Braking Function After Complex Lower Extremity Trauma

Reference:

Scientific Literature Review

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Podiatric Relevance:
This study evaluates patients’ ability to operate foot controls of an automobile following operative treatment of various isolated right sided lower extremity fractures.

Methods:
A total of 69 patients were tested in a driving simulator constructed of actual brake and accelerator assemblies attached to a steering column. 12 healthy volunteers were used as controls. 22 patients with right lower extremity long bone fractures treated by intramedullary nailing (9 femur, 13 tibial shaft) were tested at post-operative weeks 6, 9, and 12. 35 patients with articular fractures treated by ORIF with plate fixation (12 tibial plateau, 4 pilon, 12 calcaneal, 7 acetabulum) were tested at post-operative weeks 12, 15, and 18. Patients began walking weight-bearing as tolerated at the time of the initial driving test. Patients were tested in three conditions: city, suburban, and highway. The conditions varied by the number of times the subject was required to break, and how long they would have to maintain a certain speed. Each trial was approximately 90 seconds in length and each subject preformed a total of 18 randomly assigned trials. Data collected included: initial response time, foot movement time, brake reaction time, brake travel time (BTT), and total brake time. BTT (time elapsed between the moment of initial contact with the brake and the moment the brake pedal reached the end of its travel) was considered the most relevant variable in this study. A Short Musculoskeletal Functional Assessment (SMFA) was also performed at each session on each patient by a trained interviewer.

Results:
Control subjects (group I) BTT was 302 msec +/- 90msec. Subjects with long bone fractures (group II) BTT was 444 msec +/- 153 msec at 6 weeks, 377 msec +/- 127 msec at 9 weeks, and 359 msec +/- 116 msec at 12 weeks post-op. Subjects with articular fractures (group III) BTT was 412 msec +/- 161 msec at 12 weeks, 343 msec +/- 112 msec at 15 weeks, and 339 msec +/- 116 msec at 18 weeks post-op. Post hoc analysis showed significant improvement in groups II and III between the first and third time periods ($p = 0.05$) but no difference between the second and third visits. This time delay of 142 msec group II correlates to 12.5 and 6.3 less feet of breaking distance when traveling at 60mph and 30 mph respectively. SMFA was improved at each visit, but did not correlate with improvement in BTT.

Conclusions:
Driving performance at the time of initial weight bearing following operative treatment of lower extremity fractures is impaired, suggesting it may not be safe for patients to drive at this time. Braking function significantly improved over the first 6 weeks of weight bearing, week 12 for long bone fractures, and week 18 for articular fractures. This can be interpreted that a return to more normal braking function follows weight bearing by 6 weeks after operative stabilization of isolated right lower extremity fractures.