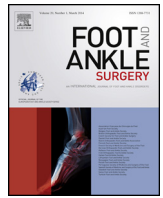




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Comparing 30-day all-cause readmission rates between tibiotalar fusion and total ankle replacement

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ABSTRACT

Background: End-stage ankle arthritis is a debilitating condition that negatively impacts patient quality of life. Tibiotalar fusion and total ankle replacement are treatment options for managing ankle arthritis. Few studies have examined short term readmission rates of these two procedures. The objective of this study was compare all-cause 30-day readmission rates between patients undergoing tibiotalar fusion vs. total ankle replacement.

Methods: This study queried the Nationwide Readmission Database (NRD) from 2013–2014 and used international classification of disease, 9th revision (ICD-9) procedure codes to identify all patients who underwent a tibiotalar fusion or a total ankle replacement. Comorbidities, insurance status, hospital characteristics, and readmission rates were statistically compared between the two cohorts. Risk factors were then identified for 30-day readmission.

Results: A total of 5660 patients were analyzed with 2667 in the tibiotalar fusion cohort and 2993 in the total ankle replacement cohort. Univariate analysis revealed that the readmission rate after tibiotalar fusion (4.4%) was statistically greater than after total ankle replacement (1.4%). Multivariable regression analysis indicated that deficiency anemia (OR 2.18), coagulopathy (OR 3.51), renal failure (OR 2.83), other insurance relative to private (OR 3.40), and tibiotalar fusion (OR 2.51) were all statistically significant independent risk factors for having a readmission within 30-days.

Conclusions: These findings suggest that during the short-term period following discharge from the hospital, patients who received a tibiotalar fusion are more likely to experience a 30-day readmission. These findings are important for decision making when a surgeon encounters a patient with end stage ankle arthritis.

Level of evidence: Level III, cohort study.

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1. Introduction

End-stage tibiotalar arthritis is a disabling condition associated with impaired functional status and decreased quality of life [1–4]. Several factors contribute to end-stage ankle arthritis, though the most common etiology is post-traumatic [5–7].

The long accepted gold standard for treating end-stage arthritis of the tibiotalar joint is tibiotalar fusion [8,9]. Patients generally experience excellent pain relief and a reduction in physical limitations following fusion, but a number of shortcomings such

as motion restriction and nonunion are associated with the procedure [10–15].

As a means to avoid some of the drawbacks associated with ankle fusion, total ankle arthroplasty (TAA) was developed [16]. The advantage of preserved range of motion that comes with TAA also comes with the risk of eventual implant failure and need for subsequent reoperation. As implant survivorship has improved, though, TAA has become an increasingly popular alternative to ankle arthrodesis for treating end-stage arthritis [17,18].

Several studies have compared the intermediate and long-term results of ankle arthrodesis and total ankle replacement, with no current, clear consensus as to which treatment modality remains most effective [19]. While, reoperation rates following the two procedures has been studied at length, few studies have examined 30-day readmission rates following the two procedures, which has

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important implications for both short term patient safety as well as cost for each procedure [19].

The objective of this study was to therefore investigate the all-cause 30-day readmission rate following treatment with either tibiotalar fusion or total ankle replacement.

2. Methods

This study utilized the data from the 2013–2014 Nationwide Readmissions Database (NRD), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality, International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) procedure codes were used to extract all total ankle replacements (81.56) and tibiotalar fusions (81.11) from the database.

Only adult (age ≥ 18), elective procedures were included. Patients who died during admission or who were transferred from another hospital for admission were excluded. As the study focus was to examine 30-day readmission rates, admissions from December 1, 2013 onward to December 31, 2013 were excluded to allow for adequate follow up time. Patients who received a tibiotalar fusion as well as subtalar fusion (81.13) were excluded. Using ICD-9-CM diagnosis codes, patients with an index admission diagnosis related to orthopedic implant failure or infection, fracture, nonunion, or malunion were excluded as a means to eliminate revision procedures. For readmissions, though, these diagnoses were included. The NRD has 6 levels for insurance status; Medicare, Medicaid, private insurance, self-pay, no charge, and other. The self-pay, no charge, and other insurance categories were combined into a single “other insurance” categorical variable.

Cases were divided into cohorts of those treated with either total ankle arthroplasty (TAA) or tibiotalar fusion (TTF). The NRD has data elements regarding common comorbidities. Demographics, comorbid conditions, hospital characteristics, and readmission rates were statistically compared between the two cohorts.

2.1. Statistical analysis

All data was extracted and analyzed using R Version 3.3.2 (R Foundation for Statistical Computing, Vienna, Austria). Given the large sample size, a Shapiro–Wilkes normality test was conducted for continuous variables to determine the normality of the distribution. The NRD has a discharge weight variable (DISCWT) that can extrapolate the data within the NRD to a national level in order to make data more generalizable. This discharge weight variable was applied to all statistical tests. The length of stay variable was recoded into a categorical variable with a length of stay greater than or equal to three days representing one group, and less than 3 days representing the other. All normally distributed continuous variables were compared between cohorts using an unpaired t-test. All non-normally distributed variables were compared with a Wilcoxon Rank Sum test. Categorical variables between groups were compared with a chi-square test.

Multi-variable logistic regression was performed using all-cause 30-day readmission as the outcome variable.

All statistical tests were considered significant with a $p < 0.05$.

3. Results

3.1. Patient characteristics

A total of 5660 cases were analyzed, with 2667 tibiotalar fusions and 2993 total ankle replacements. There were a total of 160 30-day readmissions, yielding a 2.8% 30-day readmission rate.

Table 1 summarizes the demographics, comorbid conditions, and hospital characteristics for patients treated with TTF or TAA. There was a statistically significant difference in the median age between the TTF and TAA groups (59 vs. 65 years), as well as statistically significant differences in the number of patients who had rheumatoid arthritis, congestive heart failure, depression, diabetes, obesity, and renal failure. Additionally, there was a significant difference in the type of insurance patients had, where they were discharged to, and how long they spent in the hospital

Table 1
Demographics, comorbid conditions, and hospital characteristics for patients treated with tibiotalar fusion or total ankle replacement.

| Variable | Tibiotalar fusion (n = 2667) | Total ankle replacement (n = 2994) | P Value |
|--------------------------|------------------------------|------------------------------------|------------------|
| Age (median (IQR)) | 59 (49–68) | 65 (57–72) | <0.001 |
| Female | 1202 (45.1%) | 1387 (46.3%) | 0.577 |
| Deficiency anemia | 219 (8.2%) | 95 (3.2%) | <0.001 |
| Rheumatoid arthritis | 133 (5.0%) | 96 (3.2%) | 0.035 |
| Congestive heart failure | 89 (3.4%) | 19 (0.7%) | <0.001 |
| Chronic lung disease | 440 (16.5%) | 402 (13.4%) | 0.066 |
| Coagulopathy | 52 (2.0%) | 32 (1.1%) | 0.113 |
| Depression | 395 (14.8%) | 325 (10.9%) | 0.011 |
| Complicated diabetes | 203 (7.6%) | 23 (0.8%) | <0.001 |
| Hypertension | 1507 (56.5%) | 1656 (55.3%) | 0.608 |
| Obesity | 656 (24.6%) | 500 (16.7%) | <0.001 |
| Renal failure | 214 (8.0%) | 85 (2.9%) | <0.001 |
| Insurance | | | <0.001 |
| Medicaid | 248 (9.3%) | 64 (2.1%) | |
| Medicare | 1193 (44.8%) | 1667 (55.7%) | |
| Other insurance | 292 (10.9%) | 156 (5.2%) | |
| Private insurance | 933 (35.0%) | 1106 (36.9%) | |
| Teaching hospital | 1727 (64.8%) | 1964 (65.6%) | 0.699 |
| Discharge location | | | <0.001 |
| Facility | 567 (21.3%) | 370 (12.4%) | |
| With home health care | 496 (18.6%) | 387 (12.9%) | |
| Routine | 1604 (60.1%) | 2236 (74.7%) | |
| LOS ≥ 3 days | 1130 (42.4%) | 847 (28.3%) | <0.001 |
| Readmissions | 118 (4.4%) | 42 (1.4%) | <0.001 |

Bolded numbers indicate statistical significance.

IQR = interquartile range.

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