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RESEARCH ARTICLE

THE EFFECT OF REHABILITATION TREATMENT ON SPORTS FUNCTION OF ANTERIOR CRUCIATE LIGAMENT (ACL) PATIENT'S RECONSTRUCTION

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ABSTRACT

Objective: To assess the effect of rehabilitation treatment on the sports function of patients with the anterior cruciate ligament (ACL) reconstruction.
Method: The author employs a randomized controlled approach with six months follow up
Subjects: 30 patients within the age range of 02- to 54
Intervention: The experiment consisted of two groups: One group was involved in post-operative rehabilitation protocol while the other acted as control with traditional protocol. The patients were subjected to the experiment protocol for a maximum of one hour alongside medical treatment.
Results: Preliminary results indicate that the use of post-operative rehabilitation protocol was more effective when compared to the use of conventional treatments approaches. Despite the fact that neuromuscular interventions have no likelihood of harming patients, they also have a low like hood of yielding larger improvements in the final outcomes. After the 6 weeks intervention moment, patients who were subjected to rehabilitation exercises exhibited a high level of contraction torques with normalized voluntary maximal (P = .003, Cohn d effect size =1,3).on the other hand, the contraction torques for those who only used their regular regimen were lower (P = .16, d = 0.59) as well as those taking post-operative rehabilitation exercises alone (P = .15, d = 0.31)
Conclusion: Generally, patients with knee injuries who were subjected to post-operative exercises experienced greater gains compared with those who only used medication.

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INTRODUCTION

In recent perspective, the knee has been studied and appreciated as a complex organ. This discovery has stirred innovations in decision making aspects of patient care following injury of the anterior cruciate ligament (ACL). Medical practitioners have identified various approaches in restoring the combined mechanical-neurosensory ACL function while placing more emphasis on when to conduct a repair of the local anatomical structures verses the reconstructive structure. Athlete trainers and physical therapists are reinforcing their efforts in facilitating a higher athlete cognitive engagement in the course of therapeutic exercise so as to restore and maintain nonimpaired and activation of amplitude control and timing (Noyes and McGinniss, 1985). Consequently, there is a need for Knee brace use and design to evolve in such a way that it aligns with these innovations and their effect on the rehabilitation. Appreciation for the multifaceted features of the process of rehabilitation and their effect on educational, neuromuscular and psychobehavioral treatment objective is growing. A diverse range of sources could pose a significant influence of the knee during the process of return to sports as well as clinical outcome measures required to be refined so as to assess these influence in a better way (Butler, 1989). The choice on whether on how and why to undertake reconstruction of the anterior cruciate ligament (ACL) is based on a number of factors. These includes the motivation to return to sport, recurrent meniscal injuries, presence of buckling, the level of knee solution, the level of instability and the patient's age (Ballock, Woo *et al*., 1989). The aim of the surgery is to ensure that there is a replication of the original ligament. Despite this, there is always a need for a rehabilitation program with a focus on obtaining the same functional capabilities when compared with the limb that is non- operated. Knee reconstruction combined with ligament reconstruction presents a point of critical significance in achieving the desired

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outcome. The model rehabilitation program is based on mechanical and biological comprehension of the ligament. Furthermore, in order for the knee to reach a near normal functionality, the rehabilitation need to have specific objectives, controlling healing and inflammation, reducing pain, reestablishing a complete array of emotion and facilitating the return to sports and work activities. For these operative goals to be achieved, several protocols need to be observed (Goldblatt, Fitzsimmons *et al*., 2005). Based on the above, this study seeks to analyze and identify the actual effect of rehabilitation treatment on sports function of anterior cruciate ligament (ACL) patient's reconstruction.

Objectives

- This study employs a randomized controlled trial to answer the research question.
- Through this approach, we will be able to widen our understanding of the topic and more importantly is able to answer the research question. The major aim was to ensure that the knee is rehabilitated affectively to the point of achieving a satisfactory knee without undergoing surgery.

MATERIALS AND METHODS

30 patients were involved into the experiment (15 in the experimental and 15 into the control group) at Shandong university, Qilu hospital from 2014/06/01 to 2016/09/01. The subjects, 30 of which were aged between 02 and 54 who were seeking acute care for recently (within one month) injured knee during sports activity were involved in the study for a period of 6 months. Those who were included were those who had been diagnosed as having an acute ACL injury after being clinically examined by an experienced orthopedic physician and MRI. The patients selected had to be in a position of understanding and reading English. Those with postoperative complications or multiple ligament injuries such as graft failure or infections, as well as those who could not tolerate exercises were excluded. One patient was excluded at the time of screening due to history of multiple ligament injuries and lack of measurable quadriceps H-reflex, 1 had CAR >90%. The level of pain was rated by use of a visual analog scale (VAS) while the recorded patient outcomes were done using the subjective knee-evaluation form. Furthermore, knee examination was done by use of the KT-1000 knee arthrometer whereby: the side to side variations in anterior translation were evaluated at 150 N. We will also employ Maximal Voluntary Isometric contraction to understand the rate of knee contraction, Central Activation ratio to assist us in identifying the rate of activation as well as the H-reflection which will be very helpful in obtaining the M-response ratio. The sample size will be calculated using the standard deviation. The standard deviation defines the difference between the two groups to be included in the study. When the two groups have been organized, the sample size will be calculated using the following formula: $n=Z_{\alpha}^{2}+Z_{\beta}^{2}\times\sigma^{2}d^{2}$

In this case n stands for the sample size, Zβ2 the beta error, Zα2 the level of significance for the alpha, d the magnititute of the effect, and σ2 the variance level. The study was approved by the University's ethics research board. The researcher ensured to obtain written consent forms from all the participants. The 14 patients were assigned to exercise group and other 15 patients received their regular traditional treatment. Assessment was done by an orthopedic physical for each day for the six months period.

Intervention

Exercise Group

Patients in the exercise group were subjected to a program that included progressive strengthening of muscles, balance training and accelerated muscle stretching. There were also resistance exercises, and hamstring stretching exercises. The lessons were supervised and lasted 5 days a week for six weeks. The treatment for every participant was recorded in a treatment log. (8) Knee examination was done by use of the KT-1000 knee arthrometer whereby: the side to side variations in anterior translation were evaluated at 150 N.

Control Group

These were only treated with the traditional therapies Ibuprofen tablets and the PO suspension without being subjected to post-operative subjective exercises.

RESULTS

In generating the results, the authors employed a 3 × 2 (group-by-time) consisted measure variance analysis for H:M ratio, and quadriceps CAR. Depedent post hoc t tests were considered in case of interaction to note changes over time in the two groups. Calculations on effect size were done as a pre-post variation normalized to become a standard deviation. Furthermore, self- reported outcomes were also compared with patient demographics among the study groups with a one-way variance analysis. SPSS for windows 20 were used in performing statistical analyses. $P < .05$ was set as a priori α. Findings reveal that both the control and exercise group recorded a lower level of physical activity at the six month than the pre-injury. The experiment did not establish any difference between the exercise group (n = 15) and the control group in regard to gender distribution, age or physical activity prior to injury. The level of physical frequency and intensity was lower in the control group when compared to the experimental group (P=.02). There was a significant level of increase (P= .05 on both groups during the one month after the experiment. Furthermore, there was no alteration in locus of control within the six-month follow for both groups. Those who were subjected to rehabilitation indicated a more natural healing compared to their control counterparts. Post hoc results indicate that participants in the Exercise group recorded a rise in knee- extension torque (P = .003), while those in the control group (P = .15) did not. The study further established a significant interaction for H: M ratio ($F_{2,26} = 1.5$, P = .36, $1 - \beta = 0.28$), and normalized knee-extension MVIC torque ($F_{2,26} = 3.5$, P = .05, $4 - \beta = 0.58$).

DISCUSSION

This study was focused at establishing the effectiveness of the rehabilitation treatment on sports function of anterior cruciate ligament (ACL) patient's reconstruction. The major aim is to allow speedy return of mobility, sport engagement, and increasing strength of the athletes. Evidence for the above results indicate that participants in the Exercise group recorded a rise in knee-extension torque (P = .003), while those in the control group (P = .15) did not. This means that post-operative rehabilitation for the knee injury has a potential of the level of

Table 1. A comparision of P value for post hoc baseline-post treatment results for the control and exercise group

Variable	Group								
	Control group					Exercise Group			
	Baseline	Post therapy	P[a]	Effect size	(95% CI)	Baseline	Post therapy	P[a]	Effect size (95% CI)
Maximal voluntary isometric contraction, Nm/kg	1.4±0.3	1.7±0.4	.16	0.57	(-0.31,1.48)	1.4±0.6	1.6±0.7	.16	0.3 (-0.57,1.18)
Central activation ratio, %	78.1±4.4	80.4±10.5	NA	0.28	(-0.58,1.17)	73.3±12.6	83.4±8.4	NA	0.95 (0.02,1.86)
H-reflex:M-response ratio	0.21±0.19	0.20±0.15	NA	-0.04	(-0.91,0.83)	0.22±0.14	0.12±0.30	NA	0.74 (-0.18,1.86)

functionality, and gaining stability on the body. This finding is affirmed by various studies (Wilk and Andrews, 1992, Risberg, Holm *et al*., 1999) which reiterate that knee rehabilitation has been positive in achieving a desired functional outcome. When related to past protocols, rehabilitation programs advocate and reinforce the essence for athletes to go back into sports as earls 2 months after undergoing surgery. The study further established a significant interaction for H: M ratio ($F2,26 = 1.5$, $P = .36$, $1 - \beta = 0.28$), and normalized knee-extension MVIC torque ($F2,26 = 3.5$, $P = .05$, $4 - \beta = 0.58$). The findings align with the study by Goldblatt, Fitzsimmons, Balk, and Richmond (4) which noted that knee rehabilitation could work in achieving positive body outcome and physical outcome. In fact, an extensive array of research into the bio-mechanics of the operated knee and the injured have resulted into a movement aware from the approach used in the1980s characterized by the delayed bearing of weight, post operative casting and ROM limitation to the extant rehabilitation program with instant ROM training and exercises geared towards weight bearing (Goldblatt, Fitzsimmons *et al*. 2005). Rehabilitation of the ACL-injured knee is aimed towards the best possible level of functionality, repairing the strength of the muscle, gaining stability on the body, and reducing the risk of re-injury (Vadala, Iorio *et al*. 2007).

When related to past protocols, rehabilitation programs advocate and reinforce the essence for athletes to go back into sports as earls 2 months after undergoing surgery. In most cases, the return to sport by an athlete is in most cases determined by the confidence of the patient, stability of the graft, posterior-anterior tibiofemoral motion, post-surgical timeframe, and the opinion of the medical team (Harner, Paulos *et al*., 1994). Following this findings, it is the belief of the author that knees that are subjected to ACL reconstruction ultimately necessitates an extensive rehabilitation, particularly that which emphasizes the return to symmetrical knee motion, neuromuscular control, and symmetrical quadriceps strength. A study by Kline *et al*, established that the timing and rate of extensor moments as well as torque developments were significantly lower (Kline, Morgan *et al*., 2015) (11). This implies the necessity of rehabilitating quadriceps musculature in order to enhance the rate of torque developments as well as in preparing the limb to effectively meet the demand of sports involvement. Furthermore, it aids in n neuromuscular management as well as in restoring muscular balance. What is more, rehabilitation is quite important for an athlete's return to sport since a reduced motion has a high likelihood of placing the extremity at technical disadvantage while also raising the potential for a re-injury. Post-Operative Rehabilitation is mostly divided into two categories, that is early (instant subacute and postoperative strengthening and the late rehabilitation phase) returning to sport and functional rehabilitation. With specific time and goals from the time the surgery was conducted as factors determining the progression of the phases, early phases of ACL reconstruction mostly employs guidelines that are criteria based for progression to exercise selection and full weight bearing as well as a range of motion (ROM) (Wright, Preston *et al*., 2008). On the other hand, the final stage of rehabilitation prescriptions are in typical sense wider, with generalization of relevant progressions and exercises without having to worry about on when it is safe to commence high joint and high-risk leading activities. Additionally, therapeutic approaches that are more conservative have a potential of limiting progress to later rehabilitation stages and probably results into a delay in successful return to sport. The prescription of exercises for the progression of an athlete in returning to sport and through rehabilitation ought to avoid activities that could propel stretching of the graft especially for those athletes that do not harbor sufficient functional capabilities and strength in protecting the healing process while taking part in activities that utilizes high joint. Structural studies conducted on animals establish that the strength of the graft has a tendency of reaching its lowest weak point at four months post-operatively(Butler 1989). In addition, they may not be in a position of reaching failure loads between 10% and 50% of the local ACL at the end of 12 months postopera-tive (Ballock, Woo *et al*. 1989).

Conclusion

From this analysis, it is clear that post-operative rehabilitation and a subsequent return to sport has a potential of increasing the re-integration of an athlete to sports at a similar level of competition as before the occurrence of an injury. Therefore, post-operative rehabilitation with strict criteria guideline is recommended for an effective performance and facilitating the sports function of patients with the anterior cruciate ligament (ACL) reconstruction.

REFERENCES

Ballock, R. T., S. L. Woo, R. M. Lyon, J. M. Hollis and W. H. Akeson, 1989. "Use of patellar tendon autograft for anterior cruciate ligament reconstruction in the rabbit: a long-term histologic and biomechanical study." *J Orthop Res*., 7(4): 474-485.

Butler, D. L. 1989. "Kappa Delta Award paper. Anterior cruciate ligament: its normal response and replacement." *J Orthop Res*., 7(6): 910-921.

Goldblatt, J. P., S. E. Fitzsimmons, E. Balk and J. C. Richmond 2005. "Reconstruction of the anterior cruciate ligament: meta-analysis of patellar tendon versus hamstring tendon autograft." *Arthroscopy*, 21(7): 791-803.

Harner, C. D., L. E. Paulos, A. E. Greenwald, T. D. Rosenberg and V. C. Cooley, 1994. "Detailed analysis of patients with bilateral anterior cruciate ligament injuries." *Am J Sports Med*., 22(1): 37-43.

Kline, P. W., K. D. Morgan, D. L. Johnson, M. L. Ireland and B. Noehren, 2015. "Impaired Quadriceps Rate of Torque Development and Knee Mechanics After Anterior Cruciate Ligament Reconstruction With Patellar Tendon Autograft." *Am J Sports Med*., 43(10): 2553-2558.

Noyes, F. R. and G. H. McGinniss, 1985. "Controversy about treatment of the knee with anterior cruciate laxity." *Clin Orthop Relat Res.,* (198): 61-76.

Risberg, M. A., I. Holm, O. Tjomsland, E. Ljunggren and A. Ekeland, 1999. "Prospective study of changes in impairments and disabilities after anterior cruciate ligament reconstruction." *J Orthop Sports Phys Ther.,* 29(7): 400-412.

Vadala, A., R. Iorio, A. De Carli, G. Argento, V. Di Sanzo, F. Conteduca and A. Ferretti, 2007. "The effect of accelerated, brace free, rehabilitation on bone tunnel enlargement after ACL reconstruction using hamstring tendons: a CT study." *Knee Surg Sports Traumatol Arthrosc*., 15(4): 365-371.

Wilk, K. E. and J. R. Andrews, 1992. "Current concepts in the treatment of anterior cruciate ligament disruption." *J Orthop Sports Phys Ther*., 15(6): 279-293.

Wright, R. W., E. Preston, B. C. Fleming, A. Amendola, J. T. Andrish, J. A. Bergfeld, W. R. Dunn, C. Kaeding, J. E. Kuhn, R. G. Marx, E. C. McCarty, R. C. Parker, K. P. Spindler, M. Wolcott, B. R. Wolf and G. N. Williams, 2008. "A systematic review of anterior cruciate ligament reconstruction rehabilitation: part I: continuous passive motion, early weight bearing, postoperative bracing, and home-based rehabilitation." *J Knee Surg*., 21(3): 217-224.

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