



EVALUATION OF THE RESULTS OF ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING HAMSTRING TENDON GRAFT

Orthopaedics

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ABSTRACT

INTRODUCTION:- This study was conducted to evaluate the Functional Outcome Of Arthroscopic Reconstruction using fourfold hamstring autograft in persons with ACL tear.

METHOD:- This study is a prospective study conducted in our hospital. Total 27 patients with clinical/radiological/arthroscopic evidence of ACL deficiency were treated with fourfold hamstring graft and evaluated immediate postop with clinical test & compared with preop clinical test grading. The postop results at 6 month follow up evaluated with using IKDC & LYSHOLM score.

RESULTS:- The results for manual knee laxity test were evaluated statistically before & after ACL reconstruction, using the paired T test at 5% level of significance, the results were found to be significant. The results of the mean of pre operative Lachman test was $2.86 + 0.36$ SD and post operative lachman test has mean $0.55 + 0.75$ SD with significant p value 0.001, similarly the mean preoperative Pivot Shift Test (PST) was $2.03 + 0.70$ SD and post operative was $0.22 + 0.50$ with significant p value < 0.001 . Results of ACL reconstruction after 6 months of follow up were evaluated and showed excellent results in 7(25.9%) cases, good results in 15(55.5%) cases, fair results in 4(14.8%) cases and poor results in 1(3.7%) cases, according to Lysholm score. Mean Lysholm score postoperatively was 88.37. The mean subjective IKDC after 6 month follow up was 82.16. 85.5% (23) cases of isolated ACL tear had normal and near normal knee, according to IKDC scoring system. only 1 case had graft failure due to migration of endobutton in femoral tunnel.

CONCLUSION:- This subjective study suggesting that ACL reconstruction with quadrupled hamstring graft fixed with endobutton in the femoral tunnel and bio- interference screw in the tibia is a reliable, effective and reproducible technique but more quantitative and long term studies are required.

KEYWORDS

ACL, Hamstring graft, IKDC Score, Lysholm Score

Introduction.

The knee joint is frequently involved in sports injuries, vehicular accidents and during daily living activities. Anterior cruciate ligament (ACL) is a very commonly involved ligament in these injuries

The ACL is an important restraint to anterior tibial translation and tibial rotation and contributes to the overall stability of the knee (2-4). Subjects with ACL injury demonstrate knee instability and an increase in anterior tibia translation. If an ACL insufficiency remains untreated, meniscal tear and cartilaginous damage of the joint may secondarily occur (4, 5). Therefore, ACL reconstruction is generally recommended for active younger people to restore joint stability and prevent secondary arthritis. Arthroscopic-assisted reconstruction of the anterior cruciate ligament (ACL) using hamstring grafts is a well known and widely accepted surgical procedure. The semitendinosus and Gracilis tendon (STG) is found to be a very good auto graft donor material.

The goal of the surgical treatment is to restore knee stability while allowing the patient to return to his preinjury activity levels. Patients who are unwilling to modify their active lifestyle should be considered for surgical intervention. Obtaining the normal range of motion and regaining strength equal to uninjured leg are important.

The present study is designed to analyze the post-operative outcome of arthroscopic ACL with quadrupled hamstring auto graft fixed with endobutton in the femoral side and interference screw in the tibial tunnel

AIMS AND OBJECTIVES

To assess the effectiveness and functional outcome of arthroscopic ACL reconstruction with quadrupled hamstring auto graft.

MATERIALS AND METHOD

The prospective study is conducted in Department of orthopaedics, Mahatma Gandhi Hospital attached to Dr. S. N. Medical College and associated group of hospitals, Jodhpur from August 2013 to December 2015 in All young and middle aged patients presenting with unilateral knee complaints and history of trauma to the knee. They were evaluated by a thorough general and local clinical examination of the knee. Young and middle aged, active, motivated patients, unwilling to change their active life style with a normal contra lateral knee with Clinical / radiological / arthroscopic evidence of anterior cruciate ligament deficiency were included in the study. Patients with bilateral ACL tear, any other associated ligament injuries of the knee, who are skeletally immature, with advanced degenerative changes in the knee were excluded from the study.

The uninjured knee is examined first to establish reference values after which the affected knee is examined. Lachman test, Anterior drawer test (8) and Lateral pivot shift manoeuvre (7) was performed to diagnose ACL deficiency. These are recorded as +, ++, +++ (if positive) and - (if negative). Injuries to the associated structures were assessed by performing the Valgus / Varus stress test (for collateral ligaments), McMurray's test (for menisci), Posterior drawer test (for posterior cruciate ligament), Reverse pivot shift test (for Posterolateral complex).

Routine skiagram of both knees in standing position in antero-posterior view and lateral view of the affected knee were taken and lateral view in 45° of flexion of the affected knee was also done. MRI of the knee was done in cases with equivocal clinical findings. Diagnostic arthroscopic examination of the knees was used as last resort for patients with negative or equivocal clinical and radiological findings but consistent symptoms suggesting anterior cruciate ligament deficiency. Each patient was evaluated using the IKDC scale

(20) and Lysholm score (19).

OBSERVATION & RESULTS

The present study was done to evaluate the functional outcome of arthroscopic reconstruction using fourfold hamstring auto graft in 27 persons with ACL tear. Standard arthroscopic technique was used for ACL reconstruction. Anatomical tibial and femoral tunnel were made and four fold hamstring graft was secured with the help of endobutton at femoral side and interference screw on the tibial side.

In our study 26 patients were male (97%) & 1 patient was female(3%), 11 cases (40.7%) of ACL tear injury were due to sporting and training activity, while vehicular accidents(25.9%) and daily activities comprised 33.3% of the patients.

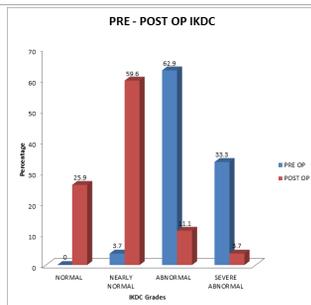
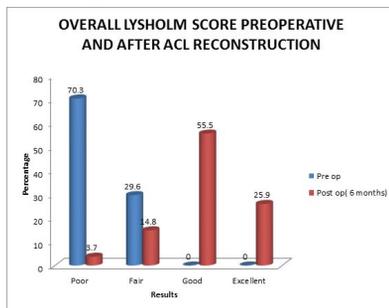
A Total of 51.8% (14 cases) patients had associated injuries usually the meniscal tear (9cases). Isolated medial meniscal tear were found in 25.9 % (7 cases) while isolated lateral meniscus tear were found in 7.4 % (2 patients) of cases. Combined medial and lateral meniscus tear were found in 7.4 % (2 cases). Grade I medial collateral tear was found in 1 patient and lateral collateral tears were found in one patient & bone contusion was found in 1 patient. There were 48% (13 cases) with isolated tears of the anterior cruciate ligament.

Results of ACL reconstruction were 55.55% (15 cases) were negative Lachman test, 59.2 % (16 cases) were negative for Anterior Drawer Test, 81.4% (22 cases) were negative Pivot shift test, results were 37.3% (10 cases) + positive for Lachman test, 33.3% (9 cases) were + positive Anterior Drawer Test, 4 cases (14.8%) were + positive Pivot shift test and results were one case (3.7%) was ++ positive Lachman test ,one case was ++ positive and another one was +++ Anterior Drawer Test, one case (3.7 %) was ++ positive Pivot shift test. There was one case of severe instability in our series with +++ positive for Lachman test, Anterior drawer test and ++ Pivot shift test as shown in Table

The results for manual knee laxity test were evaluated statistically before & after ACL reconstruction , using the paired T test at 5% level of significance, the results were found to be significant. The results of the mean of pre operative Lachman test was 2.86 + 0.36 SD and post operative lachman test has mean 0.55 + 0.75 SD with significant p value 0.001, similarly the mean preoperative PST was 2.03 + 0.70 SD and post operative was 0.22 + 0.50 with significant p value < 0.001

Results of ACL reconstruction after 6 months of follow up were evaluated and showed excellent results in 7(25.9%) cases, good results in 15(55.5%) cases, fair results in 4(14.8%) cases and poor results in 1(3.7%) cases, according to Lysholm score. Mean Lysholm score postoperatively was 88.37.

85.5% (23) cases of isolated ACL tear had normal and near normal knee, according to IKDC scoring system. The mean subjective IKDC after 6 month follow up was 82.16.



COMPLICATIONS.

22.2% (6 cases) had knee pain, 18.5% (5 cases) had difficulty in regaining full range of motion, 7.4% (2 cases) had superficial stitch line infection, 22.2% (6 cases) had sensory loss over knee, 3.7% (1 case) had graft failure due to migration of endobutton in femoral tunnel.

DISCUSSION

More and more cases of ACL tear are being diagnosed now days due to the increasing participation of people in sports, increasing vehicular accidents and due to the increasing role of arthroscopy and MRI (magnetic resonance imaging) as a diagnostic tool.

The ACL injury is not only immediately problematic because of functional instability but it is the source of long term complications such as meniscus tears, failure of secondary stabilizers and early onset of osteoarthritis. Reconstruction of the ACL allows patients to resume their active life style and can delay the onset of osteoarthritis.

Most common associated injury in our study was medial meniscal (26%) injury followed by lateral meniscus injury (7.4%) which is in accordance with meta analysis of Lewis et al in which the most common injury was medial meniscus injury (39%).Robert et al¹¹ also had medial meniscus (27.02%) as most common associated injury.

TABLE:-1 ASSOCIATED INJURIES

Most common Assoc. Injuries	Lewis et al ¹⁰	H. Robert et al ¹¹	Present study
Medial meniscus	39%	27.02%	26%
Lateral meniscus	34%	22.9%	7.4%
Lateral + medial meniscus	2%	8	7.4%

In our present study results for ACL reconstruction for Lachman test were 55.55% (15 cases) negative, 40.7% (11 cases) + positive and one case (3.7%) was ++ positive and one case showed +++ positive which is in accordance with Lewis et al meta analysis study in which 59% were -ve , 36.9% were +, and 2.87% showed ++. While our results are equivalent with Lewis et al¹⁰, however, in comparison with the studies of Nikolaus et al⁹ which had 80% -ve, 17% + and 3% ++ And Robert et al¹¹ which had 83% -ve, 14% +ve and 3% ++, our results showed greater anterior laxity.

In our study Results of Pivot shift test were 81.4% (22 cases) were negative, 4 cases (14.8%) were + positive and two cases (7.4 %) was ++ positive which are comparable with Lewis et al¹⁰ (80 % -ve), Nikolaus et al⁹ (90% -ve) and Robert et al¹¹ (84% -ve).

While results of the present study and Lewis et al for anterior laxity were almost equivalent they are poor when compared with results of Robert et al¹¹ and Nikolaus et al⁹. However results of the present study for Pivot shift are equivalent with other three studies.

TABLE;-2 RESULTS OF KNEE LAXITY TEST

Author	LACHMAN TEST				PIVOT SHIFT			
	-VE	+	++	+++	-VE	+	++	+++
Lewis et al ¹⁴⁰	59%	36.9%	2.87%	1%	80%	15%	3.8%	1.2%
Nikolaus et al ¹³⁹	80%	17%	3%	0%	90%	10%	0%	0%
Robert et al ¹⁴¹	83%	14%	3%	0%	84%	14%	2%	0%
Present study	55.5%	37.3%	3.7%	3.7%	81.4 %	14.8 %	3.7%	0%

One important finding of our study was the influence of rotational stability on the incidence of the functional subjective outcome. Patients having a negative pivot shift test showed better functional assessment scores. This is in line with the results published by Jonsson et al¹⁷ and others¹⁸ who suggested a positive pivot shift test as a predictor of later osteoarthritis based on the results of long term radiographic evaluations. Also Kocher et al. reported a significant relationship between the pivot shift test grades and patient satisfaction, whereas anterior posterior laxity did not influence the patient subjective assessment two years postoperatively.¹⁴

In view of these observations it seems to be clear that one of the main targets of any outcome evaluation of ACL treatment should be the precise documentation of transverse plane rotatory stability.

In the present study the mean postoperative Lysholm score was 88.37 which is in accordance with the mean Lysholm score of >85 of Lewis et al¹⁰ and 91 Seo SS et al¹³, and inferior to Siebold et al¹² (93), Nikolaus et al¹⁰ (93.2), Suture disc and H. Roberta et al¹¹ (94). However, this result is seen only 6 months after surgery and may not be indicative of the final outcome of the patient after 1 year. Hence, we may have to read the result cautiously.

In the present study 85.18% cases of ACL tear reported their knees as normal or near normal after reconstruction which is superior as compared with the 74% of H. Roberta et al¹¹ and 79% of Lewis et al¹⁰. Our results are comparable to the results of Sieh KM¹⁵ 86.7% and inferior when compared with 92% of Siebold et al¹².

In the present study the subjective IKDC score is 82.16% which is in accordance with the 83.6% of Sieh KM¹⁵, 83% of Charlton WPH et al¹⁶ and 87% of Seo SS et al¹³. Our score is lower when compared with the mean IKDC scores of Siebold et al¹² which is 90% and 92% of H. Roberta et al¹¹.

Short period of follow up (6 months) and non adherence to the proper physiotherapy schedule by some patients can be the reason of lower functional scores when compared with other studies

TABLE-3: LYSHOLM SCORE, OBJECTIVE IKDC SCORE, SUBJECTIVE IKDC SCORE AFTER ACL RECONSTRUCTION

Authors	Mean Subjective IKDC score	Mean Objective IKDC Score	Mean Lysholm score
Siebold et al ¹² (hamstring, endobuton.)	90 (57-100)	92%	93
H. Roberta et al ¹¹ (Hamstring, Tape locking screw)	92	74% (31+43)	94
Sieh KM ¹⁵ (Hamstring, Transfix and Interference screw)	83.615.3	86.7%(56.7+30)	—
Charlton WPH et al ¹⁶ (hamstring, bioscrew)	83	—	—
Seo SS et al ¹³ (Hamstring, Intrafix and a 4.0 mm AO cortical screw)	87.012.3	—	91.2
Lewis et al ¹⁰ (meta-analysis)	—	79%(35+44)	>85
Nikolaus et al ⁹ (Hamstring endobuton, Suture disc)	—	—	93.2
Present study (hamstring, endobuton interference screw)	82.16	85.18%(25.9+59.6)	88.37

CONCLUSIONS:

This subjective study suggest the most of patient undergoing arthroscopic ACL reconstruction were satisfied with results and statistical analysis comparing the preoperative and post operative lysholm and IKDC scores were highly significant suggesting that ACL reconstruction with quadrupled hamstring filled with endobuton in the femoral tunnel and bio- interference screw in the tibial is a reliable, effective and reproducible technique but more quantitative and long term studies are required.

The statistically analysis comparing the preoperative and post operative Anterior drawer test and pivot shift test were highly significant suggesting that ACL reconstruction with quadrupled hamstring auto graft provides anterior and rotational stability. Limitations of this study were that it was the short period study and small numbers of patients were included

REFERENCES

1. Azar FM, Arthur ST. Complications of anterior cruciate ligament reconstruction. *Tech Knee Surg* 2004; 3:238-250.
2. Butler DL, Noyes FR, Grood ES (1980) Ligamentous restraints to anterior-posterior drawer in the human knee. *J Bone Joint Surg Am* 62:259-270.
3. Markolf KL, Mensch JS, Amstutz HC (1976) Stiffness and laxity of the knee; the contribution of the supporting structures. *J Bone Joint Surg Am* 58:583-593.
4. Karlson JA, Steiner ME, Brown C, Johnston J (1994) Anterior cruciate ligament reconstruction using gracilis and semitendinosus tendons. Comparison of through-the-condyle and over-the-top graft placements. *Am J Sports Med* 22:659-666.
5. Fowler PJ, Regan WD (1987) The patient with symptomatic chronic anterior cruciate ligament insufficiency: results of minimal arthroscopic surgery and rehabilitation. *Am J Sports Med* 15:321-325.
6. Noyes FR, Maaor PA, Mathews DS, Butler DL (1983) The symptomatic anterior cruciate-deficient knee. Part I. The long-term functional disability in athletically active

- individuals. *J Bone Joint Surg Am* 65:154-162.
7. Galway RD, Beaupre A, MacIntosh DL. Pivot shift: a clinical sign of symptomatic anterior cruciate insufficiency. In: *Proceedings of the Canadian Orthopaedic Association. J Bone Joint Surg Br.* 1972; 54:763-764.
8. Losee RE, Johnson TR, Southwick WO. Anterior subluxation of the lateral tibial plateau. A diagnostic test and operative repair. *J Bone Joint Surg Am.* 1978; 60:1015-1030.
9. Nikolaus A, Streich & Sebastian Reichenbacher & Alexander Barrié & Matthias Buchner & Holger Schmitz: Long-term outcome of anterior cruciate ligament reconstruction with an autologous four-strand semitendinosus tendon autograft. *International Orthopaedics (SICOT)* (2013) 37:279–284
10. Lewis PB, Parameswaran D, Rue JP, Bach BR. Systematic review of single bundle ACL reconstruction outcomes. *Am J Sports Med* 2008;10:2028-36.
11. H. Robert, R. Limozin, T. de Poligna: Single bundle reconstruction of the anterior cruciate ligament with four strands of the semitendinosus using the TLS technique. Clinical results of a series of 74 knees with a minimum of 18 months follow-up. *Revue de chirurgie orthopédique et traumatologique* (2011)
12. Siebold R, Dehler C, Ellert T. Prospective randomized comparison of double bundle versus single bundle anterior cruciate ligament reconstruction. *J Arth Related Sug* 2008; 24: 137-45.
13. Seo SS, Kim CW, Nam TS, Choi SY. ACL Reconstruction with Autologous Hamstring Tendon: Comparison of Short Term Clinical Results between Rigid-fix and PINN-ACL Cross Pin. *Knee Surg Relat Res.* 2011; 23:208–12
14. Kocher MS, Steadman JR, Briggs KK, Sterett WI, Hawkins RJ (2004) Relationships between objective assessment of ligament stability and subjective assessment of symptoms and function after anterior cruciate ligament reconstruction. *Am J Sports Med* 32 (3):629–634
15. Sieh KM, Poon YH, Wong YK, Kan KK Hong Kong: short-term results for anterior cruciate ligament reconstruction using autologous hamstring graft with the cross-pin femoral fixation technique. *Journal of Orthopaedic Surgery* 2003;7(1):33-42.
16. Charlton WP, Randolph DA, Jr, Lemos S, Shields CL., Jr Clinical outcome of anterior cruciate ligament reconstruction with quadrupled hamstring tendon graft and bioabsorbable interference screw fixation. *Am J Sports Med.* 2003; 31:518–521.
17. Jonsson H, Riklund-Ahlstrom K, Lind J (2004) Positive pivot shift after ACL reconstruction predicts later osteoarthritis: 63 patients followed 5–9 years after surgery. *Acta Orthop Scand* 75(5):594–599
18. Streich NA, Zimmermann D, Bode G, Schmitt H (2011) Reconstructive versus non-reconstructive treatment of anterior cruciate ligament insufficiency. A retrospective matched-pair long-term follow-up. *Intern Orthop* 35:607–613.
19. Briggs KK, Lysholm J, Tegner Y, Rodkey WG, Kocher MS, Steadman JR. The Reliability, Validity, and Responsiveness of the Lysholm Score and Tegner Activity Scale for Anterior Cruciate Ligament Injuries of the Knee. *The American Journal of Sports Medicine.* 2009; 37: 890-897.
20. Irrgang Ho H, Harner CD, Fu FH. Use of the International Knee Documentation Committee guidelines to assess outcome following anterior cruciate ligament reconstruction. *Knee Surg. Sports Traumatol, Arthrosc.* 1998; 6: 107-114..