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RESEARCH ARTICLE

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ANALYSIS OF FUNCTIONALITY IN PATIENTS AFTER SURGICAL REHABILITATION OF A PREVIOUS CROSS CONNECTION

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ABSTRACT

Lesions in the anterior cruciate ligament are one of the most common, requiring surgical intervention in many cases. Post-surgery brings functional repercussions to the patient, showing the importance of a rehabilitation focused on factors that will provide improvement in strength, stability and safety for the resumption of sports practice. The aim of this study is to analyze, through the International Knee Documentation Committee (IKDC) questionnaire, the patient's level of functionality after discharge from rehabilitation of the anterior cruciate ligament surgery. This is a descriptive, analytical and cross-sectional study. The study population consisted of individuals aged 18 to 40 years, of both sexes, who underwent physical therapy rehabilitation after surgery. The data were tabulated and analyzed using SPSS (Statistical Package of Social Science) version 20.0, using descriptive and inferential statistics. For the descriptive analysis of the data, absolute and relative frequencies, mean and standard deviation were used. The results show a low functionality of the sample <82.75 (81.2%), and these data can be correlated with the low time of rehabilitation where 43.8%, only performed 2 months, but the results pointed out that the greater physiotherapy time better functionality scores appear.

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INTRODUCTION

Injury to the anterior cruciate ligament (ACL) can occur in several ways, but the most common occurrence is at the moment of movement deceleration when the individual is with the foot fixed to the ground, in knee flexion and tries to change the associated direction to deceleration, stress occurring in valgus, and when the knee is in hyperextension associated with an internal rotation of the knee, in addition to direct contact causing trauma, forcing the knee in valgus (Arliani *et al.*, 2012). This ACL injury ends up subjecting the individual to several functional deficits, requiring treatment, which can be conservative or surgical. The choice for one or another type of intervention is related to the desired lifestyle and functional tasks, and surgery is the main choice for those who intend to perform a sport, with the objective of preventing knee instability and promoting the restoration of ligament function (Myer *et al.*, 2013).

The treatment for ligament injuries is often surgical, there are several techniques for ACL reconstruction, but the most used are with graft from the patellar tendon and with hamstring graft (semitendinosus and gracilis), both options bring important changes in the degree of functionality of the individual (Myer *et al.* 2013). Both surgical options have important functional repercussions, namely, deficit in the quadriceps and hamstring muscles, pain in the knee region, asymmetry between the limbs, directly interfering with movement patterns, which may generate risks for re-injury, in addition to causing deficits in carrying out functional activities of the individual (Pinheiro, 2015). Given these factors, it is observed that it is important that all surgical rehabilitation is focused on providing the patient with strength, mobility and mainly functionality to the operated limb, leaving it in a similar state to the contralateral limb, making the patient have a return to his life without limitations or risk of injury recurrence. Therefore, this study aims to evaluate the

functionality of the lower limb of patients after ACL rehabilitation.

MATERIALS AND METHODS

This is a descriptive analytical and cross-sectional study that is a subproject of a main research entitled "Physiotherapeutic performance in orthopedic and sports disorders" which was sent and approved by the FAINOR Research Ethics Committee (CEP/FAINOR) through opinion 2.418.872. After approval, the research was announced and disseminated in rehabilitation clinics in the city of Vitoria da Conquista - Bahia. As inclusion criteria, individuals of both sexes, aged between 18-40 years, were submitted to physical therapy rehabilitation after anterior cruciate ligament surgery. Exclusion criteria were individuals who had surgical interventions associated with the ACL repair procedure and / or who had other knee injuries. Also excluded are individuals who have not undergone the physical therapy rehabilitation process and who have undergone other types of treatment such as acupuncture. The study population consisted of individuals aged between 18 and 40 years, of both sexes, who underwent physical therapy rehabilitation after ACL reconstruction surgery, and were selected through a non-probabilistic sample and by spontaneous demand.

Firstly, the Free and Informed Consent Term (ICF) was presented to the study participants, where they were informed about the theme and objectives of the study, being free to participate or not and only after signing all participants, the research was started. Soon after, the participants answered a questionnaire with information about the time of surgery and physiotherapeutic rehabilitation, and then answered the IKDC questionnaire. A sociodemographic questionnaire was also answered, consisting of questions such as: name, age, sex, how long the surgery was carried out, how long the rehabilitation lasted and how long he was on physical therapy discharge. The IKDC is a subjective questionnaire used as a knee assessment instrument, consisting of 10 items, which comprise three divisions: Symptoms (seven items), Sports activities (two items) and Function (one item). Scores range from 0 points (lowest level of function or highest level of symptoms) to 100 points (highest level of function and lowest level of symptoms) (Iversen, Rostad, Larmo, 2014). Those individuals who scored below 83% were classified as low functionality, above this, with high functionality. After recruitment and selection, data collection was performed remotely through the Google Forms platforms for the application of questionnaires and Google Meet to interview and guide research participants. Data were tabulated and analyzed using SPSS (Statistical Package of Social Science) version 20.0, using descriptive and inferential statistics. For the descriptive analysis of the data, absolute and relative frequencies, mean and standard deviation were used. The inferential statistics used was through the Mann-Whitney U test to verify the differences in relation to the techniques used. The level of significance adopted in all analyzes will be 5% ($\alpha = 0.05$).

RESULTS

The sample consisted of 16 individuals and had a mean age of 29.07 ± 5.89 years and a predominance of males 12 (75.0%). The data referring to the injury reveal that most of the research participants were injured 1 to 2 years ago 7 (43.7%), with only ACL 15 injury (93.7%). The entire sample underwent surgery,

9 (56.3%) of which less than 1 year ago. All individuals underwent rehabilitation through physical therapy, with 7 (43.6%) undergoing it for a period of 1 to 2 months, as shown in Table 1.

Table 1. Biosociodemographic and clinical characteristics of the sample. Vitória da Conquista - BA, 2020

Variables	average \pm dp ¹	
Age, years	29,07 \pm 5,89	
Sex	n	%
Male	12	75,0
Female	4	25,0
Injury time		
< 1 year	1	6,3
From 1 to 2 years	7	43,8
From 3 to 4 years	3	18,8
> 4 years	5	31,3
Existence of another associated injury		
ACL injury only	15	93,7
Another injury besides ACL	1	6,3
Time since surgery, years		
< 1	9	56,3
1 to 2	3	18,8
3 to 4	3	18,8
> 4	1	6,3
Physiotherapy period, months		
1 to 2	7	43,8
3 to 4	3	18,8
5 to 7	3	18,8
8 to 10	3	18,8

¹Sample standard deviation; Anterior Cruciate Ligament; Source: Research data.

As for the functionality of the sample, the results showed that it is predominantly low 13 (81.2%), accusing that these individuals, in general, present risk of relapse as shown in Table 2.

Table 2. Functionality given by IKDC¹. Vitória da Conquista - BA, 2020

Functionality	n	%
Low functionality (< 82.75)	13	81,2
High functionality (> 82.75)	3	18,8

¹ International Knee Documentation Committee. Source: Research data.

With the results contained in table 3, it is possible to infer that better IKDC scores are significantly associated with longer periods of rehabilitation with physical therapy ($p = 0.007$). Emphasizing that individuals who underwent physical therapy in a period of 8 to 10 months have high functionality (<82.75).

Table 3. Distribution of the IKDC¹ score by time of rehabilitation / physiotherapy. Vitória da Conquista - BA, 2020

Physiotherapy period	IKDC	p*
	Average \pm standard deviation	
1 to 2 months (n = 7)	58,42 \pm 10,72	0,007
3 to 4 months (n = 3)	76,33 \pm 10,01	
5 to 7 months (n = 3)	68,66 \pm 6,11	
8 to 10 months (n = 3)	83,66 \pm 2,08	

*ANOVA test; ¹International Knee Documentation Committee; Source: Research data.

DISCUSSION

The present study aimed to evaluate the functionality of the lower limb of patients after rehabilitation (physiotherapy), of ACL surgery and to correlate the impacts of physiotherapy to the functionality of the knee. The sociodemographic results of the sample revealed a predominance of males and an average age of 29 years, collaborating with other studies such as that of

Albano, Lima and Almeida (2017), which aimed to verify the predictive factors of return to sport at the same pre-level - lesion and its interactions in individuals who underwent RLCA, where they observed a predominance of the sample was male (86.8%), and with the same average age 28.2 ± 7.3 , highlighting the high rate of involvement among the male. Astur et al. (2016), state that the higher ACL incidence rate may be related to cultural factors such as the predominance of men in sports such as football, but that it may vary according to the sport and the sample selection, if the sample is sports such as handball, there was a predominance of ACL in females. Another important data in the results of the present study is the duration of rehabilitation, which for the most part did not exceed 2 months of treatment. This data may be related to the findings of the present study, which highlighted the low functionality of the sample even after discharge from physiotherapy. According to Queiroz (2018), functional recovery after ACL in the vast majority of cases is still not satisfactory. For the author, the hypothesis is that there are persistent sensory deficits inside the joint, since many of the original mechanoreceptors and nerve connections are not recovered, causing biomechanical asymmetries that remain over the years, favoring the high incidence of relapse and implying the installation of concomitant pathologies.

For Costa, Macedo and Hernandez (2010), in a cross-sectional study with 12 male and female patients, it was found that patients are unable to recover the complete functionality of the knee. According to the authors, this is because instability is a frequent manifestation among this population. Another factor would be the revascularization process that starts from the 2nd postoperative week and the ligamentization process, a process of histological changes that occurs with the graft that lasts up to 2 years postoperatively. The literature states that not only the time of the rehabilitation but the quality of this (protocol) are important, since the improvement of the patient's functionality is not in maintaining strength as it is the focus of many, but rather the quality of the rehabilitation of the patient's proprioception, and that although there are well-structured protocols, the lack of successful treatment in the context of muscle and joint asymmetries that are harmful to the individual's functional recovery has increased the risk of recurrence of the injury (Queiroz, 2018 & Costa, Macedo, Hernandez, 2010). In the results of the present study, there is a correlation between rehabilitation time and better levels of functionality, as most of the sample did not exceed 2 months of physiotherapy, this may have been a factor that influenced the low functionality of the sample, with the majority not exceeded 2 months of physiotherapy.

According to Fernandes (2012), in a study with eighty-six (86) athletes of both sexes who underwent arthroscopic reconstruction of the ACL, which sought to assess the relationship between the radiographic positioning of the tunnels in ACL reconstruction and functional assessments, he observed that in addition to there is a correlation between the positioning of the tunnels and lower values of functionality, it was also reported that the longer the recovery time, the better the result in terms of functionality, where at 6 months the subjective IKDC score was 75, and at 12 months 84.7. The importance of physical therapy, the correct protocol and the time needed for a safe rehabilitation that guarantees functionality is shown by Silva et al. (2010), in a study that aimed to develop and apply a rehabilitation protocol for RLCA and record the evolution through periodic analyzes with

function questionnaires validated in a sample with one (01) 17-year-old man active amateur soccer player. The results of the study showed that if the protocol is complied with, the recovery is visible through a growing picture, regarding the IKDC score, the sample showed an evolution in the period of 7 months of 36.78 points at the beginning and ending with 71.26. This study shows that, in addition to physiotherapy, periodic functionality assessments are important with methods to assess neuromuscular imbalance in intermediate stages of the rehabilitation process, which in addition to preventing new injuries or re-injury, serves as a tool to direct and reformulate the protocols of physiotherapy according to the particularity of each patient (Queiroz, 2018). The time of physiotherapy for positive results can be observed by several studies (Tavares, Lima, Almeida, 2019 & Fernandes, 2012), in research that aimed to verify the correlation between measures of functional capacity and biomechanics with quality of life in patients after RLCA with a sample who underwent at least 6 months of physical therapy after surgery. The results showed that the functionality of the patients in the sample through the IKDC was high, presenting an overall average above 75 points, diverging from the present study, where the majority of the sample was classified with low functionality, showing a correlation between rehabilitation time and better functionality.

As for the time of rehabilitation, Fabricio Junior (2015), in a study that analyzed and compared the effect of a physiotherapy protocol in two groups, accelerated and conventional, points out that rehabilitation has a fundamental role in the functionality of the operated limb after ACL reconstruction, where the accelerated group in the fourth month of physiotherapy showed a significant improvement in functionality compared to the conventional one. Soares et al. (2011), through a study that aimed to verify the effectiveness of a treatment protocol in the rehabilitation of a post-operative operation of the anterior cruciate ligament of the knee, also in a sample of 1 16-year-old male patient who underwent the surgical procedure in which a physiotherapy protocol was applied in the postoperative period of the anterior cruciate ligament for 30 days, where the results showed that the applied protocol obtained satisfactory responses in pain control, in edema control and mainly in gain in range of motion (ROM), factors that can contribute to the improvement of functionality showing the importance of physiotherapy. The success of the rehabilitation is linked to factors other than itself, such as a period of preoperative physiotherapy, a successful surgery, the patient's commitment, social motivations, psychological obstacles (fear of relection) and efficient evaluation mechanisms that help the team in decision-making (Silva et al., 2010 & Fernandes, 2012).

One of the factors that can influence the scores of the present sample to be low in terms of functionality in the majority, may be related beyond the short time of physical therapy, also the limitations of the subjective IKDC, which according to Fernandes (2012), the functional assessments they are not accurate in the first weeks after surgery, as there are restrictions imposed by doctors and physiotherapists. There are a variety of physical therapy protocols for ACL recovery, pre and post-surgery that can help improve functionality, but these must be applied correctly and with a specialized professional. It should be noted that physiotherapy is not the only factor for complete recovery and that in the choice of the protocol a number of factors such as sex, age, patient's goal, whether he

is a professional athlete or not, among others that must be taken into consideration. The results of the present study showed that the profile is mostly male and has an injury time of 1 to 2 years and most had undergone RLCA surgery less than a year and all underwent physiotherapy protocols. As for functionality, a low index was observed in its majority. The time of physiotherapy may have been one of the factors that contributed to these results since, in most cases, rehabilitation was only 2 months. Another factor may have been the limitations of the IKDC, which because of the medical and physiotherapy restrictions imposed in the early postoperative moments limits its scope. Among the limits of the present study are the low sample size and the lack of application of other assessment instruments in addition to the IKDC even with its validity. It is suggested for future studies, to specify the physiotherapy protocols and their correlation with the improvement or not of the functionality since the acl is one of the main causes of withdrawal from daily activities and of athletes who depend on the functionality to work.

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