Return to Play: Evidence based criteria

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I have no disclosures
Clinical Questions:

- Are there, validated objective/subjective criteria to determine appropriate RTP for athletes?
- Are they sensitive and specific for predicting RTP?

Literature Review:

- PubMed
- Refined by 10 years

<table>
<thead>
<tr>
<th>Condition</th>
<th>By 5 years</th>
<th>By 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>5650</td>
<td>(60%)</td>
</tr>
<tr>
<td>ACL + RTP</td>
<td>54</td>
<td>(88%)</td>
</tr>
<tr>
<td>ACL + RTS</td>
<td>264</td>
<td>(65%)</td>
</tr>
<tr>
<td>ACL + Return</td>
<td>348</td>
<td>(69%)</td>
</tr>
<tr>
<td>ACL + Subjective return</td>
<td>57</td>
<td>(68%)</td>
</tr>
<tr>
<td>ACL + Objective return</td>
<td>73</td>
<td>(72%)</td>
</tr>
</tbody>
</table>
Consensus within the literature: There is a clinical problem!

- RTP rates are pretty concerning
  - Range 20%-100%
  - 40-65% return to full level of sporting activity
    - Despite >90% strength, stable exam, 6-9 months post ACLR
  - Many RTP >1-2 years
  - 1/3 did not return to previous level of sports, 1/2 returned to competitive sports.
    - Ardern C, Sports Health 2015

- Most doctors don’t have a formal criteria
  - Time #1
    - 1/3 of 264 Analyzed studies consider time as only criteria.
      - Barber-Westin SD, Arthroscopy 2011;27(12) 1697-1705
  - Strength
    - Despite “NORMAL” release
    - Vast # of studies comparing muscle function and functional capacity of involved/uninvolved limbs.
      - Studies show decrease knee extensor strength 5-27%
      - Flexor decline – 1-21%
      - Abnormal hip strength/function
      - Lower extremity disfunction
  - Small % use functional criteria
    - Subjective
    - Objective

- Re-Injury/ Contra-lateral injury rates are very concerning
  - Secondary surgeries: meniscal,

- Osteoarthritis
  - 62-80% 10-15 years post ACLR
    - Oiestad 2010
CONCLUSION

The results of this review demonstrate that while 82% of patients returned to some form of sports participation following ACL reconstruction surgery, only 44% returned to competitive sport. This was despite approximately 90% achieving a successful surgical outcome in terms of impairment-based measures of knee function, and 85% achieving a successful outcome in terms of activity-based measures.

The key clinical messages of this review are as follows:

(1) Only about half of patients return to competitive sport after ACL reconstruction surgery.

(2) Approximately 90% of patients achieved successful outcomes in terms of impairment-based measures of knee function after ACL reconstruction surgery. This suggests that factors other than knee function could be contributing to return to sport.

(3) A better understanding of the role contextual factors (such as fear of reinjury and lifestyle change) play in achieving a successful return to sport after ACL reconstruction is warranted.

NFL Study by Shah AJSM 2010

- Return to play rate 63%
  - 37% did NOT return to play in the NFL
- NFL physicians Surveyed: 90%
  - 90-100% Return
  - 10% guessed 75% returned
- Draft status improves return
  - Top 4 rounds – RTP – 86% vs 63%
- ACL injury decreased likelihood of playing in NFL
- RTP may not be due solely to surgical outcome

- NBA rate of return – 78%
  » Bausfield AT, Arthroscopy 2009
Question: “Is there a minimal amount of time to return?”

• Bone Tunnel Considerations – 4-8 weeks
• Tendon/bone interface concerns
• Neuromuscular can persist >11 months
  – Abnormal knee kinematics w/ walking 3 months
  – 5-12 months downhill running
  – 4-12 months SL Hop
    – Hartigan EH, JOSPT 2010;40:141-154
  – Quad Power 9/10 fail at 6 months
    – Neeter C, KSSTA 2006;14:571-580

• Ligamentization
  – Get’s weaker before it get’s stronger
  – 3 months animals, 10-12 months humans
    – Li H, AJSM 1993; 21(2):277-284
“How do I know when I can go?”

• In light of the literature, that’s a tough question to answer!
• Current outcome measures lack sensitivity to detect impairments that could impact function
  – Dilemna for docs
    • “Dr. X said he could have me back in 4 months!”
    • “But you said I would be back in 6 months!”
    • Re-do’s increase disability
  – If the magical projected return time passes, frustration mounts
    • Mentally challenging
• Without reliable, tested guidelines, based on objective/subjective guidelines, RTS is a guesswork.
Objective Criteria:

• Joint stability
  – Lachman
  – Pivot Shift
  – Anterior Drawer
  – Collateral injury

• Muscle Strength
  – Free Weights
  – Hand held dynamometer - isometrics
  – Isokinetic testing

• Proprioception
  • Not much literature focuses on balance/control stability
  – Star Excursion Balance Test – (SEBT)
  – Neurocom,
  – KAT
Objective Criteria Continued:

• Leg Symmetry Index (LSI)
  – Ratio of operated leg vs non-operated leg
  – LSI values of muscle strength above 85-90%
    • 100% for pivoting sports
• Study of healthy athletes 4-16% difference side to side strength.
  – Accepted 15% deficiency before RTS.
• Utilize special equipment to determine LSI
  • Isokinetics

• Some researchers call into question hard comparisons with the “Non-injured” side
Anterior Joint Laxity

- What amount of laxity is acceptable for RTP?

**Table 3. Surgical risk stratification following anterior cruciate ligament tear**

<table>
<thead>
<tr>
<th>Knee Laxity on KT-1000</th>
<th>&lt;50 h/y Level I or II Sports</th>
<th>50-199 h/y Level I or II Sports</th>
<th>≥200 h/y Level I or II Sports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Maximum Testing</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>&lt;5mm</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>5-7mm</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td>&gt;7mm</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Modified from Fithian et al [5].
Objective Criteria: Functional Tests

• **Single leg hop tests**
  – Quick and inexpensive
  – Allow for more comprehensive assessment of functional capacity of the knee joint.
    – Thomee R, KSSTA 20:1143-1151
  – **Single leg hop for distance**
    – 85% LSI
    • Gold standard
      – Noyes 1991
    • High reliability and validity
      – Gustavsson A, KSSTA 2006; 14:778-788,
    • Reasonable substitute for isokinetic testing – (Moderately correlate)
      – Xergia S, Sport Health 2015;7(3)217-
  – **Square hop test**
    • High reliability
      – Gustavsson A, KSSTA 2006; 14: 778-788
  – **Cross over hop test**
    • Strong association with functional ability
      – Moksnes 2009
  – **Five jump testing (5JT)**
    • Explosive Power, Stride power, reliable
      – Chamari 2008
    • Triple hop for distance
    • 6 m timed hop test
    • Counter movement jump
Objective – Functional

*Hop testing prediction improved with 2+ hop tests
  – Almangoush A, 2014

• Test battery of hops
    – Hop tests generally improve continuously post surgery (3, 6, 9, & 12 months)

• Agility T test
  • Forward, backward, lateral movement
Utilized Modified tests from NFL combine
Double leg functional tests/ACLR + control group
• Broad jump
• Vertical jump
• Modified agility T test
• Modified pro shuttle
• Modified long shuttle

*Not sufficiently sensitive to detect limb deficits

Single leg hop tests more sensitive

LSI – Single leg hop distance  92 vs 100% (p<.001)
single leg cross over  92 vs 97%
Quality of Movement

• Hop testing can assess strength/power, but can’t assess symmetry of motion
  – Assess confidence
  – Faulty movement patterns
  – Kinematic asymmetries due to faulty NM or psychological factors
  – Compensatory movement patterns

• Video
Subjective Criteria

• Psychological factors
  — May be more important for evaluation of patient reported outcomes than objective findings.
    » Kocher, JBJS 2002
  • Kinesiophobia
  • Fear of Pain
  • Afraid to move
  • Fear of re-injury
  • Deficient confidence

— Patient Reported Outcomes: (PRO)
— Tampa Scale of Kinesiophobia / TSK-11
  — Assessing pain-related fear of movement
  — TSK-11 shortened form by removing 6 psychometrically weak items
  — Valid, reliable, re-test reliability
— Emotional Response of Athletes to Injury Questionnaire (ERAIQ)
  • Valid and reliable

— Anterior Cruciate Ligament – Return to Sport after Injury Scale (ACL-RSI)
  • Specific 12 item questionnaire
  • Assessing the psychological impact (emotions, confidence in performance, and risk appraisal)
  • High sensitivity (0.97) , moderate specificity (0.63) - Muller U, KSSTA 2014
  • High reliability, validity and test re-test reliability
Comparison of Physical Impairment, Functional, and Psychosocial Measures Based on Fear of Re-injury/Lack of Confidence and Return-to-Sport Status After ACL Reconstruction

Trevor A. Lentz,*†‡ PT, Giorgio Zeppieri Jr.,† PT, Steven Z. George,† PT, PhD, Susan M. Tillman,† PT, Michael W. Moser,§ MD, Kevin W. Farmer,§ MD, and Terese L. Chmielewski,† PT, PhD
Investigation performed at the University of Florida, Gainesville, Florida, USA

AJSM 2014;43(2)345-353
Reviewed Medical Charts – 73 patients ACLR

- 85% some form of sports participation
- 64% pre-injury level
- 56% able to return to same competitive level
- Increased Pain-related fear of repeat injury, quad weakness, IKDC distinguishes patients who are unable to RTS
Subjective Criteria Continued

• PRO’s continued:
  – International Knee Document Committee (IKDC 2000)
    • Most noted in literature
    • Knee specific 10 item questionnaire measuring symptoms, function
    • Valid and reliable, re-test reliability
      » Irrgang JJ, AJSM 2001;29:600-613
  – Knee Injury Osteoarthritis Outcome Survey - (KOOS)
    • Include with IKDC
    • Address broader areas of concern
      – Quality of life and Mental health
  – Visual Analog Scale (VAS)
    Fitzgerald 2000
  – Cincinnati Knee Scoring Scale
    • Also includes manual and instrumented stability testing
  – Lysholm
  – Tegner
    • Activity measures
  – Global Rating Scale
  – Preferrred PRO for the assessment of participation w/in UK NHS practice and research

• After functional testing – Two Questions
  – 1) How stable does your knee feel?
  – 2) Do you think your ready to return to full activity?
Can you predict those who will have issues with fear early in the rehab process?

- Pain experience & pain behaviors
  - Become disassociated from actual pain sensation
  - Exaggerated pain perception
- 2 possible coping reactions of fear of pain
  - Confrontation and avoidance
    - More likely to develop chronic pain w avoidance
- Athletic Fear Avoidance Questionnaire (AFAQ)
  - Sports injury Fear Avoidance in athletes
  - ID potentially negative psychological behavior to rehab
    - Dover G, JAT 2014
Muller – 40 ACLR patients, HS Graft

- **Single leg hop for distance + ACL-RSI Scale** (ACL– Return to Sport after Injury Scale)
  - Strongest predictive parameters for assessing RTS
  - Consider both Objective Functional and subjective psychological Aspects of RTS.
  - SLH-D
    - LSI score (men 88.3 +/- 17.3, women 72.3 +/- 23.6 p=0.0222: Man Whitney U test) **
    - High specificity (.88) and high sensitivity (.74)
  - Lower scores on ACL-RSI – significantly lower in nRTS patients (nRS – 48.7 +/-27.2 vs RS 76.8 +/-15, p=0.013)
    - Psychological aspects have important impact on athletes
  - LSI Mean values knee extensors 88.6 +/- 7.9%

- Model only recognized 23/31 (74%) who returned to pre-injury sport, and ID (100%) who did not RTS with model.
  - 8 returned with LSI SLH-D below cutoff. Supported by other data who note patients able to return despite being below recommended criteria for SLH test or quad strength.
- “Cut-off Model” offers a promising and practical instrument to predict RTS @ 6 mo ACLR
  - Muller U, “Predictive Parameters for return to pre-injury level of sport 6 months following ACLR surgery” KSSTA 2014
Summary:

• We need to base return on more than just time from surgery.
• Cleared to Return is a process.
  – Games create chaos, high speed, require quick reactions, and confidence.
• Criteria quoted in literature are purely empirical values.
• RTP should be based on both objective and subjective findings.
• Obviously we need functional testing.
  – How many? Which tests?
  – Single functional test may not be sensitive enough to detect performance limitations.
    • At least two or more functional tests included in RTS testing.
• There is more to RTS than just objective findings.
  – Assess the quality of movement.
• Don’t forget to measure proprioception/balance.
• Much of the literature poorly described sample sizes, not based on power calculations.
• NO EVIDENCE BASED GUIDELINES FOR RTS.
Thank you!!!!