



INTERNATIONAL SOCIETY
FOR HIP ARTHROSCOPY

Brake Reaction Time Following Hip Arthroscopy

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Introduction

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



- **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)



- 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

- **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 $\leq 20^\circ$, ACEA $\leq 20^\circ$, Tonnis angle $>15^\circ$, extrusion index $>25\%$)
 - Pain in other joints of bilateral lower extremities

- **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 calculator – 18 subjects per group (80% power)

- **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)

Means for Right Leg Break Reaction Time and Sit-to-Stand Test								
	Break Reaction Time (ms)				Sit-to-stand Test			
	Right hip arthroscopy	Control	Left hip arthroscopy	Control	Right hip arthroscopy	Control	Left hip arthroscopy	Control
Pre-operative	604 ±148	516 ± 125	598 ±121	504 ± 63.4	6.81 ±2.93	8.45 ±3.11	6.25 ±2.43	8.5 ±2.39
2 weeks	608 ±168	-	567 ±143	-	5.09 ±2.77	-	4.88 ±2.53	-
4weeks	566 ±118	-	616 ±178	-	6.8 ±3.26	-	8 ±2.45	-
6 weeks	559 ±134	-	579 ±162	-	7.64 ±3.07	-	7.88 ±2.42	-
8 weeks	595 ±95.5	-	523 ± 87.8	-	7.88 ±2.95	-	9.83 ±2.86	-

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								
	Right Arthroscopy				Left Arthroscopy			
	Break Reaction Time		Sit-to-stand		Break Reaction Time		Sit-to-stand	
	Mean	<i>P</i> ^a	Mean	<i>P</i> ^a	Mean	<i>P</i> ^a	Mean	<i>P</i> ^a
Control values								
Control vs. Pre-op	-88ms	0.1499	1.64	0.2627	-94ms	0.1031	2.25	0.0735
Control vs 2 weeks	-92ms	0.2113	3.36	0.0198	-63ms	0.4295	3.62	0.0155
Control vs 4 weeks	-50ms	0.6241	1.65	0.3628	-112ms	0.2301	0.05	0.6312
Control vs 6 weeks	-43ms	0.5552	0.81	0.7414	-75ms	0.4965	0.62	0.5961
Control vs 8 weeks	-79ms	0.7114	0.57	0.6383	-19ms	0.5755	-1.33	0.8103
Pre-operative values								
Pre-op vs. 2 weeks	-4ms	1.000	1.72	0.2005	31ms	0.3735	1.37	0.3173
Pre-op vs. 4weeks	38ms	0.6745	0.01	0.9124	-18ms	0.5755	-1.75	0.1499
Pre-op vs. 6 weeks	45ms	0.5552	-0.83	0.5961	19ms	0.7949	-1.63	0.0735
Pre-op vs. 8 weeks	9ms	0.6384	-1.07	0.1707	75ms	0.3789	-3.58	0.0658
^a 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**

- **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**

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