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Orthopaedic Surgery

Evaluation of the Outcome of Arthroscopic ACL Reconstruction by Quadrupled Hamstring Tendon Graft and Fixation with Biodegradable Screw in ACL Injury

Dr. Mohammad Rajib Mahmud[1*], Dr. Mohammad Khurshed Alam[2], Dr. Md. Zahir-Ul Islam[3], Dr. Mohammad Masudur Rahman[4], Dr. Ataul Haque[5], Dr. Md Abdullah Al Maruf[6], Dr. Md. Mahfuzzaman[7]

[1]Junior Consultant (Orthopaedic Surgery), 250 Bedded Bangamata Sheikh Fazilatunnesa Mujib General Hospital, Sirajganj, Bangladesh
[2]Associate Professor (Orthopaedic Surgery), Dhaka Medical College Hospital, Dhaka, Bangladesh
[3]Consultant (Orthopaedic Surgery), Railway General Hospital, Dhaka, Bangladesh
[4]Resident Medical Officer, Central Police Hospital, Dhaka, Bangladesh
[5]Medical Officer (Orthopaedic Surgery), Modernized District Hospital, Joypurhat, Bangladesh
[6]Clinical Staff, (Orthopaedic Surgery), Asgar Ali hospital, Dhaka, Bangladesh
[7]Consultant, Department of Orthopaedic and Traumatology, SIBL Foundation hospital, Dhaka, Bangladesh

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***Corresponding author:** Dr. Mohammad Rajib Mahmud

Abstract **Original Research Article**

Background: The BPTB graft and quadruple graft of semitendinosus and gracilis are the two most popular options for anterior cruciate ligament reconstruction. ***Objective:*** To assess the efficacy of arthroscopic ACL reconstruction with semitendinosus and gracilis tendon grafts and biodegradable screw fixation in ACL injury. ***Methodology:*** This prospective interventional study was carried out at Dhaka Medical College Hospital and a private hospital in Dhaka from July 2014 to May 2016. Thirty-one (31) patients with ACL injuries were treated with arthroscopic reconstruction of the ACL using a quadrupled hamstring autograft of semitendinosus and gracilis tendon, as well as a rehabilitation protocol. Patients were routinely followed up on and an outcome evaluation was performed at 24 weeks. Subjective and objective evaluations were performed using the IKDC and Lysholm knee scoring scales to compare preoperative and postoperative outcomes. ***Results:*** All patients had either a grade II or a grade III positive Lachman test before surgery. There was a statistically significant improvement after surgery, with 87 percent (27 patients) having a negative Lachman test and only 13 percent (4 patients) having a positive Lachman test. The pre-operative Lysholm knee score was 53, and the postoperative Lysholm knee score was 90, indicating a significant improvement (p0.05). Excellent results (>94–100 points) were obtained in 12 (38.7 percent) patients, good results (>84–94 points) in 15 (48.4 percent) patients, fair results (>64–84 points) in 2 (6.5 percent) patients, and poor results (64 points) in 2 (6.5 percent) patients, according to the Lysholm knee scoring scale. ***Conclusion:*** Quadrupled Arthroscopic ACL Reconstruction ACL injury patients can benefit from a hamstring graft of semitendinosus and gracilis tendon and fixation with a biodegradable.

Keywords: ACL Reconstruction, Arthroscopic, Orthopaedic Surgery, Dhaka Medical College Hospital.

INTRODUCTION

The anterior cruciate ligament is an intra-articular, extra-synovial structure found in the knee's central complex. It works with the other anatomical structures in the knee joint to control and limit motion, as well as to maintain static and dynamic equilibrium. It is frequently injured in athletic activities, particularly contact sports, and in car accidents [1]. Sports that require pivoting, cutting, and side-stepping, such as rugby, football, netball, and field hockey. Instability results from a lack of ACL function. As a result, injuries reoccur and the risk of intra-articular damage, including meniscal tears, is increased. ACL reconstruction frequently allows patients to resume these activities and can also postpone the onset of osteoarthritis.

OBJECTIVES

General Objective

To assess the efficacy of arthroscopic ACL reconstruction using a quadrupled semitendinosus and gracilis tendon graft and biodegradable screw-in ACL injury.

Specific Objectives

1. To evaluate clinical improvement in the Lachman, anterior drawer, and pivot shift tests.
2. To evaluate subjective improvement in knee function, pain, swelling, and giving way.
3. To observe the procedure's complications.

REVIEW OF LITERATURE

Historical background of ACL surgery

The evolution of ACL surgery over the last 30 years has been remarkable. Surgeons have recognized the ACL's importance and developed techniques for its reconstruction. As these techniques progressed, certain themes resurfaced in historical literature. The more anatomic the reconstruction, the better the function and predictability. Technological advancements enable [2, 3].

The History of the Anterior Cruciate Ligament

An Assyrian in Egypt first mentioned the anterior (ACL) and posterior (PCL) cruciate ligaments in 3000 BC, when he described the anatomy of the cruciate ligaments [4, 5]. Hippocrates described cruciate pathology between 460 and 370 BC. Cruciates were thought to be part of the nervous system rather than the musculoskeletal system [6].

1.1. Anatomy and function of ACL and Hamstrings

The ACL is not a cord, but rather a collection of fibrous fascicles. The ACL has a crimped pattern that straightens as the ligament is strained. The ACL is divided into two functional bundles, the anteromedial and posterolateral bundles, which work together to optimize its restraining function throughout the range of knee motion [7, 8].

ACL has got the following features

- 38 mm in length (range 25-41 mm)
- 10 mm in width (range 7 to 12 mm)
- Composed of numerous collagen fascicles
- Endothelium-encased -Grouped into fibers (1 to 20 m in diameter).

Femoral Attachment

The ACL originates in the intercondylar notch from the posteromedial corner of the medial aspect of the lateral femoral condyle. Attachment is an interdigitation of collagen fibers and rigid bone through a fibrocartilage transition zone and mineralized fibrocartilage. The femoral attachment of the ACL is located on the posterior part of the medial surface of the lateral condyle, well posterior to the femoral longitudinal axis.

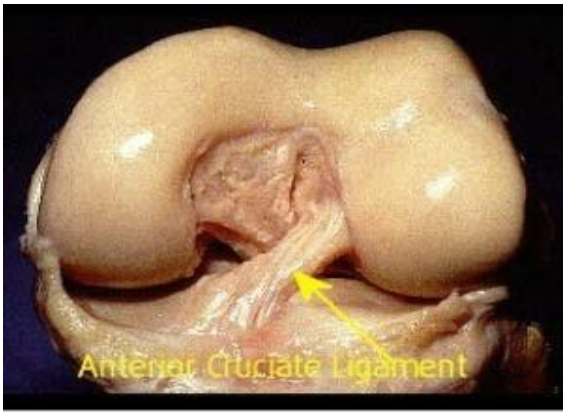

Diagram-1: Attachments of ACL

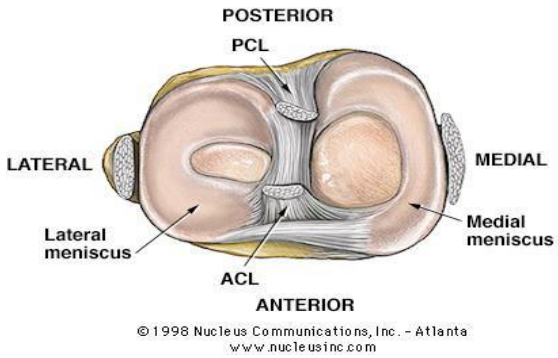

Diagram-2: Cross-Sectional View of Right knee

Functions of ACL:

a) It connects the femur and tibia.
b) Provides anteroposterior as well as rotatory stability.
c) Prevents knee hyperextension. Datta (2005) defines formalized.
d) Possesses proprioceptive function (Frank, 1997).
e) At full extension, act as a secondary restraint on tibial rotation and varus-valgus angulation.

Diagnosis of ACL injury and meniscus injury:

The most powerful tool for clinically diagnosing ACL rupture is a detailed history and physical examination to assess knee stability [9].

a. Nature of the trauma:

The patient frequently describes the knee as hyperextended or popping out of the joint, followed by reduction. Pop is often heard or felt. History of collapsing and not being able to get up right away. Resumption of activity is rarely possible, and walking is frequently difficult. The knee swells within a few hours, and aspiration of the joint reveals hemarthrosis. In this case,

b. The events causing the injury:

- Accident on the highway
- Sports that are either contact or non-contact
- A fall from a great height
- Sliding on flat ground

c. Patients experience at the time and immediately the following injury:

1. A sensation of the knee jumping out or a perceptible "popping" sensation in the knee.
2. The location, severity, and timing of pain onset.
3. Knee position at the time of injury
4. The weight-bearing status.
5. The knee's post-injury range of motion, both active and passive.
6. Inability to bear weight on the knee, as well as painful restriction of movement.
7. The speed and location of joint swelling.

d. Subsequent experience of the patient:

1. Recurrent effusions
2. Sensation of instability of the knee accentuated while ascending or descending staircases, walking on uneven ground, or making sharp turns to the right or left.
3. Giving way.
4. Locking if there is an associated meniscus injury.

Physical Examination

ACL insufficiency can be detected using a variety of clinical tests. The Lachman test and the pivot shift test are the most common [10]. The uninjured knee should be examined first to determine normal laxity as a baseline. When an adequate assessment of stability is not possible, anesthesia is preferable to uncertainty. Because the patient could have an isolated ACL tear, a meniscal tear, or another ligamentous injury, clinical tests should be performed for each of them.

The Lachman Test

Method

1. The examination is performed with the patient lying supine on the table with the involved limb on the side of the examiner.
2. With the patient's knee held between full extension and 15o flexion, the femur is stabilized with one hand while firm pressure is applied to the posterior aspect of the proximal tibia in an attempt to translate it anteriorly.

Diagram-3: Anterior drawer test, Lachman test, pivot shift test.

Inference and comments

1. A positive test indicating disruption of the anterior cruciate ligament.
2. Dehaven (1988) thinks that the Lachman test is positive in 85% of patients without anesthesia, and in virtually 100% of patients with anesthesia.
3. O'Brien et al., in 1991 used the following grading for positive Lachman test; 1± = 1-5 mm translation of tibia over femur 2± = >5-10 mm translation of tibia over femur 3± = >10 mm translation of tibia over the femur

The Anterior Drawer Test

Method

1. The patient is placed supine on the examining table.
2. Placing the hip at 45o, the knee at 90o, and the foot is fixed to the table the examiner sits on the foot of the patient to stabilize it.
3. Both hands are placed behind the knee to feel for relaxation of the hamstrings.
4. The proximal part of the leg is then pulled and pushed anteriorly and posteriorly noting the movement of the tibia on the femur.
5. The test is performed first in neutral rotation and then at 30o internal rotation and lastly at external rotation.
6. Hughston et al., (1976) proposed the following grading for evaluation of the degree of anterior drawer test.

Mild (1±): <5 mm
Moderate (2±): 5-10 mm
Severe (3±): > 10 mm

A strongly positive anterior drawer sign with the tibia in External rotation indicates that the medial capsular, posterior oblique, and ACL are ruptured. If the test is mildly or moderately positive it tells nothing about the ACL but indicates that the posterior oblique and medial capsular ligaments are disrupted.

MRI

1. MRI of the knee usually is recommended before surgery for evaluation of the other ligaments and the menisci, as findings can influence the treatment plan.
2. MRI helps the surgeon to have the correct equipment at hand before beginning the surgery.
3. Sensitivity of MRI is greater than 95% and specificity approximately 98%, with a positive predictive value of 95% and negative value of nearly 99% with fast spin-echo techniques.
4. The normal anterior cruciate ligament appears as a homogeneous dark band extending in continuity through the long axis of the ligament from origin to insertion.

5. The MRI appearance of a torn anterior cruciate ligament depends on the age and location of the lesion and the degree of disruption.

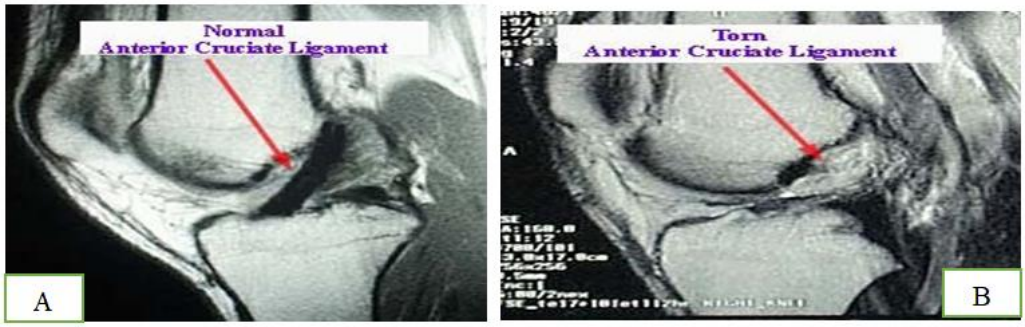

Diagram-4: MRI Image of AC A- Normal ACL. B) Torn ACL

Examination under anesthesia: All stress test should be done under anesthesia.

Indication and contraindication for the reconstruction of ACL

An ACL rupture confirmed by clinical diagnosis (with or without MRI diagnosis) in an otherwise healthy patient who experienced instability in activities or wished to maintain his or her preinjury level of activity was an indication for ACL surgery. A high-risk lifestyle requiring heavy work, sports, or recreational activities is a widely accepted indication for reconstruction after an ACL tear [11, 12]. Similarly, despite rehabilitation, repeated episodes of giving way (pivot shift) are considered a strong indication for ACL reconstruction [13]. Age is not thought to be a significant factor in and of itself, but younger patients tend to be more active and require reconstruction [14]. Loss of knee motion due to acute injury, arthrofibrosis, infection, osteoarthritis, inflammatory osteoarthropathy, patient refusal to participate in postoperative rehabilitation, and skeletally immature individuals are all contraindications to ACL reconstruction (physical preserving method should be used).

Treatment options of ACL tear:

With the natural history in mind, the surgeon must determine which therapy is most appropriate for a specific patient. The treatment options include

a. non-operative management,

b. Operative management.

Non-operative management

Is it a viable option for a patient who is willing to make lifestyle changes and avoid the activities that cause recurrent instability? Acute ACL injury without other major ligamentous damage can be treated with NSAIDs immobilization with the splint and physical therapy.

Operative management:

Repair is with the frustrating outcome, reconstruction with either autograft or allograft tissues or synthetics are recommended.

a. Primary repair

In the 1950s, some surgeons, including Palmar, O'Donoghue, and Lileah, advocated for primary repair of a torn ACL. Although the short-term results were promising, long-term retrospective and prospective reviews revealed that 40 to 50% of primary repairs failed within five years [15].

b. Primary repair with augmentation:

Augmentation of ACL repair may be made by intra-articular or extra-articular or a combination of these. For intra-articular augmentations iliotibial band, the semitendinosus or gracilis tendon are used. Extra-articular augmentation can be done by MacIntosh or by Andrew's method.

Graft choice for ACL reconstruction

The orthopedic surgeon has several options when deciding which graft is best for a patient undergoing ACL reconstruction surgery. The surgeon frequently selects an ACL graft based on his or her own experience and level of comfort with the chosen technique [16].

a. Autograft

Autografts have the advantages of low risk of adverse inflammatory reactions and virtually no risk of disease transmission. As a biological graft, it undergoes revascularization and recollagenization. The most common current graft choices are bone-patellar tendon-bone graft and quadruple semitendinosus and gracilis graft [17].

Now surgeons are using either a triple or quadruple stranded semitendinosus graft or a quadruple semitendinosus gracillis graft. This graft has an ultimate tensile load reported to be as high as 4108N. It also provides a multiple bundle replacement graft that may better approximate the function of the two bundles of ACL. Disadvantages of this graft include the concern over tendon healing within the osseous tunnel and lack of rigid bony fixation. The quadriceps tendon graft also has attracted interest recently. Biomechanical studies have shown the ultimate tensile load is about 2352N.

This graft has become an alternative replacement graft especially for revision ACL surgeries and for knees with multiple ligament injuries [18].

a. Allografts

Allograft takes a longer time to incorporate into the bone tunnels and it is relatively weak. It is not universally available and is expensive [19].

b. Synthetic grafts

Artificial ACLs have all of the same properties as natural ACLs in terms of strength, compliance, elasticity, and durability, but without drawbacks. Once the patient had recovered full function following the operation, there would be no need for a healing period, and patients may return to sports in half the time. The Gore-Tex graft was utilized in the previous decade to allow for a quick return to sports, but they eventually began to fragment owing to repetitive cycling of the knee and perhaps some chafing at the margins of the bone tunnels [20].

Xenograft

Early xenograft findings in animal and human trials were unsatisfactory. They demonstrated significant intra-articular wear and a high prevalence of severe synovitis, in addition to minimal vascular invasion and no ingrowth of host fibrous or osseous tissue. Animal research that used extracellular matrix generated from pig small intestine mucosa as a scaffold for ACL replacement in goats yielded encouraging results. Recent animal investigations of xenograft rejection revealed that removing alpha-Gal epitopes from the xenograft significantly decreased the immune response and was an essential first step in reducing immunological rejection in primates [21].

A complication of ACL reconstruction

Preoperative, perioperative, and postoperative variables can all contribute to anterior cruciate ligament surgery complications. Inappropriate diagnosis, inadequate indications, wrong preoperative range of motion, improper surgical scheduling, failure to prepare for concurrent operation, and failing to recognize concurrent diagnosis are all examples of preoperative problems.

Inadequate graft selection, graft harvest errors, inadequate notchplasty, improper tunnel placement, femoral tunnel blowout, dropped graft, graft laceration, graft-construct mismatch, screw-tunnel divergence, improper tensioning, and inadequate graft fixation are examples of intraoperative complications. Infection, loss of motion, extensor mechanism failure, patellar discomfort, deep vein thrombosis, and pulmonary embolism are among postoperative problems [22].

Biodegradable screw

As an alternative to metal, biodegradable screws have been created. The benefits include the lack of a signal artifact on post-operative MRI and the possibility of a simpler revision process. The primary drawbacks of biodegradable screws are breakage and biocompatibility issues. Many biodegradable screws performed similarly to their metal counterparts under biomechanical test settings with both hamstring and B-PT-B grafts. However, there has been a lot of variances in these studies in terms of the specimens used, the direction of the test force applied, and the polymers used. As a result, direct comparisons between implants are difficult [26].

Diagram-5: Biodegradable interference screw

Mechanical fixing methods are classified as either direct or indirect. Direct techniques, such as interference screws, staples, and spiky washers, pressure the graft against the bone's exterior surface of the bone tunnel's wall. Indirect fixation, such as cross-pin fixation, and end buttons keep the graft suspended within the bone tunnel [23]. At 24 to 40 months of follow-up, there were no significant differences in clinical outcome between biodegradable screw fixation and remote fixation with end button. Tunnel enlargement was seen in both groups, with the femoral side being more prominent. The results of magnetic resonance imaging revealed that biodegradable screws were not destroyed even two to four years after surgery [24, 25].

MATERIALS AND METHODS

From July 2014 to May 2016, this prospective interventional study was conducted at Dhaka Medical College Hospital and a private hospital in Dhaka. Patients with unilateral knee symptoms were seen at the Orthopedic outpatient department of Dhaka Medical College Hospital and a private hospital in Dhaka City, and they were clinically diagnosed with ACL injury with or without meniscus injury in both sexes.

RESULTS

This prospective research was conducted at DMCH from July 2014 to May 2016. The study included a total of 31 patients. Follow-up was provided for 6 to 12 months, with the ultimate result reported at 6 months. The following outcomes were obtained:

Table-I: Age distribution of patients (n=31)

Age group	Number of patients	Percentage (%)	Mean± SD
15-20	3	10	
21-25	11	35	
26-30	9	29	
31-35	6	19	27.5±6.4
36-40	1	3	
41-45	1	3	
Total	31	100	

The mean age was 27.5 years, with a standard deviation of 6.4 years, and the age range was 18-45 years. The majority of the patients (64%) were between the ages of 21 and 30.

Distribution of patients according to sex: (n=31)

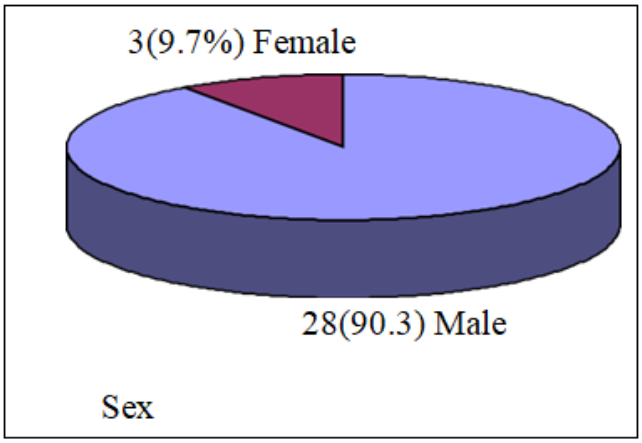

Figure-1: Pie chart showing sex distribution of the patients (n=31)

Occupational distribution of patients (n=31)

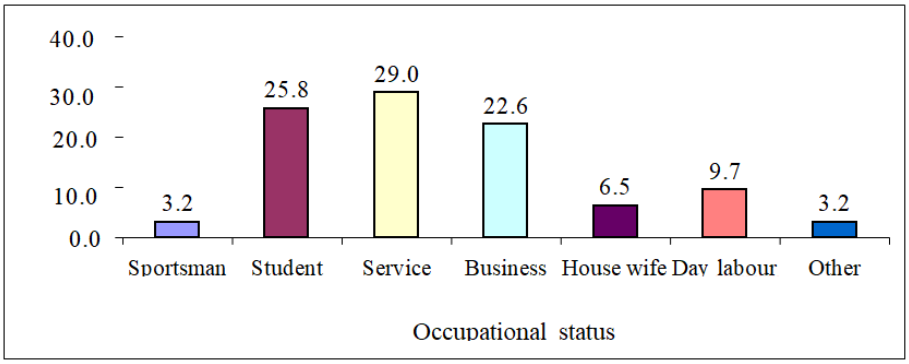

Figure-2: Bar diagram showing the occupational distribution of patients (n=31)

The distribution of the subjects by occupation is depicted in this bar chart. Sportsman accounted for 3.2 percent, students for 25.8 percent, service holders for 29.0 percent, businessmen for 22.6 percent, housewives for 6.5 percent, day laborers for 9.7 percent, and other services accounted for 3.2 percent.

Side of involvement

Table-II: Side of involvement of the knee (n=31)

Side of involvement	No. of patient	Percentage (%)
Right nee	23	74%
Left Knee	8	26%
Total	31	100%

Right side involvement was 74% and left side involvement was 26%.

Cause of injury

Table-III: Distribution of patients according to cause of injury (n=31)

Cause of injury	No. of patient	Percentage (%)
Sports	16	52
RTA	13	42
Others/Accidental fall	2	6
Total	31	100

The cause of injury was sporting activity 52%, RTA 42%, and accidental fall in 6% cases.

Associated injury of the knee:

Table-IV: Distribution according to associated injury of the knee (n=31)

Associated injury	Number of patients	Percentage (%)
Isolated ACL tear	10	32.3
ACL with a medial meniscus injury	14	45.2
ACL with a lateral meniscus injury	7	22.5
Total	31	100

45.2 percent of patients had an ACL with medial meniscus damage, 22.5 percent had an ACL with a lateral meniscus injury, and 32.3 percent had an isolated ACL injury.

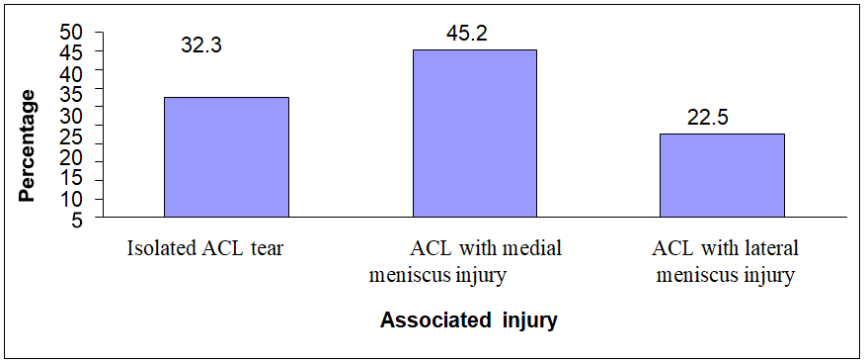

Figure-3: Bar diagram shows associated injury of the study patients (n=31)

Duration from injury to operation

Table-V: Duration of suffering from an injury to operation- in months (n=31)

Duration of sufferings (months)	Number of patients	Percentage (%)	Mean±SD
<10	10	32.25	
10-20	5	16.12	
20-30	4	12.90	
30-40	5	16.12	23.6±16.8
40-50	4	12.90	
50-60	3	9.67	
Total	31	100	

The optimal period for ACL repair is at least 6-8 weeks after the post-traumatic inflammatory reaction subsides. Again, procrastination does not produce positive results. As a result, the time elapsed between the injury and the procedure was investigated. The mean length was 23.6 months, with a standard deviation of (16.8) months.

Postoperative Hospital Stays

Table-VI: Postoperative hospital stay (in days) (n=31).

Hospital stays(days)	Number of patients	Percentage (%)	Mean±SD
<5	16	52	
5-10	12	39	
10-15	2	6	5.5±3.6
15-20	1	3	
Total	31	100	

According to the table, 52 percent of patients stayed in the hospital for fewer than 5 days following surgery. The average hospital stay was 5.5 days, with a standard deviation of 3.6 days.

Postoperative complications

Table-VII: Postoperative complications (n=31)

Complications	Number of patients	Percentage (%)
Pain	0	0
Infection	3	10
Displacement of the screw	0	0
Stiffness	0	0
Graft failure	0	0
Others	0	0
Total	3	10

In this series, 90% of patients had uneventful postoperative period three (10%) had an infection at the tibial screw site.

Subjective functional outcome

Table-VIII: Subjective functional outcome evaluation at sixth month (n=31)

Subjective outcome		Number of patients		Percentage	
		Preoperative	Postoperative	Preoperative	Postoperative
Knee function	Normal	0	11	0	35
	Near normal	0	18	0	58
	Abnormal	31	2	100	6
Pain	Mild	0	21	0	68
	Moderate	24	10	77	32
	Severe	7	0	23	0
Giving way	No	0	31	0	100
	Occasional or more	31	0	100	0
Swelling	No swelling	6	29	19	94
	Mild swelling	25	2	81	6

All patients exhibited impaired knee function and mild to severe discomfort, according to preoperative clinical assessment. All of the patients complained of edema and buckling. Following surgery, 94 percent of patients restored normal to near-normal knee function and stability. Significant reductions in pain and edema were also seen.

Objective functional outcome

Table-IX: Objective functional outcome evaluation at sixth month (n=31)

Objective outcome		N0. of patient		Percentage	
		Preoperative	Postoperative	Preoperative	Postoperative
Knee flexion	<130	7	5	23%	16%
	135	24	26	77%	84%
Lachman test	G-I	0	27	0%	87%
	G-II	13	4	42%	13%
	G-III	18	0	58%	0%
Drawer test	Positive	31	0	96%	0%
	Negative	0	31	4%	100%
Pivot shift test	Positive	0	0	0%	0%
	Negative	31	31	100%	100%
McMurray test	Positive	21	0	68%	0%
	Negative	10	31	32%	100%

The Lachman test was positive in all cases, with grade II contributing for 42% and grade III responsible for 58%. The anterior drawer test was positive in all cases. In all situations, the pivot shift test resulted in a negative result. In 68 percent of patients, the Mc Murray test was positive. Preoperatively, 77 percent of patients had 135o knee flexion, whereas 23 percent had less than 130o flexion.

Functional score and result of individual patient

Table-X: Functional score & result according to Lysholm Knee score scale (n=31)

Patient's serial No.	Functional score	Result
1	97	Excellent
2	95	Excellent
3	97	Excellent
4	90	Good
5	90	Good
6	82	Fair
7	88	Good
8	96	Excellent
9	89	Good
10	63	Poor
11	97	Excellent
12	93	Good
13	97	Excellent
14	95	Excellent
15	97	Excellent
16	90	Good
17	89	Good
18	94	Good
19	63	Poor
20	89	Good
21	94	Good
22	88	Good
23	97	Excellent
24	95	Excellent
25	96	Excellent
26	97	Excellent
27	88	Good
28	82	Fair
29	93	Good
30	90	Good
31	89	Good

In this series excellent 12, good 15, fair 2, and the poor result were achieved in 2 patients.

Distribution of patients by final outcome

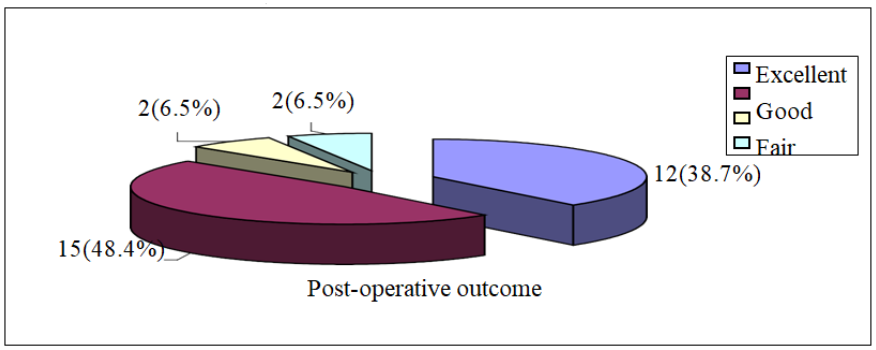

Figure-4: Pie chart showing the distribution of patients by outcome (n=31)

This table describes the distribution of postoperative outcomes. Excellent 38.7%, good 48.4%, fair 6.5% and poor was 6.5%

Comparison of pre-operative & postoperative Lysholm knee score

Table-XI: Comparison of preoperative and postoperative Lysholm knee score: (n=31)

Comparison	No. of the patients	Mean±SD	P-value
Preoperative	31	52.6±4.1	
Postoperative	31	90.3±8.4	<0.05*

* Significant

Paired sample 't' test.

Preoperative Lysholm knee score was 52.6±4.1 and the postoperative score was 90.3±8.4 Preoperative versus postoperative Lysholm scores showed significant improvement (p<0.05).

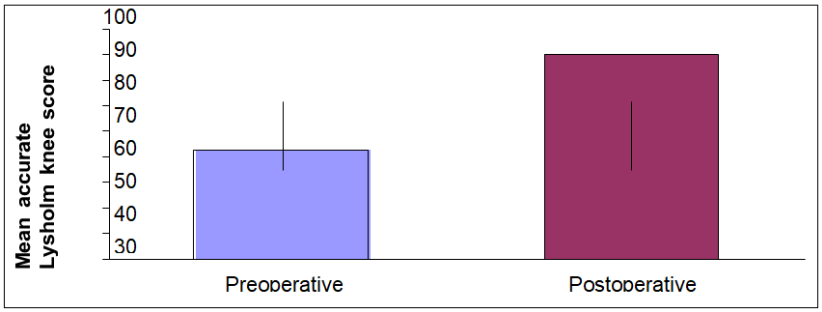

Figure-5: Bar diagram shows mean accurate Lysholm knee score of the study patients

Final Outcome

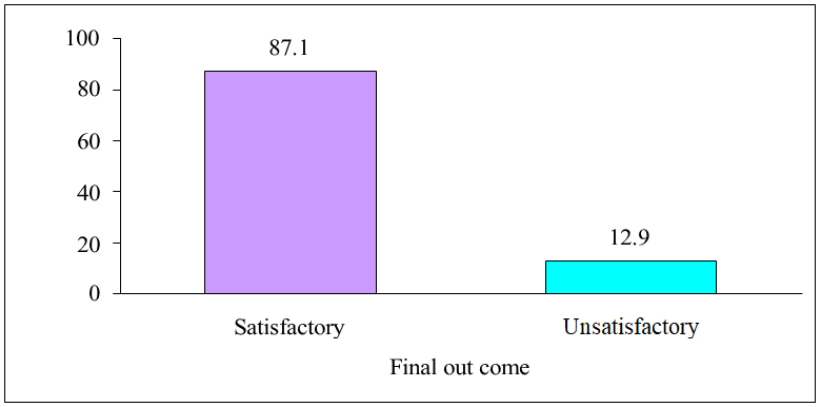

Figure-6: Bar diagram showing Final outcome of the patients (n=31)

Out of 31 patients, 27 (87.1%) had satisfactory (excellent + good), 4 (12.9%) had unsatisfactory (fair+ poor) outcome.

DISCUSSION

Many authors have reported successful clinical results following arthroscopic anterior cruciate repair using hamstring graft and fixation with biodegradable screw [26, 27]. There is still much disagreement in the current research on the best approach for ACL repair. Strong recommendation for both patellar and hamstring tendon transplants; some argue that the patellar tendon offers better stability, while others argue that the hamstring tendon graft reduces the incidence of anterior knee discomfort [28]. In this study, we look at the outcomes of Arthroscopic ACL Reconstruction using Quadrupled Hamstring Tendon Graft and Biodegradable Screw-in ACL i. One patient (3.2 percent) was a sportsman, eight patients (25.8 percent) were students, nine patients (29 percent) were service holders, seven patients (22.6 percent) were businessmen, two patients (6.5 percent) were housewives, three patients (9.7 percent) were day laborers, and one patient (3.2 percent) was another service holder (3.2 percent). The engagement on the right side was 74%, while the involvement on the left side was 26%. Sporting activity was the source of injury in 52% of instances, RTA was the reason in 42%, and an unintentional fall was the cause in 6% of cases. According to Arangio et al. (1998), ACL ruptures were frequently associated with meniscal tears and medial collateral ligament (MCL) ruptures. In our study, 21 patients (67.7%) had ACL and meniscus damage. The

optimal period for ACL restoration is at least 6-8 weeks after the post-traumatic inflammatory reaction has subsided. Again, too much lag does not provide excellent outcomes. As a result, the time between injury and procedure was investigated. The mean length was 23.6 months, with a standard deviation of (16.8) months. In our research, 52 percent of patients stayed in the hospital for fewer than 5 days after surgery. The average hospital stay was 5.5 days, with a standard deviation of 3.6 days [29]. studied 67 ACL repairs and discovered that the average hospital stay was 5 days (range 3 to 8 days).

In 90% of instances, the early post-operative phase was uneventful. After being discharged from the hospital, three patients developed an infection at the tibial screw site, which was treated with the following. All of the patients complained of giving way. Following surgery, all patients restored normal to near-normal knee function and stability. Significant reductions in pain and edema were also seen. Preoperatively, the Lachman test was positive in all patients, with grade II accounting for 42% and grade III accounting for 58%. The anterior drawer test was positive in all of the patients. In all situations, the pivot shift test resulted in a negative result. In 68 percent of patients, the McMurray test was positive. 77% of patients had 135o knee flexion, whereas 23% had less than 130o flexion. The Lachman test improved considerably post-operatively, with 87 percent of patients receiving a grade I and 13 percent receiving a grade II. The post-operative Lachman test was negative in 89 percent of patients in the [29]. conducted study. The McMurry test resulted in a negative result in all cases. After the procedure, 86 percent of patients had 135o knee flexion, whereas 14 percent had less than 130o flexion. In his investigation [30], also found that the pivot shift test was negative in 89 percent of the instances. As a result, the current study is quite similar to the Buss study.

In this series, the preoperative vs postoperative Lysholm knee score demonstrates substantial improvements (p0.05). The preoperative Lysholm score was 52.64.1, while the postoperative Lysholm score was 90.38.4 [31]. found that the Lysholm score improved significantly (P0.05) in their research. In [29-31] study preoperative mean Lysholm score was 55 and postoperative 91 points at 2 years follow-up over 120 patients [32]. reported in a comparative study, Lysholm score 95 in the ST group and 94 in the STG group.

In his study of ACL reconstruction using Quadruple graft of STG reported Lysholm score 92. The present study was closely comparable with those studies. Regarding final outcome, out of 31 patients, 27 (87.1%) had satisfactory (excellent + good), 4 (12.9%) had unsatisfactory (fair+ poor) outcome. Confidence interval (CI) At 95% confidence level is 75% – 99%. So, among the population, we found 75% - 99% satisfactory results by the procedure. It was quite an acceptable outcome [32].

CONCLUSION

The majority of patients in this research restored normal to near-normal knee function and knee stability after six months. By measuring the Lysholm score for knee function following ACL repair using quadrupled hamstring tendon graft and fixation with biodegradable screw, pain and edema were nearly nonexistent in the majority of patients, indicating that this approach is closer to 100 percent functional recovery. Though there was little evidence of superficial infection at the tibial screw site those were managed by follow-up dressing and antibiotics. By calculating confidence interval at 95% confidence level the study's final findings show that it will be a 75-99 percent successful technique for ACL repair.

RECOMMENDATIONS

For further study, the following recommendations are proposed; Large sample size should be taken for further prospective study with long period follow up.

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