The development and preliminary evaluation of a return to sport (RTS) assessment after ACL Reconstruction

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Declaration of Interest

- I declare that in the past three years, one or more authors:
  - held shares in: 360 Knee Systems, Trium, Optimised Ortho
  - received royalties from: Nil
  - done consulting work for: Arthrex, Amplitude, Optimised Ortho, 360 Knee Systems, Global Orthopaedics, Omni, Smith & Nephew, Medacta
  - given paid presentations for: Arthrex, Global Orthopaedics, Smith & Nephew, Medacta
  - received institutional support from: Smith & Nephew, Surgical Specialties, Global Orthopaedics, Zimmer, Arthrex, Friends of the Mater (equipment purchase)

- Signed: David Parker
Background

- ACL re-injury impacts both healthcare provider and patient
- Affects patient psychologically and financially
- SORI’s RTS assessment is a series of simple, valid and practical tests
- Aims to inform clinician and patient the risk of re-injury given RTS
Previous RTS assessment at SORI

Return to Sport (RTS) - Periodic clinical data collection

- Clinical assessment
- PROMS
- KT-1000
- Some functional tests

Development of a valid, meaningful and practical tool for assessing readiness for a safe RTS, hence reducing the risks of re-injury
Our literature review substantiated the development of SORI’s current RTS assessment
SORI Protocol

9 months post ACL reconstruction

RTS laboratory

Test duration of 45 minutes

Report produced
**SORI RTS Protocol**

**Demographics**
- **Age**: (Younger age = higher risk)
- **Gender**: (Females = higher risk)

**Subjective questionnaires**
- **IKDC**: Subjective function
- **ACL-RSI**: Psychological readiness
- **Expected level of participation and delay for RTS**: Motivation

**Clinical measurements**
- **Static laximetry**: KT-1000, merging to GNRB
- **Strength**: Isometric knee flexion/extension using handheld dynamometer
- **Range of Motion**
- **MRI Analysis**

**Surgical Data**

**Functional Testings**
- **Y- Balance**
- **Hop Tests**
Clinical Implications

Assessment criterion

**Good RTS results**

**Assessment criterion**

**Return To Sport Screening Summary**

<table>
<thead>
<tr>
<th>RTS Results</th>
<th>RTS Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surgery to Expected RTS</strong></td>
<td><strong>Surgery to Expected RTS</strong></td>
</tr>
<tr>
<td>&gt; 9 months</td>
<td>&gt; 9 months</td>
</tr>
<tr>
<td>6 to 9 months or not specified</td>
<td>6 to 9 months or not specified</td>
</tr>
<tr>
<td>&lt; 6 months</td>
<td>&lt; 6 months</td>
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**Range of Motion**

<table>
<thead>
<tr>
<th>Degree of Flexion</th>
<th>Degree of Extension</th>
</tr>
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<tbody>
<tr>
<td>&gt; 90°</td>
<td>&lt; 90°</td>
</tr>
</tbody>
</table>

The asymmetry can be in flexion or extension.

**Laxity (KT-1000 or GNRB)**

< 3mm side to side difference between 3 and 4 mm side to side difference > 4mm side to side difference

Side to side difference with respect to when ACLR is greater than healthy knee.

**Strength Deficit**

<table>
<thead>
<tr>
<th>Strength Deficit</th>
<th>ACLR</th>
</tr>
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<tbody>
<tr>
<td>&gt; 50%</td>
<td>&gt; 50%</td>
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</table>

ACLR strength is a ≥50% of a healthy knee.

**Hams to Quads Ratio**

<table>
<thead>
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<th>Hams to Quads Ratio</th>
<th>ACLR</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 40%</td>
<td>&gt; 50%</td>
</tr>
</tbody>
</table>

**IKDC**

> 95% percentile ≤ 95% percentile

Compared with normative data from a matched population without any knee problems.

**ACL-RSI**

> 60

**Y-Balance Tests**

Healthy 5cm further reach than ACLR

Composite score (distance % of leg length) < 95%

Healthy 4cm further reach than ACLR

Patient may fail multiple tests, but only one test is required for a fail of Y-Balance task. An overall amber is indicated if all three components are green, but composite score is amber.

**Hop Tests**

ACLR > 90% of healthy

ACLR 80-90% of healthy

ACLR < 80% of healthy

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Preliminary Results

- Data collected over >2 years (2016 onwards)
- 277 patients (161 Males, 116 Females)
- 44% of RTS patients <25 years old

Overall
- 81% failed at least 1 key component (blue)
- 58% failed 2 or more components

Objective measures

Four most frequently failed:
- Hamstring:quadriceps ratio (49%)
- ‘Hamstring strength’ (46%)
- ‘Hop for height’ (45%)
- ‘Y-balance task’ (32%) (Anterior 21%)

Subjective measures

- Over 55% of patients amber in IKDC and ACL-RS
Preliminary Results - Correlations

- Hop tasks outcomes are correlated
  - Side hop vs distance hop: $r = 0.724$ ($p < 0.001$)
  - Side hop vs height hop: $r = 0.656$ ($p < 0.001$)
  - Distance hop vs height hop: $r = 0.703$ ($p < 0.001$)

- Quadriceps (Quad) isometric strength are correlated to hop tasks
  - Quad strength diff. vs distance hop: $r = 0.419$ ($p < 0.001$)
  - Quad strength diff. vs vertical hop: $r = 0.531$ ($p < 0.001$)
  - Quad strength diff. vs side hop: $r = 0.513$ ($p < 0.001$)

- Knee evaluation is related to psychological outcome
  - IKDC vs ACL-RSI: $r = 0.513$ ($p < 0.001$)
Conclusion

- Clinical tool developed for informing healthcare provider and patient
  - multidisciplinary effort
- At 9 months, most patients are not fully capable for RTS
  - Agrees with recent literature
  - Inconsistent with anecdotal evidences and conventional clinical determinants
- Longer follow-up will allow a better understanding of re-injury prevention
  - Larger sample size will allow detailed analysis/correlations between all co-variates (clinical and biomechanical analyses)
- Future consideration - normative data may further inform RTS re-injury risk assessment
Thank You