

ORIGINAL ARTICLE

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Isokinetic Testing in Evaluation Rehabilitation Outcome After ACL Reconstruction

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ABSTRACT

Introduction: Numerous rehab protocols have been used in rehabilitation after ACL reconstruction. Isokinetic testing is an objective way to evaluate dynamic stability of the knee joint that estimates the quality of rehabilitation outcome after ACL reconstruction. Our investigation goal was to show importance of isokinetic testing in evaluation thigh muscle strength in patients which underwent ACL reconstruction and rehabilitation protocol. **Subjects and methods:** In prospective study, we evaluated 40 subjects which were divided into two groups. Experimental group consisted of 20 recreational males which underwent ACL reconstruction with hamstring tendon and rehabilitation protocol 6 months before isokinetic testing. Control group (20 subjects) consisted of healthy recreational males. In all subjects knee muscle testing was performed on a Biodex System 4 Pro isokinetic dynamometer at velocities of 60°/s and 180°/s. We followed average peak torque to body weight (PT/BW) and classic H/Q ratio. In statistical analysis Student's T test was used. **Results:** There were statistically significant differences between groups in all evaluated parameters except of the mean value of PT/BW of the quadriceps at velocity of 60°/s ($p > 0.05$). **Conclusion:** Isokinetic testing of dynamic stabilizers of the knee is need in diagnostic and treatment thigh muscle imbalance. We believe that isokinetic testing is an objective parameter for return to sport activities after ACL reconstruction.

Key words: isokinetic test, ACL reconstruction, rehabilitation.

1. INTRODUCTION

Isokinetic testing is a commonly utilized tool for the assessment of muscular strength in orthopedic and sports medicine setting abroad, but in our country or region were poor documented studies about it. In rehabilitation patients after ACL reconstruction isokinetic testing we use it for evaluation and treatment planning. Isokinetic is frequently chosen because of their inherent patient safety, objectivity and reproducibility in testing measures (1). Numerous research have documented clinical outcome studies utilizing peak torque parameters, especially the bilateral comparison ratio of the quadriceps and hamstring muscles (2, 3). A few investigations have reported outcomes utilizing muscle performance parameters such as work, power and endurance (4).

2. OBJECTIVE

Aim of this paper is to present role of isokinetic testing in evaluation thigh muscle strength in patients which underwent ACL reconstruction and rehabilitation protocol.

3. PATIENTS AND METHODS

In prospective study, we evaluated 40 subjects which were divided into two groups, experimental and control.

Experimental group consisted of 20 recreational males which underwent ACL reconstruction with hamstring tendon and rehabilitation protocol 6 month before isokinetic testing. Control group (20 subjects) consisted of healthy recreational males.

Knee muscle testing was performed on a Biodex System 4 Pro isokinetic dynamometer at velocities of 60°/s and 180°/s. All subjects included in this study had at least two prior testing on the Biodex System to familiarize them to the machine and testing sequence. The subjects were tested for knee extension and flexion strength using the following protocol: each subject performed a 6-minute active warm-up on stationary bicycle at a submaximal work level. The subjects were tested in a seated position, hip flexion at 110 to 125°, and stabilization straps were applied to the trunk and thighs. The resistance pad was placed at a level a proximally 3 cm proximal of medial malleolus. All subjects underwent testing of the uninvolved limb first. The range of motion of the knee joint during testing was set from 0-90° and all limbs were gravity compensated. Bilateral isokinetic (concentric/concentric) knee extension and flexion studies with the protocol of 60°/s (5 repetitions) and 180°/s (10 repetitions) were accomplished. Between two session subjects for 30 seconds. Vocal en-

couragement during the testing was consisted and standardized. Parameters which were followed, average power and H/Q ratios, automatically calculated by the device. In statistical analysis was used Student's T test

4. RESULTS

Statistically there are significant differences in the mean value of peak torque to body weight (PT/BW) in patients

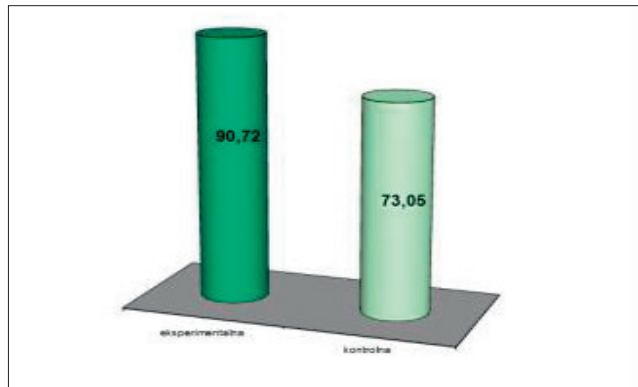


Figure 1. The mean value of PT/BW of knee flexors et velocity 60°/s

of experimental group et velocity 60°/s ($p < 0.01$). (Figure 1). No significant differences were found in the mean value of PT/BW knee extensor muscle between evaluated

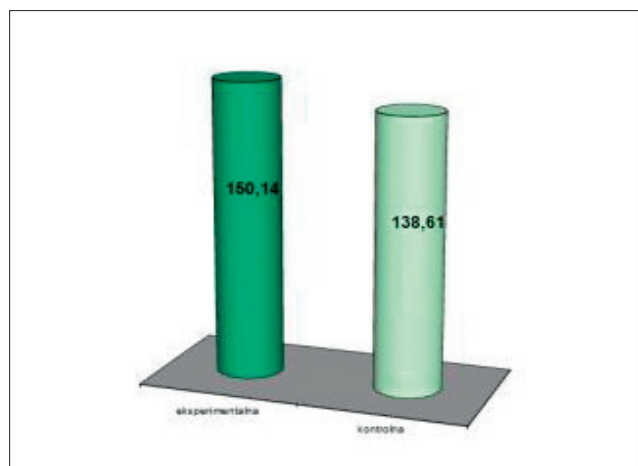


Figure 2. The mean value of PT/BW of knee extensors et velocity 60°/s

groups et velocity 60°/sec ($p > 0.05$) (Figure 2).

In addition, the endurance of dynamic stabilizers of the knee (extensor and flexor knee muscles) was statistically significant better in patients of experimental group versus control ($p < 0.01$) (Figure 3 i 4.)

Observing the mean value of the classic H/Q ratio, there was statistically significant differences between evaluated group of patients in favor of experimental group ($p < 0.05$) (Figure 5).

5. DISCUSSION

Our primary finding was that patients after ACL reconstruction and underwent rehabilitation did not have muscle disbalance in knee flexors and extensor. A major area of focus in our study was to examine effect of rehabilitation protocol in this patients which we demonstrate by measurement muscle parameters of dynamic stabilizers

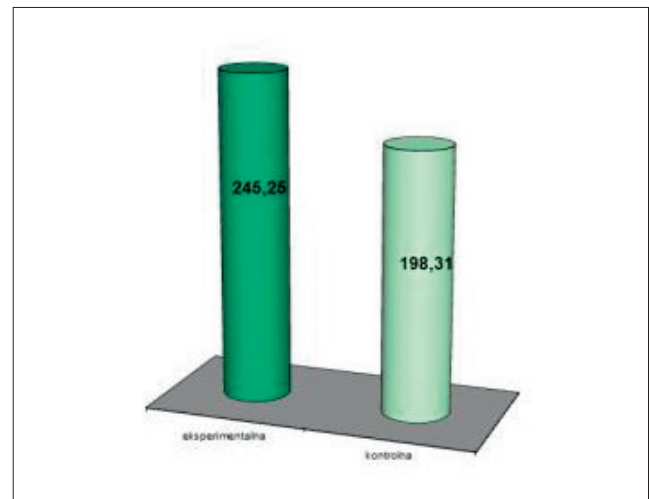


Figure 3. The mean value of PT/BW of knee extensors et velocity 180°/s

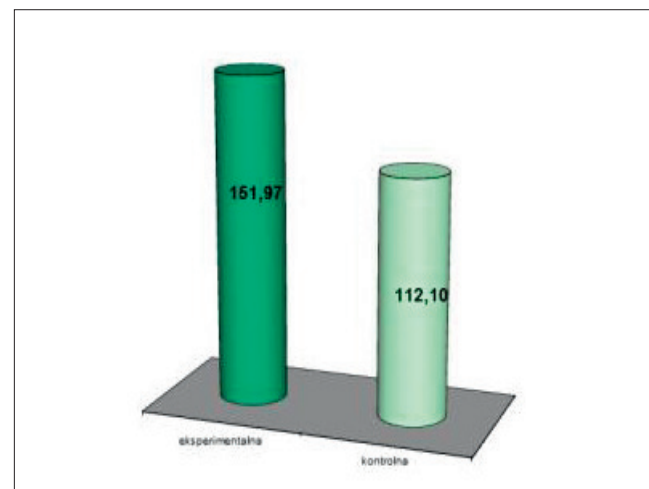


Figure 4. The mean value of PT/BW of knee flexors et velocity 180°/s

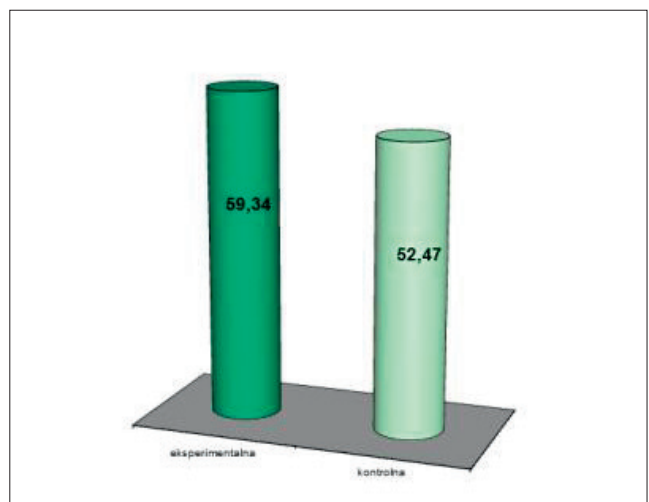


Figure 5. The mean value of H/Q ratio in experimental and control group

of knee joint on isokinetic dynamo-meter Biodex 4 pro System. During the postoperative ACL rehabilitation we recommend hamstring strengthening exercises to reduce anterior tibial translation. There are studies that show adverse results about return strength of hamstring muscles after ACL reconstruction (5, 6). Some of them demon-

strate relatively fast hamstring strength recovery, right after 12-14 weeks postoperatively on the preinjury level (5). On the other hand, Seto et al reported that hamstring strength in the reconstructed limb was significantly less in patients after ACL ligamentoplasty even after five years postoperatively (6). Results of our finding show complete recovery of the hamstrings muscles after 6 month postoperative and agrees to the study show by Wilk et al. Other than just of the recovery of hamstring muscle strength this all applies to endurance. Accelerated rehabilitation protocols after ACL reconstruction commonly employs immediate motion, weight bearing, neuromuscular electrostimulation and exercise to avoid inactivity and muscle hypotrophy of the quadriceps. We all know that the recovery of quadriceps muscle is very slow process. Up to 2 years may be needed to regain normal quadriceps muscle performance following ACL reconstruction (7). Even though, our results demonstrate that there are no significant differences in quadriceps strength muscle between ACL reconstructed patients and healthy recreational sportsmen. However, we showed that endurance of quadriceps muscle is significantly better in ACL reconstructed patients versus patients in control group, so we can conclude the positive outcome of adequate and continued rehabilitation. Our results do not agree with findings of Hoffman et al, but we must take in account that the study takes another surgical technique (patellar tendon graft) (8). The hamstring/quadriceps muscle strength ratio has been used as an indicator of normal balance between the knee flexors and extensors (9). It is some of very significant parameter in estimating the time of return to sports activities. Our ACL reconstructed patients after 6 months of the rehabilitation have the value of H/Q ratio in the recommended level which allows them to go back into sports activities.

6. CONCLUSION

Isokinetic testing of dynamic stabilizers of the knee is need in diagnostic and treatment thigh muscle imbalance after ACL injury and surgical intervention. It is an objective parameter for decision of return to sports activities after ACL reconstruction.

CONFLICT OF INTEREST: NONE DECLARED.

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