ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 07 | July - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

"PROSPECTIVE COMPARATIVE STUDY ON THE FUNCTIONAL OUTCOME OF ARTHROSCOPIC RECONSTRUCTION OF ANTERIOR CRUCIATE LIGAMENT USING BONE PATELLAR TENDON BONE GRAFT VS HAMSTRING GRAFT"

Orthopaedics

Dr. Shiv Dass Sidhu Department of Orthopaedics, Sawai Man Singh Medical College, Jaipur, Rajasthan, India.

Dr. Mahesh Chand Bansal Department of Orthopaedics, Sawai Man Singh Medical College, Jaipur, Rajasthan, India.

Dr. Devkant Meena Department of Orthopaedics, Sawai Man Singh Medical College, Jaipur, Rajasthan, India.

Dr. Ravindra Kumar Lamoria Department of Orthopaedics, Sawai Man Singh Medical College, Jaipur, Rajasthan, India.

Dr. Harshit Kumar Department of Orthopaedics, Sawai Man Singh Medical College, Jaipur, Rajasthan, India.

ABSTRACT

Objective: To do detailed comparative study on the functional outcome of bone patellar tendon bone graft and the hamstring tendon graft for reconstruction of ACL and evaluation of results. **Methods:** This was a prospective study comprising 88 patients who presented with knee instability and/or pain at SMSMC & H,Jaipur from November 2020 to July 2022. They were diagnosed clinically and confirmed by MRI to have ACL tear. Outcome evaluation was done using Lysholm knee score and IKDC.The patients were followed up at 4,8,12 weeks, 6 months and 1 year. **Results:** Mean post-operative Lysholm score in bone patellar tendon bone group was 88.9 with scores ranging from 81 to 95. Mean post-operative Lysholm score in Hamstring graft group was 88.6 with range from 79 to 95. **Conclusions:** Arthroscopic ACL reconstruction by either quadrupled STG graft or bone patellar tendon graft gives satisfactory results in short term follow up in terms of activities of daily living, patient satisfaction, and return to near normal daily activity. However, a larger scale study with longer follow up is required to evaluate the long term results.

KEYWORDS

ACL reconstruction,Bone patellar tendon bone graft, hamstring tendon graft

INTRODUCTION:

The ACL is the main stabilizer against anterior translation of the tibia on the femur and is important in preventing rotation and valgus stress. ACL deficiency leads to knee instability resulting in repeated injuries and increased risk of intra-articular damage, especially the meniscus[1].The goals of the ACL reconstruction are to restore stability to the knee thus allowing the patient to return to normal daily activities, and to delay the onset of osteoarthritis with associated injuries to the articular cartilage and the menisci[2].The advantages of arthroscopically assisted ACL reconstruction include avoidance of capsule incision,decreased fat pad trauma, avoidance of desiccation of the articular cartilage and a lesse post-op patellofemoral pain[3].Ideally, the graft used for ACL reconstruction should reproduce the anatomic and biomechanical properties of the original ACL , and allow solid fixation and rapid biological integration, with least donor-site morbidity.The two most commonly used grafts are the central third of the patellar tendon, including its bony attachments, and the quadrupled hamstrings tendon graft made of the gracilis and semitendinosus tendons. Being accessible,with good structural and fixation properties,easy bone to bone healing, and a predictable success rate,the BPTB graft has been considered the ideal graft choice[4,5,6,7,8,9]. However,problems such as Anterior knee pain, loss of sensation, patellar fracture,distal patellar contracture, and loss of extension power impair knee function despite of a successful replacement of the ACL[10,11,12,13,14]. Therefore with this study we intend to evaluate the pros and cons of both BPTB and STG autografts.

MATERIALAND METHODS:

The study was conducted in the Orthopaedics department of S.M.S.M.C & H from November 2020 to July 2022 with minimum 6 month follow up. 88 cases were selected and thorough clinical examination was done (Lachman test, anterior drawer test and pivot shift test). Tests were also done to exclude concomitant other knee ligaments injuries. Patients are evaluated with x-rays of knee and confirmed by MR imaging.

Inclusion Criteria

1. Patients between age group of 18 to 45 years presenting with complaint of knee joint pain, swelling and joint instability having a previous history of knee joint trauma during walking or other sport activity.
2. Willingness to participate in an investigational technique and follow-up with written consent.
3. Patients with clinically and radiologically confirmed grade III ACL tear.

Exclusion Criteria

1. Patients with multi-ligamentous or intraligamentous ACL damage.
2. Patients with complex tears of the meniscus and evidence of osteoarthritis on plain radiographs.

In case of acute presentation, prior to Arthroscopic reconstruction surgery, patient is treated conservatively with knee immobilizer, physiotherapy for achieving near full range of motion, symmetric quadriceps strength and to decrease joint effusion. Once the inflammation subsides, patient is prepared for surgery.

Surgical Procedure

All patients were operated under spinal anaesthesia. A pneumatic torniquet was used in all the cases.The patients were scrubbed,painted with povidone iodine solution and draped in supine position.A 6-8cm vertical incision was given on the anterior aspect of knee in a midline position.Dissection carried out and Patellar tendon was identified from base of patella to the tibial tuberosity.The central 10mm of the patellar tendon was identified and marked.With the help of oscillating saw,a wedge shaped piece of bone was cut from the mid-portion of patella securing the patellar tendon proximal attachment.Care is taken not to cut too deep into the patella,thus preventing a patellar bone fracture.Then the distal attachment of patellar tendon,i.e. the tibial tuberosity is cut and the patellar tendon is harvested alongwith the proximal and distal bony attachments.The remnant tendon is sutured together with an absorbable suture vicryl 1-0 and wound closed in layers.

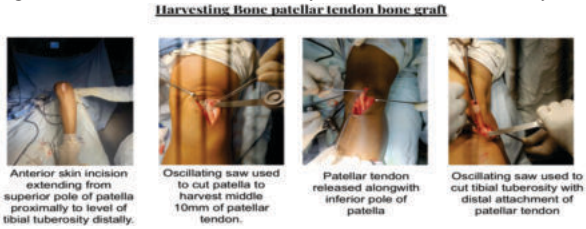


Fig:1

For harvesting the STG graft,a 3cm long vertical incision is made on the anteromedial aspect of proximal leg.The pes anserinus tendons are identified.sartorius fascia incised and Gracilis and Semitendinosus tendons were seperated. Whip stitch applied to the tendons and released using the tendon stripper. Wound closed.

Grafts shifted to the table for preparation. They were sized for adequacy of length and thickness. 2 holes were drilled in each of the bony attachments of the patellar tendon and braided polyester sutures were passed through them.

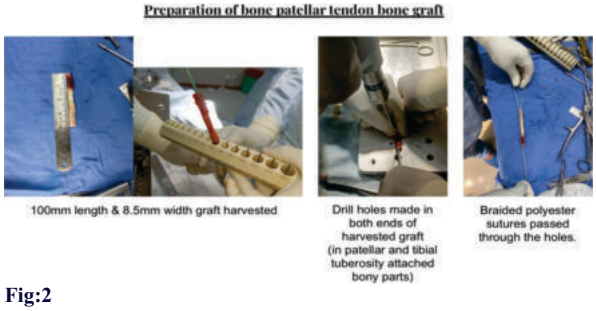


Fig:2

An 11 blade was used to create the Antero-lateral portal at a 45 degree angle into the joint just lateral to the patella tendon and just inferior to the inferior pole of patella. Antero-medial portal made under visual guidance of the scope using a spinal needle. Diagnostic arthroscopy was performed and ACL tear was confirmed.ACL footprint debrided using a shaver blade.

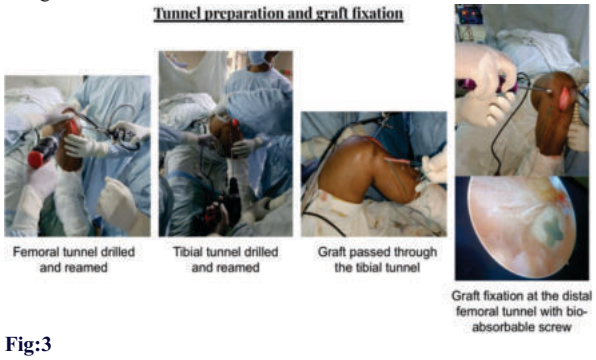


Fig:3

Femoral tunnel was prepared using the inside out technique. A guide wire was passed at the anatomic footprint of ACL with knee in 90° flexion. Then knee was flexed upto120° and then guide wire passed beyond the lateral femoral cortex. The tunnel is then drilled with the 4.5mm cannulated endoscopic drill. Next,the tibial tunnel is prepared using the outside-in technique. Aimer is used to guide the angulation. Then the graft is tracked from tibia to femur. Knee cycling done to get the desired tension in the graft.Bio-absorbable screws are used to fix the graft in the femur and tibia.Wounds were closed using non absorbable 1-0 sutures.

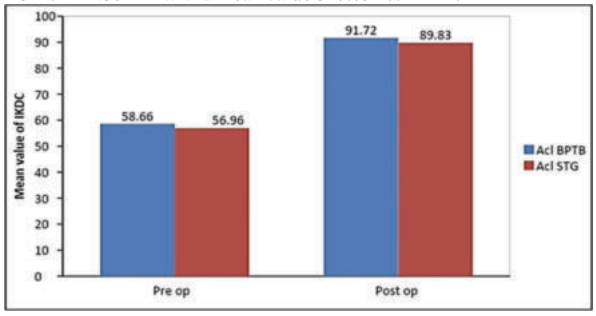
Post-operative Care

The knee brace was unlocked to allow 0-90 degrees knee motion on the second postoperative day and the patient was discharged. Weight bearing as tolerated was allowed with support(with walker), initially only 50% body weight in 1st post-op week, then 50-75% body weight during 8-14 days post-op. Full weight bearing without support was allowed as soon as the patients were comfortable and regained proper muscle power of operated limb to avoid misbalancing. The usual clinical follow-up plan included review at 10-14 days for wound inspection and suture removal, the brace set to 0-120 degrees at 4 weeks and removed at 6 weeks. Wall sliding semi-squats were allowed as early as possible. Bicycling was allowed at 2-3 months and general strengthening exercises continued. Returning to sports involving jumping, pivoting, or side-stepping was prohibited until 9 months post- operatively but with variable patient compliance.

Follow UP Plans: Post-operative knee function was evaluated by IKDC scoring and assessment of Lysholm knee score at 2 weeks, 6 weeks, 3-month, 6 months (at least), 1 year and 2 year follow ups.

OBSERVATIONS AND RESULTS:

88 patients were included in the study. There were 44 patients in the Bone patellar tendon bone graft group and 44 patients in the hamstring group .The mean age in BPTB graft group was 29.25±6.21 years and in STG graft was 28.88±6.33years. Majority of the patients were males,i.e. 79 and 9 were females. There is significant difference between duration of injury and procedure done.A duration of <3 month between injury and procedure done was found in 43 patients, while 45 out of 56 patients were having a history of >3 months.Right side was affected in 63 patients and left side was involved in 25 patients.There was wide variation in mechanism of injury causing ACL tear among patients, most common being Activity of daily living accounting for 44 cases, sports injury 32 cases and Road traffic accident 12 cases.The graft size ranged between 7.5mm to 9.5mm in BPTB autograft group with a mean size of 8.76±0.53mm while the range in STG group was from 7mm to 9mm with a mean value of 7.79±0.44mm.



Graph:1

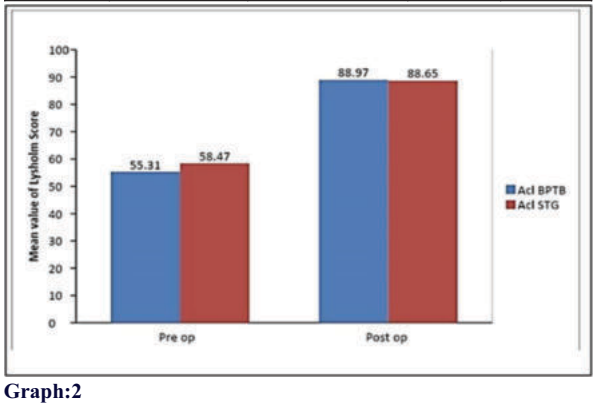
Table:1

Group	IKDC		Mean difference	P- value
	Pre-op (Mean+/-SD)	Post-op (Mean+/-SD)		
BTPB	58.65+/-5.10	91.72+/-2.69	33.06	<0.0001
STG	56.96+/-5.10	89+/-3.50	32.87	<0.0001

41 out of 44 patients (93.2%) of BPTB group while 39 out of 44 patients of STG group (88.63%) reported an IKDC score 85-94 (good score).

Table:2

Group	Lysholm Score		Mean difference	P- value
	Pre-op (Mean+/-SD)	Post-op (Mean+/-SD)		
BPTB	55.31+/-5.8	88.9+/-3.46	33.65	<0.0001
STG	58.47+/-4.44	88.65+/-3.90	30.18	<0.0001



Graph:2

Mean Lysholm Score was 88.25 in BPTB group and 88.65 in STG group at 2 yr follow up period.

DISCUSSION:

In meta-analyses by Mohtadi and Tashiro et al. residual laxity, Lachman test and negative pivot-shift favored B-PT-B graft[15,16]. However in our study we found no significant between the two groups.

A recent meta-analysis found higher osteoarthritis rates in BPTB than STG graft in both patellofemoral and medial compartments [17]. In our short term study we found no arthritic changes radiographically in both group of patients,but a longer follow up is needed for further in depth evaluation of results.

The Swedish and Norwegian registries reported higher revision rates with HT graft [18]. However in our study there was no graft tear in the either groups.Some recent studies(Spindler et al) have found that kneeling pain was significantly more common in BPTB autografts than STG grafts[19].In our study 12 out of 44 patients with BPTB graft had anterior knee pain and difficulty with kneeling and 7 out of 44 patients with STG graft had anterior knee pain and difficulty in kneeling.

On Lachmann's test majority of patients were showing good knee stability and graft strength in term of displacement 0-2 mm in 42 cases of BPTB group and 39 cases of STG group while 3-5 mm translation was noted in 2 cases of BPTB group and 5 cases of STG group.Result of Anterior drawer test were also identical to Lachmann's test among both study groups.

Out of all 44 patients operated by bone patellar tendon bone autograft,there were no patellar fractures reported either peri or post-operatively.

IKDC score was good (85-94) in majority of cases;41 cases of BPTB group and 39 cases of STG group, while only 3 cases of BPTB group and 5 cases of STG reported a IKDC score 65-84 range category.Mean IKDC score was 91.72±2.69 in BPTB group and 89.83±3.50 in STG group. Mean Lysholm Score was 88.25 in BPTB group and 88.65 in STG group.

CONCLUSION:

In this Hospital based prospective comparative randomised interventional study for ACL reconstruction; BPTB autografts had an excellent functional outcome (IKDC, Pivot shift, Lysholm) and showed comparable results to the quadrupled STG graft, with no donor site morbidity. Our study comparing STG and BPTB graft found no significant difference in knee range of motion, laxity and re- tear after a period of 2 years. Donor-site morbidity and especially risk of anterior pain and discomfort kneeling were less with STG graft. However, a large scale study and a long term follow up is required for a better comparison.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Jomha NM, Pinczewski LA, Clingeleffer A, Otto A. Arthroscopic reconstruction of anterior cruciate ligament with patellar-tendon auto graft and inter ferrence screw fixation. The results at seven years. J Bone Joint Surg (Br). 1999; 81:775-9.
2. Dye SF, Wojtys EM, Fu FH, Fithian DC, Gillquist J. Factors contributing to function of the knee joint after injury and reconstruction of the anterior cruciate ligament. In Zuckerman JD. Ed. Instructional Course Lecture. Rosemont, American Academy of Orthopaedic Surgery. 1999; 48:185-98.
3. Fu FH, Schulte KR. Anterior cruciate ligament surgery: State of the art? Clin Orthop. 1996; 325:19-24.
4. Aglietti P, Buzzi R, Zaccherotti G et al. Patellar tendon versus doubled semitendinosus and gracilis tendons for anterior cruciate ligament reconstruction. Am J Sports Med. 1994; 22:211-218.
5. Clancy WG Jr, Narechania RG, Rosenberg TD et al. Anterior and posterior cruciate ligament reconstruction in rhesus monkeys. A histological, microangiographic, and biomechanical analysis. J Bone Joint Surg. 1981; 63A:1270-1284.
6. Cooper DE, Deng XH, Burstein AL et al. The strength of the central third patellar tendon graft. A biomechanical study. Am J Sports Med. 1993; 21:818-824.
7. Grøntvedt T, Engebretsen L, Benum P et al. A prospective, randomized study of three operations for acute rupture of the anterior cruciate ligament: Five-year follow-up of one hundred and thirty-one patients. J Bone Joint Surg. 1996; 78A:159-168.
8. Marder RA, Raskind JR, Carroll M. Prospective evaluation of arthroscopically assisted anterior cruciate ligament reconstruction. Patellar tendon versus semitendinosus and gracilis tendons. Am J Sports Med. 1991; 19:478-484.
9. Noyes FR, Butler DL, Grood ES et al. Biomechanical analysis of human ligament grafts used in knee-ligament repairs and reconstructions. J Bone Joint Surg. 1984; 66A:344-352.
10. Bonamo JJ, Krinick RM, Sporn AA. Rupture of thepatellar ligament after use of its central third for anterior cruciate reconstruction. A report of two cases. J Bone Joint Surg. 1984; 66A:1294-1297.
11. Christen B, Jakob RP. Fractures associated with patellar ligament grafts in cruciate ligament surgery. J Bone Joint Surg. 1992; 74B:617-619.
12. Kartus J, Stener S, Lindahl S et al. Factors affecting donor-site morbidity after anterior cruciate ligament reconstruction using bone-patellar tendon bone autografts. Knee Surg Sports Traumatol Arthrosc. 1997; 5:222-228.
13. Risberg MA, Holm I, Tjomsland O et al. Prospective study of changes in impairments and disabilities after anterior cruciate ligament reconstruction. J Orthop Sports Phys Ther. 1999; 29:400-412.
14. Sachs RA, Daniel DM, Stone ML et al. Patellofemoral problems after anterior cruciate ligament reconstruction. Am J Sports Med. 1989; 17:760-765.
15. Mohtadi NG, Chan DS, Dainty KN, Whelan DB. Patellar tendon versus hamstring tendon autograft for anterior cruciate ligament rupture in adults. Cochrane Database Syst Rev, 2011, CD005960.
16. Tashiro T, Kurosawa H, Kawakami A, Hikita A, Fukui N. Influence of medial hamstring tendon harvest on knee flexor strength after anterior cruciate ligament reconstruction. A detailed evaluation with comparison of single- and double-tendon harvest. Am J Sports Med. 2003; 31:522-9.
17. Poehling-Monaghan KL, Salem H, Ross KE et al. Long- term outcomes in anterior cruciate Ligament reconstruction: A systematic review of patellar tendon versus hamstring autografts. Orthop J Sports Med. 2017; 14:5.
18. Gifstad T, Foss OA, Engebretsen L et al. Lower risk of revision with patellar tendon autografts compared with hamstring autografts: a registry study based on 45,998 primary ACL reconstructions in Scandinavia. Am J Sports Med. 2014; 42:2319-28.
19. Spindler KP, Kuhn JE, Freedman KB, Matthews CE, Dittus RS, Harrell FE. Anterior cruciate ligament reconstruction autograft choice: bone-tendon-bone versus hamstring: does it really matter? A systematic review. Am J Sports Med. 2004; 32(8):1986-1995.