

# ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Graft failures, surgical techniques and patient-reported outcome measures

## Akademisk avhandling

som för avläggande av medicine doktorexamen vid Sahlgrenska akademien, Göteborgs universitet, kommer att offentlig försvaras i Mölndalsaulan, V-huset, Sahlgrenska Universitetssjukhuset/Mölndal, fredagen 27:e maj 2016, klockan 9:00

av **Haukur Björnsson** Leg. läkare

Fakultetsopponent:  
Docent Karl Eriksson

Institutionen för klinisk forskning och utbildning,  
Karolinska Institutet, Stockholm

Avhandlingen baseras på följande delarbeten:

**I. Is double-bundle anterior cruciate ligament reconstruction superior to single-bundle? A comprehensive systematic review**

Björnsson H, Desai N, Musahl V, Alentorn-Geli E, Bhandari M, Fu FH, Samuelsson K  
*Knee Surg Sports Traumatol Arthrosc.* 2015; 23(3): 696-739

**II. No difference in revision rates between single- and double-bundle anterior cruciate ligament reconstruction. A comparative study of 16,791 patients from the Swedish national knee ligament register**

Björnsson H, Andernord D, Desai N, Norrby O, Forssblad M, Petzold M, Karlsson J, Samuelsson K  
*Arthroscopy.* 2015; 31(4): 659-664

**III. Predictors of revision surgery after primary anterior cruciate ligament reconstruction**

Yabroudi MA, Björnsson H, Lynch AD, Muller B, Samuelsson K, Tarabichi M, Karlsson J, Fu F, Irgang JJ  
*Submitted to Orthop J Sports Med*

**IV. A randomized controlled trial with mean 16 year follow-up comparing hamstring and patella tendon autografts in anterior cruciate ligament reconstruction**

Björnsson H, Samuelsson K, Sandemo D, Desai N, Sernert N, Rostgård-Christensen L, Karlsson J, Kartus J

*Manuscript accepted for publication in Am J Sports Med*

Göteborg 2016



UNIVERSITY OF GOTHENBURG

# ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Graft failures, surgical techniques and patient-reported outcome measures

Haukur Björnsson

Department of Orthopaedics, Institute of Clinical Sciences  
Sahlgrenska Academy at the University of Gothenburg  
Gothenburg, Sweden, 2016

## Abstract

Injuries to the anterior cruciate ligament (ACL) can result in increased joint laxity, which often ends participation in competitive sports and may, lead to degeneration of the knee. The occurrence of ACL injuries has increased in recent years and, today, ACL reconstruction is one of the most common procedures in orthopaedic surgery. Even though the research on ACL reconstruction is extensive, the optimal surgical technique is yet to be universally accepted.

*Study I* is a systematic review evaluating all the clinical studies comparing primary single-bundle (SB) and double-bundle (DB) ACL reconstruction in the current literature. 60 studies comprising 4,146 patients were included. An analysis of graft failures revealed fewer reported re-ruptures after DB reconstruction compared with SB, 19 and 44 respectively. However, only two of the 23 studies reporting re-ruptures reported statistical difference, both in favour of the DB reconstruction. Up to 45% of the studies revealed a superior outcome in DB reconstruction in terms of less antero-posterior (AP) laxity, and measurements of rotatory laxity revealed superior results in DB reconstruction measured with pivot shift and navigation in 18/42 and 9/20 studies respectively. Patient-reported outcome measures (PROMs) and functional outcomes did not differ to a large extent.

*Study II* is an observational comparative study based on data from the Swedish National Knee Ligament Register over a seven-year period with a total of 22,740 primary ACL reconstructions included. The purpose was to compare ACL revision rates and PROMs between SB and DB ACL reconstructions. The study included 16,281 SB and 510 DB reconstructions, with a revision rate of 2.1% and 1.6% respectively. No differences were found in terms of either the revision rate between the groups or the KOOS or EQ-5D.

*Study III* is a retrospective comparative study based on 251 patients between 14 and 50 years of age at the time of a primary ACL reconstruction, with a mean  $3.4 \pm 1.3$  years follow-up, to determine predictors of ACL revision. In overall, 21 (8.4%) patients underwent an ACL revision. Young age and the use of allografts at the primary reconstruction were independent predictors of an ACL revision.

*Study IV* is a randomised controlled trial consisting of 193 patients who underwent a primary ACL reconstruction using either hamstring tendon (HT) or patellar tendon (PT) autografts, to investigate clinical and radiographic results. At the follow-up, 147 (76%) patients were examined; 86 patients in the HT group with a mean  $191.9 \pm 15.1$  months follow-up and 61 patients in the PT group with mean  $202.6 \pm 10.4$  months follow-up. 8.1% in the HT group and 6.6% in the PT group had an ACL graft failure. Knee laxity measurements revealed significantly more patients with a negative pivot shift in the HT group compared with the PT group (71% vs 51%;  $p=0.048$ ). The patients in the PT group had more difficulty knee-walking ( $p=0.049$ ). There were no differences between the two groups in terms of PROMs or radiographic signs of osteoarthritis (OA). However, in both groups, more radiographic signs of OA were found in the reconstructed knee than in the contralateral healthy knee.

**Keywords:** Knee, anterior cruciate ligament, double-bundle, single-bundle, register, hamstring tendon, patellar tendon, graft failure, patient-reported outcome measures

ISBN 978-91-628-9658-4 (PRINT)

ISBN 978-91-628-9659-1 (PDF)

<http://hdl.handle.net/2077/41846>

Correspondence to: [haukurbj@hotmail.com](mailto:haukurbj@hotmail.com)

