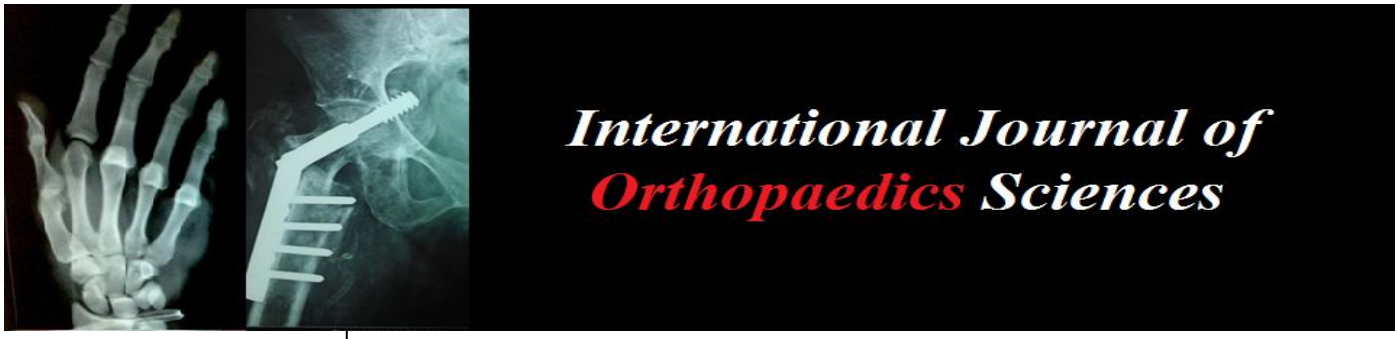

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Functional outcome of arthroscopic anterior cruciate ligament reconstruction with double mini incision bone patellar tendon bone graft

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Abstract
Introduction: Anterior cruciate ligament injury is quite common in young active individuals. Non-surgical methods leads to early osteoarthritis and painful meniscal tears. There are variety of surgical methods from internal bracing with repair, auto grafts with bone patellar tendon bone, hamstrings, quadriceps tendon, quadriceps tendon bone and peroneus longus tendon and variety of allografts. One of the best among them is bone patellar tendon bone auto graft for anterior cruciate ligament reconstruction.
Materials and Methods: A cohort of 16 cases were studied for a period of 6 months postoperatively for the functional outcome of arthroscopically assisted anterior cruciate ligament reconstruction with bone patellar tendon bone graft.
Result: This study comprised of 16 patients and followed for minimum of 6 months. Success rate is 100%, with 92% graded as excellent to good and rest 8 % with fair functional results.
Conclusion: We conclude that Anterior Cruciate Ligament reconstruction with bone patellar tendon bone graft has good functional results and high success rate.

Keywords: anterior cruciate ligament, arthroscopic reconstruction, bone patellar tendon bone graft, double mini incision graft harvest

Introduction
Anterior Cruciate Ligament (ACL) is the commonest ligament injured around knee. The cause of alarming increase in ligament injuries can be attributed to increasing incidence of road traffic accidents and contact sports. The repair and reconstructive procedures for ACL has evolved over recent years .However earlier procedures led to many complications. Arthro scope has revolutionized the reconstruction of ACL with comparatively less morbidity than previous open methods .Commonly used grafts in ACL reconstruction are auto graft (patellar tendon, hamstring tendon, quadriceps tendon, peroneus longus tendon, ITB, TFL) and allograft (Achilles, patellar tendon, hamstring tendon or tibialis anterior tendons) and synthetic graft, Silver wire. Many techniques are described for arthroscopic ACL reconstruction. The most commonly used graft recently was bone patellar tendon bone.
The present study is designed to analyze the postoperative outcome of arthroscopic Anterior Cruciate Ligament reconstruction with bone patellar tendon bone auto graft fixed in femoral tunnel and in the tibial tunnel using interference screws.

Aim of the study: is to clinically evaluate the functional outcome after arthroscopic Anterior cruciate ligament reconstruction using bone patella bone tendon graft

Material &Methods:
A total of 16 cases were studied for a period of 6months postoperatively for the functional outcome of arthroscopically assisted anterior cruciate ligament reconstruction with bone patellar tendon bone graft over a period from 2014-16. Study group included 12 males and 4 females. Maximum age was 60 and minimum age was 18 years. All patients underwent Arthroscopic assisted ACL reconstruction with BPTB auto graft harvested using double

incision technique and anteromedial port was used. Graft fixation done with interference screw. Postoperatively scored using Lysholm and Gillquistscore, IKDC score and Tegner-Lysholm score.

Inclusion criteria

Skeletally mature patients with ACL tear & clinically Lachman test positive with MRI finding suggestive of ACL tear.

Exclusion criteria

All patients with compound injury, revision ACL reconstruction, ligament laxity disorder not included in the study

Double incision BPTB harvest

Post op x-ray

Immediate post op SLR done

Post op scar

Assessment of results

Delay in surgery	No of patients	percentage
1-2 months	6	37.5%
2-6 months	4	25%
6- 12 months	2	12.5%
>12 months	4	25%

Test	No of positive	No of negative	Percentage positive
Ant drawer test	16	Nil	100%
Lachman test	16	Nil	100%
Pivot shift test	2	14	12.5%
Lever test	12	4	75%

Tegner Lysholm score	No of patients	percentage
Excellent	11	68.75
Good	4	25%
Fair	1	6.25%

IKDC score	No of patients	percentage
Normal	10	62.5%
Near normal	6	37..5%
Abnormal	nil	Nil
Severely abnormal	nil	Nil

Discussion

Anterior cruciate ligament (ACL) tears if left untreated cause constant symptoms of knee pain and disability. The advantages of arthroscopic reconstruction are proven as it causes minimal internal knee derangement than open procedure. Many grafts are available, from which Bone patellar tendon bone graft auto graft has become more popular because of its special properties. Fixation strength, pull out strength, graft slippage rate & bony ingrowth is proved to be better in BPTB graft. The time of graft incorporation into bone is 3 weeks for bone plugs & 3 months for soft tissue. Generally occurs at 6 weeks in BPTB graft and takes 2-3 weeks longer for soft tissue graft [1]. BPTB graft has sufficient load-to-failure strength and stiffness to replace native ACL.

Donor morbidity and cosmesis also must be considered. BPTB graft is sometimes associated with patellar tendinitis, stress fracture of patella, injury to saphenous nerve. But with expert surgeon these complications are negligible. We used double incision technique for graft harvest to avoid saphaneous nerve injury and better cosmesis. BPTB graft is with low morbidity, excellent cosmesis, stiffness and secure early fixation and incorporation near the joint line. Several studies have shown that ideal graft would be for Anterior Cruciate Ligament reconstructions have higher strength, stiffness, and cross-sectional area compared with other grafts, and additionally, the extensor mechanism is mostly preserved and intact and no or minimal post-operative knee pain.

In our study we used double incision technique [3, 4] over knee to obtain BPTB graft and same incision was extended to drill tibial tunnel. Earlier technical factors, specifically the absence of adequate fixation techniques, initially limited the use of BPTB graft for Anterior Cruciate Ligament reconstruction. New techniques are developed which focus on optimizing graft strength and stiffness. Successful Anterior Cruciate Ligament reconstruction using BPTB autograft requires stable initial graft fixation and ultimately graft to bone healing. BPTB reconstruction using interference screw has been shown to have excellent initial mechanical properties, including pulloutstrength [1]. Short graft fixation construct in interference fixation has been shown to increase anterior knee stability. Increased laxity when a hamstring graft is used [5, 6].

In the present study 12 male and 4 female patients underwent Anterior Cruciate Ligament reconstruction using BPTB auto graft during the study period. All patients underwent graft fixation using interference screw in the femoral tunnel and in the tibial tunnel. None of our patient had graft laceration or failure of fixation during rehabilitation. All patients underwent "anatomical" single bundle Anterior Cruciate Ligament reconstruction using BPTB graft, these included visualization of the native Anterior Cruciate Ligament, insertion sites, placing the tunnels in the footprint, knee flexion angle during femoraltunnel drilling, use of an anteromedial portal for femoral tunnel. Gavriilidis *et al*. 2008 in their cadaveric study found that drilling through anteromedial portal found to have accurate anatomic femoral positioning of the Anterior Cruciate Ligament attachment when compared with transtibial technique [2].

Single Bundle Anterior Cruciate Ligament graft placed at the centre of the native Anterior Cruciate Ligament attachment sites is more effective at controlling anterior tibial translation and the pivot shift phenomena, and more closely reproduces normal knee kinematics, whereas in isometric non-anatomical tunnel placement resulted in the combination of a posterior tibial tunnel position and a high, deep femoral tunnel position often produced a vertical Anterior Cruciate Ligament graft .Biomechanical studies have demonstrated that a vertical anterior Cruciate Ligament graft may resist anterior tibial translation, but often fails to resist the combined motions of anterior tibial translation and internal tibial rotation which occur during the pivot-shift phenomenon. Hong-Chul Lim *etal.*[7] and several meta-analysis in their study concluded that Anatomical single bundle Anterior Cruciate Ligament reconstruction restored the initial stability closer to the native Anterior Cruciate Ligament under combined anterior and internal rotational forces when compared to non-anatomical Anterior Cruciate Ligament single bundle reconstruction. In our study the time period elapsed between the injury and the Anterior Cruciate Ligament reconstruction ranged from 2months to 2 years. It comes under delayed reconstruction and patients were kept on early mobilization protocol. In our study the surgery patients were kept under rehabilitation, patients were followed according to Wilk *et al*. rehabilitation protocol for 6 months during immediate post-operative and follow up period, it was observed that adherence to physiotherapy gradually waned in most of the patients, as observed in other studies.

Lysholm and Gillquist [8] subjective score First published in 1982. It was revised in 1985 and again in 2001. The revised scale includes 8 items: 1) limp, 2) support, 3) locking,4) instability, 5) pain, 6) swelling, 7) stair climbing, and 8)squatting with maximum score 0f 100. In the present study 68.75% of the patients reported outcome as excellent with scores above 95 and 25% of patient reported good with scores above84-94 according to LGS scale. 6.25% scored >65&<83 and were grouped as fair outcome.

In the present study 62.5% of the patients graded their postoperative recovery as normal and 37.5%near normal according to International Knee Documentation Committee knee score[10]. All patients underwent the same rehabilitative program. Patients were evaluated using the International Knee Documentation, Lysholm and Gillquist score, Tegner activity score[9] and radiological feature. No patient was dissatisfied. This was probably due to the fact that most of the patients were keen on normal day to day activities than return to sports. Post-operative laxity for Anterior Cruciate Ligament reconstruction was evaluated with manual lachman test and pivot shift test. One of the primary goals of Anterior Cruciate Ligament reconstruction is to restore knee laxity and provide the patient with a stable knee without giving-way episodes to promote long-term knee health.

In our study 68.75% of the patients have negative anterior laxity and 32.25% of the patients have grade 1 laxity with hard end point. Majority of the subjects in our study are occasional sports players and farmers, none of them are aggressive athletic players. Most of the subjects were able to do activities in daily living without difficulty and able to participate in occasional sports. However, reconstructive knee surgery is not a guarantee that all subjects will return to their pre-injury level of function. A recent meta-analysis including 48 studies showed that, 82% of participantshad returned to some kind of athletic activity but only 63% returned to their pre-injury level of participation. The reasons why some athletes have been unsuccessful in returning to previous levels of activity are vast.

The importance of psychological factors has recently been emphasized, kinesiophobia, or fear of reinjury, may play a significant role in some patients' inability to successfully return to their previous level of sports. Clare L. Ardern *et al*. 2015, concluded that Lower fear of re-injury, greater psychological readiness to return to sport and a more positive subjective assessment of knee function like International Knee Documentation score Lysholm Gilquist score favoured return to the preinjury level after surgery in the meta-analysis.

Conclusion

Double incision Bone patella tendon bone graft is a good and reliable option for ACL reconstruction with saphenous nerve sparing with good cosmesis and good functional outcome. BPTB offers optimum combination of graft integrity and maintenance of motor function .Increased rate of laxity seen in the hamstrings group, along with demonstrable hamstring compromise and the high rate of tunnel widening, is sufficient reason to avoid the hamstrings graft. In all but a few cases where a discomfort on kneeling would be a significant hindrance or in the skeletally immature patient we recommend BPTB as the graft of choice. The short come of the study was objective measure of laxity was not done and we had a small sample size. It would be beneficial in future if we can have a large multicentric long term comparative randomised study with objective measure of laxity.

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