

## Determinants of Functional Outcome After Operative Calcaneus Fractures

Michael Hermelin, BA; Heather Vallier, MD;  
MetroHealth System, Cleveland, Ohio, USA

**Purpose:** Intra-articular calcaneus fractures are associated with a high frequency of complications and secondary procedures, as well as functional limitations in previous literature. The purpose of this study was to assess patient injury, medical, social, and treatment characteristics to identify associations with functional outcomes in orthopedic patients treated surgically for intra-articular calcaneus fracture. We propose to identify factors predictive of better outcome.

**Methods:** Over 12 years 96 adult patients with 109 intra-articular calcaneus fractures were treated surgically by a single surgeon. Functional outcomes were measured with Foot Function Index (FFI) and Musculoskeletal Function Assessment (MFA) surveys. The FFI is an extremity-specific score for foot and ankle function, with subscores for pain, disability, and activity, each scaled up to 100 points. The total FFI score is the average of the 3 subscores. The MFA is a generalized survey, scaled from 1 to 100 points. Lower FFI and MFA scores indicate better function.

**Results:** 60 patients with 67 fractures completed surveys (63%) after a mean of 75 months (minimum 12 months) follow-up, including 45 men and 15 women with mean age 43.4 years. 11 (18%) had open fractures, and 28 (47%) were tobacco smokers. 41 fractures (61%) were treated with open reduction and external fixation (ORIF) using an extensile lateral approach, and 26 had percutaneous reduction and fixation. At most recent follow-up 22% had radiographic evidence of posttraumatic arthrosis (PTA), occurring in 27% of patients after ORIF and 13% after percutaneous treatment. Overall, 72% of patients had returned to employment. Mean MFA of all patients was 27.2, and mean total FFI was 31.1, indicating substantial residual dysfunction when compared with a normal, uninjured population (mean 12.0 and 9.0, respectively,  $P < 0.0001$ ). Men had worse FFI scores than women (33.7 vs 22.6,  $P = 0.031$ ) but similar MFA scores. Patients treated with ORIF had better MFA (24.1 vs 31.7,  $P = 0.13$ ) and FFI scores (24.8 vs 41.2,  $P = 0.015$ ) when compared with percutaneous fixation. Presence of PTA was associated with higher mean MFA (34.4 vs 25.1,  $P = 0.12$ ) and FFI scores (38.6 vs 29.4,  $P = 0.27$ ). Age, medical illness, and fracture pattern were not associated with outcomes. However, patients with a history of alcohol abuse had worse FFI scores (50.9 vs 28.4,  $P = 0.021$ ), and patients who were unemployed after injury had worse MFA (34.5 vs 24.3,  $P = 0.069$ ) and FFI scores (42.1 vs 26.9,  $P = 0.034$ ).

**Conclusion:** After mean follow-up of 75 months, patients who sustained intra-articular calcaneus fractures had substantial residual dysfunction on both generalized and foot-specific outcome surveys. With the numbers available, patients treated with percutaneous reduction and fixation had less PTA but worse FFI scores. Worse outcomes were associated with male gender, alcohol abuse, and unemployed status. Patients who never returned to work had the worst MFA and FFI scores, indicating an opportunity to intervene with vocational rehabilitation and counseling strategies.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.