

Arthroscopically Assisted Anterior Cruciate Ligament Reconstruction: Comparison of Bone-Patellar Tendon-Bone Versus Semitendinosus Gracilis Autograft

ML Chetan^{ORCID}, K Girish Kumar^{ORCID}

Associate Professor, Department of Orthopaedics, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India.

Abstract

Background: Injuries to the anterior cruciate ligament (ACL) of the knee are immediately debilitating and can cause long-term consequences, including the early onset of osteoarthritis. The present study compared the results of Arthroscopically assisted ACL reconstruction using bone-patellar-tendon and semitendinosus gracilis (STG) tendon grafts. **Subjects & Methods:** The study was conducted from April 2019 to March 2020 at Department of Orthopaedics in Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka on 40 patients who underwent ACL reconstruction were divided into 2 groups, single-incision arthroscopically assisted ACL reconstructions using either the bone-patellar tendon-bone (group I) or the hamstring autograft without extra-articular augmentation (group II). **Results:** There is a significant risk of associated injuries with ACL deficient knees, among the group who underwent surgeries 3 months after the injury than those who underwent before 3 months. The most common mechanism of injury was the activity of daily living in twenty patients, road traffic accidents in eleven, and sporting activity in nine patients. Anterior Drawer's Translation after 1 year was seen in 15 each in groups I and II with 0-2 mm and 5 each in groups I and II with 3-5 mm. **Conclusion:** The outcome for patients in this study undergoing ACL reconstruction with a hamstring tendon graft did not differ from that of patients with a patellar tendon graft in terms of clinical stability, range of motion, and general symptoms. The hamstring tendon graft also had lower graft harvest site morbidity, as demonstrated by less kneeling pain at 1 and 2 years.

Keywords: Anterior Cruciate Ligament, Hamstring Tendon, A Patellar Tendon Graft

Corresponding Author: K Girish Kumar, Associate Professor, Department of Orthopaedics, Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka, India.

E-mail: girikummisho@gmail.com

Received: 3 September 2020

Revised: 29 September 2020

Accepted: 15 October 2020

Published: 30 December 2020

Introduction

Injuries to the anterior cruciate ligament (ACL) of the knee are immediately debilitating and can cause long-term consequences, including the early onset of osteoarthritis. It is important to have a comprehensive understanding of all possible risk factors for an ACL injury to identify individuals who are at risk for future injuries and to provide an appropriate level of counseling and programs for prevention.^[1]

Anterior cruciate ligament (ACL) tear is the most common serious ligamentous injury to the knee joint.^[2] The ACL is the primary stabilizer against the anterior translation of the tibia on the femur and is important in counteracting rotation and valgus stress. Anterior cruciate ligament deficiency leads to knee instability. This results in recurrent injuries and an increased risk of intra-articular damage, especially the meniscus. The goals of the ACL reconstruction are to restore stability to the

knee; allow the patient to return to normal activities, including sports; and delay the onset of osteoarthritis with associated recurrent injuries to the articular cartilage and loss of meniscal functions. During the past decade, arthroscopically assisted techniques have been an accepted method of reconstructing the ACL.^[3]

The bone-patellar tendon-bone and the hamstring tendon are the two most commonly used autografts for reconstruction.^[4] The bone-patellar tendon-bone autograft has been widely accepted as the gold standard for ACL reconstruction with a high success rate.^[5] However, donor site morbidities and extensor mechanism problems associated with the use of the bone-patellar tendon-bone have led to the increasing popularity of the hamstring tendon graft which had advantages of low donor site morbidities, avoidance of extensor mechanism problems and better cosmesis.^[6] The present study compared the results of Arthroscopically assisted ACL reconstruction

using bone- patellar-bone and semitendinous gracilis (STG) tendon grafts.

Subjects and Methods

The study was conducted from April 2019 to March 2020 at Department of Orthopaedics in Subbaiah Institute of Medical Sciences, Shivamogga, Karnataka on 40 patients who underwent ACL reconstruction. All patients were informed regarding the study and their written consent was obtained.

All patients were divided into 2 groups, single-incision arthroscopically assisted ACL reconstructions using either the bone-patellar tendon-bone (Group I) or the hamstring autograft without extra-articular augmentation (Group II).

The clinical diagnosis was made by positive Lachman and Pivot shift tests. The indication for surgery was an ACL tear confirmed by clinical diagnosis in an otherwise healthy patient who experienced knee instability in daily activities or wished to maintain his or her pre-injury level of activities.

The type of graft tissue used for reconstruction (bone-patellar tendon-bone versus hamstring tendon autograft) was not randomized. Bone-patellar tendon-bone autografts were used for those who wished to return to high-level activities and hamstring tendon autografts for those who had low-level activities or were concerned about cosmesis. The outcome testing in all cases was performed at the latest follow-up (at least one year).

All patients were followed-up initially by the operating surgeon. All final clinical testings and evaluations were performed by the other independent surgeon from one-year post-operation to eliminate potential bias. Results thus obtained were subjected to statistical analysis. A p-value of less than 0.05 was considered significant.

Results

[Table 1] shows that there were 17 males and 3 females in group I and 15 males and 5 females in group II.

[Table 2] shows that there is a significant risk of associated injuries with ACL deficient knees, among the group who underwent surgeries 3 months after the injury than those who underwent before 3 months.

[Figure 1] show that the most common mechanism of injury was the activity of daily living in twenty patients, road traffic accidents in eleven, and sporting activity in nine patients.

[Table 3] shows that Anterior Drawer's Translation after 1 year was seen in 15 each in groups I and II with 0-2 mm and 5 each in groups I and II with 3-5 mm.

[Table 4] shows that Lachman's translation after 2 years was seen in 17 in group I and 19 in group II with 0-2 mm and 3 in

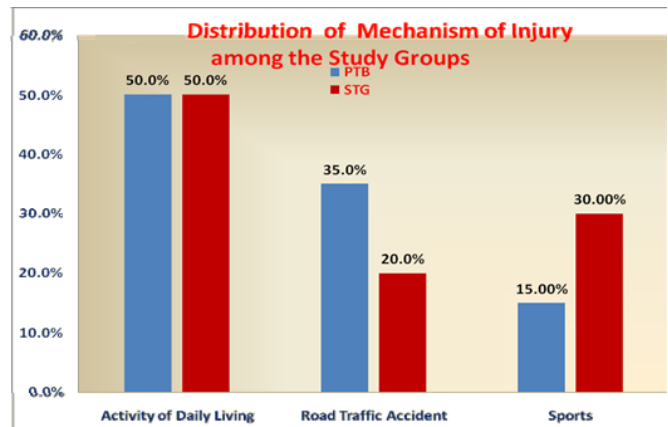


Figure 1: Mechanism of injury

group I and 1 in group II with 3-5 mm.

Discussion

Despite more than 40 years of clinical focus on the anterior cruciate ligament (ACL)-injured knee, a complete understanding of the injury mechanism, the optimal treatment plan (including reconstruction), and the best protocol for rehabilitation continue to stimulate much debate. Prevention efforts focused on ACL injuries have been laudable, but unfortunately, far too many young athletes still fall victim to this injury and are denied the opportunity to reach their full athletic potential.^[7] Besides the deleterious effects on an athletic career, many lifestyles are sadly altered as the knee deteriorates, and physical limitations are realized as osteoarthritis becomes a reality. All too often, this occurs at a very young age.^[8] Consequently, ACL research remains a booming business whose results occupy a large portion of our scientific journals and sports medicine meeting programs. But as this issue of Sports Health demonstrates, progress is being made in the search for the best medical evidence to guide injury prevention programs, reconstructive techniques, rehabilitation efforts, and guidelines for return to sport.^[9] The present study compared the results of Arthroscopically assisted ACL reconstruction using bone- patellar-bone and semitendinous gracilis (STG) tendon grafts.

Forty patients were included in the study. There were 20 patients in the BPTB group and 20 patients in the hamstring group. The mean age in PTB graft people is 29.75 years and in STG graft is 27.75 years. The majority were males 32, and 8 were females. There is a significant difference between the duration of injury and procedure done. More number of Late group (>3 months) had associated injuries.

Manual Lachman and anterior drawer's tests were used for stability testings. There was no difference in the number

Table 1: Number of patients and sex distribution

Gender	Method		Total
	PTB Grafts	STG Grafts	
Male	17	15	32
	85.0%	75.0%	80.0%
Female	3	5	8
	15.0%	25.0%	20.0%
Total	20	20	40
	100.0%	100.0%	100.0%

Table 2: Duration between Injury & Procedure

The duration between	Method		P-value
	PTB Grafts	STG Grafts	
<3 months	15	8	0.025
	75.0%	40.0%	
>=3 Months	5	12	
	25.0%	60.0%	
Total	20	20	
	100.0%	100.0%	

Table 3: Anterior drawer test after 1 year

Anterior Drawer's Translation - 1	Method		Total
	PTB Grafts	STG Grafts	
0-2 mm	15	15	30
	75.0%	75.0%	75.0%
3-5 mm	5	5	10
	25.0%	25.0%	25.0%
Total	20	20	40
	100.0%	100.0%	100.0%

Table 4: Lachman's translation after 2 years

Lachman's Translation - 2 Yr	Method		Total
	PTB Grafts	STG Grafts	
0-2	17	19	36
	85.0%	95.0%	90.0%
3-5	3	1	4
	15.0%	5.0%	10.0%
Total	20	20	40
	100.0%	100.0%	100.0%

and the distribution of grading of instability in both groups. Results of our study clearly showed that both bone-patellar tendon-bone and hamstring tendon grafts could effectively improve knee stability and functions after anterior cruciate

ligament reconstruction. At follow-up evaluation, both groups had similar subjective outcomes.

In a similar study, Corry et al,^[10] found that the two grafts did not differ in terms of clinical stability, range of motion

and general symptoms. The hamstring tendon group also had a lower graft harvest site morbidity.

In the study of arthroscopic anterior cruciate ligament reconstruction with bone-patellar tendon-bone graft. Akgun et al,^[11] found that the best results could be obtained if the reconstruction was done in the subacute period between 3-5 weeks post-injury. The patients in the bone-patellar tendon-bone group would have more desire to return to sports activity or higher functional demand than in the hamstring group, therefore higher expectation. Donor site morbidity is a major drawback of the bone-patellar tendon-bone graft. All patients in the bone-patellar tendon-bone group of the present study had experienced a disturbance of anterior knee sensation which continued for a period of time although it returned to normal within one year of the follow-up period.

Beynnon et al,^[12] found that after three years of follow-up, the objective results of anterior cruciate ligament reconstruction with a bone-patellar tendon-bone were superior to those of reconstruction with a two-strand semitendinosus-gracilis tendon graft about knee laxity, pivot shift grade, and strengths of the knee flexor muscle. However, the two groups had comparable results in terms of patient satisfaction, activity level, and knee functions. Results from our study and these prospective randomized studies were still conflicting but there was a trend toward similar outcomes.

Conclusion

The authors found that the outcome for patients in this study undergoing ACL reconstruction with a hamstring tendon graft did not differ from that of patients with a patellar tendon graft in terms of clinical stability, range of motion, and general symptoms. The hamstring tendon group also had lower graft harvest site morbidity, as demonstrated by less kneeling pain at 1 and 2 years.

References

- Miyasaka KC, Daniel DM, Stone ML. The incidence of knee ligament injuries in the general population. *Am J Knee Surg.* 1991;4:3–8.
- Noyes FR, Bassett RW, Grood ES, Butler DL. Arthroscopy in acute traumatic hemarthrosis of the knee. Incidence of anterior cruciate tears and other injuries. *J Bone Jt Surg.* 1980;62(5):687–695. Available from: <https://dx.doi.org/10.2106/00004623-198062050-00001>.
- Levy IM, Torzilli PA, Warren RF. The effect of medial meniscectomy on anterior-posterior motion of the knee. *J Bone Joint Surg.* 1982;64(6):883–888. Available from: <https://dx.doi.org/10.2106/00004623-198264060-00011>.
- Jomha NM, Pinczewski LA, Clingeleffer A, Otto A. Arthroscopic reconstruction of anterior cruciate ligament with patellar-tendon autograft and interference screw fixation. The results at seven years. *J Bone Joint Surg.* 1999;81(5):775–784. Available from: <https://doi.org/10.1302/0301-620x.81b5.8644>.
- Barrack RL, Bruckner JD, Kneisl J, Inman WS, Alexander AH. The Outcome of Nonoperatively Treated Complete Tears of the Anterior Cruciate Ligament in Active Young Adults. *Clin Orthop Relat Res.* 1990;(259):192–199. Available from: <https://dx.doi.org/10.1097/00003086-199010000-00027>.
- Dye SF, Wojtys EM, Fu FH, Fithian DC, Gillquist J. Factors contributing to function of the knee joint after injury and reconstruction of the anterior cruciate ligament. *Instr Course Lect.* 1999;48:185–198.
- Jorgensen U, Sonne-Holm U, Lauridsen F, Rosenkint A. Long term follow-up of meniscectomy in athletes. *J Bone Joint Surg.* 1987;69(1):80–83. Available from: <https://doi.org/10.1302/0301-620x.69b1.3818740>.
- Ranger C, Klestil T, Gloetzer W, Kemmler G, Benedetto KP. Osteoarthritis After Arthroscopic Partial Meniscectomy. *Am J Sports Med.* 1995;23(2):240–244. Available from: <https://doi.org/10.1177/036354659502300219>.
- Yunes M, Richmond JC, Engels EA, Pinczewski LA. Patellar versus hamstring tendons in anterior cruciate ligament reconstruction. *Arthroscopy.* 2001;17(3):248–257. Available from: <https://dx.doi.org/10.1053/jars.2001.21242>.
- Corry IS, Webb JM, Clingeleffer AJ, Pinczewski LA. Arthroscopic Reconstruction of the Anterior Cruciate Ligament. *Am J Sports Med.* 1999;27(4):444–454. Available from: <https://dx.doi.org/10.1177/03635465990270040701>.
- Akgun I, Ogut T, Kesmeszakar H, Yucel I. Central third bone-patellar tendon-bone arthroscopic anterior cruciate ligament reconstruction: a 4-year follow-up. *J Knee Surg.* 2002;15(4):207–219.
- Beynnon BD, Johnson RJ, Fleming BC, Kannus P, Kaplan M, Samani J, et al. Anterior cruciate ligament replacement: comparison of bone-patellar tendon-bone grafts with two-strand hamstring grafts. A prospective, randomized study. *J Bone Joint Surg Am.* 2002;84(9):1503–1513. Available from: <https://dx.doi.org/10.2106/00004623-200209000-00001>.

Copyright: © the author(s), 2020. It is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits authors to retain ownership of the copyright for their content, and allow anyone to download, reuse, reprint, modify, distribute and/or copy the content as long as the original authors and source are cited.

How to cite this article: Chetan ML, Kumar KG. Arthroscopically Assisted Anterior Cruciate Ligament Reconstruction: Comparison of Bone-Patellar Tendon-Bone Versus Semitendinosus Gracilis Autograft. *Asian J. Med. Res.* 2020;9(4):16-19.

DOI: [dx.doi.org/10.47009/ajmr.2020.9.4.OR4](https://doi.org/10.47009/ajmr.2020.9.4.OR4)

Source of Support: Nil, **Conflict of Interest:** None declared.