

Original Research Article

An interventional study on functional outcome of combined anterior cruciate ligament and anterolateral ligament reconstruction

Amit Kumar Jain*, Sudhir Kumar Yadav, Prasant Modi

Department of Orthopaedics, SMS Medical College, Jaipur, Rajasthan, India

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***Correspondence:**

Dr. Amit Kumar Jain,

E-mail: jaindr2@gmail.com

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ABSTRACT

Background: The anterolateral ligament (ALL) is an important structure for rotational stability of knee joint after anterior cruciate ligament (ACL) rupture. Outcome of combined ACL and ALL reconstruction will change view of high demanding ACL tear cases.

Methods: A hospital based prospective interventional study was done in Department of Orthopaedics, SMS Medical College, Jaipur to find the functional outcome of combined anterior cruciate ligament and anterolateral ligament reconstruction. A total of 45 patients underwent ACL and ALL reconstruction. Indications for a combined procedure were associated grade 3 pivot shifts, high level of sporting activity and pivoting sports. Patients were assessed pre- and post-operatively with objective and subjective International Knee Documentation Committee (IKDC) score, Lysholm score, and Tegner activity scale.

Results: The mean follow up time was around 5 months. Two patients lost to follow up. Leaving 45 patients for final evaluation. At the last follow-up, all patients had full range of motion. The Lysholm, subjective IKDC, and objective IKDC scores were significantly improved (all $p < 0.0001$). Pre-operatively, 38 patients had a grade 3 pivot shifts and 7 had a grade 2 according to the IKDC criteria. Post-operatively, 42 patients had a negative pivot shift (grade 0), and 3 patients were grade 1 ($p < 0.0001$).

Conclusions: This study demonstrates that a combined reconstruction can be an effective procedure without specific complications at a minimum follow-up of 6 months. Longer follow up is required to know any long term complications and functional outcome.

Keywords: Anterior cruciate ligament, Anterolateral ligament, Knee instability, Pivot shift, Sports injury

INTRODUCTION

Anterior cruciate ligament tear requiring surgical intervention are commonly encountered in young athletes.¹ Reports of the presence of a distinct structure with well-defined origin and insertion sites began to emerge in the early 21st century; it was termed the "anterolateral ligament".² Studies showed the ALL to play an important role in anterior and rotational stability about the knee, especially in cases with concomitant ACL injuries.⁵ Residual anterolateral rotatory instability after

ACL reconstruction led to a renewed interest in the functional role of the ALL and the development of surgical techniques to address this pathology. Up to 25% of all ACL reconstruction patients have been reported to have residual rotational instability.⁶ Moreover, isolated ACL reconstruction failure rates range from 1.8% to 14%.⁷⁻¹⁰

Anterolateral ligament originates near the lateral epicondyle on the femur and inserts on the lateral meniscus and broadly in a fanlike attachment on the tibia

between the Gerdy tubercle and the fibular head. Function is to provide anterolateral rotational stability to tibia.

Studies by numerous authors who have described an extra-articular structure in the lateral knee extending from the lateral epicondyle of the femur to the lateral tibia that may contribute to translational and rotatory stability in conjunction with the ACL.^{3,4} Biomechanical studies have shown that the ALL is an important stabilizer of internal rotation at knee flexion angles greater than 35.⁵

METHODS

The hospital based prospective study was held in the department of Orthopaedics, SMS Medical College and Hospital, Jaipur from April 2017 to November 2018. It included 45 cases of ACL tear cases treated with reconstruction of ACL and ALL ligaments with following criteria.

Inclusion criteria

Inclusion criteria were patient having Age group 18 to 50 years of either sexes with complete ACL tear having Pivot shift >2+ and Patients who give informed consent and are willing for follow up.

Exclusion criteria

Exclusion criteria Patients having meniscus tear, condylar injury. Patients with local infection, tissue adhesions, previous knee surgery. Patients with osteoarthritis knee joint. Patients with knee deformity. Patients less than 18 years age, Patients unfit for surgery. Uncontrolled diabetes mellitus, hypertension, psychiatric illness, acute myocardial infarction less than one year.

Upon arrival in orthopaedics OPD of SMS hospital all patients were thoroughly evaluated for preliminary information regarding name, age, sex, address, date of injury, mechanism of injury and other associated injury. Patients were subjected to routine blood investigations including blood haemoglobin level, total and differential leukocyte counts, ECG and chest X-ray. A pre anaesthetic check-up was performed. The affected part and corresponding lower limb was prepared just the night before surgery.

After obtaining clearance and approval from the institutional ethical committee and patients fulfilling the inclusion /exclusion criteria will be included in the study after obtaining informed consent. Detailed history will be obtained using the study proforma with special attention to clinical examination. Examination of other associated symptoms will be based on history and clinical examination. Cases of complete ACL tear with pivot shift >2+ without meniscus or condylar injury.

Patient's position

Patient was positioned with normal leg in neutral supine position. Involved leg was positioned with a side support at level of greater trochanter, to prevent abduction at hip while knee flexion. Ipsilateral foot support was used to maintain knee in 90° of flexion. The operative leg was scrubbed, painted and draped using standard sterile techniques. Once draped, markings were made on patient's skin for the tibial tubercle, the borders of patella and portal sites, site over graft harvest and bony landmark for femoral and tibial end of ALL.

Procedure

After confirmation of significant anterolateral rotatory instability by performing pivot shift test intra operative and doing diagnostic arthroscopy before taking graft.

Graft harvesting

Hamstring (semitendinosus and gracillis) tendon graft from same limb was taken using tendon stripper. Graft prepared with triple bundle of semitendinosus for ACL reconstruction with average length of 9 cm. Graft prepared with double bundle of gracillis for ALL reconstruction with average length of 10 cm. Extraction of graft from same limb was enough for reconstructing both ACL and ALL in the study. After reconstructing ACL using triple bundle of semitendinosus graft. Femoral tunnel is made using PCL jig with entry point is at foot print of ACL on medial side of lateral femoral condyle and exit is behind and below lateral epicondyle. Double bundle graft (gracillis graft) is taken out through femoral tunnel for reconstruction of ALL.

Now, stab incision is given at a point between the lateral fibular head and Gerdy's tubercle. A tunnel is made under iliotibial band from femoral end of ALL till the tibial end of ALL. Graft is passed and fixed in full extension and neutral rotation of the knee. The graft is fixed distally in the tibia with a Bio-Interference screw. Once fixation is complete, the knee is assessed through a complete range of motion and rotational stability is tested with the pivot-shift test for comparison to the preoperative state.

Post-operative management

We followed a semi-conservative rehabilitation program similar to that for a standard ACL reconstruction. The patient was trained during discharge with physiotherapy emphasizing on early restoration of full extension, quadriceps function, closed chain exercises and allows partial (20 kg) weight bearing after second postoperative week and full weight bearing thereafter. Patients were reviewed periodically with trained physiologists and rehabilitation experts in Department of Rehabilitation and Research Centre of SMS Hospital.

Follow up

Patients were followed up monthly until 6 months for detailed clinical examination and monitoring rehabilitation. Functional assessment was performed at sixth month post op. The outcome at 6 months of surgery was compared with the preoperative status.

Statistical analysis

Statistical analysis was performed with the SPSS, Trial version 23 for Windows statistical software package (SPSS inc., Chicago, IL, USA) and Primer. The Categorical data were presented as numbers (percent) and

were compared among groups using Chi square test. Groups were compared for quantitative data were presented as mean and standard deviation and were compared using by students t-test. Probability p value <0.05 was considered statistically significant.

RESULTS

Most of the patients were young adult in our study averaging around 30 years old. This was in accordance with previous experiences by other surgeons. More active involvement in sporting and other pivoting activities may have contributed to slightly younger age.

Table 1: 2000 IKDC subjective knee evaluation score.

Group	N	Mean	Std. deviation	Maximum	Minimum	Median	p value LS
Pre-operative	45	65.07	8.957	81	42	66.25	<0.001S
Post-operative	45	89.54	6.092	97	72	91.20	

Table 2: 2000 IKDC functional score.

Group	N	Mean	Std. deviation	Maximum	Minimum	p value LS
Pre-operative	45	5.50	0.961	7	4	<0.001S
Post-operative	45	8.91	0.900	10	7	

Table 3: Tegner activity level pre-injury post-operative.

Group	N	Mean	Std. deviation	Maximum	Minimum	p value LS
Pre-operative	45	71.00	6.856	84	61	<0.001S
Post-operative	45	91.67	5.851	100	79	

Table 4: Lysholm knee score (pre and post-operative)

Group	N	Mean	Std. deviation	Maximum	Minimum	p value LS
Pre-operative	45	71.00	6.856	84	61	<0.001S
Post-operative	45	91.67	5.851	100	79	

Non-contact injuries accounted for around 47% of cases and contact injuries for 44.11%. Remaining 8.82% cases exact mechanism could not be elicited. Injury in sports was following recreational sports mostly and road traffic accidents were mainly of two wheeler riders. Mean time lapsed between injury and surgery was around 5 months.

Patients experienced significant improvement in symptoms and functions as detected by international knee documentation committee score.

ACL and ALL reconstruction helped patient attain their pre-injury activity level with-out significant deterioration as observed by Tegner activity level score.

Reduced instability related symptoms following ACL and ALL reconstruction demonstrated by significant improvement in Lysholm knee score.

DISCUSSION

In our study group of 47 patients, we were able to collect data for 45 patients. A total of 2 patients were lost to follow up. Most of the patients in our study group were young adults (average age was 30.2 years) who engaged in economically and socially productive activities.

The mean duration of interval between the times of injury to the time of surgery was around 5 months. After initial episodes of trauma, many patients tend to neglect attention to their knees, and only when the pain or instability had become severe enough to affect their activities of daily living, they presented to the hospital.

Our centre being a public tertiary level hospital, most of our patients were from general population, not engaging in professional level sporting activities. Many of the general patients injured their knees while playing recreational sports (52.94%), like running, kabaddi,

wrestling and football, making sports related injury as a major cause. Road traffic accidents came out to be second major cause of ACL injuries in our study. All of them were riding two-wheelers.

Current outcome scoring systems do not evaluate the theoretical benefits of improved proprioception, ligamentization, and joint kinematics. Based on available literature, ACL and ALL reconstruction have benefits such as it helps to maintain anatomical biomechanics of the knee joint, it overcomes the rotational instability in pivoting sports patients and it does not require additional graft and uses same graft used in ACL reconstruction in this study.

Multiple clinical case series have shown improvement in clinical scores, joint stability. Recent studies have concluded that there might be a biomechanical advantage to placing the graft origin posterior and proximal to the lateral epicondyle.⁹ The tibial landmark is constant, midway between the Gerdy tubercle and fibular head.^{4,8} When the graft is placed using the described landmarks, fixation should be performed in full extension. This leads to a graft that is tight in extension and slack in flexion. Fixation in flexion would lead to loss of extension and is not recommended. Respecting this guideline is essential to having an adequate postoperative rehabilitation and return to sports.

Difficulties to visualize the graft insertion site, especially on the femoral side, require a perfect knowledge of the normal anatomy of the native ACL footprint. And identifying femoral end of ALL making tunnel and fixing it with adequate tension is a challenging task. Adapted portals, marking the landmark, perfect controls of the tunnel drilling process, intercondylar notch space management are the keys of success.

This study has some limitations the pivot-shift test used to evaluate rotational instability is a subjective test & the follow up is limited to 6 months, which is too short to evaluate potential degenerative changes.

CONCLUSION

To conclude, success after ACL reconstruction may depend not only on the tightness or strength of the reconstruction but also on the reconstruction of extra articular anterolateral ligament for rotational stability. Our study confirms that ACL reconstruction with ALL restores knee stability and function. The clinical outcomes were statistically improved and similar to those already published for the ACL and ALL reconstruction. A longer follow-up is needed to definitively validate this study.

Clinical evaluation using presenting complaints, level and type of sport, diagnostic tests etc. and arthroscopic aspect, allow the surgeon to make a decision between non operative treatment and operative reconstruction of ALL

with ACL. Anatomic ALL reconstruction is technically demanding, but reproducible. This study demonstrates that a combined ACL and ALL reconstruction can be an effective procedure without specific complication at a minimum follows up of 6 months.

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

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