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Original Research

Operatively Treated Talus Fractures: Complications and Survivorship in a Large Patient Sample

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ABSTRACT

Talus fractures are relatively uncommon; however, the sequelae of talus fractures can cause significant morbidity. Although avascular necrosis has been a consistently reported complication, the reported rates of subsequent arthrodesis have varied widely. The purpose of the present study was to report the complications in a large patient sample of operatively treated talus fractures and to describe the survivorship of open reduction internal fixation (ORIF) of the talus. Patients undergoing talus ORIF for closed or open fractures from 2007 to 2011 were identified in the United Healthcare System database by International Classification of Diseases, 9th revision, code 825.21 and Current Procedural Terminology codes 28445, 28436, and 28430. Patients with a nonoperative talus fracture or isolated osteochondral defect were excluded, leaving 1527 patients in the final analysis. We also identified patients who had required subsequent subtalar, pantalar, and tibiotalocalcaneal arthrodeses using Current Procedural Terminology codes 28725, 28705, and 28715, respectively. Complications and demographic data were recorded. Of the 1527 patients, 29 (1.9%) had undergone subsequent arthrodesis within 4 years; 64 patients (4.2%) developed wound complications that did not require surgical intervention, 11 patients (0.7%) were readmitted, 204 (13.3%) presented to the emergency department (ED), and 96 (6.3%) underwent operative irrigation and debridement (I&D). The overall complication rate was 19.5%. Patients aged >34 years had a significantly greater rate of ED visits (54.7%, $p = .015$) and overall complications (56.8%, $p < .001$). In conclusion, ORIF of talus fractures has good survivorship when considering the failure of initial surgery or the requirement for secondary arthrodesis. Medical complications and hospital readmission were relatively rare; however, ED visits and infection requiring I&D were relatively common after ORIF of talus fractures.

Talus fractures are relatively uncommon. However, they can be devastating injuries leading to chronic pain, disability, and multiple surgical procedures for the patients. Despite the low incidence, talus fractures are the second most common tarsal bone fracture with an incidence of 0.1% to 0.85% of all fractures (1). Talus fractures are generally treated operatively with open reduction internal fixation (ORIF), although select patients can be treated with percutaneous fixation or nonoperative management.

The sequelae of talus fractures can cause significant morbidity. Osteonecrosis is a well-established complication of talus fractures. Recent retrospective cohort studies have demonstrated radiographic evidence of osteonecrosis in 49% of 39 talar neck fractures and 38% of 26 talar body fractures (2,3). In their meta-analysis of outcomes of talar neck fractures, Dodd and Lefaivre (4) reported an overall rate of osteonecrosis of 31.2%.

Talus fractures have also been associated with high rates of posttraumatic arthritis, with one level 1 trauma center reported a rate of 53.3% for subtalar arthritis and 25% for tibiotalar arthritis at an average 30-month follow-up period (5). That study was small, however, with 60 talus fractures, only 2 cases of subtalar arthrodeses, and no tibiotalar arthrodeses. Dodd and Lefaivre (4) reported a mean rate of subtalar degenerative joint changes in 49% of patients with talar neck fractures. In their meta-analysis, 16 studies reported rates of subtalar degenerative joint changes, with the shortest mean follow-up time

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being 20 months in 1 study (4). Of the 16 studies, 6 had a minimum 24-month follow-up period (4). Despite many retrospective cohorts reporting the outcomes of talus fractures (4), little is known about the long-term outcomes after talus fractures, conversion from ORIF to arthrodesis, or the associated comorbidities of patients with these injuries.

The primary purpose of the present study was to evaluate and compare the medium-term outcomes in patients with operatively treated talus fractures. We sought to define the rate of subsequent arthrodesis and the rate of complications associated with operatively treated talus fractures, including nonoperative wound complications, the need for repeat operative debridement (irrigation and debridement [I&D]), and postoperative emergency department (ED) visits.

Materials and Methods

Data Collection

Patients who had undergone ORIF or percutaneous fixation for a talus fracture from January 2007 to December 2011 were identified in the orthopedic record subset of the United Healthcare System database. The United Healthcare System database is a database of administrative claims data from billing records associated with healthcare delivery to patients privately insured with the United Healthcare Group (6). The database contains claim data for >20 million patients nationally. Patients with talus fractures were identified using the International Classification of Diseases, 9th revision (ICD-9), diagnosis codes 825.21 and 825.31 (closed and open fracture of the astragalus, respectively). Only patients undergoing ORIF with Current Procedural Terminology (CPT) code 28445 (talus fracture ORIF) or code 28436 (percutaneous fixation of talus fracture) were included in the present study for analysis. Patients with a nonoperative talus fracture (CPT code 28430) or isolated osteochondral defect (CPT code 28446) were excluded from the present study. A total of 1527 operatively treated talus fractures met the inclusion criteria and were included the present analysis (Fig. 1). Other variables recorded in the database include sex, age, smoking history, and associated comorbidities. Associated comorbidities that had been diagnosed within 4 years of injury were recorded and are included in Table 1.

The postoperative complications were assessed and recorded within 30 days of hospital admission. The complications included hospital readmission, wound complications, operative debridement (I&D), ED visits, deep vein thrombosis (DVT), pulmonary embolism (PE), and myocardial infarction (MI). We also identified patients who had required subsequent ankle arthrodesis, including subtalar, pantalar, and tibiotalocalcaneal using CPT codes 28725, 28705, and 28715 respectively. We also recorded the time that had elapsed between ORIF and arthrodesis. All CPT and ICD-9 codes are listed in Table 2. The data set did not allow for stratification of fracture classification or arthrodesis type beyond the ICD-9 and CPT codes associated with each patient. Subsequent arthrodeses were recorded at 4 years from the index surgery for all 1527 operatively treated patients identified.

Statistical Analysis

Complications, region (Midwest, Northeast, South, and West), age, sex, and arthrodesis rate after ORIF were recorded for all 1527 operatively treated patients identified in the database. A generalized linear model was used to determine the significant changes in the rates of ORIF and complications over time (7). The model examined the proportion of talus fracture patients undergoing ORIF and the proportion of ORIF patients experiencing complications stratified by year from 2007 to 2011. In the model, we included the rates of I&D, wound complications, ED visits, and overall complications. Additionally, χ^2 tests were used to examine the differences in complication rates stratified by age, sex, and region. A Kaplan-Meier survival curve was used to show patients with talus fractures in whom ORIF failed, with arthrodesis as the final endpoint (Fig. 2).

Table 1
Demographic data and comorbidities of all 1527 patients who underwent open reduction and internal fixation for talus fractures from 2007 to 2011 in the United Healthcare System database

Variable	n (%)
Total patients	1527 (100.00)
Age, y	
<20	305 (19.97)
20 to 34	508 (20.17)
35 to 49	436 (28.55)
50 to 65	274 (17.94)
Gender	
Male	843 (55.06)
Female	688 (44.94)
Comorbidity	
Low back pain	116 (7.58)
Cervicalgia	107 (6.99)
HTN	46 (3.00)
Chest pain	39 (2.55)
Lumbosacral neuritis	38 (2.48)
Thoracic back pain	35 (2.29)
Degenerative disk disease	29 (1.89)
Benign HTN	23 (1.50)
HLD	22 (1.44)
Tobacco use	22 (1.44)
Cervical spondylosis	21 (1.37)
Cervical disk disease	21 (1.37)
Lumbosacral spondylosis	20 (1.31)
Cervical disk displacement	16 (1.05)
Sciatica	16 (1.05)
Hyperlipidemia	14 (0.91)
Diabetes mellitus type 2	13 (0.85)
Hypothyroidism	12 (0.78)

Abbreviations: HLD, hyperlipidemia; HTN, hypertension.

Results

Our cohort consisted of 1527 operatively treated talus fractures. The patient demographic data and comorbidities are listed in Table 1. Twenty-nine patients (1.9%) had undergone arthrodesis within 4 years after ORIF (Table 3); 64 patients (4.2%) had wound complications that were monitored and did not require surgical intervention, 11 (0.7%) were readmitted to the hospital, 204 (13.3%) had presented to the ED,

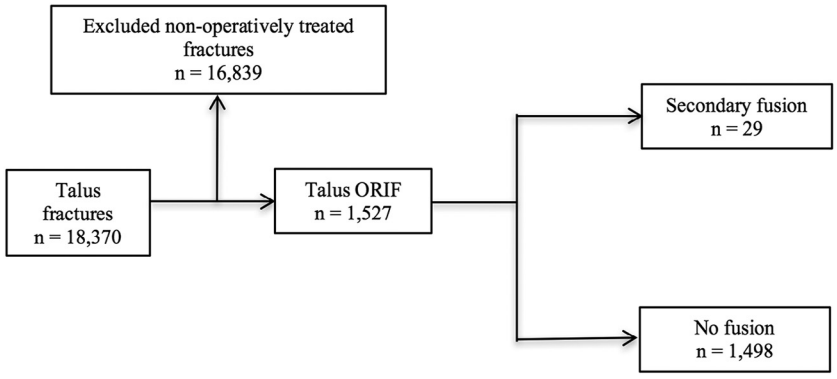

Fig. 1. Flowchart depicting the outcomes of the final cohort. The present study included 1527 of the 18,370 talus fractures treated with open reduction internal fixation (ORIF) from 2007 to 2011. Of these operatively treated talus fractures, 29 required secondary arthrodesis at 4 years after ORIF.