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Comparative study of the functional outcome of semitendinosus graft versus peroneus longus graft in arthroscopic reconstruction surgeries of anterior cruciate ligament

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ABSTRACT

Background: ACL disruption is the commonest ligamentous knee injury among active adults, invariably leading to changes in knee kinematics which are most likely to result in secondary degenerative changes and long-term functional impairment. Thus, due to the ACL's crucial role as the primary restraint against anterior tibial translation, its reconstruction using varying graft options are being extensively studied for better functional outcome.
Methods: In this prospective study, we analysed 30 patients having ACL tear (clinically and radiographically) and treated with arthroscopic reconstruction of ACL. Among these, 15 cases were operated using semitendinosus graft and 15 cases by using peroneus longus tendon graft. The study was conducted in a tertiary care hospital from January 2021 to June 2022 with minimum follow up of 6 months and maximum follow up of 15 months.
Results: Mean Lysholm score (post op) in Group ST was 90.6±3.18 and in Group PLT was 92.2±2.65. The Lysholm Score and IKDC grading between the two groups was comparable and showed no significant difference. Post-Op laxity assessed using the Lachman’s grading showed normal findings in 70% patients, and of the remaining 30% (9 patients), 5 patients from ST group and 4 patients from PLT group showed 1+ laxity at follow up examination.
Conclusions: Arthroscopy assisted ACL reconstruction with peroneus longus tendon autograft provides a steady knee, reduces postoperative donor site morbidity and enables early rehabilitation, similar to the traditional semitendinosus tendon autograft.

Keywords: ACL, Autograft, IKDC, Lysholm knee score, Peroneus longus, Semitendinosus

INTRODUCTION

The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the knee against anterior translation, and is also important in counteracting rotational and valgus stress.[1] Because of its key function as the primary restraint against anterior tibial translation, ACL disruption inevitably causes alterations in knee kinematics which are most likely to result in secondary degenerative changes and long-term functional impairment.[2,3]

The optimum graft for reconstruction of the anterior cruciate ligament should have structural and biomechanical characteristics that are comparable to those of the native ligament, allow for secure fixation and quick biologic incorporation, as well as minimise donor site morbidity. Clinical success has been achieved with a wide range of possibilities, although the best graft is still up for debate.

Hamstring tendon (HT) autograft is the most popular graft choice for ACL reconstruction worldwide.[4] All commonly used autografts are harvested from the knee which carries several potential disadvantages, such as knee laxity or quadriceps-hamstring imbalance after harvest.[5,6] Recently, the peroneus longus tendon (PLT) autograft, harvested just proximal and posterior to the lateral ankle, has been explored as an alternative autograft for ACL reconstruction.[7]

With varying degrees of success, allografts, autografts, and synthetic grafts have been employed for ACL reconstruction. In many countries, allograft and artificial graft choices are not possible. In these settings, the PLT autograft could offer an additional viable option. PLT autograft use in ACL reconstruction was first described by the Turkish group, Kerimoglu et al in 2008.[7] In 2012, the Chinese group, Zhao et al adopted its use and recently the Indonesian group, Rhatomy et al adopted the PLT autograft in 2019.[8,9] Because of high prevalence of the injury, the ACL continues to be intensively studied, and outcomes of ACL surgery receive considerable attention.[10]

Objectives of this study were to evaluate the functional outcome of arthroscopic reconstruction of anterior cruciate ligament tear using semitendinosus tendon autograft versus peroneus longus autograft, to study the therapeutic value of arthroscopy in ACL reconstruction, and to evaluate the complications of arthroscopy in case of ACL Reconstruction studies.

METHODS

In this prospective study we have analysed 30 patients who were diagnosed to be having ACL tear (clinically and radiographically) and were treated with arthroscopic reconstruction of ACL. Among these 15 cases were operated using semitendinosus graft and 15 cases by using peroneus longus tendon graft. The study was conducted at Dr. Shankarrao Chavan Govt. Medical College and Hospital, Nanded, Maharashtra, a Tertiary care Hospital, from January 2021 to June 2022 with approval from the institutional ethics committee, with minimum follow up of 6 months and maximum follow up of 15 months. Minimum age of the patient was 19 years and maximum age was 49 years with mean age of 36. Study group included 27 male patients and 3 female patients. All patients were operated under spinal/epidural anaesthesia with the use of tourniquet, and postoperative period was uneventful. Similar rehabilitation protocol was followed for all the patients after ACL reconstruction.

Inclusion criteria

Anterior cruciate ligament injury in ages 15-50 years, isolated ACL injuries/ACL injuries with grade 1, 2 meniscal injury, monotrauma cases, medically fit for surgery, and willing for arthroscopic surgery were included.

Exclusion criteria

ACL injuries with avulsion injuries or associated intra-articular condylar fractures, multi ligamentous injuries, meniscal injuries requiring total meniscectomy/meniscal repair (following initial diagnostic arthroscopy), pre-existing congenital/developmental/degenerative/collagen diseases, and infected knee joint were excluded.

Instruments and equipment's

Many specialised instruments are required for arthroscopic anterior cruciate ligament reconstruction. An arthroscopic system consists of television monitor, camera, light source and fibre optic light source cable, arthroscope, shaver system and hand piece, trocar and cannula, tourniquet (pneumatic), continuous irrigation source, arthroscopic instrument set-tendon stripper, measuring block, tibial guide, femoral guide, drill bit, probe, etc (Figure 1).

Figure 1: Camera, light cable, shaver handpiece with blades, 30º and 70º arthroscopes, outer sheath with obturator, grasper, meniscal punches.

Implants

We used endobutton at the femoral end and titanium interference screw for the tibial tunnel in all our cases.

Surgical technique

Diagnostic arthroscopy

Before harvesting of the graft, diagnostic arthroscopy was performed first. In 90 degrees of knee flexion, anterolateral port (viewing portal) is made using 11 number blade, at the level of inferior pole of patella just lateral to the patellar tendon. After all the pathologies have been recorded, the anteromedial (working) portal is then established. The associated pathologies are dealt accordingly such as partial/total meniscectomy for meniscal tears and loose body removal.

Graft harvest: Semitendinosus graft

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 tendons 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. The semitendinosus tendon was carefully dissected from the surrounding soft tissues and identified and localised using right-angled forceps. The tendon was released from the fibrous extensions and secured using ethibond sutures. 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 was cut and the tendon is harvested (Figure 2).

Figure 2: Isolation and harvesting of semitendinosus tendon graft.

Graft harvest: Peroneus longus graft

First, the bony anatomical landmarks are identified, including the lateral malleolus and the posterior border of fibula. The location of the skin incision is marked 2 to 3 cm above and 1 cm behind the lateral malleolus. To identify the peroneal nerve, which is located just under the fibular head; a mark is placed 5 cm below the fibular head. A 3cm skin incision is then made until the peroneal retinaculum. The peroneus longus and peroneus brevis tendons are identified. Using blunt dissection, the peroneus longus tendon is released from the surrounding soft tissue proximally. The distal part of the peroneus longus is tagged. Tenodesis of both peroneus longus and brevis tendons is done 2 cm distally with ethibond sutures. The peroneus longus tendon is then cut proximal to the tenodesed tendons. The proximal aspect of the peroneus longus tendon is whipstitched. Now, with a closed tendon stripper, the peroneus longus tendon is stripped proximally up to 5 cm from the fibular head to prevent peroneal nerve injury. The harvest is stopped at least 3 finger-breadths from the fibular head, and the graft is cut with the stripper facing anterior (Figure 3, Figure 4).

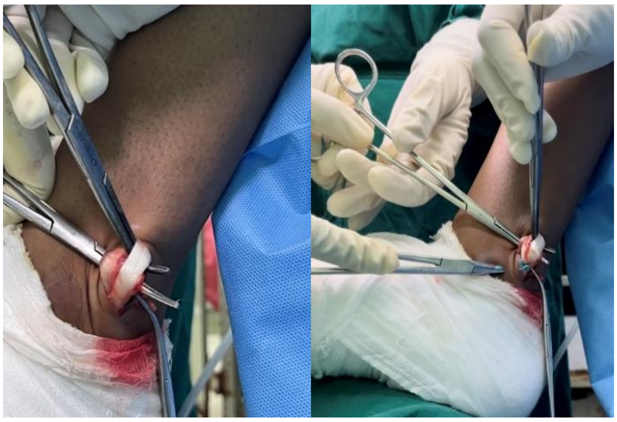

Figure 3: Isolation of peroneus longus and peroneus brevis tendons and performing distal tenodesis of both using ethibond sutures.

Figure 4: Tagging peroneus longus tendon proximally and harvesting the graft.

Graft preparation

The harvested graft is then 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 poly-braided nonabsorbable suture material (number 2 ethibond). The graft size was then measured using a sizer, by pulling the prepared and quadrupled graft with endobutton across the sizer and the prepared graft was kept protected in a moist cotton gauze piece (Figure 5).

Femoral and tibial tunnel drilling

The ACL footprint is visualised on the medial surface of the lateral femoral condyle in 90 degrees of knee flexion and the entry point is marked. Then with the femoral offset aimer the entry point is drilled with a guide wire in 120 degrees of knee flexion till the tip of the guide wire emerges on the lateral side of the distal thigh. Then the femoral tunnel was reamed with a reamer corresponding to the diameter of the graft.

Figure 5: Final graft preparation and sizing using endoloop at femoral end.

For the tibial tunnel, with the knee in 70-90 degrees of knee flexion, the tip of the tibial guide (set at 50-55°) is placed slightly medial to the midline of the ACL tibial attachment area. Then the tibial tunnel is made by reaming over the guide pin using cannulated drill bit with diameter equal to the diameter of the graft. The edges of the tunnel are smoothened using shaver leaving the remnants at the site of ACL tibial attachment site for better proprioception.

Graft passage and fixation

The endobutton along with the graft in the loop was pulled through the tunnels till the flipping of the endobutton. Once the endobutton is flipped and confirmed, the distal part of the graft was pulled down to seat the endobutton. With manual tension to the distal graft, cyclic loading of the graft was done with repeated flexion and extension of the knee and checked for impingement. After tensioning the graft, the position of the reconstructed ACL was confirmed under arthroscopic vision and the tibial site was fixed with appropriate size interference screw (Figure 6).

Post-operative care and assessment

Standard post-operative care and rehabilitation protocol was followed for all the patients. Post-operative knee function was evaluated by the Lysholm knee score and International Knee Documentation Committee (IKDC) at 1, 3, 6 and 9-month follow-ups.

Figure 6: Graft passage and fixation using Titanium screw at tibial end.

Statistical analysis

Data was entered into Microsoft excel data sheet and was analysed using SPSS 22 version software. Categorical data was represented in the form of frequencies and proportions. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. Normality of the continuous data, was tested by Kolmogorov-Smirnov test and the Shapiro-Wilk test. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. p value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

Age distribution

Mean age in Group ST was 34.67±8.54 and in Group PLT was 33.13±8.59 (Table 1).

Table 1: Age distribution between two groups.

		Group			
		Group ST		Group PLT	
		Count	%	Count	%
Age (in years)	≤30	4	26.67	7	46.67
	31-40	7	46.67	5	33.33
	>40	4	26.67	3	20.00

Sex distribution between two groups

The study included total 28 males and 2 females, with 14 males (93.33%) and 1 female (6.67%) in each study group, thus leaving no bias.

Side of injury

Both sides were affected equally in both the groups of patients included in the study (Table 2).

Mode of trauma

Majority cases were road traffic accidents in Group ST (40%) and Group PLT (46.67%) both. Twisting injury was the second most common mode of injury in both the groups (Table 3).

Associated injury

Most common associated injury was posterior horn of medial meniscus tear, seen in 4 patients of Group ST (26.67%) and 3 patients of Group PLT (20%). Of these, 1 patient of Group ST was managed conservatively while others were managed with partial menisectomy

Table 2: Side of injury distribution between two groups.

		Group			
		Group ST		Group PLT	
		Count	%	Count	%
Side	Left	5	33.33	10	66.67
	Right	10	66.67	5	33.33

Table 3: Mode of trauma distribution between two groups.

		Group			
		Group ST		Group PLT	
		Count	%	Count	%
Mode of trauma	Fall	3	20.00	3	20.00
	Fall of Object	1	6.67	0	0.00
	RTA	6	40.00	7	46.67
	Twisting Injury	5	33.33	5	33.33

Post op Lysholm score

Lysholm Score in Group ST was excellent in 60% and good in 40%. In Group PLT it was excellent in 73.33% and good in 26.67%. Mean Lysholm score (post op) in Group ST was 90.6±3.18 and in Group PLT was 92.2±2.65. Thus, there was no significant difference in mean Lysholm score (post op) comparison between two groups (p = 0.439) (Figure 7).

Post op IKDC grading

In Group ST, 66.67% had IKDC grading A and 33.33% had IKDC grading B. Whereas, in Group PLT, 73.33% were grade A and 26.67% were grade B. There was no significant difference in IKDC Grading (Post OP) distribution between the two groups (p = 0.690) (Figure 8).

Post op laxity

In Group ST, 33.33% had 1+ and 66.67% had negative Lachman test, and in Group PLT, 26.67% had 1+ and 73.33% had negative results. There was no significant difference in post op laxity (Lachman grade) distribution between the two groups (p = 0.690).

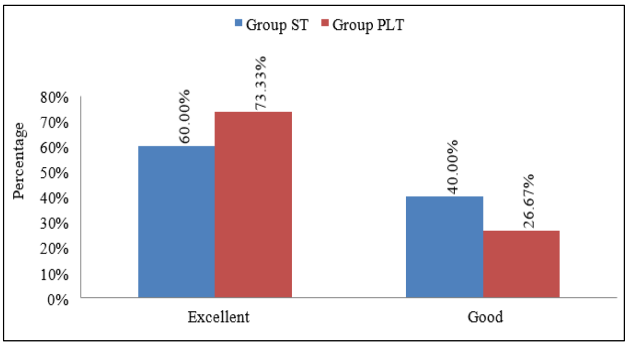

Figure 7: Bar diagram showing post op Lysholm score distribution between two groups.

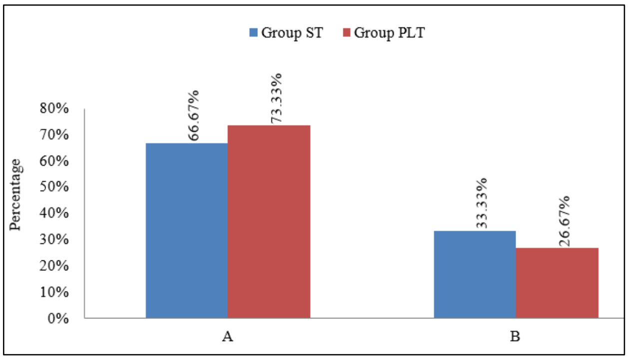

Figure 8: Bar diagram showing IKDC Grading distribution between two groups.

Table 4: Post Op laxity (Lachman grade) distribution between two groups.

Post Op laxity (Lachman grade)	Group			
	Group ST		Group PLT	
	Count	%	Count	%
1+	5	33.33	4	26.67
Negative	10	66.67	11	73.33

Post op complications

In Group ST, 20% had quadriceps hypotrophy, 6.7% had graft site infection, 26.7% had anterior knee pain and 6.7% had paraesthesia. In Group PLT, 13.3% had quadriceps hypotrophy, 6.7% had graft site infection and 13.3% had ant knee pain. Paraesthesia was not seen amongst Group PLT patients. In one case of semitendinosus graft, patient developed paraesthesia below the knee, likely due to damage to the inferior genicular nerve branch. This rate was similar to other studies.[11,19] One patient developed 10 degrees restriction of flexion at knee with range of movements ranging from 0 to 80 degrees. The patient had poor compliance to the rehabilitation protocol (Figure 9).

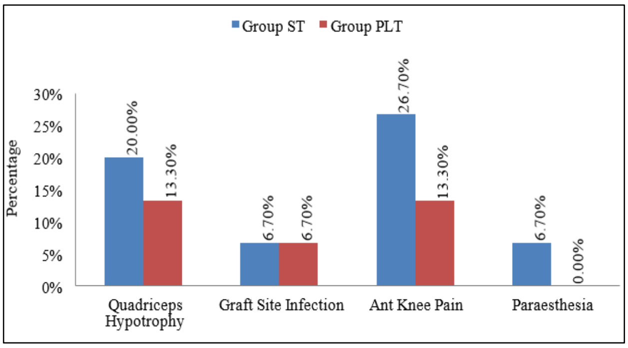

Figure 9: Bar diagram showing complications comparison between two groups.

DISCUSSION

The Lysholm score and International Knee Documentation Committee (IKDC) score are two commonly used outcome measures to evaluate the functional outcome after ACL reconstruction using tendon grafts. In this study, the grafts in comparison for ACL reconstruction were semitendinosus graft and peroneus longus graft, each of which has its merits and demerits.

In the above study, Lysholm score in Group semitendinosus was excellent in 9 patients (60%) and good in 6 patients (40%), with a mean score of 90.6±3.18. In Group peroneus longus, Lysholm score was excellent in 11 patients (73.33%) and good in 4 patients (26.67%), with a mean of 92.2±2.65. In an Indian study by Sharma et al, they found that peroneus longus autograft produced an excellent functional score (Lysholm scoring system) in 80% of the patients and remaining 20% patients had good functional score, which is in consensus with our study.[12]

According to IKDC grading, functional outcome was normal (Grade A) in 10 patients (66.67%) and near normal (Grade B) in 5 patients (33.33%) in Group semitendinosus. The functional outcome in Group peroneus longus showed normal (Grade A) in 11 patients (73.33%) and near normal (Grade B) in 4 patients (26.67%). In a similar study conducted by Kumar et al, 23 cases were rated as normal or nearly normal IKDC (92%) and 2 cases (8%) cases were rated as abnormal IKDC.[13] There were no abnormal or severely abnormal IKDC findings in either case groups included in our study.

Other comparative studies on the use of hamstring and Peroneus longus grafts showed no significant differences between the pre- and 1-year post-surgery, based on the IKDC, modified Cincinnati, and Lysholm knee scoring scale.[14,23]

In this study, anterior tibial translation was eliminated in 70% of patients who were examined at a mean of 9 months post-operatively. Of the remaining 30% (9 patients), 5 patients from the ST group (16.67%) and 4 patients from the PLT group (13.33%) had a 1+ Lachman test at the follow up examination. Knee laxity outcomes in our study were comparable to other reference studies using different autograft sources.[15,16]

The common complications encountered following arthroscopic ACL reconstruction include persistent pain, thigh hypotrophy, paraesthesias, instability, swelling, infection, knee stiffness, etc. A decrease in thigh circumference is reported more often following hamstring harvest as compared with peroneus longus group, which is also found in our study.[9,16]

Williams et al, in their study of 2500 cases of arthroscopic ACL reconstruction, reported an infection rate of 0.3%.[17] In our study, superficial wound infection at the donor site was seen in 1 case of PLT autograft and 1 case of ST group, which was treated with intravenous antibiotics and got settled.[22,23] No implant failure was observed in any of the patients included in our study. A study conducted by Garras et al stated that early diagnosis of infection and appropriate treatment are necessary to prevent cartilage damage and arthrofibrosis.[18]

Thus, comparable outcome has been found between the semitendinosus and peroneus longus grafts in follow up studies. Ultimately though, the choice of graft type for ACL reconstruction should be based on the surgeon's experience and preference, as well as the patient's individual factors such as age, activity level, and comorbidities.

This study has some limitations. Small sample size. The results of the study were assessed using subjective scores and not based on objective assessment. Short duration of follow-up. Follow up studies of longer duration are required to assess the long-term outcome as well as complications of this procedure.

CONCLUSION

Arthroscopy assisted ACL reconstruction with semitendinosus autograft or peroneus longus tendon autograft provides a steady knee, reduces postoperative morbidity and enables early rehabilitation. Peroneus longus tendon is a promising autograft for ACL reconstruction with the advantage of simplicity of harvesting technique, larger and consistent graft diameter and lesser donor site morbidity. Although, thigh hypotrophy is a common complication. In view of cosmetic concerns, the scar of a harvested peroneus longus graft conceals behind the lateral malleolus and also the scar around the tibial tunnel is significantly smaller. Hence it provides a cosmetic advantage to athletes who often need to have their legs exposed in their profession. Based on the result of this study, both semitendinosus and peroneus longus grafts can be used effectively for ACL reconstruction surgery, however, the use of the peroneus longus as the graft choice in single-bundle ACL reconstruction can be encouraged in clinical practice, as it shows comparable functional scores with the hamstring tendon.

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

REFERENCES

1. Cor van der Hart P, Michel PJ, van den Bekerom, Thomas Patt W. The occurrence of osteoarthritis at a minimum of ten years after reconstruction of the anterior cruciate ligament. J Orthop Surg Res. 2008;3(1):24.
2. Nebelung W, Wuschech H. Thirty-five years of follow-up of anterior cruciate ligament-deficient knees in high-level athletes. Arthroscopy: J Arthros Relat Surg. 2005;21(6):696-702.
3. Gillquist J, Messner K. Anterior cruciate ligament reconstruction and the long term incidence of gonarthrosis. Sports Med. 1999;27:143-56.
4. Widner M, Dunleavy M, Lynch S. Outcomes following ACL reconstruction based on graft type: are all grafts equivalent?. Curr Revi Musculosk Med. 2019;12:460-5.
5. Frank CB, Jackson DW. Current concepts review-the science of reconstruction of the anterior cruciate ligament. JBJS. 1997;79(10):1556-76.
6. Thomas AC, Wojtys EM, Brandon C, Palmieri-Smith RM. Muscle atrophy contributes to quadriceps weakness after anterior cruciate ligament reconstruction. J Sci Med Sport. 2016;19(1):7-11.
7. Kerimoglu S, Aynaci O, Saracoglu M, Aydin H, Turhan A. Anterior cruciate ligament reconstruction with the peroneus longus tendon. Acta Orthop Traumatol Turc. 2008;42(1):38-43.
8. Zhao J, Huangfu X. The biomechanical and clinical application of using the anterior half of the peroneus longus tendon as an autograft source. Am J Sport Med. 2012;40(3):662-71.
9. Rhatomy S, Asikin AI, Wardani AE, Rukmoyo T, Lumban-Gaol I, Budhiparama NC. Peroneus longus autograft can be recommended as a superior graft to hamstring tendon in single-bundle ACL reconstruction. Knee Surg Spo Traumatol Arthros. 2019;27:3552-9.
10. Bourke HE, Gordon DJ, Salmon LJ, Waller A, Linklater J, Pinczewski LA. The outcome at 15 years of endoscopic ACL reconstruction using hamstring tendon autograft. J Bone Joint Surg Br. 2012;94(5):630-7.
11. Cao HB, Liang J, Xin JY. Treatment of anterior cruciate ligament injury with peroneus longus tendon. Zhongh Yi Xue Za Zhi. 2012;92(35):2460-2.
12. Sharma D, Agarwal A, Shah K, Shah R, Shah H. Peroneus longus: Most promising autograft for arthroscopic ACL reconstruction. Indian J Orthop Surg. 2019;5(3):172-5.
13. Kumar VK, Narayanan SK, Vishal RB. A study on peroneus longus autograft for anterior cruciate ligament reconstruction. Int J Res Med Sci. 2020;8(1):183-8.
14. He J, Tang Q, Ernst S, Linde MA, Smolinski P, Wu S, Fu F. Peroneus longus tendon autograft has functional outcomes comparable to hamstring tendon autograft for anterior cruciate ligament reconstruction: a systematic review and meta-analysis. Knee Surg Sports Traumatol Arthrosc. 2021;29(9):2869-2879.
15. Kim DK, Park G, Kadir KB, Kuo LT, Park WH. Comparison of knee stability, strength deficits, and functional score in primary and revision anterior cruciate ligament reconstructed knees. Sci Repor. 2018;8(1):9186.
16. Rhatomy S, Wicaksono FH, Soekarno NR, Setyawan R, Primasara S, Budhiparama NC. Eversion and first ray plantarflexion muscle strength in anterior cruciate ligament reconstruction using a peroneus longus tendon graft. Orthop J Spor Med. 2019;7(9):2325967119872462.
17. Williams III RJ, Laurencin CT, Warren RF, Speciale AC, Brause BD, O'Brien S. Septic arthritis after arthroscopic anterior cruciate ligament reconstruction: diagnosis and management. Am J Sports Med. 1997;25(2):261-7.
18. Stucken C, Garras DN, Shaner JL, Cohen SB. Infections in anterior cruciate ligament reconstruction. Sports Health. 2013;5(6):553-7.
19. Bi M, Zhao C, Zhang S, Yao B, Hong Z, Bi Q. All-inside single-bundle reconstruction of the anterior cruciate ligament with the anterior half of the peroneus longus tendon compared to the semitendinosus tendon: a two-year follow-up study. J Knee Surg. 2018;31(10):1022-30.
20. Torg JS. Conrad W, Kalen V – Clinical diagnosis of anterior cruciate ligament instability in the athlete. Am J Sports Med. 1976;4:84-91.
21. Park CH, Lee WC. Donor site morbidity after lateral ankle ligament reconstruction using the anterior half of the peroneus longus tendon autograft. Am J Sports Med. 2017;45(04):922-8.
22. Rahnemai-Azar AA, Sabzevari S, Irarrázaval S, Chao T, Fu FH. Anatomical individualized ACL reconstruction. Arch Bone Jt Surg. 2016;4(04)291-7.
23. Xu H, Zhang C, Zhang Q, Du T, Ding M, Wang Y, et al. A systematic review of anterior cruciate ligament femoral footprint location evaluated by quadrant method for single-bundle and double-bundle anatomic reconstruction. Arthroscopy: J Arthrosc Rela Surg. 2016;32(8):1724-34.

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