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Comparative Study of Different Methods of Graft Fixation in ACL Reconstruction

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Abstract

Introduction: Contact sports produce injury to the anterior cruciate ligament (ACL) secondary to twisting, valgus stress, or hyperextension all directly related to contact or collision, When matched for activities, a greater prevalence for ACL injury is found in females compared with males. *Methodology:* The surgery was done with patient supine under spinal anaesthesia or general anaesthesia, under tourniquet control. Initial diagnostic arthroscopy was done using standard arthroscopic portols and the status of both menisci, Anterior cruciate ligament, Posterior cruciate ligament was noted. Partial meniscectomy was done in cases where it was indicated. *Results:* Knee score was excellent in 18 cases of titanium screw group and 20 cases of bioscrew group. One Patient in bioscrew group had fair result. Among 50 patients in the group, 49 cases had good to excellent results in fair and 1 case. *Conclusion:* Arthroscopic ACL reconstruction with BPTB graft and interference screw fixation affords excellent subjective results and good clinical ligament stability

Keywords: Anterior Cruciate Ligament; Partial Meniscectomy; ACL Reconstruction.

Introduction

The anterior cruciate ligament (ACL) is a band of dense connective tissue which courses from the femur to the tibia. The ACL is a key structure in the knee joint, as it resists anterior tibial translation and rotational loads. The anterior cruciate ligament (ACL) is one of the most commonly injured ligaments of the knee. These injuries are most often a result of low-velocity, non-contact, deceleration injuries and contact injuries with a rotational component [1].

Isolated anterior cruciate ligament injuries account for about half of all knee injuries; about 1 in 3000 persons in the general population injures the ACL in a given year [2]. ACL tears are common in young active persons, 70% occurring during sporting activities.

In general, the incidence of ACL injury is higher in people who participate in high-risk sports, such as basketball, football, skiing, and soccer. However, ACL injuries are very commonly seen with road traffic accidents also [3].

Contact sports produce injury to the anterior cruciate ligament (ACL) secondary to twisting, valgus stress, or hyperextension all directly related to contact or collision, When matched for activities, a greater prevalence for ACL injury is found in females compared with males. The incidence of ACL tear in female high school basketball players and female volleyball players of all ages [4] is 4 times higher than age and sports matched males. The incidence of ACL tear in indoor soccer players is 6 times greater than in male indoor soccer players of all ages [5].

Patients with acute anterior cruciate ligament (ACL) injuries present frequently with acute haemarthrosis. More than 70% of patients with an

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acute traumatic haemarthrosis have an ACL tear, either partial or complete .The best time to diagnose such a tear is within the first few hours before there is gross swelling and muscle spasm, but this is not always possible [6].

Methodology

All the patients were initially examined in outpatient department; MRI scanning was done in all patients. All of the patients underwent examination under anaesthesia (Lachmann and pivot shift tests)

Inclusion Criteria

- Patients with confirmed ACL tear
- Instablity during activites of daily living
- Unilateral ACL reconstruction

Exclusion Criteria

- Bilateral ACL reconstructions
- Patients with associated PCL tears
- Patients with associated postero-lateral instability.
- Patients with associated MCL/LCL injuries

Surgical Technique

The surgery was done with patient supine under spinal anaesthesia or general anaesthesia, under tourniquet control.

Initial diagnostic arthroscopy was done using standard arthroscopic portols and the status of both menisci, Anterior cruciate ligament, Posterior cruciate ligament was noted. Partial meniscectomy was done in cases where it was indicated.

We chose bone-patellar-tendon- bone graft because

1. Good biomechanical properties
2. Two bony ends can be secured to bony tunnel using interferential Screws- Bioscrews/ Titanium screws

The graft is pulled through .the holes and secure into; place with two screws. A. Damaged AC is removed and a notch is drilled into the distal femur. Ancision is made in the knee from the patella to the proximal tibia.C, Drill holes are mace into the tibia and the femur. D. A Graft and replacement ligament arc harvested from the Mocialwt-way view.

Follow UP

Patients were followed up at the OPD at 4 weeks, 3 months, 6 months. Outcome measurements evaluated

1. Lachman test, Anterior drawer test
2. Pivot shift test
3. KT-IOOO arthrometer
4. Range of motion
5. Return to previous level of activity
6. Lysholm knee scoring

Lysholm knee scoring scale considers both subjective and objective evaluation hence it is considered for the study.

Lysholm knee scoring scale carries maximum points for instability and pain, which affects the patient satisfactory level.

Lysholm knee scoring was graded pre operatively, post operatively as excellent, good, fair, and poor.

The maximum score in Lysholm knee score is 100.

Excellent	95-100
Good	84-94
Fair	65-83
Poor	<64

Next the pre injury, pre-treatment, and post treatment activity level were recorded.

Four activity levels are defined as per IKDC scoring.

Level I- Jumping, Pivoting, hard cutting, foot ball, Soccer

Level II: Heavy manual work, Sking, Tennis

Level III: Light manual work, Jogging, Running

Level IV: Sedentary work, activity of daily living.

Results

Out of them randomly, 50 cases were selected for the study. Out of 50 cases, 25 cases of bioscrews and 25 titanium screws fixation were taken for comparative study.Average age of patients were 33 years. Range: 16- 40 years

Of the 50 cases in the study group, 49 were males and 1 female patient.

Out of 50 patients, 26 were right knees, and 24

were left knees.

ACL injury was seen following twisting injury while sporting activities like cricket, football, badminton or sudden trauma while walking and after fall from bike or RTA. Commonest was twisting injury in 27 cases and RTA in 23 cases.

Out of 50 cases, medial meniscal injury seen in 5 cases, lateral meniscal tear in 9 cases, both meniscal injury in 5 cases, Chondromalacia patellae in 5 cases and LCL speain in 1 case

Among 50 patients, 6 patients of titanium screws and 4 patients of bioscrews group had fixed flexion deformity of 10 to 15 degrees upto 4 weeks periods, which gradually improved after physiotherapy.

In Bioscrews group, one patients had restriction of range of flexion upto 100 degrees which persisted even after physiotheraphy.

Knee score was excellent in 18 cases of titanium screw group and 20 cases of bioscrew group. One Patient in bioscrew group had fair result.

Among 50 patients in the group, 49 cases had good to excellent results in fair and 1 case.

Mean Score was 95 in bioscrew group and 96 in titanium screw group, indicating no difference in functional outcome following two different methods of femoral fixation of BPTB graft in ACL reconstruction.

In the study group, 3 complications were seen.

In titanium screw group, one patient had bursa formation over thigh at screw insertion site. It did not subside after physiotherapy and analgesics, was advised surgical excision of bursa for the same. 1 patient had superficial wound infection at thigh wound. Which subsided with dressings and antibiotics.

In bioscrew group, one patient had knee stiffness. Range of flexion was restricted upto 100 degrees, persisted even after physio.

Anterior knee pain (15%) and numbness (18%) were noted in both groups.

Degenerative joint disease were seen in:

- Chronic ACL deficient screws and
- Old Age

Table 1: Side affected

	Right Knee	Left Knee
Titanium Screws	15	10
Bio screws	11	14

Table 2: Mode of injury

	Twisting Injury	RTA
Titanium Screws	14	11
Bio screws	13	12

Table 3: Anterior drawers lachmann test

	Titanium Screws	Bio Screws
Grade 0 (<3mm)	23	22
Grade 1 (3-5mm)	2	3
Grade 2 (6-10mm)	0	0
Grade 3 (>10mm)	0	0

Table 4: Pivot shif test

	Titanium Screws	Bio Screws
Grade 0 No Pivot	23	22
Grade 1 Glide	2	3
Grade 2 Pivot Shift	0	0
Grade 3 Dramatic pivot shaft with ease on force applied to allow knee reduction	0	0

Table 5: KT-1000 Arthometer

	Titanium Screws	Bio Screws
< 3 mm	23	22
3 – 5mm	2	3

Discussion

The Anterior cruciate ligament is an important stabilizing structure of knee joint and rupture of ligament is disabling to the patients. Thus reconstruction of this ligament is very important to get the patient back to pre-injury status and to

improve his quality of life.

An ideal ACL reconstruction should restore normal knee mechanics and stability, allowing patients to return to their previous functional levels. There should be a low incidence of recurrent meniscal injury and decreased risk of traumatic degenerative arthritis. Ensuring anatomic graft placement is most important factor that ensures successful outcome and adequate graft fixation is most necessary.

In our study, we used arthroscopic ACL reconstruction using BPTB graft by single incision technique. Fixation methods of graft in femur were either titanium or bioabsorbable screws. BPTB graft was selected because of:

Good Biomechanical Properties

- It has two bony ends and can be secured to bony canal with interference screws - titanium or bioabsorbable. These are the two different fixation implants used at our hospital.
- Good incorporation of bony plugs into the canal, so that patient can participate into contact sports.
- Restoration of stability of knee joint is the first objective in ACL reconstruction and to achieve this, type of graft and method of fixation play major role. In our study, we used BPTB graft and compared the outcome after two methods of fixation-titanium screws and bioscrews-interference screws.

Table 6: Comparison of grading

	No of patients	Grade – 0 Lachmann (%)	Instrumented Testing(%)
Ruiz.et.al[7]	30	88	73
Johma.et.al[8]	59	95	64
Our Study	50	90	90

Table 7: Comparison of Mean Lysholm Score

	No of Patients	Follow up in Months	Mean Lysholm Score
Ruiz.et.al[7]	30	84	87
Johma.et.al[8]	59	84	94
Our Study	50	6-9	95-96

The differences between the studies compared to our study was that, our study was of shorter duration and hence had very good Lachmann and Instrumented testing compared to Ruiz and Johma studies/

Loss of range of motion is a primary concern in ACL reconstruction surgeries. Shelboume [9,10] Suggested, loss of range of motion can be a sequelae of anterior knee pain or may increase risk of anterior knee pain.

Shelboume and Gray recommended waiting 3 weeks after the injury before ACL reconstruction, to decrease the incidence of arthrofibrosis and loss of motion. Shelboume et al. also achieved improved range of motion with accelerated rehabilitation protocol.

In present study, acceleration rehabilitation protocol was followed and hence loss of range of motion was not a significant complication.

In our study, there was no significant difference between titanium and bioscrews in Lachmann testing, pivot shift testing, KT-1000 testing and [11] Lysholm knee scores. Our findings were similar to other studies. Shen et al in their meta-analysis of 790 cases in 10 studies concluded that there is no difference in functional outcome after metallic screws or bioabsorbable screws in ACL reconstruction.

Emond [12] et al. study comprised a total of 745 patients undergoing ACL reconstruction (including 378 patients managed with bioabsorbable screws and 367 patients managed with metal screws). No significant differences were identified between the two screw types with respect to IKDC, Lysholm, or Tegner activity scores or with respect to the results of laxity testing with arthrometry. The complication rates were also statistically similar in the two groups. Again findings were similar to our study.

Most studies showed no intergroup difference in terms of outcomes measured with validated clinical scores such as IKDC (International Knee Documentation Committee), Lysholm score and Tegner activity level. In another study done by Rocco papalia [13] et al., there was no significant difference regarding range of motion between two groups (metalic screws vsbio absorbable screws). But, Knee stability as evaluated with pivot shift and KT arthrometershowed a significant difference only in one study, favouring metallic interference screws. Tunnel widening is much more evident and marked patients who underwent ACL reconstruction with bio absorbable screws, with no influence on the final clinical results achieved. Complication rates between the two screw classes were similar and were not

significant.

In all the above mentioned studies, BPTB graft was selected for the study, as in ours. Similar to above mentioned studies, Knee stability examination, knee scores and complications in our study, did not differ in the two groups, but difference was that, our study was of shorter duration. Since the duration was short, knee stability examination with Lachmann test, KT-1000 and pivot shift and Lysholm scores in our study were better than in Ruiz and Johma series.

Anterior knee pain after ACL reconstruction is complex and related to many factors:

1. Poor preoperative range of motion,
2. Preexistent patellar chondromalacia,
3. Post-operative immobilization, inadequate or inappropriate rehabilitation,
4. Pain from graft harvest site,
5. Violation of the extensor mechanism.

In our study, 15% patients had anterior knee pain (patella, patellar tendon and tibial tuberosity) on followup, but it was seen in both titanium screw group and bioscrew group. Hence was not significant in comparative study.

Conclusion

The clinical results associated with bioabsorbable screws and titanium screws are similar. Laxity evaluation demonstrated no significant differences between bioabsorbable screws and metal screws. The complication rates associated with bioabsorbable screws and metal screws were also similar. The results of this study, confirms that there are no significant differences in the outcomes associated with bioabsorbable screws as compared with titanium screws for ACL reconstruction using BPTB graft.

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