Minimal Gait Disturbance After Successful Repair of Femoral Neck Fractures in Young Adults with < 1cm Shortening at Mid-Term Follow-up

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INTRODUCTION:

Excellent functional outcomes after operative fixation of femoral neck fractures (FNFs) in young patients are not guaranteed and the need for reconstructive surgery is common. While some amount of femoral neck shortening is accepted in these injuries, data on patient outcomes available for "*successful*" *or* uncomplicated repair of FNFs in young patients is scarce. We hypothesize that these hips that healed with <10mm of femoral neck shortening will have little, or no, impact on a patient's gait pattern at mid-term follow up. Our objective was to investigate hip and pelvic kinematic and kinetic changes through gait analysis and correlate them with patient reported functional outcomes scores (PRFOs).

METHODS:

This prospective study evaluated patients $\leq$ 55 years of age with $\geq$2 year follow up after repair of an isolated AO/OTA 31-B FNF. Overall, 45 eligible patients were screened, 12 met inclusion criteria and 6 consented to participate in the study. Patients underwent 3-dimensional motion analysis and walked at a self-selected speed while peak joint angles of the pelvis, hip, knee and demand moments at the hip and knee were analyzed. Outcomes were compared to the contralateral (uninjured) extremity and statistical analysis was performed with paired t-tests. Differences of >5° between operative and nonoperative extremities were defined as clinically meaningful by convention. PRFOs were assessed with the Short Musculoskeletal Function Assessment (SMFA). Significance was set at $p<0.05$.

RESULTS:

The mean age at time of injury was 45.6 ± 10.1 years, all subjects were male, and average time from injury to analysis was 5.2 years (range: 2-10 years). Femoral neck shortening averaged 6.5mm (range: 2 to 8 mm). The group demonstrated symmetric patterns of motion at the pelvis, hip, and knee, with no difference exceeding 5°. There was a significant difference in pelvic drop (coronal plane), with an average drop of 3.2° on the operative extremity ($p=0.033$). Compared to the uninjured extremity, there was no difference in the peak hip adduction moment of the injured side ($p=0.285$) or at any point during stance phase ($p=0.296$). The mean SMFA "bother" and "dysfunction" index scores were 9.16 and 8.24, respectively. There was a strong negative linear correlation with the maximum pelvic displacement in the frontal plane and the SMFA bothersome score (r= -0.832, $p=0.040$).

DISCUSSION AND CONCLUSION:

It is widely assumed that mild amounts of femoral neck shortening will yield positive functional outcomes, yet no study has adequately analyzed the clinical results of young patients after repair of a FNF using a formal kinematic study (i.e. gait analysis). This study demonstrated that successful repair of a FNF in young adults demonstrated negligible clinical impact on their gait pattern at mid-term follow up. Gait analyses showed only minor angular shifts at the hip and pelvis that did not near thresholds expected to cause a gait disturbance, nor were they correlated with PRFOs.