



Contents lists available at ScienceDirect

Chinese Journal of Traumatology

journal homepage: <http://www.elsevier.com/locate/CJTEE>

Original Article

Does age, time since injury and meniscal injury affect short term functional outcomes in arthroscopic single bundle anterior cruciate ligament reconstruction?

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ARTICLE INFO

Article history:

Received 25 May 2017

Received in revised form

30 August 2017

Accepted 25 October 2017

Available online 8 December 2017

Keywords:

Anterior cruciate ligament

Anterior cruciate ligament reconstruction

Hamstring tendons

Rehabilitation

ABSTRACT

Purpose: We conducted this study to correlate the short term clinical outcomes after anterior cruciate ligament (ACL) reconstruction with patients' age, time since injury and associated meniscal injury.

Methods: A total of 43 patients who underwent ACL reconstruction between October 2013 and February 2015 were taken for the study. Preoperative demographic data, clinical scores (Lysholm, IKDC) were recorded for each patient. Time since injury and associated meniscal injuries were recorded. Then a standardized surgical technique was used for each graft type. They were followed up for 6 months and the Lysholm and IKDC scores were evaluated.

Results: Only 33 patients completed 6 months follow-up at the end of this study. Twenty-four patients (72.7%) were in the age group of 18–30 years. Nine patients belonged to age group 30–50 years (27.3%). The *p* value for differences in Lysholm scores between the two age groups was not significant (0.339). The *p* value for differences in IKDC scores between the two age groups was not significant either (0.138). The mean Lysholm scores were 93.86 ± 3.024 for the group who presented <6 months post-injury, 92 ± 5.494 for the group who presented between 6 months and 1 year and 94.64 ± 3.104 for the group who presented after 1 year; whereas the mean IKDC scores were 92.43 ± 0.793 , 90.64 ± 6.598 and 90.89 ± 2.113 respectively. The correlation of outcomes with meniscal injury had no statistical significance.

Conclusion: Based on our study, we conclude that age, time since injury and associated meniscal injury does not affect short term functional outcome in ACL reconstruction.

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Introduction

Anterior cruciate ligament (ACL) rupture is one of the commonest injuries dealt with in sports trauma. At least 3% of athletes sustain an ACL injury in a 4 year sporting period.¹ Treatment needs to be decided for each patient by the surgeon based on various patient factors, expectations and demands. The standard treatment of an ACL deficient knee is an intra-articular reconstruction, of which the quadrupled hamstring graft and the bone-patellar-tendon-bone graft are the two most commonly used methods. Several previous studies demonstrated no difference in the functional outcomes of the two grafts.^{2–4} Functional outcome post-ACL

reconstruction depends on demographic, psychologic, intra-operative and postoperative factors. Little has been discussed in the literature regarding the patient and injury-related factors and their association with functional outcomes. We included age, time since injury and associated meniscus injury as these are independent variables and are not under operating surgeon's control. Studies have shown that physiological age and activity level of patients are more important in decision making rather than chronological age in ACL reconstruction.⁵ Also studies have shown that time since injury and concomitant meniscus injury are not associated with poor short term outcomes.^{6,7} Better understanding of these variables and their association with functional outcomes will help the clinicians to predict the prognosis early. Very few studies^{3,8} have been conducted in the Indian subcontinent. We conducted this study to document whether there is any correlation between age of the patient, time since injury and meniscal injury with short-term functional outcomes of arthroscopically assisted anterior cruciate

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Peer review under responsibility of Daping Hospital and the Research Institute of Surgery of the Third Military Medical University.

ligament reconstruction in Indian population presenting to a tertiary health care centre.

Materials and methods

We conducted a prospective study on patients who underwent ACL reconstruction from October 2013 to February 2015. All patients presenting to the orthopaedic department with symptomatic ACL deficient knee between 0 and 18 years were included for the purpose of this study. Patients who had prior knee surgery, infection, associated posterior cruciate ligament injury, associated grade III collateral ligament injury, associated meniscal injury with more than two third of its diameter and more than grade one Kellegren-Lawrence arthritis were excluded from the study. Institute Ethics Committee approval was obtained for the study. Informed consent was obtained from the patients after explaining them the procedure. Forty-three patients were included for the purpose of this study during this period. All these patients underwent ACL reconstruction with either bone patellar tendon graft or quadrupled hamstring graft.

Prior to surgery, all patients were subjected to standard ACL preoperative rehabilitation protocol, so that at the time of surgery all had full knee ROM without any knee effusion. Baseline data collected included age, sex, time since injury and mode of injury. Functional scores in the form of Lysholm score, IKDC subjective score and modified IKDC knee examination score were recorded.

All the patients underwent surgery under regional anesthesia. In operating room, examination under anesthesia was done to assess knee laxity. Under tourniquet, diagnostic arthroscopy was done for each patient. Meniscus status assessed and necessary procedure carried out in the form of meniscectomy or repair. The integrity of articular cartilage, ACL, posterior cruciate ligament (PCL) and the intraarticular cavity was assessed. Then the appropriate graft was harvested using standard technique for each graft. The patellar tendon graft was harvested through a midline incision with the knee in 90-degree flexion. The central 1/3rd of the tendon or 10 mm was harvested whichever was smaller. Around 25 mm bony cut was made from the patella and 25 mm cut in the tibial tuberosity. The hamstring graft harvesting was done through a 3 cm incision anteromedially on the tibia starting approximately 4 cm distal to joint line and 3 cm medial to the tibial tuberosity. The sartorius fascia found here was carefully reflected to find the gracilis and semitendinosus tendons running deep to it. They were then harvested one by one using securing non-absorbable sutures and tendon stripper.

The grafts were then passed through drilled tunnels after preparation of the notch and secured with bioscrew (ArthrexInc, Florida, USA) in both femoral and tibial tunnels when bone patellar tendon graft was used. When quadrupled hamstrings were used, the graft was fixed with endobutton (Retrobutton, ArthrexInc, Florida, USA) for the femur and bioscrew for the tibia.

Postoperatively, the knee was protected with a knee brace and rehabilitation was started as per standard protocol.⁹ Patients were usually discharged at 5–6 days postoperatively. Suture removal was done on the 14th day. Then patients were regularly followed up every two weeks till six weeks and then monthly till six months. At 6 months postoperation, reassessment of Lysholm and modified IKDC scores was done. The results thus obtained were tabulated and analyzed using appropriate statistical tests (paired *t*-test for parametric variables, Chi-square tests for nonparametric variables). Association was studied with Pearson correlation.

Results

Six months follow-up was completed by only 33 patients at the time of study. Of the 33 patients who completed 6 months follow-up, 24 patients (72.7%) were in the age group of 18–30 years. Nine

patients belonged to age group of 30–50 years (27.3%). Thirty-two patients were male and 1 was female. Twenty (60.6%) patients had left sided injury and 13 (39.4%) patients had right sided injury.

Sixteen (51.6%) patients were injured during a sports-related activity and volleyball injuries accounted for half of all sports-related injuries. Ten (32.2%) patients were injured in a road traffic accident (RTA). Five (16.1%) patients had a history of fall from height/into depth.

Thirty-two (96.9%) patients had complaints of instability of the knee, this being the most common symptom. Pain was the next most common symptom, with 29 (87.9%) patients complaining of it. Twenty-two (66.8%) patients complained of swelling of knee. Ten (30.3%) patients had complaints of knee locking episodes/catching and 7 (21.3%) patients complaining of crepitus on knee ROM/walking.

For convenience, patients were divided into 2 age groups: 18–30 years and 30–50 years. Twenty-four patients fell in the 18–30 years group and 9 in 30–50 years group. We looked for any difference in postoperative Lysholm and IKDC scores among the various age groups for any correlation.

The 18–30 years age group had improvement in mean Lysholm score of 61.62 preoperatively to 94.17 at six months postoperatively. The age group of 30–50 years had improvement in mean Lysholm score from 54.19 preoperatively to 91.87 at six months follow-up. The *p* value for differences in Lysholm scores between the two age groups was not significant (*p* = 0.339, Table 1). The age group of 18–30 years improvement in mean IKDC score from 50.2 preoperatively to 91.33 at six months postoperatively. The age group of 30–50 years had improvement in mean IKDC score from 38.99 preoperatively to 89.72 postoperatively. The *p* value for differences in IKDC scores between the two age groups was not significant (*p* = 0.138, Table 1).

According to the time from injury to surgery, we divided the patients into groups of 0–6 months, 6 months–1 year and >1 year. Seven (21.2%) patients had presented before 6 months post-injury. 12 (36.4%) patients presented between 6 months–1 year after injury. 14 (42.4%) patients presented after more than a year since the time of injury.

At 6 months, the mean Lysholm scores were 93.86 ± 3.024 for the group who presented <6 months post-injury, 92 ± 5.494 for the group who presented between 6 months and 1 year and 94.64 ± 3.104 for the group who presented after 1 year. The *p* value for the differences of Lysholm scores between these groups was 0.274 (Table 2).

At 6 months, the mean IKDC scores were 92.43 ± 0.793 for the group who presented <6 months post-injury, 90.64 ± 6.598 for the group who presented between 6 months–1 year and 90.89 ± 2.113 for the group who presented after 1 year. The *p* value for the differences of IKDC scores between these groups was 0.655 (Table 2). Hence, there were no statistically significant differences between the scores of patients operated at various times since injury.

Twelve (36.3%) patients had only medial meniscus injury. Three (9%) patients had only lateral meniscus injury. Five (15.4%) patients had both medial and lateral meniscus injuries.

Table 1
Correlation between age groups and clinical scores.

Score	Time	Age group (year)	Mean score	SD	<i>p</i> value
Lysholm scores	Preoperation	18–30	61.62	11.62	0.339
		30–50	54.19	10.78	
	6 Months	18–30	94.17	4.63	
		30–50	91.87	1.94	
IKDC scores	Preoperation	18–30	50.2	9.45	0.138
		30–50	38.99	11.14	
	6 Months	18–30	91.33	4.77	
		30–50	89.72	1.85	

SD means standard deviation.

Table 2
Lysholm and IKDC scores according to time since injury.

Score	Time since injury	Mean score	Standard deviation	95% confidence interval for mean		Min	Max	p value	Power
				Lower	Upper				
Lysholm	<6 m (n = 7)	93.86	3.024	91.06	96.56	90	98	0.274	31.43%
	6 m–1 y (n = 12)	92.0	5.494	88.51	95.49	78	99		
	>1 y (n = 14)	94.64	3.104	92.85	96.43	91	100		
IKDC	<6 m	92.43	0.793	91.7	93.16	92	93	0.655	2.39%
	6 m–1 y	90.64	6.598	86.45	94.83	71	94		
	>1 y	90.89	2.113	89.67	92.11	86	93		

Taking Lysholm scores at 6 months into account, the group without meniscal injuries had a mean score of 94.23 ± 3.39 while the group with meniscal injuries had a mean score of 93.05 ± 4.63 . Similarly taking IKDC scores at 6 months into account, the group without meniscal injuries had a mean score of 92.42 ± 1.77 while the group with meniscal injuries had a mean score of 90.29 ± 5.04 .

We found the correlation between meniscus injuries and Lysholm and IKDC scores was not statistically significant (p value = 0.40 for Lysholm and 0.09 for IKDC scores).

Five patients had pain at 6 months postoperatively. One patient had a stitch abscess on a protruding vicryl suture, which subsided with suture removal and clean dressing. Two patients had some persistent instability while climbing up albeit much lesser than preoperation. Both had anterior laxity upto 5 mm. However, both were clinically asymptomatic.

Discussion

The results from our study shows that age of the patient, time since injury and associated meniscal injury less than two thirds of its diameter do not significantly influence the short term functional outcomes in ACL reconstruction.

The age distribution of patients in our study shows that ACL injuries are common in the physically active population group of 18–30 years, with diminishing incidence thereafter.

More than half of the patients (51.6%) were injured during a sporting activity. 32.2% were injured in a road traffic accident. Worldwide, however, 70.4% of ACL injuries are in sports-related activities.⁴ These differences can be attributable to the lower prevalence of competitive sports in the population studied.

Also more often than not, females are more prone to ACL injuries as per the literature.¹⁰ However, our study had only 1 female patient. 42.4% patients presented after more than 1-year post-injury. The earliest time gap observed was 4 months and the maximum delay observed was 9 years between injury and surgery. However, we found no statistically significant differences in the functional scores (Lysholm and IKDC) of these patients. Longer follow-up is required to detect degenerative changes when they set in. Our study was conducted in a population of predominantly rural background where still indigenous treatment techniques such as native bandaging hold a prominent place in injury management. Indian rural population usually present to modern tertiary healthcare facilities after some time of intentional neglect or after a period of native treatment. We had 2 patients (one in each group) who had at least 1 month of indigenous treatment before approaching our hospital. However at the time of surgery both patients were optimised to have full knee ROM without any effusion, so the postoperative function is not biased. In a study by Tow et al² the time delay between injury to surgery ranged from 3 weeks to 35 months. In the study by Boonriong et al¹¹ the hamstring group had a mean duration from injury to surgery of 9.5 months while the bone patellar tendon bone group had a mean delay of 18 months. Our

study did not have any significant difference in time delay between these two groups. Also the scores between the various groups as per delay had no significant differences statistically.

The frequency of meniscal injuries ranges from 48% to 65% in association with ACL injuries, and more often medial meniscus is involved.¹² We also found 60.7% patients had associated meniscus injuries, with 36.3% patients having only medial meniscus injuries. 9% patients had only lateral meniscus injuries and 15.4% patients had both medial and lateral meniscus injuries. We found no statistical significance between meniscus injuries and postoperative scores (p value = 0.4 for Lysholm and 0.09 for IKDC score). Tow et al² found that 58% of patients who had undergone meniscectomy exhibited poorly on IKDC scores while 31% without meniscectomy exhibited poorly on IKDC scores. These differences were statistically significant again showing that meniscectomy correlates with poorer scores. Sofu et al¹³ evaluated the results of meniscectomy on scores after ACL reconstruction. They found that after at least 2 years, meniscectomy correlates with poorer clinical outcomes as gauged by feeling of apprehension, poorer IKDC scores and delayed return to sports activities.

In our study, 5 patients reported knee pain 6 months postoperatively. 3 out of these 5 patients had a meniscus lesion, dealt with surgically by partial meniscectomy. 4 of them had presented later than 1-year post-injury. Also, 2 of these patients had osteoarthritic knee changes intraoperatively.

The main limitation of our study was the small sample size and short follow-up. Also we had only one patient more than forty years. Hence whether the outcome is affected by age cannot be commented in patients with age more than forty years.

To conclude, age of the patient, time since injury and associated meniscal injury do not influence the short term functional outcome scores in ACL reconstruction. A larger study with longer follow-up could probably shed more light on the role of these variables.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.cjtee.2017.10.002>.

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