

Complication Rates Following Operative Treatment of Closed Calcaneus Fractures in the Medicare Population

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Background/Purpose: Calcaneus fractures can result in significant disability secondary to deformity and subtalar arthritis. Open reduction and internal fixation (ORIF) has been advocated by some authors, but some clinical studies indicate that benefits of operative fixation may be offset by the risks of short-term complications. The purpose of this study was to use a large Medicare population database to report on short-term complication rates and subtalar fusion rates following operative management of calcaneus fractures. In addition, the study examined the effects of reversible patient factors of obesity, smoking, and type 2 diabetes (T2DM) on these complication rates.

Methods: This retrospective, large database study identified all Medicare-insured patients within the PearlDiver Patient Record Database who underwent treatment for closed fractures of the calcaneus during the 8-year period from 2005-2012. The PearlDiver database is a publicly available, national database including approximately 51 million patients. Patients treated for closed fractures of the calcaneus were identified by cross-referencing CPT and ICD-9 codes for closed treatment, percutaneous fixation, ORIF, or primary subtalar fusion. Primary subtalar fusion was subdivided into "early" (procedure occurring <6 months after diagnosis) or "late" (procedure occurring >6 months after diagnosis). All patient groups were stratified into demographic categories based on diagnoses of type 2 diabetes, tobacco use disorder, and obesity (body mass index [BMI] >30 kg/m²). Outcomes measured for all treatment groups were postoperative 90-day complication rates of infection, thromboembolism, medical complications, as well as 2-year subtalar fusion and 2-year non-subtalar fusion rates (ankle, triple, midtarsal, tarsometatarsal). Patients with diagnoses of these complications prior to surgical intervention as well as those with associated fractures of the ankle, tarsal, and metatarsal bones were excluded. Demographic information queried from the database included patient gender and age. A X² test was performed to test the association between categorical variables and report the odds ratio (OR) with a 95% CI. Significance was set at $P < 0.05$.

Results: A total of 40,038 patients diagnosed with closed calcaneus fracture were identified. Of these patients, 13.2% (n = 5288) were managed operatively. Within this group, 81.1% were treated with ORIF, 7.5% with percutaneous treatment, 5.6% with early primary subtalar fusion, and 5.8% with delayed primary subtalar fusion. Of patients undergoing ORIF, 14.6% were diagnosed with obesity (BMI >30), 29.8% smoking, and 30.7% T2DM. Statistically significant differences in rates of postoperative infection, thromboembolism, and medical complication

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.

were found in obese patients ($P < 0.01$), smokers ($P < 0.01$), and T2DM patients ($P < 0.01$) as compared to their respective reference groups (Table 1). Rates of subtalar fusion within 2 years following ORIF were significantly higher in smokers compared to nonsmokers ($P < 0.01$). Rates of non-subtalar fusion within 2 years following ORIF were significantly higher in obese patients compared to nonobese patients ($P < 0.01$) and T2DM patients compared to non-T2DM patients ($P < 0.01$). In patients undergoing primary subtalar fusion, there was a significantly higher rate of postoperative infection in patients treated within 6 months of diagnosis compared to delaying treatment for more than 6 months ($P < 0.01$).

Table 1: Postoperative Complication and Subtalar Fusion Rates Following ORIF for Closed Calcaneus Fracture

		Odds Ratio (95% CI)				
		90 day Infection	90 day Thromboembolism	90 day Medical Complication	2 Year Subtalar Fusion	2 Year Non-Subtalar Fusion
Comorbidity	Reference					
Obesity (BMI > 30)	Non-Obese (BMI < 30)	18.6% vs 7.3% 2.9 (2.3-3.7)	4.8% vs 1.8% 2.7 (1.7-4.2)	27.1% vs 9.4% 3.6 (2.9-4.4)	2.5% vs 1.5% 1.7 (1.0-3.1)	2.7% vs 0.7% 3.9 (2.1-7.2)
Smoker	Non-Smoker	11.8% vs 7.4% 1.7 (1.4-2.1)	2.8% vs 2.0% 1.4 (0.9-2.0)	18.9% vs 10.8% 1.8 (1.5-2.1)	2.5% vs 0.9% 2.9 (1.7-4.8)	1.2% vs 0.9% 1.3 (0.7-2.4)
Type 2 Diabetes	Non-Type 2 Diabetic	16.1% vs 7.0% 2.5 (2.1-3.1)	3.9% vs 1.8% 2.2 (1.5-3.2)	33.3% vs 8.1% 5.6 (4.7-6.7)	1.4% vs 1.7% 0.81 (0.5-1.4)	2.2% vs 0.6% 3.7 (2.0-6.7)
Male	Female	8.6% vs 8.7% 0.98 (0.81-1.2)	2.4% vs 1.7% 1.5 (0.97-2.3)	7.3% vs 15% 0.45 (0.37-0.55)	1.8% vs 1.9% 1.36 (0.84-2.2)	0.7% vs 1.1% 0.59 (0.31-1.1)
Note: Bold indicates a significant difference between the comorbidity and its reference ($p < 0.05$)						

Conclusion: Obesity, smoking, and T2DM are independently associated with increased postoperative complications following ORIF for closed calcaneus fracture in the Medicare population. Smoking is associated with higher 2-year rates of subtalar fusion while obesity and T2DM are associated with higher 2-year rates of other fusions. Calcaneus fractures managed with primary subtalar fusion within 6 months of diagnosis may be at greater risk of postoperative infection as compared to those treated after 6 months.