 50 years of age. Their preoperative Lysholm scores increased from 63 (range, 32-95) to 93 (range, 76-100) post-operatively, and Cincinnati scores improved from 49 (range, 18-73) to 89 (range, 73-100). International Knee Documentation Committee scores all improved by at least 1 grade.

The patient population in our study was similar to those in previous studies measuring outcomes of ACL reconstruction with respect to mechanism of injury, time to surgery, reason for surgery, and concomitant injuries. The patient satisfaction rate of 100% matched or surpassed that previously reported.<sup>6,8,23</sup>

The Cincinnati Knee Scores in our patients indicated all but 1 patient in our series had good or excellent results. The patient who had the fair result was our oldest patient and was 83.8 years old at the time of follow-up. She was also assessed at 15.8 years of follow-up, and she attributed her results more to her age and the multiple falls she had sustained in the previous 2 to 3 years.

Any of the lesser or negative responses given on the SF-36 questionnaire were attributed by the patients to other comorbidities or even to age itself. Several of the patients studied stated they had chronic back pain or other medical issues that affected their scores. No patient attributed any low score or answer to their operative knee. Average SF-36 scores for our patients were greater than those of the general population; however, this fact should not be misconstrued. We do not believe that having an ACL reconstruction will improve a person's overall functionality over that of the rest of the population, injured or uninjured. It is most likely that our population's scores are higher because of their active lifestyle and motivation to maintain such a lifestyle, thus making them appropriate candidates for surgery in the first place.

Only 1 patient (6%) suffered reinjury that required revision surgery. Blyth et al<sup>6</sup> reported 1 (3%) reinjury in 30 patients without any mention of revision surgery. Plancher et al<sup>23</sup> reported a 7% reinjury rate in their population of ACL reconstruction in 40- to 60-year-old patients.

Our study does have limitations. First, the patient population is very small. Second, there was no control group of age-matched patients undergoing nonoperative treatment for ACL deficiency. However, given the reasons that our patient population chose surgery, there would be an inherent selection bias, including age-matched patients choosing not to undergo surgery. Another potential weakness of the

study is the lack of recent objective patient data, such as physical examination findings and radiographs. However, for this population, we believe the most important outcomes were a patient's perceived knee performance, satisfaction, and daily functioning. Coupled with the modified Cincinnati Knee Scores, this information gives us a good representation of outcome success.

## CONCLUSION

Our results suggest that individuals 60 years and older who have symptomatic instability from an absent or insufficient ACL can have good to excellent subjective outcomes with surgical reconstruction. We believe that patients of any age who are active and desire to maintain their level of activity can be successfully treated with ACL reconstruction if there are no contraindications.

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