Journal of Medical Care Research and Review

Homepage: http://mcrr.info/index.php/mcrr/index

(O):2589-8949 (P): 2589-8930

Comparison of the Functional Outcome of Arthroscopic PCL Reconstruction on The Basis of Lysholm Score & Tegner Activity Level

Md. Mohoshin Sarker[1], Md. Sarwar Rahman[2], Md. Tofiqul Hasan Bhuiyan[3]

[1]Jr. Consultant, Othopaedic Surgery, Upazila Health Complex, Chatkhil, Noakhali, Bangladesh

[2]Jr. Consultant, Orthopaedic Surgery, Upazila Health Complex, Ranisankoil, Thakurgaon, Bangladesh

[3]IMO (Orthopaedic Surgery), NITOR, DHAKA, Bangladesh

Corresponding Author: Md. Mohoshin Sarker

DOI: https://doi.org/10.52845/mcrr/2023/06-11-2

Abstract:

Background: PCL injuries are increasing in our country due to growing number of motorcycle accidents and consequently we are getting more patients with PCL injuries in our hospitals. Isolated PCL injuries are less common (3%) than those with concomitant posterolateral corner (PLC) or other ligamentous injuries (97%).

Objective: To assess the comparison of the functional outcome of arthroscopic PCL reconstruction on the basis of lysholm score & tegner activity level.

Methodology: This prospective observational study was conducted in the department of Orthopaedic Surgery, BSMMU, Dhaka from July, 2019 to September, 2021. Within this period total 16 patients after considering the inclusion and exclusion criteria. All the data were compiled and sorted properly and the quantitative data was analyzed statistically by using Statistical Package for Social Science (SPSS-25). The results were expressed as percentage and mean ± SD and p<0.05 was considered as the level of significance at 95% confidence interval.

Result: Mean age of all study population was 31.56±4.94 years (22-40 year), where in maximum patients belonged to 26-35 years of age (62.6%). Mean duration of sufferings was 2.71± 0.82 months (range: 3-6 months), whereas majority of the study patients (75%) were suffered for <3 months. Values are expressed within parenthesis percentage (%) over column in total. Mean diameter of graft of all patients was 7.53 ± 0.34 mm (range: 7.00-8.50 mm). The mean preoperative Lysholm score for 16 knees was 60±6.18 (Range, 50 to 74) and the mean postoperative Lysholm score was 88.56±4.31 (range, 79 to 97). Fifteen of 16 patients (93.7%) showed good or excellent results in the final assessment. The mean preoperative Tegner score for 16 knees was 2.94±0.93 (range, 2 to 5), whereas the mean postoperative Tegner score was 5.75±1.61 (range, 3 to 9). There were statistically significant improvements in Lysholm score (P <0 .001), Tegner score (P <0 .001).

Conclusion: Assessment of functional outcomes pre- and postoperatively were done using the Lysholm knee scoring scale. After follow-up for 09 months, the analytical results showed patients achieved satisfactory knee function after PCL reconstruction by using a quadruple hamstring autograft.

Keywords: Quadruple hamstring tendon autograft, Arthroscopic reconstruction, Motor cycle accident.

INTRODUCTION

PCL injuries are increasing in our country due to growing number of motorcycle accidents and consequently we are getting more patients with PCL injuries in our hospitals. Isolated PCL injuries are less common (3%) than those with concomitant posterolateral corner (PLC) or other ligamentous injuries (97%). Complete tears occur in approximately 40% of cases; partial tears in approximately 55% and avulsion tears in 7% [1]. Annual incidence of Isolated PCL tear is 2 per 100000 persons and these group of patients are at higher risk of developing osteoarthritis [2]. Highly experienced arthroscopic surgeons and facilities are available in our hospital regarding arthroscopic PCL reconstruction and to the best of our knowledge no study was carried out to evaluate the functional outcome of arthroscopic isolated PCL reconstruction by quadruple hamstring tendon autograft at Bangabandhu Sheikh Mujib Medical University, Dhaka or any other institution in Bangladesh. The sport-specific incidence of PCL injuries ranges from 1% to 4%. Deficiency of the PCL results in abnormal tibiofemoral knee kinematics during functional activities as well as degenerative changes primarily in the medial and patellofemoral compartments. Most PCL ruptures may be managed successfully with supervised conservative treatment [3]. studied 133 patients with isolated PCL injury who were treated through an unsupervised rehabilitation program and found that 42% consistently rated the knee as good or

excellent [4]. Studied 15 patients with PCL injury and reported that 53% had an overall IKDC of A or B, and 73% were participating in moderate to strenuous activities [5]. Arthroscopic PCL reconstruction has recently increased in frequency and satisfactory results with an IKDC of A or B (range, 68% to 82%) have been documented for most patients in whom surgical principles and techniques were adequate [6]. The goals of PCL reconstruction are to reproduce the normal anterior tibial step-off, restrain posterior tibial displacement and allow stable & pain-free knee function. Surgical management of isolated PCL injuries is typically reserved for patients with acute or chronic symptomatic grade III PCL injuries [7]. The desire to restore knee function has driven growing interest in surgical reconstruction of the injured PCL. With improved arthroscopic instruments and techniques, a greater number of Grade III isolated Posterior Cruciate Ligament Reconstruction (PCLR) are being performed [8]. PCLR has been shown to produce more satisfactory and consistent stability when compared to the non-operative group in a systematic review [9]. Assessment of functional outcomes pre- and postoperatively were done using the Lysholm knee scoring scale, the Knee injury and Osteoarthritis Outcome Score (KOOS) and visual analogue scale (VAS). The mean follow-up from operation at time of reporting was seven months (range, 2 to 12 months). There were four combined PCL and PLCs, two isolated PLCs and one patient who underwent an isolated PCL reconstruction. There were significant improvements between pre-operative and post-operative in all functional outcome scores utilized following PCL reconstruction and/or modified Larson's reconstruction. Lysholm knee scoring scale improved from pre-operative to post-operative at 41.14±12.32 to 74.86±13.52 (p=0.0001) and VAS from 5.71±2.06 to 2.86±2.48 (p=0.001). On sub-analysis they showed that higher functional outcomes were present when surgery was done less than six months from the time of index injury. There were no complications (e.g., infections, revisions) in the cohort at the time of reporting.

Materials & Methods

This prospective observational study was conducted in the department of Orthopaedic Surgery, BSMMU, Dhaka from July, 2019 to September, 2021. Within this period total 16 patients after considering the inclusion and exclusion criteria. Tegner activity level, Lysholm score, IKDC score & Posterior drawer test were used to assess the functional outcome and ligamentous stability of the knee. All the data were compiled and sorted properly and the quantitative data was analyzed statistically by using Statistical Package for Social Science (SPSS-25). The results were expressed as percentage and mean ± SD and $p<0.05$ was considered as the level of significance at 95% confidence interval.

Inclusion criteria:

1. Presence of an isolated Grade-III PCL tear.
2. Age between 20 to 45 years.
3. Both male & female.

Exclusion criteria:

1. Age < 20 years and >45 years.
2. Fracture at knee region (tibial plateau, patella, femoral condyles).
3. Associated ligamentous injury.
4. Associated meniscal and cartilage lesion.
5. Patients with osteoarthritis.

Statistical Analysis: All the data was compiled and sorted properly and the quantitative data was analyzed statistically by using Statistical Package for Social Science (SPSS-25). The results were expressed as percentage and mean ± SD and $p<0.05$ was considered as the level of significance. Comparison of continuous variables between the two groups were made with student t-tests. Comparison of proportions between two groups were made with Chi-Square tests.

Results

Table I: Age distribution of the study population (n=16)

Mean Age	31.56± 4.94	22-40 year
BMI	23.60±2.85 kg/m2	range: 18.64-28.61 kg/m^2
Duration of suffering	2.71± 0.82 months	(range: 3-6 months
Graft diameter (mm)	7.53 ± 0.34 mm	(range: 7.00-8.50 mm).

Mean age of all study population was 31.56±4.94 years (22-40 year), where in maximum patients

belonged to 26-35 years of age (62.6%). Mean duration of sufferings was 2.71± 0.82 months (range: 3-6 months), whereas majority of the study patients (75%) were suffered for <3 months. Values are expressed within parenthesis percentage (%) over column in total. Mean diameter of graft of all patients was 7.53 ± 0.34 mm (range: 7.00-8.50 mm).

Table II: Gender distribution of the study population (n=16)

Gender	Frequency	Percentage (%)
Male	12	75
Female	4	25
Total	**16**	**100**

Most of the study population were male (75%) with a male: female ratio 3:1. Mean BMI of all study population was 23.60±2.85 kg/m^2 (range: 18.64-28.61 kg/m^2), wherein majority of the study population (62.6%) were overweight or obese (BMI ≥23).

Table III: Injured side of the knee among study population (n=16)

Limb Involved	Frequency	Percentage (%)
Right	11	68.8
Left	5	31.3
Total	**16**	**100**

Most of the study population had suffered from injury over right knee joint (68.8%).

Table IV: Causes of injury among study population (n=16)

Cause of Injury	Frequency	Percentage (%)
Motorcycle Accident	10	62.5
Domestic accident	3	18.8
Sports	3	18.8
Total	**16**	**100**

Most of the study population had injured from motor cycle accident (62.5%), while 18.8% had injured from daily accident and rest 18.8% had injured from sports event.

Table V: Comparison of Preoperative & postoperative range of motion (ROM) of knee:

Knee flexion (ROM)	Pre-operative n=16 N (%)	Post-operative (09 months) n=16 N (%)	p value*
Normal 135º	15(93.75)	14(87.5)	<0.001
Near normal (130 º-135 º)	1(6.25)	1(6.25)	
Abnormal (120 º -129 º)	0(0)	1(6.25)	
Severely abnormal (<120 º)	0(0)	0(0)	

* Paired Students 't' test was performed

Preoperative ROM was normal in 93.75% study population whereas postoperatively after 09 months, 87.5% study population obtained normal. Significant improvement was found in this study when comparing the preoperative and 09 months postoperative knee ROM (p <0.001).

Table VI: Evaluation of preoperative and postoperative posterior drawer test (n=16)

Posterior drawer test	Preoperative n=16 N (%)	Postoperative (09 months) n=16 N (%)	p value*
Negative	0(0)	15(95)	<0.001
Grade I	0(0)	1(5)	
Grade II	0(0)	0(0)	
Grade III	16 (100)	0(0)	

* Paired Students 't' test was performed

Preoperative grade III posterior drawer test was positive in all of the study patients, while postoperatively majority (n=15, 95%) patients were negative for posterior drawer test. Significant improvement was found when comparing the preoperative and 09 months postoperative posterior drawer test (p <0.001).

Table VII: Comparison of preoperative and postoperative Lysholm knee score (n=16)

Lysholm knee score	Preoperative n=16 N(%)	Postoperative (09 months) n=16 N(%)	p value*
Mean± SD (median, range)	60±6.18 (59.5, 50-74)	88.56±4.31 (88.50, 79-97)	<0.001
Interpretation			
Poor (<65)	13(81.3)	0(0)	
Fair (65-83)	3(18.7)	1(6.3)	
Good (84-90)	0(0)	11(68.8)	
Excellent (>90)	0(0)	4(25)	

* Paired Students 't' test was performed

Preoperative Lysholm knee score (Appendix VII) was poor in majority of cases (81.3%), while 09 months postoperative functional outcome of the subjects were good or excellent in most of the cases (93.7%). Besides, significant improvement was found in this study when comparing the preoperative and 09 months postoperative Lysholm knee score (p <0.001).

Table VIII: Comparison of preoperative and postoperative Tegner activity score (n=16)

Tegner activity score	Preoperative n=16, N(%)	Postoperative (09 months) n=16, N(%)	p value*
Mean±SD	2.94±0.93	5.75±1.61	<0.001
Median	3	6	
Range(minimum-maximum)	2-5	3-9	

* Paired Students 't' test was performed

Mean preoperative Tegner activity score for 16 knees was 2.94±0.93 (range: 2 to 5). The mean postoperative Tegner score was 5.75±1.61 (range: 3 to 9). The improvement from preoperative to 09 months postoperative values was statistically significant (P<0.001).

Discussion

The present study assessed the fruitfulness of isolated grade III posterior cruciate ligament reconstruction arthroscopically by quadruple hamstring tendon autograft. The analysis of age distribution in this study showed that the age range was 22-40 years and

mean age was 31.56 years. Nearly similar result was shown by Wang *et al* [10]. In their study the mean age was 32.02 years. In another study Waly & Gawish et al. showed the mean age was 34 (range 27-45) years [11]. In most of the cases young people are the victim of isolated PCL injury. The majority of patients of our study were male 75% and female were 25%. Similar result was shown by Wu et al [12]. In their study 77.27% patients were male and 22.72% were female. Similar male predominant result was found by Norbakhsh et al [13]. The reason of male predominance may be due to their more involvement in random mobility for works with motorcycles, sports and manual activities. Lee et al in their study showed that the mean BMI of the patients was 27.6±4.5 which is similar to our study where BMI of all patients mean was 23.60±2.85 kg/m^2 (range: 18.64-28.61 kg/m^2) [14]. But majority of our study population (62.6%) were overweight or obese (BMI ≥23). Out of 16 patients 68.8% had injury at right knee and 31.3% had injury at left knee. Similar result was shown by Boutefnouchet et al [15]. In their study they got predominant right knee injury (66.7%). The reason for predominant right knee injury may be due to motor bike accident. Causes of injury are important and vital factors for PCL injury. In our study we found motor bike accidents (62.5%) as the major cause of injury apart from other activities. According to Caldas et al motor vehicle accidents were the leading factor for isolated and combined PCL injuries which accounted for 49.3% the cohort [16]. On the other hand, similar result was shown by Wu et al [12] and Lin et al [17]. In their study Motorcycle accidents was 78% or traffic accidents 46.7% respectively. Boutefnouchet et al in their study found sports (73.33%) as the major cause [15]. In present study, 12 patients (75%) presented with symptoms within 3 months and 4 patients (25%) presented within 3-6 months. The mean duration of symptoms was 2.71± 0.82 months. Those patients who were operated within 3 months of the initial injury had significant functional outcomes. This result was nearly similar (mean 2.7 ± 0.9 months) to Waly & Gawish [11]. Hohmann et al have reported 31% of all patients with early surgery had a normal or near normal knee, whereas only 15% of patients with late reconstruction reported the knee to be normal or near normal & showed that early surgical reconstruction for injuries of knee ligaments had markedly better functional outcome than late surgical intervention [18]. For ligament laxity, 15 of our study population (95%) revealed less than 5 mm ligament laxity when performed posterior drawer test. Instability of the operated knee is significantly improved (95%) from Grade III to Grade 0 in the present study (P value <0.001). Nearly similar result was found by Wu et al [12] where 82% of the study population revealed less than 5 mm ligament laxity when measured and in the study of Norbakhsh et al [13] 78.8% revealed less than 5mm ligamentum laxity at final follow-up. To evaluate the subjective symptoms Lysholm score is essential. In our study the postoperative mean (±SD) Lysholm score (88.56±4.31) was significantly improved than preoperative scores (60±6.18). The preoperative Lysholm knee score was poor in majority cases (81.3%), while 09 months postoperative functional outcome of the subjects were good or excellent in most of the cases (93.7%). Besides, significant improvement was found in this study when comparing the preoperative and 09 months postoperative Lysholm knee score (p value <0.001). Mean (±SD) of Lysholm score improved from preoperative 46.4 ± 18.87 to postoperative 83.47 ± 10.54 (P < 0.001) in the study of Lin et al [17]; and from 58.2 ± 2.6 to 88.9 ± 4.1 (P <0.05) in the study of Waly & Gawish [11]. Similar result was also found by Lee et al; Boutefnouchet *et al*; Wu et al [12,14,15]. Zhao et al in his study found more strand or greater diameter results in a better functional outcome in PCL reconstruction [19]. We found similar correlation between Graft diameter & Lysholm score. In our study graft diameter of 8 mm and more, showed excellent outcome; whereas graft diameter of 7.5 mm had relatively good outcome and graft of less than 7.5 mm showed only good outcome. For the assessment of activity level in the present study we found mean Tegner score improved significantly from 2.94±0.93 preoperatively to 5.75±1.61(P value <0.001) at the final follow-up which is similar to the study of Lin et al where Tegner score improved from 2.47 ± 1.85 to 6.07 ± 1.58 (P <0.001) [17]. Similar result was also found by Rushdi et al; Wang et al; Zayni et al; Boutefnouchet et al [10, 15, 20, 21].

Conclusion

Assessment of functional outcomes pre- and postoperatively were done using the Lysholm knee scoring scale. After follow-up for 09 months, the analytical results showed patients achieved satisfactory knee function after PCL reconstruction by using a quadruple hamstring autograft.

Bibliography

1. El Nahas, M., 2015. Arthroscopic posterior cruciate ligament reconstruction. Al-azhar assiut medical journal, 13(4).

2. Sanders, T.L., Pareek, A., Barrett, I.J., Kremers, H.M., Bryan, A.J., Stuart, M.J., Levy, B.A. and Krych, A.J., 2016. Incidence and long-term follow-up of isolated posterior cruciate ligament tears. Knee Surgery, Sports Traumatology, Arthroscopy, 25(10), pp.3017-3023.
3. Fowler, P.J. and Messieh, S.S., 1987. Isolated posterior cruciate ligament injuries in athletes. The American journal of sports medicine , 15(6), pp.553-557.
4. Shelbourne, K.D., Davis, T.J. and Patel, D.V., 1999. The natural history of acute, isolated, nonoperatively treated posterior cruciate ligament injuries. The American journal of sports medicine, 27(3), pp.276-283.
5. Shino, K., Horibe, S., Nakata, K., Maeda, A., Hamada, M. and Nakamura, N., 1995. Conservative treatment of isolated injuries to the posterior cruciate ligament in athletes. The Journal of bone and joint surgery. British volume , 77(6), pp.895-900.
6. Chan, Y.S., Yang, S.C., Chang, C.H., Chen, A.C.Y., Yuan, L.J., Hsu, K.Y. and Wang, C.J., 2006. Arthroscopic reconstruction of the posterior cruciate ligament with use of a quadruple hamstring tendon graft with 3-to 5-year follow-up. Arthroscopy: The Journal of Arthroscopic & Related Surgery, 22(7), pp.762-770.
7. Bedi, A., Musahl, V. and Cowan, J.B., 2016. Management of posterior cruciate ligament injuries: an evidence-based review. JAAOS-Journal of the American Academy of Orthopaedic Surgeons, 24(5), pp.277-289.
8. Eguchi, A., Adachi, N., Nakamae, A., Usman, M.A., Deie, M. and Ochi, M., 2013. Proprioceptive function after isolated single-bundle posterior cruciate ligament reconstruction with remnant preservation for chronic posterior cruciate ligament injuries. Orthopaedics & Traumatology: Surgery & Research, 100(3), pp. 303-308.
9. Ahn, S., Lee, Y.S., Song, Y.D., Chang, C.B., Kang, S.B. and Choi, Y.S., 2016. Does surgical reconstruction produce better stability than conservative treatment in the isolated PCL injuries? Archives of orthopaedic and trauma surgery, 136(6), pp.811-819.
10. Wang, R., Xu, B., Wu, L. and Xu, H., 2017. Long-term outcomes after arthroscopic single-bundle reconstruction of the posterior cruciate ligament: a 7-year follow-up study. Journal of International Medical Research, 46(2), pp.865-872.
11. Waly, A.H.T. and Gawish, H.M., 2020. Outcomes of the All Inside Single Bundle Posterior Cruciate Ligament Reconstruction Using Quadrupled Semitendinosus Tendon Graft. The Egyptian Orthopedic Journal, pp.98-108
12. Wu, C.H., Chen, A.C.Y., Yuan, L.J., Chang, C.H., Chan, Y.S., Hsu, K.Y., Wang, C.J. and Chen, W.J., 2007. Arthroscopic reconstruction of the posterior cruciate ligament by using a quadriceps tendon autograft: a minimum 5-year follow-up. Arthroscopy: The Journal of Arthroscopic & Related Surgery, 23(4), pp.420-427.
13. Norbakhsh, S.T., Zafarani, Z., Najafi, A. and Aslani, H., 2014. Arthroscopic posterior cruciate ligament reconstruction by using hamstring tendon autograft and transosseous screw fixation: minimal 3 years follow-up. Archives of orthopaedic and trauma surgery, 134(12), pp. 1723-1730.
14. Lee, D.W., Jang, H.W., Lee, Y.S., Oh, S.J., Kim, J.Y., Song, H.E. and Kim, J.G., 2014. Clinical, functional, and morphological evaluations of posterior cruciate ligament reconstruction with remnant preservation: minimum 2-year follow-up. The American journal of sports medicine, 42(8), pp.1822-1831.
15. Boutefnouchet, T., Bentayeb, M., Qadri, Q. and Ali, S., 2013. Long-term outcomes following single-bundle transtibial arthroscopic posterior cruciate ligament reconstruction. International orthopaedics, 37(2), pp.337-343.
16. Caldas, M.T.L., Braga, G.F., Mendes, S.L., Silveira, J.M.D. and Kopke, R.M., 2013. Posterior cruciate ligament injury: characteristics and associations of most frequent injuries. Revista brasileira de ortopedia, 48, pp. 427-431.
17. Lin, Y., Huang, Z., Zhang, K., Pan, X., Huang, X., Li, J. and Li, Q., 2020. Lower Tibial Tunnel Placement in Isolated Posterior Cruciate Ligament Reconstruction: Clinical Outcomes and Quantitative Radiological Analysis of the Killer Turn. Orthopaedic Journal of Sports Medicine, 8(8), p.232.
18. Hohmann, E., Glatt, V. and Tetsworth, K., 2017. Early or delayed reconstruction in multi-ligament knee injuries: A systematic review and meta-analysis. The Knee, 24(5), pp.909-916.
19. Zhao, J. and Huangfu, X., 2007. Arthroscopic single-bundle posterior cruciate ligament reconstruction: retrospective review of 4-versus 7-strand hamstring tendon graft. The Knee, 14(4), pp.301-305.

20. Rusdi, A., Shahrulazua, A., Siti, H.T. and Nizlan, N.M., 2014. Short-term functional outcomes of a delayed single-stage reconstruction of chronic posterior cruciate ligament and posterolateral corner deficiency. Clin Ter, 165(1), pp.28-34.

21. Zayni, R., Hager, J.P., Archbold, P., Fournier, Y., Quelard, B., Chambat, P. and Sonnery-Cottet, B., 2011. Activity level recovery after arthroscopic PCL reconstruction: a series of 21 patients with a mean follow-up of 29 months. The Knee, 18(6), pp.392-395