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ASSESSMENT OF ARTHROSCOPIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION IN BASRAH

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Abstract

Background: Anterior cruciate ligament (ACL) injuries are common, particularly among young, active individuals, and are associated with significant morbidity. Arthroscopic ACL reconstruction has become the gold standard for restoring knee stability and function, yet the optimal candidate and timing for surgery remain subjects of ongoing research.

Patients and Methods: This descriptive follow-up study, conducted at Basra Teaching Hospital from October 2011 to January 2014, enrolled 35 male patients aged 18-65 years with confirmed ACL injuries. Participants underwent arthroscopic ACL reconstruction using hamstring and gracilis tendon grafts. Outcomes were assessed using the Tegner-Lysholm scoring system, focusing on knee function and stability, over one year post-surgery. Statistical analyses were performed using SPSS version 26, with significance set at $p < 0.05$.

Results: The majority of participants (62.8%) were aged 21-30 years, with a mean age of 24.6 ± 2 years. Right knee injuries were more common (57.1%). Most injuries (82.8%) were sports-related, predominantly from contact sports (74.3%). Post-operatively, significant improvements were observed in knee stability tests: Lachman test positive rates dropped from 100% to 5.7%, Pivot Shift test rates from 71.4% to 5.7%, and Anterior Drawer test rates from 100% to 14.2% ($p < 0.001$). The Tegner-Lysholm scores showed substantial enhancement, with poor outcomes decreasing from 48.5% to 5.7% and excellent ratings increasing from 0% to 22.8% ($p < 0.001$). Professional athletes had better recovery outcomes (average score 91.7) compared to non-professionals (average score 79.9, $p = 0.041$). Complications were minimal, with infection and ACL failures each occurring in 5.7% of cases, and leg-foot paresthesia in 2.8%.

Conclusion: Arthroscopic ACL reconstruction is effective in significantly improving knee function and stability among young, active males, particularly those engaged in professional sports. Early surgical intervention, coupled with tailored rehabilitation, is crucial in achieving optimal outcomes. These findings advocate for a proactive approach in managing ACL injuries

Keywords: ACL Reconstruction, Arthroscopy, Tegner-Lysholm Score, Sports Injuries, Knee Surgery

Introduction

The anterior cruciate ligament (ACL) is one of the most frequently injured ligaments in the knee,[1] with annual injury rates in the United States estimated to be between 100,000 and 200,000 cases .[2] Notably, these injuries occur more frequently in women than in men .[3] The ACL plays a crucial role as a primary stabilizer of the knee, countering the stresses of rapid, dynamic movements such as cutting, turning, and pivoting, which are typical during athletic activities.[4] This significance predisposes the

ACL to a higher risk of injury compared to other knee ligaments.

Consensus among researchers indicates that, particularly for young and active patients, surgical reconstruction of the torn ACL is the preferred treatment. This approach enables patients to return to their previous levels of activity while helping to prevent further joint complications. It has become one of the most common procedures performed by sports medicine surgeons .[3]

Historically, initial attempts at ACL repair yielded unsatisfactory outcomes, prompting surgeons to explore alternative strategies such as extra-articular reconstruction using local structures. However, the evolution of surgical techniques has highlighted the benefits of more anatomical, intra-articular reconstructions. With advancements in arthroscopic technology, the use of intra-articular soft tissue grafts has become the standard practice, maintaining its predominance in surgical approaches to ACL reconstruction.[5] Despite the general success of this technique, ongoing refinements aim to further improve patient outcomes.

This study aims to establish baseline knowledge about ACL reconstructions via arthroscopy and to identify which patients in the Basrah Orthopedic Department are optimal candidates for this procedure.

Patients and Methods

Study Design and Population: A one-year follow-up descriptive study was conducted at Basrah Teaching Hospital, Basrah City, Iraq, from October 2011 to January 2014. The study enrolled 35 male patients. The participants were primarily young, active males. These patients were either diagnosed at our facility or referred from other hospitals or outpatient clinics.

Inclusion Criteria:

Confirmed ACL injury

Medically fit and active

Age 18-65years

Adherence to the pre-and post-operative program in this study

Good range of knee motion

Quadriceps girth equal to or less than 0.5 cm difference between legs

Exclusion Criteria:

Acute knee injury less than 3 weeks old

Sedentary lifestyle indicative of older age groups

Severe quadriceps muscle wasting greater than 2 cm difference.

Concurrent ligament injuries (e.g., LCL, MCL)

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Active infections anywhere in the patient

Proven ligamentous laxity

Advanced osteoarthritic changes

Outcomes Measurement: Outcomes were primarily assessed through improvements in knee function, stability, and patient satisfaction post-reconstruction which were assessed using the Tegner- Lysholm score.

Ethical Endorsement: The study protocol was reviewed and approved by the Basrah Health Directorate and the Iraqi Board of Health specializing in Orthopedic. All participants provided written informed consent before their inclusion in the study.

Patients Evaluation: Patients underwent a comprehensive evaluation including a detailed questionnaire, full history, systemic and regional examinations, and laboratory investigations (hematological, biochemical, and virology tests). Imaging studies included X-rays (AP and lateral views) and MRI to exclude any hidden pathologies that could affect the surgical plan or follow-up results. All patients were rigorously evaluated pre-operatively using a comprehensive set of knee examination tests to assess the integrity and function of the ACL and associated structures. These tests included (the Lachman Test, Rotatory Test, Pivot Shift Test, Anterior Drawer Test, and Examination for ligamentous laxity).

Operation technique: The surgical technique involved standardized procedures to ensure consistent outcomes. After anesthesia, a formal knee incision was made, consisting of an antero-lateral incision for the camera portal and an antero-medial incision for other surgical tools. A 5 mm diameter inflow torcher-cannula was inserted intra-articularly to facilitate the flow of fluid into the joint, enhancing the visualization of the joint space with a connected camera.

The arthroscopic examination was performed using a 70-degree slope camera (Type 1188) to thoroughly reassess the knee and plan the surgical procedure. This examination focused on the ACL, which typically appears lax and frayed in cases of significant injury, indicative of functional incompetence.

The ACL reconstruction process began with the removal of the damaged ACL and surrounding synovial layers using a shaver, improving the visibility within the joint. Attention then shifted to the pes anserinus site, where a 4 cm incision was made to access and harvest the hamstring and gracilis tendons. These tendons were then prepared as a double-stranded graft, secured

with non-absorbable Nylon No. 2 suture material at both ends, leaving the central part free of sutures.

The prepared graft was quadrupled, with one end attached to a femoral button and the other prepared for insertion into the tibial tunnel. Tibial and femoral tunnels were drilled, the graft was positioned, and secured using a titanium or biodegradable screw, ensuring the graft's stability and optimal positioning within the knee joint.

Post-operative procedures included a thorough check of knee motion to detect any technical issues or graft impingement, followed by joint space washing, suturing of incisions, and application of a splint for immobilization. The patient was then transferred to the ward for recovery.

Statistical Analysis: Data were analyzed using SPSS version 26. Statistical tests included the Chi-square test and independent t-tests, with significance set at $p < 0.05$ and confidence intervals at 95%. These analyses were crucial for determining the efficacy of the surgical interventions and assessing patient outcomes post-reconstruction.

Results

Table I. shows a predominance of knee injuries among young adults aged 21-30 years in Iraq, particularly related to contact sports, with 62.8% of cases in this age group. Most injuries occur in the right knee (57.1%) and are significantly concentrated in the south of Iraq (82.8%). Sports injuries are the leading cause of these incidents, accounting for 82.8% of the total, with contact sports being particularly hazardous (74.3%). There is a higher frequency of injuries among nonprofessional athletes (51.4%) compared to professionals (31.4%), suggesting that recreational athletes may lack proper training or preventive measures. This demographic and injury-type distribution highlights the need for targeted preventive strategies and interventions, especially in high-risk groups and regions.

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Table 1. Socio-Demographical Data Distribution

Variables		Frequency	Percentage
Age	10-20 year	5	14.2%
	21-30 year	22	62.8%
	31-40 year	8	22.8%
Side	Right knee	20	57.1%
	Left knee	15	42.8%
Address	South of Iraq	29	82.8%
	Middle of Iraq	4	11.4%
	North of Iraq	2	5.7%
Mechanism of injury distribution	Sport	29	82.8%
	RTA	3	8.5%
	Accidental	3	8.5%
Type of sport	Contact	26	74.3%
	Non-contact	3	8.5%
Sport profession	Professional	11	31.4%
	Nonprofessional	18	51.4%

Table II presents data on the duration since injury and associated injuries among 35 individuals. The most common timeframe since injury is 1-6 months (25.7%), with a gradual decrease in frequency as the duration increases. In terms of associated injuries, the medial meniscus is most frequently affected (28.5%), followed by cartilage damage (22.8%), while no injuries to the lateral meniscus or PCL were reported. This pattern highlights a need for targeted medical interventions for the medial meniscus and cartilage, which are commonly affected and can impact long-term joint health. The absence of lateral meniscus and PCL injuries suggests these may be less prevalent or severe in this group.

Table II. Duration and Associated Injuries Data Distribution

Variables		Frequency	Percentage
Duration Since Injury	1-6 months	9	25.7%
	7-12 months	8	22.8%
	13-18months	7	20%
	19-24 months	5	14.2%
	>24 months	6	17.1%
Associated injuries	Medial meniscus	10	28.5%
	Lateral meniscus	0	0.0%
	Cartilage damage	8	22.8%
	PCL	0	0.0%

Table III demonstrates significant improvements in knee stability and function following surgery, as evidenced by clinical tests and Tegner Lysholm scores. Pre-operatively, 100% and 71.4% of patients tested positive in the Lachman and Pivot Shift Tests, indicating instability, which dramatically improved to 5.7% at 6 and 12 months post-operatively. Similarly, the Anterior Drawer Test results improved from 100% to 14.2% positive tests over the same periods. There were no changes in Rotatory Tests and Ligamentous laxity, remaining at 0% throughout, suggesting no initial issues or unaffected conditions by the surgery.

Improvements in the Tegner Lysholm Score were also significant, with a reduction in poor outcomes (from 48.5% to 5.7%) and increases in good and excellent ratings, indicating enhanced knee function post-operation. The statistical significance of these improvements is supported by a p-value of <0.001, confirming the effectiveness of the surgical intervention.

Table III. Special Tests And Tegner Lysholm Score Data Distribution Pre And Post-Operative

Variables		Frequency (No. 29)	Lysholm Score
Sport Status	Professional	11 (31.4%)	91.7. Excellent
	Non-Professional	18 (51.4%)	79.9 Fair
	P-Value	0.058	0.041

Table IV shows the Tegner Lysholm scores, assessing post-surgery knee function, in relation to sports professionalism among 29 individuals. Professional athletes, representing 31.4% of the sample, scored an excellent average of 91.7. Non-professional athletes, 51.4% of the sample, scored a fair average of 79.9. The difference in scores is statistically significant (p-value = 0.041), indicating better recovery outcomes for professional athletes. The marginal p-value of 0.058 for sports status suggests a non-significant trend towards better outcomes in professionals, likely due to superior pre-surgery conditioning and rehabilitation.

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Table IV. Tegner Lysholm Score to the sport professionalism.

Variables		Pre-operative	Pos- operative (6 months)	Posoperative (12months)	P- value
Special tests	Lachman T.	35 (100%)	2 (5.7%)	2 (5.7%)	<0.001
	Rotatory T.	0 (0%)	0 (0%)	0 (0%)	<0.001
	Pivot shift T	25 (71.4%)	2 (5.7%)	2 (5.7%)	<0.001
	Anterior draw T	35 (100%)	7 (20%)	5 (14.2%)	<0.001
	Ligamentous laxity	0 (0%)	0 (0%)	0 (0%)	<0.001
Tegner Lysholm	Poor (<65)	17 (48.5%)	2 (5.7%)	2 (5.7%)	<0.001
	Fair (65-83)	14 (40%)	16 (45.7%)	14 (40%)	
	Good (84-90)	4 (11.4%)	10 (28.5%)	11 (31.4%)	
	Excellent (>90)	0 (0%)	7 (20%)	8 (22.8%)	

Table V presents the complication rates post-surgery among 35 individuals. Notably, the data shows low incidence rates: infections and ACL failures each occurred in 5.7% of cases, while leg-foot paresthesia was reported in 2.8%. There were no instances of neuro-vascular injury, deep vein thrombosis (D.V.T), or complex regional pain syndrome, indicating a generally favorable surgical outcome with minor complications.

Table V. Complication Data Distribution

Variables		Frequency	Percentage
Complications	Infection	2	5.7%
	Neuro-vascular injury	0	0.0%
	Deep venous thrombosis	0	0.0%
	Complex regional pain	0	0.0%
	ACL failure	2	5.7%
	Leg-foot paresthesia	1	2.8%

Discussion

Arthroscopic anterior cruciate ligament (ACL) reconstructions remain a focal point of global orthopedic research due to the variability in outcomes. These variations can be attributed to differences in surgical

techniques, patient selection, and rehabilitation protocols.

Our study aligns closely with existing literature, finding the most commonly affected age group to be between 21-30 years old, constituting 62.8% (22/35) of cases with a mean age of 24.6 ± 2 years. These results are comparable to those reported by Daniel DM [6] and Hawkins RJ ,[7] with mean ages of 26 and 22 years, respectively.

Contrary to many studies indicating higher ACL injury rates in women,[1] our study exclusively involved male participants (100%). This discrepancy may reflect cultural differences affecting sports participation among women in our region, or possibly a tendency for women to adapt their activities in response to ACL issues.

In our cohort, right knee injuries were more prevalent (57.1%), which is consistent with findings by Umesha et al. who reported a ratio of 1.72:1 of the right knee to be affected more than the left one [(8).8] The predominance of the right knee might be attributed to its dominant use, increasing its susceptibility to trauma.

The mechanism of injury predominantly involved non-contact events (82.8%), largely during sports activities (74.2%), similar to the proportions reported in literature reviews by Waldén et al. 2015, confirmed that most injuries (85%) resulted from non-contact mechanisms, with pressing, re-gaining balance after kicking, and landing after heading as common injury scenarios [9]

Regarding timing for surgical intervention, our findings suggest variability in patient outcomes based on the timing of surgery. Early surgery (1-6 months post-injury) was associated with better functional scores (mean Lysholm score of 88) compared to delayed procedures, in contrast to the findings by Vermeijden et al. who found that there were no significant differences in functional outcomes, including meniscal or chondral lesions, failure and reoperation rates, stiffness, range of motion deficits, complications, muscle strength, instrumented laxity, and overall functional outcomes between patients treated early and late [().10]

Effective quadriceps rehabilitation was crucial for successful outcomes, with pre-operative quadriceps muscle girth nearly identical to the contralateral side being a prerequisite for surgery in our study. Our

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clinical assessments predominantly relied on the Lachman test, which demonstrated high diagnostic accuracy, both pre- and post-operatively. This is in line with Donaldson et al findings which suggest its high sensitivity and specificity .[11]

Radiologically, routine X-rays and MRI were utilized to assess associated injuries and graft integrity. Our results align with Jeffrey, demonstrating the high sensitivity of MRI in detecting ACL pathologies and associated meniscal injuries, which were confirmed arthroscopically.[12]

During arthroscopic examinations, 28.5% of patients were found to have medial meniscus (MM) partial tears, for which partial meniscectomies were performed successfully. Additionally, 22.8% showed cartilage damage, treated via shaving during surgery.

These findings were compared to existing studies, with FR Noyes [13] (FR Noyes 1980) reporting higher incidences of femoral cartilage and MM injuries, and Matthew J. MD [14] noting a lower prevalence of MM injuries associated with ACL surgeries. This highlights the variability in injury patterns and emphasizes the need for tailored surgical interventions based on individual assessments.

The incidence of post-operative complications such as infection and graft failure were 5.7%, with specific cases requiring additional interventions. This rate is higher than that reported in some studies, possibly due to variations in sample sizes or clinical practices.[14]

An unusual complication observed in one participant following ACL reconstruction failure was distressing leg-foot paresthesia, which significantly impacted daily activities. This individual remains under continuous follow-up and treatment. Notably, this type of complication has not been widely documented in the literature, suggesting a rare or underreported phenomenon.

Our study employed the Tegner-Lysholm score scale, recognized for its effectiveness in assessing outcomes of knee surgeries. Initially, most patients scored poorly, indicating significant impact on their quality of life. Post-operatively, scores improved significantly, with most patients experiencing enhanced daily function and reduced symptoms.[15-17)]

Regular follow-ups over a year showed sustained improvements, with significant initial gains maintained. However, some variability was noted, such as persistent mild pain in 11.4% of patients and slight limping in 8.5%. Despite these issues, the improvements in knee function were

generally retained, and the use of supportive aids was not necessary.

These results highlight the effectiveness of the Tegner-Lysholm scale in monitoring post-surgical recovery and underscore the importance of tailored rehabilitation programs to optimize patient outcomes.

Of the patients with non-contact ACL injuries, 37.9% (11/29) were professionals and 51.4% (18/29) were recreational athletes. Post-surgery, professionals had a higher average Tegner-Lysholm score of 91.7, compared to 79.9 for recreational athletes, highlighting better recovery outcomes for those engaged in professional sports.

Conclusions

Our data show that professional athletes experience the most significant improvements following 4-strand hamstring ACL surgery, suggesting that they benefit most and should be prioritized for such procedures. Conversely, recreational athletes, particularly those whose injuries result from road traffic accidents or other accidents, display less motivation to adhere to our rehabilitation program. Additionally, non-professional patients typically see the most progress within the first six months post-surgery, with little improvement observed thereafter

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Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.
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