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Outcome of anterior cruciate ligament reconstruction using bone-patellar tendon-bone auto graft

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ABSTRACT

Introductions: A rupture of the Anterior Cruciate Ligament (ACL) is the most common ligament injury resulting in instability of the knee which can cause secondary articular injury and early osteoarthritis (OA). Aim of this study was to evaluate the short term outcomes of ACL reconstruction using Bone Patellar Tendon Bone Auto Graft (BPTB) auto graft and factors that might contribute to poor results.

Methods: Patients with Anterior Cruciate Ligament injury during the period of July 2013 to May 2014 were enrolled to observe the outcome of the ACL reconstruction using BPTB without arthroscopy. Lysholm Knee Scoring Scale was used to determine the clinical outcome. Outcome parameters were evaluated using Statistical Package for Social Science Version 20 (SPSS).

Results: Total 30 normal or near normal function outcome of knee was reported in 29 (97%) patients after ACL reconstruction using BPTB without arthroscopy. There was no failure of grafts. Good static knee stability achieved with increased patient's satisfaction. Lysholm Score was excellent in 27 (90%) and good in 3 (10 %) cases. Anterior knee pain persisted in 6 cases (20%).

Conclusions: Excellent functional outcome with BPTB auto graft in Anterior Cruciate Ligament injury was achieved.

Keywords: ACL reconstruction, bone-patellar tendon-bone auto graft, clinical outcome

INTRODUCTIONS

Up to 300,000 Anterior Cruciate Ligament (ACL) reconstructions are performed annually in the United States. An estimated 80% of these reconstructions are done with auto grafts, with the remainder being performed with allograft from various sources.[1] An ideal graft would replicate the anatomy and biomechanics of the native ACL, with rapid incorporation and low donor site morbidity.[2-4] This study was conducted to evaluate the short term outcomes of ACL reconstruction using BPTB auto graft and associated factors that might contribute to poor results.

METHODS

A prospective observational study was done in patients with ACL injury during the period of July 2013 to May 2014 to observe the outcome using BPTB reconstruction without arthroscopy at Patan Hospital, Lagankhel, Lalitpur; Shree Birendra Hospital, Chhauni and NAMS, Bir Hospital, Kathmandu from July 2013 to May 2014. Lysholm Knee Scoring Scale[4] was used to determine the clinical outcome.

Ethical clearance was taken from the Institutional Review Board of NAMS. Written consent was obtained from all the patients. Inclusion criteria was age 20 to 50 years with positive Lachman test, pivot-shift test, and closed or nearly closed growth plates based on radiographs. Excluded from the study were: open knee injury and associated lower limb, pelvic or spinal fracture with vascular injuries; neurological involvement and compartment syndrome; bilateral ACL injuries; prior ACL reconstruction of the knee requiring a revision procedure; associated posterior cruciate ligament (PCL) tears or multiple-ligament injuries; pre-existing deformity in either of the knee; spinal disorders with neurological deficits and associated osteoarthritic changes.

Functional outcome was assessed 3, 6, and 9 months after the surgery with measurement of Lysholm Knee Scoring Scale[4] knee flexion and extension; patients satisfaction by visual analogue score (VAS) score; and anterior laxity was assessed by anterior drawer test, Lachman test and pivot shift test.

The SPSS version 20 was used for data analysis. Parametric data was analyzed using student t-test and nonparametric data by Chi-square. Confidence interval was set to be 95% and p value <0.05 was considered significant.

RESULTS

There were 30 patients, with mean age 30.93±6.23 years, majority 20-30 years and right knee involvement. The mean knee flexion preoperatively and postoperatively at 3, 6 and 9 months improved to near normal, (Table 1). The means flexion lag was 1.5 degree compared to normal side and mean extension lag was 1.72 degree.

There was no statistically significant difference in mean value of preoperative flexion and extension (P>0.05). Lysholm Knee Score at 9 months was excellent (>90) in 22 cases, good (84-90) in 8, and none in fair (65-83) or poor (<65) category.

The means of preoperative flexion and extension was statistically not significant (P>0.05), (Table 2).

Table 1. Knee Flexion and extension before and after ACL reconstruction using BPTB without arthroscopy (n=30)

Mean ± SD	Normal Side	Preoperatively	3 Months	6 Months	9 Months
Flexion (degrees)	131.5±23	130.5±9	104.80±5.57	118.73±3.39	130±1.01
Extension (degrees)	8.9±0.6	4.90±0.76	5.17±0.59	6.40±0.56	7.18±0.51

Table 2. Mean knee Flexion/Extension comparison between preoperatively and postoperatively (9 Months)

	Preoperatively	Postoperatively (9 Months)	Std Deviation	P
Mean Knee Flexion (degrees)	130.5	130	1.01	>0.05
Mean Knee Extension (degrees)	4.90	7.18	0.59	>0.05

Table 3. Lysholm Knee Score before and after ACL reconstruction using BPTB without arthroscopy (n=30)

	Preoperatively	At 3 Months	At 6 Months	At 9 Months
Mean Lysholm Knee Score ± SD	62.50±7.13	56.43±6.13	81.36±6.80	91.70±2.79

Table 4. Mean VAS Score after ACL reconstruction using BPTB without arthroscopy (n=30)

	3 Months	6 Months	9 Months
Mean VAS Score ± SD	3.66±0.76	1.53±0.50	0.30±0.46

Preoperatively anterior drawer test, Lachman test and pivot shift test were positive for all cases but postoperatively at 9 months follow up, the anterior drawer test and Lachman test significantly improved and pivot shift test was negative in all cases.

DISCUSSIONS

In our study, there was male predominance with the ratio of 4:1, similar to Lars Ejerhed, MD (male 70%),[5] Taylor DC[6] (M:F 4.8:1) and Mountcastle[7] (M:F 3.3:1). The male predominance in most of the study may be because male is more active and frequently involved in outdoor activities and contact sports.

Our mean flexion lag of 1.5 degree was better than other studies. Dong Jiang[8] reported mean flexion lag 2 degree in double blind group and 2.5 in single blind group. In a similar study by Kanniraj[9] average flexion loss was <5 degree in 92% and <15 degree in 8%.

The average extension loss in our study was 1.72 degree, similar to Dong Jiang[8] (0.8 degree in double blind group and 0.9 in single blind group), Kanniraj[9] <3 degree in 76 (96%) and 3 to 5 degree in 3 (4%).

Anterior laxity of joints assessed by anterior drawer test, Lachman test and pivot shift test were positive for all cases preoperatively but postoperatively at 9 months all tests significantly improved.

In a study by Shuzhen Li[10] the postoperative Lachman test was negative in 44 out of 78 patients in the BPTB group and postoperative pivot test negative in 158 out of 179.

Similar study conducted by Matthew, 80.8% (autograft) and 85.1% (allograft) had negative pivot shift test.[11] But in our study at 9 months follow up anterior drawer test and Lachman test was significantly improved and pivot shift test was negative in all cases.

In our study, preoperative mean Lysholm Knee Score was 62.50±7.13 degrees and postoperative at 3 months 56.43±6.13, 6 months 81.36±6.80 and 9 months 91.70±2.79. Similarly, Lysholm Knee Score at 9 months was excellent (>90) in 22 cases, good (84-90) in 8 cases. In similar study by Kanniraj[9] the mean Lysholm knee score improved from 48 (range, 24–77) to 92 (range, 81–96) ($p<0.0001$); scores were excellent (>90) in 46 (58%) patients and good (83-90) in 32 (40.50%) patients.

In a study by Lars Ejerhed[5] the mean Lysholm Knee Score preoperative was 70 (14-95) and postoperatively it was 95 which is similar to our study. Dong Jiang[8] too reported similar findings.

In our study patient satisfaction mean VAS improved (Table 4), similar to Matthew.[11]

The risk of anterior knee pain, patellar tendon rupture and patellar fracture is higher[12] but we did not have such complications of BPTB auto graft at 9 months follow up. Similarly, we did not have any post-operative infection and graft failure.

Present study has limitations of small sample size and shorter follow up. We analyzed only Lysholm Knee Scoring Scale. Inclusion of objective parameters like quadriceps strength, hamstring strength may have added value to the analysis.

CONCLUSIONS

Excellent clinical outcome was achieved in anterior cruciate ligament (ACL) reconstruction with bone-patellar tendon-bone (BPTB) autograft without arthroscopy.

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