Evidence-Based Management of Acute ACL Injury

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Objectives

• To present the most current evidence for management and an approach to counseling and treating young active patients after acute anterior cruciate ligament injury that
  – Establishes real expectations of return to activity and incidence of reinjury.
  – Includes non-operative management
Disclosure: We DO NOT have a financial relationship with any commercial interest.
Our typical pre-op goals

• no pre-operative flexion contracture or quad lag
  – Quad contraction with superior glide of the patella
  – Normal patellar mobility
• Little to no effusion
• Walk without a limp

Is this enough? What’s the evidence?
What are successful outcomes? (Lynch BJSM 2013)

- Return to sports (previous activity)
  - Does this really happen?
  - MOON cohort
    - 63% college AFB and 69% HS FB. 43% of the players were able to return to play at the same self-described performance level. Approximately 27% felt they did not perform at a level attained before their ACL tear, and 30% were unable to return to play at all.
    
- 72% of soccer players

- Ardern et al meta analysis 2011
  - 63% return to preinjury level of sports, 44% to competitive sports
What are successful outcomes? (Lynch BJSM 2013)

• Return to sports (previous activity)
  – NFL (Andrews/Lemak)
    • Shah et al AJSM 2010
    • 61% 31/49 returned to the NFL a mean of 11 months after surgery
What are successful outcomes? (Lynch BJSM 2013)

• No reinjury (Does this really happen?)
  – MOON soccer (20% in women)
  – Paterno et al (Hewett prevention cohort) – 20% in those 18 and younger
  – Shelbourne data set – 17% in college age and younger
  – Pinczewski data set 17% - higher in younger and males
  – All rates higher with allografts in young athletes
What are successful outcomes? (Lynch BJSM 2013)

- No reinjury (Does this really happen?)
  - Contralateral ACL
    - 12-25% - higher in younger and females
  - OA
    - 45-70% at 15 years. Higher in those who returned to strenuous sports
  - Revision ACL
    - Worse outcomes short term
    - More OA and disability long term
• They followed post-ACLR and control (teammates) of athletes who played sports that require cutting or pivoting movements for 24 months.
• 29.5% of the athletes with a history of ACLR and 8.5% of the control athletes suffered an ACL injury.
• The overall incidence rate of a second ACL injury was nearly 6 times greater than control subjects in that 24-month period.
Paterno et al

- Within the ACLR group, female athletes were more than twice as likely to tear the ACL in their contralateral knee rather than the graft in the surgical knee.
- Athletes in the ACLR group who suffered another ACL injury did so soon after they returned to play. 30.4% were injured in less than 20 athlete-exposures (AE), and 52.2% were injured in less than 72 AEs.
Are PTs/surgeons appropriately counseling patients?

Jon Goff

Clint Sixtim

Terrell Thomas
What should we be counseling patients?

- Just because you have ACLR, doesn’t mean you will return to sports at all, and most likely not at the same level of performance.
- Your risk of reinjury is high in the near term, higher if you are younger, higher (ipsilateral) if you are male and (contralateral) if you are female.
- Regardless of surgery, your risk of OA is high in the long term.
  - If you need revision surgery risk of OA is higher.
Does surgical delay help/hurt/make no difference?

- Frobell et al BMJ 2013 (5 year)
- FINDINGS: The new report shows that there was no difference in any outcome between those who were operated on straight away, those who were operated on later and those who did not have an operation at all. The message to the medical experts who are treating young, active patients with ACL injuries is that it may be better to start by considering rehabilitation rather than operating straight away.
What does the evidence show

- Eitzen et al JOSPT
- FINDINGS: A 5-week progressive exercise therapy program in the early stage after ACL injury led to significantly improved knee function before the decision making for reconstructive surgery or further nonoperative management. The compliance to and tolerance for the program was high, with few adverse events.
Recommendation

• Treatments to decrease effusion early
  – Cold, compression, elevation
  – **Active** motion

• Treatments to restore/preserve passive and active knee extension
  – Stretching
  – Patellar mobilization
  – Quad strengthening
Recommendation

• Treatments to increase/maintain quad strength
  – Progressive exercise
  – NMES
• Treatments to restore normal movement patterns/gait
  – Neuromuscular training (at least 4 sessions of perturbation training)
Recommendation

• Short-term progressive exercise therapy programs should be incorporated in the early stage after ACL injury, to optimize knee function as a first step in the preparation to return to previous activity (or not) with (or without) surgery.

• Rehab should also incorporate exercise and postures for secondary prevention
Can Individuals Return to Sports after ACL Injury without reconstruction?

Yes
Why Consider Non-Operative Management?

- Some patients may wish to delay or avoid surgery
- Different practice patterns outside of United States
- Surgical reconstruction and return to sports activities are not an effective strategy for preventing early onset knee OA
- Not all patients need to have reconstructive surgery
Unsuccessful Non-Operative Management

• Success with non-operative management after ACL injury is poor without decision rules
  – 60-80% have recurrent giving way episodes
  – Compromised function
  – Secondary knee injuries

• Inability to prospectively identify good candidates for non-operative care contributes to blanket surgical approach
Management Algorithm

- ACL deficient ✓
- Regularly active in high demand sports activities ✓
- Acute/subacute timeframe ✓
- Relatively Isolated injury ✓
Screening Examination Criteria

• No physical impairments
  – No effusion
  – Full knee ROM
  – ≥70% Quadriceps strength
  – Able to hop on injured leg without pain
ACL SCREENING

• Hop testing *(in brace?)*
  – Single hop
  – Triple cross-over hop
  – Triple hop
  – *Timed hop* (% ≥ 80%)
• KOS (% ≥ 80%)
• Global rating (% ≥ 60%)
• Number of giving way episodes (% ≤ 1)

Failure to meet *any* of the criteria: Non-Coper

*Explore* — *Engage* — *Experience* — *Excel™*
Rehabilitation

• Perturbation training
  – Neuromuscular training technique
  – Greater knee stability, return to sports in potential copers
  – Normalizes movement patterns in potential copers

Fitzgerald et al Phys Ther 2000
Chmielewski et al 2004
Training Program Dosage

- 10 treatments, administered bi-weekly to as frequently as daily
- Number of session per week and program progression are dependent on
  - the ability of the patient to appropriately perform the techniques
  - the response of the patient’s knee joint
  - time constraints, including the amount of time left in the competitive season
Return to Activity Criteria

<table>
<thead>
<tr>
<th>Test</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadriceps Strength Index (QI)</td>
<td>≥ 90%</td>
</tr>
<tr>
<td>All 4 single-legged hop tests</td>
<td>≥ 90%</td>
</tr>
<tr>
<td>Knee Outcome Survey-Activities of Daily Living scale (KOS-ADLs)</td>
<td>≥ 90%</td>
</tr>
<tr>
<td>Global Rating score (GRS)</td>
<td>≥ 90%</td>
</tr>
</tbody>
</table>
• **6 times more likely** to return to sports without episode of giving way if in perturbation group. Only one failure in perturbation group.
ACL screening and rehabilitation—extension of injury

- do no harm/no further injury
  - more than 1000 screenings
    - two repairable menisci
    - zero chondral defects
Potential Copers

- 88/147 elected non-operative management for short return to sport
  - 83 passed rehabilitation (5 failed)
  - 63 (81%) full return to sport
  - 5 modified their activity
    - 1 later had ACLR
  - 13 unsuccessful return to sport
    - 3 with giving way
    - 10 swelling or pain
  - 2 lost to FU
  - 36 later had ACLR
A Pair-Matched Comparison of Return to Pivoting Sports at 1 Year in Anterior Cruciate Ligament-Injured Patients After a Nonoperative Versus an Operative Treatment Course

Hege Grindem, Ingrid Eitzen, Håvard Moksnes, Lynn Snyder-Mackler and May Arna Risberg


<table>
<thead>
<tr>
<th>Outcomes at 1-Year Follow-up</th>
<th>Nonoperative (n = 69)</th>
<th>Operative (n = 69)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall return to sport a</td>
<td>47/69 (68.1%)</td>
<td>47/69 (68.1%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Return to level I sport b</td>
<td>23/42 (54.8%)</td>
<td>26/42 (61.9%)</td>
<td>.66</td>
</tr>
<tr>
<td>Return to level II sport b</td>
<td>24/27 (88.9%)</td>
<td>21/27 (77.8%)</td>
<td>.51</td>
</tr>
<tr>
<td>Sports frequency, times per week</td>
<td>3.3 (1.6)</td>
<td>3.3 (1.8)</td>
<td>.83</td>
</tr>
<tr>
<td>KT-1000 side-to-side difference, mm</td>
<td>5.6 (2.8)</td>
<td>2.7 (1.8)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Single hop for distance, LSI</td>
<td>96.3 (6.4)</td>
<td>90.5 (14.0)</td>
<td>.009</td>
</tr>
<tr>
<td>Crossover hop, LSI</td>
<td>95.9 (6.2)</td>
<td>91.3 (11.2)</td>
<td>.02</td>
</tr>
<tr>
<td>Triple hop for distance, LSI</td>
<td>97.1 (5.5)</td>
<td>92.6 (11.4)</td>
<td>.01</td>
</tr>
<tr>
<td>6-m timed hop, LSI</td>
<td>97.7 (5.5)</td>
<td>93.5 (9.8)</td>
<td>.006</td>
</tr>
<tr>
<td>KOS-ADLS</td>
<td>95.4 (4.9)</td>
<td>91.0 (7.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>GRS for knee function</td>
<td>88.8 (12.0)</td>
<td>88.7 (10.7)</td>
<td>.95</td>
</tr>
<tr>
<td>IKDC 2000</td>
<td>88.5 (9.2)</td>
<td>85.0 (11.6)</td>
<td>.05</td>
</tr>
</tbody>
</table>
Drink The (Evidence-Based) Kool-Aid…
It Won’t Hurt (I Promise)
Case 2: Brian

- Brian, a lacrosse midfielder, tore his ACL in the last preseason scrimmage of his senior year in college.
- He came to see me with his ATC and parents 1 week after injury with resolved impairments.
- We screened him and he had limb symmetry of over 90% on all hop tests and 85% quadriceps strength.
- He underwent perturbation training (3 weeks), progressive strengthening and agility drills.

- He was ready to play in a limited role in 2 games and then played fully for 5 other games.
“We ended up losing in the national quarterfinals but did win our conference championship for the first time ever. I'm so glad I was able to come back and help my team; I really appreciate all the opportunity to get back out there to play. There was an article in the New York Times a few days ago about Haverford and I'm in there with my brace.”
“Brian (5) went to Haverford, where he helped the team reach the N.C.A.A. Division III quarterfinals.”

The New York Times
May 22, 2010 Unexpected Turns
Mark Athletes’ Journey
By BILL PENNINGTON
Case 3: Luke

- Luke was a sophomore in High School who tore his ACL in an early season dual match.
- We saw Luke the day after the match.
- After screening and perturbation training (16 days), he competed in the Beast of the East tournament in December and completed the high school wrestling season and some post-season special tournaments.
- Luke went on to be a 2 time State Champ
• Luke wrestled at Naval Academy Prep and ended his career as a nationally ranked 184 pounder at the Naval Academy
• With his early round wins in the NCAA tournament in 2011 he became one of just 13 wrestlers in Navy’s history to post 30 or more wins twice in a career
• 102-37 career at Navy
Can Individuals Return to Sports after ACL Injury without reconstruction?

Yes
Should Individuals Return to Sports after ACL Injury even if they have reconstruction?

Maybe not
Players want to play and players are going to play

Given the large re-injury rate in the first year…

• The surgeon sleeps better with our treatment and return to play algorithm
THANK-YOU!!!!!

Dare to be first.