

To study the clinical and functional outcome of single bundle arthroscopic ACL reconstruction using autologous hamstring tendon graft

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Received: 17-11-2025 / Revised: 23-12-2025 / Accepted: 19-01-2026

DOI: <https://doi.org/10.32553/ijmbs.v10i1.3280>

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Conflict of interest: No conflict of interest

Abstract:

Objective: To study the clinical and functional outcome of single bundle arthroscopic ACL reconstruction using autologous hamstring tendon graft.

Methods: A randomised prospective trial was conducted in 40 patients of ACL tear, in the age group 20-45 years. After selection of the patients, pre-operative clinical scoring was done. All patients were taken for single bundle ACL reconstruction using autogenous hamstring quadrupled graft fixing with adjustable loop and bio-interference screw. Preoperative and postoperative Clinical assessment was done by using Lysholm Gillquist score and IKDC score.

Results: It was observed that the mean Lysholm score at pre-operatively was 79.38 ± 11.32 . At 2 weeks the Lysholm score declined to 39.00 ± 5.93 and then it gradually increased to 89.62 ± 8.90 at 24 weeks. Further, it was observed that there was a significant mean difference in lysholm score across various time points (p value of <0.001). The mean IKDC score at pre-operatively was 56.70 ± 12.27 . At 2 weeks the IKDC score declined to 33.03 ± 4.22 and then gradually increased to 88.99 ± 6.50 at 24 weeks.

Conclusion: Single bundle arthroscopic ACL reconstruction using autologous hamstring tendon graft provides a good functional result in young active adults. Arthroscopic ACL reconstruction using adjustable loop endobutton and bio-absorbable interference screw at tibial end gives excellent result with minor complications.

Keywords: Lysholm Gillquist score, IKDC, Endobutton, Interference screw, Arthroscopic ACL reconstruction.

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Introduction

Anterior cruciate ligament (ACL) injury remains a common orthopaedic problem with an annual incidence of approximately 95,000 cases a year and some 50,000 of

these knees are reconstructed annually. The prevalence of ACL injuries in the general population has estimated about 1 case in 3,500 people. ACL injury in the children or

the elderly is less common and comprises of less than 5% of total cases and they are usually treated conservatively.[1] The female: male ACL tear ratio has been reported to be as high as 9:1. The majority of ACL injuries are sustained in sports activities, with basketball, soccer, and skiing predominating in noncontact injuries. Contact injuries are frequently described in football players. The true incidence of ACL injuries is not known, as many patients sustaining injuries are unaware of the severity of the injury and may not seek medical attention initially.[2] Diagnosis mainly rely on history, clinical examination, Lachman test, dynamic extension test, and Pivot shift test, X Rays, MRI (accuracy 95%to 100%), and diagnostic arthroscopy. Lachman test is the most sensitive test (95% sensitivity) among the clinical tests. [3,4] Once the diagnosis of ruptured ACL is made, management can be divided into conservative and surgical. Correct choice of treatment depends on assessment of three patient factors: Age, Functional disability and Functional requirements. During the last 20 years the majority of published articles have agreed that operative reconstruction is the accepted method to treat the ACL rupture. Surgical options are: Extra-articular (Iliotibial Band Tenodesis) or Intra-articular. In Intra-articular further two types: Interference fixation (interference screws, staples, washers, and cross pins) and Cortical fixation (endobutton, transfix, Tight Rope). Each of the techniques has its advantages and pitfalls.[5] Graft used may be Autograft (bone–patellar tendon–bone graft, the quadrupled hamstring tendon graft, quadriceps and tendoachillis), Allograft and Synthetic. Among these bone–patellar tendon–bone graft and the quadrupled hamstring tendon graft most commonly used. Method of graft placement may be single bundle or double bundle.[6] We conducted a simple randomized prospective study to analyse the clinical and functional outcome of single bundle arthroscopic ACL reconstruction using autologous hamstring tendon graft.

Material and Methods

After obtaining written informed consent, a randomised prospective trial was conducted in 40 patients of ACL tear, in the age group 20-45 years. After selection of the patients, pre-operative clinical scoring was done. All patients were taken for single bundle ACL reconstruction using autogenous hamstring quadruple graft fixing with adjustable loop endobutton and bio-interference screw. Postoperatively all patients undergone standard physiotherapy protocol and then followed upto 6 months. Follow up was done at 2 weeks, 8 weeks, 12 weeks and 24 weeks. Clinical assessment was done by using Lysholm Gillquist score and IKDC score. **Patients included were those with** age group between 20-45 years of both sexes without pre-existing arthritis in the knee joint with clinical and radiological evidence of ACL tear with or without associated menisci injury. **Patients excluded were those with** bilateral anterior cruciate ligament tears, multi ligamentous injury of knee, severe co morbidities, previously operated knee and other systemic diseases like diabetes mellitus and hypertension.

Graft Harvest: A longitudinal incision 2.5-3 cm was made starting from tibial tuberosity about 1 finger width medial to it and going distally parallel to the anterior tibial crest. With blunt dissection the sartorius fascia was exposed and incised transversely between the gracilis and semitendinosus tendon. Through this incision the gracilis tendon was scooped out using forcep. The insertion of gracilis tendon to the bone was excised, the distal cut end was pulled firmly and at the same time closed ended tendon stripper was used to strip the tendon and cut at the musculotendinous junction. The same procedure was repeated to harvest the semitendinosus tendon.

Graft Preparation: Graft was prepared by removing all the muscle tissue from the tendons and then whip stitching the ends of the tendons by no-5 ethibond suture. The tendons were than double looped to form a fourfold tendon construct and its length was

measured. Usually, 8 mm or more thickness was taken for ACL reconstruction. The graft was then looped around the adjustable

loop endobutton. The length of the graft was taken as 12cm from the endobutton to the end of graft.



Photo: 1 Graft preparation

Photo: 2 Graft harvesting

Photo: 3 Instruments

Statistical Analysis

- The data was entered into a Microsoft Excel and analysed using statistical software SPSS (version 22).
- Categorical variables were analysed using Chi square test.
- Normally distributed variables were analysed using the student-t test.
- Analysis of variance (ANOVA) was used for demographic data.

- P value <0.05 was considered as statistically significant.

Results

Age Distribution

In this study age of the patients ranges from 20-45 years. More than 50% of patients belong to 20-25 years age group. Age distribution of patients is shown in table-1.

Table-1: Age distribution of patients

Age Groups	Frequency	%
20 - 25 years	23	57.5%
26 - 30 years	7	17.5%
31 - 35 years	6	15.0%
36 - 40 years	4	10.0%
Total	40	100%

The mean age of males undergoing surgery was 26.75±5.95 years whereas the mean age of females was found to be 25.25±7.27 years respectively.

Sex Distribution

Out of 40 patients in the present study 36 (90%) were males and 4(10%) were females as shown in table-2.

Table -2: Sex distribution

Sex	Frequency	%
F	4	10.0%
M	36	90.0%
Total	40	100%

Joint Affected

In the present study, right side was involved in 26(65%) patients and on the left side in 14(35%) patients as shown in table-3.

Table -3: Joint affected

Knee	Frequency	%
Left	14	35.0%
Right	26	65.0%
Total	40	100%

On comparing the knee joint involved in different sex, right knee was involved more in males as compared to females.

Functional Evaluations

Lysholm knee score

It was observed that the mean Lysholm score pre-operatively was 79.38 ± 11.32 . At

two weeks the Lysholm score declined to 39.00 ± 5.93 and then it increased to 62.32 ± 7.50 at 8 weeks and then gradually increased to 89.62 ± 8.90 at 24 weeks. Further, it was observed that there was a significant mean difference in Lysholm score across various time points (p value of <0.001) as shown in table 5.

Table-4

Lysholm score	N	Mean \pm SD	Median	Min – Max
Pre-operative	40	79.38 ± 11.32	82.00	54 – 94
2 Weeks	40	39.00 ± 5.93	38.00	30 – 56
8 Weeks	38	62.32 ± 7.50	62.50	40 – 74
12 Weeks	34	84.09 ± 11.00	86.00	44 – 95
24 Weeks	30	89.62 ± 8.90	91.50	62 – 97

Further it was observed that when the mean difference of Lysholm score was compared between pre-operatively and other time points there was a fall in the score initially

at 2 weeks by 40.045 and by 16.818 at 8 weeks. However, it increased by 6.318 at 12 weeks and 11.182 at 24 weeks.

Table-5

Lysholm score	Lysholm score	Mean Difference	Std. Error	p value
Pre-operatively	2 weeks	40.045*	3.121	<0.001
	8 weeks	16.818*	2.648	<0.001
	12 weeks	-6.318	2.263	0.164
	24 weeks	-11.182*	2.228	0.001
2 weeks	8 weeks	-23.227*	1.947	<0.001
	12 weeks	-46.364*	2.318	<0.001
	24 weeks	-51.227*	2.044	<0.001
8 weeks	12 weeks	-23.136*	1.679	<0.001
	24 weeks	-28.000*	1.489	<0.001
12 weeks	24 weeks	-4.864*	0.864	<0.001

Interpretation

Table -6

Score	Outcome	Patients
98-100	Excellent	0
93-97	Good to excellent	14
82-92	Fair to good	11
66-81	Fair	3
≤65	Poor	2

(n=30)

IKDC score

It was observed that pre-operatively the mean IKDC score was 56.70 ± 12.27 . Post-operatively at 2 weeks the IKDC score

declined to 33.03 ± 4.22 and then it increased to 64.71 ± 9.91 at 8 weeks, 75.246 ± 12.71 at 12 weeks and 85.06 ± 9.35 at 24 weeks which was statistically significant (p value of <0.001).

Table -7: IKDC score

IKDC Score	N	Mean \pm SD	Median	Min – Max
Pre-operatively	40	56.703 ± 12.27	53.95	35.6 - 82.7
2 Weeks	40	33.033 ± 4.22	32.10	25.2 - 41.3
8 Weeks	38	64.713 ± 9.91	64.30	35.6 - 82.7
12 Weeks	34	75.246 ± 12.71	78.70	35.6 - 91.9
24 Weeks	30	85.06 ± 9.35	86.20	57.4 - 96.5

Further it was observed that when the mean difference of IKDC score was compared between pre-operatively and other time points there was a fall in the score initially at 2 weeks by 22.850 and by 7.891 at 8

weeks. However, it increased by 19.864 at 12 weeks and 29.632 at 24 weeks which was statistically significant (p value <0.001).

Table-8: comparison of IKDC score with different time points

IKDC	Lysholm score	Mean Difference	Std. Error	p value
Pre-operatively	2 weeks	22.850*	2.287	<0.001
	8 weeks	7.891	2.604	0.095
	12 weeks	-19.864*	2.721	<0.001
	24 weeks	-29.632*	3.279	<0.001
2 weeks	8 weeks	-30.741*	1.541	<0.001
	12 weeks	-42.714*	1.96	<0.001
	24 weeks	-52.482*	1.829	<0.001
8 weeks	12 weeks	-11.973*	1.374	<0.001
	24 weeks	-21.741*	1.49	<0.001
12 weeks	24 weeks	-9.768*	1.567	<0.001

Interpretation

Table-9

IKDC score	Preoperative	Post-operative (24 weeks)
A	0	3
B	4	22
C	19	3
D	7	2

(n=30)

A= normal outcome

B= near normal outcome

C= abnormal outcome

D= severely abnormal outcome

Discussion

The study was conducted at Indira Gandhi Institute of Medical Sciences, Patna. Total 40 patients were included in this study who fulfilled our inclusion criteria, out of which 10 patients lost during follow up. The purpose of the study was to assess the clinical and functional outcome of single bundle arthroscopic ACL reconstruction using autologous hamstring tendon graft. The age group of the patients in this study was between 20-45 years and maximum number of patients belongs to age group between 20-25 years (23 out of 40 patients). The mean age of male patients was 26.75(\pm 5.95) years and the mean age of female patients was found to be 25.25(\pm 7.27) years respectively.[7, 8, 9] Kochhal Net al conducted a study and found that patients falling in the age group of 16-25 years of age, are more prone to have ACL injuries followed by age group of 25-35 years.[7] The number of male patients in this study was 36 and that of female patients was 4. The dominance of male patient may be due to the fact that males are more active in sports and outdoor activity in our country.[10]

In the present study left knee was involved in 14 (35%) patients and it was common in female patients whereas right knee was involved in 26 (65%) patients and it was more common in male patients. The most

common mode of injury was road side accident followed by sports injury.[11] The choice of graft is a topic of debate but hamstring graft is preferred now a days. The advantage of using hamstring graft for using arthroscopic ACL reconstruction includes reduced incidence of anterior knee pain, decreased surgical site morbidity and decreased occurrence of patellofemoral adhesions. Functional outcome in this study was assessed by using Lysholm knee score and IKDC score. It was observed that the pre-operative mean Lysholm score was 79.38 \pm 11.32. At two weeks the Lysholm score declined to 39.00 \pm 5.93 and then it increased to 62.32 \pm 7.50 at 8 weeks and then gradually increased to 89.62 \pm 8.90 at 24 weeks. Further, it was observed that there was a significant mean difference in Lysholm score across various time points (p value of <0.001) as shown in table 5. Similar results have been shown in the studies done by Shaikh et al, Morey et al and Megahed R et al. [12,13,14] After 24 weeks of follow up, out of 30 patients 14 patients showed good to excellent outcome, 11 patients showed fair to good outcome, 3 patients showed fair outcome and 2 patients showed poor outcome as shown in table 6. Megahed R et al in their study showed that total LYSHOLM score improved significantly from 54.33 \pm 14.04 to 94.37 \pm 8.14. [14] It was observed that pre-operatively the mean IKDC score was 56.70 \pm 12.27. Post-operatively at 2 weeks the IKDC score declined to 33.03 \pm 4.22 and then it increased to 64.71 \pm 9.91 at 8 weeks, 75.246 \pm 12.71 at 12 weeks and 85.06 \pm 9.35 at 24 weeks which was statistically significant (p value of <0.001). After 24 weeks of follow up the 3 patients showed normal outcome, 22

patients showed near normal outcome, 3 patients showed abnormal outcome and 2 patients showed severely abnormal outcome as mentioned in table 9. Similar results have been shown in the studies done by Hussein M et al and Gundavarapu A et al.[15,16] Gundavarapu A et al in his study found that the mean preoperative IKDC score was 44.53 ± 3.630 SD and post-operative mean score was 88.53 ± 3.994 SD with significant p value < 0.01 . [16] Two patients developed complication in our study. One patient developed common peroneal nerve palsy in the post-operative period which was managed conservatively. Another patient developed knee stiffness in the post-operative period due to poor compliance and he was managed by knee manipulation under general anaesthesia followed by physiotherapy. [17] So from the above observation we can conclude that arthroscopic reconstruction of ACL is an excellent treatment option. In young patient's autologous hamstring tendon graft for ACL reconstruction gives a good result. Hamstring tendon graft fixation using adjustable loop endobutton and bio-interference screw gives a good functional outcome. ACL rehabilitation protocol for regaining hamstring power is essential for the success of ACL reconstruction surgery to achieve good functional outcome. [18]

Conclusion: Single bundle arthroscopic ACL reconstruction using autologous hamstring tendon graft provides a good functional result in young active adults. Arthroscopic ACL reconstruction using adjustable loop endobutton and bio-absorbable interference screw at tibial end gives excellent result with minor complications.

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