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ORIGINAL ARTICLE

Effects of anterior cruciate ligament rupture and reconstruction on sexual activity of male patients

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ABSTRACT

Objectives: This study aims to investigate the impact of anterior cruciate ligament (ACL) injury and its reconstruction on men's sexual functions.

Patients and methods: Between February 2016 and November 2019, a total of 27 sexually active male patients (mean age: 33.7±4.3 years; range, 26 to 40 years) who were operated for ACL injury at least six months after trauma were retrospectively analyzed. Erectile function was assessed using the International Index of Erectile Function questionnaire (IIEF) and knee function was evaluated by using the International Knee Documentation Committee (IKDC) Scoring System, Lysholm Knee Scoring Scale, and Tegner Activity Score. Sexual and functional questionnaires were applied to evaluate three different periods retrospectively. These periods were as follows: the period before an ACL injury (Period I); the period in which the patient suffered from an ACL injury, but not operated (Period II), and the period after the ACL reconstruction (Period III).

Results: There was a statistically significant difference in the comparison of knee function scores according to three different periods. Sexual function scores were significantly different between Periods I and II, and between Periods I and III. However, although the IIEF value was higher in Period III than in Period II, no statistically significant difference was observed. A moderate correlation was found between the sexual functional scores of IIEF and IKDC scores.

Conclusion: Our study results suggest that ACL injury affects sexual functions adversely. The change in sexual functions after ACL surgery depends on the success of surgery. While deciding on the treatment of ACL injury, the patient's sexual life should be questioned along with his expectations.

Keywords: Anterior cruciate ligament, knee, orthopedic, sexual activity, sexual, sports medicine.

Sexual activity is an important factor that affects the quality of life.[1] Problems with sexual activity can cause serious negative effects on an individual's life. It is strongly associated with physical and emotional dissatisfaction and depression.[2,3] The World Health Organization (WHO) defines sexual health as "a physical, emotional, mental and social state of well-being associated with sexuality".[4] Anterior cruciate ligament (ACL) injury and reconstruction, which affects the state of physical well-being, can affect the sexual health of individuals.

Anterior cruciate ligament is the most commonly injured ligament in the knee caused by trauma in active individuals, and it affects knee stability and proprioceptive sensation, causing instability in the knee, weakness and weakening of the leg.[5,6] Individuals may not return to their physical activity routines; they may avoid putting pressure on their knees. In addition, the patients may not regain the knee functions necessary for sexual activity after ACL injury. There is no study to examine the relationship between ACL injury and sexual activity

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in the literature, and sexual activity is not usually questioned in the evaluation of patients. This study is planned to fill this gap in the literature.

In the present study, we hypothesized that ACL rupture would negatively affect the sexual activity and ACL reconstruction would positively affect sexual activity. We, therefore, aimed to investigate the effects of ACL rupture and reconstruction on the sexual health of male patients and to evaluate the necessity of questioning sexual activity while deciding on surgery for patients with ACL injuries.

PATIENTS AND METHODS

This single-center, retrospective study was conducted at Kayseri City Hospital, Department of Orthopedics and Traumatology between February 2016 and November 2019. Patients who underwent ACL reconstruction due to ACL injury in our hospital were screened. Male patients aged between 18 and 50 years, who underwent surgery at least six months after trauma, had anatomical single-bundle arthroscopic ACL reconstruction with hamstring graft, applied the same rehabilitation protocol after surgery, were followed for at least six months after surgery, were included in the study. Patients who had surgical site infection, bilateral ACL injuries, additional injury such as posterior cruciate ligament, medial collateral ligament, lateral collateral ligament, posterolateral corner injury or meniscus tear, were not sexually active, or had additional internal, urological, psychiatric problems could affect sexual activity were excluded from the study. Finally, a total of 27 male patients (mean age: 33.7±4.3 years; range, 26 to 40 years) who met the study criteria were enrolled (Figure 1).

Evaluation of knee functions

The patients were called for a final check-up and their complaints were questioned and examined by a single team. The International Knee Documentation Committee (IKDC), Lysholm and Tegner scoring systems were used to identify the knee function of the patients.[7,8] To evaluate knee functions, three different questionnaires were administered to these patients who had anterior cruciate reconstruction and at least six months after surgery, for three different retrospective time periods. The period in which the patient lived a normal life before the injury (Period I), the period when the injury occurred, but in which the patient was not operated and took at least six months (Period II), and the period from

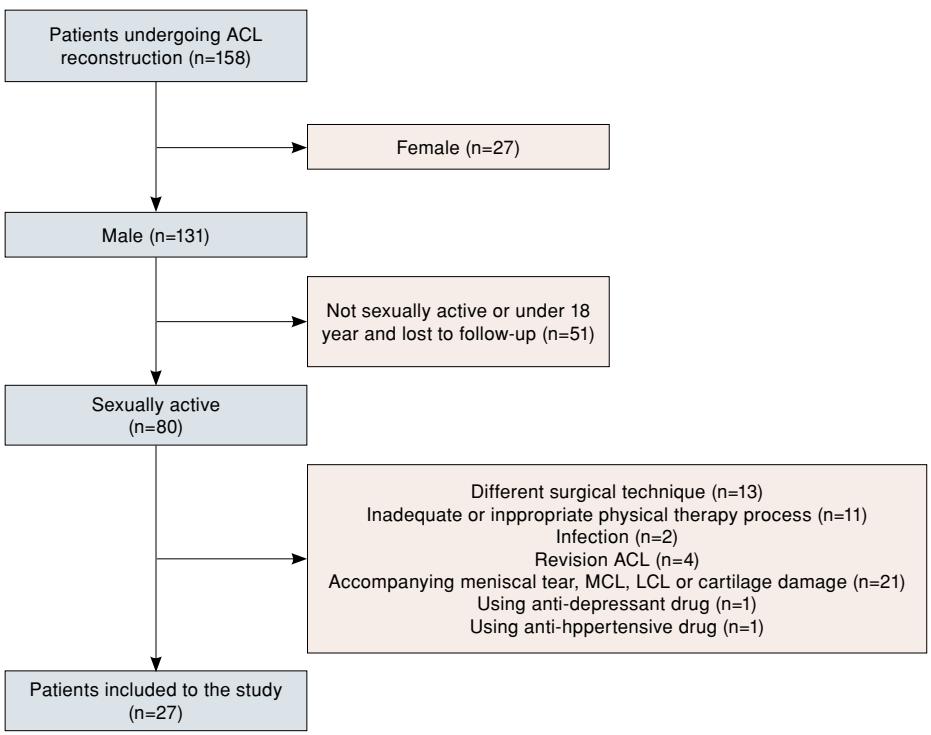


FIGURE 1. Study flowchart.
ACL: Anterior cruciate ligament; MCL: Medial collateral ligament; LCL: Lateral collateral ligament.

which six months passed since the operation until date (Period III).

Evaluation of sexual functions

While performing knee function scoring, sexual function scoring was also done. The International Erectile Function Index (IIEF) was used to evaluate sexual functions.[9] The IIEF form was applied separately for three different periods of time: pre-injury period (Period I), period between injury and surgery (Period II), and postoperative period (Period III) at the final control.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean ± standard deviation (SD), median (min-max) or number and frequency, where applicable. The suitability of the data to normal distribution was tested using the Shapiro-Wilk test. Friedman test was used to analyze repeated measurements. Binary comparisons between repeated measurements were made with the Dunn test. The relationship between participants' sexual function scores and knee function scores was evaluated using the Spearman correlation analysis. A p value of <0.05 was considered statistically significant.

RESULTS

The mean and median values of age, height, weight and body mass index of all patients included in the study are shown in Table I. Twelve (44.4%) patients had ACL reconstruction from the right knee and 15 (55.6%) from the left knee.

Knee functional evaluation results

In the comparison between Period I and II, which showed the effect of ACL injury on knee functions, the scores of Period II Tegner (2 [0-6]), Lyscholm (42 [11-72]) and IKCD (27 [12-68]) were lower compared to the Period I (6 [4-9], 100 [100-100], 82 [70-97], respectively). The difference between the periods was considered statistically significant (p<0.05) (Table II).

In the comparison between Periods II and III, which showed the effect of ACL reconstruction on knee functions, the Tegner (4 [2-6]), Lyscholm (83 [40-99]), and IKCD (53 [38-67]) scores in Period III were higher than Period II. The difference was statistically significant in Tegner, Lyscholm, and IKDC scores (p<0.05) (Table II).

In the comparison between Periods I and III, which showed the success of the reconstruction, the Tegner (4 [2-6]), Lyscholm (83 [40-99]), and IKCD (53 [38-67]) scores were lower in Period III compared to Period I (6 [4-9], 100 [100-100], 82 [70-97]), respectively and the postoperative functions could not reach the preoperative values. The difference was statistically significant in Tegner, Lyscholm, and IKDC scores (p<0.05) (Table II).

Sexual function results

In the comparison between Periods I and II, which showed the effect of ACL injury on sexual functions, the IIEF score in Period II (55.0 [14.0-70.0]) was lower compared to Period I (69.0 [64.0-73.0]). The difference between the periods was considered statistically significant (p<0.05) (Table III).

In the comparison between Periods II and III, which showed the effect of ACL reconstruction on sexual functions, the IIEF score in Period III (60.0 [48.0-71.0]) was higher than in Period II (55.0 [14.0-70.0]). The change in IIEF score was not considered significant (Table III).

In the comparison between Periods I and III, which showed the success of the reconstruction, the IIEF score in Period III (60.0 [48.0-71.0]) was lower than in Period I (69.0 [64.0-73.0]). The change in the IIEF value was considered statistically significant (p<0.05) (Table III).

TABLE I
Age, height, weight, body mass index and follow up period after surgery data of the patients (n=27)

	Mean±SD	Median	Lowest-Highest
Age (year)	33.7±4.3	34.0	26-40
Height (cm)	178.3±4.4	178.0	170-187
Weight (kg)	84.6±9.5	85.0	62-99
BMI (kg/m^2)	26.6±2.5	26.3	20.7-31.3
Follow-up (months)	28.9±1.7	30.0	12-40

SD: Standard deviation; BMI: Body mass index.

TABLE II
Evaluation of knee function results between periods

	Period I		Period II		Period III		
	Median	Min-Max	Median	Min-Max	Median	Min-Max	*p*
Tegner (n=27)	6	4-9	2	0-6	4	2-6	<0.001*,†,‡
Lyscholm (n=27)	100	100-100	42	11-72	83	40-99	<0.001*,†,‡
IKDC (n=27)	82	70-97	27.0	12.0-68.0	53	38-67	<0.001*,†,‡

IKDC: International Knee Documentation Committee; * Shows the statistically significant difference between Period I-Period II (p<0.05); † Shows the statistically significant difference between Period II-Period III (p<0.05); ‡ Shows the statistically significant difference between Period I-Period III (p<0.05).

TABLE III
Evaluation of the results of sexual function between periods

	Period I		Period II		Period III		
	Median	Min-Max	Median	Min-Max	Median	Min-Max	*p*
IIEF (n=27)	69.0	64.0-73.0	55.0	14.0-70.0	60.0	48.0-71.0	<0.001*,†,‡

IIEF: International Erectile Function Index; * Shows the statistically significant difference between Period I – Period II (p<0.05); † Shows the statistically significant difference between Period II – Period III (p<0.05); ‡ Shows the statistically significant difference between Period I – Period III (p<0.05).

Relationship between knee and sexual functions

A moderate correlation was found between sexual functional scores of IIEF and IKDC scores (r=0.393, p<0.05).

DISCUSSION

In our study, a significant deterioration in sexual functions and improvement after reconstruction were detected after ACL injury. We believe that pain is the cause of impaired sexual functions, impaired sexual concentration of feelings of insecurity, weakening of extensor muscle strength or impaired proprioceptive function. Post-traumatic psychological factors also probably contribute to sexual dysfunction. Research on sexual activity in patients with other medical conditions such as cancer and pelvic floor disorders has shown that stress, anxiety, and depression are the main contributors to sexual dysfunction. Similarly, the psychological and emotional effects of trauma can reduce libido and performance after trauma.[10] The robustness of reconstruction affects overall sexual satisfaction.

Previous studies have demonstrated that an active sex life is linked to health, and limitations in sexual activity can cause unhappiness and tension in daily life.[11] Orthopedic surgeons rarely talk to patients about sexual activity. Therefore, physicians have little information about patients' expectations, limitations, and return to sexual activity. However, there are many studies in the literature showing that orthopedic problems and surgical interventions affect sexual activity.[12]

According to the study published by Yoon et al.,[13] 53.1% of patients with total hip arthroplasty had difficulty during intercourse due to limitations and pain before undergoing surgery. A total of 39.1% of patients had difficulty in positioning the leg during the postoperative relationship and had to change position due to fear of dislocation.

In a study investigating the effect of total knee replacement on sexual functions, sexual quality or frequency was found to be limited before surgery in 45% of patients.[14] Patients experienced sexual limitations of an average of 17.1 months (range, 0 to 60) before surgery, largely due to pain (87%) and decreased clearance or flexibility (44%). A total of 55% patients reported the need to change their sexual position to fit their knees, and 97% of these patients avoided kneeling during sex. Postoperatively, fewer patients had to adjust their sexual positions to fit their knees and avoided weighting on the affected knee during sex. After one-year recovery, 60% of the patients could do sexual activity more easily than the previous year, 84% of these patients suffered from less pain, and 30% experienced greater mobility or range of motion. In the study of Adas et al.,[15] postoperative sexual functions were found to be similar to preoperative sexual functions in 12 (11%) of 108 patients who underwent external fixation. However, postoperative scores decreased in 96 (89%) patients. None of the

patients reported permanent sexual dysfunction.[15] In the study of Shulman et al.,[10] among patients who had orthopedic trauma that did not include the pelvic region, sexual dysfunction was reported in 31% of proximal humerus fracture patients, 32% of distal radius fracture patients, 47% of tibial plateau patients, 11% of ankle fracture patients, and 42% of long bone nonunion at three-month follow-up. In the study by Nugent et al.,[12] 65% of patients with rotator cuff tears reported that their shoulders interfered with the quality and/or frequency of their sexual activity. After surgery, the majority of patients (79%) showed improvement in sexual activity. In addition, 31% of the patients removed their sling to engage in sexual activity after the surgery.

Quadriceps muscle is actively used in many sexual intercourse positions. Many possible etiological factors for quadriceps muscle weakness associated with ACL damage and reconstruction have been identified, but have not been definitively clarified yet. Results are usually shown to be responsible for arthrogenic muscle inhibition and muscle atrophy, and decreased muscle strength. Arthrogenic muscle inhibition is particularly due to the injured joint. Due to reduced sensation, the muscles are affected and decreased motor stimulation disappears and causes muscle inhibition. It is thought that the loss of mechanical receptors in the ACL disrupts the ligament-muscle reflex between the ACL and quadriceps, causing it to be unable to actively receive high-synonymous motor units during voluntary quadriceps contractions.[10] Arthrogenic muscle inhibition has been defined in all studies examining ACL rupture and quadriceps activation after reconstruction. Although biomechanical stability is achieved after ACL reconstruction, loss of proprioceptive function and quadriceps strength may be associated with the inability to reach pre-injury level, despite a statistically significant elevation of sexual functions after ACL reconstruction.

To date, many evaluation criteria have been established to evaluate the results of ACL reconstructions and compare them with each other. Common use of these are Lysholm and Tegner activity scales, and IKDC knee ligament evaluation form.[7,8] In this study, the IKDC form was used, which is frequently used in the literature and accepted as valid, and Lysholm criteria, which is a subjective evaluation method based on the satisfaction of patients. Also, we conducted a correlation study between sexual function and knee function scores, considering that the physical examination findings may not always be compatible with the functional results of the knee. We found a moderate correlation between IIEF and IKDC scoring from their sexual functional scores.

The number of individuals with an active sexuality is significantly more than those who have a sedentary lifestyle and would not be able to return to sports activities. Sexuality is known as an important component of human identity throughout its life cycle. Although studies have shown that the prevalence of sexual activity decreases with age, individuals may also be sexually active in their 70s and 80s.[16] Therefore, while making surgical treatment decisions, physical activity and patient expectations, as well as the sexual life of the patient, should be questioned.

In the present study, the preferred positions in sexual activity are not questioned. The retrospective design of the study and the small number of patients are the main limitations. In addition, Since the questionnaire was made at the last control, the patients had difficulty remembering period I and period II while remembering period III more easily. Further large-scale, prospective studies are needed to confirm these findings.

In conclusion, ACL injury causes worsening of sexual function scores in parallel with knee function scores and reconstructive of the ligament causes improvement in these scores; however, there is no return to pre-injury scores. The success of reconstruction affects overall sexual satisfaction. Based on these findings, while making the decision of surgical or conservative treatment, the patient's sexual life should be questioned with the expectation of the patient.

Ethics Committee Approval: The study protocol was approved by the Kayseri City Hospital Clinical Research Ethics Committee (date: 09.07.2020, no: 96). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Consent for Publication: A written informed consent was obtained from each patient.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Conceived of the study, and participated in its design and coordination: E.C.M., F.O.; Collected data from participants: E.C.M., M.E.; Performed the statistical analysis: E.C.M., A.E.G.; Helped to draft the manuscript: E.C.M., E.S., M.K.

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