Re-Exploration of the Post-Operative Route to Functional Mobility After Lower Limb Reconstruction

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Abstract

Background: Although trauma and reconstructive services continue to advance, there remains little evidence regarding the post-operative return of functional mobility. The aim of this study was to implement the recently validated Hamlyn Mobility Score (HMS)[1] to quantify and characterise the recovery process following post-traumatic lower limb reconstruction.

Methods: Twenty patients who had undergone post-traumatic lower limb reconstruction were followed up at 3-monthly intervals for 1-year. At each time point, an ear worn motion sensor (e-AR sensor, Imperial College London) was used to assess the performance of subjects during a short activity protocol. Kinematic features and the HMS were calculated longitudinally, allowing analysis of mobility throughout recovery as well as between subjects with varying severity of injury. Ethical approval was granted by the National Research Ethics Committee (12/WS/0066) and the study was registered prospectively at clinicaltrials.gov (CR01934).

Results: The functional mobility of the patient cohort according to the HMS improved throughout the full follow-up period. Patients with more severe fractures recovered at a slower rate, with Gustilo-1 fractures (G1) completing the majority of their recovery in the first 3-months, G2 until 6-months, and G3 patients continuing to recover through the 9-month time point. All activities making up the HMS contributed similarly to the recovery patterns with strong inter-activity correlations (Spearman's Rho = 0.726, $p < 0.001$). Gait analysis during the 6-minute walk revealed that walking quality continues to improve 12-months post-operatively, whereas walking capacity (distance) plateaus after 6-months. The HMS detected late complications where subject recovery trajectories deviated more than 0.5 standard deviations below that of the cohort.

Conclusions: This study provides the first objective longitudinal report on return to functional mobility following post-traumatic lower limb reconstruction. The low cost and objectivity of the HMS makes it suitable for a variety of clinical and research applications, including home monitoring for personalised rehabilitation, early detection of complications, and evaluation of clinical management strategies.

Table 1. Longitudinal Hamlyn Mobility Scores stratified according to fracture severity

Figure 1. Post-operative recovery stratified according to fracture severity

References

1. Kwasnicki RM, Hettiaratchy S, Jarchi D, et al. Assessing Functional Mobility After Lower Limb Reconstruction: a Psychometric Evaluation of a Sensor-Based Mobility Score. *Ann Surg*. 2014 (epub ahead of print May 2014)

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