

## ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: A COMPARISON BETWEEN BONE PATELLAR TENDON BONE GRAFT AND LIPSCOMB PROCEDURE - A FOLLOWUP STUDY OF 7 YEARS

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### ABSTRACT

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#### BACKGROUND

Anterior Cruciate Ligament injury has become more common and the demand by the patients to return to pre-injury level of activity has made reconstruction of the ligament very crucial. Though there are various techniques in reconstructing the anterior cruciate ligament, in this study, we compare two most commonly used techniques to see whether there is any significant difference in the outcome.

#### METHODS

Study included 25 patients in the age group of 19-36 years, of which 23 were males. The patients were divided randomly into 2 groups, and 15 patients underwent Anterior Cruciate Ligament reconstruction using Bone Patellar Tendon Bone Graft and 10 patients had Hamstring graft.

#### RESULTS

Patients were followed up at regular intervals monthly for the first six months and then at three monthly intervals. Patients were assessed using Knee Scoring Scale of Lysholm and Gillquist and International Knee Documentation Committee (IKDC) scoring system. In addition, activity level, harvest site pain, thigh atrophy, kneeling pain and hamstring pain were assessed. All patients were followed up for a minimum period of 2 years. 20% of both groups were able to return to strenuous activity level, and 67% of Patellar tendon group and 50% of the Hamstring tendon group were able to return to moderate level of activity. 55% of patients in the patellar tendon group and 20% of patients in the hamstring tendon group had donor site pain in the first 6 months. 73% of patients in the hamstring group had at least 10 mm of thigh wasting. Pain on kneeling was seen only in the patellar tendon group (35%) while hamstring pain was found only in the hamstring group (20%).

#### CONCLUSIONS

Patients in the patellar tendon group had increased anterior stability and were able to return to strenuous occupation. The difference in thigh atrophy between the two groups was not significant. The hamstring group had lower graft harvest site morbidity. Lachman test was the single most accurate test in diagnosing Anterior Cruciate Ligament injuries.

#### KEYWORDS

Anterior Cruciate Ligament, Bone Patellar Tendon Bone Graft, Hamstring Graft.

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**INTRODUCTION:** Very few subjects in contemporary orthopaedics has evoked as much thought and controversy as that of when and how to optimally reconstruct the Anterior Cruciate Ligament of the knee. Of the many techniques described for Anterior Cruciate Ligament, reconstruction autografts of hamstring tendon or patellar tendon are practiced by most surgeons.<sup>1,2,3</sup> Open and arthroscopic techniques of repair has been compared but has not shown significant difference in outcome in the long term followup studies.<sup>4,5,6</sup>

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**AIM OF STUDY:** To evaluate and compare the two techniques of Anterior Cruciate Ligament reconstruction, the Lipscomb procedure using semitendinosus and gracilis tendon as grafts and the Modified Jones procedure using the bone patellar tendon bone graft<sup>7</sup>. The operative time, post-operative knee scores, level of activity, harvest site pain, thigh atrophy, kneeling pain, and hamstring pain were assessed.

**MATERIALS AND METHODS:** This study was conducted at the Department of Orthopaedics, Aster Medcity, Kochi. Study included 25 patients in the age group of 19-36 years, of which 23 were males. All had complete rupture of Anterior Cruciate Ligament with or without associated other ligament and meniscal injuries. 9 patients had associated medial meniscal injury, 3 had associated Medial Collateral Ligament Injury and 2 had all the three injuries.

All patients were initially treated conservatively with knee immobilisation. Clinically, Anterior Cruciate Ligament rupture was diagnosed by Lachman test, Anterior Drawer test, Slocum’s Anterior Drawer test, Jerk test of Hughston and Pivot Shift test of McIntosh. The average time of 7 weeks from initial trauma was given before Anterior Cruciate Ligament reconstruction was done. Anterior Cruciate Ligament was reconstructed only after making sure that it was an Anterior Cruciate Ligament dependent knee. All patients underwent diagnostic arthroscopy to confirm Anterior Cruciate Ligament rupture and other associate injuries. Of the 9 patients with meniscal injuries, 7 patients underwent arthroscopic partial meniscectomy and 2 had arthroscopic meniscal repair. The patients were divided randomly into 2 groups, and 15 patients underwent Anterior Cruciate Ligament reconstruction using Bone Patellar Tendon Bone Graft and 10 patients had Hamstring graft.

In the Modified Jones procedure, graft consisting of patellar tendon, 2-3 cm long and 10 mm wide distal attachment of patellar tendon from the Tibial tuberosity along with 2-3 cm long and 10 mm wide segment from patella is harvested. In Lipscomb procedure, semitendinosus and Gracilis tendons are harvested as grafts. In both the procedures, the graft is passed through the tibial and femoral tunnels and secured with interference screw or staples. The time taken for both procedures was assessed. Postoperatively, the knee is immobilised in a ranger knee splint which allows up to 40 degrees of flexion and prevents extension of knee. Postoperatively, the patient is put on static quadriceps exercise and is allowed up to 40 degrees of flexion. Non-weight bearing mobilisation is started on the first postoperative day itself. Range of flexion is increased to 90 degrees by second week and full range of flexion by four weeks. Touchdown weight bearing with knee brace is allowed by third week and full weight bearing allowed by eight weeks.

Patient is not allowed to participate in contact sports for 9 months. Patients were followed up at regular intervals monthly for the first six months and then at three monthly intervals. Patients were assessed using Knee Scoring Scale of Lysholm and Gillquist and International Knee Documentation Committee (IKDC) scoring system. In addition, activity level, harvest site pain, thigh atrophy, kneeling pain and hamstring pain were assessed. All patients were followed up for a minimum period of 2 years.

**OBSERVATIONS AND RESULTS:** Lachman test was positive in all cases. 84% of patients had positive Pivot shift. Anterior drawer test was positive in only 52% patients.

The Lachman test was the single most sensitive test in diagnosing Anterior Cruciate Ligament injuries. Both the IKDC rating and Lysholm Knee score did not show any statistically significant difference between the two groups. 47% of the Patellar tendon group and 40% of the Hamstring tendon group showed normal grade as per the IKDC ratings and the same percentage of patients showed excellent ratings as per the Lysholm knee scores. The details of both these scores are given in Table I and Table II.

The postoperative level of activity was assessed and it was found that 20% of both groups were able to return to strenuous activity level and 67% of Patellar tendon group and 50% of the Hamstring tendon group were able to return to moderate level of activity. The details of activity level assessment are given in Table III. Harvest site pain or numbness was assessed and 55% of patients in the patellar tendon group and 20% of patients in the hamstring tendon group had donor site pain in the first 6 months. This pain was absent in both groups by the end of first year.

Thigh atrophy was seen more in the hamstring group than in the patellar tendon group. 73% of patients in the hamstring group had at least 10 mm of thigh wasting and details of this assessment is given in Table IV. Pain on kneeling was seen only in the patellar tendon group (35%) while hamstring pain was found only in the hamstring group (20%). The average operative time for both procedures was 50 minutes with time varying from 40 minutes to 90 minutes. There was statistically significant difference in operating time between the two groups.

Rating	Patellar Tendon		Hamstring Group	
	Number	%	Number	%
A	4	40	5	33
B	3	30	7	47
C	2	20	2	13
D	1	10	1	7

**Table 1**

Scores (Points)	Patellar Tendon		Hamstring Group	
	Number	%	Number	%
Excellent (95-100)	4	40	7	47
Good (84-94)	4	40	4	27
Pair (65-83)	1	10	3	20
Poor (65)	1	10	1	6
<b>Median Lysholm Score</b>	<b>91</b>		<b>93</b>	

**Table 2**

Activity Level	Before Injury		After Injury	
	Patellar Tendon	Hamstring Group	Patellar Tendon	Hamstring Group
I (Strenuous )	40%	40%	20%	20%
II (Moderate)	40%	47%	50%	67%
III (Light)	10%	13%	13%	6.5%
IV (Sedentary)	10%	0%	10%	6.5%

**Table 3: Activity Level**

Difference	Patellar Tendon		Hamstring Group	
	Number	%	Number	%
10 mm	5	50	11	73
10-20 mm	4	40	3	20
20 mm	1	10	1	7

**Table 4: Thigh Atrophy**

**DISCUSSION:** The results as shown did not show any difference between the two groups. This finding was similar to study conducted by Otero and Hutchison (JBJS 1994)<sup>10,8</sup>. Though they found that hamstring graft was slightly inferior to patellar tendon graft in terms of laxity as per the Lachman Test and CT-100 Arthrometer testing, there was no significant difference in functional outcome scoring. Donor site pain was more in the patellar tendon group which too was similar to our finding.<sup>9,10</sup> Lachman test was found to be the single most important diagnostic test in diagnosing Anterior Cruciate Ligament injuries. This test had the advantage that this test could be performed even when there was severe pain.

**CONCLUSION:** Outcome for patients undergoing Anterior Cruciate Ligament reconstruction with hamstring tendon graft did not differ from that of patients with patellar tendon graft in terms of clinical stability, range of motion and general symptoms.<sup>11,12</sup> Even though there was no significant difference between the two groups, those in the patellar tendon group had increased anterior stability and were able to return to strenuous occupation. The difference in thigh atrophy between the two groups was not significant<sup>13,14</sup>. The hamstring group had lower graft harvest site morbidity.

Lachman test was the single most accurate test in diagnosing Anterior Cruciate Ligament injuries.

## REFERENCES

1. Hamner DL, Brown CH, Steiner ME, et al. Hamstring tendon grafts for reconstruction of the anterior cruciate ligament: biomechanical evaluation of the use of multiple strands and tensioning techniques. *J Bone and Joint Surg Am* 1999;81(4):549-557.
2. Brown CH, Wilson DR, Hecker AT, et al. Graft-bone motion and tensile properties of hamstring and patellar tendon anterior cruciate ligament femoral graft fixation under cyclic loading. *J Arthroscopy* 2004;20(9):922-935.
3. Corry IS, Webb JM, Clingeleffer AJ, et al. arthroscopic reconstruction of the anterior cruciate ligament. A comparison of patellar tendon autograft and four-strand hamstring tendon autograft. *Am J Sports Medicine* 1999;27(4):444-454.
4. Ferretti A, Conteduca F, Morelli F, et al. Regeneration of the semitendinosus tendon after its use in anterior cruciate ligament reconstruction. *Am J Sports Medicine* 2002;30(2):204-207.
5. Aglietti P, Buzzi R, Zaccherotti G, et al. Patellar tendon versus doubled semitendinosus and gracilis tendons for anterior cruciate ligament reconstruction. *Am J Sports Medicine* 1994;22(2):211-217.
6. Aglietti P, Zaccherotti G, Buzzi R, et al. A comparison between patellar tendon and doubled semitendinosus/gracilis tendon for anterior cruciate ligament reconstruction. A minimum five-year follow-up. *J Sports Traumatol Rel Res* 1997;19:57-68.
7. Freedman KB, D'Amato MJ, Nedeff DD, et al. Arthroscopic anterior cruciate ligament reconstruction: a meta-analysis comparing patellar tendon and hamstring autografts. *Am J Sports Med* 2003;31(1):2-11.
8. Otero AL, Hutchison L. Comparison of the doubled semitendinosus/gracilis and central third patellar tendon autografts in arthroscopic anterior cruciate ligament reconstruction. *Arthroscopy* 1993;9(2):143-148.
9. Noyes FR, Butler DJ, Grood ES, et al. Biomechanical analysis of human ligament grafts used in knee ligament repairs and reconstructions. *J Bone and Joint Surg Am* 1984;66(3):344-352.
10. Westerheide KJ, Flumhe DJ, Francis KA, et al. (Pittsburgh, PA): long term follow up of allograft versus autograft bone patellar tendon bone ACL reconstruction. Presented at the June, 2002 AOSSM Meeting, Orlando FL. awaiting publication.
11. Eriksson K, Anderberg P, Hamberg P, et al. A comparison of quadruple semitendinosus and patellar tendon grafts in reconstruction of the anterior cruciate ligament. *J Bone Joint Surg Br* 2001;83(3):348-354.
12. Beard DJ, Anderson JL, Davies S, et al. Hamstring vs. patella tendon for anterior cruciate ligament reconstruction: a randomised controlled trial. *Knee* 2001;8(1):45-50.
13. Noyes FR, Westin BSD. Reconstruction of the anterior cruciate ligament with human allograft: comparison of early and later results. *J Bone Joint Surg* 1996;78(4):524-537.
14. Spindler KP, Kuhn JE, Freedman KB, et al. ACL reconstruction autograft choice: bone-tendon-bone versus hamstring: does it really matter? A systematic review. *AM J Sports Med* 2004;32(8):1986-1995.