Hurry up and wait: Rehab after ACLR: where are we today

Lynn Snyder-Mackler ScD, PT
University of Delaware
Newark, DE

Disclosure: I DO NOT have a financial relationship with any commercial interest.

Poor Outcomes

250,000+ US Anterior Cruciate Ligament (ACL) Injuries per Year
Majority Have ACL Reconstruction

Expectations ≠ Outcomes

Return to Sport
Without reinjury: 91% ≠ 55% Competitive Level (Mall, 2014)
30% 2nd Injury (Mall, 2014)
No Osteoarthritis: 98% ≠ ~50% by 10 years (Lohmander, 2004 & 2007)

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, 5 times higher if you return to a level I sport.
• Regardless of surgery, your risk of OA is high in the long term
  — If you need revision surgery risk of OA is higher
Can we change these odds?

YES

Our typical pre-op rehab 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?

Does “prehab” make a difference?

- 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.

Benchmarked to NKLR and IKDC norms (Grindem et al BJSM 2015)

- DOC showed superior 2-year patient-reported outcomes compared with NKLR (usual care).
- 86–94% of the ACLR patients who underwent progressive preoperative and postoperative rehabilitation at the sports medicine clinic had 2-year postoperative patient-reported outcomes (IKDC) comparable to the general population.

Benchmarked to subset of MOON that matched DOC inclusion criteria – Level I and 2 sports (Failla et al AJSM 2016)
Coper classification early after ACL rupture changes with progressive neuromuscular and strength training and is associated with two-year success -The Delaware-Oslo ACL Cohort study - (IN REVIEW)

- Nearly half of the non-copers became potential copers after 10 sessions of NMST (p<0.001). Coper classification post-training was strongly associated with two-year success.
- Potential copers had 3 times the odds of success compared to ACLR non-copers. Those non-copers who did not have ACLR had 0.51 times the odds of success compared to non-copers who had ACLR.

What about after surgery?

Day 1
- Inflammation control
- Full active knee extension
  - Patellar mobility
- Quadriceps strengthening
  - NMES
- Gait training

Day 2 – 1st day PT

Meet Taylor
- 18 year old Pennsylvania Gatorade Player of the Year in Pennsylvania
- Full scholarship to play volleyball at UNC Chapel Hill
- Tears ACL in club game in January of senior year in high school
- ACLR (BPTB autograft)
Meet Joe, who’s doc got the wrong “slow” message – no PT for a few weeks (CPM though!) 10 weeks post-op

Day 2 – 1st day PT

Aggressive elevation and effusion control

NMES to quads – high intensity

Milestones week 1

- Full extension
- Flexion to 110 degrees
- Effusion decreasing
- Good quad contraction with a superior patellar glide
- SLR without a lag
From here it's all about optimal loading of all the tissues...the wait begins.
MEASURE QUAD STRENGTH!!!!

IF YOU DO NOT HAVE AN ISOKINETIC DYNAMOMETER USE A 1 RM ON A KNEE EXTENSION MACHINE. DO NOT USE HHD OR LEG PRESS – THEY BOTH UNDERESTIMATE!!!

Sinacore JA et al JOSPT

Surgeons

Inspect What You Expect

Explore Engage Experience Excel™

Criteria to enter running progression

• Full ROM equal to contralateral
• 80% QI
• Trace or zero effusion

Explore Engage Experience Excel™

• Clearance for RTA is commonly time based
  (Barber-Westin 2011)

• Outcomes after surgery
  – Decreased quadriceps strength (Schmitt 2012)
  – Low patient-reported measures (Hartigan 2010, Logerstedt 2012, KSSTA, AJSM, Schmitt 2012)

Test Score

Quadriceps Strength Index (QI) ≥ 90%

All 4 single-legged hop tests ≥ 90%
Passing screening exam and running progression

beginning to **practice**, not direct return to preinjury level and intensity

---

**Grindem et al (BJSM 2016)**

- The risk of knee reinjury was reduced by 58% for each month RTS was delayed until 9 months after surgery
- Only 5.6% of patients who passed RTS criteria before returning to level I sports suffered reinjuries compared to 37.5% of those who didn't pass
- More symmetrical quadriceps strength prior to return to sport significantly reduced the risk of knee reinjury
- Those who returned to level I sports had a 4.68 times higher risk of knee reinjury than those who did not.

---

**Using these simple decision rules could reduce second injury by 84%**

**Table 1** Discharge tests and criteria used during the study period

<table>
<thead>
<tr>
<th>Test</th>
<th>Discharge permitted when each criteria was met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isokinetic test at 40, 180 and 360°</td>
<td>Quadriiceps deficit &lt;10% at 60°</td>
</tr>
<tr>
<td>Single hop</td>
<td>Limb symmetry index &gt;90%</td>
</tr>
<tr>
<td>Triple hop</td>
<td>Limb symmetry index &gt;90%</td>
</tr>
<tr>
<td>Quadriceps jump</td>
<td>Limb symmetry index &gt;90%</td>
</tr>
<tr>
<td>On-field sports-specific rehabilitation</td>
<td>Fully completed</td>
</tr>
<tr>
<td>Running test</td>
<td>&lt;11 s</td>
</tr>
</tbody>
</table>

---

**Do Secondary prevention program**

- Prevention Exercises:
  - Nordic Hamstring Curls
  - Standing Squat
  - Drop Jumps
  - Triple Single-leg Hop
  - Tuck Jumps
Only One Second ACL Injury in Two Years After Men Perform a Secondary ACL Injury Prevention Program and Return to High Level Sports
*JISPT (in press)*

- The median age of the men was 21.5 years and all athletes were regular participants in Level I (n=38) or II (n=2) sports.
- Two years after ACL reconstruction all athletes had returned to sport, 95% at their preinjury level and **only one athlete** had had a second ACL injury (23 months after ACLR).

Taylor’s timeline

- January 2014 ACL rupture and surgery
- Agreement – no matter how good her knee looks, she isn’t playing for a year
  - Taylor and her parents
  - UDPT
  - Surgeon (Chris Dodson, Rothman)
  - Coach (Joe Sagula, UNC) and volleyball AT staff

Goes to UNC

- Secondary prevention emphasis – (thanks to Darin Padua’s group for helping with this)
- Continued strengthening program with strength and conditioning coach
- No practice with the team – redshirt freshman year
- As Fall progressed, used our Volleyball Interval Hitting Program to prepare for return
- Late January 2015 – began Spring practice as full member of the team
Freshman (RS) Season 2015

Solid season. Starter and Rookie of the Year for Carolina.

In conference play, tallied 232 kills, 178 digs, 50 blocks and 11 aces. She is the first North Carolina ACC Player of the Year since 2005. She was also a two-time ACC Player of the Week and was the first in program history to be honored as the AVCA National Player of the Week and ESPNW Player of the Week.

"That's awesome! Proud to be an example."

Key Points:
Return to play - Level I without reinjury

- Prehab – 10 visits beyond a quiet knee, progressive NMST.
- Very early impairment resolution after ACLR w/quad strengthening.
- Criterion based progression.

- Pass stringent criteria for
  - Running
  - Return to activity
- Secondary NMST prevention program
- Pass on field/court progression
  - Soreness rules
  - Effusion testing

NO RETURN BEFORE 9 MONTHS
(recommend 12 months for <18 years old)

Parents and young athletes need to be cautioned that return to Level I sports carries a 5-6 times higher risk of reinjury.

Thank you!!!!!