Long-term outcome following anterior cruciate ligament injury before age 13

- a prospective case series with 9.5 years follow-up

Guri Ekås (MD), Håvard Moksnes, Hege Grindem, May Arna Risberg and Lars Engebretsen
Affiliation and disclosure statement

1. Oslo Sports Trauma Research Centre, Norwegian School of Sport Sciences, Oslo, Norway.

2. Institute of Clinical Medicine, University of Oslo, Oslo, Norway.

3. Division of Orthopaedic Surgery, Oslo University Hospital, Oslo, Norway.

4. Division of Orthopedic Surgery, Coastal Hospital of Hagevik, Os, Norway.

One of the authors has declared the following potential conflict of interest or source of funding: L.E. has received fellowship grants and research grants from Arthrex and Smith & Nephew.

G.R.E, H.M, H.G and M.A.R have declared no conflicts of interest.
Our treatment algorithm

Additional injuries needing surgery?
- Bucket handle
- Osteochondral defect
- Unstable ramp lesion

ACL injury

Recurrence instability? Secondary injuries?
- yes
- no

Active rehabilitation
Supervision PT
Knee brace

Early ACL reconstruction

Delayed ACL reconstruction

Active rehabilitation and FU

Instability
Secondary injuries

1, 2, 3
Aim

1. Our primary aim was to evaluate knee function and activity level with performance-based and patient-reported outcome measures.

2. The secondary aim was to describe knee surgeries, complications and secondary knee injuries.
Follow-up at maturity

- **Functional testing (8 years)**
  - Isokinec dynamometry
  - Single-leg Hop tests

- **Patient reported outcome measures (PROMs) (8 years)**
  - Knee Outcome and Osteoarthritis Score (KOOS)
  - International Knee Documentation Committee subjective form (IKDC)

- **Clinical examination (8 years)**

- **Chart reviews (8 and 9.5 years)**

- **Bilateral MRI and long-standing radiographs (9.5 years)**
Oslo Pediatric ACL Cohort

Mean age at injury 11 years ± 1.5 (7-13 years)

Withdrawn
N= 2

N= 46

N= 44

15 females
29 males

Mean age 19.1 years ± 1.6 (16-23)
Mean 8 years from injury ± 1.7 (5-11)
24/44 patients ACL-reconstructed

8 patients
Surgery within 2 years

16 patients
Surgery later than 2 years

16 patients
Meniscal surgery

ACL-reconstruction at mean age 15.3 ± 1.7 years (13 - 19)
Limb symmetry index (LSI) for extension and flexion peak torque: 
(peak torque of involved leg)/(peak torque of uninvolved leg) × 100.
Patient reported outcome scores

Individual

Mean

ACL-R group IKDC: mean 88 ± 13.7 (52 - 100)

Non-Op group IKDC: mean 90 ± 11.8 (53 - 100)

IKDC 36 of 44 patients (82 %) > Patient Acceptable Symptom State
KOOS subscales 32-43 of 44 patients (73-98 %) > Patient Acceptable Symptom State
Activity level

<table>
<thead>
<tr>
<th>Sport</th>
<th>Activity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handball, soccer, basketball, floorball</td>
<td>I</td>
</tr>
<tr>
<td>Volleyball, martial arts, gymnastics, ice hockey, tennis/squash, alpine/telemark skiing, snowboarding, dancing/aerobics</td>
<td>II</td>
</tr>
<tr>
<td>Cross-country skiing, running, cycling, swimming, strength training</td>
<td>III</td>
</tr>
</tbody>
</table>

*Al Hefty scale modified to Norwegian sports by Eitzen and Grindem

1, 6, 7
New meniscal injuries

16 patients (34%) had new meniscal injuries since baseline to a previously healthy meniscus

- 6 new tears (in 6 patients) healed (3 after surgery)
Conclusion

Active rehabilitation + optional delayed ACL reconstruction

- 55% ACL reconstructed
- 36% meniscal surgery
- 91% sports active; 2/3 non-pivoting sport
- Good function and high PROM scores
Conclusion

- Copers do exist
- Active rehabilitation is an option
- Close follow-up is warranted
- Early or Delayed surgery is needed in some

References:


2. Ekas G, Moksnes H, Grindem H, Risberg MA, Engebretsen L. Knee pathology in young adults following pediatric Anterior Cruciate Ligament injury -A prospective case series of 47 patients with mean 9.5 years follow-up (accepted 2019, AJSM)


