

To Compare the Post Operative Functional Outcome between Men and Women after Arthroscopic ACL Reconstruction

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Abstract

The anterior cruciate ligament (ACL) is one of 2 cruciate ligaments which aids in stabilization of the knee joint. It is a strong band made of connective tissue and collagenous fibres that originate from the anteromedial aspect of the intercondylar region of the tibial plateau and extends posteromedially to attach to the lateral femoral condyle.

Study Design: Prospective cohort study.

Study Area: This study was done at Hospital for Orthopedics, Sports Medicine, Arthritis and Accident -Trauma (HOSMAT), Bangalore, which is a tertiary care referral Centre for Orthopaedics and Sports medicine.

Results: The mean age of the study population was 32.91 ± 8.36 years. Based on distribution, 40% belong to 17-30 years, 42% belong to 31-40 years, 14% belong to 41-50 years, 4% belong to 51-60 years.

Conclusion: In conclusion, the findings of this study were able to demonstrate that females not only exhibited greater instrumented laxity after arthroscopic ACL reconstruction but also showed inferior functional scores in IKDC and Lysholm scoring systems as compared to men.

Keywords: Anterior cruciate ligament, Intercondylar, Tibial.

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Introduction

The anterior cruciate ligament (ACL) is one of 2 cruciate ligaments which aids in stabilization of the knee joint. It is a strong band made of connective tissue and collagenous fibres that originate from the anteromedial aspect of the intercondylar region of the tibial plateau and extends posteromedially to attach to the lateral femoral condyle. The anteromedial bundle and posterolateral bundle form the 2 components of the ACL. [1-3]

The Anterior and the posterior cruciate ligament (PCL) together form a cross (or an "x") within the knee and prevents excessive forward or backward motion of the tibia in relation to the femur during flexion and extension. The ACL additionally provides rotational stability to the knee with varus or valgus stress. [4]

The ACL is the most commonly injured ligament in the knee. The annual reported incidence in the United States alone is approximately 1 in 3500 people. However, data may not be accurate as there is no standard surveillance. Most ACL tears occur in athletes by noncontact mechanisms versus contact mechanisms, such as rotational forces versus a direct hit to the knee. [4]

There is no age bias; however, it has been suggested that women are at increased risk of ACL injury

secondary to a multitude of factors. Some studies suggest that females may have weaker hamstrings and preferential utilize the quadriceps muscle group while decelerating. When engaging the quadriceps musculature while slowing down, this places abnormally increased stress on the ACL, as the quadriceps muscles are less effective at preventing anteriortibial translation versus the hamstring muscles. A second factor that may increase the risk of ACL injury is the increased valgus angulation of the knee. [5,6]

With clear evidence of women experiencing higher rate of ACL injury, an increasing interest has been developed to examine if there are any gender differences in outcomes after ACL reconstruction. With over 100,00 ACL reconstruction cases being performed per year in the US alone, it highlights the importance of understanding the disparities that exist to provide adequate patient care. [4] The purpose of this prospective study is to determine whether the results of arthroscopic ACL reconstruction using various autologous grafts are equivalent in men and women at short range follow-up.

Materials and Methods

Study Design: Prospective cohort study.

Study Area: This study was done at Hospital for Orthopedics, Sports Medicine, Arthritis and Accident -

Trauma (HOSMAT), Bangalore, which is a tertiary care referral Centre for Orthopaedics and Sports medicine.

Study Population: All the patients in HOSMAT Hospital, Bangalore who satisfies inclusion criteria are considered for the study.

Sample Size: 60 cases (30 men and 30 women)

Statistical Analysis: Statistical Methods Statistical

analysis was performed by the software SPSS 22.0 version.

Continuous variables was explained with mean \pm SD and categorical variables by frequencies or percentages. The test of significance would be Z test of proportions and chi square test.

Results

Table 1: Distribution based on age

	Frequency	Percentage
17 – 30	40	40%
31 – 40	42	42%
41 – 50	14	14%
51 – 60	4	4%
Total	100	100%
Mean Age	32.91 \pm 8.36 years	

The mean age of the study population was 32.91 \pm 8.36 years. Based on distribution, 40% belong to 17-30 years, 42% belong to 31-40 years, 14% belong to 41-50 years, 4% belong to 51-60 years.

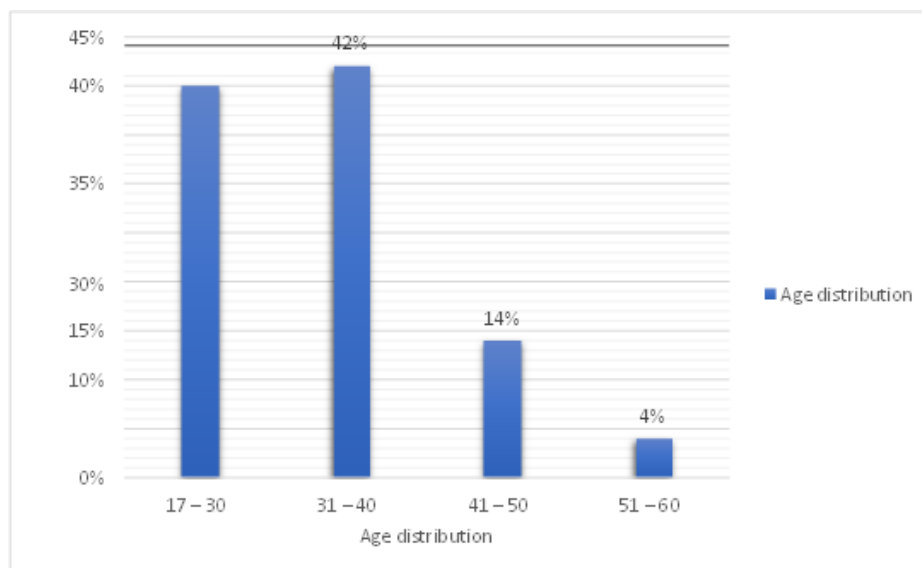


Figure 4: Distribution based on age

Table 2: Distribution based on gender

	Frequency	Percentage
Male	72	72%
Female	28	28%
Total	100	100%

In the present study, 72% were male and 28% were female.

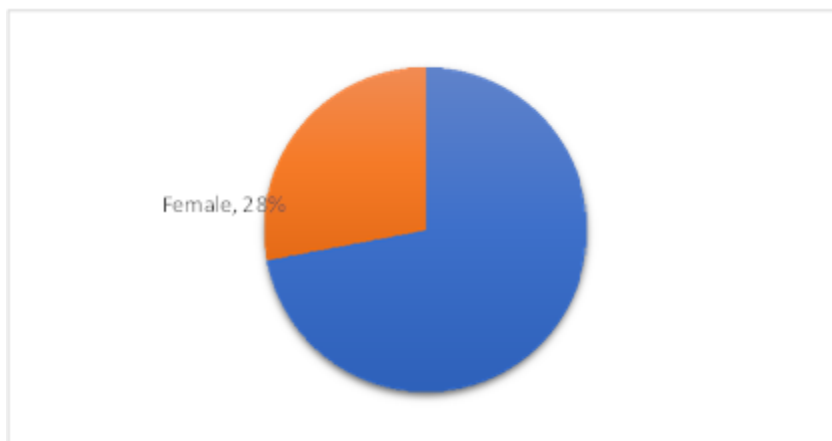


Figure 5: Distribution based on gender

Table 3: Distribution based on side of injury

	Frequency	Percentage
Right	52	52%
Left	48	48%
Total	100	100%

In the present study, 52% had right sided injury and left sided injury.

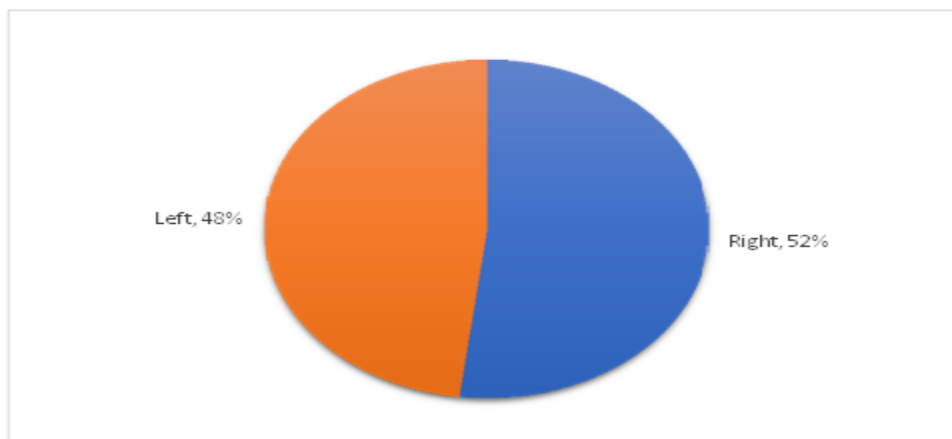


Figure 6: Distribution based on side of injury

Table 4: Distribution based on diagnosis

	Frequency	Percentage
ACL	47	47%
ACL + LM	16	16%
ACL + MM	25	25%
ACL + LM + MM	7	7%
ACL + MCL	1	1%
ACL + LM + MCL	1	1%
ACL + MM + MCL	1	1%
ACL + LM + MM + MCL	1	1%
ACL + PCL + MM	1	1%
Total	100	100%

Based on diagnosis, 47% diagnosed with ACL, 16% with ACL+LM, 25% diagnosed with ACL + MM, 7% diagnosed with ACL+LM+MM, 1% each diagnosed with ACL+MCL, ACL+MCL+LM, ACL + MM + MCL, ACL + MM + LM + MCL and ACL + PCL + MM.

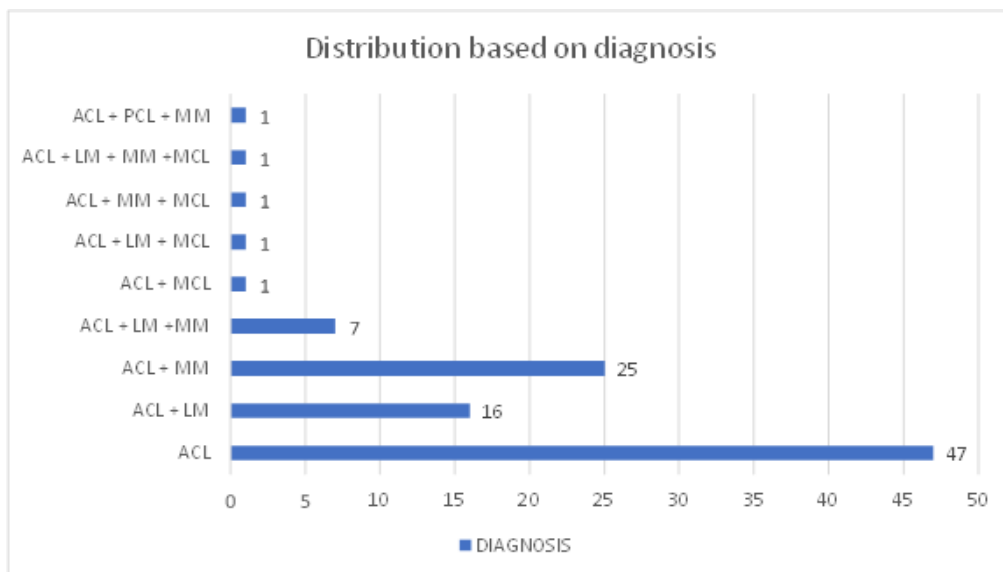


Figure 7: Distribution based on diagnosis

Table 5: Gender wise distribution based on diagnosis

	Male		Female		Total	
	N	%	N	%	N	%
ACL	33	45.8%	14	50.0%	47	47%
ACL + LM	13	18.1%	3	10.7%	16	16%
ACL + MM	19	26.4%	6	21.4%	25	25%
ACL + LM + MM	5	6.9%	2	7.1%	7	7%
ACL + MCL	0	0.0%	1	3.6%	1	1%
ACL + LM + MCL	1	1.4%	0	0.0%	1	1%
ACL + MM + MCL	0	0.0%	1	3.6%	1	1%
LM + MM + MCL	0	0.0%	1	3.6%	1	1%
ACL + PCL + MM	1	1.4%	0	0.0%	1	1%
Total	72	100.0%	28	100.0%	100	100%

Chi square test= 9.63, p=0.38, Not statistically significant

No statistically significant difference observed with relation to diagnosis and gender as the pvalue calculated to be >0.05.

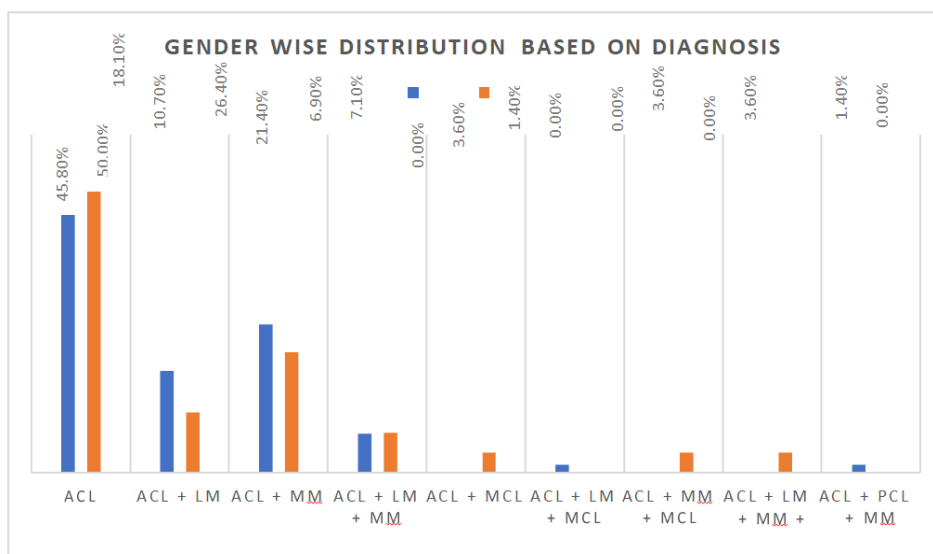


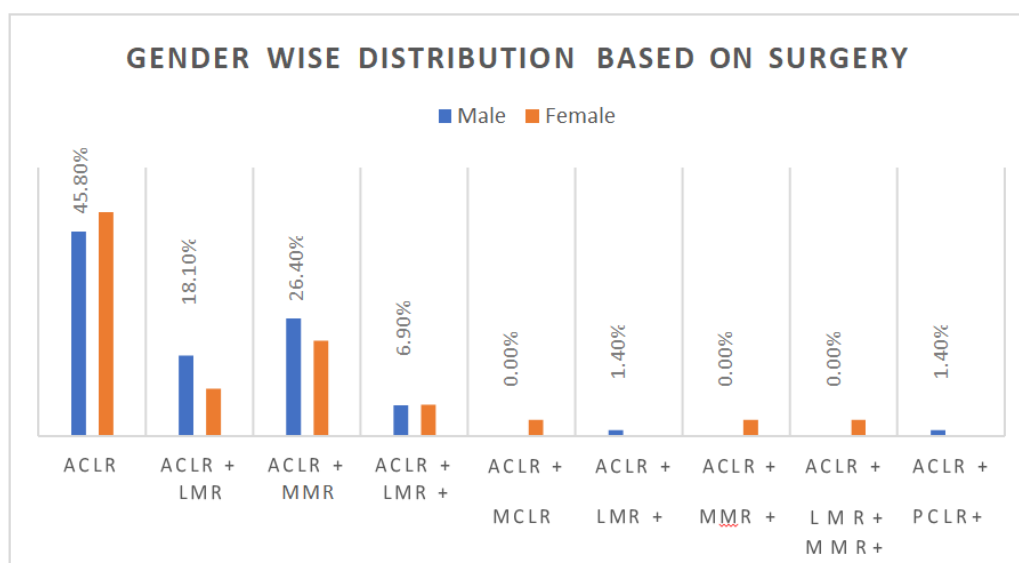
Figure 8: Gender wise distribution based on diagnosis

Table 6: Gender wise distribution based on Type of surgery.

	Male		Female		Total	
	N	%	N	%	N	%
ACLR	33	45.8%	14	50.0%	47	47%
ACLR + LMR	13	18.1%	3	10.7%	16	16%
ACLR + MMR	19	26.4%	6	21.4%	25	25%
ACLR + LMR + MMR	5	6.9%	2	7.1%	7	7%
ACLR + MCLR	0	0.0%	1	3.6%	1	1%
ACLR + LMR + MCLR	1	1.4%	0	0.0%	1	1%
ACLR + MMR + MCLR	0	0.0%	1	3.6%	1	1%
ACLR + LMR + MMR + MCLR	0	0.0%	1	3.6%	1	1%
ACLR + PCLR + MMR	1	1.4%	0	0.0%	1	1%
Total	72	100.0%	28	100.0%	100	100%

Chi square test= 13.76, p=0.31, Not statistically significant

In the present study, No statistically significant difference observed with relation to type of surgery and gender as the p value calculated to be >0.05.

**Figure 9: Gender wise distribution based on Type of surgery.**

Discussion

Anterior cruciate ligament (ACL) tears are among the most common orthopedic injuries, with annual incidence of isolated tears recently estimated to be approximately 70 cases per 100,000 person-years when adjusting for age and biological sex [7]

ACL reconstruction (ACLR) for ACL tears remains the standard of care for patients participating in high-demand activities, with the literature showing excellent postoperative outcomes in the vast majority of patients, particularly with the advancement of arthroscopic techniques^[73]. In an effort to better understand outcomes following ACLR, there has been a continued interest in the differences between male patients and female patients. ACLR outcomes have been evaluated in a variety of different ways within recent literature. Some studies have reported none to minimal differences between men and women regarding outcomes and laxity of knee joint after ACL reconstruction, others have reported significantly lesser outcomes and greater laxity in females [8-10].

This study aims to evaluate the differences between men and women in laxity and functional outcomes after arthroscopic ACLR reconstruction.

Age Distribution

The mean age of the study population was 32.91 ± 8.36 years. Based on distribution, 40% belong to 17-30 years, 42% belong to 31-40 years, 14% belong to 41-50 years, 4% belong to

51-60 years.

In the present study, 52% had right sided injury and left sided injury. In a similar study, Asaeta et al^[12] reported that female athletes were found to be four times more likely to sustain a second ACL injury and six times more likely to sustain a contralateral injury than male athletes following ACL reconstruction

Type of Graft

In the present study, HS graft was used in majority (75%) of the study population, BPTB in 3%, HS+PL in 2% and HS+PL+BPTB in 1% of the study

population. This observation was not statistically significant with relation to gender as the p value calculated to be >0.05 . Etzel et al [11] reported that BPTB autografts have lower graft failure rates in young women. BPTB and HT autografts have similar patient-reported outcomes in young women. More research is needed to analyze graft choice in this population. [12] Ferrari et al [9] reported that Preoperative KT-1000 Mean manual maximum side-to-side difference was 6.95 mm (SD, 3.5 mm; range, 1 to 15 mm) for men and 7.15 mm (SD, 3.0 mm; range, 0.5 to 13 mm) for women ($P=0.67$). Postoperative Overall KT-1000 results show a maximum side-to-side difference for men was 0.76 mm (range, 11.5 to 7.0 mm; SD, 2.8 mm) and 1.73 mm (range, 3 to 7 mm; SD, 2.2 mm) for women, which was statistically significantly lower ($P=.014$). However, no differences were found in the percentage of patients with greater than 5 mm side-to-side difference, with 5 men (4%) and 2 women (3%) being classified as arthrometric failures. Mouarbes et al., in a recent systematic review and meta-analysis, looked at ACLR outcomes with quadriceps tendon (QT) autograft, BTB autograft, and hamstring tendon autograft with a minimum 12-month follow-up. In both males and females, the authors found that QT autograft had comparable clinical outcomes, and graft survival rates compared with BTB and hamstring autografts, but that they had shown significantly less harvest site pain compared with BTB autograft and better functional outcome scores compared with hamstring autograft. However, the authors noted there while grafts are comparable, there are studies with reports of objectively increased laxity in female patients with hamstring autografts [13]. Salem et al [14], in 2019, performed a study comparing ACLR outcomes with BTB versus hamstring autografts in female patients (ages 15 to 20 years). At 24 months following ACLR, the authors found that BTB autograft leads to fewer graft ruptures than hamstring autograft in female patients. Within this subpopulation female athletes age 15–20, they are 2–8 times more likely to suffer a primary ACL tear than males playing similar sports and those who underwent ACL reconstruction the graft failure rate of BTB was 6.4% which was significantly lower than hamstring at 17.5% ($p = 0.02$), while there has been no statistically significant graft-specific failure rate in the general population. Additionally, younger female patients are more likely to have smaller hamstring grafts (8.22 mm (7–10.5)) which has been linked to increased risk of graft failure. This increased rate of graft failure was also demonstrated in the 2020 Group MK et al study which showed the incidence of ACL graft revision at 6 years after index surgery was 2.1 times higher with hamstring autograft compared to BTB autograft in a cohort of high school- and college-aged male and female athletes [15]

Conclusion

In conclusion, the findings of this study were able to demonstrate that females not only exhibited greater instrumented laxity after arthroscopic ACL reconstruction but also showed inferior functional scores in IKDC and Lysholm scoring systems as compared to men. It is worth mentioning that our study analysed the outcomes on a short-term follow up and literature exists on long term follow up which state otherwise as well. With broad evidence suggesting the disparities between the genders after ACL reconstruction, factors such as muscle strength differences, anatomical differences, biomechanical variations, access to care, compliance to exercise protocol and other factors needs to be considered. To improve the outcomes in females, further research is required with specific solutions addressing these issues.

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