

# Outcomes and Complications of Tibiotalar Arthrodesis Stratified by Body Mass Index

Nicolas Phillip Kuttner<sup>1</sup>, Aaron Owen, Ankur Khanna<sup>2</sup>, Harold B Kitaoka<sup>3</sup>, Daniel B Ryssman<sup>3</sup>, Norman S Turner<sup>4</sup>

<sup>1</sup>Orthopedic Surgery, Ohio State University, <sup>2</sup>LSUHSC School of Medicine, <sup>3</sup>Mayo Clinic, <sup>4</sup>Mayo Grad School of Medicine

**INTRODUCTION:** Tibiotalar arthrodesis (TTA) is a common surgery for end-stage ankle arthritis. Elevated body mass index (BMI) has been studied as a contributing factor to complications including nonunion, infection, reoperation, and readmission in TTA. However, many of these studies have either used national registries or involved small, underpowered cohorts. The present study aimed to determine the effect of BMI on the rate of nonunion and complications following TTA using a large cohort from a single academic institution.

**METHODS:** We retrospectively identified 527 primary TTAs from 2005-2017. Patients were stratified according to BMI. The reference group included BMI 18.5 to <30. Patients in the obese category were stratified according to the World Health Organization classification. Ankle radiographs were evaluated for radiographic date of fusion and nonunions. Outcomes including revisions, reoperations, symptomatic implant removal, subsequent adjacent joint arthrodesis, infections, and readmissions were studied. The data was analyzed using Pearson Chi-square and odds ratios for categorical variables. Anova and Kaplan-Meier estimation assessed continuous variables, and time to event outcomes respectively. The mean follow up for the cohort was 34.3 months.

**RESULTS:** Patients with Obesity Class III had elevated risk of complications compared to normal weight patients including nonunion (OR 3.96, p=0.002), revision (OR 3.69, p=0.03), superficial infection (OR 9.36, p=0.002), and readmissions (OR 10.90, p=0.01). There was no difference in the rate of reoperation (p=0.448), symptomatic implant removal (p=0.805), adjacent joint arthrodesis (p=0.353), or deep infection (p=0.507) when stratified by BMI.

**DISCUSSION AND CONCLUSION:** This study found differences in the rates of tibiotalar nonunion, revision, superficial infections, and readmissions when stratified by BMI with the greatest risk of complications associated with Obesity Class III patients. This study provides useful information to guide risk stratification and counseling of patients prior to TTA.

**Table 1: Demographics, Stratified by BMI**

Age	BMI Range (kg/m <sup>2</sup> )		Mean		SD	P value	
	18.5-29.99	30-34.99	35-39.99	≥40			
	18.5-29.99	30-34.99	35-39.99	≥40	62.4	13.3	0.0071*
					60.3	13.1	
					57.4	12.5	
					57.8	10.8	
<b>BMI</b>	18.5-24.99	25-29.99	30-34.99	≥40	26.7	2.4	—
					32.3	1.4	
					37.1	1.4	
					44.7	5.7	
<b>Sex</b>	18.5-29.99	30-34.99	35-39.99	≥40	% Female	% Male	0.0422*
					34	66	
					37	63	
					45	55	
					52	48	

SD = Standard Deviation, \* = statistical significance, 1 = Anova; 2 = Chi Square

**Table 2: Outcome measures, Stratified by BMI**

Outcome	BMI Range (kg/m <sup>2</sup> )		Rate (Percent)		Odds Ratio	P value (95% CI)	Chi Square P Value
	18.5-29.99	30-34.99	35-39.99	≥40			
<b>Nonunion</b>	18.5-29.99	30-34.99	35-39.99	≥40	10/208 (4.8%)	1.0	—
					6/172 (3.5%)	0.72	0.52 (0.26-2.01)
					2/87 (2.3%)	0.47	0.32 (0.10-2.17)
					10/60 (16.7%)	3.96	0.002 (1.56-10.02)*
<b>Revision</b>	18.5-29.99	30-34.99	35-39.99	≥40	5/208 (2.4%)	1.0	—
					3/172 (1.7%)	0.72	0.66 (0.17-3.06)
					0/87 (0%)	0	0.15 (NA)
					5/60 (8.3%)	3.69	0.03 (1.03-13.21)*
<b>Reoperation</b>	18.5-29.99	30-34.99	35-39.99	≥40	20/208 (9.6%)	1.0	—
					17/172 (9.9%)	1.03	0.93 (0.52-2.04)
					6/87 (6.9%)	0.70	0.43 (0.27-1.80)
					9/60 (15.0%)	1.66	0.24 (0.71-3.86)
<b>Implant Removal</b>	18.5-29.99	30-34.99	35-39.99	≥40	14/208 (6.7%)	1.0	—
					10/172 (5.8%)	0.86	0.72 (0.37-1.98)
					4/87 (4.6%)	0.67	0.49 (0.21-2.09)
					5/60 (8.3%)	1.26	0.67 (0.44-3.65)
<b>Adjacent Joint Arthrodesis</b>	18.5-29.99	30-34.99	35-39.99	≥40	13/208 (6.2%)	1.0	—
					13/172 (7.6%)	1.23	0.62 (0.55-2.72)
					2/87 (2.3%)	0.35	0.16 (0.08-1.60)
					5/60 (8.3%)	1.36	0.57 (0.47-3.99)

BMI = Body Mass Index, \* = statistical significance, NA = Not Available

**Table 4: 30/90 Readmissions, Superficial/Deep Infections, Stratified by BMI**

Infection Type	BMI Range (kg/m <sup>2</sup> )		Rate (Percent)		Odds Ratio	P value (95% CI)	Chi Square P Value
	18.5-29.99	30-34.99	35-39.99	≥40			
<b>Superficial Infection</b>	18.5-29.99	30-34.99	35-39.99	≥40	2/208 (1.0%)	1.0	—
					10/172 (5.8%)	6.36	0.007 (1.37-29.42)*
					2/87 (2.3%)	2.42	0.37 (0.34-17.49)
					5/60 (8.3%)	9.36	0.002 (1.77-49.57)*
<b>Deep Infection</b>	18.5-29.99	30-34.99	35-39.99	≥40	2/208 (1.0%)	1.0	—
					5/172 (2.9%)	3.08	0.16 (0.59-16.10)
					2/87 (2.3%)	2.42	0.90 (0.34-17.49)
					2/60 (3.3%)	3.55	0.66 (0.49-25.76)
<b>30 Day Readmission</b>	18.5-29.99	30-34.99	35-39.99	≥40	1/208 (0.5%)	1.0	—
					1/172 (1.3%)	3.68	0.23 (0.38-35.65)
					4/87 (4.6%)	9.98	0.01 (1.10-90.58)*
					3/60 (5.0%)	10.90	0.01 (1.11-106.74)*
<b>90 Day Readmission</b>	18.5-29.99	30-34.99	35-39.99	≥40	1/208 (0.5%)	1.0	—
					4/172 (2.3%)	4.93	0.12 (0.55-44.51)
					5/87 (5.9%)	12.62	0.004 (1.45-109.69)*
					3/60 (5.0%)	10.90	0.01 (1.11-106.74)*

BMI = Body Mass Index, \* = statistical significance