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Results of anatomical ACL Reconstruction

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Abstract

Background: The knee joint is the most commonly injured of all joints and the anterior cruciate ligament is the most commonly injured ligament. Reconstruction of ACL allows the patient to return to pre-trauma activity level and delays occurrence of associated meniscal injury and onset of osteoarthritis. The “ideal graft” for ACL reconstruction is still a topic of debate. The most commonly used grafts are bone patellar tendon bone graft and hamstring graft.

Purpose: To evaluate the results of arthroscopic anatomical anterior cruciate ligament reconstruction with hamstring graft using Lysholm knee scoring scale.

Method: The prospective study consists of 40 patients who had undergone arthroscopic ACL reconstruction using Hamstring autograft at the Department of Orthopedic Surgery, at General Hospital, Ahmedabad with a minimum of 6 months follow up from June 2016 to November 2018.

Results: The patients were followed up at 6 weeks, 3 months, 6 months and 1 year and were evaluated using the Lysholm Score. 90% of the patients in this study belong to the 20-40 year age group. Only patients above the age of 18 were included in this study. Out of 40 patients included in this study, 34 were males and 6 were females. The average injury to operative time interval for surgery was 4 months. The results were analyzed as per Lysholm Score as mentioned earlier. 57% (n=23) patients showed excellent results and 38% (n=15) patients showed good results and 5% (n=2) patients showed fair results.

Keywords: anterior cruciate ligament, arthroscopy, hamstring graft

Introduction

Anterior cruciate ligament (ACL) is an intra-articular, extra synovial Structure present in the central complex of the knee joint which along with other structures in and around knee joint controls, limits motion and maintains static and dynamic equilibrium of the knee joint [1-3].

The knee joint is the most commonly injured of all joints and the anterior cruciate ligament is the most commonly injured ligament [4]. The modern high-speed vehicular trauma and sports life have led to an increase in the ligament injuries of the knee. The Anterior Cruciate ligament (ACL) is the primary stabilizer of the knee and prevents the Knee against anterior translation [5]. It is also important in counteracting rotational and valgus stress [6]. After ACL injury, most patients experience recurrent episodes of instability, Pain and decreased function [7].

Reconstruction of ACL allows the patient to return to pre-trauma activity level and delays occurrence of associated meniscal injury and onset of osteoarthritis [8]. The incidence of associated cartilage damage in acute tears reported at 15 - 40% whereas it increases to 79% in chronic tears [8].

Reconstruction is also essential to restore the stability of the knee [9]. Arthroscopic reconstruction of torn ACL has become the gold standard in treating [10] ACL tears.

In the evaluation of the arthroscopic ACL reconstruction many methods have evolved and still, research is going on to find a native knee kinematics. The obliquity and anatomical placement of the femoral tunnel has been a major point of interest in recent research on ACL reconstruction and there are very few studies available regarding this topic.

Various surgical procedures and graft selections have been proposed for ACL reconstruction Auto graft such as bone-tendon-bone (BTB), semitendinosus tendon (ST), iliotibial band, achilles tendon, tibialis anterior tendon, quadriceps tendon; allografts and synthetic grafts. Various mode of fixation are also available like transfixation device, endobutton, bioscrews, ligament staples, tight rope etc [16].

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The “ideal graft” for ACL reconstruction is still a topic of debate. The most commonly used grafts are bone patellar tendon bone graft and hamstring graft. The hamstring graft is increasingly used nowadays due to increased incidence of anterior knee pain with bone patellar tendon bone graft and faster rehabilitation, as well as advancements made in soft tissue graft fixation techniques [24].

Here we are highlighting anatomical ACL reconstruction by hamstring auto graft using the accessory anteromedial portal.

Material

The prospective study consists of 40 patients who had undergone Arthroscopic ACL reconstruction using Hamstring autograft at the Department of Orthopedic Surgery, at General Hospital, Ahmedabad with a minimum of 6 months follow up:

Period of Study

From June 2016 to November 2018.

Inclusion Criteria

Clinical evaluation of instability by the surgeon, chronic cases only, normal contralateral knee

Exclusion Criteria

ACL injuries with associated intra-articular fractures, osteoarthritic changes in x-ray, acute injury, patient below 18 years, prior knee injury

Instrumentation:

Specialized instruments required for arthroscopic ACL reconstruction were used. The fluid medium used is Normal Saline, 3 Liter bottles were used, as it exerts more pressure and also does not need frequent changing.

Postoperative Care

Each and every patient was encouraged to lie supine with foot end elevated for 24 hours, as spinal anesthesia was given during the procedure. He was encouraged to use ice packs to reduce the swelling. Round the clock analgesia (initially, i.v., later oral) was administered to assist in physiotherapy. Wound inspection was done on the 3rd postoperative day. Only if the wound was healthy and patient's compliance for physiotherapy was assured, the patient was discharged on oral antibiotics. Sutures were removed on the 14th postoperative day.

All knees were examined before surgery; in the operating room immediately and after the procedure; and at two, four, six, and twelve months.

Ability to bear weight (graded as full, /partial, or impossible) was assessed preoperatively and at two, four, six, and twelve months.

Difficulty with squatting (assessed as no problem flexing the knees greater than or equal to 90 degrees, ability to flex the knees greater than or equal to 90 degrees with slight difficulty, unable to flex the knees greater than or equal to 90 degrees, or unable to squat) were assessed preoperatively and at four, six, and twelve months.

Observation and Analysis

Following are the observation and result from the analysis of data collected. Average follow up period in this study was 18 months.

1. Age Incidence

90% of the patients in this study belong to the 20-40 year age

group, thus ACL injury is more common in the younger age group. Most common in 20-25(30%) year age group, followed by 26-30(25%), 36-40(20%), 31-35(15%), 36-40(20%) and 5% each in >40 years and <20 years

2. Sex Incidence

Table 1: Sex distribution of patient

Gender	Number	Percentage
Male	34	85%
Female	6	15%
Total	40	100%

In this study 85% (n= 34) of the patients were male and 15% (n=6) patients were female

3. Limb Involved

Table 2: Limb involved of patient

Side	Number	Percentage
Right	22	55
Left	18	45
Total	40	100

Right-sided knee injury was present in 55% (n=22) and left-sided knee injury was present in 45% (n=18).

4. Mode of Injury

Table 3: Mode of injury of patient

Mode Of Injury	Number	Percentage
Road traffic accident	18	45
Fall down	15	37
Sport	7	18
Total	40	100

Mode of injury for ACL in this study is RTA (45%, n=18), fall down (37%, n=15) and sport (18%, n=7). RTA and fall down being most common causes of injury.

5. Symptoms

Pain (n=40,100%) and sense of giving (n=40,100%) away being most common and consistent symptoms. Swelling was present in n=20(50%) patients and locking sensation present in n=11 (27.5%)

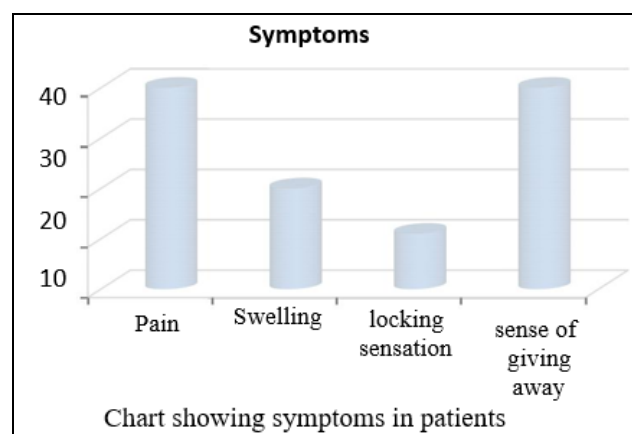


Fig 1: Symptoms in patients included in the study

6. Signs

Drawer test, Lachmann test, pivot shift test being the most common and consistent finding (100%, n=40) in a complete ACL tear. McMurray's test was positive in associated meniscus injury, in 13(32.5%) patient had a positive test for the

medial meniscus. In 4(10%) patient with lateral meniscus tear McMurray's test was found positive as a least common finding.

7. Meniscus Injury

The medial meniscus is more commonly involved than the lateral meniscus

Table 4: Meniscus injury associated with ACL

Associated meniscus injury	Number of patients	Percentage
Medial meniscus	13	32.5%
Isolated Lateral meniscus	0	0%
Both meniscus	4	10%

Medial meniscus was commonly involved in 32.5% (n=13) patients. Both the menisci were involved in 10% (n=4) of patients. Isolated lateral meniscus injury was not observed in present study.

8. Difficulty in squatting on follow up

35 patients in this study did not have any problem in squatting and only 5 patient had slight problem.

9. Difficulty in sitting crossed leg on follow up

28 patients in this study did not have any difficulty in sitting crossed leg and 12 patients had slight problem.

10. Range of motion achieved

Table 5: Range of motion measured in follow-up

Range Of Motion	Number	Percentage
120-130	11	27.5
111-120	17	42.5
101-110	10	25
<=100	2	5
TOTAL	40	100

70% of the patient had excellent rom (above110) without any difficulty.5% had range of motion below 100°. 42.5% (n=17) had 111-120° and 27.5% (n=11) had 120-130° & 25% (n=10) had 100-110° ROM.

11. Injury to arthroscopy interval

Average injury to arthroscopic interval was 4 months. 55% of patient underwent surgery within 4-6 month of injury 37.5% underwent between 0-3 months.

Table 6: Injury arthroscopic interval in month

Injury to arthroscopy interval	No of patients	Percentage
0-3	15	37.5%
4-6	22	55%
7-10	2	5%
11-13	1	2.5
Total	40	100%

12. Results

The results were analyzed as per Lysholm Score as mentioned earlier.

Table 7: Grading the Tegner Lysholm knee scoring scale

Poor	<65	Fair	65-83	Good	84-90	Excellent	>90
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57% (n=23) patient showed excellent results and 38% (n=15) patient showed good results and 5% (n=2) patient showed fair results.

Table 8: Final Lysholm Score of Study

Lysholm score	No of patients	Percentage
Excellent	23	57%
Good	15	38%
Fair	2	5%
Total	40	100%

The average Lysholm Score was 90.85 in 40 patients at average of 18 months of follow up

14. Complication

One patient in this study had pain and stiffness up to 4 month postoperative due to lack of compliance from the patient side towards physiotherapy. Pain resolved and patient achieved up to 100° of flexion with the help of physiotherapy later on.

One of our patient (2.5%) had a complication in form of superficial infection at graft site which resolved after debridement and with antibiotic coverage, and showed fair (82/100) outcome as per Lysholm scoring system.

Clinical Cases



Fig: 43 y/o male, Rt ACL tear, 24 months follow up. Lysholm score 92/100



Fig: 22 y/o male, RT ACL tear, 16 months follow up Lysholm score 98/100

Discussion

The present study is to evaluate the functional outcome of arthroscopic anatomical single bundle ACL reconstruction using quadrupled hamstring autograft.

This prospective study was conducted in General Hospital, Ahmedabad to clinically evaluate the results of arthroscopic single-bundle ACL reconstruction. This study group comprised of 40 Patients with a minimum follow up period of 6 months. In this study, the most common mode of injury was road traffic accident (45%) followed fall down (37%) followed by sports injuries (18%). Male predominance was

found in this study, 34 (85%) patients were males and 6 (15%) were females. Most of the patients were in the age group of 20 – 25 years (30%). 55% of patients (n=22) underwent ACL reconstruction 4 to 6 months after Injury.

The right knee was involved in 22 (55%) of patients and left knee in 18 (45%) patients. There was not much difference in side preference of injury.

D.W Lewis *et al.* [17], in their study on the incidence of meniscal injuries at the time of ACL reconstruction, found that 58% of patients had meniscal injuries and that medial meniscus was most commonly injured. They also concluded that meniscal repair or resection did not alter the final outcome.

In this study, there was associated meniscal injury in 13 (32.5%) of patients. Thirteen patients had an injury to the medial meniscus whereas 4 (10%) of patients had an injury to both the medial and lateral meniscus. The most commonly injured was medial meniscus which was in accordance with other studies.

The results of the study were compared with the studies of D Choudhary *et al.* [18-21]

The average age of patients at the time of surgery in the present study was 29 years whereas that of Railey *et al.* [19], Mahir *et al.* [20], and Kumar *et al.* [21] were 33, 23 and 27 years respectively.

The average Lysholm score at the end of the study of D Choudhary *et al.* [18] was 92, Jomha *et al.* [22] was 94, Railey *et al.* [19], was 91, Mahir *et al.* [81], was 93.5, Ashok Kumar *et al.* [21], 2016 was 90 and in the present study average Lysholm score, at last follow up was 90.85 which was comparable with the other studies.

Table 9: Lysholm score in the various study

	Study	Average Lysholm Score
D Choudhary <i>et al.</i> [18]	2005	92
Jomha <i>et al.</i> [22]	1999	94
Railey <i>et al.</i> [19]	2004	91
Mahir <i>et al.</i> [20]	2005	93.5
Ashok Kumar <i>et al.</i> [21]	2016	90
Present study		90.85

Williams *et al.* [23] in their study of 2500 cases of arthroscopic ACL reconstruction, reported an infection rate of 0.3%. One of our patient (2.5%) had a complication in form of superficial infection at graft site which resolved after debridement and with antibiotic cover, and showing fair (82/100) outcome as per our scoring system.

There was no significant patellofemoral pain noticed in the patients in this study. This is similar to the study by Railey *et al.* [19] and Alireza Sadeghpour *et al.* [24] who did not observe any clinically relevant patellofemoral pain and faster rehabilitation in patients in whom arthroscopic ACL reconstruction using hamstring graft was done instead of PTB graft

Kaseta *et al.* [11] emphasized the importance of portal position and reconstruction surgical technique; which determines the femoral tunnel position, which ultimately affects the outcomes of ACL reconstruction. (Fig 2, 3)

The conventional trans tibial technique, where the tibial tunnel is created first, does not allow anatomical femoral tunnel placement. The relatively high position of the femoral tunnel requires close to the perpendicular placement of a graft, which is not conducive to restoration of rotatory stability. Modified transtibial techniques were designed to overcome the shortcomings of the traditional transtibial

technique by allowing changes in the tibial tunnel position and the insertion site of a reamer for less oblique femoral tunnel placement. In a cadaveric study by Sim *et al.* [12], a modified transtibial technique was less effective than the anteromedial portal technique or outside-in technique in restoring anterior translation at 0° flexion of the knee. However, in antero medial portal technique the field of view is limited by the sole availability of the anterolateral portal for arthroscopic visualization, extensive cortical bone destruction is unavoidable [13]

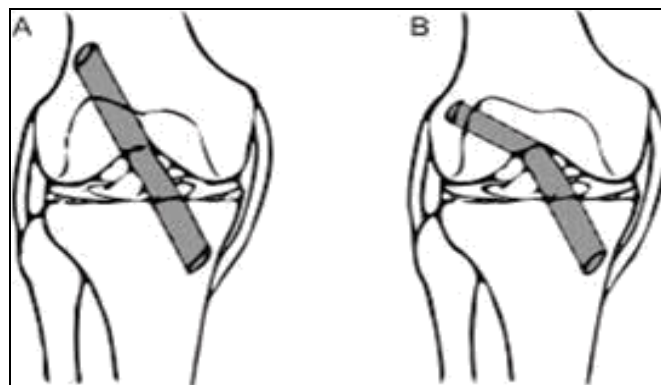


Fig 2: A. Position of graft in conventional technique B. Position of graft in Anatomical location USI

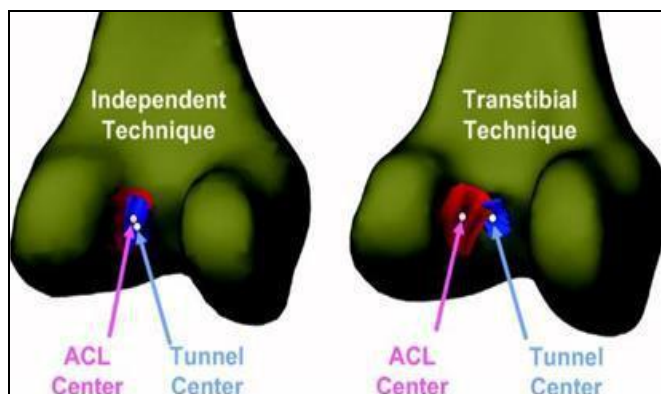


Fig 3: Placement of tunnel in A: Aam Portal & B: Trans Tibial Technique

The accessory anteromedial portal technique can be an alternative to the above-mentioned techniques that offer the following advantages [14]:

1. Femoral tunneling can be performed without interference with visualization by the lateral femoral condyle by using the anteromedial portal as a viewing portal. Tunnel position can be identified intraoperatively without removal of the drilling instrument.
2. The femoral tunnel can be created close to the lateral wall of the notch by adjusting the obliquity compared to the anteromedial technique, which allows more flexibility with tunnel obliquity and length; according to bone quality, graft type, and graft fixation method.
3. Notchplasty for working space and visualization can be avoided.

Several factors have been identified as significantly influencing the biomechanical characteristics and the functional outcome of an ACL reconstructed knee joint and were kept in focused in this study and gave comparable results as per J. dargel [24] *et al.*

These factors are

1. Individual choice of autologous graft material using either patellar tendon-bone grafts or quadrupled hamstring tendon grafts
2. Anatomical bone tunnel placement within the footprints of the native ACL
3. Adequate substitute tension after cyclic graft preconditioning
4. Graft fixation close to the joint line using biodegradable graft fixation materials that provide an initial fixation strength exceeding those loads commonly expected during rehabilitation ^[15]

The long term benefits of arthroscopic anterior cruciate ligament reconstruction are not yet determined however short-term results are encouraging. There is a clear need for prospective long term follow up studies with a focus on objective measures of stability, functional outcome and onset of degenerative arthritis to scientifically investigate continued results of anatomical anterior cruciate ligament reconstruction with a focus on risk factors associated with poor outcomes.

Conclusion

From the above series following conclusions are made:

- ACL injuries are common in young individuals between 20-40 years of age (90%).
- Males are more commonly affected (85%).
- Medial meniscus more commonly involved than lateral meniscus.
- RTA is a most common cause of ACL tear (45%), followed by Fall down (37%) and sport (18%).
- In this series excellent results are obtained in 57% of cases where as good results are obtained in 38% of the cases & fair result in 5%, as per Lysholm knee score.
- Arthroscopic anterior cruciate ligament reconstruction reduces postoperative morbidity and enables early rehabilitation to compare to open technique.

Anatomical ACL reconstruction provides excellent stability especially rotational stability which was not possible in non-anatomical ACL reconstruction. So from this series, it can be concluded that Anatomical ACL reconstruction using Hamstring Graft Technique has yielded excellent to good results in almost all patients with minimal complication and provides stable knee.

Abbreviations

ACL	:	Anterior Cruciate Ligament
AKBK Brace	:	Above Knee below Knee Brace
AMB	:	Antero Medial Bundle
BTB	:	Bone Tendon Bone
CT Scan	:	Computed Tomography Scan
DOA	:	Date of Admission
DOD	:	Date of Discharge
DOO	:	Date of Operation
ER	:	External Rotation
F	:	Female
Fig.	:	Figure
FWB	:	Full Weight Bearing
IR	:	Internal Rotation
Lt.	:	Left
LCL	:	Lateral Collateral Ligament
LM	:	Lateral Meniscus
MCL	:	Medial Collateral Ligament
MM	:	Medial Meniscus
NWB	:	Non Weight Bearing

PWB	:	Partial Weight Bearing
PCL	:	Posterior Cruciate Ligament
PH-BH	:	Posterior Horn – Bucket Handle
PLB	:	Postero Lateral Bundle
Rt.	:	Right
ROM	:	Range of Motion
RTA	:	Road Traffic Accident
SLR	:	Strait Leg Raising
SQE	:	Static Quadriceps Exercise
ST	:	Semi Tendinious

References

1. Robert H Miller: Knee injuries: Campbell's operative orthopedics, 9th edition. 2, 1186.
2. Kennedy JC, Weinberg HW, Wilson AS. The anatomy and function of ACL. JBJS, 1974; 56-A:223-235.
3. Schultz RA, Miller DC, Kerr CS *et al*: Mechanoreceptors in human cruciate ligaments, JBJS, 66-A, 1072-1076.
4. Haimes JL, Wroble RR, Grood ES, Noyes FR. Role of medial structures in the intact and anterior cruciate ligament-deficient knee. Limits of motion in the human knee. Am J Sports Med. 1994; 22:402-409
5. Frank CB, Jackson DW. Current concepts review. The science of reconstruction of the anterior cruciate ligament. J Bone and Joint Surg Am. 1997; 79:1556-76.
6. Kanamori A, Woo SL, Ma CB, Zeminski J, Rudy TW, Li G, Livesay GA. The forces in the anterior cruciate ligament and knee kinematics during a simulated pivot shift test: a human cadaveric study using robotic technology. Arthroscopy. 2000; 16:888-9.
7. Del Pizzo W, Norwood LA, Kerlan RK, Jobe FW, Carter VS, Blazing ME, *et al*. Analysis of 100 patients with anterolateral rotatory instability of the knee. Clin Orthop 1977; 122:178-180.
8. Satku K, Kumar VP, Ngoi SS. ACL injuries. To counsel or to operate? J Bone Joint Surg Br 1986; 68:458-61
9. Curl WW, Krome J, Gordon ES. Cartilage injuries: A review of 31,516 knee arthroscopies. Arthroscopy. 1997; 13(4):456-60.
10. Fu FH, Bennett CH, Ma CB. Current trends in anterior cruciate ligament reconstruction: Operative procedures and clinical correlation. Am J of Sports Med 2000; 28:124-130.
11. Reconstruction technique affects femoral tunnel placement in ACL reconstruction, Clin Orthop Relat Res. 2008; 466:1467–1474
12. Sim JA, Gadikota HR, Li JS, Li G, Gill TJ. Biomechanical evaluation of knee joint laxities and graft forces after anterior cruciate ligament reconstruction by anteromedial portal, outside-in, and transtibial techniques, Am J Sports Med. 2011; 39:2604-2610.
13. Chang CB, Choi JY, Koh IJ, Lee KJ, Lee KH, Kim TK. Comparisons offemoral tunnel position and length in anterior cruciate ligament reconstruction: modified transtibial versus anteromedial portal techniques, Arthroscopy. 2011; 27:1389-1394
14. Brown CH, Jr, Spalding T, Robb C. a Medial portal technique for single-bundle anatomical anterior cruciate ligament (ACL) reconstruction, Int Orthop. 2013; 37:253-269
15. Anders JO, Struwe MS, Sander K, Layher F, Venbrocks RAZ. Orthop Unfall. German. 2007; 145(6):719-25.
16. Speziali A, Delcogliano M, Tei M *et al*. Musculoskelet Surg, 2014; 98:179.
<https://doi.org/10.1007/s12306-014-0338-8>

17. Lewis DW, Chan D, Fisher O, Lechford R, Mintowt-Czyz WJ, Lewis MW. Incidence of Meniscal and Chondral Injuries At The Time Of Acl Reconstruction, And Their Relationship With Outcome At 2 Years. *Orthopedic Proceedings*, 2012; 94-B(SUPP IX):41.
18. Chaudhary D, Monga P, Joshi D, Easwaran J, Bhatia N, Singh A. Arthroscopic reconstruction of the anterior cruciate ligament using bone– patellar tendon–bone autograft. Experience of the first 100 cases. *J Orth Surg*. 2005; 13:147-152.
19. Williams RJ, III Hyman J, Petrigliano F, Rozental T, Wickiewicz TL. Anterior cruciate ligament reconstruction with a four-strand hamstring tendon autograft. *J Bone Joint Surg Am*. 2004; 86:225-232.
20. Mahiroğullari M, Kuşkucu M, Kiral A, Pehlivan O, Akmaz I, Tirmik U. Early results of reconstruction of chronic anterior cruciate ligament ruptures using four-strand hamstring tendon autografts *Acta Orthop Traumatol Turc*. 2005; 39:224-230.
21. Kumar PK, Rambabu P, Srinivasarao K. *et al*. Functional outcome of arthroscopic reconstruction of anterior cruciate ligament tears. *J. Evolution Med. Dent. Sci*. 2016; 5(10):427-432, DOI:10.14260/jemds/2016/98
22. Jomha NM, Pinczewski LA, Clingeleffer A, Otto DD. Arthroscopic reconstruction of the anterior cruciate ligament with patellar-tendon autograft and interference screw fixation results at seven years. *J Bone Joint Surg Br*. 1999; 81:775-9.
23. Williams RJ 3rd, Laurencin CT, Warren RF, Speciale AC, Brause BD, O'Brien S. Septic arthritis after arthroscopic anterior cruciate ligament reconstruction. Diagnosis and management. *Am J Sports Med*. 1997; 25:261-7.
24. Sadeghpour A, Ebrahimpour A, Attar B, Azizian Z. Comparison of patellar versus hamstring tendon autografts in arthroscopic anterior cruciate ligament reconstruction: A 6-month follow-up of a randomized clinical trial. *J Res Med Sci*. 2017; 22:105. Published 2017 Sep 26. doi:10.4103/jrms.JRMS_939_16.