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A PROSPECTIVE STUDY COMPARING ALL INSIDE ARTHROSCOPIC ACLR USING VARIABLE LOOP SUSPENSORY CORTICAL BUTTON FIXATION ON FEMORAL AND TIBIAL END V/S ACLR USING CORTICAL BUTTON SUSPENSORY FIXATION ON FEMORAL END AND FULL TIBIAL TUNNEL WITH INTERFERENCE SCREW ON TIBIAL END

Orthopaedics

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ABSTRACT

Anterior cruciate ligament injuries are one of the most commonly encountered ligament injury in knee. The all-inside ACL reconstruction technique is a relatively new development in ACL surgery. Some features of this technique include closed-socket tunnels, dual suspensory graft fixation, decreased bone removal(1). We have prospectively compared the outcome after All-Inside ACL reconstruction Technique using variable loop cortical button suspensory fixation and ACL reconstruction using Suspensory fixation on femoral and full tibial tunnel with interference screw fixation on tibial end in patients who have partial or complete ACL tear on the basis of post-operative pain, range of motion, and patient satisfaction levels .

KEYWORDS

Anterior cruciate ligament, all-inside, suspensory fixation.

INTRODUCTION:

Anterior cruciate ligament injuries account between 25 to 50% of ligamentous knee injuries[2]. ACL injuries have an estimated incidence as high as of 400,000 patients each year in the United States[3]. The all-inside ACL reconstruction technique was originally described over twenty years ago[4]. The technique referenced in this manuscript was described by Lubowitz et al., 2011[5]. The all-inside ACL Reconstruction has the advantages of 1)Bone preservation, 2)Advantage of re-tensioning the ACL graft after fixation, 3)Use in skeletally immature patients, 4)Use of only a single hamstring tendon in the graft, 5)Uses cortical endobuttons as suspensory fixation devices and no complications associated with screws[6].

OBJECTIVES:

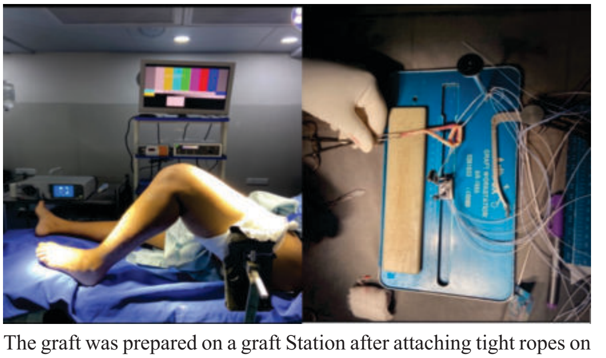
Objectives of the present study was to compare the all inside ACL reconstruction using variable loop suspensory cortical button fixation vs ACL reconstruction using cortical button suspensory fixation on femoral end and full tibial tunnel with interference screw on tibial end in cases of ACL injuries and to assess the functional outcome in patients admitted to Srikara Hospital, Miyapur Hyderabad from-March 2020 to May 2021 in terms of pain, knee's range of motion and patients satisfaction.

METHODOLOGY:

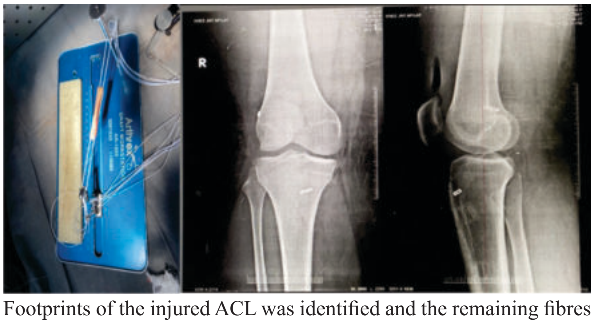
It was a Prospective study conducted at Srikara hospitals, Miyapur Hyderabad from march 2020 to may 2021. 60 patients aged between 18-50 years with partial or complete ACL tear that was associated with or without meniscal tears were treated. In 30 patients all-inside ACL reconstruction was done and in 30 patients conventional ACL reconstruction was done using suspensory fixation on femoral end and full tibial tunnel with interference screw. Both groups were similar in all criteria. All patients who had multiple co-morbidities, associated injuries of posterior cruciate ligament, medial collateral ligament, lateral collateral ligament, posterolateral corner injury, ACL injuries with bony avulsions, radiologically documented knee osteoarthritis > K-L Grade 2, revision cases, patients with chronic synovitis, patients with concomitant reparable meniscal injuries were also excluded because of potential effects on outcomes. We have analysed all initial AP, lateral radiographs and available MRI scans. Patient's history and medications were documented. AP and lateral radiographic examination at the time of injury, after surgery and at the time of last follow-up were documented. No apparent differences between the two groups regarding group size, age, sex or co- morbidities were recorded. At minimum follow-up of 1, 3, 6 months, knee range of motion, VAS scores was recorded. Results with complications were analysed in both the groups and there were no significant differences between the two groups at later follow ups.

Surgical procedures:

Patients were randomized to either All- inside or conventional technique groups. All- inside ACL reconstruction was done in 30 patients with the patient in supine position and knees flexed (90 degrees) with a side-support stand on a radiolucent table. First diagnostic arthroscopy was done and ACL tear was confirmed. Ipsilateral semitendinosus graft was harvested with the help of tendon stripper harvested with the help of Tendon stripper.



The graft was prepared on a graft Station after attaching tight ropes on either ends to obtain a four-stranded graft of length 65mm and diameter 8mm. Femoral socket of 25 mm and tibial socket of 20 mm were prepared. Two markings were made, one on the graft and another on leading tight rope representing femoral tunnel length and condylar length respectively .



Footprints of the injured ACL was identified and the remaining fibres are debrided. A femoral socket of 25mm was prepared using femoral reamer of 8mm from anteromedial portal after the guide pin was passed from AM portal. Pulling sutures to shuttle the graft was passed and held. Tibial socket was prepared using Arthrex flip cutter passed through the tibial jig after placing on the tibial ACL foot print. Once the tip of flip cutter was visualised in the joint, the flipcutter was switched to open the blade (8mm) to make retrograde reaming and prepare a 20mm tibial socket. After the creation of both sockets, both the tight rope sutures were shuttled into the femoral tunnel by the pulling suture which was passed through AM portal to pull the graft from the anteromedial. The leading tight rope sutures were pulled after shuttling it through the femoral tunnel, endobutton was flipped after reaching over lateral femoral condylar cortex. Graft was then pulled into the femoral socket. The same steps were followed for the tibial fixation. Final graft tensioning was done. Position of the endobuttons was confirmed by fluoroscopic guidance. Wound closure was done and No.12 suction drain was placed in situ. All the surgical procedures were performed by the same qualified surgeon.

Post Operative Rehabilitation and Physiotherapy:
From post-operative period to 4 weeks:
Static quadriceps exercise atleast 5-10 minutes every hour, active ankle ROM exercises, active assisted and passive knee flexion exercises, full weight bearing mobilisation was allowed with knee brace after 24 hours of surgery.

1month-3months:
Active knee flexion, knee brace was discontinued after 8 weeks. Walking without long knee brace allowed from 6 weeks. Squatting with support was allowed 4-6 times a day. The patient was asked to perform active graded quadriceps exercise. Cycling was promoted after 3 months.

3months-6months:
Jogging with steps less than 1meters were promoted from 4th month onwards. Squatting without support was allowed from 5th month onwards. Patient was promoted to continue active graded quadriceps exercise with further increase in the level of difficulty. After 6 months, steps >1metres and <2meters were allowed. Track and field events were allowed from 6 months onwards (with avoidance of long and high jumps). Patient was asked to wear the knee brace at places where a fall might result upto 6 months. Beyond 6 months jogging on uneven ground was allowed. Contact sports were allowed. Patient was promoted training of all degrees to gain the pre injury activity level.

Data analysis:
All the data were compiled in a tabulated manner and analysis was done using SPSS21 software.

Result analysis:
Age: In our study, mean age group was 27.4years with range of 18-50years

Sex: Out of 60 patients, 42 were males and 18 were females.

Mechanism of injury: The common mode of injury was by road traffic accidents accounting for 58%, followed by slips or falls during daily activities constituting 31%, followed by sports injuries accounting 6% and other accounting 5%.

Table 1: Lachman grading at 1 Month – First follow up

Lachmangrading - Pre Op					
Lachman Grade	Conventional Group		All Inside Group		Test of Significance (p-value)
	Number	%	Number	%	
Grade 2	12	40.0	13	43.3	0.927
Grade 3	13	43.3	13	43.3	
Grade 4	5	16.7	4	13.4	

Both the group showed no significant difference in their pre-operative Lachman grades. P-value <0.05 was considered significant.

Table 2: Lachman grading at 1 month - First follow up

Post-Op Lachman Grades					
Lachman Grade	Conventional Group		All Inside Group		Test of Significance (p-value)
	Number	%	Number	%	
Grade 1	30	100	30	100	1.000
Grade 2	0	0	0	0	

All patients at 1st follow up showed grade 1 laxity which was not significant.

Table 3:Lachman Grading At 3rd & 6th Month - Second And Third Follow Up

Post-Op Lachman Grades					
Lachman Grade	Conventional Group		All Inside Group		Test of Significance (p-value)
	Number	%	Number	%	
Grade 1	29	96.7	29	96.7	1.000
Grade 2	1	3.3	1	3.3	

2nd and 3rd follow up, 1 patient in conventional group (3.3%) and 1 patient in all-inside group (3.3%) showed laxity corresponding to grade 2 which was not significant.

Table 4: Pre-op values of Pivot Shift Test

Pre-Op Pivot Shift Test Values					
Test	Conventional Group		All Inside aGroup		Test of Significance (p-value)
	Number	%	Number	%	
Yes	28	93.3	27	90.0	0.640
No	02	6.7	03	10.0	

Pre-operative results showed that the two groups were standardized as far their pre-operative Pivot test results were concerned. There was no difference between two groups.

Table 5: Pivot Shift Test values after 1month at 1st follow up

Pivot Shift Test Values at 1st Follow-Up					
Test	Conventional Group		All Inside Group		Test of Significance (p-value)
	Number	%	Number	%	
Yes	01	03.3	01	03.3	1.000
No	29	96.7	29	96.7	

At 1st follow up visits, the results in the both groups were comparable and was not significant which can be concluded that both grafts are equally good for the purpose.

Table 6: Pivot Shift Test values after 3months at 2nd follow up

Pivot Shift Test Values at 2nd Follow-Up					
Test	Conventional Group		All Inside Group		Test of Significance (p-value)
	Number	%	Number	%	
Yes	01	03.3	01	03.3	1.000
No	29	96.7	29	96.7	

At 2nd follow up visits, the results in the both groups were comparable and was not significant which can be concluded that both grafts are equally good for the purpose.

Table 7: Pivot Shift Test values after 6months at 3rd follow up

Pivot Shift Test Values at 3rd Follow-Up					
Test	Conventional Group		All Inside Group		Test of Significance (p-value)
	Number	%	Number	%	
Yes	01	03.3	01	03.3	1.000
No	29	96.7	29	96.7	

At 3rd follow up visits, the results in the both groups were comparable and was not significant which can be concluded that both grafts are equally good for the purpose.

Table 8: Range of Extension Lag during follow up

Range of Extension Lag during Follow-Up							
Follow-Up	Conventional Group			All Inside Group			Test of Significance (p-value)
	No Lag	1□-10□ Lag	>10□ Lag	No Lag	1□-10□ Lag	>10□ Lag	
At 1 Month	7	23	0	24	6	0	<0.001
At 3 Months	27	3	0	28	2	0	1.000
At 6 Months	29	1	0	30	0	0	1.000

Extensor lag is a very sensitive indicator of quadriceps muscle strength. At 1st follow up, the conventional group showed significantly greater extension lag (**p-value <0.001**) compared to all-inside group which was **statistically significant**. But at the 2nd and 3rd follow up, both the groups showed no significant difference in extension lag was considered.

It can be concluded that most patients undergoing ACL reconstruction with conventional technique tend to gain have quadriceps muscle strength loss due to surgical reconstruction between 3rd and 6th months period. Compare to conventional technique, all-inside group has good recovery of the extensor muscle power. The actual difference at each follow up are very narrow, both the groups are comparable in this parameter yet there is clear evidence of early recovery of knee extensor function in the all-inside group.

Table 9: Post-Op VAS score

Post-Op VAS score									
Post-Op day	Conventional Group				All Inside Group				Test of Significance (p-value)
	VAS 1-2	VAS 3-4	VAS 5-6	VAS 7-8	VAS 1-2	VAS 3-4	VAS 5-6	VAS 7-8	
Day 1	0	0	4	26	5	25	0	0	<0.001
Day 3	0	10	20	0	14	16	0	0	<0.001
Day 7	0	30	0	0	22	8	0	0	<0.001

Post-operative pain was less experienced among patients in the all-inside technique compared to conventional method at day 1, day 3 and day 7 with **p-value of <0.001** which was **statistically significant**.

Table 10: Post-Op Satisfaction among patients

Post-Op Satisfaction									
Post-Op period	Conventional Group				All Inside Group				Test of Significance (p-value)
	Yes	%	No	%	Yes	%	No	%	
Day 1	16	53.3	14	46.7	29	96.7	1	3.3	<0.001
At 1 week	25	83.3	5	16.7	30	100.0	0	0.0	0.052
At 1 month	29	96.7	1	3.3	30	100.0	0	0.0	1.000

At day 1, post-operative satisfaction was more among patient in all-inside group compared to conventional technique with p-value of <0.001 which was statistically significant. There was no significant difference in post-operative satisfaction at 1week and at 1month among both group.

DISCUSSION:

This is a prospective randomized study comparing the functional outcome, knee extensor lag-thereby quadriceps strength and pain score outcome in the conventional ACL reconstruction versus the all-inside ACL reconstruction technique. The main difference between the two being that the conventional techniques uses two autograft tendons (semitendinosus and gracilis), while the all-inside technique uses the semitendinosus alone and spares the gracilis [7]. There are very few clinical trials that compared All inside technique with the conventional technique, reporting superiority of the all-inside technique as regards post operative pain[8][10]. Advantage of all-inside technique is that the socket drilling is performed independently over ACL footprints which results in a more anatomic position, with increased stability of the knee[4][5][11]. In this study, lower VAS pain scores were reported in all-inside technique compared to conventional method. The three studies that compared all-inside and conventional techniques showed lesser VAS score in the all-inside group than the conventional group[5][8][9][12].

This study also proved that day 1 post-operative satisfaction was more in all-inside group compared to conventional technique. At 1st follow up, the conventional group showed significantly greater extension lag compared to all-inside group though there was no significant difference in 2nd and 3rd follow up. The all-inside technique appears to be equivalent in terms of outcomes to the conventional technique, and given the less-invasive nature and versatility in graft choices is a safe and effective technique for primary ACL reconstruction.

CONCLUSION:

Regarding results and failure rates, the all-inside procedure with dual suspensory fixation and a quadrupled semitendinosus graft resembles the traditional interference screw technique with a semitendinosus-gracilis graft. Improved early outcomes are made possible by the technique's less invasive nature, which has a single tendon harvest and short tibial and femoral tunnels. This preserves any potential for future revision surgery. Additionally, it enables more versatile grafts and can act as a backup strategy in the event that short tendons are found or physeal-sparing treatments are necessary.

The future trend in orthopaedic surgery is toward less invasive and patient satisfaction with good outcomes, all-inside technique is a good alternative method because it considers preserving bony tissue and gracilis tendon with less post-operative pain, along with more knee flexor strength and equal outcomes compared to conventional ACL reconstruction surgery.

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