UNIVERSITY OF GOTHENBURG

ANATOMIC ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

CURRENT EVIDENCE AND FUTURE DIRECTIONS

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Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin vid Göteborgs universitet kommer att offentligen försvaras i Mölndalsaulan, V-huset, Sahlgrenska Universitetssjukhuset/Mölndal, fredagen den 20:e april klockan 09:00

Fakultetsopponent

Professor Lars Engebretsen
Department of Orthopaedic Surgery
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Faculty of Medicine University of Oslo, Norway

The thesis is based on the following papers

THEMES I – II
Clinical outcome and level of evidence

I. **Treatment of anterior cruciate ligament injuries with special reference to surgical technique and rehabilitation: an assessment of randomized controlled trials**
Andersson D, Samuelsson K, Karlsson J.
Arthroscopy, 2009; 25(6): 653-85

II. **Treatment of anterior cruciate ligament injuries with special reference to graft type and surgical technique: an assessment of randomized controlled trials**
Samuelsson K, Andersson D, Karlsson J.
Arthroscopy, 2009; 25(10): 1139-74

III. **Systematic review on level of evidence in anterior cruciate ligament reconstruction**
Samuelsson K, Desai N, McNair E, van Eck CF, Petzold M, Fu FH, Bhandari M, Karlsson J.
Submitted to The American Journal of Sports Medicine

THEME III
Anatomic anterior cruciate ligament reconstruction

IV. **Anatomic single- and double-bundle anterior cruciate ligament reconstruction, part 2: clinical application of surgical technique**
Karlsson J, Irrgang JJ, van Eck CF, Samuelsson K, Mejia HA, Fu FH.
The American Journal of Sports Medicine, 2011; 39(9): 2016-26

V. **Systematic review on cadaveric studies of anatomic anterior cruciate ligament reconstruction**
van Eck CF, Samuelsson K, Vyas SM, van Dijk CN, Karlsson J, Fu FH.
Knee Surg Sports Traumatol Arthrosc., 2011; 19(S1): 101-8

VI. **"Anatomic" anterior cruciate ligament reconstruction: a systematic review of surgical techniques and reporting of surgical data**
van Eck CF, Schreiber VM, Mejia HA, Samuelsson K, van Dijk CN, Karlsson J, Fu FH.
Arthroscopy, 2010; 26(9): 2-12

VII. **Anatomic anterior cruciate ligament reconstruction scoring system: development and validation**
van Eck CF, Gravare-Silbernagel K, Samuelsson K, Musahl V, van Dijk CN, Karlsson J, Irrgang JJ, Fu FH.
Submitted to The American Journal of Sports Medicine

VIII. **Anatomic anterior cruciate ligament reconstruction scoring system: a systematic review on single- versus double-bundle**
Samuelsson K, Desai N, Ahldén M, van Eck CF, Fu FH, Musahl V, Karlsson J.
Manuscript

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Abstract

Injury to the anterior cruciate ligament (ACL) is one of the most common orthopedic diagnoses. It is also one of the most researched areas in orthopedic surgery, with well over eleven thousand publications. Despite this, the solution for the best reconstructive technique is still not known and patients suffer from their injury in both the short- and the long-term.

An assessment of the outcomes was performed on randomized clinical trials. In terms of rehabilitation, a postoperative knee brace did not affect the clinical outcome and closed kinetic chain exercises produced less anteroposterior laxity and better subjective outcomes than open kinetic chain exercises. In terms of graft type, the patellar tendon graft produced initially more anterior knee pain and kneeling pain than the hamstring tendon graft. Moreover, the harvest site affected muscle strength initially and the hamstring tendon graft produced more tunnel widening. In terms of surgical technique, double-bundle ACL reconstruction produced less rotatory laxity than single-bundle. Finally, bioabsorbable screws and titanium screws produced equal clinical outcome.

An analysis and systematic review was performed on studies of primary ACL reconstruction. This analysis revealed that most therapeutic studies were of a low level of evidence and that the most common study type was case series. The three most common represented journals were Arthroscopy, Knee Surgery Sports Traumatology Arthroscopy and The American Journal of Sports Medicine. Furthermore, there was a correlation between the journals' impact factor and the mean level of evidence and there was a higher mean level of evidence over time.

Anatomic ACL reconstruction is currently one of the modern techniques for ACL reconstruction. This shift in paradigm has created confusion about the term "anatomic". Two systematic reviews assessed surgical data from studies claiming anatomic ACL reconstruction. The reviews revealed substantial under-reporting, making it difficult to do valid interpretations of the outcomes. A current concepts article was therefore published, outlining the concepts of anatomic ACL reconstruction, including principles and a definition: the functional restoration of the ACL to its native dimensions, collagen orientation and insertion sites. Ultimately, a scoring system was developed for the objective grading of surgical methods in studies of anatomic ACL reconstruction. This scoring system was subsequently implemented in studies comparing single- and double-bundle ACL reconstruction, which revealed means of the score well below a proposed minimum. In summary, a thorough analysis and review of what constitutes an anatomic ACL reconstruction was done, and an assessment was performed on studies comparing single- and double-bundle ACL reconstruction and studies claiming anatomic ACL reconstruction.

Keywords: Anatomic, Anterior Cruciate Ligament, Reconstruction, Score, Level of Evidence

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