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Operative versus nonoperative treatment of acute Achilles tendon rupture: An analysis of 12,570 patients in a large healthcare database

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ABSTRACT

Background: The purpose of this study was to compare the latest patient demographics and rerupture rates of operative versus nonoperative treatment of acute Achilles tendon rupture in the United States.
Methods: Patients undergoing treatment of an acute Achilles tendon rupture from 2007 to 2011 were identified by cross-referencing ICD-9-CM and CPT codes through the PearlDiver Patient Record Database.
Results: In total, 12,570 patients were treated for an acute Achilles tendon rupture. The ratio of operative to nonoperative treatment increased from 1.41 to 1.65. Males were more likely to undergo surgery than females. There were no significant differences in short-term rerupture rate for operative (2.1%) versus nonoperative (2.4%) treatment.
Conclusions: The proportion of patients who received operative treatment for an acute Achilles tendon rupture increased slightly during the 5 year period, suggesting that surgeons in the United States have been slower to adopt nonoperative treatment than their European counterparts.

1. Introduction

Achilles tendon rupture is a common injury resulting in significant functional limitation in orthopedic patients. Traditionally, operative treatment has been believed to decrease rerupture rates, improve heel-rise strength, and allow for an earlier return to work compared to nonoperative treatment [1–4]. Although surgery-related complications, including infection, scar or skin adhesions, and sural nerve damage, are well known, the associated risks have been viewed as acceptable trade-off for patients and surgeons who pursue surgery [4–6]. More recent level I evidence studies and meta-analyses have suggested equivalent rerupture rates and strength between operative versus nonoperative treatment, particularly if accelerated rehabilitation and early weightbearing are utilized [1,3,6,7].

Several studies have reported a recent decrease in the incidence of surgically treated Achilles tendon ruptures in their respective countries and attribute this trend to the results from the latest randomized trials. From a Finnish registry, Matilla et al. [8] reported a decline in the incidence of surgically treated Achilles tendon ruptures from 2008 to 2011 after steadily rising from 1987 to 2008. From a Swedish registry, Huttunen et al. [9] reported a decline in the percentage of patients treated surgically from 43% in 2001 to 28% in 2012 in men and 34% in 2001 to 22% in 2012 for women. However, the latest trends in acute Achilles tendon rupture treatment in the United States are unknown.

The purpose of this study was to compare the latest trends, patient demographics, and post-treatment complication rates of operative versus nonoperative treatment of acute Achilles tendon rupture using a large national insurance database. Based on post-treatment complication rates, a number needed to harm (NNH) for operative treatment was calculated.

2. Materials and methods

Patients undergoing treatment of acute Achilles tendon rupture were identified through the PearlDiver Patient Record Database (PearlDiver Technologies, Warsaw, IN) using a combination of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) and Current Procedural Terminology (CPT) codes. This is a publicly available national database of insurance billing records, with the largest contribution from

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United Health Group (Decatur, IL). There are more than 2.9 billion individual patient records from over 20 million patients from 2007 to 2011. Access to the database was granted by PearlDiver Technologies for the purpose of academic orthopedic research. The PearlDiver database allows for cross-referencing and searching of health care data using Boolean search language. Using a predetermined algorithm (Fig. 1), patients were first identified with the ICD-9 code for acute Achilles tendon rupture (845.09). Because Achilles ruptures in the pediatric population are rare and represent a different clinical scenario with different treatment options [10], patients under the age of 20 were excluded. Then, identified patients were divided into two groups: (1) patients who received a primary repair (CPT 27650) without graft and/or tendon transfer within 30 days of diagnosis were assigned to the operative group, and (2) patients who did not undergo surgery and received an application of a short leg (CPT 29405) or long leg cast (CPT 29345) within 30 days of diagnosis were assigned to the nonoperative group. Those who underwent repair with graft and/or tendon transfer were assumed to have chronic Achilles tendon ruptures and were therefore excluded.

Demographic and post-treatment complication rates were then queried for both treatment groups. The patient's gender and age as well as the year and region in which the patient was treated were collected. Patients were identified as sustaining a rerupture if they underwent a second Achilles tendon procedure for primary repair with or without graft or secondary repair and/or tendon transfer, after 30 days and within 1 year of the index surgery (operative) or within 1 year of casting (nonoperative). Patients were recognized as incurring a postoperative infection if they received a debridement procedure within 90 days of the index treatment. Furthermore, patients diagnosed with a lower extremity deep vein thrombosis (DVT) within 90 days of the index treatment were identified. All ICD-9-CM and CPT codes used for the algorithm are listed in Fig. 1.

The Chi-square test was used to test the association between categorical variables. The Chi-square test for trend was used for interval variables. Significance was set at the $p < 0.05$ level. The number needed to harm (NNH) was calculated as the reciprocal of the cumulative risk increase.

3. Results

Over the study period, 12,570 patients (7625 operative and 4945 nonoperative) in the database were treated for an acute Achilles tendon rupture (Table 1). The majority of treated patients were men (74%). The South region was the most represented region (41%), followed by the Midwest (26%). Patients aged 30–39 years had the highest number of patients of any age group (32%), followed by those aged 40–49 years (30%) and aged 50–59 (20%).

The majority of patients received operative treatment (61%). The ratio of operative to nonoperative treatment of acute Achilles tendon rupture increased slightly from 1.41 in 2007 to 1.65 in 2011 ($p = 0.010$). When grouped by gender, the ratio increased from 1.72 in 2007 to 2.01 in 2011 for men and 0.78 in 2007 to 0.95 in 2011 for women (Fig. 2). Overall, male patients were more likely to undergo surgery (66%) than female patients (47%) ($p < 0.001$). There were no significant differences in treatment type among the geographic regions ($p = 0.178$). The number of operative patients outnumbered the nonoperative patients in all age groups. Patients aged 30–39 years were most likely to receive surgery (64%), followed by those aged 40–49 (62%), 20–29 years (57%), and 50–59 years (56%) ($p < 0.001$). Conversely, patients > 60 years of age underwent the highest rate (49%) of nonoperative treatment of any age group.

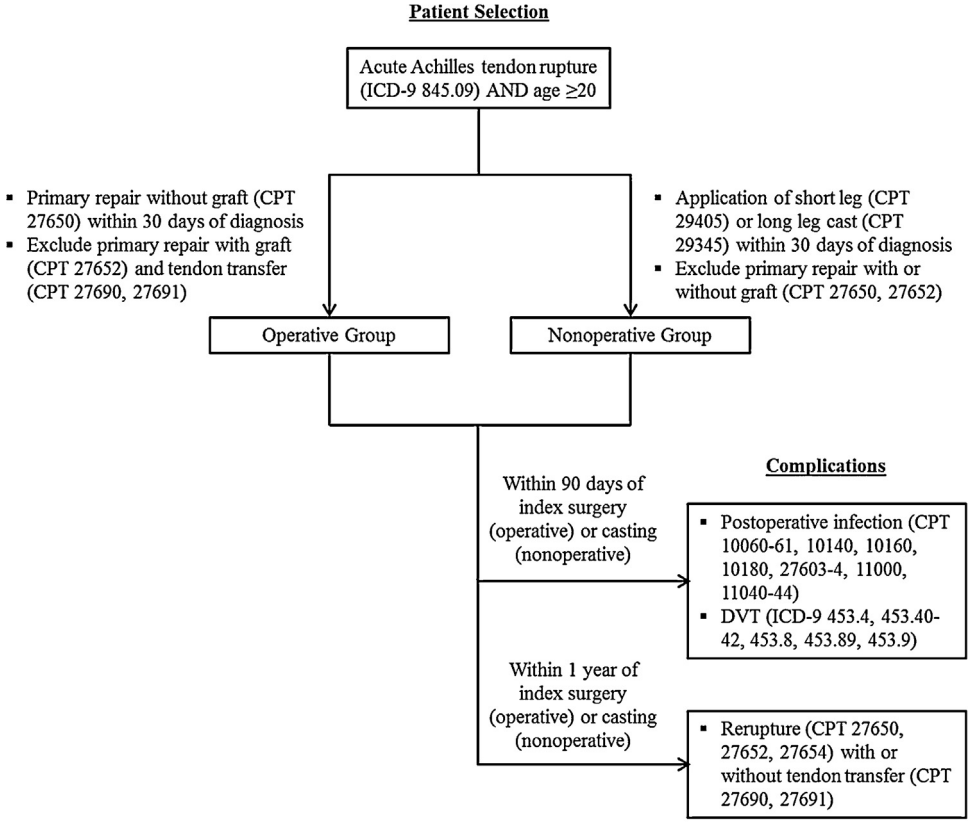

Fig. 1. Algorithm for patient selection and identifying post-treatment complications.