Long-term consequences of anterior cruciate ligament injury

Knee function, physical activity level, physical capacity and movement pattern

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Akademisk avhandling

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Avhandlingen kommer att försvaras på svenska.

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Abstract
Knee function after more than 20 years post injury is rarely described and none of the few follow-up studies have evaluated functional performance tasks. This thesis investigated self-reported knee function, physical activity level, physical capacity and movement pattern in the long-term perspective (on average 23 years) in persons who had suffered a unilateral ACL injury, treated either with physiotherapy in combination with surgery (ACL\(_R\), n=33) or physiotherapy alone (ACL\(_PT\), n=37) and compared to age-and-gender matched controls (n=33).

This thesis shows that regardless of treatment, there are significant negative long-term consequences on self-reported knee function and physical activity more than 20 years after injury. In comparison to the controls, the ACL-groups (ACL\(_R\) and ACL\(_PT\)) had lower knee function as measured by the Lysholm score and the Knee injury and Osteoarthritis Outcome Score (KOOS). The persons with an ACL injury also had a lower knee-specific physical activity level (Tegner activity scale), while no differences were seen in general physical activity level (International Physical Activity Questionnaire, IPAQ) compared to healthy controls. Regarding physical capacity, both ACL groups showed inferior jump capacity in the injured leg compared to the non-injured leg. However, compared to controls the ACL-injured had a relatively good jump performance. Knee extension peak torque, concentric and eccentric, was also lower for the injured leg compared to the non-injured leg for both ACL\(_R\) and ACL\(_PT\). In addition, the ACL\(_PT\) group showed reduced eccentric knee flexion torque of the injured leg. The non-injured leg, on the other hand, showed almost equal jump capacity and strength as controls. Balance in single-limb stance (30s) was inferior in persons who had an ACL injury. This was true for both the injured and non-injured leg and regardless of treatment. Movement pattern during the one-leg hop was analysed by a set of kinematic variables consisting of knee angles (flexion, abduction, rotation) and Centre of Mass (CoM) placement in relation to the knee and ankle joints. Both ACL\(_R\) and ACL\(_PT\) displayed movement pattern asymmetries between injured and non-injured legs. In comparison to controls, the ACL\(_R\) group had a similar movement pattern with the exception of larger external knee rotation at Initial contact and less maximum internal rotation during the Landing. ACL\(_PT\) showed several differences compared to controls both regarding knee angles and CoM placement. The ACL-injured persons with no-or-low knee osteoarthritis (OA) had better knee function as reflected by higher scores on Lysholm and KOOS subscale ‘symptom’ compared to those with moderate-to-high OA. The degree of OA had no influence on reported physical activity level, jump capacity, peak torque or the kinematic variables.

In conclusion, this thesis indicates that persons with a unilateral ACL injury, regardless of treatment, have some negative long-term consequences e.g. self-reported knee function, knee-specific activity level, strength and balance deficits, when compared to age-and-gender matched controls. The results, however, also indicate that the ACL-injured can manage reasonably well in some jumps and general activity level but have an inferior performance in more knee-demanding tasks. The ACL\(_R\) group had similar movement pattern with the exception of knee rotation, indicating that a reconstruction may restore the knee biomechanics to some extent. The ACL\(_PT\) group on the other hand, seem to use compensatory movement strategies showing several differences compared to controls.

Keywords
Cross-sectional design, isokinetic, peak torque, centre of pressure, kinematics