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Original Article

Functional Outcome of Post Anterior Cruciate Ligament Reconstruction Patients in Dr. M. Djamil Central General Hospital Padang 2020-2022

Rinaldiansyah[1], Rizki Rahmadian[2*], Fory Fortuna[3], Roni Eka Sahputra[2], Yose Ramda Ilhami[4], Selfi Renita Rusjdi[5]

[1]Faculty of Medicine, Universitas Andalas, Padang, Indonesia
[2]Department of Orthopedics and Traumatology, Faculty of Medicine, Universitas Andalas/ Dr. M. Djamil Central General Hospital, Padang, Indonesia
[3]Department of Surgery, Faculty of Medicine, Universitas Andalas/ Dr. M. Djamil Central General Hospital, Padang, Indonesia
[4]Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Andalas/ Dr. M. Djamil Central General Hospital, Padang, Indonesia
[5]Department of Parasitology, Faculty of Medicine, Universitas Andalas, Padang, Indonesia

Correspondence should be addressed to Rizki Rahmadian, Department of Orthopedics and Traumatology, Faculty of Medicine, Universitas Andalas/ Dr. M. Djamil Central General Hospital, Perintis Kemerdekaan Street, East Sawahan, East Padang, Padang 25129, Indonesia. email: rizki_md@yahoo.com

ABSTRACT

Background: The anterior cruciate ligament (ACL) is the main stabilizer of the knee joint. The incidence of ACL injuries is quite high, especially in individuals who participate in sports. ACL injuries result in knee instability, hindering daily activities and sports participation. This study aimed to determine the functional outcomes of patients who have undergone ACL reconstruction.
Methods: This study was descriptive, with a cross-sectional approach, and used medical record data from Dr. M. Djamil Central General Hospital Padang. The total sampling technique was used from patients after ACL reconstruction in 2020-2022. Patients with bilateral knee injuries, multiple ligament injuries, or revision reconstruction were excluded from the study. The samples were contacted to determine their functional outcome by filling out the Lysholm Knee Score.
Results: This study analyzed 27 patients, with 77.8% in the 19-44 age group, and no patients were over 60 years old. This study identified 85.2% of male patients with sports-related injuries being the most common (70.4%). The non-dominant knee was injured more frequently (51.9%). Functional outcomes, as assessed by the Lysholm Knee Score, showed excellent, good, and moderate results in 37 %, 29.6%, and 33.3% of patients, respectively.
Conclusions: ACL reconstruction was most frequently performed in the adult population aged 19–44 years, predominantly in males. Sports-related injuries were the primary cause, with the majority of reconstructions involving the non-dominant knee. The average patient achieved good functional outcomes after ACL reconstruction.

Keywords: Anterior cruciate ligament reconstruction, Functional outcome, Human and medicine, Lysholm knee score, Sports injury

INTRODUCTION

The anterior cruciate ligament (ACL) is part of the cruciate ligaments in the knee that connect the femur bone to the tibia bone.[1] The ACL serves as the primary stabilizer of the knee to maintain normal biomechanical movement and prevent anterior translation of the tibia on the femur.[2] ACL rupture can lead to knee instability and may result in secondary bone injuries, joint structure damage, and disruption of daily activities.[3]

The incidence of ACL rupture is reported to be around 200,000 per year in the United States.[4] Based on a report in Italy in 2019, ACL rupture cases ranked highest among all major knee ligament injury events, accounting for 49%.[5] ACL rupture is a common type of knee injury occurring during sports and contributes to nearly 50% of all sports-related

knee injuries.[6] ACL is the most frequently ruptured ligament in athletes.[4]

For individuals with ACL injury and instability, ACL reconstruction with arthroscopy is considered the gold standard treatment.[7] International literature supports surgical ACL reconstruction as the preferred therapy for active individuals in sports due to the critical involvement of the ACL in joint kinematics and preservation of intra-articular knee structure.[8] ACL reconstruction surgery involves replacing the ligament using tissue graft with the aim of restoring its function to its original condition.[9] Tissue grafts used can be autografts, allografts, or artificial grafts. Hamstring tendon autograft is the graft of choice for ACL reconstruction at M. Djamil Central General Hospital Padang and is also the most widely used for ACL reconstruction worldwide.[10] Hamstring tendon offers better strength, lower donor site morbidity, and reduces the risk of patellar fracture compared to bone-patellar tendon-bone.[11]

Functional outcomes post-reconstruction have significant urgency as they reflect the success rate of the procedure and its impact on patient recovery and quality of life.[12] The Lysholm Knee Score is a valid, reliable, easy-to-use questionnaire used to assess various aspects of knee functionality.[13] Therefore, this questionnaire is often used to assess knee functional outcomes post-ACL reconstruction.[14]

Despite most patients achieving nearly normal levels of life and being able to return to sports activities,[15] data show that complications still frequently occur, with 39% of patients experiencing issues and 28% requiring reoperation.[16] These complications, such as knee pain, stiffness, limited range of motion, and muscle strength deficit, can hinder patients' ability to perform daily activities and even limit their participation in sports competitions.[7,16] Therefore, comprehensive understanding of functional outcomes post-reconstruction is crucial as it can provide valuable insights for medical practitioners in improving surgical techniques, planning patient rehabilitation, and providing accurate information to patients regarding recovery expectations and associated risks.[12]

Based on the above exposition, considering the high incidence of ACL injuries, it is important to assess the functional outcomes of patients after ACL reconstruction. Further research on patient functional outcomes after ACL reconstruction is needed, especially in West Sumatra, which has not been the focus of previous studies. By analyzing variables such as age, gender, mechanism of injury, and knee dominance, this study sheds light on how these factors influence functional outcomes in the local context. Such insights are critical for tailoring treatment plans, setting realistic recovery expectations, and improving rehabilitation strategies for specific patient subgroups. Therefore, researchers are interested in conducting a study on the functional outcomes using Lysholm Knee Score of patients post-ACL reconstruction at Dr. M. Djamil Central General Hospital Padang.

MATERIAL AND METHODS

Research Design and Setting

This study is classified as descriptive research with a cross-sectional approach. The research was conducted at the medical records department of Dr. M. Djamil Central General Hospital Padang in December 2023.

Study Population and Sampling

The total sampling technique was used to recruit participants from among the patients who had undergone ACL reconstruction between 2020 and 2022. All collected data were carefully matched according to the defined exclusion and inclusion criteria.

Inclusion and Exclusion Criteria

The inclusion criteria for this study were as follows:

- Patients who underwent ACL reconstruction.
- Patients who provided consent to participate in the study.

The exclusion criteria were as follows:

- Multiligament injury patients.
- Patients with bilateral ACL injuries.
- Patients undergoing revision ACL surgery.

Data Collection

Secondary data were obtained from medical records and included the patients' names, contact numbers, dates of birth, gender, and mechanisms of injury. For primary data collection, the researcher contacted respondents to seek their consent for completing the questionnaire. Following consent, a form was provided to the respondents containing informed consent information, patient biodata, details about the patient's dominant knee, and the Indonesian version of the Lysholm Knee Score questionnaire.[17]

Ethical Approval

Ethical approval for this study was granted by the Health Research Ethics Committee Dr. M. Djamil Central General Hospital Padang (No: DP.04.03/D.XVI.XI/626/2023)

RESULTS

The medical records department provided the initial data of 48 patients diagnosed with ACL. After excluding 12 patients who opted not to undergo ACL reconstruction surgery, two patients who were lost to follow-up, six patients with multiligament injuries, and one patient with bilateral knee injuries, the sample size for this study was reduced to 27 individuals.

Table 1 shows that the majority of ACL reconstruction cases occurred in the 19–44 years age group (77.8%), with no patients over 60 years. The gender distribution revealed a significant disparity, with males accounting for 85.2% of cases and females accounting for only 14.8%. Regarding the mechanism of injury, sports-related incidents were the most common, accounting for 70.4% of the cases. Additionally, injuries slightly favored the non-dominant knee (51.9%) over the dominant side (48.1%).

Mechanism of ACL Injury

Table 2 further details the mechanism of ACL injuries by age and gender. In the 19–44 years age group, sports-related injuries were predominant (78.9%), followed by non-sports injuries (75 %). Gender-specific analysis showed that all sports-related injuries occurred in males (100%), whereas non-sports injuries were evenly distributed between males and females (50% each). These findings emphasize the role of sports as a significant risk factor and highlight the predominance of ACL injuries in young, physically active males.

Table 1. Distribution of Patient Characteristics Frequency

Characteristics	Frequency (n)	Percentage (%)
Age Group (years)		
10-18	4	14.8
19-44	21	77.8
45-59	4	7.4
>60	0	0
Gender		
Men	23	85.2
Women	4	14.8
Mechanism of Injury		
Sport	19	70.4
Non-sport	8	29.6
Side Involved		
Dominant	13	48.1
Non-Dominant	14	51.9
Total	27	100

Table 2. Distribution of mechanism of ACL injury with age and gender

Characteristic	Mechanism of Injury	
	Sport n (%)	Non-Sport n (%)
Age Group (years)		
10-18	3 (15.8)	1 (12.5)
19-44	15 (78.9)	6 (75)
45-59	1 (5.3)	1 (12.5)
>60	0	0
Gender		
Men	19 (100)	4 (50)
Women	0	4 (50)
Total	19 (100)	8 (100)

Table 3. Distribution of Patient's Functional Outcome

Score Categories	Frequency (n)	Percentage (%)
Excellent	10	37
Good	8	2.7
Fair	9	33.3
Poor	0	0
Total	27	100

Functional Outcome

The majority of patients achieved favorable outcomes, with 37% rated as excellent, 29.7% as good, and 33.3% as fair, as seen in Table 3. Notably, no patient fell into the poor category, and the average Lysholm Knee Score was 86.85, categorized as good. These findings demonstrate the generally positive functional recovery following ACL reconstruction, with most patients achieving significant improvement in knee function.

DISCUSSION

This research analyzed age characteristics by recording the age of patients undergoing ACL reconstruction. The results of this study found that patients undergoing ACL reconstruction at Dr. Djamil Central General Hospital Padang from 2020 to 2022 were most frequently in the age group of 19-44 years, with 21 patients (77.8%), followed by the age group of 10–18 years with four patients (14.8%), and two patients (7.4%) in the 45–59 age group, with no patients found in the age group above 60 years. The research also found that the youngest patient undergoing ACL reconstruction was 16 years old, while the oldest patient was 51 years old, with an average age of 26 years. These findings are consistent with a study by Mlv et al. which found that the majority of ACL reconstruction patients were in the 21–25 age group, with the youngest patient being 16 years old, the oldest 58 years old, and an average patient age of 27.97 years.[18]

This study found that the majority of patients were young adults, with 70.4% of injuries resulting from sports activities and 29.6% from non-sports activities, such as traffic accidents. This is consistent with other research that concludes ACL injuries occur more frequently in physically active individuals.[19] The adult age, which is a productive period involving various activities such as work, social interaction, pursuing hobbies, and exercising, can render individuals susceptible to physical injuries.[20] These activities can disrupt the musculoskeletal system, including muscles, bones, joints, tendons, ligaments, and supporting connective tissues, with ACL injury being one of the consequences.[21]

The findings of this study revealed that the majority of adults participating in sports ac-

tivities, marked by ACL injuries in these patients, were caused by sports activities, accounting for 15 patients (78.9%). Young adults tend to exhibit less cautious behavior regarding the potential for knee injuries, such as engaging in reckless activities on the road or participating in challenging sports. Additionally, unstable emotional factors can influence the risk of injury, especially in contact sports such as football and basketball.[19] This study did not find any patients in the elderly age group, with only two patients (7.4%) in the pre-elderly age group. As individuals age, many tend to reduce the intensity and frequency of physical activities that pose a risk of ACL injury. Decreased participation in activities involving sudden or drastic movements is a natural response to physical changes that occur with aging. Additionally, the decline in muscle strength and flexibility often seen in older age can result in more controlled and less extreme movements, consequently reducing the risk of ACL injury.[22]

This study found that ACL reconstruction patients at Dr. M. Djamil Central General Hospital Padang from 2020 to 2022 were predominantly male, with 23 individuals (85.2%), while females accounted for four individuals (14.8%) with a ratio of 5.75 : 1. The findings of this study are consistent with research in India by Sudhakar et al. (2021), which found that ACL reconstruction patients were predominantly male, with 12 individuals (80%).[11] Research by Yuliana and Kushartanti (2020) in Yogyakarta also found a predominance of male patients, with 15 individuals (88.2%).[20] Studies examining the incidence of ACL injuries in general have found that such injuries occur more frequently in males due to their higher level of participation in sports, particularly high-risk sports such as soccer and basketball.[3] This aligns with the results of this study, which found that all ACL injuries resulting from sports activities occurred in male patients, totaling 19 patients (100%). This can be attributed to the dominance of males, as they tend to engage in activities with higher risks and have more active lifestyles. Typically, males have roles as breadwinners, which often involve traveling and engaging in tasks with significant impacts.[18]

However, other studies indicate that women are 3–6 times more likely to suffer ACL injuries compared to men due to the increasing athleticism and participation of women in sports.[23] Anatomical factors, such as differences in ACL diameter, smaller and narrower intercondylar area size, and joint laxity, have also been proven to be risk factors for non-contact ACL injuries. Additionally, neuromuscular abnormalities such as knee valgus position, lack of muscle control (activation of quadriceps and hamstring muscles), as well as issues with hips and core strength, are also suspected to contribute to the etiology of these injuries in women.[21]

Hormonal factors also play a role in this process. Estrogen receptors are present in ACL fibroblasts, which are responsible for collagen production, a major component of ACL tensile strength. When estrogen is abundant, collagen production may decrease, leading to a decrease in ACL strength. Some theories also state that the vasodilatory effects of estrogen can increase tissue water content, resulting in ligament stability disturbances. Additionally, relaxin is known to reduce ligament tensile strength by releasing metalloproteinases that can damage collagen. Therefore, these hormones likely play a direct role in weakening the ACL, which may contribute to the increased risk of ACL injuries in women.[24] This study found that men undergo ACL reconstruction more frequently due to their significantly higher sports participation. Despite the increasing participation of women in sports, the majority of participants were men, resulting in a higher likelihood of ACL injury among men. This study also did not find female patients with ACL injuries attributed to sports activities.

Various methods are used in the literature to describe foot dominance based on different tasks, such as the foot used to manipulate objects or lead movements, the supporting foot in unilateral stabilization tasks, or the foot used to kick a ball while standing in bilateral mobilization tasks.[25] This study employed a subjective evaluation

method involving questions about the preferred limb for specific actions, such as "the foot used to kick a ball, dribble a ball, the foot used to push off when jumping, and the preferred foot for standing on one leg." Although no neurological evaluation could be performed on the patients, the method used in this study has proven to be highly effective in determining foot dominance.[25]

The findings of this study indicated that the majority of patients underwent ACL reconstruction on the non-dominant knee side (14 individuals, 51.9%). This difference was not significantly different from the dominant knee side in 13 patients (48.1%). These results align with a study in Bali in 2020, which reported that ACL injuries often occur on the non-dominant side, accounting for 56.3%, due to lower quadriceps muscle strength as a support for the major ligaments in the knee joint compared to the dominant side.[21] However, these findings do not align with a study by Uzun et al. in Turkey, where the majority of ACL injuries occurred on the dominant knee side, with 120 out of 235 patients (51.1%), likely due to the high level of competitive sports and activities among the patients.[25]

This study found minimal differences in the number of injuries based on the knee side. The incidence rate of injuries on the knee side appears to be influenced by various factors, especially the type of sports performed by the patients, whether contact or non-contact sports. In contact sports such as soccer and basketball, injuries to the knee tend to occur due to trauma from contact with opposing players, making it difficult to predict which side will be injured. Conversely, in non-contact sports such as volleyball, running, and badminton, it can be predicted that the knee side used more often for support, rotation, and movement will have a higher risk of injury.[25]

This study focuses on evaluating the functional outcomes of patients post ACL reconstruction at Dr. M. Djamil Central General Hospital Padang with hamstring graft technique using Lysholm Knee Score. Of the 27 respondents, 37% achieved the category of excellent, indicating a significant improvement in their knee function post-surgery. Meanwhile, 29.7% obtained a score in the good category and 33.3% scored in the fair category. It is important to note that no patient scored poor. The average functional outcome score for patients in this study reached 86.85 points, which falls into the good category.

Similar results were obtained in a study by Shervegar et al., with an average Lysholm Knee Score post-reconstruction reaching 84.4 points, and a total of 64% of patients falling into the good and excellent categories.[26] Another study by Uzun et al. yielded similar results, with an average functional outcome score post-ACL reconstruction reaching 88.4.[25] Higher levels of functional outcomes were observed in the findings by Khan and Azzam, where the total percentage of good and excellent functional outcomes post-surgery reached 90% of the overall population.[27] Another study conducted by Sudhakar et al. also showed that the majority of functional outcomes were good and excellent, reaching 80%.[11]

The differing outcomes regarding the high percentage of respondents in the fair functional outcome category in this study may be attributed to various factors, with one of the most influential factors being patient noncompliance with the physiotherapy rehabilitation program after ACL surgery. Through rehabilitation, patients can achieve normal joint range of motion and pain-free movement, improve muscle strength around the knee, especially in the hamstring and quadriceps muscles, and attain normal proprioceptive function of the knee joint. This highlights the potential for expanding or improving rehabilitation and postoperative management to enhance functional outcomes, particularly in the moderate-outcome group. A deeper understanding of the challenges faced by respondents in achieving maximum scores can inform adjustments in rehabilitation strategies and postoperative care to optimize patient outcomes. Therefore, it is crucial to continuously address and refine these aspects to improve the quality of recovery after ACL recon-

struction. If rehabilitation implementation is effective, it will lead to optimal achievement of initial goals, and patients will attain highly satisfactory functional outcomes, consistent with the findings of the study by Ramadan et al. in Surakarta.[28]

The results of this study showed that all female patients had functional outcomes in the fair category. These findings align with the research by Devana et al.,[29] who concluded a significant relationship between gender and functional outcomes, where females tend to have lower functional outcomes and satisfaction levels than males. Biomechanical evaluations post-surgery often show superiority in males. Females commonly experience a decrease in knee extensor muscle strength compared to males at one year post-operation, and they also demonstrate slower development of quadriceps torque in the injured body part. Previous studies have also concluded that female athletes undergoing ACL reconstruction have lower rates of successful return to previous sports. They generally have suboptimal psychological readiness compared to male athletes.[29]

The limitations of this study include the evaluation of functional outcomes in patients after ACL reconstruction at Dr. M. Djamil Central General Hospital Padang using the Lysholm Knee Score questionnaire, which was completed online by the respondents. Consequently, the researchers were unable to directly observe and assess the physical condition of the patients' knees. Another limitation is the limited number of ACL reconstruction cases in 2020, as many patients deferred surgery due to the Covid-19 pandemic.

CONCLUSION

ACL reconstruction was most frequently performed in the adult population aged 19–44 years, predominantly in males. Sports-related injuries were the primary cause, with the majority of reconstructions involving the non-dominant knee. The average patient achieved good functional outcomes after ACL reconstruction. These findings can guide clinicians in optimizing surgical and rehabilitation strategies, improving patient education, and enhancing overall care quality. Further studies with advanced statistical analyses are needed to gain deeper insights and to enhance their clinical relevance.

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DATA AVAILABILITY STATEMENT

Due to privacy restrictions, raw data cannot be made publicly available. However, aggregated and anonymized data are available from the corresponding author upon request.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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