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ORIGINAL ARTICLE

Fear of re-injury and its effect on returning to pre-injury sports activity level following anterior cruciate ligament reconstruction: single-center study

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ABSTRACT

Objective: To investigate the fear of re-injury and its effect on returning to pre-injury sports activity level among patients who underwent anterior cruciate ligament (ACL) reconstruction.

Methods: A cross-sectional study was conducted among patients who underwent ACL reconstruction in King Fahad Hofuf Hospital, Eastern province, AlAhsa, Saudi Arabia in the last 5 years with a sample size of 385 patients. The questionnaire included the Arabic version of the return to sport (RTS) after ACL scale to assess patients' readiness for RTS without the fear of ACL injury, and Godin Leisure-Time Exercise Questionnaire to determine the level of exercise following surgery.

Results: A total of 204 patients eligible for the study were included with a mean age of 29.9 ± 14.5 years. Exactly 199 (97.5%) patients were males and 185 (90.7%) were football players. Among patients, 62.5% felt relaxed about playing sports and confident about the ability to perform well at sport (60.3%). However, only 46.4% of patients had thought of being likely to re-injury of knee by participating in sports again. Post-surgery, 89.2% were highly active. Young-aged patients and students showed statistically significant (p = 0.004) scores to return to pre-injury sport activity.

Conclusion: Less than half of the ACL reconstruction patients experienced fear of re-injury. Therefore, optimizing the surgical technique along with post-operative close follow up of the patient's psychological and physical status affect the patient's performance and activity level after surgery.

Keywords: Anterior cruciate ligament, sport activity, fear of injury, ACL reconstruction, Saudi Arabia.

Introduction

An anterior cruciate ligament (ACL) tear is one of the most frequent sports-related knee injury and the incidence of it is increasing yearly worldwide [1,2]. People who are in professional sporting groups are at higher risk of developing this type of injury [3]. The diagnosis of ACL tear could be made by taking history, physical examination, and mainly radiography using magnetic resonance imaging [4,5]. After confirming the diagnosis of ACL tear, the patient should proceed with the treatment that aimed to restore the knee function and improve the quality of life [5]. The treatment plan should be individualized for each patient to achieve that goal because rehabilitation and surgical techniques could vary from one patient to another [5]. Following ACL reconstruction, rehabilitation is a crucial part of the recovery in order to obtain good functional stability, get to the desired performance level, and minimize the risk of re-injury [6].

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Allowing the patient to return to sporting activities after ACL reconstruction remains a difficult decision that orthopedic surgeons must take [7]. Many factors must be considered before the patient could participate safely in physical activities and load the reconstructed knee [7]. Despite these efforts, more than 50% of the patients fail to return to their pre-injury activity level within 2 years following surgery [8]. The failure to return to pre-injury sport or activity level is attributed mainly to persistent knee symptoms such as pain, swelling, job nature, family demands, lack of interest post-surgery, and a common fear of re-injury [8].

Plenty of studies have been conducted globally concerning the fear of re-injury and its impact on return to pre-injury sport activity after ACL reconstruction. In a cross-sectional study conducted in Sweden, only 40% returned to their pre-injury sport following the surgery. Participants who did not return to their pre-injury sport linked that to not trusting their knee, fear of re-injury, and poor knee function [9]. Psychological readiness to return to sport (RTS) was the strongest factor associated with a successful return to pre-injury activity after ACL reconstruction [9]. In a meta-analysis and systematic review by Ardern et al. [10], among 5,770 participants, found that fear of re-injury was the main factor associated with lack of sport participation following ACL reconstruction despite normal knee function.

In the Kingdom of Saudi Arabia, only a few studies have been conducted to investigate the fear of re-injury and its impact on return to pre-injury sport activity following ACL reconstruction. In a cross-sectional study conducted in Jeddah, the authors concluded that fear of re-injury despite good functional outcomes could be increased due to many factors such as rate of sports participation, resuming activity following the injury and knee function [11]. There is a lack of studies that address this issue in the Eastern Province of Saudi Arabia. Therefore, this study aimed to investigate the fear of re-injury and its effect on returning to pre-injury sports activity level among patients who underwent ACL reconstruction in King Fahad Hospital, in Hofuf in AlAhsa region in the Eastern Province of Saudi Arabia.

Subjects and Methods

This was a cross-sectional study conducted among patients who were admitted and underwent ACL reconstruction in King Fahad Hofuf Hospital, Eastern Province, AlAhsa, Saudi Arabia. Since there are no similar previous studies conducted at the same center or the region in this regard, the research involved a convenient sample size that included all patients who underwent ACL reconstruction in the past 5 years from 2017 to 2021. Using the Cochran formula; $n = z^2 (p) (1-p) \div C^2$, where z = standard normal deviation set at 95% confidence level (1.96), p = percentage picking a choice or response (0.5), and c = confidence interval (0.05). The sample size was estimated to be 385 patients.

The inclusion criteria were restricted to the patients who were admitted and underwent unilateral ACL reconstruction in King Fahad Hofuf Hospital, AlAhsa, Eastern Province, Saudi Arabia, and those who underwent concomitant knee surgery along with ACL reconstruction for both genders aged 18 years and above and who participated in sports before the surgery and were mentally stable and they voluntarily decided to participate. However, those who underwent bilateral ACL reconstruction and those who were not participating in sports prior to surgery or those who underwent another type of surgery on the same leg (other than knee) concomitantly with ACL reconstruction. Or those who were from other regions and patients who were below 18 years and those who had any underlying inflammatory symptoms (e.g., redness, swelling, pain, and limited range of motion) or those who had any leg, knee, or foot congenital diseases or abnormalities or deformities and those who were suffering from mental illness or being treated for a psychiatric disease or not voluntarily decided to participate were excluded from the study.

The questionnaire was divided into five parts. The first part demonstrated the patient's biographical data including gender, nationality, age, job, residence, marital status, and educational level. The second part contains the patient's type of sports participation, years of sports participation, number of sport activities per week, hours of sports activity per day. Third part included the patient's past medical, surgical history (orthopedic and non-orthopedic), year of ACL surgery, which knee was operated, other knee operation at the same time, primary or revision surgery, history of surgery on the same leg, and duration of rehabilitation. Fourth part included the Arabic version of RTS after ACL scale [12]. The questionnaire included 12 questions to assess patients' readiness to RTS without the fear of ACL injury. Fifth part used the Godin Leisure-Time Exercise Questionnaire (GLTEQ) to determine the level of exercise following surgery [13].

The questionnaires were collected using Google forms, and the data were exported using Microsoft Excel Software. The data were collected, reviewed, and then fed to Statistical Package for Social Sciences version 21 (SPSS: An IBM Company). All statistical methods used were two-tailed with an alpha level of 0.05 considering significance if p-value was less than or equal to 0.05.

As for Anterior Cruciate Ligament Return to Sport after Injury (ACL-RSI), the score was graded on a visual analog scale from 0 points (extremely negative psychological responses) to 100 points (no negative psychological responses). The mean score for each domain and overall mean score (out of 100) were displayed with standard deviation.

Considering GLTEQ which assesses physical activity level, the overall score was obtained and categorized into highly active, moderately active, or insufficiently active based on referenced scoring method and cutoff

points [13]. Descriptive analysis was done by prescribing frequency distribution and percentage for study variables including participants' personal data, medical history, type and duration of sport, and ACL reconstruction data. Overall post-surgical post activity level among study patients was graphed. Cross tabulation for showing factors associated with patients RSI using one-way analysis of variance (ANOVA) and independent sample *t*-test.

Results

A total of 204 patients eligible for the study were included. Patients' ages ranged from 18 to 49 years with a mean age of 29.9 ± 14.5 years. Exactly 199 (97.5%) patients were males and the vast majority (98.5%) were Saudi nationals. A total of 142 (69.6%) were married. As for educational level, 123 (60.3%) had a university level of education or above. Exactly 114 (55.9%) were government employees. A total of 24 (51.1%) had a chronic health problem and 36 (42.9%) had undergone surgery (non-orthopedic). As for played sports, 185 (90.7%) played football which was for more than 10 years among 68.1% (Table 1).

The surgery of right knee was done among 137 (67.2%) patients. The reconstruction surgery was done on one phase among 192 (94.1%) patients. A total of 102 (50%) patients did physiotherapy for less than 6 months (Table 2).

As for emotions, the highest positive score was for feeling relaxed about playing sport (62.5%), followed by being nervous about playing sport (54.7%). The lowest positive score was for being fearful of re-injuring knee by playing sport (46%). Considering confidence in performance, the highest positive score was for being confident about the ability to perform well at sport (60.3%), followed by being confident that the knee would not give way by playing sport (60.1%). Regarding risk appraisal, the highest positive score was for thoughts of going through surgery and rehabilitation would prevent from playing sport (57.8%). The highest mean score was for confidence in performance (58.5% ± 28.3%), followed by emotions (52.8% ± 29.3%), and for risk appraisal (52.1% ± 28.8%). The overall mean score regarding return fear was 55.1 ± 27.2 (Table 3).

Exactly 182 (89.2%) were highly active, while 11 (5.4%) were insufficiently active/sedentary (Figure 1).

A higher positive score was significantly found among young-aged patients (64%) than among old age group (47.2%) (p = 0.004). Also, divorced/widow had a higher positive score than married (70.6% *vs.* 50.4%, respectively; p = 0.001). Students showed higher positive score for return than governmental employee (80.8% *vs.* 50.8%; p = 0.001). Also, the mean return score was 61.6% for those who played sport for 1-5 years versus 39.6% for others who played sport for less than 1 year (Table 4).

Table 1. *Bio-demographic characteristics of patients who were admitted and underwent ACL reconstruction in King Fahad Hofuf hospital, Al-Ahsa, Saudi Arabia.*

Bio-demographic data	*N*	%
Age in years		
18-24	17	8.3
25-29	43	21.1
30-34	55	27.0
35-39	46	22.5
40-44	33	16.2
45-49	10	4.9
Gender		
Male	199	97.5
Female	5	2.5
Nationality		
Saudi	201	98.5
Non-Saudi	3	1.5
Marital status		
Single	56	27.5
Married	142	69.6
Divorced/widow	6	2.9
Educational level		
Below secondary	10	4.9
Secondary/diploma	71	34.8
University/above	123	60.3
Employment		
Unemployed	14	6.9
Student	13	6.4
Governmental sector employee	114	55.9
Private sector employee	63	30.9
Have chronic health problem		
Yes	24	51.1
No	23	48.9
History of undergoing surgery		
Yes	36	42.9
No	48	57.1
What kind of sport did you do before the injury?		
Foot ball	185	90.7
Others	19	9.3
How many years have you played the mentioned sport?		
<1 year	13	6.4
1-5 years	21	10.3
5-10 years	31	15.2
>10 years	139	68.1

Table 2. *ACL reconstruction data among study patients, King Fahad Hofuf hospital, Al-Ahsa, Saudi Arabia.*

ACL reconstruction data	*N*	%
Side of ACL surgery		
Right knee	137	67.2
Left knee	67	32.8
Do you have injuries to other ligaments of the knee?		
No	204	100.0
Stage of the reconstruction surgery		
One stage	192	94.1
Two stages	12	5.9
Physiotherapy period after the reconstruction surgery		
<6 months	102	50.0
6-12 months	85	41.7
>12 months	17	8.3

Table 3. *ACL-RSI among study patients.*

ACL-RSI	*N*	%
Emotions		
Are you nervous about playing your sport?	54.7	35.9
Do you find it frustrating to have to consider your knee with respect to your sport?	54.2	34.7
Are you fearful of re-injuring your knee by playing your sport?	46.0	35.8
Are you afraid of accidentally injuring your knee by playing your sport?	46.6	33.6
Do you feel relaxed about playing your sport?	62.5	33.6
Mean ± SD	52.8 ± 29.3	
Confidence in performance		
Are you confident that you can perform at your previous level of sport participation?	56.4	31.7
Are you confident that your knee will not give way by playing your sport?	60.1	33.0
Are you confident that you could play your sport without concern for your knee?	56.9	34.6
Are you confident about your knee holding up under pressure?	58.7	33.4
Are you confident about your ability to perform well at your sport?	60.3	33.4
Mean ± SD	58.5 ± 28.3	
Risk appraisal		
Do you think you are likely to re-injury your knee by participating in your sport?	46.4	31.7
Do thoughts of having to go through surgery and rehabilitation prevent you from playing your sport?	57.8	34.1
Mean ± SD	52.1± 28.8	
Overall (Mean ± SD)	55.1 ± 27.2	

Discussion

A patient with an ACL tear who was surgically treated with neuromuscular rehabilitation program might have painless knee with no edema within a few periods. Later, they might also be able to RTSs, gradually, by performing simple sports activities other than cutting, jumping, or pivoting movements [14]. This way the patients might avoid the stress of the operation, though, as the research showed that about 60% of those patients do not return to their pre-injury activity level [15,16].

The current study aimed to study the fear of re-injury and its impact on returning to pre-injury sports activity level among patients who underwent ACL reconstruction in King Fahad Hofuf Hospital in Al Ahsa region in the Eastern Province of Saudi Arabia. The study showed that playing football was the dominant sport among study patients. Also, about two-thirds of the cases undergone reconstruction surgery at the right knee and which was one stage study among the vast majority of the cases. About half of the cases had physiotherapy for less than 6 months after reconstruction surgery and nearly less than

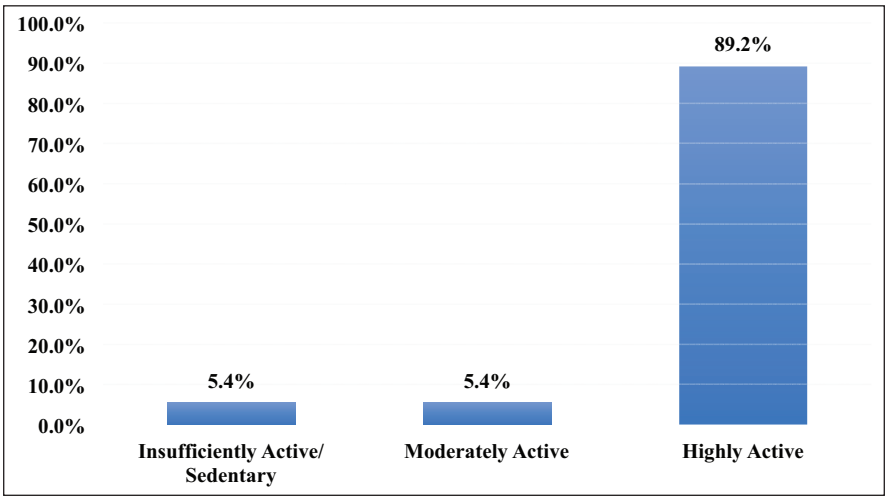

Figure 1. *Overall post-surgical post activity level among study patients, King Fahad Hofuf hospital, Al-Ahsa, Saudi Arabia.*

Table 4. *Factors associated with patients RSI.*

Factors	Overall		*p*-value
	Mean	SD	
Age in years			0.004*
18-29	64.0	27.6	
30-39	53.1	26.6	
40-49	47.2	25.1	
Gender			0.817**
Male	55.0	27.3	
Female	57.8	21.6	
Marital status			0.001*
Single	65.1	26.4	
Married	50.4	26.3	
Divorced/widow	70.6	26.6	
Educational level			0.538
Below secondary	49.3	29.9	
Secondary/diploma	57.6	26.8	
University/above	54.0	27.3	
Employment			0.001*
Unemployed	55.6	25.2	
Student	80.8	16.1	
Governmental sector employee	50.8	27.2	
Private sector employee	57.4	26.5	
Side of ACL surgery			0.798**
Right knee	55.4	26.8	
Left knee	54.4	28.1	
Stage of the reconstruction surgery			0.523**
One stage	54.7	27.2	
Two stages	59.9	26.9	

Continued

Factors	Overall		*p*-value
	Mean	SD	
Physiotherapy period after the reconstruction surgery			0.600
<6 months	55.2	29.2	
6-12 months	56.1	24.5	
>12 months	48.8	27.9	
What kind of sport did you do before the injury?			0.373**
Foot ball	54.5	27.4	
Others	60.4	25.2	
How many years have you played the mentioned sport?			0.005*
<1 year	39.6	17.4	
1-5 years	61.6	31.2	
5-10 years	43.5	22.1	
>10 years	58.1	27.3	

** Independent *t*-test.
* $p < 0.05$ (significant).
p: One way ANOVA.

half of them undergone physiotherapy for 6-12 months. A study conducted in Jeddah revealed that 14.7% football players had ACL tear [17]. Other studies revealed that the frequency of ACL repair operations ranged between 32 and 78 per 100,000 persons per year [18]. Furthermore, it has been estimated to be one in 3,000 in the United States of America [19]. Likewise, some authors have reported that the number of ACL repairs done has increased in the previous few years [20,21].

Regarding patients' fear of exercise and their return, the current study showed that the mean score reported for their fear of re-injuring knee by playing sport was 46% which is not so high. Also, 46.4% thought that they are likely to re-injuring their knee by participating in their sport. Totally, more than half of the study participants showed high positive score regarding return to sport (RSI) after ACL reconstruction surgery. The highest scores were for their confidence in performance mainly their ability to perform well at their sport and confidence that their knee would not give way by playing their sport. Also, about two-thirds were relaxed about playing their sport. As for level of physical activity, the current study showed that the vast majority of the patients (more than three-fourths) were highly active while remaining were either moderately active or insufficiently active/sedentary.

Kvist et al. [22] found that about half of the patients returned to their pre-injury activity level. The patients who did not return to their pre-injury activity level had more fear of re-injury. Also, Lee et al. [23] found that 62.2% patients had undergone ACL reconstruction returned to their previous level of sports while 28.8% did not. Of whom, 20% filed to return due to fear of re-injury and the remaining 17.8% said they had not returned due to knee instability and pain. Other studies showed that fear of re-injury is a main factor for the inability to return to the previous level of activity [6,11,24,25]. Another study by Raizah et al. [26] revealed that only 10.8% of the patients recorded a low level of kinesiophobia after ACL reconstruction, while only 6.9% recorded a high level. On the other hand, Alhamam et al. [27] reported that the kinesiophobia rate after ACL reconstruction was very high. About three-fourths of patients had a high score of kinesiophobia, and 31% had low scores of kinesiophobia.

Conclusion

One of the most crucial psychological aspects of post ACL reconstruction rehabilitation is the fear of re-injury. It has been shown that less than half of the ACL reconstruction patients experience fear of re-injuring themselves with more than half of the patients being psychologically confident and relaxed to return to their pre-injury activity level and physically feel well in participating and preforming actively in their sports post-surgery, and completing physiotherapy. Therefore, optimizing the surgical technique along with post-operative close follow-up and monitoring of the patient's psychological and physical status affects the patient's performance and activity level after surgery. Also, this study showed that the fear of re-injury was higher in athletes who had surgery >3 months after the injury than in those who had it closer to the time of the injury, indicating that pre-operative experiences of instability might negatively affect post-operative emotional reactions upon returning to competition.

List of Abbreviations

ACL Anterior cruciate ligament
ACL-RSI Anterior Cruciate Ligament Return to Sport after Injury

GLTEQ Godin Leisure-Time Exercise Questionnaire
RTS Return to sports

Conflict of interest
The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent to participate
Written informed consent was obtained from all the participants.

Ethical approval
The ethical approval was obtained from the Institutional Review Board Research Ethical Committee of the King Faisal University, AlAhsa, Saudi Arabia with a reference number KFU-REC-2022-SEP-ETHICS190, dated: September 9, 2022.

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