

Original Article



Functional Outcome of Anatomic Single Bundle Anterior Cruciate Ligament Reconstruction Using Quadruple Hamstring Autograft

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ABSTRACT

Introduction: Arthroscopic Anterior Cruciate Ligament(ACL) reconstruction using quadruple hamstring autograft is an established and widely practiced surgery for ACL injured knee. The goal of ACL reconstruction is to enable the patient to return to preinjury status. The purpose of this study was to evaluate the functional outcome of anatomic single bundle anterior cruciate ligament reconstruction using quadruple hamstring autograft.

Methods: This was a prospective analytical study of 30 patients with ACL injury who underwent arthroscopic ACL reconstruction using hamstring autograft in National Trauma Center, NAMS from January 2020 to June 2020. Functional outcome using Tegner Lysholm score and the complications were assessed.

Results: Mean age of patient was 27 ± 42 years. Most common mode of injury was fall injury. Mean graft diameter was 7.6 ± 0.45 mm. Tegner Lysholm score improved from pre operative score 60.76 ± 1.23 to postoperative score 91 ± 2.43 . 12 patients (40%) had excellent outcome and 18 patients (60%) had good functional outcome. No major complications were seen.

Conclusion: Arthroscopic anatomic anterior cruciate ligament reconstruction using quadrupled hamstring autograft is an effective method for ACL injury and gives excellent to good functional outcome .

Keywords: Anterior Cruciate Ligament; Quadrupled hamstring autograft; graft diameter; Tegner Lysholm Score.

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INTRODUCTION

Anterior Cruciate Ligament (ACL) injury is one of the most common injury of knee among high level athletes and is also common in young and active individual. Its prevalence is estimated to be 1 in 3000 in United States (more than 120,000 cases annually).¹

ACL reconstruction is an established and widely practiced surgical procedure with proven efficacy and a low morbidity profile.² It helps to prevent instability and premature osteoarthritis. The goal of ACL reconstruction is to enable patient to return to pre injury status.

Arthroscopic techniques have been advanced and refined to assist in the reconstruction of the anterior and posterior cruciate ligaments. The arthroscopically aided approach has the advantages of smaller skin and capsular incisions, improved viewing of the intercondylar notch for placement of tunnel and attachment sites, less postoperative pain, fewer adhesions, earlier motion and easier rehabilitation.³ Arthroscopically assisted ACL reconstruction using a hamstring or patella bone tendon bone autograft is the standard surgical treatment particularly for those who are unable to perform jumping and cutting manoeuvres in sports because of resulting knee instability.⁴ Transportal arthroscopic approach for femoral tunnel preparation and placement of graft is widely used. Adoption of this approach has been shown to improve femoral tunnel placement in terms of visualization, long horizontal tunnel placement and fewer chances for posterior blow out.

A wide variety of fixation solutions to attach the hamstring tendons have been proposed. Most commonly used devices for femoral fixation are interference screws, transfix screws and cortical suspension devices. Devices for tibial fixation can be intratunnel and extratunnel. Cortical suspension devices have been widely used in ACL reconstruction for femoral side. Various studies have shown that cortical suspension devices have the necessary biomechanical properties with regard to ultimate failure strength, displacement and stiffness for initial fixation of soft tissue in the femoral tunnel for ACL reconstruction.⁵ Endobutton is the first generation suspensory fixation with fixed length loop. The length of the loop is fixed but it is stiffer and slippage free which seem to have created a more favourable biomechanical environment.

The purpose of this study was to evaluate the functional outcome of arthroscopic ACL reconstruction with quadrupled hamstring tendon autograft using endobutton and bioabsorbable interference screw. To appreciate functional outcome, Tegner Lysholm score⁶ was used in this study.

METHODS

It was a prospective observational study conducted at National Trauma Center, Bir Hospital, Kathmandu from January 2020 to June 2020, after approval from Institutional Review Board of NAMS.

All patients of age >16 years with symptomatic ACL injury confirmed by MRI were included in the study after taking informed consent. Patients with multiligament injuries and comorbidities were excluded from the study.

Detailed history and examination findings were noted. After spinal anaesthesia, limb was assessed for Lachman and Pivot shift test. Diagnostic arthroscopy was performed through Standard portals and arthroscopic findings were noted. Then graft was harvested from the ipsilateral limb and prepared on ACL graft master. Femoral insertion of ACL was identified posterior to the median ridge and cleared with radiofrequency probe. Accessory anteromedial portal was made and beathpin was inserted under guidance of femoral offset aimer hooked at posterior end of lateral femoral condyle with knee flexed at 120 degree. Beathpin was overdrilled with 4 mm cannulated drill bit and depth measured and femoral tunnel was drilled with endofemoral drill bit equal to the size of quadrupled hamstring graft keeping at least 5 mm of outer cortex intact.

Then the knee was kept at 90 degree flexion and tibial tunnel made with the help of ACL tibial elbow aimer placed just anterior to the posterior border of anterior horn of lateral meniscus. The graft was looped in appropriate size endobutton and inserted through tibial tunnel. Fixation was done in femoral tunnel by endobutton, graft tensionin was done and graft fixed in tibia by bioscrew with knee flexed at 15 degrees of flexion.

Standard ACLR rehabilitation protocol was followed for postoperative rehabilitation. Stitch removal done at 2 weeks. Patient was followed up

at 6 weeks, 3 months and 6 months. Functional assessment was performed by Tegner Lysholm Score at 6 months. Outcome is graded as Excellent if total score is between 95-100, Good if 84-94, Fair if 65-83 and Poor if <64.⁶

Statistical analysis was performed using statistical package for the social sciences (SPSS) version 11.5 software package.

RESULTS

31 patients underwent ACL reconstruction during this study period. 1 patient was lost to follow up. Out of 30 patients, 8 (26.7%) were female and 22 (73.3%) were male. Right knee was involved in 20 patients (66.67%) and left in 10 (33.33%). Age of patients ranged from 20 years to 42 years with mean age of 27 ± 4.2 years. Mode of injury was Fall injury in 15 patients (50%), Road traffic accident in 8 patients (26.67%) and sports injury in 7 patients (23.3%).

11 patients (36.67%) had associated meniscal injury out of which 7 had medial meniscus injury and 4 had lateral meniscus injury. 3 patients (10%) had associated chondral lesion. Size of hamstring autograft ranged from 7 to 8.5 mm with mean size of 7.6 ± 0.45 mm.

28 patients (93.3%) attained full range of motion at 6 weeks. 2 patients with irregular follow up and non compliant to physiotherapy required 3 months to attain full range of motion. None of the patients developed infection. 3 cases had postoperative effusion. Mean preoperative Tegner Lysholm score was 60.76 ± 1.23 and postoperative score at 6 months was 91 ± 2.43 with p value 0.001. 12 patients (40%) had excellent outcome and 18 (60%) had good outcome.

Table showing Pre operative and postoperative Tegner Lysholm Score grading

Score grading	Preoperative Score		Postoperative score	
	Number	Percentage	Number	Percentage
Poor (<65)	24	80%	0	0%
Fair (65-83)	6	20%	0	0%
Good (84-90)	0	0%	18	60%
Excellent (>90)	0	0%	12	40%
Total	30	100%	30	100%

DISCUSSION

The primary goal of ACL reconstruction is to restore the stability of the knee. Successful clinical outcomes following anterior cruciate ligament reconstruction with a semitendinosus graft has been reported by many authors.⁷ The choice of fixation in ACL reconstruction is still evolving and the current fixation device which has been widely used were the Endobutton and the bio composite interference screws which has helped to render an improved rehabilitation program post operatively.⁸

All patients in our study underwent arthroscopy assisted ACL reconstruction with single bundle quadrupled semitendinosus tendon autograft from ipsilateral limb using endobutton and bioabsorbable interference screw. Mean age of patients in our study was 27 ± 4.2 which was comparable with the study of Mishra et al⁹ (30.53 ± 7.24). The commonest mode of injury in our patients was Fall injury (50%) followed by RTA.

The mean size of graft in our study was 7.6 ± 0.45 mm which was similar to the study by Pokharel et al¹⁰ (7 ± 0.5 mm) and Chodavarapu et al¹¹ (7.9mm). In study by Mishra et al⁹, the mean size was 8.2 ± 0.39 mm. Treme et al proposed that

graft length is related to the height and BMI of the patient while the diameter is related to the thickness of the thigh. He further opined that a graft diameter of <7mm will have a higher risk of failure.¹²

Thapa et al¹³ in their study reported outcome that the mean Tegner Lysholm score improved from 47.7 to 91.5 at a 6 months follow up. Suranigi et al¹⁴ reported improvement of score from 60.2 ± 6.02 to 91.72 ± 3.17. H.E. Bourke et al¹⁵ reported the outcome of isolated anterior cruciate ligament ruptures treated with anatomical endoscopic reconstruction using hamstring tendon autograft at a mean of 15 years. A total of 152 patients underwent subjective assessment at 15 years. The mean Lysholm knee score of 15 years was 93. In our study, 28 out of 30 patients strictly followed the rehabilitation protocol. Lysholm score was recorded at 6 months follow up postoperatively when the mean Lysholm score improved from preoperative score of 60.76 ± 1.23 to 91 ± 2.43. The improvement of the score was statistically significant. (p=0.0001).

Mishra et al⁹ reported superficial infection in 9 cases, joint effusion in 6 cases, and giving way in 9 cases out of 120 cases. Chodavarapu et al¹¹ reported superficial infection in 1 case and stiffness in 2 cases. Pokharel et al¹⁰ reported stiffness in 2 cases. Suranigi et al¹⁴ reported graft rerupture in 1 case, cyclops lesion in 1 case and superficial infection in 1 case. Leo Chan et al¹⁶ reported that the technique of ACL reconstruction using quadrupled fold semitendinosus tendon autograft for ACL reconstruction using the Endobutton for femoral fixation has been used for over ten years with no known instance of fixation failure. Ian et al concluded that in ACL reconstruction using hamstring graft, the postoperative ROM following rehabilitation protocol was almost equal to the pre injury status at the end of follow up.¹⁷

In our study, 3 cases had swelling in the knee joint in post operative period and were monitored regularly and settled gradually over 6 weeks. 2 patients couldn't achieve full ROM at 6 weeks due to poor compliance with physiotherapy and regained full ROM at 3 months. 1 patient complained of slight sense of giving way during exertional activity. There was no case of infection.

CONCLUSION

Anatomic single bundle ACL reconstruction with quadrupled hamstring autograft fixed with endobutton on femur and bioscrew at tibia is very good method of ACL reconstruction with predictable outcome. There has been an encouraging result with these initial findings of ACL reconstruction in terms of knee stability, range of motion and functional improvement of operated knee. There were no major complications in our study. Thus anterior cruciate ligament reconstruction using quadrupled semitendinosus autograft offer an excellent to good functional outcome.

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