RESEARCH PAPER

Comparison of Functional Outcome of Arthroscopic ACL Reconstruction in Patients with Full Tibial Tunnel Technique and All Inside Technique with Respect to Post Operative Pain and Function

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ABSTRACT

Aim & Background: The All-inside arthroscopic ACL reconstruction is an advanced technique in knee arthroscopy. All-inside arthroscopic ACL reconstruction is a modified form of full-tibial tunnel technique, in which there will be a tibial socket rather than the full tibial tunnel and this technique has not yet been broadly investigated. For that reason, the functional outcomes of arthroscopic ACL reconstruction between the All-inside technique and the Full-tibial tunnel technique were compared.

Methods: This prospective study was done on 50 patients who were randomized into two consecutive groups each consisting of 25 individuals. One group operated by using the All-inside technique (group 1) and the other operated by using the Full-tibial tunnel technique (group 2). Hamstring auto-graft (semitendinosus) was used for both the groups and it was quadrupled or tripled depends on their length. Postoperative pain was measured by Visual analog score (VAS) while functional outcome was evaluated by using the International knee documentation committee (IKDC) score.

Results: Both the All-Inside and the Full-tibial tunnel group showed significant differences in VAS scores from first post-operative day (POD) to fifth post-operative day (POD) and on 11th POD. The VAS scores at the end of six, twelve and twenty-four weeks were not significantly different (P value >0.05). Furthermore the IKDC scores of the All-Inside and the Full-tibial tunnel group prior to surgery (p-value 0.684), and postoperatively at six weeks (P value 0.601), at twelve weeks (P value 0.999), and at twenty-four weeks follow-up (P value 0.766) were not significant.

Conclusion: Our prospective randomized control study concluded that the All-inside arthroscopic ACL reconstruction techniques had a significant reduction of pain during immediate to early post-operative periods. However there was no statistically significant differentiation between All-inside as well as Full-tibial tunnel techniques concerning functional outcome and postoperative pain when evaluated at six weeks, twelve weeks and twenty-four weeks.

Keywords: Anterior cruciate ligament tear, All-inside ACL reconstruction, ACL reconstruction with semitendinosus graft, functional outcome of ACLR

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1. INTRODUCTION

Among knee arthroscopic surgeries, ACL reconstruction is the most common procedure in orthopedics worldwide. This has evolved from open ACL reconstruction to arthroscopic technique. Semitendinosus, gracilis, peroneus longus and quadriceps tendon are the commonly used auto-grafts for the ACL reconstruction. But some surgeons prefer bone-patellar tendon-bone graft for athletes and revision surgeries. There are various implants used to fix these grafts, including interference

metallic screws, interference absorbable screws, and suspension systems with endo-button[1,2] . The All-Inside arthroscopic ACL reconstruction is a newer technique [3] which differs from the classical full-tibial tunnel technique by having a tibial bone socket instead of tibial bone tunnel. However this method requires semitendinosus graft for reconstruction due to the short socket compared to the regular techniques[4] . The Full-tibial tunnel technique can be associated with more pain than the All-inside technique [5,6] . Yet despite itsimportance in the treatment of anterior cruciate ligament tears, few studies have looked into All-inside ACL reconstruction.

2. METHODOLOGY

A prospective study was done on a set of fifty patients. They were randomized into two successive groups, each consisting of twenty-five patients; one group (group 1) underwent All-inside arthroscopic ACL reconstruction while the other (group 2) by the Full-tibial tunnel arthroscopic ACL reconstruction. In this study, skeletally mature patients with Lachman confirmed ACL tears with or without concomitant meniscal injury and consent to participate and follow-up in post-operative rehabilitation were included. Patients with meniscus tears requiring repair, ACL avulsion fractures, ACL tears associated with PCL and/or collateral ligament tears requiring surgery, ACL tears associated with fractures around the knee, and patients needing revision surgery for the ACL were excluded from this study. Functional outcomes were measured by using International Knee Documentation Committee (IKDC) Score and Visual Analog Pain Score (VAS). Visual Analog scoring for pain was performed 1 day pre-operatively and post-operatively from day 1 to day 5 and on day 11, then at six weeks, twelve weeks, and twenty-four weeks. Functional outcome was measured using IKDC scoring pre-operatively, and post-operatively at six weeks, twelve weeks and twenty-four weeks.

3. SAMPLE SIZE :

The prevalence of ACL tear is 1 in 1740 population. The required minimum sample size for each group is twenty-three and so the sample size is forty-six. The sample size for conducting this study was calculated using the formula
given below

$$n = \frac{t^2 \times p\,(1-p)}{m^2}$$

4. STATISTICAL ANALYSIS

Patient information was collected and noted in a Master chart. 'The SPSS Statistical package –version 23' was used for data analysis. Frequency analysis, and percentage analysis were used for categorical variables while the mean and SD were used for continuous variables. The Unpaired sample t-test and the Mann-Whitney U test were use to find out the significant difference between the bivariate samples in the Independent groups (All-inside and Full tunnel). Chi-Square test was used to find the significance in categorical data. The probability value of .05 is considered as a significant level in all the statistical tools.

5. PROCEDURE

To begin with, an injection of Inj. Cefoperazone-Sulbactam 1.5 g i.v and Inj. Amikacin 500 mg i.v was given to all
the tourniquet was applied in the proximal portion of the thigh. Under anaesthesia, knee examination was done and then diagnostic arthroscopy was proceeded. During this diagnostic arthroscopy, meniscal tears or chondral lesions were addressed and if required, soft tissue notchplasty was done for clear visualization. Then 3 cm long vertical incision was made medial to the tibial tuberosity over the skin, sartorius sheath was identified, and incised along the superior margin without harming the medial collateral ligament. Semitendinosus was identified and separated by releasing the vincula with the help of right-angled artery forceps. Graft was harvested by using the open tendon stripper and finally the tibial attachment was released along with the periosteum. The harvested graft was quadrupled (Figure 1) or tripled [7] if the tendon length was inadequate. For Full-tibial tunnel technique, the graft was prepared with endobutton/tight rope (RT) for femur side (suspensory method of fixation). For All-inside technique, the graft was prepared with endobutton/tight rope (RT) for femur side (suspensory method of fixation) and with tightrope attachable button system (ABS) for tibial side (suspensory method of fixation).

5.1 PREPARATION OF FEMORAL SOCKET

In both All-inside and Full-tibial tunnel groups, antero-medial portal technique was used for preparing femoral socket. With the knee in hyperflexed position, the femoral attachment of ACL was marked at the 10 o'clock position for right knee and 2 o'clock position for left knee, by using femoral offset or awl over the ACL footprint. Then 4.0 mm guide pin was driven along the

full length to create a femoral tunnel and the femoral socket was made by using a femoral reamer according to the tendon diameter.

5.2 TIBIAL TUNNEL PREPARATION (Independent Variable)

With the knee in 90 degree flexion, tibial jig placed over the footprint by using the anterior horn of lateral meniscus as the reference and the guide pin was advanced till the footprint. In Full-tibial tunnel technique, the tibial reamers were driven for the entire length and finally the prepared graft was pulled via tibial tunnel into the femoral socket and fixed. For tibial side graft was fixed with interference screw. But in the All-inside technique, after the guide pin insertion, retrograde drill (flip-cutter in Arthrex) was advanced in normal mode till the footprint and then it was flipped so as to open the cutting flute. Then the tibial socket was created by drilling in retrograde fashion as required with the markings over the flip-cutter as a guide. The flip-cutter was advanced into the joint, un-flipped and it was removed. The prepared graft was pulled via antero-medial portal into the femoral socket and fixed. Tibial side fixation was achieved by pulling the tightrope so as the graft somersault into the tibial socket. ABS button attached with tight rope and fixed over the tibial cortex.

After skin closure, dressing was applied and a long knee extension brace was given to all the patients.

6. POSTOPERATIVE MANAGEMENT

Immediate post-op X-ray was taken (Figure 2) and the intravenous antibiotics was continued for two days. If the patient did not tolerate diclofenac, Tramadol + Paracetamol was given as an alternative. On the second day, full weight bearing was started with a long knee brace. Active assisted movements were started on the 2nd day. The patient was discharged on the 5th day and suture removal was done on the 11th day.

6.1 Rehabilitation

7-14 days: bending of the knee (actively and passively)

14-21 days: SLRT (active), wall slide (active), half squatting, step-ups

3-6 weeks: supine lying down, lateral / prone position flexion/extension, lifting up hamstring muscles, moving legs in a circle while lying down static bicycle

6 weeks to 6 months: driving car at the end of three months quadriceps/hamstring exercise with weight cuffs hip adduction/abduction/flexion/extension swimming

3 months – 6 months: beginning of jogging and driving two-wheelers by the end of six months

7. RESULTS

VAS Score and IKDC Score of both All-Inside and Full-tunnel techniques were compared and given below in table 1 and table 2 respectively.

On postoperative Day 1 to Day 5 and Day 11, the VAS scores between the two groups were significant. The VAS scores at the end of six, twelve and twenty-four weeks were not significantly different (P value >0.05). Furthermore the IKDC scores of the All-Inside and the Full-tibial tunnel group prior to surgery (p-value 0.684), and afterwards at six weeks postoperatively (P value 0.601), at twelve weeks (P value 0.999), and at twenty-four weeks follow-up (P value 0.766) were not significant.

All inside group patients had no infection but in Full tunnel group 1(4%) patients had Interference screw site abscess at 6 weeks. In the Full Tunnel group, 1 (4%) patient had screw site prominence with pain at 3 months. In the Full Tunnel group, 1 (4%) patient had screw site inflammation in the 5th month. In All Inside group 1 (4%) patients had stiffness and in Full Tunnel group 2 (8%) patients had stiffness at 6 months. In All Inside group 1 (4%) patient and in Full Tunnel group 2 (8%) patients had stiffness. 96% patients in the All Inside group and 92% patients in the full-tibial tunnel group recovered to their pre-traumatic level.

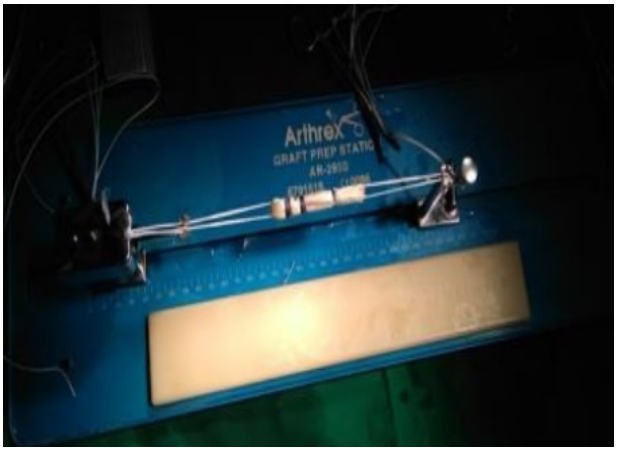

Figure 1: Quadrupled semitendinosus graft with Arthrex implants (RT & ABS button) on both sides.

IKDC SCORES								
	Pre-op		**6 weeks**		**12 weeks**		**24 weeks**	
	All inside group	**Full tunnel group**	**All inside group**	**Full tunnel group**	**All inside group**	**Full tunnel group**	**All inside group**	**Full tunnel group**
Normal	0	0	0	0	17 (68%)	17 (68%)	21 (84%)	21 (84%)
Nearly Normal	0	0	19(76%)	17 (68%)	5 (20%)	5 (20%)	3 (12%)	2 (8%)
Abnormal	21(84%)	22(88%)	5 (20%)	7 (28%)	3 (12%)	3 (12%)	1 (4%)	2 (8%)
Severely abnormal	4(16%)	3(12%)	1 (4%)	1 (4%)	0	0	0	0
P Value	0.684 > 0.05		0.601 > 0.05		0.999 >0.05		0.766 > 0.05	

Figure 2: Immediate post-op X-ray of All-Inside ACLR

TABLE 1: Comparison of Pre-op & Post-op VAS scores in both All Inside and Full tunnel groups.

Day	**VAS SCORE-All Inside Group**	**VAS SCORE-Full tibial tunnel group**
Pre-op	0.08+0.277	0.08+0.277
Post-op Day 1	3.64+/-0.081	5.68+/-0.988
Post-op Day 2	2.76+/-0.779	4.48+/-0.963
Post-op Day 3	2.00+/-0.866	3.72+/-0.891
Post-op Day 4	1.24+/-0.831	2.84+/-0.624
Post-op Day 5	0.68+/-0.802	2+/-0.707
Post-op Day 11	0.16+/-0.473	1.12+/-0.726
At 6 weeks	0	0.20+/-1.00
At 12 weeks	0	0
At 24 weeks	0	0.24+/-1.20

TABLE 2: Comparison of Pre-op & Post-op IKDC scores in both All Inside and Full tunnel groups

TABLE 3: COMPARISON OF PRESENT STUDY RESULTS WITH OTHER STUDIES

STUDY	**No of patients**	**Average follow-up**	**Post-op pain**	**Functional outcome (IKDC score)**
James H. Lubowitz et al [9] (2013)	150	24 months	Less in All inside group	The same in both groups
Horea Benea et al [10] (2013)	46	24 weeks	Less in All inside group	The same in both groups

Kumar Shantanu et al [11] (2016)	100	24 weeks	Less in All inside group	The same in both groups
In this study	50	24 weeks	Initially less in All inside group	The same in both groups

8. DISCUSSION

Arthroscopic ACL reconstruction is considered as an effective treatment method for ACL tear. In this study, we compared the functional outcome of All-inside arthroscopic ACL reconstruction and the Full tibial-tunnel arthroscopic ACL reconstruction using quadrupled/tripled semitendinosus graft. There were twenty-five patients in each of two groups, and fifty patients in total were randomly assigned. We operated the patients by using All-Inside technique for the first group and the Full-tibial tunnel technique for the second group. In All-inside group there were twenty four males and one female whereas Full-tibial tunnel group had twenty three males and two females. Many researchers have shown that anatomical as well as hormonal factors make females to have higher incidences on ACL injuries. The male majority in our study could be because of knee injury mechanisms from excessive loading stresses. Brown et al[8] studied sex differences in ACL injury incidence in 2009 and found out that females get injured more but less engagement in demanding environments increases incidence among males.

The ages for the patients ranged between nineteen years to forty-nine years with average ages of 28.32 years for All-inside group and 30.20 years for Full-tibial tunnel group. The minimum age in the All-inside group was nineteen years, and forty years as the maximum. The Full tibial tunnel technique had a lower age limit of nineteen years and an upper age limit of forty-nine years. The side with injury in the All-inside group was distributed as follows: Left knee – 48% (12 patients); Right knee – 52% (13 patients). In the case of Full tibial tunnel technique, left knee injury occurred in 48% (12 patients) of cases while right knee injury occurred in 52% (13 patients). In 2009, Brown et al[8] also observed that there were no differences on limb when it came to recovery time for those affected by ACL tears. A comparison of various study results are given below in the Table 3.

9. LIMITATIONS OF THE STUDY

Short-term follow-up and the small number of samples were the significant drawbacks to this research. For pain evaluation, narcotic intake is usually monitored, with VAS score compared against baseline since personal variations regarding pain perception might be wide-ranging.

10. CONCLUSION

Our prospective randomized control study concluded that the All-inside arthroscopic ACL reconstruction techniques had a significant reduction of pain during immediate to early post-operative periods. However there was no statistically significant differentiation between All-inside as well as Full-tibial tunnel techniques concerning functional outcome and postoperative pain when evaluated at six weeks, twelve weeks and twenty four weeks.

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