Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

Original Research Article

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING BONE-PATELLA TENDON-BONE AUTOGRAFT WITH PRESS-FIT FEMORAL FIXATION: A MIDTERM FUNCTIONAL OUTCOME

Dr Vikramadityasingh V Samorekar

Assistant Professor, Department of Orthopaedics, Gadag Institute of Medical Sciences (GIMS), Gadag, Karnataka

Corresponding Author: Dr Vikramadityasingh V Samorekar

Received: 08-09-2023 / Revised: 18-09-2023 / Accepted: 25-09-2023

Abstract

Reconstruction of torn Anterior cruciate ligament (ACL) with bone patellar tendon bone autograft (BPTB) has become the gold standard with high success rate. The purpose of this study was to prospectively evaluate the functional outcome following ACL reconstruction using BPTB GRAFT and fixing it with endobutton and interference screw.

Materials and method: We evaluated the result of 25 knees that have been treated with ACL reconstruction using BPTB autograft for femoral fixation with endobutton and interference screw for tibia from March 2020 to jan 2022. The mean followup period was 18 months.

Results and conclusion: The Lysholm score postoperatively was 89.16. 23.6% of the 25 patients have good to excellent outcome, 67% patients have good to fair outcome and 9.4% patients have fair outcome.

Keywords: arthroscopic ACL reconstruction, bone patellar tendon bone(BPTB) graft, Lysholm score, Tegner activity scale, anterior drawer test, Endobutton, Interference screw.

INTRODUCTION

Anterior Cruciate Ligament (ACL) injury is a significant cause of disability in active individual.[1]After ACL injury, most patients experience recurrent episodes of instability, pain and decreased function.[2] Reconstruction of ACL allows the patient to return to pre trauma activity level and delays the occurrence of associated meniscal injury and onset of osteoarthritis.[3]Arthroscopic reconstruction of torn ACL with bone patellar bone (BTB) has become the gold standard in treating ACL tears with high success rate.[4] It has the advantage of bone to bone healing and it does not sacrifice the knee stabilizers [5-8]Recently, more aggressive rehabilitation protocol has been adopted in ACL reconstruction. This requires good initial fixation strength of the graft which will allow immediate range of motion exercises and rapid return to sports activities.[9]

We are presenting in favour of BTB graft fixed with Endobutton femoral fixation and interference screw for tibia. The bone plug in the femoral tunnel is flushed with the outlet and does not suffer the "windscreen wiper effect" that occurs when the hamstring tendon rubs over the rim of the outlet of tunnel.[11-12] 360 degree bone-to-bone (block-to-tunnel) union occurs within 4 to 6 weeks, similar to fracture healing.[12-13]

In this study, we have analyzed the midterm functional outcome of Arthroscopic ACL reconstruction using autologous ipsilateral BTB graft and Endobutton femoral fixation.

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

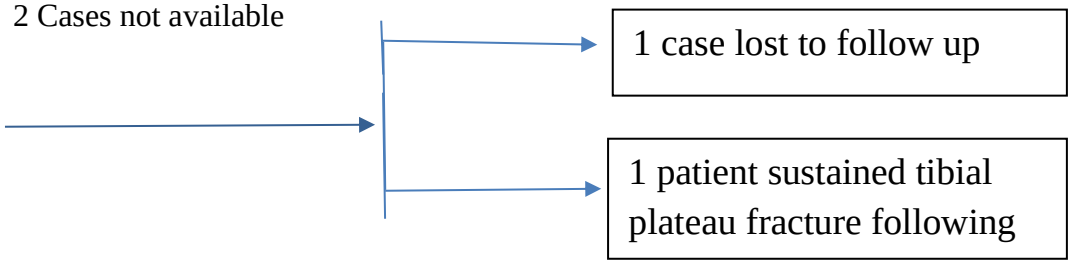
MATERIALS AND METHODS-

In the study, we have prospectively evaluated patients who have signed for Arthroscopic ACL reconstruction using BTB autograft and Press-fit femoral fixation from March 2020 to Jan 2022.

CRITERIA

INCLUSION	EXCLUSION
1. All patients who are willing to participate and follow up, with no prior knee surgery. 2. Anterior drawer test +ve 3. MRI and Arthroscopy confirmed complete ACL tear 4. Normal contralateral knee 5. ACL injuries with chondral and meniscal lesions were also included in this study.	Associated intra articular fractures Multi ligament reconstruction Revision ACL surgery Patients with poor compliance like psychiatric disorders and severe addicts Generalized ligament laxity patients

Out of 25 cases , only 23 cases were for study at the end of 18 months.



All patients were reviewed periodically at 2 weeks, 4 weeks, 8 weeks, 12 weeks, 6 months, 12 months and 18 months for assessment. Subsequently patients were statistically analyzed to find out whether it has any effect on Anterior drawer test, Lachman test, Lysholm score and extension loss. The local medical ethical board approved the study protocol and informed consent was obtained from each patient.

Surgical technique-

Diagnosis of ACL tear was confirmed arthroscopically and associated chondral lesions and meniscal tears were managed accordingly. The central third of the patellar tendon (10mm) autograft was used as graft. Anatomic placements of the tunnels were employed. For eccentrically placed drill sleeve, we repositioned the drill sleeve by a free hand technique. This step was mandatory to make sure the graft was transfixed and not eccentrically snared.

The graft was fixed in the femoral tunnel with Endobutton. Interference screw fixation was done on tibial side in 30degrees flexion. A postoperative long knee brace was applied at the conclusion of the procedure.

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

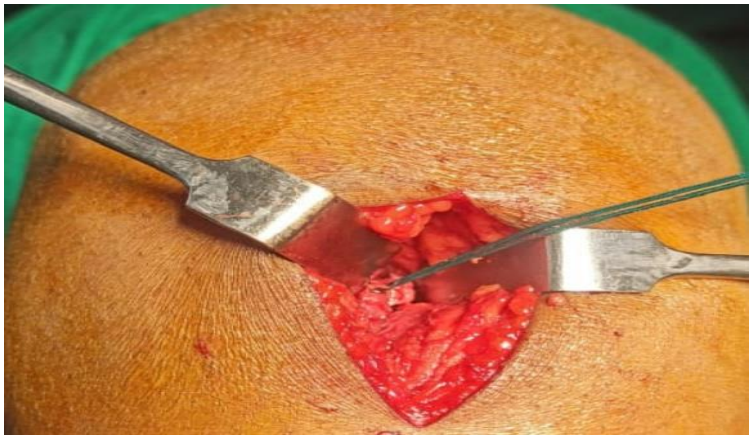


Fig-1Midline incision over the knee

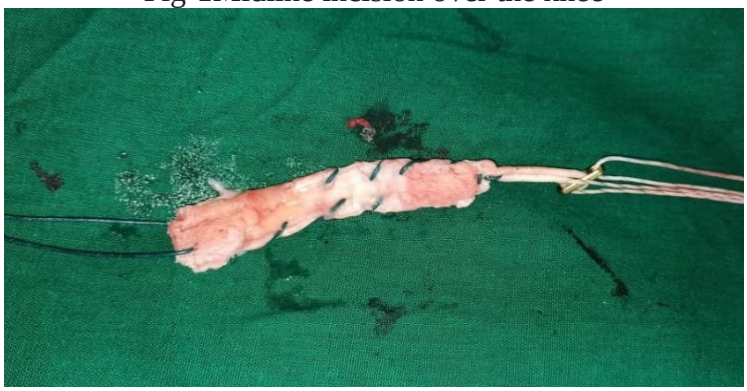


Fig-2 BPTB graft harvested and prepared

Fig-3 BPTB Graft prepared and inserted

Fig-4 Post insertion cycling done

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

Fig-5 Final interference screw fixation done on tibial side

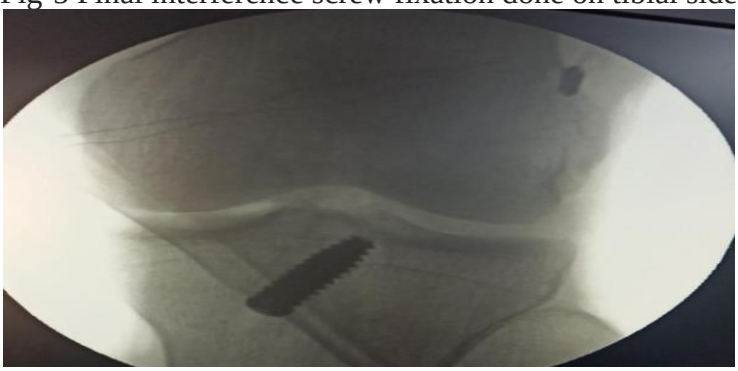


Fig-6 C-arm AP-image showing the implant position

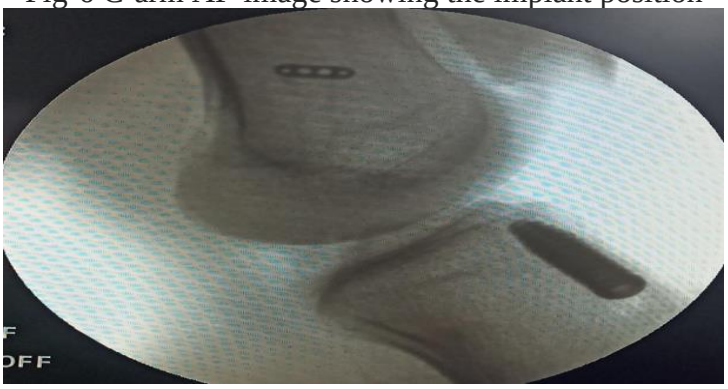


Fig-7 C-arm lateral view

Fig-8 Post-operative X-ray image.

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

Post operative knee rehabilitation-
Closed chain exercises were started on day one with active straight leg raising (SLR). Weight bearing as tolerated was allowed with the knee immobilized in extension and a walker support. Active flexion and active assisted knee mobilization at a rate of 15 degrees per week was started. Patients were advised for a gradual quadriceps strengthening exercises. Walker was discontinued once quadriceps control was acquired and knee extension was achieved. Physiotherapy was continued up to 9 months. Gradual return to sports at 6 to 8 months postoperatively, if rehabilitation criteria were successfully achieved.

Physical examination-
Range of motion (ROM) was assessed by goniometer and thigh circumferences were measured in centimeters. Lachman, anterior and posterior drawer, and pivot shift tests were performed manually. Ligamentous laxity in anterior drawer test was graded as 1 (0 to 5 mm), 2 (6 to 10 mm), or 3 (10 mm).

Fig-9 Lachman test under spinal anaesthesia

Functional scoring scales-
The patients were evaluated using the Lysholm Scoring Scale, Tegner activity scale, The Anterior Knee Pain scale and Visual Analogue scale (VAS). The patient satisfaction factor was evaluated by a pretest semi structured Questionnaire method.
Data analysis-
Wilcoxon Signed Rank Test was used to assess whether there was any significant changes in the tests used. Critical value (α) was fixed at 0.05. P Value less than 0.05 was taken as significant and less than 0.01 was taken as highly significant. The statistical correlation between compliance to physiotherapy and knee scores were tested with Kruskal Wallis Test. SPSS 17.0 version was used to analyze data.

RESULTS-
23 patients who were prospectively evaluated consisted of mean age group falling into 27.7 ± 8.4 (range, 22 to 55 years). There were 21 males and 2 female patients. Left knee injuries were predominating over right. The majority of the study populations were students (40%). Forty percent of the patients sustained sports related injuries. About fifty-five percent of patients who clinically reported were those who sustained the injury over a period of 6 weeks. The most common presenting complaint was knee pain which was followed by instability and

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

locking. The most common associated injury observed was the menisci injury, in which the medial meniscus tear was the predominating (35%) (Tab. I). Fifteen patients out of the total study group underwent ACL reconstruction exclusively and rest of the patients were subjected for additional surgical procedures like meniscal repair, partial and complete medial meniscectomy etc.

Table-I

Associated meniscal injuries	No of patients	Percentage (%)
Medial meniscus	08	35%
Lateral meniscus	03	13%
Both the menisci	01	4%

Table-II

Distribution of Anterior drawer test among pre-operative and post-operative patients shown.

Anterior drawer test	Pre		Post	Z	P	
	Count	%	Count	%		
Negative	08	35	21	91.3	3.35	0.001
Grade-1	13	56.5	02	8.7		
Grade-2	02	8.5	00	0.0		

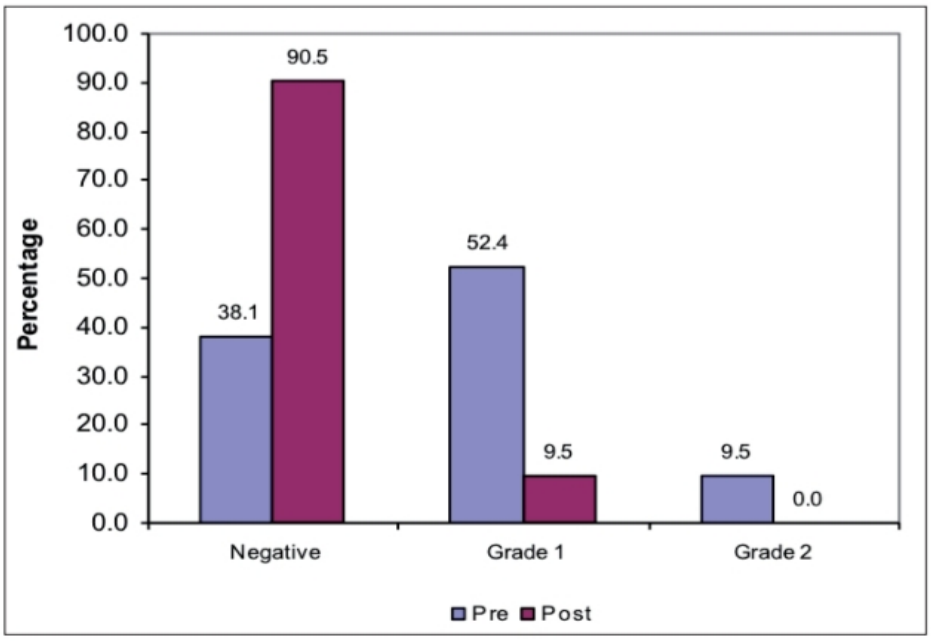


Fig-10The distribution of the preoperative and postoperative Lachman test. Note that there is significant decrease in knee laxity from pre operative level. (Significant at 0.01 level)

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

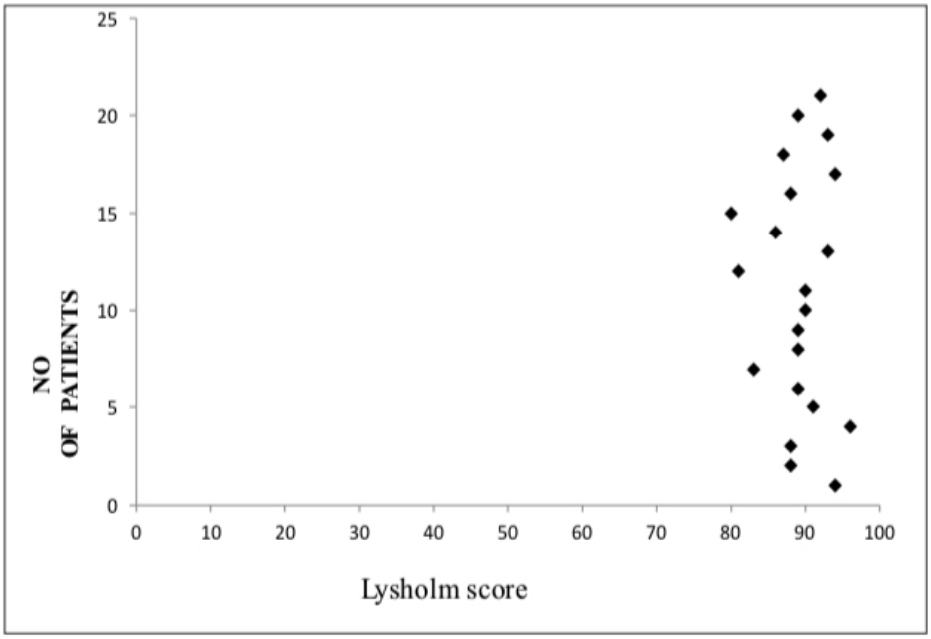


Fig-11 The distribution of postoperative Lysholm scores at follow-up is shown. The mean Lysholm score postoperatively was 89 (range, 80 to 96; SD, 4.14)

Table-III
Post-operative scoring scales

Scores	Mean	Range	SD
Lysholm score	89.05	80-96	4.14
Tegner activity score	5.44	4-7	1.12
VAS	1.7	1-3	0.6

DISCUSSION-

There are some conflicts and limitations regarding the initial fixation method of the BTB graft in the femoral tunnel with various fixation implants.[14] Windshield wiper effect is lower in patellar tendon ACL reconstruction.[15] Based on our study we could conclude that Arthroscopic ACL reconstruction using central third BTB autograft gave good stability at 18 months follow up. Our results are comparable with various other studies.[15] Shaieb et al. in 2002 had done a prospective randomized comparative study, where BTB was fixed with interference screws. They studied 31 cases in total in the BTB group and had excellent and good results in 88%, fair results in 6% and poor outcome in 6%.[16] Fox et al. published that Lysholm knee scoring scale was used in 12 studies and the mean score was 91 (range, 85–96).[17] In their study, Ibrahim et al. at 2005 achieved a mean Lysholm and Gilquist score of 91.6 and 92.7 for the bone-patellar tendon-bone graft and semitendinous-gracilus (STG) groups, respectively.[18]

Limitations-

i) Small sample size
ii) Short term follow up

CONCLUSION-

Our study has reached a conclusion that patients who have undergone this fixation method have comparable functional scoring scales, clinical outcome and minimum knee laxity with other fixation methods. However a randomized and long-term studies are required for better

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

understanding the outcome of arthroscopic assisted anterior cruciate ligament reconstruction using bone-patellar tendonbone (BTB) graft.

REFERENCES-

1. Gianotti S, Marshall S, Hume P, Bunt L. Incidence of anterior cruciate ligament injury and other knee ligament injuries: A national population-based study. Journal of Science and Medicine in Sport. 2009;12(6):622-627.
2. Fithian DC, Paxton LW, Goltz DH. Fate of the anterior cruciate ligament-injured knee. Orthop Clin North Am. 2002;33:621- 636.
3. Church S, Keating JF. Reconstruction of the anterior cruciate ligament: timing of surgery and the incidence of meniscal tears and degenerative change. J Bone Joint Surg Br. 2005;87(12): 1639-1642.
4. Kim HS, Seon JK, Jo AR. Current Trends in Anterior Cruciate Ligament Reconstruction. Knee Surg Relat Res. 2013;25(4): 165-173.
5. Aune AK, Holm I, Riseberg MA, Jensen HK, Steen H. Four strands hamstring tendon autograft compared with patellar tendon bone autograft for anterior cruciate ligament reconstruction: A randomized study with two year follow up. Am J Sports Med. 2001;29:722-728.
6. Freedman KB, D'Amato MJ, Nedeff DD, Kaz A, Bach BR Jr. Arthroscopic anterior cruciate ligament reconstruction: a metaanalysis comparing patellar tendon and hamstring tendon autografts. Am J Sports Med. 2003;31:2-11.
7. Biau DJ, Tournoux C, Katsahian S, Schranz PJ, Nizard RS. Bone-patellar tendon-bone auto grafts versus hamstring auto grafts for reconstruction of anterior cruciate ligament: metaanalysis. BMJ. 2006;332:995-1001.
8. Goldblatt JP, Fitzsimmons SE, Balk E, Richmond JC. Reconstruction of the anterior cruciate ligament: meta-analysis of patellar tendon versus hamstring tendon autograft. Arthro - scopy. 2005;21(7):791-803.
9. Howell SM, Taylor MA. Brace-free rehabilitation, with early return to activity, for knees reconstructed with a double looped semitendinosus and gracilis graft. Journal of Bone and Joint Surgery. 1996;78(6):814-825.
10. Colvin A, Sharma C, Parides M, Glashow J. What is the Best Femoral Fixation of Hamstring Autografts in Anterior Cruciate Ligament Reconstruction? A Meta-analysis. Clin Orthop Relat Res. 2011;469:1075-1081.
11. Philip Cheung, et al. Tunnel widening after quadrupled hamstring anterior cruciate ligament reconstruction. Journal of Orthopaedic Surgery. 2010;18(2):198-202.
12. Rosenberg TD, Franklin JL, Baldwin GN, Nelson KA. Extensor mechanism function after PT graft harvest for anterior cruciate ligament reconstruction. Am J Sports Med. 1992;20:519-525.
13. Otero AL, Hutcheson L. A comparison of the doubled semitendonosus/gracilis and central third of the PT autografts in arthroscopic anterior cruciate ligament reconstruction. Arthroscopy. 1993;9(2):143-148.
14. Baumfeld JA, et al. Tunnel widening following anterior cruciate ligament reconstruction using hamstring autograft: a comparison between double cross-pin and suspensory graft fixation. Knee Surg Sports Traumatol Arthrosc. 2008;16(12):1108- 1113.
15. Clark R, Olsen RE, Larson BJ, Goble EM, Farrer RP. Crosspin fixation: A new technique for hamstring anterior cruciate reconstruction of the knee. Arthroscopy. 1998;14:258-267.
16. Harilainen A, Sandelin J, Jansson K. A Cross-pin femoral fixation versus metal interference screw fixation in anterior cruciate ligament reconstruction with hamstring tendons: Results

ISSN: 0975-3583, 0976-2833 VOL 14, ISSUE 9, 2024

of a controlled prospective randomized study with 2-year followup. Arthroscopy. 2005;21(1):25-33.
17. Kousa P, Jarvinen TL, Vihavainen M, Kannus P, Järvinen M. The fixation strength of six hamstring tendon graft fixation devices in anterior cruciate ligament reconstruction. Part I: Femoral site. Am J Sports Med. 2003;31(2):174-181.
18. Zantop T, Weimann A, Rümmler M, Hassenpflug J, Petersen W. Initial fixation strenght of two bio absorbable pins for the fixation of hamstring grafts compared to interference screw fixation: single cycle and cyclic loading. Am J Sports. 2004;32(3):641-649.
19. Ahmad CS, Gardner TR, Groh M, Arnouk J, Levine WN. Mechanical properties of soft tissue femoral fixation devices for anterior cruciate ligament reconstruction. Am J Sports Med. 2004;32(3):635-640.
20. Padulo J, Oliva F, Frizziero A, Maffulli N. Muscles, Ligaments and Tendons Journal - Basic principles and recommendations in clinical and field science research: 2016 update. MLTJ. 2016;6(1):1-5.
21. Gurtler RA, Stine R, Torg JS. Lachman test evaluated. Quantification of a clinical observation. Clin Orthop Relat Res. 1987;216:141-150.
22. Clatworthy MG, Annear P, Bulow J-U, Bartlett RJ. Tunnel widening in anterior cruciate ligament reconstruction: a prospective evaluation of hamstring and patella tendon grafts. Knee Surgery, Sports Traumatology, Arthroscopy. 1999;7(3): 138-145.
23. Ahn JH, Park JS, Lee YS, Cho YJ. Femoral bioabsorbable cross-pin fixation in anterior cruciate ligament reconstruction. Arthroscopy. 2007;23(10):1093-1099.
24. Ibrahim AR, Hamido F, Al Misfer AK, Mahgoob A, Ghafar SA, Alhran H. Anterior cruciate ligament reconstruction using autologous hamstring double bundle graft compared with single bundle procedures. J Bone Joint Surg [Br]. 2009;91-B:1310- 1315.
25. New Briggs KK, Lysholm J, Tegner Y, Rodkey WG, Kocher MS, Steadman J. The reliability, validity, and responsiveness of the Lysholm score and Tegner activity scale for anterior cruciate ligament injuries of the knee: 25 years later. Am J Sports Med. 2009;37(5):890-897.