

Return to sport after pediatric and adolescent ACL injury

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligen försvaras i R-aulan, Sahlgrenska Universitetssjukhuset, Mölndal, onsdagen 12 juni 2024, klockan 9:00

av Baldur Thorolfsson, leg. läkare

Fakultetsopponent:

Professor Jon Olav Drogset,

NTNU, Institutt for nevromedisin og bevegelsesvitenskap, Fakultet for medisin og helsevitenskap, Trondheim, Norge

Avhandlingen baseras på följande delarbeten

- I. **Adolescents have twice the revision rate of young adults after ACL reconstruction with a hamstring tendon autograft: a study from the Swedish National Knee Ligament Registry** Thorolfsson B, Svantesson E, Snaebjornsson T, Sansone M, Karlsson J, Samuelsson K, Hamrin Senorski E. *Orthop J Sports Med.* 2021; 12;9(10):23259671211038893
- II. **Lower rate of acceptable knee function in adolescents compared with young adults 5 years after ACL reconstruction: Results from the Swedish National Knee Ligament Registry** Thorolfsson B, Lundgren M, Snaebjornsson T, Karlsson J, Samuelsson K, Hamrin Senorski E. *BMC Musculoskelet Disord.* 2022; 19;23(1):793
- III. **Greater self-efficacy, psychological readiness and return to sport amongst paediatric patients compared with adolescents and young adults, 8 and 12 months after ACL reconstruction** Thorolfsson B, Piussi R, Snaebjornsson T, Karlsson J, Samuelsson K, Beischer S, Thomeé R, Hamrin Senorski E. *Knee Surg Sports Traumatol Arthrosc.* 2023;31(12):5629-5640
- IV. **Prediction of Return to Sport after Pediatric and Adolescent ACL Reconstruction** Thorolfsson B, Winkler P, Piussi R, Simonson R, Samuelsson K, Karlsson J, Hamrin Senorski E. *Manuscript*
- V. **Sport Specific Outcomes, Concomitant Injuries, and Return to Sport Rates after Pediatric and Adolescent ACL** Winkler P, Thorolfsson B, Piussi R, Simonson R, Samuelsson K, Karlsson J, Hamrin Senorski E. *Manuscript*

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR KLINISKA VETENSKAPER**



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Abstract

The incidence of anterior cruciate ligament (ACL) injuries in pediatric and adolescent patients is increasing. ACL reconstruction at a young age has been identified as a risk factor for an ACL revision later on, and studies on clinical outcomes and return to sport are inconsistent. The thesis consists of five studies with the overall aim to investigate the outcomes after ACL injury, treatment, rehabilitation and return to sport in pediatric and adolescent patients.

Study I is a cohort study based on data from the Swedish National Knee Ligament Registry (SNKLR) with the aim to determine whether the age at ACL reconstruction affects the risk of undergoing revision surgery in pediatric and adolescent patients. A total of 2,848 patients aged five to 35 years who underwent a primary ACL reconstruction with a hamstring tendon autograft between 2005 and 2015, were included. The results of the study showed that adolescents (males 16-19 years/females 14-19 years) had almost twice as high revision rates as young adults (20-35 years). **Study II** is a cohort study based on data from the SNKLR, where the aim is to determine whether the patients' age affects the proportion of patients who achieve a patient-acceptable symptom state (PASS) on the Knee injury and Osteoarthritis Outcome Score (KOOS) subscales one, two, five and 10 years after an ACL reconstruction. A total of 2,848 patients aged five to 35 years who underwent a primary ACL reconstruction between 2005 and 2017 and had completed the KOOS questionnaire at the one-, two-, five- or 10-year follow-ups were included. The results showed that adolescents reported a significantly lower KOOS score than young adults at the two-, five- and 10-year follow-ups and that a lower percentage of adolescents achieved a PASS across all KOOS subscales compared with the young adults at the five-year follow-up. **Study III** is a cohort study based on a rehabilitation outcome registry, Project ACL. The study aimed to study the differences in rehabilitation-specific outcomes between pediatric patients, adolescents, and young adults within the first 2 years after the ACL reconstruction. A total of 691 patients aged 11–25 years registered for primary ACL reconstruction with a hamstring tendon autograft between 2013 and 2020, were included. The results showed that a significantly higher number of pediatric patients had returned to sport compared with adolescents and young adults at both eight and 12 months. **Study IV** is a prospective observational registry-based cohort study. The aim of this study was to evaluate the clinical outcomes, level and rate of return to sport, and predictive factors for return to sport after an ACL reconstruction in pediatric and adolescent patients. Patients aged 10 to 18 years at the time of primary ACL reconstruction who were registered in SNKLR were screened for eligibility. A survey was sent to all patients > 20 years old at the time of survey distribution. Overall, 1,567 patients were included in the study. The results showed that 66 to 70% of pediatric and adolescent patients effectively resumed sports activities following the ACL reconstruction. **Study V** is a prospective observational registry-based cohort study on the same cohort as Study IV. The aim was to evaluate sport specific outcomes, concomitant injuries, and return to sport rates after an ACL reconstruction in pediatric and adolescent patients. The results showed that concomitant injuries and second ACL injuries were common after ACL reconstruction in pediatric and adolescent patients. Significant differences in concomitant medial collateral ligament injuries were found between the different types of sports, with the highest prevalence seen in handball (5%). After an ACL injury, not all patients manage to return to elite level of sport and 9% of patients do not return to sport at all.

Keywords: adolescent; anterior cruciate ligament; ACL; physis; pediatric; registry; revision; return to sport.