

Comparison Between Strength of Muscles Rotating the Knee in Healthy Individuals and Patients one Year after an ACL Reconstruction

Marcin Popieluch¹, Robert Śmigiełski¹, Dariusz Straszewski¹, Marcin Plenzler¹, Michał Staniszewski²

¹Carolina Medical Center, Scientific Research Department, Warsaw, POLAND, ²Józef Piłsudski University of Physical Education in Warsaw, Human Anatomy Department, Warsaw, POLAND

Objectives: In this study we have made an attempt to establish torque value of the muscles rotating the knee of patients who had ruptured their ACLs during an amateur football practise on an artificial turf. In this study we presented biomechanical research on torques of muscles responsible for internal and external rotation of the lower leg. We presented a method whereby it is possible to measure the muscle strength before and after the ACL rupture but also during the process of rehabilitation and after its finish. The available literature on measurements of torque of the knee is quite extensive though it mainly describes torques of muscles flexing and extending the joint. In Polish literature there is scarcity of studies focused on torques of muscles rotating the knee. In foreign literature there is an increasing emphasis on the role of lower leg rotation, as the element greatly impacting, for instance, the position of the foot.

Methods: The study presents results of 22 patients and 50 healthy individuals (not practising any particular sport regularly) being the control group. All patients had their ACLs reconstructed using the double-bundle technique. The material for the graft was obtained from the hamstrings. The aim was to measure the maximal torque of the muscles responsible for external and internal rotation of the knee (lower leg in a static state using a special device). The device allowed measurement of the torque of muscles rotating the lower leg in its axis by stabilizing the ankle with special emphasis on foot mounting (stabilization of footwear). The special device was connected to a PC with CPS/HMF software. The software enabled observation and recording of increase in the value of the torque until it reached its maximum. The measurements were taken in two knee positions: 30 degrees and 90 degrees flexion.

Results: The result were analyzed statistically, means and SDs were calculated. Only right-legged subjects were included in the analysis. The Shapiro-Wilk test was used to test normality of the distribution. Some of the data did not have a normal distribution so in order to compare results of different groups a non-parametric Mann-Whitney U test was used. The groups differed significantly in terms of age ($p=0.001$), did not differ in terms of body height ($p=0.529$) or mass ($p=0.233$). Statistically significant differences ($p<0.001$) were marked by an asterisk (*). Each measurement of the left and right leg was also compared between the groups. The Kruskal-Wallis one-way analysis of variance by ranks was used and significant differences were those with $p<0.001$. When analyzing it has been noted that there was a statistically significant difference ($p<0.001$) between the torque value of muscles responsible for internal rotation (S40) when examining the right limb (after ACL reconstruction) in both groups. Significant differences were observed in all starting positions, as well as in both degrees of flexion – 30 and 90. Deficit of muscle strength on the right side – the injured one – when compared to the left was sometimes as high as 30%.

Conclusion: 1. Near 30% deficit of strength of muscles responsible for internal rotation of the knee indicates that the knee is rotationally unstable after a year from the surgery. 2. Based on the fact that using the hamstrings tendons – responsible for internal rotation of the knee – in order to reconstruct the ACL, poses a risk of rotational instability of the joint for as long as a year after the procedure, the rehabilitation protocol for such patients should be adjusted or completely changed.

The Orthopaedic Journal of Sports Medicine, 2(11)(suppl 3)

DOI: 10.1177/2325967114S00144

©The Author(s) 2014