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Comparison of functional outcome of ACL reconstruction using modified transtibial technique (MTT) and transportal technique (TP) for making the femoral tunnel in a randomised prospective study

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Abstract

Introduction: In ACL reconstruction, the placement and obliquity of tibial and femoral tunnels affect the orientation of graft in coronal and sagittal planes hence important for its function. Commonly used conventional transtibial technique (TT) had the disadvantage of more vertical tunnel. In the modified transtibial technique (mTT) the entry for the tibial tunnel is shifted slightly superomedially, and the leg is adducted and internally rotated.

Aim: To compare the functional outcome of Arthroscopic ACL reconstruction using Bone –Patellar tendon – Bone graft with two different techniques (mTT vs. TP) of femoral tunnel placement.

Methods: It was a prospective study of two groups (30 each) in which group 1 underwent Arthroscopic ACL reconstruction using PTB graft using the modified transtibial technique (mTT) for making the femoral tunnel and group 2 using transportal technique(TP). The outcome was assessed in terms of knee function (Lysholm knee scoring), clinical testing and radiological assessment (X-ray and CT) of tunnel orientation. Short-term and mid-term functional results were analyzed.

Results: The short-term results have shown that the transportal technique(TP) had given slightly better functional outcome with the more anatomical femoral tunnel as compared to the modified transtibial technique(mTT)but statistically not significant. But midterm results have shown that there is no much difference in the knee function, and there was no statistically significant difference (p-value < 0.05) noted between the two groups. The transportal technique (TP) group had better rotary stability, but the femoral tunnel length was more in mTT group.

Conclusion: At short-term and midterm follow up, no statistically significant difference(p-value < 0.05) was noted between the two groups (mTT vs. TP) in terms of knee function, rehabilitation, and patient's satisfaction. Long-term results should be compared.

Keywords: Anterior cruciate ligament, transportal technique, modified transtibial technique

Introduction

Anterior cruciate ligament reconstruction is becoming the most common soft tissue surgery in the knee. After invention of Arthroscopy, number of ACL reconstruction is skyrocketing making this is the most common arthroscopic surgery. There are many factors which are influencing the functional outcome of ACL reconstructions. Creation of tibial and femoral tunnels is one such issue^[1, 2].

In ACL reconstruction the placement and obliquity of tibial and femoral tunnels affects the orientation of graft in coronal and sagittal planes and hence very important for rotational stability and maintenance of knee kinematics for long terms^[3].

Transtibial technique is extensively used for drilling of femoral tunnel in arthroscopic anterior cruciate ligament (ACL) reconstruction. Recent research suggests that this technique less effectively controls instability as the graft is placed in a non-anatomical position. Literature suggests that if the femoral tunnel is drilled by using an anteromedial portal (transportal technique), better knee stability can be achieved theoretically as the graft can be placed more anatomically^[4, 5].

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Lysholm knee scoring is the most commonly used scoring system for knee which was used in this study. The purpose of this study is to compare the functional outcome of ACL reconstruction using Modified trans tibial technique (MTT) and Transportal technique (TP) for making femoral tunnel using Bone Patellar tendon bone graft in a randomised prospective study.

Aim

To compare the functional outcome of Arthroscopic ACL reconstruction using Bone Patellar tendon – Bone graft with two different techniques (mTT vs. TP) of femoral tunnel placement.

Materials and Methods

The study was conducted in Madurai for the period from January 2012 to December 2015. In this study a total number of 60 patients were randomly divided into two groups – 30 each.

All the patients who were having chief complaints of instability were diagnosed clinically by anterior drawer test, Lachman test, and pivot shift test and were confirmed by MRI. ACL tears that were more than 3 weeks' old were included in this study. All patients had pre-operative quadriceps strengthening and range of movements exercises. All the patients were undergone arthroscopic single bundle ACL reconstruction using bone patellar tendon bone graft. Among the 60 patients, 30 patients were undergone the surgery using trans portal technique and other 30 patients using modified transtibial technique.

All patients underwent a standard post operative rehabilitation program. They were evaluated at the end of 6, 12, 18 and 24 months using Lysholm Knees scoring system, clinically anterior drawer test and pivot shift test were done to assess stability and radiologically x-rays of AP and lateral views were taken to assess for femoral tunnel orientations. In AP x-ray coronal angles were measured, in lateral x-rays sagittal angles were measured. Coronal angle is the angle between femoral tunnel and line parallel to the articular surface of femur (in AP x-ray) sagittal angle is the angle between femoral tunnel and extension line of the posterior cortex of femoral shaft (in lateral x-ray) The femoral tunnel length was measured arthroscopically.

Results

Among 60 patients in this study, 52 were male and 8 were female, right knee was involved in 38 and left knee was involved in 22 patient. 47 patient had sustained injury due to road traffic accident (RTA) and 13 patients had accidental fall. All patient were operated at an average period of 6-12 weeks since injury. 8 patient were lost to follow up in this study, so only 52 were available for follow-up. The mean age of patients was 27 years. The youngest patient was 19 years and the eldest was 41 years old. Skeletally immature patients were not included in this study as patellar tendon graft should not be harvested as there are chances of growth retardation. A maximum number of patients were in the age group of 26-30 years (61%) next large group was 20-25 years (24%). There were many associated injuries found during arthroscopy. 18 patients had lateral meniscal tear 26 patients had medial meniscus tear and 8 had both. Results were analysed and compared between both groups after 24 months. Average sagittal angle in transportal group was 49.08 (SD=1.631) and in modified transtibial group 47.93 (SD=1.492). (Table 1) Average coronal angle in transportal group was 42.12

(SD=1.740) and in modified transtibial group 51.26 (SD=1.767). (Table 2) Average femoral tunnel length in transportal group was 34.92 mm (SD=1.754) and in modified transtibial group 41.89 mm (SD=1.783). (Table 3) In Lysholm knee scoring after 24 months, the results were excellent in 6 patients in TP group and 5 patients in MTT group. (Table 4) Good results in 15 patient in TP group and 17 patient is MTT group. Fair results in 4 patients in TP group and 5 patients is MTT group.

Table 1: Femoral tunnel obliquity angle – sagittal

Group	Mean	Std. Deviation	P value
Transportal	49.08	1.631	
Modified Trans Tibial	47.93	1.492	0.010

Table 2: Femoral tunnel obliquity angle – coronal

Group	Mean	Std. Deviation	P value
Transportal	42.12	1.740	
Modified Trans Tibial	51.26	1.767	<0.0001

Table 3: Femoral tunnel length

Group	Mean	Std. Deviation	P value
Transportal	34.92	1.754	
Modified Trans Tibial	41.89	1.783	<0.0001

Table 4: Post operative 2 years follow-up

Group	Excellent (95-100)	Good (84-94)	Fair (65-83)	P value
Transportal	6	15	4	
Modified Trans Tibial	5	17	5	0.024

Discussion

In trans portal technique (TP) creation of femoral tunnel is independent of tibial tunnel and so we can create more horizontal tunnel as per needs of the patients resulting in more anatomical tunnel, which provided more anteroposterior and rotational stability. But on the other side, this is technically demanding procedure, which may produce short tunnel and posterior cortical blow out as a complication.

Lee DH *et al.* reported that femoral tunnel obliquity was more horizontal and anatomical in transportal technique than transtibial technique [6]. Chang CB *et al.* reported that oblique tunnel placement in transportal technique can increase risks of short femoral tunnel. They demonstrated that to produce an anatomical femoral tunnel using transtibial route, the starting point should be 1.5cm to 2.0cm below the joint line and anterior to MCL [7].

The modified trans tibial technique (MTT) which is dependent on tibial tunnel is technically easy, also produces horizontal and anatomical tunnel resulting in more anterior posterior and rotational stability which are comparable to transportal technique. Heming JF *et al.* in their study, demonstrated the anatomical limitations of transtibial technique in ACL reconstruction [8]. Lee SR *et al.* demonstrated that the positioning of femoral tunnel in transportal technique is nearly same as in modified transportal technique [9].

The sagittal angles in both techniques were more (or) less same which is not statistically not significant. The coronal angle differences in both techniques were even though statistically significant, they were not clinically much significant. Femoral tunnel length was more in MTT than TP technique. The Lysholm knee scoring also gave more (or) less

same results is both technique which is statistically not significant.

Conclusion

At the end of this study, after analysing all results, we have come the conclusion that tunnel characteristics including anatomic position, tunnel length, graft obliquity, and clinical outcome after single bundle ACL reconstructions using PTB graft performed with modified transtibial technique were not significantly different from those of transportal technique and the clinical results were comparable.

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