Disclosures

- JDH: Editorial Board (Arthroscopy; Frontiers In Surgery); Paid consultant (Smith & Nephew); Royalties (SLACK Incorporated); Research support (Smith & Nephew, Depuy Synthes); Committees (AOSSM SAE, AANA Research, AAOS OAFP WG PM)
- AMV, DAD, BJG, NB: None.
Introduction

- Return to driving following orthopedic surgery has important medicolegal implications
  - Seated position >>> Position of “impingement”
  - Pain >>> Driving safety
Introduction

- Brake reaction time (BRT)
  1. Mental processing time
     - See stimulus, perceive stimulus, decide what to do
  2. Muscle activation time
     - Muscle contraction, limb movement from accelerator to brake
  3. Device processing time
     - Machine registration of force application to brake pedal
     - Stop vehicle (or display response time on machine)
Purpose

• To determine if a difference existed in BRT before and after hip arthroscopy in comparison to age- and gender-matched controls
  – Hypothesis: Post-hip arthroscopy BRT would not be significantly different from pre-operative values or from that of age- and gender-matched controls
Methods

• Inclusion criteria:
  – Adults undergoing primary right or left hip arthroscopy for symptomatic FAI, chondrolabral pathology after failed non-surgical treatment by a single surgeon

• Exclusion criteria
  – No valid driver’s license; neurological disease
  – Pediatric patients
  – Revision hip arthroscopy; Open hip surgery
  – Peritrochanteric, deep gluteal space endoscopy
  – Arthritis (Tonnis 2, 3); Dysplasia (LCEA ≤20°, ACEA ≤20°, Tonnis angle >15°, extrusion index >25%)
  – Pain in other joints of bilateral lower extremities
Methods

• Study design: Prospective cohort
  – Minimum eight week follow-up
  – BRT measured (same person, every time, not senior author):
    • Pre-op (maximum of six weeks prior)
    • Post-op (2, 4, 6, 8 weeks [+/- 2 days for each interval])
  – STST (Sit-To-Stand Test) measured at physical therapy:
    • Measures number of times person can rise from chair in 10 seconds
    • Strong correlation with BRT following ACL-R, AKS
      – $$$ - Free (versus BRT testing – expensive)
  – Statistical analysis
    • Mann-Whitney, ANOVA compared groups
    • Spearman’s rho correlation compared tests and controls
    • A priori power calculation – 18 subjects per group (80% power)
Methods

- RT-2S Reaction Time tester (Advanced Therapy Products, Glen Allen, VA, USA)
  - Valid, reliable in healthy adults
  - BRT tested 10X (mean calculated) for each leg
  - STST completed after BRT
Results

- 19 subjects (10F, 9M; 35.0 +/- 11.4 years of age)
  - No difference (p>0.05) in pre- and post-op BRT
  - No difference (p>0.05) in BRT between subjects and controls
  - Strong negative correlation between BRT and STST pre-op, and post-op (4, 6 wks)
  - Moderate negative correlation between BRT and STST post-op (2 wks)

<table>
<thead>
<tr>
<th></th>
<th>Break Reaction Time (ms)</th>
<th>Sit-to-stand Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Right hip arthroscopy</td>
<td>Control</td>
</tr>
<tr>
<td>Pre-operative</td>
<td>604 ±148</td>
<td>516 ± 125</td>
</tr>
<tr>
<td></td>
<td>6.81 ±2.93</td>
<td>8.45 ±3.11</td>
</tr>
<tr>
<td>2 weeks</td>
<td>608 ±168</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5.09 ±2.77</td>
<td>-</td>
</tr>
<tr>
<td>4 weeks</td>
<td>566 ±118</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>6.8 ±3.26</td>
<td>-</td>
</tr>
<tr>
<td>6 weeks</td>
<td>559 ±134</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>7.64 ±3.07</td>
<td>-</td>
</tr>
<tr>
<td>8 weeks</td>
<td>595 ±95.5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>7.88 ±2.95</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2 Mean break reaction time for the right leg and sit-to-stand scores in right hip arthroscopy, left hip arthroscopy and their matched control groups.
# Results

## Comparison Break Reaction Time and Sit-to-Stand

<table>
<thead>
<tr>
<th></th>
<th>Right Arthroscopy</th>
<th></th>
<th>Left Arthroscopy</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Break Reaction Time</td>
<td>Sit-to-stand</td>
<td>Break Reaction Time</td>
<td>Sit-to-stand</td>
</tr>
<tr>
<td>Control values</td>
<td></td>
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<td></td>
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<tr>
<td>Control vs. Pre-op</td>
<td>-88ms</td>
<td>0.1499</td>
<td>1.64</td>
<td>0.2627</td>
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<td>Control vs 2 weeks</td>
<td>-92ms</td>
<td>0.2113</td>
<td>3.36</td>
<td>0.0198</td>
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<td>Control vs 4 weeks</td>
<td>-50ms</td>
<td>0.6241</td>
<td>1.65</td>
<td>0.3628</td>
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<tr>
<td>Control vs 6 weeks</td>
<td>-43ms</td>
<td>0.5552</td>
<td>0.81</td>
<td>0.0155</td>
</tr>
<tr>
<td>Control vs 8 weeks</td>
<td>-79ms</td>
<td>0.7114</td>
<td>0.57</td>
<td>0.6383</td>
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<tr>
<td>Pre-operative values</td>
<td></td>
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<td></td>
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<tr>
<td>Pre-op vs. 2 weeks</td>
<td>-4ms</td>
<td>1.000</td>
<td>1.72</td>
<td>0.2005</td>
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<td>Pre-op vs. 4 weeks</td>
<td>38ms</td>
<td>0.6745</td>
<td>0.01</td>
<td>0.9124</td>
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<td>Pre-op vs. 6 weeks</td>
<td>45ms</td>
<td>0.5552</td>
<td>-0.83</td>
<td>0.5961</td>
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<td>Pre-op vs. 8 weeks</td>
<td>9ms</td>
<td>0.6384</td>
<td>-1.07</td>
<td>0.1707</td>
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</tbody>
</table>

* Mann-Whitney

Table 3. Comparison of sit-to-stand and break reaction times between control and preoperative values at each time interval tested: mean difference between control controls and each time interval and mean difference between pre-op values and each time interval, and statistical significance ($P$).
Limitations

- Small sample size
  - Possible beta error, despite a prior power analysis
- Different number of years driving (despite age-matching)
- Detection bias (testing q2 weeks)
  - No “take-home” device
- Did not monitor: pain, analgesic dose, other med intake, quad strength, hip/knee/foot/ankle motion, proprioception
- Did not account for hearing, visual acuity, fatigue, motor vehicle factors
Conclusions

• Following hip arthroscopy, brake reaction time is not significantly different from pre-operative values or that of controls
  – 2, 4, 6, 8 weeks following surgery

• Brake reaction time demonstrated significant correlation with sit-to-stand time in the first six weeks following hip arthroscopy
References