

## Summary

### **THE INFLUENCE OF KNEE EXTENSORS TRAINING ON ITS STABILITY AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION**

**Introduction:** The main goal of the physiotherapy of patients after anterior cruciate ligament (ACL) reconstruction is to restore the full function of the joint while protecting the healing graft. At the beginning of the 1990s, scientific reports revealed that the knee extensor exercises in the open kinetic chain (OKC) might cause greater pain and deterioration of graft function, and this could affect the deterioration of the knee joint stability (KJS). It also seems that the combination of exercises in a closed and open kinetic chain (CaOKC) may result in a greater increase in the strength of the quadriceps femoris than exercises performed only in a closed kinetic chain (CKC).

**Aim:** The aim of the study was to determine the impact of early introduction of knee extensor muscle training in the CaOKC on KJS, in people after ACL reconstruction. In addition, training performed in the CaOKC was compared with training performed only in the CKC in terms of the impact on the strength of extensors and flexors of the knee joint, as well as the impact on pain and the sense of knee joint functional quality.

**Material and methods:** As part of the study, 39 men aged 20-37 after the ACL reconstruction were examined. The graft was collected from the tendons of the hamstring muscles. Subjects were randomly assigned to one of the two groups: group O (in which the subjects performed resistance exercise in the CaOKC) and group Z (in which the subjects performed resistance exercises only in the CKC). Training lasted from the 5th to the 12th week after the ACL reconstruction.

The measurements were carried out at the 4th, 8th and 12th week after surgery and included: KJS measurement with the GNRB arthrometer, strength measurement of knee extensors and flexors under isometric conditions using a BTE Primus RS dynamometer and the IKDC 2000 questionnaire, assessing pain and the sense of knee joint functional quality.

**Results:** The analysis of the results showed no statistically significant differences ( $p < 0.05$ ) in: operated knee joint anterior stability, operated knee extensors and flexors muscle strength, and in the subjective sense of pain and functional quality of this joint between patients

performing training in the CaOKC and patients performing training in the CKC only. In both groups, a statistically significant increase was observed in the strength of flexors and extensors of the operated knee joint, as well as reduction in pain and improvement of subjective sense of functional quality of this joint.

**Conclusions:** The conducted research and performed analysis allow to formulate the following conclusions regarding resistance training of knee extensors muscles in people after ACL reconstruction.

1. Resistance training of knee extensors performed in a closed and open kinetic chain, started in the fifth week after surgery, has no statistically significant effect on the anterior stability of the knee joint.
2. Resistance training of knee extensors performed in a closed kinetic chain, started in the fifth week after surgery, has no statistically significant effect on the anterior stability of the knee joint.
3. Resistance training of knee extensors performed in a closed and open kinetic chain has no statistically significant impact on the increase in the maximal torque of knee flexors and extensors, compared to training performed only in a closed kinetic chain.
4. Resistance training of knee extensors performed in a closed and open kinetic chain has no statistically significant impact on the sense of functional quality of this joint and the sense of pain compared to the training performed in a closed kinetic chain only.

**Key words:** close kinetic chain, open kinetic chain, anterior cruciate ligament reconstruction, laxity, knee joint