

Anterior Knee Pain after Bone Patellar Tendon Bone Graft for Arthroscopic-Assisted Anterior Cruciate Ligament Reconstruction

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ABSTRACT

Objective: To determine the change in frequency and intensity of anterior knee pain after a bone patellar tendon bone graft for arthroscopic-assisted anterior cruciate ligament reconstruction after 06 months.

Study Design: Longitudinal study.

Place and Duration of Study: Department of Orthopedics Combined Military Hospital, Rawalpindi Pakistan, from Jul 2019 to Jun 2021.

Methodology: We studied 100 patients who underwent Anterior Cruciate Ligament reconstruction and met our inclusion criteria. A Visual Analogue Scale pain score was used to assess anterior knee pain in this group. They were reevaluated at four weeks, eight weeks, and twenty-four weeks.

Results: The data of 100 patients (mean age of 29.2 ± 6.71 years) who underwent Anterior Cruciate Ligament reconstruction surgery and followed prescribed rehabilitation protocol was analysed. The VAS scores of all patients at 04 weeks, 08 weeks and 24 weeks were evaluated. The incidence of severe anterior knee pain was 3 patients (3%) at 04 weeks and 1 patient (1%) at 6 months. The frequency of patients in the moderate pain category was 13(13%), 06(06%) and 04(04%) at the 04, 08 and 24 weeks, respectively. At the four-week follow-up, 44 patients (44%) were pain-free, increasing to 70 patients (70%) at the six-month follow-up.

Conclusion: At six months following Anterior Cruciate Ligament repair with bone patellar tendon bone graft, there was a significant reduction in the intensity of anterior knee discomfort in patients.

Keywords: Anterior Knee Pain, Arthroscopy, Patellofemoral Pain Syndrome, Visual Analog Scale.

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INTRODUCTION

Anterior cruciate ligament (ACL), comprising of antero-medial and postero-lateral bundles, provides significant stability to the knee joint.¹ Injury of ACL is considered one of the most common presentations in outpatient department. ACL reconstruction using different kinds of grafts is the gold standard treatment option; however, the choice of graft source has not yet been standardized. Patellar tendon, hamstring tendon, quadriceps tendon and iliotibial band are the routinely used grafts for aforementioned procedure.^{1,2}

Some researchers advocate that for young athletes, bone patellar tendon bone (BPTB) graft is favored as it provides better fixation strength due to the presence of bone plugs at each end of graft.³ On the other hand, donor site morbidities like anterior knee pain or discomfort on kneeling are well documented in literature as well.⁴ It has been observed that anterior knee pain increases appreciably after

ACL reconstruction of patients with atrophied or weak quadriceps muscle. Extensor strength of quadriceps muscle post ACL reconstruction was assessed in a series and average difference of 10-30% was observed at 6 months follow up. Multiple other studies have proclaimed that donor site morbidity after ACL reconstruction with BPTB graft is the major contributor to the origin of patello-femoral pain. However, this discomfort experienced by patients is usually ignored.^{5,6}

According to our hypothesis, graft site morbidity is the principal cause of knee pain, but as seen by our study results, this pain subsides with time and quadriceps training. After a graft BPTB for arthroscopic-aided anterior cruciate ligament reconstruction, anterior knee pain is a common complaint, although the cause is unknown. Pain can range from modest discomfort to excruciating agony.⁷ Severe discomfort inhibits patients from carrying out daily tasks. The aim of this study is to emphasise that anterior knee pain settles down to a large extent with time and rehabilitation protocol.

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METHODOLOGY

This longitudinal study was conducted at Combined Military Hospital Rawalpindi, Pakistan after obtaining approval from Institutional Ethical Review Board (IERB No. 115/10/20) Jul 2019 to Jun 2021.

Inclusion Criteria: Patients of either gender aged between 18 and 40 years, with Anterior cruciate ligament (ACL) reconstruction via ipsilateral BPTB graft, and a minimum follow-up of 6 months were included.

Exclusion Criteria: Revision ACL reconstruction, graft other than BPTB e.g., Hamstring graft, patient with preoperative anterior knee pain and patient having any infective etiology were excluded.

After obtaining the written informed consent, 100 patients experiencing significant postoperative anterior knee pain were included in this study. This sample size was calculated using WHO sample size calculator using prevalence of anterior knee pain as 34.5%.⁷

Over the period of 2 years, 210 ACL reconstruction using BPTB graft were performed in our centre. One hundred patients out of these met our inclusion criteria. All patients were enrolled in a rehabilitation protocol after ACL reconstruction. Patients were clinically evaluated post operatively at 04, 08 and 24 weeks. After the graft's removal, the tendon gap was closed with Vicryl.¹ Paratenon was closed with Vicryl (2/0 Ethicon), the femoral tunnel was drilled using a femoral jig, and screw was used to secure the BPTB graft on both the femoral and tibial sides.

After ACL reconstruction, all patients were asked to follow isokinetic rehabilitation for quadriceps strengthening. The rehabilitation protocol included active flexion up to 90 degrees and straight leg raise for 1st month. During the second month, flexion was increased up to maximum limit with slight weight training for quadriceps and hamstring muscles. In the third month, cycling and active weight training was included in the protocol. The patient's subjective rating was determined using a Visual Analogue Scale (VAS) score. The scale had cutoff points of 0-3 points for minor pain, 4-7 points for moderate pain, and 8-10 points for severe pain. "Significant" anterior knee discomfort was classified as "moderate-to-severe pain," which was defined as pain with a Visual Analogue Scale of 4 or higher for the purposes of this study.

Data was analysed using Statistical Package for Social Sciences (SPSS) version 26. Quantitative variables were presented using mean and standard deviation, while qualitative variables were presented using frequencies and percentages.

RESULTS

In our study a total of 100 patients fulfilling the inclusion and exclusion criteria were included. Amongst subjects under study all patients were male. Mean age of the patient was 29.2 ± 6.71 with ranging from 18 to 40 years. At the four-weeks, two-month, and six-month follow-ups, we used VAS to assess pain. At 04 weeks follow up, 44 patients (44%) had no pain, followed by 40 patients (40%) who had mild pain, 13 patients (13%) with moderate pain, and 03 patients (03%) had severe pain (Table-I). At two months, VAS revealed that 56 patients (56%) were in no pain, 37 patients (37%) were in mild pain, 6 patients (6%) were in moderate pain, and 1 patient (1%), was in severe pain (Table-II). At the six-month follow-up, 70 patients (70%) reported no pain, 25 patients (25%) reported mild pain, 4 patients (4%) reported moderate pain, and 1 patient (1%) reported severe pain (Table-III).

Table-I: Visual Analogue Scale Pain Scores at 04-Week Follow-up (n=100)

Visual Analog Scale	04 Weeks
No Pain	44(44%)
Mild	40(40%)
Moderate	13(13%)
Severe	3(3%)

Table-II: Visual Analogue Scale Pain Scores at 02-Month follow-up (n=100)

Visual Analog Scale	02 Month
No Pain	56(56%)
Mild	37(37%)
Moderate	6(6%)
Severe	1(1%)

Table-III: Visual Analogue Scale Pain Scores at 06- Month follow-up (n=100)

Visual Analog Scale	06 Month
No Pain	70(70%)
Mild	25(25%)
Moderate	4(4%)
Severe	1(1%)

DISCUSSION

The anterior cruciate ligament (ACL) is the primary static stabiliser against tibia on femur anterior translation, absorbing up to 86% of the total stress. Various parts of the ACL appear to support the knee

joint at different stages of knee motion. The ACL prevents anterior tibial translation, axial tibial rotation, and valgus knee rotation. Because the original ACL has weak biological healing capabilities, it is frequently reconstructed to preserve functional stability and avoid early knee joint deterioration.⁸ The structure and biomechanics of the native ACL are not totally restored by a reconstructed ACL, although it is a start in the right direction. The first graft utilised for ACL repair was a BTB autograft. Bone plugs at both ends of the graft preserve native tendon-bone contact, allowing bone-to-bone healing to complete graft-host integration.⁹ Creeping substitution results in a real bony association at the graft-tunnel interface, which is known to last longer than soft tissue-bone healing via a fibrovascular scar.¹⁰

Several studies have documented complications following ACL reconstruction. Anterior knee pain is most commonly linked to the harvesting of BPTB grafts, but it can also occur in patients who have undergone reconstruction with hamstring graft.¹¹ Mohtadi *et al.* looked at 330 patients who were divided into three groups: PT, single-bundle STG grafts, and double-bundle STG grafts.¹² There was no significant difference in the frequency of anterior knee discomfort, subsequent meniscal lesions, or stiffness between these groupings.¹²

During BPTB graft harvesting, cutting the periosteum on both the patellar and tibial sides enhance the degree of surgical stress.¹³ One of the main reasons of anterior knee soreness, according to Biau *et al.* is donor site morbidity in the use of BPTB grafts.¹⁴ A patellar tendon deficiency produced by the removal of the centre third of the patella may cause increased sensitivity and pain when the anterior compartment is directly pressed during knee movements.¹⁵ The correlation between quadriceps dysfunction and the incidence of patellofemoral discomfort has been well-documented. The infrapatellar branch of the saphenous nerve can be injured by the central patellar tendon harvesting, which is one of the factors that contributes to the higher prevalence of anterior knee discomfort. Patients should begin weight bearing immediately after surgery, flex the knee from 0 to 90 degrees, and conduct close chain stretching activities.¹⁶ We measured pain severity from the time of surgery to six months afterward in this study. The results depict sequential decrease of visual analogue score in majority of the patient with time. According to Corry *et al.* similar decrease in the severity of anterior knee

pain following surgery over time was demonstrated in literature reaching up to 55% at 1 year and 31% at 2 years.¹⁷

Shelbourne *et al.* concluded that incidence of knee pain after BPTB graft decreased significantly with time especially in those who were in rehabilitation protocol focusing on early hyper extension of knee.¹⁸ There are other methods by which post-operative anterior knee pain can be minimized like filling the bone defects of patellar and tibial donor sites with autologous bone graft, by employing meticulous closure of paratenon and by utilizing double-incision approach for BPTB graft harvesting as it may help to preserve the infrapatellar branch of saphenous nerve thereby minimizing the post-operative anterior knee pain.¹⁹

Our study has some limitations, firstly we have only assessed the pain via analogue scales without quantifying the pain intensity. Secondly, other risk factors related with anterior knee discomfort, such as BMI, arthritis, or other concomitant meniscal injury, were not evaluated.

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CONCLUSION

At six months follow up there was a significant decrease of occurrence and severity of anterior knee pain in patients undertaking rehabilitation protocol. Donor site morbidity is not the only cause for anterior knee pain, therefore using a BPTB graft is safe and supported by our study.

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Authors' Contribution

The following authors have made substantial contributions to the manuscript as under:

JIN & MSA: Conception, study design, drafting the manuscript, approval of the final version to be published.

MAAS & ZA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

ZK & AH: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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