NEW LABORATORY TEST FOR DYNAMIC STABILITY IN ACL DEFICIENT KNEE JOINT

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INTRODUCTION

Anterior cruciate ligament (ACL) injuries are common in sports. Most ACL injuries are noncontact in nature and frequently occur in sports such as soccer, basketball, handball and volleyball. Knee injuries are the most common, and have the greatest potential to cause both short term and long term disability. Dynamic stability of the knee during such activities is determined by the balance of muscle strength, lower extremity muscle fatigue, ligament function, joint structures contact, and ground reaction forces applied to the leg.

The purpose of this research was to determine the effect of the controlled landing tests in dynamic stability of ACL deficient knee pre- and post reconstruction. The test protocol included experimental and control groups. The experimental group included examinees with ACL deficient knee while control group consisted of healthy examinees.

METHODS

The protocol consisted of the following testing phases: 1. testing of the knee joint muscle power (execution of the maximum voluntary contraction during which the myoelectric signals were collected) and 2. testing of the knee joint dynamic stability (execution of the test with one-leg (landings) from the 40 cm and 20 cm high bench, during which the kinematic and kinetic parameters were collected). The following variables were studied: kinematic 2 (valgus and varus, inner and outer rotation and angle of the flexion and extension in the knee joint), ground reaction force 3 and EMG signals of the four main muscles of the lower extremities have been measured during execution of the maximum static contraction lasting 10 seconds. The protocol was performed twice, pre- and post reconstruction of ACL. For motion analysis, in this research, we used BTS optical-electronic system. BTS Elite offers integration of kinematics data with the external signals of force platforms and EMG devices 1.

RESULTS AND DISCUSSION

Correlation analysis of the measured signals gave an insight in the motor control and reproducibility of the landing stereotype. Statistically significant difference between groups in the first measurement as well as between injured and healthy knee was observed. That was the case especially in kinematical parameters (in inner and outer rotation angle as well as valgus-varus movement). Generally, a change in landing dynamics of the injured knee was observed. The differences are reduced following the reconstruction, and that is especially the case in examinees that underwent proprioceptive treatment during rehabilitation.

CONCLUSIONS

The test could be applicable as an indicator of readiness of athletes to sustain training workload as well as a predictor of injury occurrence in healthy people.

ACKNOWLEDGEMENT

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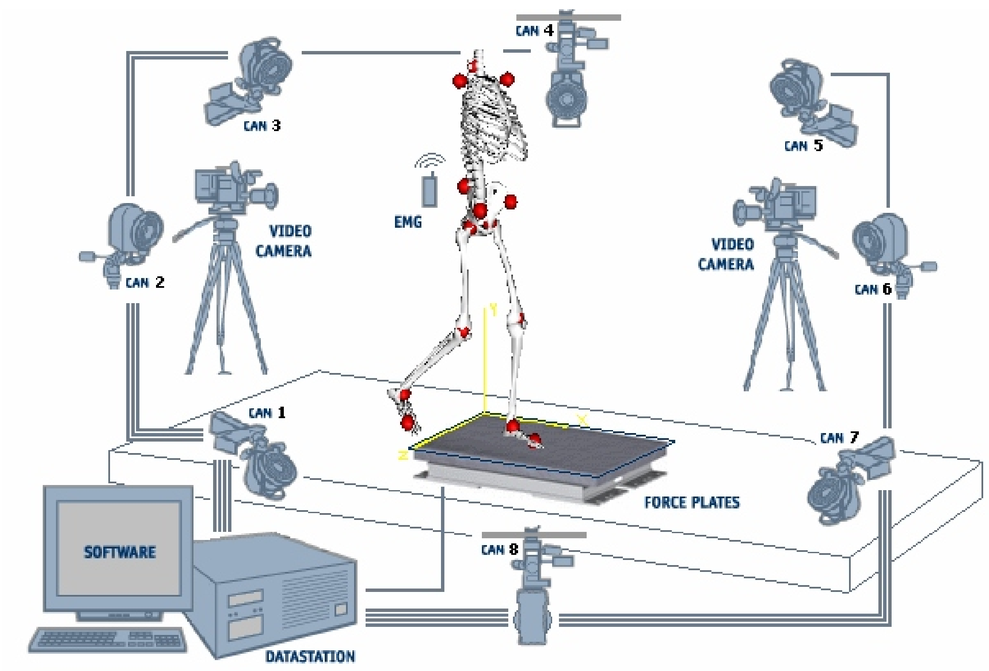

Figure 1: BTS motion analysis system

Figure 2: Testing of the knee joint dynamic stability

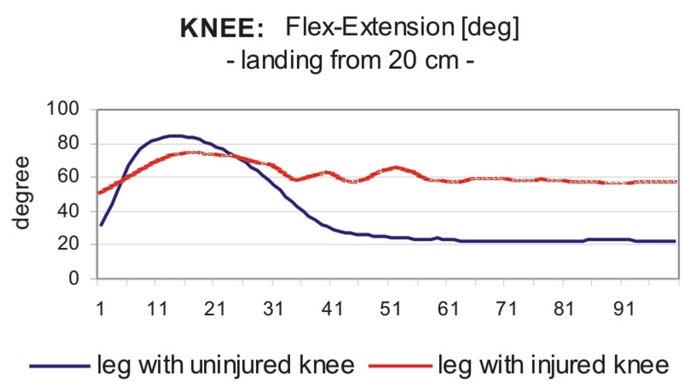

Figure 3: Kinematics differences between two legs

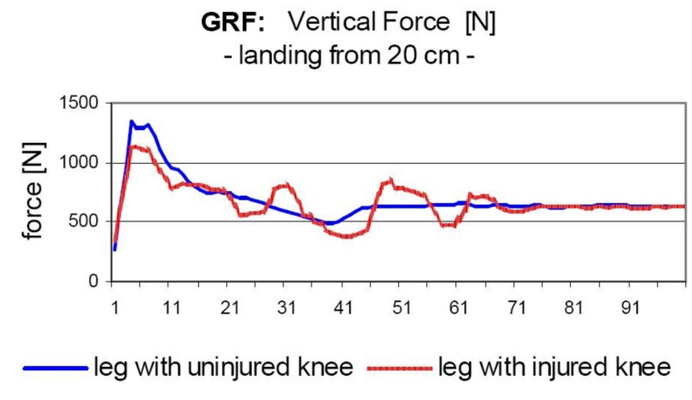

Figure 4: Differences in GRF between two legs