

A PROSPECTIVE STUDY OF FUNCTIONAL ASSESSMENT OF ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING VARIOUS GRAFTS

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Abstract

Background: The anterior cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the knee from anterior translation. It is also crucial for balancing valgus and rotational stress. An established and often performed surgical treatment with a low morbidity profile and demonstrated success is ACL reconstruction. **Objectives:** The present study was designed to study the functional assessment of ACL reconstruction using various grafts. **Materials and Methods:** The study was conducted on 18 patients admitted with clinical and radiological deficiency of ACL, Department of Orthopaedics, Gandhi Hospital, Secunderabad. Functional assessment of ACL reconstruction using various grafts, assess the functional outcome of arthroscopy-assisted anterior cruciate ligament reconstruction with quadrupled semitendinosus tendon graft using endobutton and bioabsorbable interference screw in terms of range of motion, postoperative knee stability, graft site morbidity, subjective knee functions and prospective assessment of functional outcome using tegner lysholm knee scoring system. **Results:** In our study, the majority of the cases i.e. 14 (77.78%) were in the age group of 21-40 years, followed by 3 (16.66%) cases in the age group 41-60 years. Of 8 cases (44.44%) affected were due to slip and fall. In the present study, hamstring tendon autografts were used in 10 (55.56%) cases, peroneus longus graft was used in 6 (33.33%) cases while bone-patellar tendon-bone autograft was used in 2 (11.11%) cases. Postoperative knee pain was evaluated using a visual analogue scale. In two patients in BPTB, 1 (50%) patient had mild pain while flexing the knee and 1 (50%) patient had experienced no knee pain. **Conclusion:** In conclusion, the results of our study substantiate the similarities between the grafts found in previous reports. Good or excellent results can be obtained in most ACL reconstructions using hamstring tendon autografts or peroneus longus grafts. BPTB autograft is a better graft for sportspersons with highly intense activities and by taking an oblique incision for harvest of BPTB graft the incidence of anterior knee pain has been reduced to minimal or negligent.

INTRODUCTION

An anterior cruciate ligament (ACL) is the most frequently injured ligament in the knee joint, usually injured when engaging in sports activity, but nonsports injuries are not uncommon.^[1,2] It can happen when you chase after and play with children, or when you fall from a ladder while doing chores around the house. The goal of ACL restoration is to

provide a stable knee so that the patient may resume regular daily activities or sports following surgery.^[3,4] The use of different grafts in ACL restoration has changed significantly during the past few decades. With differing degrees of effectiveness, autografts, allografts, and synthetic grafts have all been attempted.^[5]

Autografts can come from various tendon sources. The two most common are the hamstring tendon

graft and the patellar tendon (PT) graft, commonly known as the Bone-Patellar-Tendon-Bone (BPTB) graft.^[6] BPTB graft has the benefit of bone-to-bone healing, which allows tunnel and graft to be easily incorporated, leading to a quicker return to work and athletic activity.^[7] However, BPTB carries the potential for morbidity at the donor site, including motion loss, patellofemoral discomfort, and fracture of the patella. On the other hand, a hamstring autograft is easily harvested with little morbidity at the donor site and is similar to native ACL.^[8,9]

Peroneus brevis and peroneus longus have a synergistic action; hence longus can be spared as an autograft. This tendon is increasingly being used as a graft in reconstructive orthopaedics, including spring or deltoid ligament reconstruction in the foot and medial patellofemoral ligament reconstruction in the knee.^[10] Peroneus longus tendon has been used as the first option for ACL autograft in a few earlier studies, with favourable clinical results and low donor site morbidity. However, another research did not agree with the morbidity of the donor site.^[10] Some experimental documents reported, on the other hand, found no difference in hamstring tendon and peroneus longus tensile strength in their biomechanical analysis. We hypothesized that the peroneus longus tendon would be an acceptable graft for arthroscopic ACL reconstruction.^[11] Hence, it would be particularly useful for sportsmen who rely on hamstring strength or for patients who, most of the time, are kneeling during their religious or social activity. Various fixation methods have been described for ACL reconstruction. They can be classified into aperture fixation and suspensory methods.^[12] The suspensory methods can be sub-classified into cortical, cancellous and cortisol-cancellous suspension methods. The most commonly used devices for femoral fixation are interference screws, transfix screws and cortical suspension devices.^[13] Cortical suspension devices have been widely used in ACL reconstruction for femoral side graft fixation. Various studies have shown that cortical suspension devices have the necessary biomechanical properties for ultimate failure strength, displacement, and stiffness for the initial fixation of soft tissue in the femoral tunnel for ACL reconstruction.^[14,15] Devices for tibial fixation can be divided according to the location of fixation: intratunnel fixation and extratunnel fixation. Intratunnel fixation methods primarily rely on interference screws (metallic or bioabsorbable) or a cross-pin system. The aperture fixation methods like the interference screws allow for early firm fixation and heal with tight bone-tendon interface.

The present study was designed to study the functional assessment of ACL reconstruction using various grafts.

MATERIALS AND METHODS

Study Design: A Prospective Study.

Source of Data

The study was conducted on 18 patients (serving soldiers) admitted with clinical and radiological deficiency of ACL from October 2021 to December 2023, in the Department of Orthopaedics, Gandhi Hospital, Secunderabad, Telangana. The study results included 18 patients (serving soldiers) with a minimum of 2 years of follow-up.

Inclusion Criteria

Patients presenting in outpatient with age group above 18 years, clinically diagnosed and MRI confirmed ACL insufficiency, no previous ligament reconstruction done, patients willing to give informed consent

Exclusion Criteria

ACL injuries with avulsion injuries or associated with multi-ligament injury, patients with prior ipsilateral knee surgery, patients with signs of infection, patients with associated fractures, and patients not willing to give informed consent.

Clinical Assessment

On admission of the patient, a careful history was elicited from the patient to reveal the mechanism of injury and the severity of the trauma. The patients were then evaluated clinically for laxity by Lachman, Ant drawer by millimetre, pivot shift test, and assessed by Lysholm and Gillquist knee scoring system.

Radiographic Assessment

Standard guidelines were followed to get radiographs. Antero-posterior and lateral radiographs of the affected knee. All the patients were also evaluated by MRI of the knee preoperatively.

Pre-Operative Evaluation

All the patients were explained the aims of the study, and the methods involved and an informed written consent was obtained before being included in the study. All patients with clinical and radiological deficiency of ACL were initially evaluated with diagnostic arthroscopy of the knee. Patients meeting the inclusion and exclusion criteria were selected for the study.

Operative Procedure

All patients were operated on by a single surgeon using the Anteromedial portal technique. Arthroscopy assisted ACL reconstruction with single bundle quadrupled semitendinosus tendon autograft from ipsilateral limb using Endobutton (Smith and Nephew), cortical suspensory fixation method for femoral side and Bioabsorbable interference screw (Smith and Nephew), aperture fixation method for tibial side.

Post-Operative Period

Immediate postoperative complications like post-operative swelling, compartment syndrome, neurological damage and vascular injury are looked for. Patients were hospitalized for 2 weeks postoperatively and were sent on 6 weeks medical leave for convalescence.

Graft Harvest and Preparation

A) Hamstring graft preparation:

A 4-cm oblique skin incision was made over the anteromedial surface of the proximal tibia which is about 4 cm below the medial joint line and 3 cm medial to the tibial tuberosity. The subcutaneous tissues were dissected and pes anserinus insertion was identified. The semitendinosus and gracilis tendon were palpated by running the fingers from above downwards in the anteromedial aspect of the proximal tibia. The incision was further elongated if required and Sartorius fascia was exposed and cut. Gracilis and semitendinosus tendons were carefully dissected from the surrounding soft tissues and identified and localised using right-angle forceps. The tendons were released from the fibrous extensions and secured. A closed tendon stripper encircling the tendon was advanced with minimal counter traction securing the tendon. The stripper was carefully advanced with the knee held in 70-degree flexion and precautions were taken to prevent the amputation of the graft. The stripper is advanced till the tendon muscle junction is cut and the tendon is harvested. The harvested graft was prepared by clearing the muscle remnants and the graft ends were stitched together with a running whip stitch 4 to 5 cm from the free ends with polybraided nonabsorbable suture material (number 2 ethibond). The graft size was then measured using a sizer, by pulling the graft across the sizer and the prepared graft was protected in a moist cotton gauze piece.



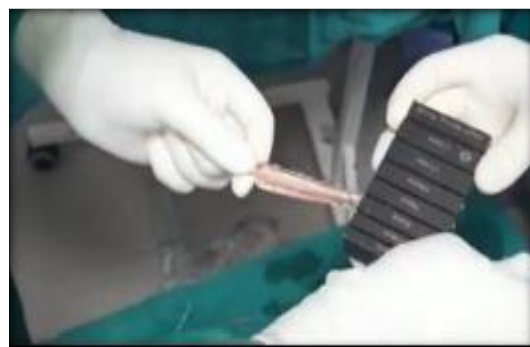
Incision for hamstring graft



Hamstring graft harvesting



Hamstring graft preparation



Graft size determination

Figure 1: Hamstring Graft Harvesting & Preparation

B) Peroneus longus graft preparation

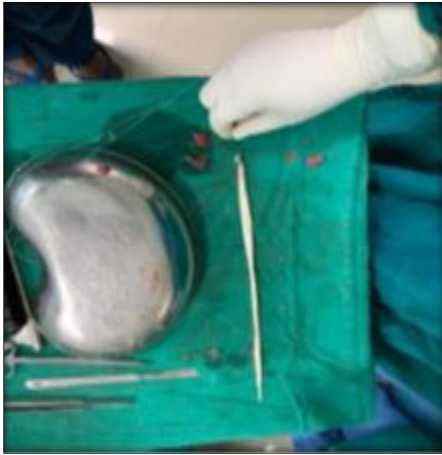
The incision is marked 2 cm above and 1 cm below the lateral malleolus, incise the skin and subcutaneous tissue, expose fascia over the peroneus, incise fascia in line with skin incision with help of right angle lift tendons. a) whip stitches applied to PL (pure tendinous) tendon and cut as distally as possible. b) tenodesis stitch applied to combine PL and PB (muscle belly) tendon. The proximal part of the tendon is stripped off, up to 4-5cm distal to the fibular head.



Incision for peroneus graft



Peroneus graft harvesting



Peroneus Graft Preparation

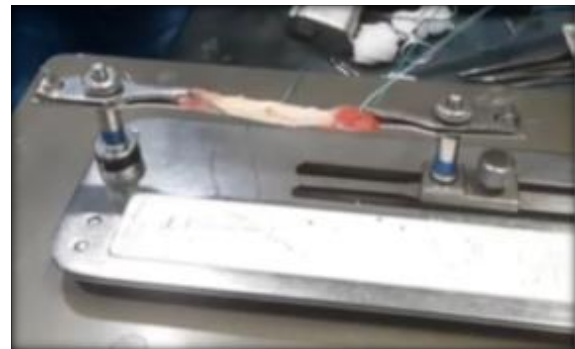
Figure 2: Peroneus longus graft harvesting & preparation

C) Bone Patellar Tendon Bone Graft Harvesting:

Patient positioned with knee at 90 degree of flexion, two vertical incisions of 20mm are given, proximal incision does not go below tip of patella, distal incision centred on anterior tibial tubercle, subcutaneous tissue is incised on patella and anterior tibial tubercle, scissors are passed subcutaneously from proximal to distal incision between peritendon and patellar tendon, mid 3rd of tendon is then dissected using double blade stripper (9mm in female or 11mm in male). A 20mm x 10mm patellar bone block, interdependent from the patellar tendon, is harvested using an oscillating saw blade. Kellys forceps passed between tendon and peritendon from tibial to patellar incision using, allowing extraction of bone block through tibial incision, oscillating saw is used to cut 20 mm tibial bone block, BPTB graft is thus harvested via double incision approach.



BPTB graft harvesting



BPTB Graft Preparation

Figure 3: Bone patellar tendon bone graft harvesting & preparation

Follow Up

The Patients were followed up at regular intervals at 06 weeks, 3 months, 6 months, 9 months and at 2 years postoperatively. A standard rehabilitation protocol was followed for all patients. All the patients were subjected to manual laxity testing (Lachman, pivot shift test) and objective laxity was measured by rotametre. At these intervals, all the patients were evaluated by the modified Lysholm knee scoring system. All the patients were also analyzed for their symptoms pre and post-operatively



BPTB incision

RESULTS



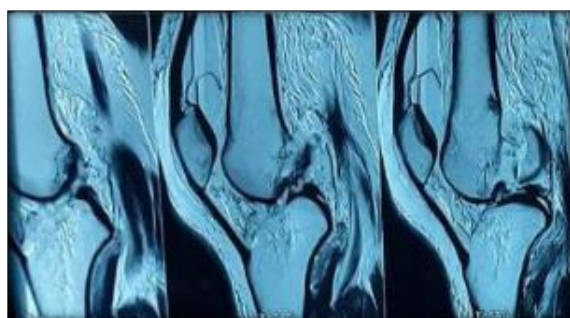
Pre OP X-ray



Pre OP MR



Post-OP X-ray



Post-OP MRI

In our study, the majority of the cases i.e. 14 (77.78%) were in the age group of 21-40 years, followed by 3 (16.66%) cases in the age group 41-60 years. The mean age was 28.72 ± 7.6 years. In the present study, males were more commonly involved. The majority of the patients were males 24

(80%) and 6 (20%) were females. Table 1 shows the age distribution. [Table 1]

Of 8 cases (44.44%) affected were due to slip and fall, 6 cases (33.33%) were due to RTA, and 4 cases were due to sports injuries. The right side limb was involved in 12 (66.67%) cases, while in 6 (33.33%) cases left limb was affected. Giving away was the most common symptom seen in all the patients followed by pain (77.78) and swelling in 11 (61.10%) cases, and clicking and locking in 8 (44.44%) patients. In our study, only 5 (27.78%) patients had isolated Anterior Cruciate Ligament injury, 55.56% of patients had an associated injury to the medial meniscus and 16.67% of patients had an associated injury to the lateral meniscus. In the present study, hamstring tendon autografts were used in 10 (55.56%) cases, peroneus longus graft was used in 6 (33.33%) cases while bone-patellar tendon-bone autograft was used in 2 (11.11%) cases. [Table 2]

Postoperative knee pain was evaluated using a visual analogue scale. In hamstring graft and peroneus longus graft patients, no patient experienced any pain postoperatively. In two patients in BPTB, 1 (50%) patient had mild pain while flexing the knee and 1 (50%) patient had experienced no knee pain. 8 (80%) patients who received Hamstring grafts had excellent Lysholm scores postoperatively, while 2 (20%) were in good category. In peroneus longus graft patients, 5 (83.33%) were in the excellent category, and 1 (16.67%) patients had good outcome. In BPTB graft patients, all the 2 patients had good functional outcomes postoperatively. 10 patients who received Hamstring grafts graded their post-operative recovery as normal. Among patients who received peroneus longus graft, 5 patients had normal, and 1 patient had near normal recovery. While in BPTB patients, 1 had normal and the other had near normal recovery. [Table 3]

Table 1: Age Distribution

Age in year	Number of cases
18-20	1 (5.56%)
21-40	14 (77.78%)
41-60	3 (16.66%)
61-80	0 (0%)
Total	18 (100%)

Table 2: Mode of Injury and Type of Fractures

	Number of Patients
Mode of injury	
Motor vehicle accidents (RTA)	6 (33.33%)
Fall	8 (44.44%)
Sports	4 (22.23%)
The fracture occurred	
Right side	12 (66.67%)
Left side	6 (33.33%)
Presenting Symptoms	
Pain	14 (77.78%)
Swelling	11 (61.10%)

Giving Away	18 (100%)
Locking	8 (44.44%)
Clicking	8 (44.44%)
Associate Injuries	
Associated medial meniscal injury	10 (55.56%)
Associated lateral meniscal injury	3 (16.67%)
Isolated ACL injury	5 (27.78%)
Type of Graft Used	
Hamstring	10 (55.56%)
Peroneus longus	6 (33.33%)
BPTB	2 (11.11%)

Table 3: Grading of Hamstring Graft according to Lysholm and Comparison of IKDC Pre-op and Post-OP

Lysholm Grading	Hamstring (n=10)		Peroneus Longus (n=6)		BPTB (n=2)	
	Post-op	Pre-op	Post-op	Pre-op	Post-op	Pre-op
Excellent (>90)	0	8	0	5	0	0
Good (84-90)	0	2	0	1	0	2
Fair (65-83)	0	0	0	0	0	0
Poor (<65)	0	0	0	0	0	0
IKDC						
Normal	0	10	0	5	0	1
Near Normal	0	0	0	1	0	1
Abnormal	0	0	0	0	0	0
Severely Abnormal	0	0	0	0	0	0

IKDC = International Knee Documentation Committee

DISCUSSION

The primary goal of ACL reconstruction is to restore the stability of the knee. Successful clinical outcomes following anterior cruciate ligament reconstruction with a semitendinosus graft have been reported by many authors.^[16] The choice of fixation in ACL reconstruction is still evolving and the current fixation device which has been widely used was the Endo button and the Bio composite interference screws which have helped to render an improved rehabilitation program postoperatively.^[17]

All patients in our study underwent Arthroscopy assisted ACL reconstruction with single bundle quadrupled semitendinosus tendon autograft from ipsilateral limb using Endobutton (Smith and Nephew), cortical suspensory fixation method for femoral side and Bioabsorbable interference screw (Smith and Nephew), Aperture fixation method for tibial side.

There are few prospective randomised studies on ACL reconstruction directly comparing the outcome of both grafts.

In a randomised, prospective study, we compared the long-term functional results in three groups of patients, whose treatment differed in the choice of the autograft. Apart from the graft, all other important factors for the clinical outcome were identical.

In our study, the mean age was 28.72 ± 7.6 years. Chaudhary et al,^[18] in their study had a mean age of 26.8 years. Jomha et al,^[19] in their study had a mean age of 26 years. Deehan et al,^[20] in their study had a mean age of 25 years. In our study, we had 83.33% male patients and 16.67% female patients. Chaudhary et al,^[18] in their study had 93.59% males and 6.41% females.

In our study, 66.67% of patients had injuries on the right side and 33.33% of patients had injuries on the

left side. Chaudhary et al,^[18] noted in their study that 56.41% of patients had injuries on the right side and 43.59% of patients had an injury on the left side. Chahal et al,^[21] in their study noted that 54.64% of patients had injuries on the right side and 45.36% of patients had injuries on the left side. Deehan et al,^[20] in their study noted that 61% of patients had injuries on the right side and 39% of patients had injuries on the left side. Jomha et al,^[19] in their study noted that 45.76% of patients had an injury on their right side and 54.24% of patients had an injury on their left side.

In our study we had 44.44% of patients endured a "fall", which was the most common mode of injury, 22.22% due to sports-related injury and 33.33% of patients' mode of injury was road traffic accident. Chaudhary et al,^[18] in their study noted that injuries caused by sporting activities accounted for 66.7% of the patients, whereas motor vehicle accidents and household injuries accounted for 30.8% and 2.5% respectively. Studies conducted by Patond et al,^[22] found sports activities to be the predominant cause of ACL injuries.

The Associated Injuries, in our study only 27.78% of patients had isolated ACL, 55.56% of patients had an associated injury to the medial meniscus and 16.67% of patients had an associated injury to the lateral meniscus. Chaudhary et al,^[18] in their study noted that 23.1% patients had an isolated injury to an anterior cruciate ligament, 37.9 % patients had an associated injury to the medial meniscus and 16.7% patients had an associated injury to the lateral meniscus.

At present the most commonly used grafts for ACL reconstructions are bone-patellar tendon-bone autograft and hamstring tendon autografts. In the present study, hamstring tendon autografts were used in 10 cases, peroneus longus graft was used in 6 cases and bone-patellar tendon-bone autograft was

used in 2 cases. In our study, we used combined semitendinosus and gracilis grafts in 10 patients. This technique using quadrupled semitendinosus reconstruction had little morbidity, a low reoperation rate, and excellent clinical results,^[23-25] Donor-site morbidity, including anterior knee pain, is a frequent complication associated with BPTB autografts, possibly leading to patient dissatisfaction. Previous studies assessing kneeling pain have also shown high rates of anterior knee pain with the BPTB autograft, which persists long-term Hamstring tendon autografts are often recommended for patients wanting to avoid postoperative anterior knee pain.

In the present study, Pre and post-operative scoring using IKDC score reveals significant improvement in Hamstring graft patients with higher IKDC scores, compared to peroneus longus and BPTB grafts. 8 patients who received Hamstring grafts had excellent Lysholm scores postoperatively, while 2 were in a good category. In peroneus longus graft patients, 5 were in the excellent category, and 1 patient had a good outcome. In BPTB graft patients, all the 2 patients had good functional outcomes postoperatively. Bourke et al,^[26] reported the outcome of 'isolated' anterior cruciate ligament (ACL) ruptures treated with anatomical endoscopic reconstruction using hamstring tendon autograft at a mean of 15 years. A total of 152 patients underwent subjective assessment at 15 years. The mean Lysholm knee score at 15 years was 93. O'NEILL,^[27] and Karampudi et al,^[28] reported the results of a retrospective study on patients who underwent arthroscopic ACL reconstruction.

CONCLUSION

In conclusion, the results of our study substantiate the similarities between the grafts found in previous reports. Good or excellent results can be obtained in most ACL reconstructions using hamstring tendon autografts or peroneus longus grafts. BPTB autograft is a better graft for sportspersons with highly intense activities and by taking an oblique incision for harvest of BPTB graft the incidence of anterior knee pain has been reduced to minimal or negligent. Hamstring tendon autografts or peroneus longus grafts provided good subjective outcomes.

REFERENCES

- Moses B, Orchard J, Orchard J. Systematic review: annual incidence of ACL injury and surgery in various populations. *Research in sports medicine*. 2012;20(3-4):157-79.
- Dauty M, Crenn V, Louguet B, Grondin J, Menu P, Fouasson-Chailloux A. Anatomical and neuromuscular factors associated to non-contact anterior cruciate ligament injury. *Journal of Clinical Medicine*. 2022;11(5):1402.
- Möller E, Weidenhielm L, Werner S. Outcome and knee-related quality of life after anterior cruciate ligament reconstruction: a long-term follow-up. *Knee surgery, sports traumatology, arthroscopy*. 2009;17(7):786-94.
- Dingenen B, Gokeler A. Optimization of the return-to-sport paradigm after anterior cruciate ligament reconstruction: a critical step back to move forward. *Sports medicine*. 2017;47:1487-500.
- D'Ambrosi R, Meena A, Arora ES, Attri M, Schäfer L, Migliorini F. Reconstruction of the anterior cruciate ligament: a historical view. *Annals of Translational Medicine*. 2023;11(10).
- Genuario JW, Faucett SC, Boublik M, Schlegel TF. A cost-effectiveness analysis comparing 3 anterior cruciate ligament graft types: bone-patellar tendon-bone autograft, hamstring autograft, and allograft. *The American journal of sports medicine*. 2012;40(2):307-14.
- Schoderbek Jr RJ, Treme GP, Miller MD. Bone-patella tendon-bone autograft anterior cruciate ligament reconstruction. *Clinics in sports medicine*. 2007;26(4):525-47.
- Kim JG, Yang SJ, Lee YS, Shim JC, Ra HJ, Choi JY. The effects of hamstring harvesting on outcomes in anterior cruciate ligament-reconstructed patients: a comparative study between hamstring-harvested and unharvested patients. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*. 2011;27(9):1226-34.
- Miller SL, Gladstone JN. Graft selection in anterior cruciate ligament reconstruction. *Orthopaedic Clinics*. 2002;33(4):675-83.
- Sidny NZ, Mustafiz M, Wafee A, Hossain MS, Ahmed AI, Talukder S, Islam DN. Peroneus Longus Tendon Autograft for Primary Arthroscopic Reconstruction of the Anterior Cruciate Ligament. *Journal of Orthopaedics and Sports Medicine*. 2024;6(2):112-9.
- Hossain GJ, Islam MS, Khan MM, Islam MR, Rahman SM, Jahan MS, Halder RC, Rahaman SK, Al Mamun MB, Harun ME. A prospective study of arthroscopic primary ACL reconstruction with ipsilateral peroneus longus tendon graft: Experience of 439 cases. *Medicine*. 2023;102(9):e32943.
- Crum RJ, Kanakamedala AC, Obioha OA, Lesniak BP, Musahl V. Aperture and suspensory fixation equally efficacious for quadriceps tendon graft fixation in primary ACL reconstruction: a systematic review. *The journal of knee surgery*. 2020;33(07):704-21.
- Mishra AK, Girish S. A prospective study of functional outcome of ACL reconstruction with quadrupled semitendinosus tendon autograft using Endobutton and bioabsorbable interference screw. *International Journal of Orthopaedics*. 2018;4(3):47-55.
- Johnson JS, Smith SD, LaPrade CM, Turnbull TL, LaPrade RF, Wijdicks CA. A biomechanical comparison of femoral cortical suspension devices for soft tissue anterior cruciate ligament reconstruction under high loads. *The American journal of sports medicine*. 2015;43(1):154-60.
- Nye DD, Mitchell WR, Liu W, Ostrander RV. Biomechanical comparison of fixed-loop and adjustable-loop cortical suspensory devices for metaphyseal femoral-sided soft tissue graft fixation in anatomic anterior cruciate ligament reconstruction using a porcine model. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*. 2017;33(6):1225-32.
- Aglietti P, Buzzi R, Menchetti PP, Giron F. Arthroscopically assisted semitendinosus and gracilis tendon graft in reconstruction for acute anterior cruciate ligament injuries in athletes. *The American journal of sports medicine*. 1996;24(6):726-31.
- Freedman KB, D'Amato MJ, Nedeff DD, Kaz A, Bach BR. Arthroscopic anterior cruciate ligament reconstruction: a metaanalysis comparing patellar tendon and hamstring tendon autografts. *The American journal of sports medicine*. 2003;31(1):2-11.
- Chaudhary D, Monga P, Joshi D, Easwaran R, Bhatia N, Singh AK. Arthroscopic reconstruction of the anterior cruciate ligament using bone-patellar tendon-bone autograft: experience of the first 100 cases. *Journal of Orthopaedic Surgery*. 2005;13(2):147-52.
- Jomha NM, Pinczewski LA, Clingeleffer A, Otto DD. Arthroscopic reconstruction of the anterior cruciate ligament with patellar-tendon autograft and interference screw fixation: the results at seven years. *The Journal of Bone & Joint Surgery British Volume*. 1999;81(5):775-9.

20. Deehan DJ, Salmon LJ, Webb VJ, Davies A, Pinczewski LA. Endoscopic reconstruction of the anterior cruciate ligament with an ipsilateral patellar tendon autograft: a prospective longitudinal five-year study. *The Journal of Bone & Joint Surgery British Volume*. 2000;82(7):984-91.
21. Chahal J, Lee A, Heard W, Bach Jr BR. A retrospective review of anterior cruciate ligament reconstruction using patellar tendon: 25 years of experience. *Orthopaedic Journal of Sports Medicine*. 2013;1(3):2325967113501789.
22. Patond KR, Chauhan VD, Kumar N. Semitendinosus transfer for anterior cruciate ligament insufficiency. *Ind J of orthopaedics*. 1992; 26:1.
23. Goncharov EN, Koval OA, Bezuglov EN, Vetoshkin AA, Goncharov NG, Encarnación Ramirez M, Nurmukhametov R, Montemurro N. Outcome of Primary Anterior Cruciate Ligament Reconstruction with Peroneus Longus and Bone-Patellar Tendon-Bone Autografts: A Clinical Comparative Study. *Surgeries*. 2023;4(3):434-45.
24. Migliorini F, Pintore A, Vecchio G, Oliva F, Hildebrand F, Maffulli N. Hamstring, bone-patellar tendon-bone, quadriceps and peroneus longus tendon autografts for primary isolated posterior cruciate ligament reconstruction: a systematic review. *British Medical Bulletin*. 2022;142(1):23-33.
25. Fermín TM, Hovsepian JM, Symeonidis PD, Terzidis I, Papakostas ET. Insufficient evidence to support peroneus longus tendon over other autografts for primary anterior cruciate ligament reconstruction: a systematic review. *Journal of ISAKOS*. 2021;6(3):161-9.
26. Bourke HE, Gordon DJ, Salmon LJ, Waller A, Linklater J, Pinczewski LA. The outcome at 15 years of endoscopic anterior cruciate ligament reconstruction using hamstring tendon autograft for 'isolated anterior cruciate ligament rupture. *The Journal of Bone & Joint Surgery British Volume*. 2012;94(5):630-7.
27. O'NEILL DB. Arthroscopically assisted reconstruction of the anterior cruciate ligament. A prospective randomized analysis of three techniques. *JBJS*. 1996;78(6):803-13.
28. Karampudi A, Imrose MS, Harish DC, Md S. Functional outcome after arthroscopic anterior cruciate ligament reconstruction using quadrupled hamstring graft-A prospective analysis. *J Dent Med Sci*. 2021; 20:27-39.