〈 Clinical Research 〉

Low Risk for Local and Systemic Complications After Primary Repair of 1626 Achilles Tendon Ruptures

Nicholas Rensing, MD, Brian R. Waterman, MD, Rachel M. Frank, MD, Kenneth A. Heida, MD, and Justin D. Orr, MD

Abstract: Introduction. *Historically, Achilles tendon repairs and other surgeries about the hindfoot have demonstrated a significantly higher rate of wound healing complications and surgical site morbidity. The purpose of this study was to evaluate the comprehensive complication profile and risk factors for adverse short-term, clinical outcomes after primary repair of Achilles tendon ruptures.* Methods. *Between the years 2005 and 2014, all cases of primary Achilles tendon repair (Current Procedural Terminology code 27650) entered into the National Surgical Quality Improvement Project (NSQIP) database were extracted for analysis. Primary outcomes of interest were rates of total complication, reoperation, and rerupture within 30 days of index surgery. Independent risk factors associated with these selected endpoints were assessed with chi-square and logistic regression analysis and odds ratios with 95% confidence intervals were used to express relative risk.* Results. *Of 1626 patients with an average age of 44 years (SD 13.3), the average ASA classification was 1.69 and hypertension (20.7%), morbid obesity (8.3%), and diabetes (4.9%) were among the most common medical comorbidities. A total of 28 (1.7%) patients sustained perioperative complications, including 1.3% with local complications (0.7% superficial wound infection, 0.4% wound disruption) and no cases of peripheral nerve injury or early repair failure. Systemic complications occurred in 0.4%, most commonly with deep venous thrombosis or nonfatal thromboembolism. Preoperative albumin was independently associated with an increased risk of local wound complications (odds ratio [OR] 28.67; 95% CI 1.42-579.40;* P = *.029). Chronic obstructive pulmonary disease (OR 22.33, 95% CI 2.49-199.81;* P = *.006) and bleeding disorder (OR 14.83, 95% CI 1.70-129.50;* P = *.015) were more likely to result in a systemic complication, and preoperative creatinine correlated with an increased risk of any complication (OR 6.11, 95% CI 1.15-32.34;* P = *.033). In total there were 5 (0.3%) readmissions with 2 (0.1%) unplanned reoperations attributed to local wound complications.* Conclusion. *Among a broad-based demographic of the United States, the rate of local wound complications was exceedingly low in the short-term perioperative period, although this risk may be significantly magnified with subtle decreases in albumin levels. Preoperative risk stratifications should carefully scrutinize for subtle abnormalities in nutritional parameters and renal function prior to undergoing Achilles surgery.*

> "There currently is not sufficient empirical evidence to favor one treatment modality over the other for management of acute Achilles tendon ruptures."

Levels of Evidence: *Therapeutic, Level II: Prospective, comparative trial*

Keywords: Achilles tendon; rupture; complication; outcome studies; local; systemic; surgery

DOI: 10.1177/1938640016676340. From the Department of Orthopaedic Surgery and Rehabilitation, William Beaumont Army Medical Center, El Paso, Texas (NR, BRW, KAH, JDO); and Rush University Medical Center, Chicago, Illinois (RMF). Address correspondence to: Justin D. Orr, MD, Orthopaedic Surgery Service, William Beaumont Army Medical Center, 5005 North Piedras Street, El Paso, TX 79920-5001; e-mail: justin_orr77@msn.com.

Optimal treatment of acute Achilles tendon ruptures is controversial, with some authors advocating early acute repair to reduce risk of rerupture and others proposing nonoperative treatment with early functional rehabilitation to minimize the risks of surgical complications.[1-7] One multicenter prospective, randomized controlled trial demonstrated similar functional outcomes and minimal risk of rerupture with nonoperative treatment and accelerated functional rehabilitation for acute Achilles tendon ruptures compared with traditional open operative repair followed by an identical rehabilitation protocol.[7] As well, a recent comparative study demonstrated no difference in rerupture, complications, and deep venous thrombosis (DVT) rates between operative and nonoperative treatment of Achilles tendon ruptures in a military cohort but did note quicker return to duty with operative repair.[5] Yet another series demonstrated a trend toward improved functional level with surgical repair compared with nonoperative management.[4] Comprehensive literature review analyses have further demonstrated that operative repair may result in lower rerupture rates but at the cost of higher complication profiles.[1-3,6] While some rare complications such as DVT may occur with similar frequencies in operative and nonoperative treatment groups,[1,5] other complications such as delayed wound healing and infections may occur more commonly with operative treatment.[2-4,7] There currently is not sufficient empirical evidence to favor one treatment modality over the other for management of acute Achilles tendon ruptures.[8,9]

The decision whether to treat acute Achilles tendon ruptures operatively or nonoperatively is ultimately up to the discretion of the operating surgeon. Clinicians must balance the potential benefits of operative repair (eg, lower rerupture rate and earlier return to work or athletic activities) with possible negative outcomes such as wound complications and thromboembolic events. In order to make an informed decision, surgeons must account for patient risk factors and comorbidities in each individual case. Much of the current outcomes-based research regarding Achilles tendon rupture management has focused on single-institution series with relatively small patient sample sizes. Although these studies as well as comprehensive meta-analyses are helpful, a more comprehensive assessment of patient-based risk factors for complications following Achilles tendon repair might serve valuable for preoperative counseling and risk stratification. Such data may serve to identify those patients at higher risk for early complications following surgical management. The purpose of this study was to evaluate the comprehensive complication profile and risk factors for adverse early, clinical outcomes following primary repair of Achilles tendon ruptures utilizing a nationwide surgical registry.

Methods

This study received institutional review board exemption and approval. Through the National Surgical Quality Improvement Project (NSQIP) of the American College of Surgeons the data set was obtained from 2005 to 2014. Methodology for similar NSQIP studies has been previously described in multiple publications,[10-12] and the program provides a user guide[13] that can readily be referenced. The NSQIP database provides perioperative information that is recorded by risk-assessment nurses specifically trained at participating institutions. This allows access to variables to include demographics, comorbidities, and others collected prospectively and searchable through Current Procedural Terminology (CPT) codes. Additionally, all complications and mortalities within the first 30 days postoperatively are monitored and recorded. The NSQIP model has been validated for predicting morbidity and mortality in the orthopaedic surgery settings.[10-12]

For this study, the CPT code 27650 was used to isolate primary Achilles tendon repairs performed during the specified time period in participating hospitals. Numerous surgical variables were recorded and analyzed (Table 1). Primary outcomes to include major and minor systemic and local complications and mortality were also collected (Tables 2 and 3). Local complications were defined as involving only the surgical site, and systemic complications involved other organ systems.

Statistics

Statistical analysis was performed using a chi-square analysis to identify patient and surgery-based risks factors for outcomes of interest. Multivariate analysis was then performed to identify independent risk factors using information obtained from the previous chi-square analysis. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated following both chi-square and multivariate logistic regression analysis. A P value $<.05$ and CIs excluding 1.0 were used to identify statistically significant risk factors. Variables were analyzed as discrete or continuous as indicated (Table 3).

Results

Between 2005 and 2014, total of 1626 patients undergoing primary Achilles tendon repair were identified in the NSQIP database. The mean age of the cohort was 44.3 years (range, 18-88 years; SD, 13.3). The cohort was predominantly male (75.8%), nonsmoking (87.8%), and functionally independent (99.1%). Notable comorbidities identified within the cohort included hypertension (20.7%), morbid obesity (8.3%), diabetes (4.9%), and cardiac disease (1.0%) with an average ASA classification of 1.69. The average length of stay was 0.3 days (range, 0-59 days; SD, 1.8) (Table 1).

A total of 28 (1.7%) patients had recorded complications during the 30-day postoperative period (Tables 2 and 3). The majority of complications were defined as local complications 21 (1.3%) with the most common overall complication being superficial wound infection (0.7%) or wound disruption

Table 1.

Patient Demographic and Preoperative Characteristics.

Characteristic	Value	Patients for Whom Characteristic Was Determined (n)
Age, years, mean ± SD	44.3 ± 13.3	1626
Age group, years, n (%)		
<40	649 (39.9)	
40-49	430 (26.4)	
50-59	307 (18.9)	
≥60	240 (14.8)	
Sex, n (%)		1625
Male	1232 (75.8)	
Female	393 (24.2)	
Body mass index, kg/m^2, mean ± SD	30.2 ± 6.4	1525
Body mass index, kg/m^2, category, n (%)		
≤29.9	906 (59.4)	
30.0-39.9	493 (32.3)	
≥40.0	126 (8.3)	
Mean ASA	1.62	1625
ASA classification, n (%)		
1	687 (42.3)	
2	752 (46.3)	
3	182 (11.2)	
4	4 (0.2)	
Medical comorbidities, n (%)		
Diabetes	79 (4.9)	
Diabetes requiring insulin	23 (1.4)	
Smoking (current smoker within 1 year)	198 (12.2)	
Regular alcohol use[a]	10 (0.6)	
Chronic obstructive pulmonary disease	13 (0.8)	
Cardiac issues (congestive heart failure/ myocardial infarction)[b]	16 (1.0)	
Hypertension	337 (20.7)	
Bleeding disorder	19 (1.2)	

(continued)

Table 1. (continued)

Characteristic	Value	Patients for Whom Characteristic Was Determined (n)
Steroid use	18 (1.1)	
Open wound or wound infection[c]	16 (1.0)	
Functional status		1616
Independent	1601 (99.1)	
Partially dependent	15 (0.9)	
Preoperative laboratory values, mean ± SD		
Serum albumin, g/dL	4.2 ± 0.4	207
White blood count, $\times 10^3/\mu L$	7.3 ± 2.1	636
Hematocrit, %	42.5 ± 3.7	663
Platelets, $\times 10^3/\mu L$	236.3 ± 59.4	634
Creatinine, g/dL	1.0 ± 0.2	571
International normalized ratio	1.0 ± 0.1	202
Wound classification		1626
Clean	1594 (98.0)	
Other	32 (2.0)	
Type of anesthesia		1626
General	1304 (80.2)	
Spinal/epidural	223 (13.7)	
Other	99 (6.1)	
Operative time, minutes, mean ± SD	57.6 ± 28.3	1625
Operative time, minutes		
<86	1424 (87.6)	
≥86	201 (12.4)	
Length of hospital stay, days, mean ± SD	0.3 ± 1.8	1626

Abbreviation: American Society of Anesthesiologists.
[a]Alcohol more than 2 drinks per day in the 2 weeks before admission.
[b]Congestive heart failure (CHF) within 30 days before surgery/chronic CHF with new signs or symptoms in 30 days before surgery; history of myocardial infarction within past 6 months before surgery; history of percutaneous cardiac stent placement.
[c]Noted preoperatively or intraoperatively.

(0.4%). No patients within the cohort were noted to have peripheral nerve injury or early repair failure. Systemic complications were rare (0.4%), with thromboembolic events comprising nearly all of the systemic complications recorded. There were no patient deaths in the 30-day postoperative period recorded within the cohort. Readmissions likewise were rare with only 5 (0.3%) and only 2 (0.1%) underwent unplanned reoperation as the result of local wound complications.

Statistical analysis identified several variables associated with complications.

Table 2.

Total Number (n) of Major/Minor Systemic Complications.

Characteristic	n (%)
Major systemic complications	3 (0.2)
Pulmonary embolism	3 (0.2)
Other systemic complication	0
Postoperative sepsis	0
Acute renal failure	0
Cardiac arrest requiring CPR	0
Myocardial infarction	0
Minor systemic complications	4 (0.3)
Deep venous thrombosis	3 (0.2)
Pneumonia	1 (0.1)
Renal insufficiency	0
Urinary tract infection	0
Any systemic complication	7 (0.4)

Abbreviation: CPR, cardiopulmonary resuscitation.

Table 3.

Total Number (n) of Major/Minor Local Complications.

Characteristic	Overall n (%)
Major local complications	5 (0.3)
Deep wound infection	5 (0.3)
Reoperation	3 (1.68)
Peripheral nerve injury	0
Rerupture	0
Minor local complications	17 (1.1)
Superficial wound infection	12 (0.7)
Wound dehiscence	6 (0.4)
Any local complication	21 (1.3)

(Table 4) Patient preoperative albumin (OR, 28.67; 95% CI, 1.42-579.40; P = .029) and advancing age (OR, 1.03; 95% CI, 1.01-1.06; P = .047), when evaluated as continuous variables, predicted an increased risk of local wound complications. Preoperative diagnoses of chronic obstructive pulmonary disease (OR, 22.33; 95% CI, 2.49-199.81; P = .006) or bleeding disorder (OR, 14.83; 95% CI, 1.70-129.50; P = .015) were more likely to result in systemic complications. Last, preoperative creatinine correlated with an increased risk of any complication (OR, 6.11; 95% CI, 1.15-32.34; P = .033). There was no other patient or surgical variable that was associated with a significantly increased or decreased risk of complication. Again, there was no perioperative mortalities recorded during the study period.

Discussion

The decision to treat acute Achilles tendon ruptures operatively or with nonoperative functional rehabilitation remains a source of controversy. While some authors have demonstrated that operative repair may result in decreased rerupture rates at the risk of higher wound complications,[1-4,14] others[5-7] argue minimal to no significant functional or clinical benefit for operative treatment exists. To date, there is not compelling evidence to dismiss operative treatment altogether for the management of acute Achilles ruptures.[8,9] In fact, some patients, particularly high demand cohorts, may benefit from earlier return to work or athletic activities with surgical management.[4-6,15,16] This study sought to better characterize known complications following primary Achilles tendon repair using a large national surgical database in order to identify patients who are at higher risk for early complications and perhaps delineate candidates more ideally suited for nonoperative management.

To our knowledge, this is the largest series to report early postoperative complications and associated risk factors related to acute Achilles tendon repair. However, the authors acknowledge certain limitations common to database studies, particularly the NSQIP registry. First, the overall validity of the data is dependent on accurate recording at the participating institutions.[13] As with any database, a certain margin of error is

Table 4.

Results of Univariate/Chi-Square Analyses for the Influence of Risk Factors on, Any Complication, Systemic Complications, and Local Complications.

	Overall Complications		Systemic Complications		Local Complications	
Risk factor	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
Age (years)						
Age (continuous)	1.02 (0.99-1.05)	.1923	0.97 (0.92-1.03)	.3901	1.03 (1.01-1.06)	.0468
40-49 vs <40	0.90 (0.33-2.51)	.8466	0.84 (0.18-3.95)	.8221	1.01 (0.28-3.59)	.9923
50-59 vs <40	1.27 (0.46-3.54)	.6424	0.23 (0.01-4.37)	.3301	2.14 (0.68-6.68)	.1918
≥60 vs <40	1.64 (0.59-4.56)	.3442	0.90 (0.14-5.75)	.91	2.28 (0.69-7.54)	.1768
Sex						
Male vs female	1.17 (0.47-2.91)	.7315	4.82 (0.27-84.81)	.2828	0.80 (0.31-2.061)	.6371
Body mass index, kg/m^2, mean						
Body mass index (continuous)	1.03 (0.98-1.08)	.2586	1.00 (0.89-1.12)	.9781	1.04 (0.98-1.10)	.1827
30.0-39.9 vs <30	1.01 (0.43-2.34)	.9871	1.02 (0.22-4.81)	.9799	1.04 (0.39-2.74)	.9395
≥40.0 vs <30	2.11 (0.73-6.16)	.1704	2.40 (0.37-15.45)	.3577	2.21 (0.66-7.44)	.2014
Functional status						
Dependent vs independent	4.33 (0.55-34.13)	.1645	6.86 (0.34-137.14)	.2076	5.95 (0.74-47.54)	.0927
Transfer status						
All others vs admitted from home	6.22 (0.23-166.43)	.2758	23.94 (0.85-678.35)	.0627	8.27 (0.31-223.17)	.209
Wound classification						
All others vs clean	0.85 (0.05-14.77)	.9084	3.26 (0.18-60.72)	.4289	1.13 (0.06-19.82)	.9356

(continued)

Table 4. (continued)

Risk factor	Overall Complications		Systemic Complications		Local Complications	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
ASA classification						
≥3 (severe or life-threatening disturbance) vs ≤2 (no or mild disturbance)	1.70 (0.64-4.53)	.2879	1.29 (0.16-10.78)	.8133	1.84 (0.61-5.52)	.2779
Preoperative laboratory values						
White blood cell count ($\times 10^3/\mu L$) (continuous)	1.18 (0.95-1.47)	.1248	1.64 (1.19-2.25)	.0023	0.97 (0.71-1.32)	.8428
Hematocrit (%) (continuous)	0.96 (0.83-1.11)	.5751	0.88 (0.66-1.17)	.3634	0.99 (0.84-1.17)	.894
Platelets ($\times 10^3/\mu L$) (continuous)	0.99 (0.98-1.01)	.1336	1.01 (0.99-1.03)	.182	0.985 (0.974-0.997)	.0119
International normalized ratio (continuous)	3.95 (0.05-347.85)	.548	10.27 (0.16-677.97)	.2759	9.92 (0.15-680.88)	.2875
Creatinine (continuous)	6.11 (1.15-32.34)	.0333	8.60 (0.76-96.93)	.0817	4.56 (0.61-34.14)	.1393
Serum albumin (g/dL) (continuous)	2.38 (0.21-27.29)	.4875	0.29 (0.01-27.70)	.5959	28.67 (1.42-579.40)	.0287
Creatinine (≥2.0 vs <2.0 g/dL)	9.71 (0.23-419.07)	.2368	—	—	13.20 (0.30-579.01)	.181
Prealbumin (≤3.5 vs >3.5 g/dL)	1.70 (0.08-37.32)	.7353	5.19 (0.18-148.44)	.336	2.20 (0.10-50.18)	.6211
Medical comorbidities						
Smoking (current smoker within 1 year)	1.21 (0.41-3.51)	.731	0.48 (0.03-8.45)	.614	1.71 (0.57-5.14)	.3382
Regular alcohol use	2.66 (0.13-53.22)	.5231	10.22 (0.48-218.10)	.1365	3.54 (0.18-71.38)	.4102
All diabetes	1.52 (0.35-6.52)	.5734	1.29 (0.07-23.21)	.862	2.09 (0.48-9.13)	.3271
Insulin-dependent diabetes	1.18 (0.07-21.07)	.9126	4.53 (0.24-86.55)	.316	1.57 (0.09-28.26)	.7613
Non–insulin-dependent diabetes	2.20 (0.51-9.51)	.2912	1.85 (0.10-33.50)	.679	3.02 (0.69-13.31)	.1434
Dyspnea	1.79 (0.10-33.64)	.6969	6.90 (0.35-138.02)	.2063	2.39 (0.13-45.12)	.5619

(continued)

Table 4. (continued)

Risk factor	Overall Complications		Systemic Complications		Local Complications	
	OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Chronic obstructive pulmonary disease	4.90 (0.62-39.00)	.1335	22.33 (2.49-199.81)	.0055	2.74 (0.14-52.94)	.5038
Hypertension	0.83 (0.31-2.20)	.7061	0.25 (0.01-4.47)	.3483	1.20 (0.44-3.30)	.7259
Cardiac disease	1.68 (0.09-31.32)	.7274	6.48 (0.33-128.53)	.2204	2.24 (0.12-42.00)	.5896
Bleeding disorder	3.25 (0.42-25.24)	.2594	14.83 (1.70-129.50)	.0148	1.89 (0.10-34.79)	.6683
Preoperative open wound	1.68 (0.09-31.32)	.7274	6.48 (0.33-128.53)	.2204	2.24 (0.12-42.00)	.5896
Steroid use for chronic condition	3.45 (0.44-26.82)	.2374	5.77 (0.30-112.92)	.2479	4.67 (0.59-36.81)	.1433
Operative time, minutes						
Operative time (continuous)	1.00 (0.99-1.02)	.7495	0.99 (0.96-1.02)	.5196	1.01 (0.99-1.02)	.4599
>1 SD above mean vs ≤1 SD above mean	0.60 (0.23-1.54)	.2865	2.13 (0.12-37.73)	.6055	0.42 (0.16-1.11)	.081
Type of anesthesia						
General vs spinal/epidural/regional	0.59 (0.25-1.40)	.2312	0.52 (0.10-2.68)	.4328	0.62 (0.22-1.72)	.3572
Time from operation to discharge (continuous)	0.99 (0.53-1.83)	.9645	1.29 (0.67-2.46)	.4462	1.15 (0.67-1.97)	.6211
Length of stay (continuous)	0.89 (0.49-1.61)	.7041	—	—	0.99 (0.72-1.36)	.9328
≥4 vs <4 days	1.50 (0.08-27.51)	.7852	5.77 (0.30-112.92)	.2479	1.99 (0.11-36.91)	.6433
≥5 vs <5 days	—	—	12.64 (0.56-283.15)	.1098	4.37 (0.21-92.74)	.3439

Abbreviation: ASA, American Society of Anesthesiologists.

expected. While the NSQIP registry captures many ambulatory surgeries, outpatient surgical centers generally do not routinely participate in the database. This may alter the patient demographic and overall external validity of the data. Furthermore, the data are limited to 30 days postoperatively; hence, later complications such as tendon rerupture may be missed. The authors contend that many of the most worrisome postoperative complications following Achilles tendon repair, including some reruptures, occur within 30 days, thus the utility of the NSQIP registry is ideal for the purposes of the current study. Next, it is impossible to know what types of Achilles tendon repairs were performed (eg, open, limited open, mini-open, or percutaneous), as all acute and subacute Achilles tendon repairs are presumably coded as CPT code 27650. This is a limitation that could affect interpretation of these results, as we recognize that less invasive surgical techniques have demonstrated lower complication profiles.[15-19] Finally, this data set only evaluates patients managed surgically. One might argue that patients treated nonoperatively with unfavorable comorbidity burdens would likely have increased risk of complications had they been managed surgically. While this may be true, intuitively these patients are probably more appropriately served with nonoperative management in order to avoid complications associated with a surgical wound and general anesthesia.

The current study of 1626 patients demonstrates a local complication rate of 1.3%, with all of these representing wound infections or dehiscence. This compares favorably to previous studies which cite local wound complication rates of 2% to 15% with superficial, as opposed to deep wound infections, being the most common.[1,3,4,14,20] Inherent limitations of the NSQIP database data may account in some part for the lower local wound complication rates in the current study. At the same time, during the time period of our surgical cohort, minimally invasive operative techniques were becoming increasingly popular and may result in similar functional and clinical outcomes as standard open repair without the same rates of local wound complications.[15-19] The current study also reports no reruptures during the 30-day postoperative period. Previous authors[1,4,5,7,14] have demonstrated short-term rerupture rates of 0% to 3.7% following open Achilles tendon repair with others[15-17,19] reporting no short-term reruptures using only minimally invasive techniques. As noted, the current authors are unable to make any conclusions regarding rerupture rates using NSQIP data, as most reruptures certainly occur outside the immediate 30-day postoperative period and are captured with at least 1-year follow-up.

Overall, the current study found that systemic complications were rare (0.4%), and all but one was the result of either DVT or pulmonary embolism (PE). DVT and subsequent PE, while commonly reported following more proximal orthopaedic procedures, are exceedingly rare following foot and ankle surgery. Previous large database series have reported the overall incidence of thromboembolic events following all foot and ankle surgery to be less than 1%.[21,22] However, with regard to incidence specifically after Achilles tendon repair, Lapidus et al[23] noted a 7.2% incidence of symptomatic thromboembolic events and no PEs in a series analyzing more than 45 000 consecutive orthopaedic surgery patients from a national healthcare registry. Similarly, the pooled rate of DVT following Achilles tendon repair in a recent meta-analysis was 7.1%.[1] It is worthwhile to note there were no PE-related deaths in the current cohort of patients. Only preoperative chronic obstructive pulmonary disease (COPD) and bleeding disorders specifically increased the risk of systemic complications, largely comprised of thromboembolic events, in our study. To our knowledge, the role of COPD in predicting thromboembolic events has not been previously studied in foot and ankle surgery. Parvizi et al[24] noted that COPD and hypercoagulability—but not bleeding disorders—were 2 of 5 risk factors that increased the risk for DVT by ore than 300% in nearly 2 million joint arthroplasty patients. In a similar study, preoperative COPD and anemia increased the risk of symptomatic PE among nearly 24 000 joint arthroplasty patients.[25] Anemia and/or the presence of bleeding disorders may correlate with need for blood transfusion and subsequent risk of DVT in joint arthroplasty patients, but this is not relevant to Achilles tendon repair, a surgery with minimal risk of significant blood loss. Given these findings, consideration for nonoperative management of Achilles tendon ruptures may be warranted in patients with these comorbidities.

Statistical analysis revealed 2 other patient-related factors correlating with complications following Achilles tendon repair: preoperative albumin and creatinine levels. Hypoalbuminemia, a marker of poor overall nutritional status and subsequent impaired wound healing, has been shown in previous NSQIP studies to be a predictor of postoperative local orthopaedic complications.[10,26-29] In the current study, preoperative albumin level was an independent risk factor for local wound complications. Because albumin level was evaluated as a continuous variable, we are unable to establish a preoperative threshold predictive of complications; however, this is the first study to our knowledge demonstrating this relationship in the setting of primary Achilles tendon repair. These results may influence surgeons toward nonoperative management of acute Achilles tendon ruptures in patients with preoperative hypoalbuminemia as a proxy for nutritional deficiencies. Interestingly, other comorbidities often associated with poor wound healing potential to include diabetes mellitus, obesity, and smoking history were not significantly associated with local complications in this study. Preoperative creatinine was an independent risk factor for any complication. Creatinine level was evaluated as a continuous variable without any significance, but was significant risk factor when dichotomized into less than or greater than 2.0 g/dL. This implies that even mild renal disease

can predispose patients to local and systemic complications following Achilles tendon repair. To our knowledge, no previous study has demonstrated a correlation between preoperative renal impairment and risk of complications following Achilles tendon repair; however, several previous authors have drawn such conclusions with regard to other orthopaedic procedures.[10,30,31] As with hypoalbuminemia, surgeons must be cognizant that patients with evidence of impaired renal function based on preoperative laboratory evaluation might be best served with nonoperative management of acute Achilles tendon ruptures in order to avoid complications. Finally, these results argue in favor of obtaining routine metabolic labs to assess albumin and creatinine levels for all patients being considered for surgical management of acute Achilles tendon ruptures.

Conclusion

Among a broad demographic of patients undergoing operative treatment for acute Achilles tendon ruptures, the rate of local wound complications was exceedingly low in the 30-day postoperative period. This risk may be magnified with subtle decreases in albumin levels or renal function. Preoperative risk stratifications should carefully scrutinize for subtle abnormalities in nutritional parameters and renal function prior to undergoing Achilles surgery. Patients with known COPD or bleeding disorders should strongly be considered for nonoperative management, as these conditions may increase the risk of systemic complications such as thromboembolic events.

Authors' Note

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or reflecting the views of the Department of Defense or the US government. The authors are employees of the US government.

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