

## Original Research Article

# Quality of life and thigh girth following anterior cruciate ligament reconstruction using hamstring autograft

Mirza A. Baig\*

Department of Orthopaedics, Shadan Institute of Medical Sciences, Hyderabad, Telangana, India

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**\*Correspondence:**

Dr. Mirza A. Baig,

E-mail: [atif.med@gmail.com](mailto:atif.med@gmail.com)

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### ABSTRACT

**Background:** Arthroscopic anterior cruciate ligament reconstruction is commonly performed with intent to return earlier to normal activities, so graft selection becomes more important. The use of hamstring tendon autograft is supposed to have less postoperative morbidities. In this prospective study we assess the early post-operative complications.

**Methods:** 25 patients were operated in Shadan Institute of Medical Sciences and Research Centre, Hyderabad, India, by the same surgeon and were assessed preoperatively, and 3 and 6 months after surgery. The hamstring and quadriceps strength were measured with PRIMUS RS machine. The patients were also assessed for their subjective complaints using International Knee Documentation Committee (IKDC) knee scoring system.

**Results:** The peak power of flexion and extension of the knee joint significantly improved following the surgery which is essential for any athletic activities. Quadriceps and hamstring strengths were restored to 90%, which suggests that the grafting has been successful in restoring isometric strength. This is necessary to return to sporting activities. Power of hamstrings and quadriceps significantly improved following surgery. Quadriceps and hamstring endurance recovered and improved at the end of 6 months following surgery. Using IKDC scoring, nearly normal were 14, normal were 10 and abnormal 1. 3 patients (12%) presented with anterior knee pain. Sensory loss was noted in 6 patients (24%) at the end of 6 months following surgery. Swelling was noted in 5 patients (25%).

**Conclusions:** Most morbidities are temporary in nature and do not significantly affect the patient's activities.

**Keywords:** Anterior cruciate ligament, Hamstring, Semitendinosus gracilis, Quadriceps, Torque, Peak power, endurance, H/Q ratio, Isokinetic, Isometric, Endobutton

### INTRODUCTION

Rupture of the anterior cruciate ligament (ACL) impairs the stability of the knee, resulting in difficulty with athletic performance increased risk of subsequent meniscal injury and increased risk of degenerative joint disease<sup>1</sup>. Arthroscopic-assisted reconstruction of the ACL using hamstring grafts is a well-known and widely accepted surgical procedure.<sup>2</sup> As ACL reconstruction becomes more frequently performed, there is an increasing expectation of a more rapid return to sporting

activities. The use of hamstring tendon autograft has been perceived to have less post-operative morbidities.<sup>3</sup> There is a perception that ACL reconstruction with the hamstring method is associated with lower postoperative morbidity, namely anterior knee pain (AKP), a more rapid return to full range of motion, especially knee extension and a rapid recovery of quadriceps function. However, this technique is not without complications. The early post-operative complications were evaluated in this study.<sup>4</sup> Reconstruction of the ACL is a frequently performed procedure used to restore functional stability

in ACL- deficient knees, restoring the normal kinematics of the knee and even return to activities of daily living, work and study.<sup>5</sup> Thus, graft selection involves consideration of the long-term outcome and also early postoperative morbidity.

The aim of this study was to document the morbidities associated with ACL reconstruction using hamstring tendon autograft, this includes the effect on hamstring and quadriceps strength, AKP and sensory deficits. The sensory deficits include deficit of the saphenous nerve and it's infra patellar branch.

## METHODS

A prospective study was carried out at Shadan Institute of Medical Sciences and Research Centre, Hyderabad, India on twenty five patients who underwent ACL reconstruction using the hamstring tendons from April 2016 to January 2019. Of these, 20 were males and 5 were females. The age range was 16 to 42 years of age, with an average of 29.32 years of age. All the surgeries were performed by the same surgeon. The indication for surgery was ACL rupture confirmed by clinical diagnosis in a patient who experienced instability of knee in daily activities and wished to attain a normal stability in knee. The patients were assessed preoperatively and then at the third and sixth month postoperatively.

The inclusion criteria were no previous ligament reconstruction performed; a healthy contralateral knee; no diagnosis of re-injury during the follow-up period; all skeletally mature patients.

### Surgical technique

All patients underwent an arthroscopic ACL reconstruction and were performed by the same surgeon. Hence, the technique, graft placement, graft fixation and rehabilitation were identical inpatients.

With the patient under general or regional anaesthesia, a single dose of prophylactic antibiotics of 1 g ceftriaxone was given prior to inflation of tourniquet. A tourniquet was applied high on the thigh and inflated. The hamstring tendon autograft was harvested at pesanserinus with a longitudinal anteromedial incision. The semitendinosus and gracilis tendons were harvested separately using a metal tendon stripper, after ensuring the fascial attachments and accessory attachments were divided under direct vision. The graft was cleared of adherent muscle fibres, and folded over twice to create four strands and these were stitched together with ethibond sutures. Femoral fixation was performed with an Endo Button attached to the graft. On the tibia lend, the graft was fixed with titanium interference screw.

## Rehabilitation

Postoperatively hinged knee immobilizer is applied, knee hamstring and quadriceps closed chain exercises are started. Knee flexion passively done 30° to 90° in 3 to 4 weeks and once general strength is good proprioception and coordination exercises are started, straight line running on treadmill achieved by 3 months and return to sports activity by 6 months.

## Method of analysis

The patients were assessed preoperatively and clinical reviews were performed at 3 and 6 months postoperatively. Evaluation included assessment with Tegner Lysholm knee scoring scale, measurement of thigh and calf girth and examination with PRIMUS RS dynamometer (Primus RS) computerized machine.<sup>6</sup>

Tegner Lysholm knee scoring scale has been used to describe outcome following ACL reconstruction.<sup>6</sup> The Tegner Lysholm knee scoring scale consists of 8 sections. Final score is graded as <65- poor; 65-83- fair; 84-90- good; >90- excellent.

Results were analysed using Microsoft excel and presented in number and percentages.

## RESULTS

The study consisted 20 males (80%) and 5 females (5%) (Table 1).

**Table 1: Male-female distribution.**

Sex	Frequency	Percentage (%)
Male	20	80
Female	5	20
<b>Total</b>	<b>25</b>	<b>100</b>

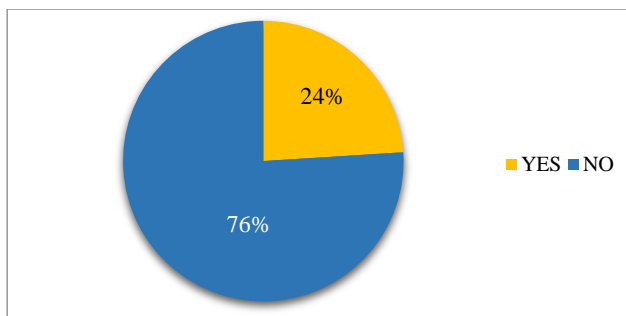
The mean preoperative quadriceps girth was 82%, compared to the normal side. This dropped to 78% after 3 months but climbed to 92% by 6 months (Table 2).

**Table 2: Thigh and calf muscle girth.**

Girth	Pre-op (%)	Post-op 3 months (%)	Post-op 6 months (%)
<b>Thigh muscle</b>	82	78	92
<b>Calf muscle</b>	94	92	98

The mean preoperative calf girth was 94%, compared to the normal side. This dropped to 92% after 3 months but climbed to 98% by 6 months.

Sensory deficits (Figure 1) were only present in 6 patients with complaints of numbness over the scar site and extending distally.



**Figure 1: Sensory loss after surgery.**

**Table 3: Tegner Lysholm knee scoring scale.**

Tegner Lysholm knee scoring scale		Pre-op	3 months	6 months
>90	Excellent	0	7	14
84-90	Good	0	14	10
65-83	Fair	18	4	1
<65	Poor	7	0	0

Tegner Lysholm knee scoring scale (Table 3) the initial recovery after 3 months was good in majority of patients (14) later on it climbed to excellent in majority (14) patients.

**DISCUSSION**

**Muscle girth and strength**

The main complication of hamstring tendons harvest is hamstring strength recovery.<sup>7</sup> In our study, there was a drop in the girth at 3 months postoperatively. However, the girth for hamstrings recovered and there was no decrease in hamstring muscle strength noted after rehabilitation by 6 months.

However the ACL reconstruction procedure itself reduces quadriceps and hamstring strength in the injured limb, regard less of tendon harvest site, at 1 month after surgery.<sup>8</sup> Intraarticular damage to the bone, including notchplasty and drilling, and extra articular damage to the muscle and periosteal tissues can cause strength reduction of the muscles. This could explain the initial decrease in quadriceps strength.

However, both the strength and girth of the quadriceps and hamstrings did recover and improve by the sixth month after surgery. Hence the morbidity with regards to thigh muscle strength is temporary and full recovery is expected by the sixth month after ACL reconstruction.

**Anterior knee symptoms**

**Sensory change**

A study by Spicer et al noted that areas of sensory change over the front of the knee were identifiable in 50% of

patients and of these, 86% demonstrated sensory change in the distribution of the infra-genicular branch of the saphenous nerve.<sup>9</sup> They postulated injury of the infra-genicular branch can occur during the skin incision, the initial exposure of tendon and drilling of tibial tunnel, or during dissection of tendons proximally and during the passage of the tendon stripper as the nerve courses superficially to the gracilis.

In our study, sensory change was noted in 6 patients (24%) after 6 months. Strict adherence to the surgical techniques mentioned below, especially in keeping the knee flexed during tendon harvest and ensuring that all fascial adhesions are cleared, is important in prevention of neurological injury. However despite this neurological injury, these 6 patients did not complain of significant limitation of their sporting activities or work.

**AKP**

In our study, out of 25 patients, 4 complained of anterior knee pain. However, only two complained of pain that interfered with sporting activities and other 2 experienced pain only with strenuous activities, for example, after running 3 kms. Patello-femoral pain, quadriceps weakness and flexion contracture are shown to be related.<sup>10</sup> Sachs et al noted that AKP is frequent complication at about 25% incidence and is related to both residual extension loss and quadriceps weakness. They felt that it is essential to regain complete ROM and immediate full extension to avoid patella-femoral symptom and anterior knee pain. In our patients, there were no significant problems with the achievement of extension and quadriceps strength and hence we postulate that the small number of patients with significant

**Infection**

None of the patient had superficial or deep infection 6 month post-operatively.

**Swelling**

Swelling was present in 4 patients out of 25. Their IKDC grade was either abnormal (1 patient) or nearly normal (3 patients).

**CONCLUSION**

This is a prospective study to assess the quality of life and thigh girth following arthroscopic ACL reconstruction using the quadruple stranded hamstring grafts. 25 patients who underwent ACL reconstruction surgery using quadruple hamstring tendon graft were included in this study. The thigh girth following arthroscopic ACL reconstruction surgery and quality of life was assessed using Tegner Lysholm score. Clinical features like AKP and sensory loss were also assessed. Within the limitation of expertise available at our institute, the following conclusions were drawn: The

quality of life improved 3 months post-surgery with return to work satisfactory at 3 months and return to sporting activities at 6 months in most patients. The improvement in activity level has correlated with increase in the thigh and calf muscle girth.

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*Ethical approval: The study was approved by the institutional ethics committee*

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