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Review Article

Comparison of Clinical Outcome Between Peroneus Longus Tendon Auto graft versus Hamstring Tendon Auto graft for Anterior Cruciate Ligament Reconstruction, Which One is Better?: A Systematic Review and Meta-analysis

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ABSTRACT

Introduction: Anterior cruciate ligament injury is quite possibly the most widely recognized knee injury, with an expected 200,000 wounds in the US every year. ACL reconstruction (ACLR) is the current best treatment choice for reestablishing knee stability, to decrease the gamble of optional meniscal tears and indicative osteo-joint pain, and requires either an autograft, allograft, or artificial graft. Hamstring ligament (HT) autograft is the most well-known unite decision for ACLR overall. As of late, the peroneus longus ligament (PLT) autograft, gathered simply proximal and back to the sidelong lower leg, has been investigated as an elective autograft for ACLR. The point of this study is to complete a meta-analysis of: (1) the accessible information for PLT autograft in regards to functional results, knee laxity, contributor site torment or paresthesia, and join endurance and (2) clinical examinations looking at PLT autograft versus HT autograft in leg tendon recreation.
Methods: This study included unique articles providing details regarding (1) clinical investigations of ACLR (single-bundle or double-bundle) utilizing PLT autograft (anterior-half, posterior-half, or full-thickness); and (2) studies straightforwardly contrasting results of PLT versus HT. All strategies were essential tendon reproductions performed for indicative chronic ACL injury, without meniscal injury.
Result: We performed a subgroup analysis to evaluate the IKDC score outcome between PLT versus HT autograft in ACLR. (7–10 We found that there is significant difference statistically between these two groups in IKDC score outcome. (mean difference 0.60 (-0.99, 2.19) ; 95% CI, P = <0,00001); (mean difference 3.16; 95% CI, = 2.00, 4.32). We performed a subgroup analysis to evaluate Lysholm Score between PLT vs HT in ACLR. From three studies added in this subgroup analysis, we found no statistical difference in between those two groups for the Lysholm score. (mean difference 1.56; 95% CI, P = 0.05); (mean difference 1.56; 95% CI, 0.03, 3.09).
Discussion: Useful results utilizing PLT autograft were satisfactory with 83.96% of cases showing great to amazing outcomes by Lysholm score and 75.82% of cases showing typical or almost ordinary IKDC emotional score. The mean IKDC abstract score was steady with the scores revealed by the MOON group and others. The IKDC emotional score connected with the Lysholm score and adjusted Cincinnati score. Knee laxity results were similar to other reference concentrates on utilizing different autograft sources. Pivot shift test was negative in 80.7% of ACLR patients with PLT autograft. ACLR. Four studies were included in this stud, giving direct correlations among PLT and HT

autografts. No significant differences were found as far as Tegner movement scale, knee laxity (Lachman test grade 0, Lachman test grade 0 or 1), contributor site agony or paresthesia, and failure rates between 138 PLT and 144 HT autografts. Interestingly, a significantly higher mean Lysholm score (p = 0.05) and IKDC abstract score (p = 0.00001) were found in the PLT bunch. Rhatomy et al. straightforwardly thought about the distance across of 4-strand PLT and 4-strand HT, showing a PLT mean width of 8.8 ± 0.7 mm versus 8.2 ± 0.8 mm for HT. Spragg et al. detailed the probability of a patient requiring amendment ACLR was 0.82 times lower for every 0.5 mm steady expansion in diameter within the range from 7.0 to 9.0 mm, and one more review observed a huge positive connection between's graft diameter and IKDC score.

Conclusion: PLT autograft had fundamentally better Lysholm and IKDC subjective scores compared to HT autograft. Given these discoveries, PLT autograft is an appropriate elective join decision from outside the knee for patients going through ACLR.

Keywords: ACLR, PLT, HT

INTRODUCTION

Anterior cruciate ligament injury is quite possibly the most widely recognized knee injury, with an expected 200,000 wounds in the US every year. ACL reconstruction (ACLR) is the current best treatment choice for reestablishing knee stability, to decrease the gamble of optional meniscal tears and indicative osteo-joint pain, and requires either an autograft, allograft, or artificial graft. Hamstring ligament (HT) autograft is the most well-known unite decision for ACLR overall. Different autografts incorporate bone-patellar ligament bone and quadriceps ligament, yet no one around the world acknowledged best quality level of uniting decision exists for use in ACLR. As of late, the peroneus longus ligament (PLT) autograft, gathered simply proximal and back to the sidelong lower leg, has been investigated as an elective autograft for ACLR.[1–3]

All current famous autografts are harvested from the knee which conveys a few likely impediments, for example, knee laxity or quadriceps-hamstring lopsidedness after gather and for a long time injury, the HT autograft may not be adequate to make reasonable unite. In numerous coun-attempts, allograft and artificial graft choices are impractical. In these settings, the PLT autograft could offer an extra reasonable choice. PLT autograft use in leg tendon remaking was first depicted by the Turkish gathering, Kerimoglu et al. in 2008. In 2012, Zhao et al. took on its utilization and as of late the Indonesian group, Rhatomy et al. embraced the PLT autograft in 2019.[3–6]

Clinical preliminaries straightforwardly contrasting clinical consequences of PLT and those of HT are missing and no concentration quantitatively sums up the aftereffects of distributed clinical preliminaries and registries. The point of this study is to complete a meta-analysis of: (1) the accessible information for PLT autograft in regards to functional results, knee laxity, contributor site torment or paresthesia, and join endurance and (2) clinical examinations looking at PLT autograft versus HT autograft in leg tendon recreation. PLT autograft will have similar utilitarian results and join endurance rates when contrasted with HT autograft for ACLR was estimated.

MATERIALS AND METHOD

Search Strategy

A systematic review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Figure 1). A comprehensive literature search was performed to gather a full-length, peer-reviewed paper in English on the comparison of clinical outcomes between PLT autograft versus HT autograft for ACLR. We searched PubMed, Google

Scholar, and Cochrane Library. The focus of this systematic review and meta-analysis is to compare the clinical outcome between PLT autograft versus HT autograft for ACLR. Keywords in the search matched the MeSH rule and the terms used are ("ACL reconstruction"), AND ("Peroneus Longus Tendon Autograft"), AND ("Hamstring Tendon Autograft").

Inclusion Criteria

This study included unique articles providing details regarding (1) clinical investigations of ACLR (single-bundle or double-bundle) utilizing PLT autograft (anterior-half, posterior-half, or full-thickness); and (2) studies straightforwardly contrasting results of PLT versus HT. All strategies were essential tendon reproductions performed for indicative chronic ACL injury, without meniscal injury.

Insignificant articles and studies that neglected to meet inclusion criteria, for example, reviews, articles with just biomechanical studies, or allograft endlessly studies investigating results after the recreation of different tendons outside the knee utilizing PLT autograft were rejected.

Quality Evaluation

Assessment of study quality and risk of bias assessed using criteria developed by the Oxford Center for Evidence-based Medicine, perspicacity defined by the Grades of Recommendation Assessment, Development and Evaluation (GRADE) Working Group, and sanction made by the Agency for Healthcare Research and Quality (AHRQ). While the class of evidence is categorized into "class I" for good quality RCT, "class II" for moderate to poor quality RCT and good quality cohort, "class III" for moderate or poor-quality cohorts and case-control studies, "class IV" for the case series.

RESULTS

Literature Search, Study Selection, and Study Characteristics

The electronic research resulted in 236 records from various databases. After the process of identification, screening, eligibility, duplication elimination,and exclusion, the remaining 4 studies were included in the qualitative and quantitative synthesis. The remaining articles were excluded due to a lack of mean and standard deviation data and did not meet the inclusion and exclusion criteria.

Statistical Analysis

We utilized the Review Manager version 5.3 software (RevMan; The Cochrane collaboration Oxford, England) to perform all statistical analyses. Based on the heterogeneity of the current study, we performed a sensitivity analysis to further assess the overall results. The heterogeneity across studies was examined through the I^2statistic described as follows: low, 25% to 50%; moderate 50% to 75%; or high>75%. We applied the fixed-effect models to calculate the total MDs/ORs when low heterogeneity was seen in studies. In other cases, we used the random-effects model. Studies with a *P* value less than .05 were thought to have statistical significance. Forest plots showed the findings of out meta-analysis.

IKDC outcome

We performed a subgroup analysis to evaluate the IKDC score outcome between PLT versus HT autograft in ACLR.[(7–10] We found that there is significant difference statistically between these two groups in IKDC score outcome. (mean difference 0.60 (-0.99, 2.19); 95% CI, P = <0,00001); (mean difference 3.16; 95% CI, =2.00, 4.32).[11–14]

	PLT			HT				Mean Difference	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year
Bi 2018	89.3	8.4	62	90.4	7.1	62	25.2%	-1.10 [-3.84, 1.64]	2018
Rhatomy 2019	92.5	6.2	24	88.8	9.7	28	20.6%	3.70 [-0.67, 8.07]	2019
Shi 2019	90.13	3.01	18	89.22	3.83	20	26.6%	0.91 [-1.27, 3.09]	2019
Su 2019	86.25	3.71	34	80.14	3.46	34	27.6%	6.11 [4.40, 7.82]	2019
Total (95% CI)			**138**			**144**	**100.0%**	**2.41 [-1.20, 6.03]**	

Heterogeneity: $Tau^2 = 11.59$; $Chi^2 = 24.95$, df = 3 (P < 0.0001); $I^2 = 88\%$
Test for overall effect: Z = 1.31 (P = 0.19)

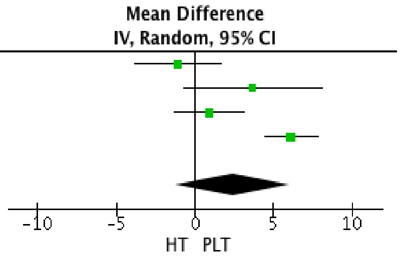

Figure 1 Pooled analysis of IKDC outcome

Lysholm Score outcome

We performed a subgroup analysis to evaluate Lysholm Score between PLT vs HT in ACLR. From three studies added in this subgroup analysis, we found no statistical difference in between those two groups for the Lysholm score. (mean difference 1.56; 95% CI, P =0.05); (mean difference 1.56; 95% CI, 0.03, 3.09).[11,13,14]

	PLT			HT				Mean Difference	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI	Year
Shi 2018	94	6.81	18	93	5.22	20	15.5%	1.00 [-2.89, 4.89]	2018
Su 2019	90.94	3.81	34	89.32	4.13	34	65.6%	1.62 [-0.27, 3.51]	2019
Rhatomy 2019	94.9	5.6	24	93.1	7.3	28	19.0%	1.80 [-1.71, 5.31]	2019
Total (95% CI)			**76**			**82**	**100.0%**	**1.56 [0.03, 3.09]**	

Heterogeneity: $Chi^2 = 0.10$, df = 2 (P = 0.95); $I^2 = 0\%$
Test for overall effect: Z = 2.00 (P = 0.05)

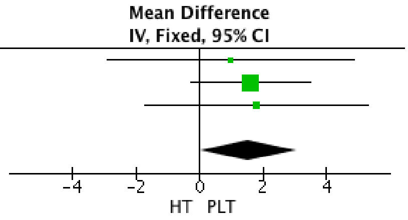

Figure 3 Pooled analysis of Lysholm score outcome

DISCUSSION

The main finding of the current review was that PLT appeared to be a reasonable elective decision, gathered external the knee, for ACLR. Investigation of clinical examinations archiving PLT auto graft shows acceptable results for leg tendon reproduction, furnishing a steady and utilitarian knee with low grimness and unite disappointment rates. Investigation of near examinations uncovered knee laxity and join endurance rates for PLT auto graft tantamount to HT autografts, with PLT auto graft showing essentially better tolerant detailed useful results (Lysholm score, IKDC emotional score).

Useful results utilizing PLT auto graft were satisfactory with 83.96% of cases showing great to amazing outcomes by Lysholm score and 75.82% of cases showing typical or almost ordinary IKDC emotional score. The mean IKDC abstract score was steady with the scores revealed by the MOON group and others. The IKDC emotional score connected with the Lysholm score and adjusted Cincinnati score. Knee laxity results were similar to other reference concentrates on utilizing different auto graft sources. Pivot shift test was negative in 80.7% of ACLR patients with PLT auto graft. Mean differences in anterior tibial translation were 1.82 mm and 4.44% of patients encountered a side-to-side distinction in anterior tibial translation more noteworthy than 3 mm. Complication rates for PLT were additionally like those as of late distributed for other auto graft sources. Giver site agony or paresthesia near sidelong malleolus was accounted for in just 4.35% of cases treated with PLT auto graft. Graft failure was displayed in just 1.68% of ACLR cases using PLT auto graft. A tant amount amendment pace of 2.7% was accounted for utilizing HT auto graft from the New Zealand ACL registry. Other variable results were not agreeable to factual examination in our review, since they were accounted for in a couple of series. Just one review assessed Marx's movement score with PLT in ACLR, announced with 12.4 ± 3.7 post-activity compared to 5.4 ± 2.6 pre-activity. The Marx movement scale likewise connected well with existing action rating scales: Spearman relationship coefficient for Cincinnati scales, 0.67; for Tegner scale, 0.66. This information supports the utilization of PLT auto graft for ACLR.[14–17]

Four studies were included in this stud, giving direct correlations among PLT and HT autografts. No significant differences were found as far as Tegner movement scale, knee laxity (Lachman test grade 0, Lachman test grade 0 or 1), contributor site agony or paresthesia, and failure rates between 138 PLT and 144 HT autografts. Interestingly, a significantly higher mean Lysholm score (p = 0.05) and IKDC abstract score (p = 0.00001) were found in the PLT bunch. Rhatomy et al. straightforwardly thought about the distance across of 4-strand PLT and 4-strand HT, showing a PLT mean width of 8.8 ± 0.7 mm versus 8.2 ± 0.8 mm for HT. Spragg et al. detailed the probability of a patient requiring amendment ACLR was 0.82 times lower for every 0.5 mm steady expansion in diameter within the range from 7.0 to 9.0 mm, and one more review observed a huge positive connection between's graft diameter and IKDC score.[11–14]

Graft harvest time is less for the PLT than HT. There is no fibrous connection between the PLT and close-by structures. A 2-cm cut is made to uncover the PLT obviously at the shallow area 1 cm posterior and 2 cm proximal to the lateral malleolus. Around, 5 min of surgical time is expected for harvesting the PLT, which shows that these techniques might be time-saving and practical. An abatement in thigh circumference was accounted more frequently following HT collect contrasted to PLT, which could bring about a quadriceps-hamstring imbalance and decrease dynamic knee stability. Henceforth, PLT as an autograft from outside the knee could be an extraordinary choice.[17–22]

A few constraints of this study ought to be referenced. To start with, unnoticed contrasts intolerant populaces, demographic data (age, sex, time of surgery, time of follow-up), and associated injuries (medial collateral ligament, meniscus, or cartilage injuries), could influence ensuing useful results as well as complication rates. Additionally, included examinations used considerably unique careful strategies (single or double-bundle reconstruction; anterior half, posterior half, or full-thickness PLT; two-strand, three-strand, or four-strand graft; transtibial or transportal femoral tunnel boring procedure; and non-anatomic or anatomic tunnel locations), different fixation techniques (endo button plus bioscrew, tightrope, all-inside, interference screw), and lack of standardized rehabilitation protocols

Lastly, there is no settled test to assess the capacity of the PLT in disconnection. The impact of PLT harvest should keep on being assessed. Be that as it may, foot and ankle rating scale, foot arch morphology, stability test, range of motion, and strength appraisal all support low morbidity to the ankle and foot. All things considered, the PLT is a reasonable auto graft harvested outside the knee for ACLR to possibly keep away from the quadriceps-hamstring imbalance or as an extra auto graft source for a multiple ligament injury.

CONCLUSION

PLT auto graft had fundamentally better Lysholm and IKDC subjective scores compared to HT auto graft. Given these discoveries, PLT auto graft is an appropriate elective join decision from outside the knee for patients going through ACLR.

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Conflict of Interest: None

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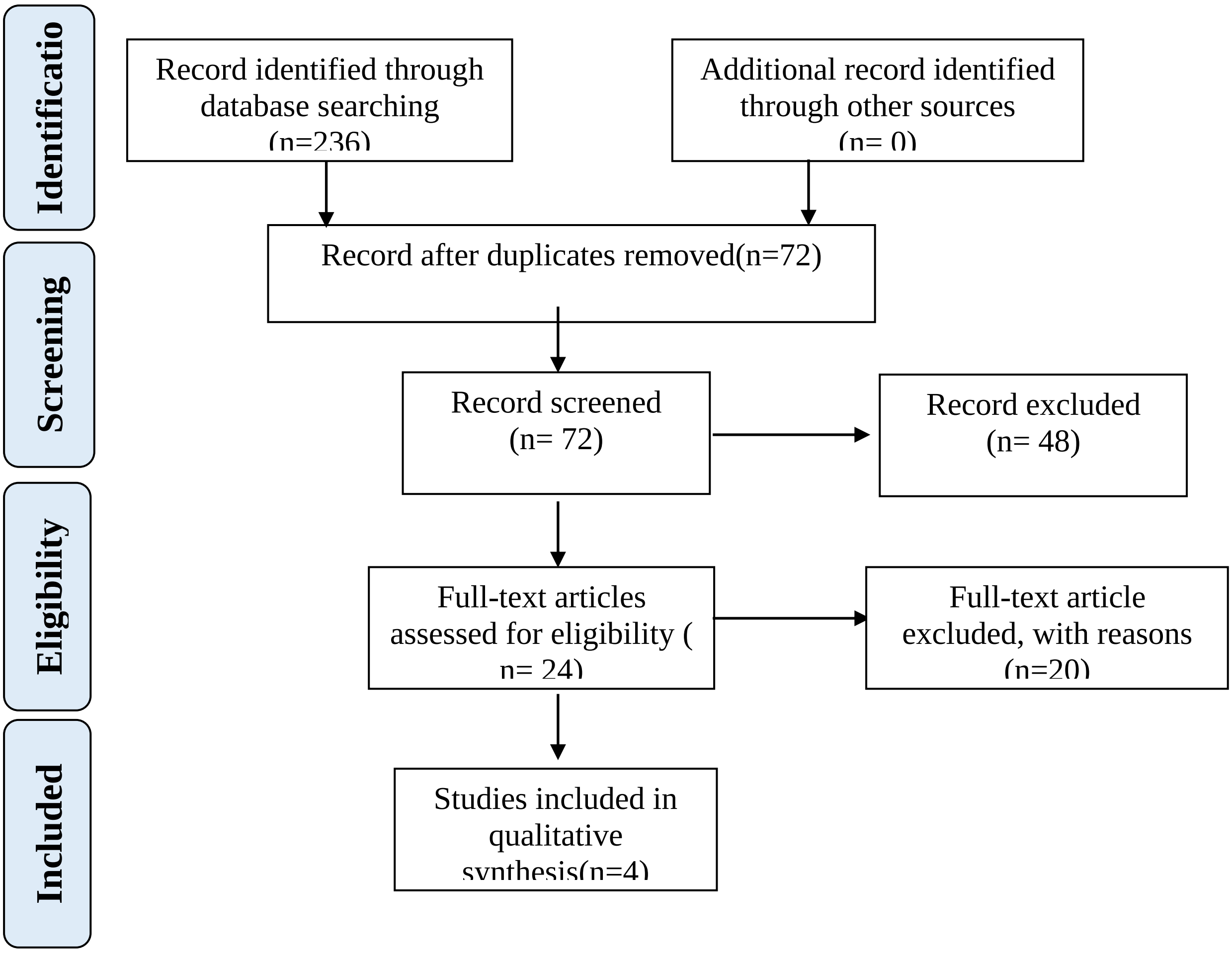

Table 1 List of studies included

No	Reference	Journal	Study Design	Level of Evidence
1	Bi *et al*, 2017	Thieme Medical Publishers	A Prospective Randomized Controlled Study	I
2	Shi *et al*, 2018	The Journal of Knee Surgery	Randomized Controlled Trial	I
3	Rhatomy *et al*, 2018	Knee Surgery, Sports Traumatology, Arthroscopy	Prospective Cohort Study	II
4	Rhatomy et al, 2019	Journal of Clinical Orthopaedics and Trauma	Prospective Cohort Study	II
5	Su *et al*, 2019	Invest Clin	Randomized Controlled Trial	I

Table 2 Characteristic of Patients

No	**Reference**	**Total Sample Size**	**Treatment Protocol**					**Mean age (SD)**					**Gender Male/Female ratio**	
			AHPL	**Semi**	**Injury mechanism Motorcycle accident/sport/other**			**AHPL**	**Semi**	**Injury mechanism Motorcycle accident/sport/other**			**AHPL**	**Semi**
1	Bi *et al*, 2017	124 patients	62	62	-	-	-	29.1 ± 6.5	27.9 ± 6.7	-	-	-	34/28	31/31
2	Shi k *et al*, 2018	38 patients	18	20	-	-	-	42	40	-	-	-	38	38
3	Rhatomy *et al*, 2018	52 patients	24	28	-	-	-	23.4 ± 8.1 years	26.4 ± 8.6 years	-	-	-	20/4	24/4
4	Rhatomy et al, 2019	75 patients	-	-	6	52	17	-	-	26.7 ±8.57			-	-
5	Su *et al*, 2019	68 patients	34	34	-	-	-	30.81 ± 4.26	31.04 ± 4.57	-	-	-	21/13	24/10

Table 3 Outcome Characteristics

No.	Reference	Study Comparison	Follow up Duration	Clinical outcomes	Complications
1.	Bi *et al*, 2017	To measuredoutcome all-inside single bundle reconstruction of the anterior cruciate ligament with the anterior half of the peroneus longus tendon compared to the semitendinosus tendon	30.0± 3.6 months	Anterior drawer test Pivot shift test KT-1000 AOFAS Tunnel positions VAS	
2.	Shi *et al*, 2018	To compare the efficacy and safety of this alternative autograft for anterior cruciate ligament (ACL) with autologous hamstring tendon (HT)	6 months 12 months 24 months	Mechanical test Knee Lachman test KT-2000 measurements Subjective index appraisal Ankle biomechanical testing torque comparison of concentric contraction for donor ankle and contralateral ankle torque comparison of concentric contraction for donor ankle at preoperative visit torque comparison of eccentric contraction for donor ankle and contralateral ankle torque comparison of eccentric contraction for donor ankle at preoperative visit	
3.	Rhatomy *et al*, 2018	The purpose of this study is to compare the functional outcome and donor site morbidity between the peroneus tendon and hamstring tendon in ACL reconstruction	12 months	IKDC Modified Cincinnati Lysholm Thigh Circumference AOFAS FADI	
4.	Rhatomy *et al*, 2019	The purpose of this study is to evaluate the functional outcome and donor site morbidity of single bundle ACL reconstruction using peroneus tendon graft.	24 months	IKDC Modified Cincinnati Tegner-lysholm AOFAS FADI Single hop Triple hop Cross over hop Timed hop	
5.	Su *et al*, 2019	The purpose of this study is to compare the functional outcome between the peroneus tendon autograft and hamstring tendon autograft in ACL reconstruction	24 months	IKDC Lysholm	

Table 4. Characteristic of Outcome of studies

No	Reference	Outcome Measure								
		IKDC	**VAS**	**KT-1000**	**AOFAS**	**Anterior Drawer Test**	**Pivot Shift**	**Knee Lachman Test**	**Tegner/ Lysholm**	**Modified Cincinnati**
1	Bi *et al*, 2017	AHPLT: Preoperative: 52.6 ± 6.2 Postoperative: 89.3 ± 8.4 Semi: Preoperative: 51.2 ± 5.9 Postoperative: 90.4 ± 7.1	AHPLT: Preoperative: 2.89 ± 2.6 Postoperative: 0.10 ± 0.30 Semi: Preoperative: 2.38 ± 1.8 Postoperative: 0.15 ± 0.35	AHPLT: Preoperative: 5.06 ± 1.37 Postoperative: 1.85 ± 0.77 Semi: Preoperative: 4.66 ± 1.42 Postoperative: 1.71 ± 0.57	AHPLT: Preoperative: 99.4 ± 1.14 Postoperative: 99.1 ± 1.40 Semi: Preoperative: 99.1 ± 1.40 Postoperative: 99.4 ± 1.27	AHPLT: Preoperative positive: 43/62 Postoperative negative: 59/62 Semi: Preoperative positive: 51/62 Postoperative negative: 60/62	AHPLT: Center of the femoral tunnel: 30.4 ± 4.2% of the femoral length Center of the femoral tunnel: 33.3 ± 5.0% of the femoral height Center of the femoral tunnel: 36.5 ± 5.4% of tibial plateau along the Amis and Jacob line Tibial width: 43.1 ± 2.2% Semi: Center of the femoral tunnel: 29.6 ± 5.3%of the femoral length Center of the femoral tunnel: 34.3 ± 3.9% of the femoral height Center of the femoral tunnel: 35.4 ± 4.4% of tibial plateau along the Amis and Jacob line Tibial width: 44.2 ± 1.9%	-	-	
2	Shi *et al*, 2018	6 Months: group A: 89.45 ± 2.89 Group B: 90.12 ± 4.56 12 months: group A: 90.48 ± 2.36 Group B: 90.17 ± 4.32 24 months: group A: 90.13 ± 3.01 Group B:	-	-	-	-	-	6 Months: group A: 16:2 Group B: 17:3 12 months: group A: 15:3 Group B: 17:1 24 months: group A: 14:4 Group B:	Tegner: 6 Months: group A: 6 ± 0.46 Group B: 6 ± 0.57 12 months: group A: 5 ± 0.96 Group B: 6 ± 0.03 24 months: group A: 5 ± 0.89	

		89.22 ± 3.83						16:2	Group B: 6 ± 0.12 Lysholm 6 Months: group A: 94 ± 6.02 Group B: 95 ± 2.35 12 months: group A: 94 ± 6.67 Group B: 95 ± 3.55 24 months: group A: 94 ± 6.81 Group B: 93 ± 5.22	
3	Rhatomy *et al*, 2018	Peroneous: Preop: 58.7 ± 11.2 Postop: 92.5 ± 6.2 Hamstring: Preop: 56.9 ± 15.7 Postop: 88.8 ± 9.7			Peroneous: 97.3 ± 4.2 Hamstring:				Lysholm Peroneous: Preop: 70.8 ± 10.2 Postop: 94.9 ± 5.6 Hamstring: Preop: 69.8 ± 15.9 Postop: 93.1 ± 7.3	Peroneous: Preop: 66.6 ± 13.5 Postop: 92.7 ± 5.9 Hamstring: Preop: 67 ± 16.3 Postop:88.1 ± 8.5
4	Rhatomy et al, 2019	Preop: 54.6 ± 14.2 Postop: 95.69 ± 3.35							Tegner-lysholm Preop: 67.8 ± 15.29 Postop: 89.7 ± 8.35	Preop: 65.45 ± 16.24 Postop: 93.29 ± 7.04
5	Su *et al*, 2019	3.24 (0.29 to 6.19)							Lysholm 1.55 (0.20 - 2.89)	

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