UZ LEUVEN

SAMEN GRENZEN VERLEGGEN

ACL rupture

Prof. dr. K. Peers

Physical Medicine & Rehabilitation

UZ Leuven

paradigm shift

- evidence based

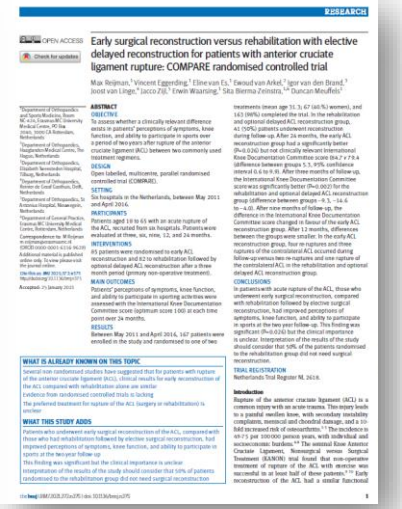
Level	Example of Evidence
Level 1	Meta-analysis of Homogenous RCTs Randomized Control Trial
Level 2	Meta-analysis of Level 2 or Heterogenous Level 1 Evidence Prospective Comparative Study
Level 3	Review of Level 3 Evidence Case-control Study Retrospective Cohort Study
Level 4	Uncontrolled Cohort Studies Case Series
Level 5	Expert Opinion Case Report Personal Observation
Foundational Evidence	Animal Research *In Vitro* Research Ideas, Speculation

Higher

Lower

ORIGINAL ARTICLE

A Randomized Trial of Treatment for Acute Anterior Cruciate Ligament Tears



RESEARCH

Early surgical reconstruction versus rehabilitation with elective delayed reconstruction for patients with anterior cruciate ligament rupture: COMPARE randomised controlled trial

KCE

Belgian Health Care Knowledge Ce

Publications

BMJ Open Pilot study to investigate the feasibility of conducting a randomised controlled trial that compares Immediate versus Optional Delayed surgical repair for treatment of acute Anterior cruciate ligament injury: IODA pilot trial

SEARCH

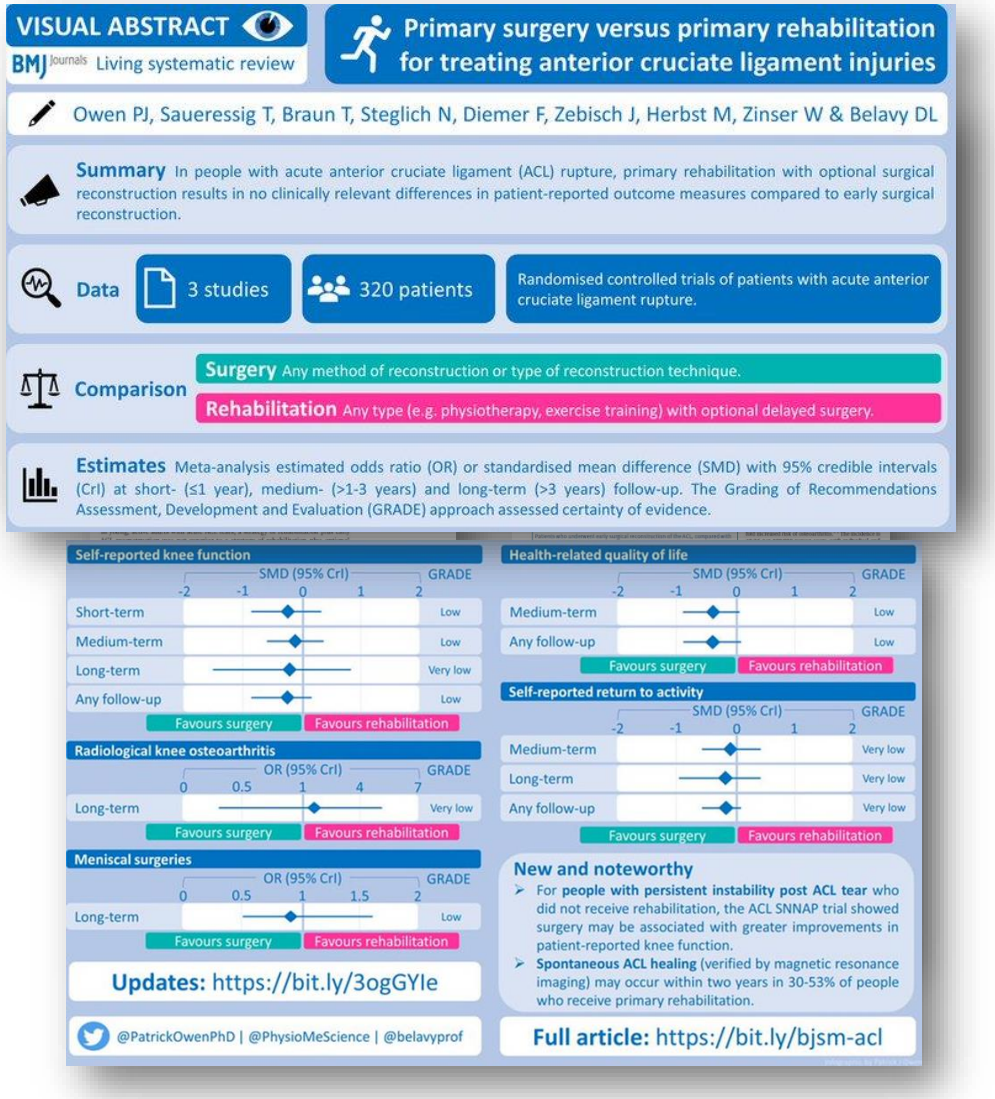
COVID-19 Contributions

Home › KCE Trials › Funded trials › KCE-181158

KCE-181158: Feasibility of conducting a pragmatic, randomized trial that compares Immediate versus Optional Delayed surgical repair for treatment of acute anterior cruciate ligament injury - IODA trial

Summary (French or Dutch)

- Options:
  - early reconstruction or rehabilitation with optional delayed reconstruction
- Evidence:
  - KANON trial, COMPARE trial, (SNNAP trial: chronic)
  - (ongoing: IODA trial, NNKLR trial)
- Masterpaper KUL (Lissens, Peers 2020)
  - 240/395 (60%): 1 option (early ACLR)
  - 328/395 (83%): insufficient information
  - 25/395 (6%): EBM options



- Return to sport elite/pivoting sports without ACLR?
  - Premier league: *Weiler BMJ 2015*
  - Jupiler league / Proximus league
  - Basket – Volley – Chearleading – Jiujitsu – …

Evidence of ACL healing on MRI following ACL rupture treated with rehabilitation alone may be associated with better patient-reported outcomes: a secondary analysis from the KANON trial

Stephanie Rose Filbay [1], Frank W Roemer [2,3], L Stefan Lohmander [4], Aleksandra Turkiewicz [5], Ewa M Roos [6], Richard Frobell [4], Martin Englund [5]

Normal ACL

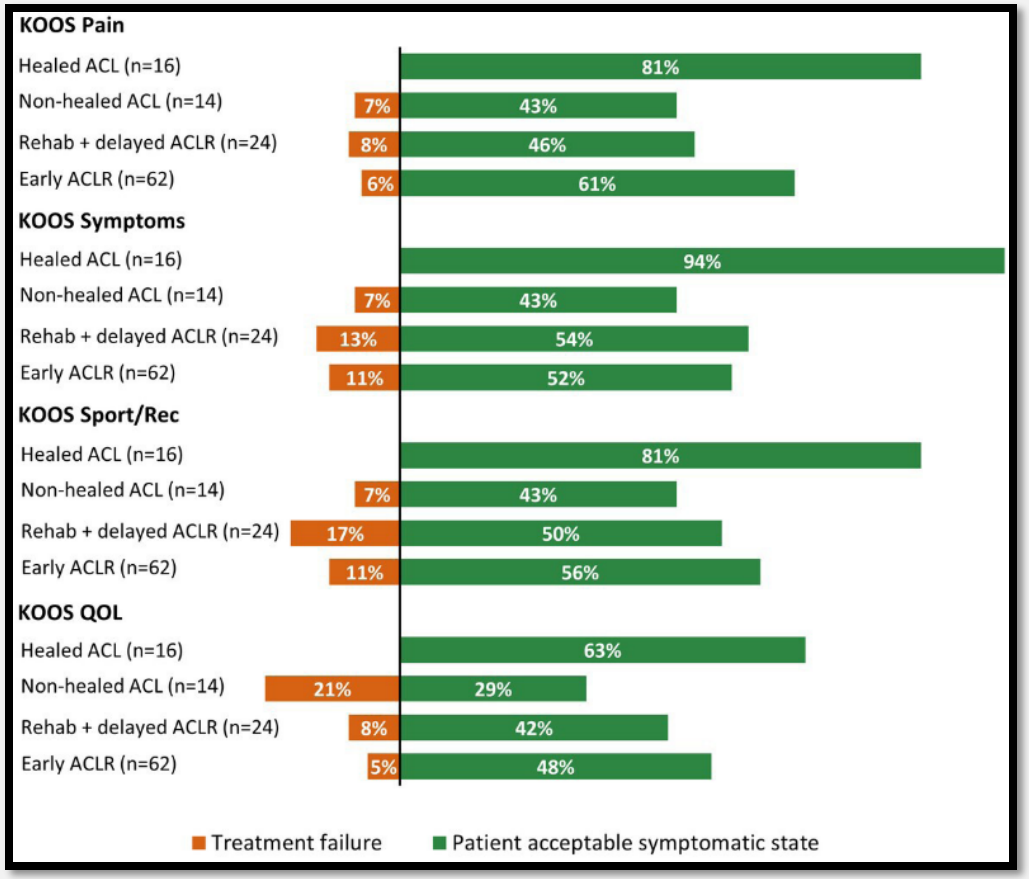
Thickned but normal course

Thinned/elongated but continous

Absent/discontinuity

	Rehabilitation alone at 5-year follow-up (n=28)				
ACLOAS ACL grade	3 months	6 months	1 year	2 years	5 years
0	0 (0)	2 (17)	5 (38)	7 (28)	8 (33)
1	8 (57)	4 (33)	0 (0)	0 (0)	0 (0)
2	2 (14)	3 (25)	5 (38)	7 (28)	6 (25)
3	4 (29)	3 (25)	3 (23)	11 (44)	10 (42)
Delayed ACLR	–	–	–	–	–
Missing MRI	14*	16*	15*	3	4

Patients with evidence of ACL healing - best PROMS



WHAT THIS STUDY ADDS

⇒ Approximately half of all participants randomised to rehabilitation who did not cross over to delayed ACL reconstruction (ACLR) had evidence of ACL healing on MRI at 2-year and 5-year follow-up.

⇒ People with evidence of ACL healing on MRI at 2 years reported better Knee Injury and Osteoarthritis Outcome Score (KOOS) patient-reported sport and recreational function and KOOS-quality of life scores compared with the non-healed, delayed ACLR and early ACLR groups.

⇒ A high proportion of people (63% to 94%) with evidence of ACL healing on MRI reached the patient acceptable symptom state threshold for each KOOS subscale, and no one reached the criteria for treatment failure.

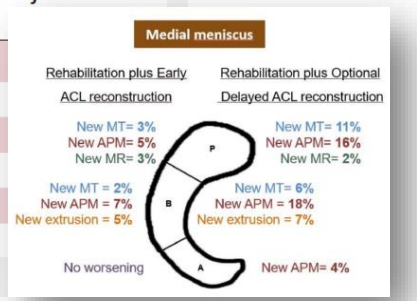
- (Re)injury without ACL reconstruction?
  - COMPARE: 2Y f/u

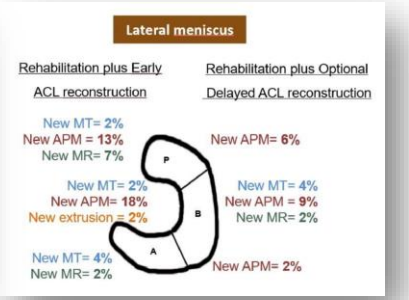
Table 5 | Serious adverse events

Adverse event	Early ACL reconstruction (n=85)	Rehabilitation+optional delayed ACL reconstruction (n=82)
Re-rupture of ACL reconstruction (No)	4	2
Rupture of contralateral ACL (No)	3	1
Removal of tibial screw (No)	1	2
Arthroscopic intervention for meniscal tear after ACL reconstruction or new knee trauma (No)	4	3
Arthroscopic debridement for extension deficit (No)	2	4

  - KANON: 5Y f/u meniscal surgery - damage

	Rehabilitation plus early ACL reconstruction (n=61)	Rehabilitation plus delayed ACL reconstruction (n=30)	Rehabilitation only (n=29)
Persons with development of meniscal damage on MRI, N (%)	27 (45)*	17 (57)§	12 (46)¶
Persons with meniscal surgeries (N, %)	30 (49)	17 (57)	15 (52)
Number of meniscal surgeries	37	25	19
Before ACLR, N (%)‡	0 (0)	13 (52)	–
During ACLR, N (%)‡	28 (76)	9 (36)	–
After ACLR, N (%)‡	9 (24)	3 (12)	–





- Osteoarthritis without ACLR?
  - 5y: KANON no difference on MRI
  - 20y: no RCT results

Radiology

ORIGINAL RESEARCH • MUSCULOSKELETAL IMAGING

Development of MRI-defined Structural Tissue Damage after Anterior Cruciate Ligament Injury over 5 Years: The KANON Study

Frank W. Roemer, MD • L. Stefan Lohmander, MD, PhD • Martin Englund, MD, PhD • Ali Guermazi, MD, PhD • Anna Åkesson, BSc • Richard Frobell, PT, PhD

Summary

Young adults with acute anterior cruciate ligament injury showed no major difference in frequency of structural tissue damage on MRI scans at 2 and 5 years whether their injury was treated with reconstruction or rehabilitation alone.

Osteoarthritis and Cartilage

OARSI OSTEOARTHRITIS RESEARCH SOCIETY INTERNATIONAL

Surgical reconstruction of ruptured anterior cruciate ligament prolongs trauma-induced increase of inflammatory cytokines in synovial fluid: an exploratory analysis in the KANON trial

S. Larsson*, A. Struglics, L.S. Lohmander, R. Frobell

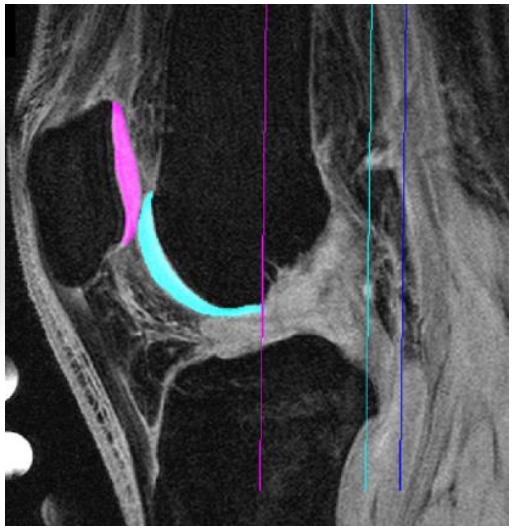
Lund University, Faculty of Medicine, Department of Clinical Sciences Lund, Orthopaedics, Lund, Sweden

Original article

Loss of patellofemoral cartilage thickness over 5 years following ACL injury depends on the initial treatment strategy: results from the KANON trial

Adam G Culvenor,[1,2] Felix Eckstein,[2,3] Wolfgang Wirth,[2,3] L Stefan Lohmander,[4] Richard Frobell[4]

▶ Early reconstruction is unable to prevent structural deterioration in the patellofemoral joint after anterior cruciate ligament injury—from the viewpoint of patellofemoral pathology, early reconstruction is not indicated.

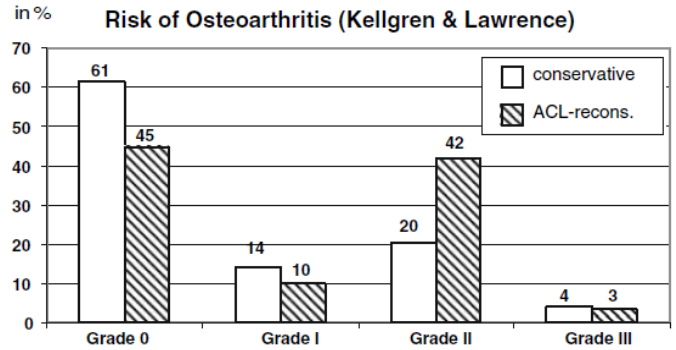


- Osteoarthritis without ACLR?
  - 5y: KANON no difference on MRI
  - 20y: no RCT-results

Twenty-Year Follow-up Study Comparing Operative Versus Nonoperative Treatment of Anterior Cruciate Ligament Ruptures in High-Level Athletes

Daan T. van Yperen,*† MD, Max Reijman,† PhD, Eline M. van Es,† MSc, Sita M.A. Bierma-Zeinstra,‡ PhD, and Duncan E. Meuffels,† MD, PhD
Investigation performed at the Department of Orthopaedic Surgery, Erasmus University Medical Center, Rotterdam, the Netherlands

No difference regarding:
- Knee OA
- Functional outcome
- Meniscectomies

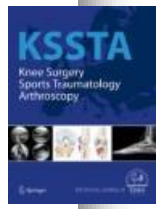


Knee Surg Sports Traumatol Arthrosc (2008) 16:442–448
DOI 10.1007/s00167-008-0498-x

KNEE

Function, osteoarthritis and activity after ACL-rupture: 11 years follow-up results of conservative versus reconstructive treatment

M. A. Kessler · H. Behrend · S. Henz · G. Stutz · A. Rukavina · M. S. Kuster



- Cost effectiveness ?
  - EBM: ACLR unlikely to be cost-effective


Original research

OPEN ACCESS

ACL reconstruction for all is not cost-effective after acute ACL rupture

Vincent Eggerding ,[1] Max Reijman,[1] Duncan Edward Meuffels ,[1] Eline van Es,[1] Ewoud van Arkel,[2] Igor van den Brand,[3] Joost van Linge,[4] Jacco Zijl,[5] Sita MA Bierma-Zeinstra,[6] Marc Koopmanschap[7]

Routine early ACL reconstruction (index) is not considered cost-effective as compared with rehabilitation plus optional reconstruction for a standard ACL population (comparator) given the maximum willingness to pay of 20 000 €/QALY

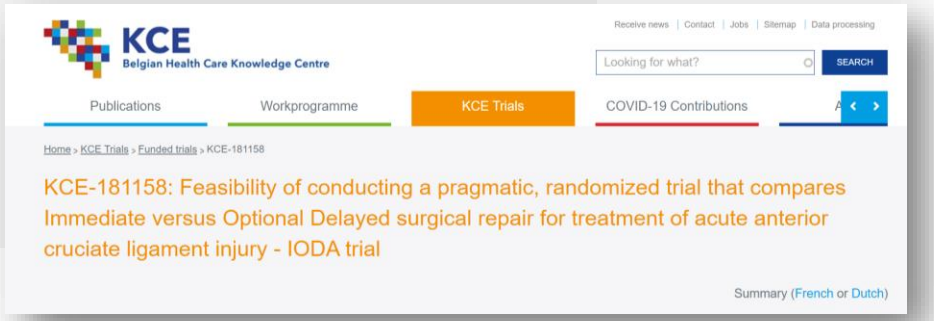

No economic benefit of early knee reconstruction over optional delayed reconstruction for ACL tears: registry enriched randomised controlled trial data

Aliasghar A Kiadaliri,[1,2] Martin Englund,[1,3] L Stefan Lohmander,[4,5,6] Katarina Steen Carlsson,[7,8] Richard B Frobell[4]

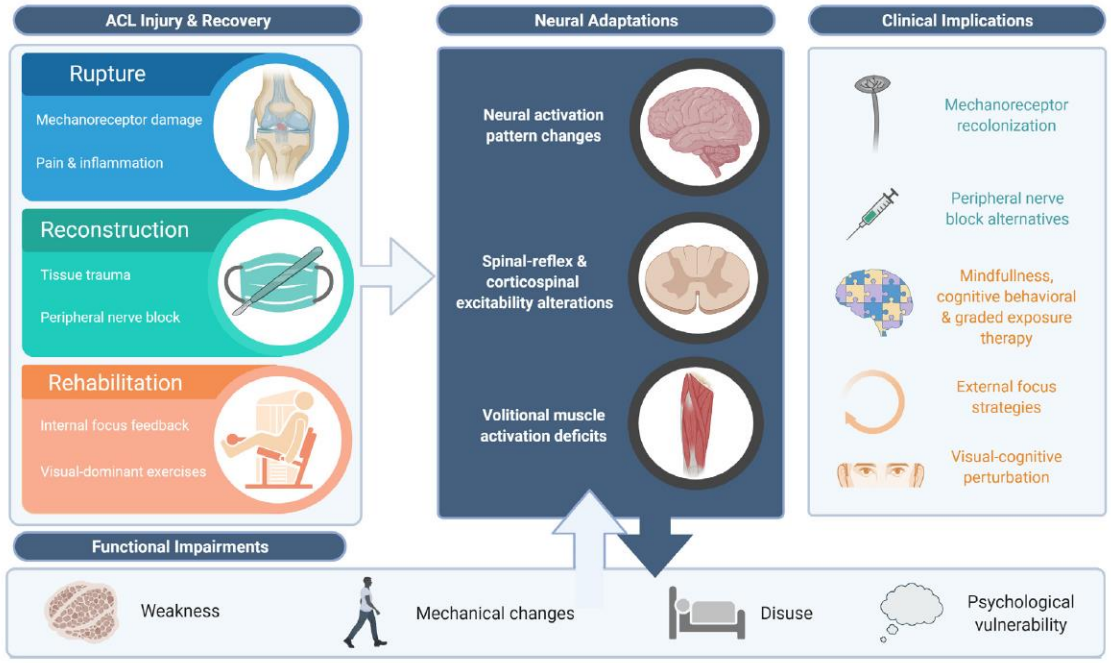
From a societal perspective, early ACL recontruction is unlikely to be a cost-effective option compared with optional delayed ACL reconstruction if needed over a 5-year period.

- EBM: early ACLR or rehabilitation + optional delayed ACLR
- Shared decision

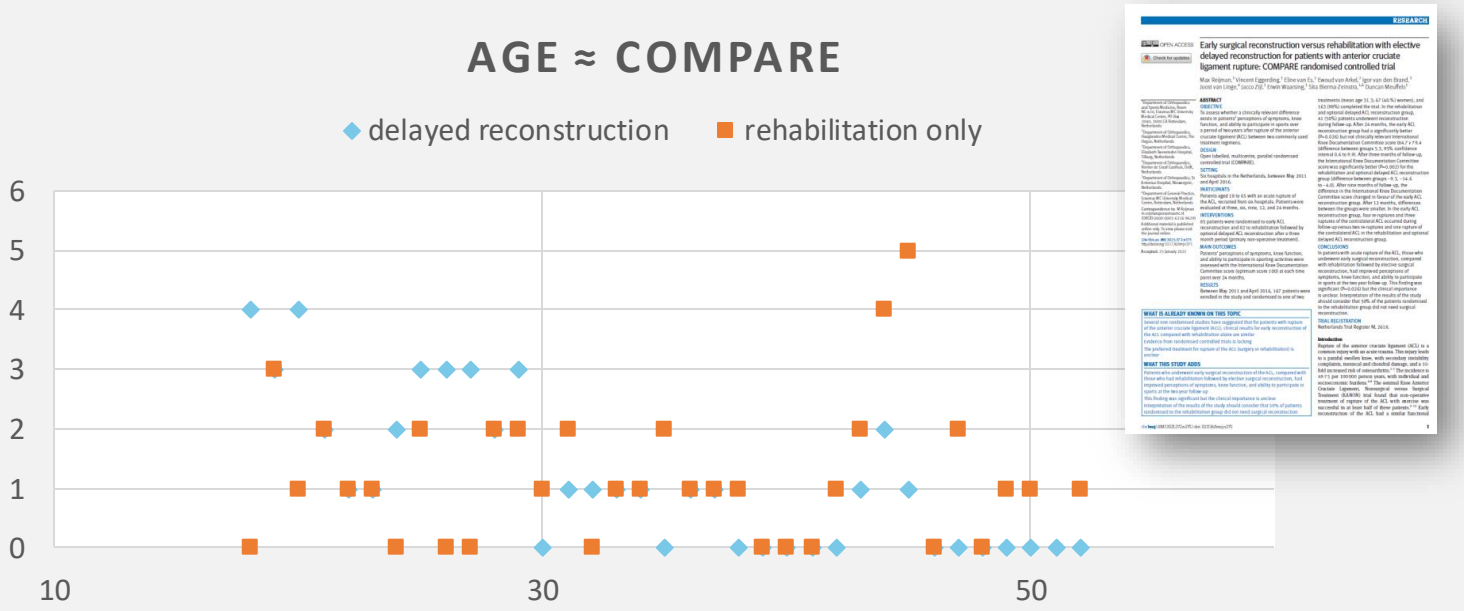
- Prediction: IODA

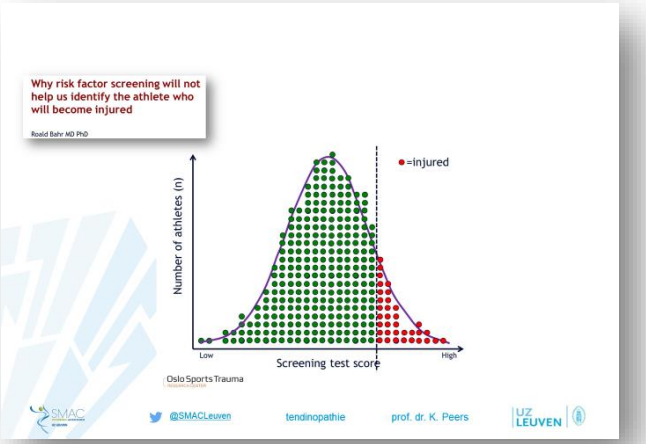


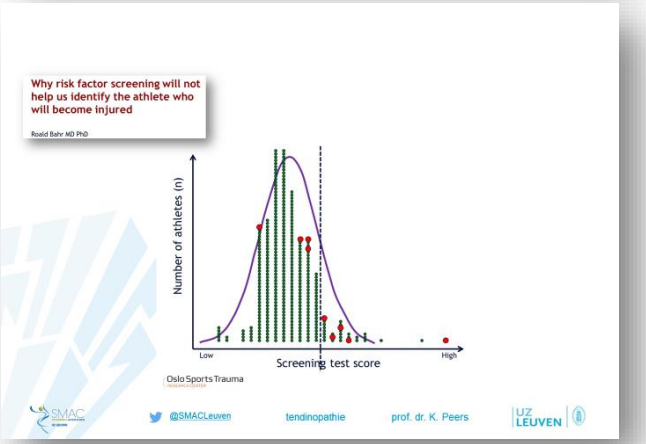
- Musculoskeletal complexity not simplicity
  - EBM: stability ≠ functionality
  - Neural impairments – adaptations
  - Fear and rehab / RTS
  - Risk factors: age – level of sport ?



- Musculoskeletal complexity not simplicity
  - Age – level of sport
  - = rehabilitation / reconstruction / general population

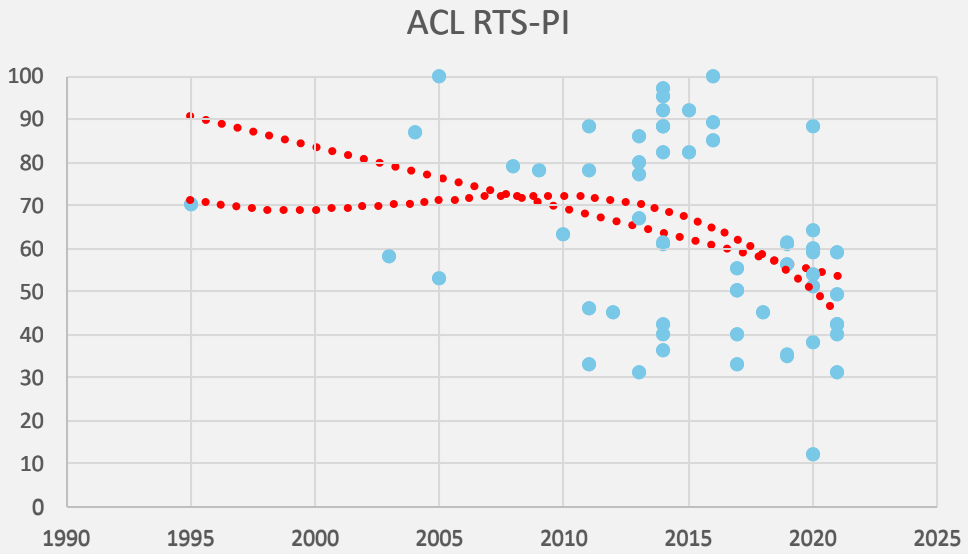


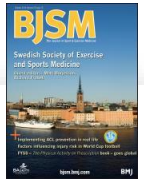




- Importance of high quality ACL rehabilitation

RTS-pre injury level: systematic reviews



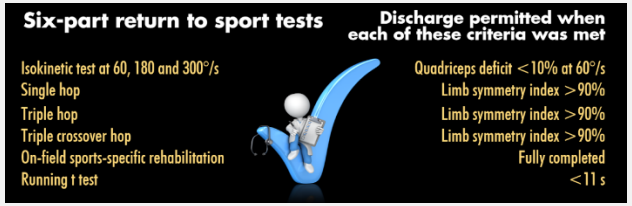


Lower extremity performance following ACL rehabilitation in the KANON-trial: impact of reconstruction and predictive value at 2 and 5 years

Ylva B Ericsson,[1] Ewa M Roos,[2] Richard B Frobell[3]

- Muscle strength and physical performance can recover (as compared with the uninjured side) after 8 months of supervised exercise in a high proportion of young active individuals with acute anterior cruciate ligament (ACL) injury.
- We failed to identify differences in muscle strength and functional performance test results, performed at the end of the exercise period after ACL injury, between those treated with and without ACL reconstruction (ACLR).
- Results of the one-leg rise test, performed at the end of the exercise period after ACL injury, predicted self-reported outcome at 2 and 5 years after the injury.

- Importance of high quality ACL rehabilitation
  - Early rehabilitation
  - Hard work
  - Specific, criteria driven
  - Variable, enjoyable
  - Neural plasticity
  - RTS decision



- Importance of high quality ACL rehabilitation
  - Early rehabilitation
  - Hard work
  - Specific, criteria driven
  - Variable, enjoyable
  - Neural plasticity
  - RTS decision

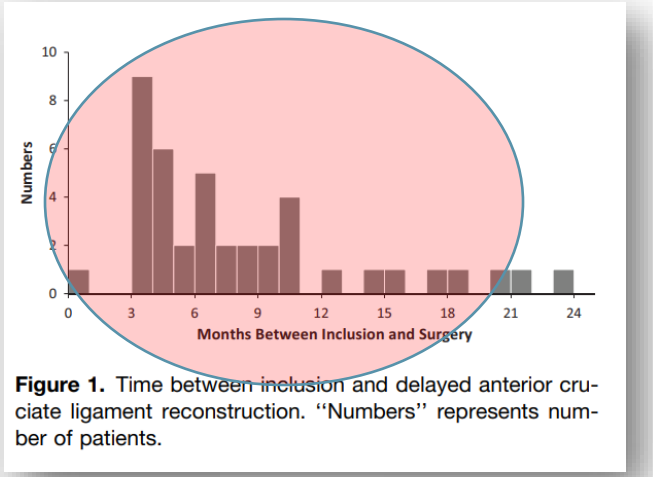
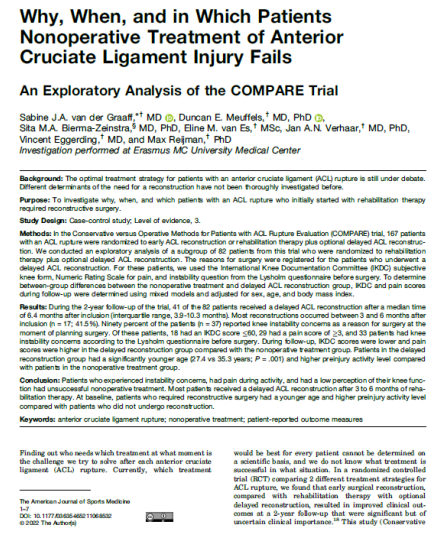


Figure 1. Time between inclusion and delayed anterior cruciate ligament reconstruction. ''Numbers'' represents number of patients.



Why, When, and in Which Patients Nonoperative Treatment of Anterior Cruciate Ligament Injury Fails

An Exploratory Analysis of the COMPARE Trial

Sabine J.A. van der Graaff,*† MD, Duncan E. Meuffels,† MD, PhD, Sita M.A. Bierma-Zeinstra,§ MD, PhD, Eline M. van Es,† MSc, Jan A.N. Verhaar,† MD, PhD, Vincent Eggerding,† MD, and Max Reijman,† PhD

Investigation performed at Erasmus MC University Medical Center

Background: The optimal treatment strategy for patients with an anterior cruciate ligament (ACL) rupture is still under debate. Different determinants of the need for a reconstruction have not been thoroughly investigated before.

Purpose: To investigate why, when, and which patients with an ACL rupture who initially started with rehabilitation therapy required reconstructive surgery.

Study Design: Case-control study; Level of evidence, 3.

Methods: In the Conservative versus Operative Methods for Patients with ACL Rupture Evaluation (COMPARE) trial, 167 patients with an ACL rupture were randomized to early ACL reconstruction or rehabilitation therapy plus optional delayed ACL reconstruction. We conducted an exploratory analysis of a subgroup of 82 patients from this trial who were randomized to rehabilitation therapy plus optional delayed ACL reconstruction. The reasons for surgery were registered for the patients who underwent a delayed ACL reconstruction. For these patients, we used the International Knee Documentation Committee (IKDC) subjective knee form, Numeric Rating Scale for pain, and instability question from the Lysholm questionnaire before surgery. To determine between-group differences between the nonoperative treatment and delayed ACL reconstruction group, IKDC and pain scores during follow-up were determined using mixed models and adjusted for sex, age, and body mass index.

Results: During the 2-year follow-up of the trial, 41 of the 82 patients received a delayed ACL reconstruction after a median time of 6.4 months after inclusion (interquartile range, 3.8–10.3 months). Most reconstructions occurred between 3 and 6 months after inclusion (n = 17; 41.5%). Ninety percent of the patients (n = 37) reported knee instability concerns as a reason for surgery at the moment of planning surgery. Of these patients, 18 had an IKDC score ≤60, 29 had a pain score of ≥3, and 33 patients had knee instability concerns according to the Lysholm questionnaire before surgery. During follow-up, IKDC scores were lower and pain scores were higher in the delayed reconstruction group compared with the nonoperative treatment group. Patients in the delayed reconstruction group had a significantly younger age (27.4 vs 35.3 years; $P = .001$) and higher preinjury activity level compared with patients in the nonoperative treatment group.

Conclusion: Patients who experienced instability concerns, had pain during activity, and had a low perception of their knee function had unsuccessful nonoperative treatment. Most patients received a delayed ACL reconstruction after 3 to 6 months of rehabilitation therapy. At baseline, patients who required reconstructive surgery had a younger age and higher preinjury activity level compared with patients who did not undergo reconstruction.

Keywords: anterior cruciate ligament rupture; nonoperative treatment; patient-reported outcome measures

Finding out who needs which treatment at what moment is the challenge we try to solve after each anterior cruciate ligament (ACL) rupture. Currently, which treatment would be best for every patient cannot be determined on a scientific basis, and we do not know what treatment is successful in what situation. In a randomized controlled trial (RCT) comparing 2 different treatment strategies for ACL rupture, we found that early surgical reconstruction, compared with rehabilitation therapy with optional delayed reconstruction, resulted in improved clinical outcomes at a 2-year follow-up that were significant but of uncertain clinical importance.[16] This study (Conservative

The American Journal of Sports Medicine
1–7
DOI: 10.1177/03635465211069832
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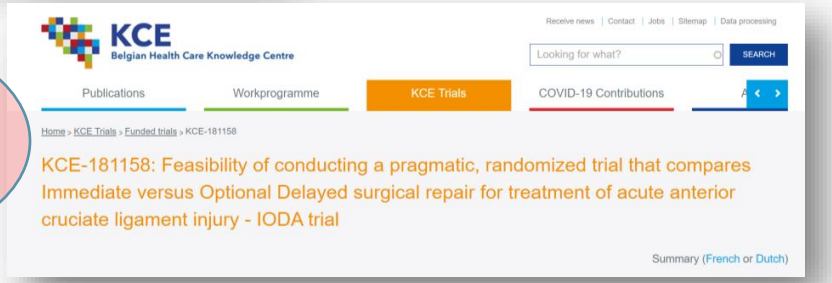
2-3→1 delayed surgery



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Home > KCE Trials > Funded trials > KCE-181158

KCE-181158: Feasibility of conducting a pragmatic, randomized trial that compares Immediate versus Optional Delayed surgical repair for treatment of acute anterior cruciate ligament injury - IODA trial

Summary (French or Dutch)

UZ LEUVEN

INTRO RTS OA COMPLEX
EBM RE-INJURY COST REHAB

IODA-TRIAL BELGIUM

ABAOT
ACL(R)

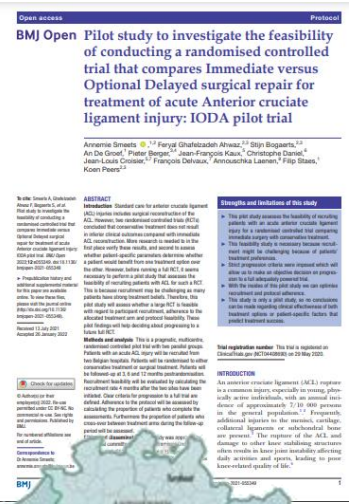
IODA PILOT TRIAL	Total sample (mean±SD)
Number	29
Gender	6 females / 23 males
Age	27,25 ± 8,26 years
Height	176,89 ± 7,59 cm
Weight	75,57 ± 14,74 kg
Education	9 secondary school 14 bachelor degree 6 master degree
Randomization	14 immediate surgery 15 conservative treatment
Time to randomization	24,28 ± 10,59 days post-injury
Injury Mechanism	5 contact injury 24 non-contact injury

Competitive level	Recreational level	No regular sport participation
17 soccer	3 soccer	1
2 ultimate frisbee	1 cycling	
2 volleybal		
1 handball		
2 basketball		

Cruciate ligaments	+ Meniscus	+ Collateral ligaments	+ Cartilage
Full ACL: 16	Medial: 1	MCL: 9	Yes: 3
Partial ACL: 9	Lateral: 4	LCL: 1	No: 22
PCL : 0			

IODA: - Pragmatic RCT vs selection bias
- Trend less re-rupture
- Trend less delayed surgery

Cross over	Delayed surgery
5 patiens	4 patients
3 patients Conservative → surgery 2 patients Surgery → conservative treatment	Between 6 en 36 months post-injury


BMJ Open

Pilot study to investigate the feasibility of conducting a randomised controlled trial that compares Immediate versus Optional Delayed surgical repair for treatment of acute Anterior cruciate ligament injury: IODA pilot trial

CONCLUSION:

EBM two options

Embrace complexity

Improve rehabilitation

Thanks & welcome to join us @ IODA