

Evaluate the Effect of Duration for Injury on International Knee Documentation Committee (IKDC) Score With an Anterior Cruciate Ligament Injury Patients

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Abstract

The anterior cruciate ligament (ACL) tear is one of the most common knee injuries. **Aim;** to evaluate the effect of duration for injury on IKDC score with an anterior cruciate ligament injury patients. **Patients and methods;** Non-equivalent control group design was utilized to conduct this study. The study sample, 60 adult patients with an ACL injury, patients were divided into two equal groups, group one their injury less than 3 months and group two their duration of injury more than 3 months. **Tools;** the International Knee Documentation Committee (IKDC) scale and exercise program. **Results,** the mean age were (24.7), and the majority of them were students, regarding the IKDC scale there was a highly statistically significant difference between both groups during pre-operative and all of the follow up periods. **Conclusion;** An improvement was observed at 3&6 months follow up of patients with an ACL injury of less than 3 months than those patients whose injury more than 3 months. **Recommendation;** providing patients with instructions for seeking medical advice for their sports injuries of great importance for early diagnosis and management of their injuries.

Keywords: Anterior Cruciate Ligament Injury, Duration Of Injury & IKDC Score.

Introduction

The anterior cruciate ligament (ACL) is critical for knee role in athletes who require knee constancy in activities such as running, cutting, jumping, and kicking. The ACL originates on the posteromedial aspect of the lateral femoral condyle and inserts anterior to and between the intercondylar distinctions of the tibia. The ACL functions as the primary restraint to limit anterior tibial translation and as a secondary limit to internal rotation of the tibia (Aglieiti, et al., 2014).

Diagnosis of an ACL injury depends on: first history; the injury often is associated with immediate pain and an audible "pop.", swelling of the knee is noted within a few hours (acute hemarthrosis). The patient often states that the knee feels too unstable to continue playing and that weight bearing is difficult. Physical exam; a careful physical examination can diagnose most ACL injuries (Dugan, 2015).

Treatment: Initial stabilization; the initial treatment of the acutely injured ACL is splinting and the use of crutches for comfort and early active range of motion (ROM). The goal is to obtain full ROM. Ice, elevation, and analgesics are prescribed in the initial post-injury period. Treatment decisions should be based on many factors, including patient age, activity level, type of sporting activity (especially jumping, cutting, and pivoting sports), degree of instability, and associated knee pathology. Treatment options include; physical therapy, medications and surgery (Shea, 2015).

Rehabilitation is a problem-solving and educational process aimed at reducing the disability experienced by someone (with physical impairment) as a result of a disease, but always within the limitations imposed by available resources and by the underlying disease (Baum & Irrgang 2013).

Nurses play a vital role in rehabilitation for patients who had ACL reconstruction surgery. Rehabilitation therapy will be needed, rehabilitation will include the use of crutches and, possibly, a knee brace range-of-motion exercises to regain full knee motion, muscle-strengthening and stability exercises. The nurse gives teaching about weight bearing limit, exercise restraints. Nurses' Initial aims are to reduce pain and swelling in knee, regain normal joint movement and strengthen the muscles around the knee and assess for signs of complications (Sharonl, et al., 2007).

Significance of the study

A delay in the timing of surgery and rehabilitation of > 3 months compared with performing the surgery and rehabilitation ≤ 3 months after the anterior cruciate ligament (ACL) injury leads to an increased risk of injuries or degenerative changes in the ACL-deficient knee. According to Assiut University hospital records 350 patients underwent ACL surgery in 2017.

Aim of the study

This study aim was to evaluate the effect of duration for injury on IKDC score with an anterior cruciate ligament injury patient.

Research question

Does the duration of an anterior cruciate ligament injury effects on the IKDC score?

Patients and Methods

Research design; Non-equivalent control group design was utilized in this study; the sample is common in the same type of injury but not in the same sport

Setting: this study was conducted in the department of orthopedic surgery and out-patient arthroscopy clinic at Assiut University hospital.

Patients; A sample of 60 adult patients with an ACL injury was included in the study, both gender, having an ACL injury; their age ranges from 18 to 60 years, patients were taken from time of admission in the department (pre operatively) and 3 months, 6 months and 12 months (post operatively) follow up in the out-patient arthroscopy clinic, patients were divided into two equal groups (30 patients for each), group one their injury less than 3 months and group two their duration of injury more than 3 months.

Exclusion Criteria

1. Patients with radiographic evidence of osteoarthritis (grade 3 or 4 osteoarthritis according to the Kellegren and Lawrence system) or inflammatory arthritis at the time of injury or first-time clinical evaluation .
2. Patients who sustained intra-cerebral/spinal cord injury at the time of initial presentation.

Sample size calculatio:

G power program 3.1.3 was used to calculate sample size in order to detect a-significant difference in mean of (IKDC) between two groups under the study hypothesized; effect size 0.7, power 80%, ∞ error 0.05, allocation ratio 1:1 and 26 patients were included in each group with total sample size 52 patients.

- Sample size was increased 4 patients in each group.
- 80 patients were included in this study, 20 dropouts because some patients were not living in Assiut city and it was difficult for them to come and some of them were not cooperative with the study, the final sample size was estimated on 60 patients.

Tools; Two tools were used in this study and were developed by the researcher to collect the necessary data for this study.

Tool I: Subjective knee evaluation using International Knee Documentation Committee (IKDC) scale (Anderson, et al., 2000) it was divided into two parts:

Part 1: Demographic patient characteristics: which were consist of: patient's name, age, gender,

level of education, occupation, time of ACL injury, and surgery day.

Part 2: IKDC subjective knee evaluation form:

This questionnaire has been designed to give information as to how patient's knee is able to do the usual activities .

This scale includes 3 sections:

1. Symptoms
2. Sports activity
3. Function and activity of daily living.

Scoring syste :

$$\text{IKDC Score} = \left[\frac{\text{Sum of Items}}{\text{Maximum Possible Score}} \right] \times 100$$

Tool II: Exercise program for patients with an ACL injury.

This tool was developed to teach the patients the rehabilitation exercises which were given in a simplified Arabic booklet to the patients and then those patients were followed up to assess the effect of the rehabilitation on their condition comparatively with their injury duration, and to see which group would have a better functional level, it consists of 5 phases: week 1-2 after the operation, week 2-6 after the operation, weeks 6-12 after the operation, preparation for return to sport 3-6 months, and return to sport at 6-9 months.

Methods

1. Content validity was established by panel of 5 expertises from medical and surgical nursing staff who reviewed the tools for clarity, relevance, comprehensiveness, understanding, applicability and easiness, minor modifications were required.
2. Content reliability was estimated by Alpha Cronbach's test and its result was R=0.68.
3. A pilot study was carried out in December 2016 to test the feasibility and practicability of the study tools on 10% (6 patients) of the sample they were involved to the study. It also provided an estimate of time needed to fill out the tools.
4. Data were collected from orthopedic surgery and out-patient arthroscopy clinic at Assiut University hospital during the period from December /2016 to April /2018. The tools were filled out through interviewing each patient individually.

Ethical consideration

•there was no risk for patients participating in the study , patients was assured confidentiality and anonymity and their right to withdraw from the study without any rational at any time during the study after attaining their informed consent for participation in the study.

Statistical analysis

Data collected were analyzed by computer program SPSS" version.17" Chicago. USA. Data expressed as

"mean \pm standard deviation" "number, percentage". Using T test to determine significance for numeric variables. Using Chi. square test to determine significance for non-parametric variables. Using Pearson correlation for numeric variables in the same group.

n.s P > 0.05 no significance.

**P < 0.01 moderate significance.

*** P < 0.001 highly significance.

Limitation of the study

It was difficult to follow up some of patients because they were not living in Assiut city and it was difficult for them to come, some of patients were not cooperative with the study.

Results

Table (1): Frequency distribution of patients according to their Socio-demographic characteristics.

Personal data	ACL injury < 3 months N=30		ACL injury > 3 months N=30		Total N=60
	N.	%	N.	%	N. %
Age group 18yrs to 60yrs	<u>Means\pmSD</u> 24.75 \pm 5.559				
Level of education					
Secondary school	9	30	9	30	18 (30.0)
University	21	70	21	70	42 (70.0)
Occupation					
Student	15	50	22	36.7	37 (61.7)
Worker	10	33.3	5	8.3	15 (25.0)
Private	2	6.7	2	3.3	4 (6.7)
Farmer	3	10	1	1.7	4 (6.7)

Table (2): Comparison between both groups using the International Knee Documentation Committee (IKDC) scale; Symptoms.

Symptoms	Group case	N.	Mean	Std. Deviation	P.V.
Pre- operative	ACL injury < 3 months	60	27.9167	13.79055	0.001*
	ACL injury > 3 months				
Follow up 3m.	ACL injury < 3 months	60	14.1833	4.72459	
	ACL injury > 3 months				
Follow up 6m.	ACL injury < 3 months	60	9.6500	3.09633	
	ACL injury > 3 months				
Follow up 12m.	ACL injury < 3 months	60	6.5000	2.19784	
	ACL injury > 3 months				

Table (3): Comparison between both groups using the International Knee Documentation Committee (IKDC) scale; sport activity q (8).

Sport activity q(8)	Group case	N.	Mean	Std. Deviation	p.value
Pre-operative	ACL injury < 3 months	30	3.5333	.81931	.182
	ACL injury > 3 months	30	3.2333	.89763	
Follow up 3m.	ACL injury < 3 months	30	1.4000	.56324	.079
	ACL injury > 3 months	30	1.7667	.97143	
Follow up 6m.	ACL injury < 3 months	30	1.0000	.00000	.155
	ACL injury > 3 months	30	1.0667	.25371	
Follow up 12m.	ACL injury < 3 months	30	1.0000	.00000 ^a	-----
	ACL injury > 3 months	30	1.0000	.00000 ^a	

Table (4): Comparison between both groups using the International Knee Documentation Committee (IKDC) scale; sport activity q(9).

Sport activity q(9)	ACL injury < 3 months										ACL injury > 3 months										P		
	How does your knee upset your ability to																						
	Not difficult at all		Minimum Difficult		Moderately Difficult		Extremely difficult		Unable to do		Not difficult at all		Minimum		Moderately Difficult		Minimum		Unable to do				
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	
Go up steps																							
Pre-operative	1	3.3	2	6.7	19	63.3	8	26.7	0	0.0	7	23.3	11	36.7	10	33.3	2	6.7	0	0.0	0	0.0	0.01**
After 3months	10	33.3	14	46.7	6	20.0	0	0.0	0	0.0	6	20.0	19	63.3	5	16.7	0	0.0	0	0.0	0	0.0	0.39
After 6months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	27	90.0	1	3.3	2	6.7	0	0.0	0	0.0	0	0.0	0.26
After 12months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	---
Go down steps																							
Pre-operative	1	3.33	2	6.7	20	66.7	7	23.3	0	0.0	6	20.0	13	43.3	6	20.0	5	16.7	0	0.0	0	0.0	0.01**
After 3months	10	33.3	14	46.7	6	20.0	0	0.0	0	0.0	8	26.7	17	56.7	5	16.7	0	0.0	0	0.0	0	0.0	0.74
After 6months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	26	86.7	2	6.7	2	6.7	0	0.0	0	0.0	0	0.0	0.11
After 12months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	---
Go down on your knees on the front of your knee																							
Pre-operative	0	0.0	14	46.7	10	33.3	6	20.0	0	0.0	4	13.3	15	50.0	6	20.0	4	46.7	1	3.3	1	3.3	0.16
After 3months	15	50.0	14	46.7	1	3.3	0	0.0	0	0.0	14	46.7	14	46.7	1	3.3	0	0.0	1	3.3	1	3.3	0.79
After 6months	29	96.7	1	3.3	0	0.0	0	0.0	0	0.0	26	86.7	4	13.3	0	0.0	0	0.0	0	0.0	0	0.0	0.177
After 12months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	----
Dumpy																							
Pre-operative	0	0.0	8	26.7	8	26.7	10	33.3	4	13.3	1	3.3	9	30.0	11	36.7	5	16.7	4	13.3	4	13.3	.525
After 3months	16	53.3	13	43.3	1	3.3	0	0.0	0	0.0	5	16.7	18	60.0	4	13.3	1	3.3	2	6.7	2	6.7	0.02*
After 6months	29	96.7	1	3.3	0	0.0	0	0.0	0	0.0	24	80.0	5	16.7	0	0.0	1	3.3	0	0.0	0	0.0	0.12
After 12months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	----
Be seated with your knee bent																							
Pre-operative	0	0.0	1	40.0	9	30.0	8	26.7	1	3.3	0	0.0	13	43.3	9	30.0	5	16.7	3	10.0	3	10.0	0.63
After 3months	15	50.0	15	50.0	0	0.0	0	0.0	0	0.0	7	23.3	15	50.0	5	16.7	1	3.3	2	6.7	2	6.7	0.02*
After 6months	29	96.7	1	3.3	0	0.0	0	0.0	0	0.0	27	90.0	2	6.7	0	0.0	1	3.3	0	0.0	0	0.0	0.49
After 12months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	----
Upswing from a chair																							
Pre-operative	0	0.0	1	56.7	11	36.7	1	3.3	1	3.3	6	20.0	13	43.3	8	26.7	3	10.0	0	0.0	0	0.0	0.06
After 3months	12	40.0	17	56.7	1	3.3	0	0.0	0	0.0	13	43.3	10	33.3	5	16.7	2	6.7	0	0.0	0	0.0	0.08

Sport activity q(9)	ACL injury < 3 months										ACL injury > 3 months										P		
	How does your knee upset your ability to																						
	Not difficult at all		Minimum Difficult		Moderately Difficult		Extremely difficult		Unable to do		Not difficult at all		Minimum		Moderately Difficult		Minimum		Unable to do				
	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%	N.	%		N.	%
After 6months	29	96.7	1	3.3	0	0	0	0	0	0	23	76.7	5	16.7	2	6.7	0	0.0	0	0.0	0	0.0	0.06
After 12 months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0	0	0.0	0	0.0	0	0.0	0	0.0	----
Track straight ahead																							
Pre-operative	0	0	0	0.0	5	16.7	22	73.3	3	10.0	2	6.7	4	13.3	2	6.7	17	56.7	5	16.7	5	16.7	0.07
After 3 months	0	0	6	20.0	19	63.3	4	13.3	1	3.3	0	0	5	16.7	41	46.7	9	30.0	2	6.7	2	6.7	0.37
After 6 months	15	50.0	1	5.0	0	0	0	0	0	0	3	10.0	19	63.3	8	26.7	0	0.0	0	0.0	0	0.0	0.001**
After 12 months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0	0	0.0	0	0.0	0	0.0	0	0.0	----
Hurdle and land on your involved leg																							
Pre-operative	0	0	1	3.3	0	0	2	6.7	2	9.0	2	6.7	2	6.7	2	6.7	0	0.0	24	80.0	24	80.0	0.16
After 3 months	0	0	1	3.3	3	10.0	19	63.3	7	23.3	1	3.3	0	0	5	16.7	12	40.0	12	40.0	12	40.0	0.24
After 6 months	7	23.3	1	3.3	13	43.3	0	0	0	0	0	0	5	16.7	23	76.7	2	6.7	0	0.0	0	0.0	0.001**
After 12 months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0	0	0.0	0	0.0	0	0.0	0	0.0	----
Stop and start rapidly																							
Pre-operative	3	10.0	2	7.3	3	10.0	2	6.7	0	0	6	20.0	17	56.7	5	16.7	2	6.7	0	0.0	0	0.0	0.54
After 3 months	23	76.7	7	23.3	0	0	0	0	0	0	24	80.0	5	16.7	1	3.3	0	0.0	0	0.0	0	0.0	0.50
After 6 months	25	83.3	3	10.0	2	6.7	0	0	0	0	29	96.7	1	3.3	0	0	0	0.0	0	0.0	0	0.0	0.19
After 12 months	30	100	0	0.0	0	0.0	0	0.0	0	0.0	30	100	0	0	0	0.0	0	0.0	0	0.0	0	0.0	----

Table (5):- Comparison between both groups using the International Knee Documentation Committee (IKDC) scale; sport activity q(10).

Variable	ACL injury < 3 months		ACL injury > 3 months		P1	P2	P3
	Purpose prior to the knee injury						
	Mean ±SD		Mean ±SD				
Pre-operative	4.333±1.728		4.200±1.297		0.001*	0.001*	.737
Follow up 3mo.	7.966±1.272		6.233±1.406				0.001*
Follow up 6mo.	8.600±.855		7.800±.996				0.001*
Follow up 12mo.	8.0000±.000		8.0000±.000				-----
Total	7.225±2.043		6.558±1.864		0.009*		

Comparison between: P1. ACL injury < 3 months.

P2. ACL injury > 3 months.

P3. ACL injury > 3 months and ACL injury < 3 months

Table (1): the mean age of was (24.75± 5.559), regarding level of education; (70%) of patients in both groups were highly educated and the highest percent of them (61.7%) were students.
Table (2): there was a highly statistically significant

difference between both groups regarding their symptoms on the IKDC scale P. (0.001**).
Table (3): there was no statistically significant difference between both groups regarding their sporting activity on the IKDC scale.

Table (4), there was a highly statistically significant difference between patients with an ACL injury < 3 months and patients with an ACL injury > 3 months regarding how does their knee affect their ability to: go upstairs pre-operatively P.V(0.001*), go down stairs pre-operatively P.V(0.001*), squat at 3 months post operatively P.V(0.02*), sit with knees bent at 3 months post operatively P.V(0.02*), run straight ahead at 6 months post operatively P.V(0.001*), and their ability to jump and land on the affected leg at 6 months post operatively P.V(0.002*).

Table (5), there was a highly statistically significant difference regarding mean \pm SD of the (IKDC) scale; function prior to the knee injury among patients whose ACL injury < 3 months and patients with ACL injury > 3 months, while regarding comparison between both groups there was a statistically significant difference only at 3 and 6 months of follow up.

Discussion

The mean age were (24.7) years of patients in both groups ACL injury is more common in this age group because of their more active lifestyle as well as higher participation in sports. This result agree with (Mohammed, 2016) who found that ACL is most prevalent in patients with a mean age of (28.2) years. While the result of this study disagrees with (Hussien, 2013) who found that the mean age of patients was 47 years and also disagree with (Collins et al., 2013) who reported that the age of participants ranged from 16 to 52 years.

The majority of patients in both groups were highly educated. This result agrees with (Mohammed, 2016) who found that the majority of patients were highly educated, and disagrees with the study results of (Salem et al., 2012) which showed that the majority of patients were secondary educated.

Regarding occupations, the majority of patients were students. This result disagrees with (Salem et al., 2012) who found that patients were about equally to have a manual or sedentary occupation.

There was a highly statistically significant difference between both groups regarding their symptoms on the IKDC scale pre-operatively and all of the follow up periods, this result disagree with (Marcacci et al., 2013) who reported that there was no significant difference between the groups for International Knee Documentation Committee rating score.

There was no statistically significant difference between both groups regarding their sporting activity on the IKDC scale in relation to the highest level of activity in which they can participate in on a regular basis pre-operatively and all of the follow up periods. There was a highly statistically significant difference between patients with an ACL injury < 3 months and

patients with an ACL injury > 3 months regarding their sporting activity on the IKDC scale regarding how does their knees affect their ability to: go upstairs pre-operatively, go down stairs pre-operative, squat at 3 months post operatively, sit with knees bent at 3 months post operatively, run straight ahead at 6 months post operatively and their ability to jump and land on the affected leg at 6 months post operatively. (Bruce & Robert, 2010) in their study which was conducted on 20 cases at 6 months post operatively found that 13 cases had no problems with squatting (65%), 5 cases with slightly impaired squatting (25%) and 2 cases not beyond 90° (10%), (Huang & Wang, 2011) activities of daily living pre-operatively including sitting down, rising from the sitting position, squatting, going upstairs and down stairs cannot be performed properly, and patients have limited range of motion in the knee joint .

There was a highly statistically significant difference regarding mean \pm SD of the (IKDC) scale; function prior to the knee injury among patients whose ACL injury < 3 months and patients with an ACL injury > 3 months, while regarding comparison between both groups there was a statistically significant difference only at 3 and 6 months of follow up, this result disagree with (Zsolt, 2010) whose results showed that 6 weeks and 4 months after surgery the differences were statistically significant.

This result contradicts the results by (Julie & Robert 2013) who declared that the IKDC defined no improvement in function as less than 11.5-point change in score, making it likely that our demonstrated difference of 2.7 points would not be clinically important at all three test speed.

Conclusion

An improvement was observed at 3&6 months follow up of patients with an ACL injury of less than 3 months than those patients whose injury more than 3 months.

Recommendations

- Orientation programs on mass media (TVs & radio) on importance of early medical consultation and early surgery to improve their functional level.
- Providing university students with instructions for seeking medical advice for their sports injuries is of great importance for early diagnosis and management of their injuries.

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