

Patellar Tendon Graft for Anterior Cruciate Ligament When to Use It

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Abstract

Background: Anterior cruciate ligament (ACL) reconstruction being one of the most common procedures being done, graft selection is very important, the length of the patellar tendon being fixed, and it has to match the required length of intra-articular portion of graft as closely as possible.

Objective: The objective of this study is to assess if there is any correlation between the length of patellar tendon and the length of the ACL in a particular knee.

Materials and Methods: A total of 20 cadaveric knees were dissected to study if there is any correlation between the length of ACL and patellar tendon of the particular knee.

Results: There were wide variations in the length of the patellar tendon when compared to ACL and does not have a correlation.

Conclusion: As the length of patellar tendon graft and ACL do not accurately correlate with each other and pre-operatively, dimensions of both should be evaluated for proper graft selection.

Key words: Anterior cruciate ligament, Arthroscopy, Cadaver, Patellar tendon, Ptb length mismatch

INTRODUCTION

Anterior cruciate ligament (ACL) reconstruction is one of the most common procedures being done nowadays in the field of sports medicine. The debate on ideal graft is always there with patellar tendon and Hamstring tendons being the most commonly used ones. Achilles tendon, quadriceps tendon, and allograft are also being used but with less frequency. Bone-patellar tendon graft has the advantage of immediate strong fixation stability and bone to bone healing but has the problem of increased incidence of anterior knee pain and patellar problems such as fracture or chondromalacia. The hamstring tendon graft does not have the problem of anterior knee pain but lacks the immediate

strong fixation. Bone to bone union in patellar tendon graft is always better than tendon to bone healing in hamstring graft. The advantage of aperture fixation in patellar tendon graft is achieved when the tendon length matches the length of ACL which is not seen in all the cases. There are various ways to predict patellar tendon length pre-operatively but whether it correlates to the length of the corresponding ACL is what to be studied. Various measures to assess the patellar tendon graft are available, such as the one from lateral knee X-ray, but no precise measuring tool for ACL length is used routinely pre-operatively though magnetic resonance imaging can give a reasonable idea. Pre-operative assessment can probably guide the surgeon to choose graft wisely to prevent intraoperative complications or unnecessary additional steps to accommodate the graft length-ACL mismatch.

Objective

The objective of the study was to assess the length of the patellar tendon and ACL length in a knee and to study whether there is any correlation between them or is there any discrepancy among them and if so is it predictable or variable.

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MATERIALS AND METHODS

It was a cross-sectional type of the study. A total of 20 well-preserved adult cadaveric knees in the Department of Anatomy, Government Madurai Medical College, were taken up for the study. The cadaveric knees were dissected using a longitudinal midline incision, subcutaneous tissue dissected, and the patellar tendon was identified and delineated. The length and width at the midpoint of the patellar tendon were measured using a compass with the knee in 90° flexion, and then, medial parapatellar arthrotomy was done, and ACL was identified from tibial attachment to femoral attachment. Then, its length was measured similarly using a compass, and the results were tabulated and analyzed.

RESULTS

A total of 20 knees were dissected and the length and width of the patellar tendon and ACL were measured. The results of the study and analysis are given as follows. Table 1 shows the lengths of ACL compared against the length of the patellar tendon and their differences in each knee. Table 2 shows the pearson correlation statistics between lengths of ACL and patellar tendon.

There is no significant correlation between length of the patellar tendon and length of the ACL at $P > 0.05$ and Pearson correlation ($r = 0.399$, $P = 0.081$). Limitation of the study was its small sample size.

DISCUSSION

Patellar tendon graft initially was the gold standard graft for all ACL reconstruction initially. With the usage of Hamstring grafts, the popularity of bone-patellar tendon-bone (BTB) graft has gradually declined but is still used by those who prefer it anyway. The advantages of the patellar tendon graft are the strong bone to bone fixation it provides with interference screw fixation. The strong bone to bone fixation achieved by interference screws is unparalleled by other fixation techniques which can facilitate early rehabilitation which is very important in the outcome of the procedure. Aperture fixation as achieved in patellar tendon graft has been shown to be biomechanically superior than suspensory fixation. The common problems encountered in harvesting the patellar tendon graft are patellar fracture and post-operative anterior knee pain. Some studies have even demonstrated residual quadriceps weakness though it seems to improve gradually over a period of time. Patella Baja also has been described in some studies as a post-operative complication but has not been substantiated well

Table 1: Results

Length of the patellar tendon	Versus length of the ACL	Difference
4.7	3.4	1.3
4.6	3.0	1.6
3.85	2.7	1.15
4.2	2.7	1
4.0	3.0	1
4.05	3.2	0.85
5.0	3.0	2
5.0	2.7	2.3
5.15	3.4	1.75
5.3	3.4	1.9
4.3	2.8	1.5
4.3	2.8	1.5
4.3	3.2	1.1
4.3	3.0	1.3
3.95	3.1	0.85
3.95	3.2	0.75
4.2	2.9	1.3
4.3	2.7	1.6
4.4	3.0	1.4
4.8	3.3	1.5

ACL: Anterior cruciate ligament

Table 2: Statistical analysis correlation

	Length of the patellar tendon	Length of the ACL
Length of the patellar tendon		
Pearson correlation	1	0.399
Significant (two-tailed)		0.081
N	20	20

ACL: Anterior cruciate ligament

in other studies. The problem of anterior knee pain can be minimized by carefully resuturing the paratenon after graft harvest. Patellar fracture and damage to the chondral surface can be prevented by careful surgical technique. The width of the patellar tendon is usually adequate so as the central one-third is adequate to provide a graft with a width of at least 8 mm. The patellar tendon graft is usually slightly long and to facilitate fixation the femoral bone plug has to be slightly advanced in the tunnel or has to be flipped on the tibial side to achieve bone to bone fixation by interference screws, but again the concept of aperture fixation is lost and hence its advantages. If the advantage of rigid bony fixation and aperture fixation is lost, then Hamstring tendon graft with less donor site morbidity has an advantage over the BTB graft. Aglietti *et al.*¹ found that with good surgical technique results with PTB and hamstring grafts are the same. Colombet and Bouguennec² described that suspensory fixation with PTB graft had good results. Aune *et al.*^{3,4} showed interference screw fixation to be better with PTB than hamstring tendons. Twisting of PTB graft does not have predictable effect on graft force.

Otsuka *et al.*⁵ in their paper have concluded that anatomic fixation of PTB graft decreased tunnel length. Poehling *et al.*^{6,7} in his systemic review showed equal long term results with PTB and hamstring grafts. Gaines *et al.*⁸ described screw fixation as best option in graft length mismatch. Navali *et al.*⁹ showed there is only a weak correlation between patient height and the length of the patellar tendon. Grave *et al.*¹⁰ used single bone plug technique to avoid graft length mismatch. Patellar tendon length measured on true lateral radiograph is usually predictable. Denti showed poor correlation between intra-articular portion of ACL graft and PTB graft with body weight and height.^{11,13}

CONCLUSION

Bone-patellar tendon graft which was the gold standard graft previously still is as good alternative for Hamstring tendon graft. However, the dimensions of the graft and intra-articular length of the graft required should be assessed and evaluated to choose the best possible option available.

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