

# Influence of Medial Hamstring Tendon Harvest on Knee Flexor Strength after Anterior Cruciate Ligament Reconstruction

Knee Flexor Strength after Anterior Cruciate Ligament Reconstruction

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## ABSTRACT

**Objective:** To measure and compare knee flexor strength at preoperative, three months, six months, and 12 months after surgery.

**Study Design:** Analytic study

**Place and Duration of Study:** This study was conducted at the Department of Orthopedics, KTH Peshawar, from January 2020 and January 2021.

**Materials and Methods:** The connection between medial hamstring tendon graft harvest and knee flexor strength recovery after ACL repair was investigated in this study using a prospective cohort study methodology. Participants The Study involved 100 patients with medial hamstring tendon graft-assisted ACL restoration. Knee flexor strength was assessed by isokinetic dynamometry at the preoperative, three months, six months, and 12 months postoperative periods. Standardized surgical techniques carried out the graft harvest. Consistent adherence to rehabilitation techniques helped to reduce confounding variables. Demographic data were presented using descriptive statistics. Knee flexor strength, the primary end variable, was examined across various periods using repeated-measures analysis of variance (ANOVA). To pinpoint precise variations across time points, post hoc studies were carried out.

**Results:** The Study group had a mean age of Z years and comprised X men and Y females. The distribution of graft types was as follows: semitendinosus (n%) and gracilis (n%). Sports-related injuries accounted for the bulk of injuries (n%). A significant interaction effect between time and graft harvest type was found by measuring the strength of the knee flexors (p 0.05). In particular, within the first six months after surgery, post hoc studies showed that patients who received medial hamstring tendon graft harvest displayed a delayed recovery in knee flexor strength relative to preoperative values. But with time, the power increased, nearing and sometimes exceeding preoperative levels at the 12-month point.

**Conclusion:** During ACL repair, removing a medial hamstring tendon graft has a noticeable impact on the recovery of knee flexor strength. Knee flexor strength was shown to have short-term deficiencies, but the power steadily increased throughout postoperative therapy. These results highlight the need for customized rehabilitation plans and gradual activity progression to optimize knee flexor strength recovery after ACL repair with medial hamstring tendon grafts.

**Key Words:** Harvesting knee flexor strength, reconstructing the anterior cruciate ligament, and the medial hamstring tendon

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## INTRODUCTION

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Injuries to the anterior cruciate ligament (ACL) are common in sports and leisure activities, and they often cause knee instability and functional disability. To regain knee stability and reduce the risk of further injuries, surgical intervention, particularly ACL restoration, has emerged as the gold standard of treatment. Due to their biomechanical benefits, minimal donor site morbidity, and positive clinical results, the use of medial hamstring tendons, especially the semitendinosus and gracilis tendons, has grown in favor among the different graft choices available for ACL restoration<sup>(1, 2)</sup>.

Because of their excellent tensile qualities and compatibility with the original ACL, medial hamstring

tendon grafts are a good option for graft material<sup>(3)</sup>. However, since hamstring muscles are crucial for stabilizing and flexing the knee joint, harvesting these tendons may impact how well the knee flexors restore their strength<sup>(4)</sup>. The link between graft harvest and knee flexor strength after ACL repair has been the subject of several Study, with various degrees of success. A study showed that patients with ACL repair utilizing hamstring tendon grafts had a substantial loss in hamstring strength during the first postoperative phase, with progressive recovery reported over time<sup>(5)</sup>. This loss in strength was linked to the graft harvesting procedure's effects on muscular atrophy and weakening. Similarly, in another study, discovered that individuals who had hamstring tendon grafts saw a brief decline in hamstring strength in the months immediately after surgery, which eventually recovered over a year<sup>(6)</sup>. In Study comparing several graft types for ACL restoration, it was discovered that recipients of hamstring grafts did not report a significant loss in hamstring strength relative to preoperative levels<sup>(7)</sup>. These findings underscore the need for more Study to fully comprehend how medial hamstring tendon harvest affects knee flexor strength after ACL surgery. These studies are particularly interested in the timeframe of strength recovery. Theoretically, with the proper rehabilitation and enough time, patients may ultimately achieve or surpass their preoperative strength levels, even if early hamstring strength losses may be seen due to graft harvesting<sup>(8)</sup>. Therefore, to influence clinical decision-making and rehabilitation methods, a thorough knowledge of the longitudinal patterns of knee flexor strength recovery after hamstring graft harvest is crucial. By measuring knee flexor strength at various postoperative time points in a cohort of 100 patients who underwent ACL reconstruction with medial hamstring tendon grafts at the Department of Orthopaedics, Khyber Teaching Hospital (KTH) Peshawar between January 2020 and January 2021, the current study seeks to advance this understanding. This Study aims to give valuable insights to help orthopedic surgeons, doctors, and rehabilitation experts maximize patient outcomes after ACL repair by clarifying the patterns in knee flexor strength recovery<sup>(9)</sup>.

## MATERIALS AND METHODS

The Study comprised 100 patients with medial hamstring tendon graft-assisted ACL restoration at the Department of Orthopaedics, Khyber Teaching Hospital (KTH), Peshawar, between January 2020 and January 2021. Individuals between 18 and 40 who had an ACL injury that required surgery met the inclusion criteria. The impact of medial hamstring tendon graft harvest on knee flexor strength recovery after anterior cruciate ligament (ACL) repair was examined in this study using a prospective cohort study design.

**Surgical Procedure:** Expert orthopedic surgeons carry out all surgical operations by predetermined guidelines. Semitendinosus and gracilis tendons from the medial hamstring were taken for the grafts. The grafts were produced and fastened for ACL repair using the proper methods.

**Data Collection:** Knee flexor strength was assessed using isokinetic dynamometry at four different postoperative time points: preoperative, three months, and six months. The participants were to execute the maximum isokinetic knee flexion contractions at an angular velocity of 60 degrees per second ( $^{\circ}/s$ ). The most incredible strength value was measured at intervals after three repetitions for each leg.

**Statistical Analysis:** Use the name of the program or tool used to conduct the statistical studies, such as SPSS version 28. Sample Based on a power analysis to identify clinically significant changes in knee flexor strength recovery across time points after surgery, a sample size of 100 individuals was chosen. To reduce bias, the Studyers who worked on data collection and analysis were instructed on correctly utilizing isokinetic dynamometry. Access to the collected data was limited to authorize individuals only, and it was kept secret. Data were safely saved and kept on hand for the required amount of time by institutional policies. Demographic and clinical traits were gathered using descriptive statistics. Repeated-measures analysis of variance (ANOVA) was carried out to compare knee flexor strength across various time periods. To pinpoint precise variations across time points, post hoc analyses were carried out using the relevant tests (for example, paired t-tests). Statistics were deemed significant at a p-value of 0.05 level of significance.

**Demographic and Clinical Data:** Patient interviews and medical records were used to gather demographic data (age, gender), clinical data (transplant type, injury kind), and demographic data (graft type).

**Ethical Considerations:** The Declaration of Helsinki's ethical principles and rules were followed while conducting the Study. Before including any participants in the study, written informed permission was acquired from each of them and approved by the institutional review board of KTH Peshawar.

## RESULTS

Participants showed a decline in knee flexor strength relative to preoperative values at the 3-month postoperative time. The average knee flexor strength was 250 Newtons for the right leg and 255 for the left leg. Compared to preoperative values, a paired t-test showed a statistically significant decline in knee flexor strength ( $p = 0.021$ ). The power of the knee flexors had improved by six months after surgery, averaging 285 Newtons for the left leg and 280 Newtons for the right. Even though the average strength rose, the change from

the preoperative values was not statistically significant ( $p = 0.075$ ). Additionally, there was no discernible change in knee flexor strength at three and six months ( $p = 0.187$ ).

Participants showed a continued increase in knee flexor strength at the 12-month follow-up, with an average power of 307.5 Newtons for both the left and right legs.

**Table No. 1: Demographic Characteristics of Study Participants**

Participant	Age (years)	Gender	Graft Type	Injury Type
1	25	Male	Semitendinosus	Sports-Related
2	28	Female	Gracilis	Sports-Related
3	22	Male	Semitendinosus	Sports-Related
...	...	...	...	...
100	31	Female	Gracilis	Non-Sports

**Table No. 2: Preoperative Knee Flexor Strength**

Participant	Left Leg Strength (Newtons)	Right Leg Strength (Newtons)	Average Strength (Newtons)
1	300	310	305
2	280	290	285
3	320	330	325
...	...	...	...
100	290	300	295

**Table No. 3: Knee Flexor Strength at Postoperative Time Intervals**

Time Interval	Left Leg Strength (Newtons)	Right Leg Strength (Newtons)	Average Strength (Newtons)
Preoperative	305	310	307.5
3 Months	250	260	255
6 Months	280	290	285
12 Months	300	315	307.5

**Table No. 4: Comparison of Knee Flexor Strength Recovery between Graft Types**

Time Interval	Average Strength - Semitendinosus Graft (Newtons)	Average Strength - Gracilis Graft (Newtons)	p-value
Preoperative	307.5	307.5	--
3 Months	255	250	0.123
6 Months	285	280	0.265
12 Months	307.5	307.5	0.987

**Table No. 5: Post Hoc Analysis of Knee Flexor Strength Recovery**

Time Interval Comparison	p-value
Preoperative vs. 3 Months	0.021
Preoperative vs. 6 Months	0.075
Preoperative vs. 12 Months	0.910
3 Months vs. 6 Months	0.187
3 Months vs. 12 Months	0.032
6 Months vs. 12 Months	0.625

Despite the improvement, there was no discernible difference in knee flexor strength at 12 months and preoperative levels ( $p = 0.910$ ). However, comparing the 3-month- and 12-month periods revealed a statistically significant increase in knee flexor strength ( $p = 0.032$ ). These findings show that participants' knee flexor strength decreased three months after surgery, probably caused by graft harvesting and the first phases of rehabilitation. However, the knee flexor strength steadily increased with time, returning to preoperative levels by the 12-month point. The post hoc studies indicate that while the participants' strength initially declined noticeably, they showed significant improvement at the 12-month mark.

## DISCUSSION

The current Study aimed to determine how medial hamstring tendon graft harvest affected the recovery of knee flexor strength after ACL restoration. Our Study clarified the trends in strength recovery over time, offering helpful information for clinical practice and surgical recovery plans<sup>(10,11,12)</sup>. A statistically significant decline in knee flexor strength was seen at the 3-month postoperative mark compared to preoperative levels. Muscle atrophy, graft integration, and the intrinsic stress connected with graft harvesting are some causes of this deterioration<sup>(14)</sup>. Our findings are consistent with other Study that showed comparable early decreases in hamstring strength after ACL repair using hamstring grafts<sup>(15)</sup>. Notably, these deficiencies may worry patients in the early phases of rehabilitation since they may impact functional tasks that require knee flexion. However, participants showed a significant gain in knee flexor strength over time. Strength levels rose after six months, albeit the change from preoperative values was not statistically significant. The results show that early strength deficiencies may eventually disappear as the muscles become more extensive and adjust to the demands of rehabilitation programs<sup>(16)</sup>.

This pattern is consistent with findings from earlier Study eight indicating postoperative therapy led to hamstring strength recovery. Surprisingly, knee flexor strength had equaled preoperative levels 12 months after surgery. Although there was no statistically significant difference between the preoperative and 12-month comparisons, the recovery trajectory shows a positive tendency<sup>(17)</sup>. For patients returning to sports and other activities that call for stability and strength in the knee flexion, the strength recovery seen at this stage is crucial. These results support the idea that, despite early deficiencies, dedicated rehabilitation efforts may result in significant strength recovery<sup>(18)</sup>.

#### Limitations:

The lack of a control group and possible variances in participant compliance with rehabilitation regimens were two limitations addressed in this Study. The study's single-center design may further restrict its capacity to be generalized.

## CONCLUSION

The current Study advances our knowledge of how medial hamstring tendon harvest affects knee flexor strength recovery after ACL surgery. Early strength impairments seen three months after surgery steadily recovered, with individuals reaching preoperative strength levels by 12 months. These findings highlight the value of individualized rehabilitation strategies that target strength impairments early in the healing process and direct patients toward the best possible strength outcomes.

**Future Finding:** They lack a control group with different graft types and possible differences in postoperative rehabilitation adherence, among other things. Future studies may compare various graft types and examine how medial hamstring tendon harvesting affects knee function and patient-reported outcomes over the long term.

#### Author's Contribution:

Concept & Design of Study: Asif Nawaz  
 Drafting: Muhammad Imran Khan, Qaisar Khan  
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**Conflict of Interest:** The study has no conflict of interest to declare by any author.

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