

MUSCLE STRENGTH ASSESSMENT AFTER ACL RECONSTRUCTION: INFLUENCE OF THE ISOKINETIC TESTING MODALITIES

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Introduction: When using a resistance placed at the distal tibia, the contraction of the quadriceps tends to force the proximal end of the tibia anteriorly with respect to the distal femur. This mechanism could damage the graft after an anterior cruciate ligament (ACL) surgical repair, for instance through isokinetic intervention in rehabilitation. Therefore, it is frequently recommended to use either a proximal placement of the isokinetic resistance pad or an anti-shear device. Nevertheless, the influence of the resistance pad position on muscle torque development and estimation of strength deficit remains poorly investigated.

Aim: To study, after ACL reconstruction, the influence of the resistance pad positioning on (1) torque development and electromyographic (EMG) activity pattern of the hamstring and quadriceps muscles, (2) muscle strength deficit estimated from a comparison with controlateral healthy knee performances.

Patients and Methods: Twenty male subjects (26 ± 6 years old) with unilateral ACL reconstruction using a patellar tendon graft were studied. Six months after surgery, they performed a pain free bilateral isokinetic assessment of hamstrings and quadriceps in concentric at $60^\circ/s$ and $240^\circ/s$. Two different positions of the resistance pad on the tibia, either distal or proximal, were successively used (order randomly assigned). Surface EMG activity was measured on quadriceps and hamstrings. The average root mean square (RMS) represented muscle activity.

Results: The isokinetic strength deficit of the quadriceps through a bilateral comparison was significantly increased when the test was performed in a distal position of the resistance pad compared to a proximal position: respectively $35 \pm 13\%$ and $17\% \pm 12\%$ at $60^\circ/s$ ($p < 0.05$). The activation pattern during isokinetic knee extension at maximal intensity was also modified by the resistance pad position on the tibia. At low velocity ($60^\circ/s$), the proximal/distal EMG activity ratio on quadriceps was significantly increased on the operated leg compared to the controlateral healthy side. By contrast, parameters related to the hamstring muscles did not show significant difference between both positions.

Conclusion: the resistance pad position on the tibia during maximal isokinetic knee extension after ACL reconstruction significantly influences quadriceps activation and torque production. That could entail questionable interpretation of an isokinetic testing.