

SUMMARY

Introduction: Anterior cruciate ligaments (ACL) are the most important passive stabilizers of the knee joint. ACL injuries are one of the most common and frequent injuries of musculo-skeletal system, especially in group of young, active people. The ACL rupture is most often an effect of non-contact or contact injuries during participation in sport or other physical activities. The ACL rupture leads to mechanical and functional instability of the knee.

The anterior cruciate ligament is not only the main passive stabilizer of the knee joint, but also plays a significant sensory role due to the presence of mechanoreceptors in its structure. Scientific research has confirmed that an ACL injury and the following functional instability of the knee joint results from its mechanical destabilization and impaired neuromuscular control, as an effect of the damage of the proprioceptors in the ligament.

Assessment of balance and postural stability should be integral part of complex functional assessment of patients at different stages after ACL reconstruction. It is especially important at so called end-stage rehabilitation phase, when clinical decision about patients return to activity (work, sport, physical activity) are made. Balance and postural stability impairments and functional asymmetry between operated and non-operated lower limb may indicate impaired function of the knee joint and increased risk of secondary injury.

Objective: The aim of this PhD thesis research was complex assessment of balance and postural stability of patients with ACL injury at different stages after its surgical reconstruction (3 and 6 month), using Y-Balance Test and stabilometric force platform. Additional, practical effect of this study is the assessment of the possibility of using new, simple and non - expensive tool – Y-Balance Test, for the purpose of balance and postural stability evaluation in the study group.

Material and methods: 50 adult patients (50 males with a mean age of 26.5 years) with primary, total, unilateral, isolated ACL rupture participated in this study. All subjects had undergone surgical reconstruction of the ACL, using semitendinosus and gracilis muscle autografts. All subjects in the study group were operated in the same hospital (The Holy Family Hospital, Rudna Mała/Rzeszów), by the same operator. The study was performed twice; the first was conducted three months after ACL

reconstruction (study I – 50 subjects) and the follow-up study six months after the surgery (study II-30 subjects).

The main part of this study was the assessment of dynamic balance and postural control using Y-Balance Test, with original instrumented device and Y-Balance Test Protocol and the assessment of static balance, using Cosmogamma stabilometric force platform.

Results: Main results considering Y-Balance Test :

- in the first study statistically significant differences between operated and non-operated limb were observed in all Y-Balance Test parameters. The results for operated limb were significantly lower comparing to non-operated limb;
- in the second follow-up study (6 months after the ACL reconstruction) the differences between operated and non-operated limb were smaller, although still statistically significant;
- all results of the Y-Balance Test in the second study has improved significantly, comparing to the first study. Statistically significant improvement of the results were observed for both operated and non-operated limb.

Main results considering assessment of static balance, using Cosmogamma stabilometric force platform:

- similarly to Y-Balance Test results, the results of static balance assessment using Cosmogamma stabilometric force platform, indicates deficits in balance and functional asymmetry between operated and non-operated limb in the group of patients after ACL reconstruction, both in first and second study;
- most of the statistically significant differences between operated and non-operated limb were observed in single leg stance trials with eyes closed. This may indicate their potential value in the assessment of static balance and postural control in the study group.

Conclusions:

- the results of Y-Balance Test and the results of static balance assessment using Cosmogamma stabilometric force platform indicates existing deficits of balance and functional asymmetry between operated and non-operated limb in the study group;
- absence of statistically significant correlations between the results of Y-Balance Test and the results of static balance assessment using Cosmogamma stabilometric force platform, indicates that these tools are focused on the assessment of two different aspects of very complex process of human balance and postural control;

- the results of this study indicates the possibility of using Y-Balance Test as an simple, non-expansive and sensitive tool for the purpose of assessment of dynamic balance impairments and functional asymmetry between operated and non-operated limb in patients after ACL reconstruction.