

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING PATELLAR TENDON AND QUADRICEPS TENDON: A COMPARATIVE STUDY

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ABSTRACT

Objective: The goal of this study was to compare the results of knee anterior cruciate ligament reconstruction with the use of patellar tendon and quadriceps tendon.

Methodology: In this study 30 patients with rupture of anterior cruciate ligament of knee were compared in two 15-person group with the use of patellar tendon and quadriceps tendon. After precise rehabilitation program for six month, patients were compared according to scoring system. Variables of this system included: Knee extension, knee flexion, anterior drawer test, quadriceps muscle weakness, patellofemoral symptoms, infrapatellar symptoms, effusion, giving way symptoms, and radiographic changes of degenerative arthritis. Each variable was given scores (0,5,10) depending to symptoms, and sum of scores was recorded and compared for each person in each group.

Results: The use of quadriceps tendon had lesser infrapatellar symptoms as compared with patellar tendon ($p < 0.04$). This difference was significant. Average of total score for group PT was 78.6 and group QT was 81; both of them were in the excellent range and there was no significant difference between these two groups.

Conclusions: In reconstruction of anterior cruciate ligament of knee, using quadriceps tendon was more appropriate for conditions in which patients require longtime kneeling (knee flexion) and will result in patient's earlier return to activity and more satisfaction.

KEY WORDS: Anterior cruciate ligament reconstruction, patellar tendon, quadriceps tendon.

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INTRODUCTION

The true prevalence of Anterior cruciate ligament (A.C.L) injury is not clear but it is the

most frequent knee ligament injury among athletes.¹ Acute reatures of ACL are more fraquent at its middle part and following sport trauma.^{2,3} Primary repair of these reatures were not associated with good results and therefore attention has been directed to reconstruction of this ligament.⁴⁻⁶ Type of graft being used in this reconstruction is controversial. The proper graft for reconstruction of ACL must have the maximum similarity regarding anatomy, strength and biomechanics and in addition to biologic fusion should provide a firm fusion with femor and tibia. The most applied tissues for replacement of the ruptured ACL include

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patellar tendon as Bone-patellar bone tendon graft and semitendinus tendon. Fulkerson et al. have described using quadriceps tendon with or without a patellar bone fragment.^{7,8} With proper conditions quadriceps tendon has, this tendon has been used for reconstruction in patients with ACL rupture, and simultaneously the results have been compared with the common patellar tendon-using operation.^{9,10} Currently surgeons intend more to use patellar tendon.^{11,12} that is due to the proper strength of this tendon and having two osseous head in graft.

In orthopaedic literatures, applying quadriceps tendon has been recommended more for Revision of ACL reconstruction.¹³ Generally, pain and disability reports after surgery by using of quadriceps tendon were few.¹⁴ In our study we have compared the results of ACL reconstruction with patellar tendon and with quadriceps tendon.

METHODOLOGY

In this clinical trial, 30 cases of all patients with ACL rupture had came to Ahwaz Imam Khomeini Hospital during 2004-2005, were randomly selected and divided into two groups of 15-person each. First group used patellar tendon and second group used quadriceps tendon for ACL reconstruction.

In these thirty patients, ligamental reconstruction was performed as open surgery with one medial patellar incision. Prior to reconstruction, all patients need to have a range of motion of >120 complete knee flexion and extension for preparation to surgery. Those who

lacked this intended range of motion were excluded from the study.

After surgery all patients underwent precise physiotherapy and programmed rehabilitation for ACL reconstruction. After surgery, patients were encouraged to do hyperextension movements, and were allowed to bear weight two days after surgery. Physical therapy was ordered for reinforcement of quadriceps muscles and initiation of knee motions, until they have 90 flexion within first two weeks and 120 flexion within first month after surgery. After six weeks that the intended range of motion of knee was gained, patients were allowed to complete weight bearing. Patients were allowed to do sport activities after 6 months.

At the end of six months, Patients were visited, their data were recorded in an already prepared questionnaire and results of examination were recorded and scored based on standard scoring system (Table-I). Intended criteria in this system included knee extension, flexion, Anterior drawer test, quadriceps muscle weakness, patellofemoral problems, Intrapatellar problems included effusion, giving way and changes of degenerative arthritis at radiographs.

Each of the above clinical criteria according modified Lishlom knee score were given scores (0,5,10) depending their severity, and after combining all scores, each patient's score was calculated. Scores more than 70 were placed into group excellent, scores 60-70 into group good, scores 50-59 into group intermediate and scores 40-49 into group poor. (Table-I)

Table-I: Evaluation of variables

<i>Variables</i>	<i>10</i>	<i>5</i>	<i>0</i>
Quadriceps muscle strength	Without weakness	Weakness against force	Weakness against gravity
Knee extension	complet	20 loss	>45 loss
Knee flexion	100-120 degree	70-90 degree	Less than 70 degree
Ant.drawer test	Displacement of 3 mm	Displacement of 5 mm	Displacement of >5mm
Patellofemoral problems	Without paroblem	Pain after daily activities	Pain after excercise
Infrapatellar problems	Without problem	Pain after kneeling	Pain during daily activities
Effusion	Without effusion	Little effusion	Moderate to great effusion
Giving way	absent	sometimes	recurrent
Degenerative changes at knee radiographs	Without change	Mild (minor)	Moderate to severe

Table-II: Scoring of results based on standard table

Variables	Group PT (number of patients)			Group QT (number of patients)		
	Score 10	Score 5	Score 0	Score 10	Score 5	Score 0
Quadriceps muscle strength	11	4	—	10	3	2
Knee extension	14	1	—	12	3	—
Knee flexion	15	—	—	15	—	—
Ant.drawer test	13	2	—	12	3	—
Patellofemoral problems	6	7	2	10	3	2
Infrapatellar problems	7	6	2	11	4	—
Effusion	14	1	—	14	1	—
Gining way	15	—	—	15	—	—
Radiografic changes	15	—	—	15	—	—

Criteria and final scores were compared in both groups and statistical analysis was performed using soft ware SPSS and non-parametric Mann-whitney test.

RESULTS

All patients studied were male and their mean age was 25 years (19 to 33). In all of them Cause of injury was sport trauma. The primary treatment after injury included hemarthrosis evacuation and casting for four weeks followed by physical therapy. Anterior drawer test was positive in all patients, lateral pivot shift test and knee jerk test in 13 patients (43%) patients plain radiographs of knee were normal. MRI of knee demonstrated rupture of ACL in all patients and partial injury of medial meniscus in twenty-six patients (86%).

Results of surgery based on scoring and comparison in both group are shown in Table-II. After combining the scores, patients, scoring in both groups were determined as Following. *In group PT:* One case, Score 65; four, Score 70; two, score 75; two, score 80; three, score 85; three, score 90. *In group QT:* One case, score 60, One, Score 70, One, Score 75, Four, Score 80, Six, Score 85, Two, Score 90. In total, average sum of scores was 78.6 in group PT and 81 in group QT. Overall results based on standard scoring system are shown in Table-III.

Statistical analysis provided following results:

- * With regard to knee extension, mean value for group PT didn't reflect acceptable difference (P=0.291)
- * As regard knee flexion, there was no difference between two groups (p=1)
- * In anterior deawer test, the difference between two groups was not significant, too (P= 0.630).
- * As regards quarcips weakness, although the results in PT group were slightly better, but there was no difference between two groups (P= 0.446).
- * Patellofemoral symptoms, results of QT group were better, but difference between two groups was not significant, too (P=0.191).
- * With regard to infrapatellar symptoms, symptoms in group QT were less, results of that group were better and difference was acceptable (P<0.041).
- * The difference was not significant, as regards effusion, giving way and changes of degenerative arthritis.
- * Mean values of groups were also not significantly different (P=0.423).

DISCUSSION

There are a variety of ideas from different sources about using graft and choosing graft

Table-III: Knee scoring comparison after reconstruction of ACL

	Excellent >70	Good 60-70	Fair 50 - 59	Poor 40-49
PT	10 cases	5 cases	—	—
QT	13 cases	1 cases	1 cases	—

type for knee ACL reconstruction. Currently, patellar and semitendinus tendon are used more than other tissues to reconstruct ACL.¹⁵ In this study, using patellar tendon and quadriceps tendon for ACL reconstruction has been compared regarding different symptoms. These two methods were not considerably different with regard to rehabilitation and return to previous activities. There was also no considerable difference between two groups regarding knee range of motion. The only difference between two groups was lesser infrapatellar symptoms in quadriceps tendon-applying group, that was most obvious and their difference was significant ($P < 0.04$). Results of this study is in agreement with other studies evaluating use of quadriceps tendon in patients requiring long time kneeling.¹² In other studies return to previous activities was sooner in quadriceps tendon group.¹³ But there was not significant difference between two groups in this study. In other studies, authors have recommended using quadriceps tendon in cases of patellar tendinitis and patellar chondromalacia, too.¹²

The problem of this type of study is that, it needs more time to evaluate probable degenerative changes in operated patient's knees, but we can follow up them in future.

CONCLUSION

This study demonstrates that results of knee ACL reconstruction using quadriceps tendon is comparable with patellar tendon. Since Patellofemoral joint problems in first method are less than those in second method, this procedure can be recommended in Iran and Middle East area where repeated and longtime sitting and kneelings are common due to cultural and religious reasons.

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