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Original Research

Body Mass Index as a Predictor for Postoperative Complications Following Carpometacarpal Arthroplasty

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Purpose: Carpometacarpal (CMC) arthroplasty is an effective surgical treatment to relieve pain and improve function for osteoarthritis of the CMC joint. The association between body mass index (BMI) and postoperative complications has been studied for other orthopedic procedures, including total knee arthroplasty, total hip arthroplasty, and total shoulder arthroplasty. However, BMI has not been studied as a risk factor for postoperative complications following CMC arthroplasty. The purpose of this study was to determine the postoperative complications associated with different categories of BMI following CMC arthroplasty. We hypothesized that increasing BMI is associated with more severe complications.
Methods: The American College of Surgeons National Surgical Quality Improvement Program database was queried for all patients who underwent CMC arthroplasty between 2015 and 2020. Patient demographics, comorbidities, surgical characteristics, and 30-day postoperative complication data were collected. Patients were stratified into cohorts based on BMI as follows: underweight (BMI < 18.5 kg/m^2), normal/reference (18.5 kg/m^2 ≤ BMI < 30.0 kg/m^2), obese (30.0 kg/m^2 ≤ BMI < 35.0 kg/m^2), severely obese (35.0 kg/m^2 ≤ BMI < 40.0 kg/m^2), and morbidly obese (BMI ≥ 40.0 kg/m^2). Multivariate logistic regression was used to identify postoperative complications associated with each cohort.
Results: In total, 6,432 patients were included in this study: 3,622 (56.3%) patients were included in the normal/reference cohort, 77 (1.2%) patients were included in the underweight cohort, 1,479 (23.0%) patients were included in the obese cohort, 718 (11.2%) patients were included in the severely obese cohort, and 536 (8.3%) patients were included in the morbidly obese cohort. The obese cohort was independently associated with a higher rate of superficial incisional surgical-site infection (odds ratio [OR], 2.11; 95% confidence interval [CI], 1.00–4.44; $P = .050$). The morbidly obese cohort was independently associated with readmission (OR, 3.35; 95% CI, 1.15–9.74; $P = .026$) and reoperation (OR, 3.40; 95% CI, 1.04–1.11; $P = .043$).
Conclusions: Morbid obesity is a clinically significant predictor for readmission and reoperation within 30 days following CMC arthroplasty. Obesity is a clinically significant predictor for superficial incisional surgical-site infection within 30 days following CMC arthroplasty.
Clinical relevance: A better understanding of BMI as a risk factor for postoperative complications may allow surgeons to improve preoperative risk stratification and patient counseling.
Type of study/level of evidence: Prognostic III.

Osteoarthritis (OA) of the carpometacarpal (CMC) joint is the second most common site in the hand.[1] Thumb CMC joint OA prevalence increases with age, and it can cause pain, deformity, and loss of function.[2] Given its profound impacts on hand function and activities of daily living, it is the most common site on the hand for which surgery is sought.[2,3] Surgical intervention is based on the extent of functional limitations and pain impacting the patient's

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quality of life and lack of improvement with nonsurgical measures (eg, activity modification, splintage, analgesia, education, and steroid injections). Although various surgical techniques exist, ligament reconstruction and tendon interposition is typically regarded the standard.[4–6]

Although increased body mass index (BMI) has been associated with OA in weight-bearing joints (ie, the knee,[7] hip,[8] spine,[9,10] and foot[11]), recent data suggest that high BMI also increases the risk of OA in non–weight-bearing joints.[12] Partially through the activation of inflammatory pathways by proinflammatory adipokines,[13] high BMI increases the risk of OA in the hand generally and, more specifically, at the thumb CMC joint.[12] As a result of this inflammatory process, overweight and obese patients can have a more severe progression of OA at any joint and can benefit significantly from joint arthroplasty.

Given the pathological relationship between OA and high BMI, risk stratification of joint arthroplasty in overweight and obese individuals should be studied. High BMI has been long associated with an elevated risk of postoperative complications following weight-bearing joint arthroplasty, which include readmission, increased length of stay, infection, dislocation, poor implant survival, and low absolute functional scores.[14,15] However, few studies have explored the relationship between BMI and postoperative complications following thumb CMC arthroplasty.

The purpose of this investigation was to determine whether higher BMI was associated with increased postoperative complications. We hypothesized that patients with higher BMI would experience higher rates of complication in the postoperative period, specifically infection, readmission, and increased length of stay.

Methods

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database was queried for all patients who underwent CMC arthroplasty between 2015 and 2020. The NSQIP database is fully deidentified, therefore rendering this study exempt from approval by our University's Institutional Review Board. Data in the NSQIP database are obtained from more than 600 hospitals in the United States and are collected by trained Surgical Clinical Reviewers.

Current Procedural Terminology code 25447 was used to identify patients who underwent CMC arthroplasty from 2015 to 2020. Cases for patients younger than 18 years of age or cases performed in the trauma setting were automatically excluded from the database. Cases were also excluded if any of the following variables had missing information: height/ weight, American Society of Anesthesiologists (ASA) classification, and functional health status before surgery.

Variables collected in this study included patient demographics, comorbidities, preoperative laboratory values, surgical characteristics, and 30-day postoperative complication data. Patient demographics included age, BMI, gender, functional health status before surgery, ASA classification, current smoking status, and chronic steroid use. Preoperative comorbidities included insulin- and non–insulin-dependent diabetes mellitus, chronic obstructive pulmonary disease (COPD), congestive heart failure, hypertension requiring medication, disseminated cancer, open wound/wound infection, and bleeding disorder. Preoperative laboratory values included hematocrit levels. Surgical characteristics included transfusion before surgery and operative duration. Postoperative complications that occurred within 30 days included pneumonia, superficial incisional surgical-site infection (SSI), deep incisional SSI, organ/space SSI, wound dehiscence, reintubation, pulmonary embolism, failure to wean off ventilator, urinary tract infection, stroke, cardiac arrest, myocardial infarction, bleeding transfusion, deep vein thrombosis, sepsis, septic shock, readmission, reoperation, non–home discharge, and mortality.

Body mass index was calculated from height and weight using the following formula: ([weight in pounds]/[height in inches × height in inches]) × 703. The initial pool of patients was divided into cohorts based on BMI as follows: underweight (BMI < 18.5 kg/m^2), normal/reference (18.5 kg/m^2 ≤ BMI < 30.0 kg/m^2), obese (30.0 kg/m^2 ≤ BMI < 35.0 kg/m^2), severely obese (35.0 kg/m^2 ≤ BMI < 40.0 kg/m^2), and morbidly obese (BMI ≥ 40.0 kg/m^2).

A total of 6,624 patients who underwent CMC arthroplasty were identified in NSQIP from 2015 to 2020. Cases were excluded as follows: 63 for missing height/weight, 14 for missing ASA classification, and 116 for missing functional health status before surgery. Of the 6,432 patients remaining after exclusion criteria, 3,622 (56.3%) patients were included in the normal/reference cohort, 77 (1.2%) patients were included in the underweight cohort, 1,479 (23.0%) patients were included in the obese cohort, 718 (11.2%) patients were included in the severely obese cohort, and 536 (8.3%) patients were included in the morbidly obese cohort.

All statistical analyses were conducted using SPSS Software version 29.0 (IBM Corp.). Patient demographics and comorbidities were compared between cohorts using bivariate logistic regression. Postoperative complications were also compared between cohorts using bivariate logistic regression. Multivariate logistic regression, adjusted for all significantly associated patient demographics and comorbidities, was used to identify associations between BMI and postoperative complications following CMC arthroplasty. Odds ratios (ORs) were reported with 95% confidence intervals (CIs). The level of statistical significance was set at a P value of <.05.

A post hoc power analysis was performed using one-way analysis of variance for common complications among the different cohorts. The level of significance was set at 0.05 for the post hoc test.

Results

Bivariate analysis was used to compare patient demographics and comorbidities, as shown in Table 1. The patient demographics and comorbidities with significantly higher rates were identified for each cohort, with reference to the normal BMI cohort.

Bivariate analysis was also used to compare 30-day postoperative complications between each cohort with reference to the normal BMI cohort, as shown in Table 2. The underweight cohort did not have any postoperative complications. The obese cohort was significantly associated with a higher rate of superficial incisional SSI (P = .037). The severely obese cohort was also significantly associated with a higher rate of superficial incisional SSI (P = .032). The morbidly obese cohort was significantly associated with higher rates of readmission (P = .005), reoperation (P = .010), and non–home discharge (P = .020).

Multivariate analysis, adjusted for significantly associated patient demographics and comorbidities, was used to identify the postoperative complications associated with different categories of BMI, as shown in Table 3. The obese cohort was independently associated with a higher rate of superficial incisional SSI (OR, 2.11; 95% CI, 1.00–4.44; P = .050). The severely obese cohort was not independently associated with any postoperative complication after adjustment. The morbidly obese cohort was independently associated with readmission (OR, 3.35; 95% CI, 1.15–9.74; P = .026) and reoperation (OR, 3.40; 95% CI, 1.04–1.11; P = .043). The morbidly obese cohort was not independently associated with non–home discharge after adjustment.

The results of the post hoc power analysis are shown in Table 4. Although the sample size was sufficiently powered to identify

Table 1
Patient Demographics and Comorbidities for Patients Who Underwent Carpometacarpal Arthroplasty Based on Body Mass Index

Characteristics	Normal	Underweight		Obese		Severely Obese		Morbidly Obese	
	Number (%)	Number (%)	*P* Value	Number (%)	*P* Value	Number (%)	*P* Value	Number (%)	*P* Value
Total	3,622 (100.0%)	77 (100.0%)		1,479 (100.0%)		718 (100.0%)		536 (100.0%)	
Age, y									
18–39	39 (1.1%)	0 (0.0%)	.998	17 (1.1%)	.992	3 (0.4%)	.083	8 (1.5%)	.744
40–64	1,956 (54.0%)	44 (57.1%)	—	855 (57.8%)	—	427 (59.5%)	—	353 (65.9%)	—
65–74	1,201 (33.2%)	26 (33.8%)	.878	454 (30.7%)	**.034**	236 (32.9%)	.237	154 (28.7%)	**< .001**
≥75	426 (11.8%)	7 (9.1%)	.444	153 (10.3%)	.056	52 (7.2%)	**< .001**	21 (3.9%)	**< .001**
Gender			**< .001**		**.004**		**.044**		**< .001**
Women	2,718 (75.0%)	74 (96.1%)		1,052 (71.1%)		513 (71.4%)		452 (84.3%)	
Men	904 (25.0%)	3 (3.9%)		427 (28.9%)		205 (28.6%)		84 (15.7%)	
Functional status			.999		.140		.130		**.011**
Independent	3,614 (99.8%)	77 (100.0%)		1,472 (99.5%)		714 (99.4%)		531 (99.1%)	
Dependent	8 (0.2%)	0 (0.0%)		7 (0.5%)		4 (0.6%)		5 (0.9%)	
ASA classification			.780		**< .001**		**< .001**		**< .001**
1–2	2,677 (73.9%)	58 (75.3%)		907 (61.3%)		339 (47.2%)		135 (25.2%)	
≥3	945 (26.1%)	19 (24.7%)		572 (38.7%)		379 (52.8%)		401 (74.8%)	
Diabetes mellitus									
No	3,374 (93.2%)	76 (98.7%)	—	1,264 (85.5%)	—	551 (76.7%)	—	380 (70.9%)	—
Non-insulin	180 (5.0%)	1 (1.3%)	.166	149 (10.1%)	**< .001**	114 (15.9%)	**< .001**	95 (17.7%)	**< .001**
Insulin	68 (1.9%)	0 (0.0%)	.997	66 (4.5%)	**< .001**	53 (7.4%)	**< .001**	61 (11.4%)	**< .001**
Current smoker			**< .001**		**.002**		**.002**		**.038**
No	3,110 (85.9%)	53 (68.8%)		1,138 (89.1%)		647 (90.1%)		478 (89.2%)	
Yes	512 (14.1%)	24 (31.2%)		161 (10.9%)		71 (9.9%)		58 (10.8%)	
COPD			.150		.924		.258		**.039**
No	3,465 (95.7%)	71 (92.2%)		1,414 (95.6%)		680 (94.7%)		502 (93.7%)	
Yes	157 (4.3%)	6 (7.8%)		65 (4.4%)		38 (5.3%)		34 (6.3%)	
Congestive heart failure			.999		.316		**.037**		**.012**
No	3,617 (99.9%)	77 (100.0%)		1,475 (99.7%)		714 (99.4%)		532 (99.3%)	
Yes	5 (0.1%)	0 (0.0%)		4 (0.3%)		4 (0.6%)		4 (0.7%)	
Hypertension			**< .001**		**< .001**		**< .001**		**< .001**
No	2,268 (62.6%)	67 (87.0%)		696 (47.1%)		269 (37.5%)		169 (31.5%)	
Yes	1,354 (37.4%)	10 (13.0%)		783 (52.9%)		449 (62.5%)		367 (68.5%)	
Disseminated cancer			.999		.999		.999		.482
No	3,619 (99.9%)	77 (100.0%)		1,479 (100.0%)		718 (100.0%)		535 (99.8%)	
Yes	3 (0.1%)	0 (0.0%)		0 (0.0%)		0 (0.0%)		1 (0.2%)	
Open wound/wound infection			.999		.426		.285		.159
No	3,618 (99.9%)	77 (100.0%)		1,476 (99.8%)		716 (99.7%)		534 (99.6%)	
Yes	4 (0.1%)	0 (0.0%)		3 (0.2%)		2 (0.3%)		2 (0.4%)	
Preoperative anemia			.180		.683		.778		.358
No	1,553 (42.9%)	37 (48.1%)		685 (46.3%)		360 (50.1%)		251 (46.8%)	
Yes	164 (4.5%)	1 (1.3%)		68 (4.6%)		36 (5.0%)		32 (6.0%)	
Chronic steroid use			.458		.223		.485		.310
No	3,492 (96.4%)	73 (94.8%)		1,436 (97.1%)		696 (96.9%)		512 (95.5%)	
Yes	130 (3.6%)	4 (5.2%)		43 (2.9%)		22 (3.1%)		24 (4.5%)	
Bleeding disorders			.876		.429		.978		.219
No	3,567 (98.5%)	76 (98.7%)		1,452 (98.2%)		707 (98.5%)		524 (97.8%)	
Yes	55 (1.5%)	1 (1.3%)		27 (1.8%)		11 (1.5%)		12 (2.2%)	
Transfusion before surgery			—		—		—		—
No	3,622 (100.0%)	77 (100.0%)		1,479 (100.0%)		718 (100.0%)		536 (100.0%)	
Yes	0 (0.0%)	0 (0.0%)		0 (0.0%)		0 (0.0%)		0 (0.0%)	
Operative duration (min)									
0–49	862 (23.8%)	20 (26.0%)	.658	342 (23.1%)	.678	168 (23.4%)	.820	128 (23.9%)	.758
50–93	1,870 (51.6%)	32 (41.6%)	—	766 (51.8%)	—	373 (51.9%)	—	268 (50.0%)	—
≥94	890 (24.6%)	25 (32.5%)	.112	371 (25.1%)	.816	177 (24.7%)	.976	140 (26.1%)	.405

Boldface *P* values indicate statistical significance with $P < .05$.

significant differences in superficial incisional SSI for the obese and severely obese cohorts, it was insufficiently powered for the morbidly obese cohort. Additionally, the sample size was sufficiently powered to identify differences in readmission, reoperation, and non–home discharge for morbid obesity, but not for the other cohorts.

Discussion

In this retrospective study of 6,432 patients from a large national database, higher BMI was associated with postoperative complications following thumb CMC arthroplasty. Through bivariate analyses, we identified obesity as a clinically significant risk factor for superficial incisional SSI, readmission, reoperation, and non–home discharge. Furthermore, multivariate analyses demonstrated that BMI in the range of 30–35 kg/m^2 was independently associated with a higher rate of superficial incisional SSI, and BMI > 40 kg/m^2 was independently associated with higher rates of readmission and reoperation.

Obesity is an important patient comorbidity to consider during preoperative planning, as it has been associated with postoperative complications for a variety of procedures.[16,17] The harmful effects of obesity are believed to be mediated by the abnormal anatomy of adipose tissue, vascular insufficiency, oxidative stress, cellular

Table 2
Bivariate Analysis of 30-Day Postoperative Complications Following Carpometacarpal Arthroplasty Based on Body Mass Index

Complication	Normal	Underweight		Obese		Severely Obese		Morbidly Obese	
	Number	Number	*P* Value	Number	*P* Value	Number	*P* Value	Number	*P* Value
Pneumonia	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Superficial incisional SSI	16 (0.44%)	0 (0.00%)	—	14 (0.95%)	**.037**	8 (1.11%)	**.032**	4 (0.75%)	.347
Deep incisional SSI	3 (0.08%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Organ/Space SSI	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	1 (0.19%)	.982
Wound dehiscence	3 (0.08%)	0 (0.00%)	—	1 (0.07%)	.860	1 (0.14%)	.653	0 (0.00%)	—
Reintubation	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	1 (0.19%)	.982
Pulmonary embolism	1 (0.03%)	0 (0.00%)	—	0 (0.00%)	—	1 (0.14%)	.252	0 (0.00%)	—
Ventilator >48 hours	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Urinary tract infection	9 (0.25%)	0 (0.00%)	—	7 (0.47%)	.200	3 (0.42%)	.435	1 (0.19%)	.785
Stroke	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Cardiac arrest	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Myocardial infarction	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	1 (0.19%)	.177
Bleeding transfusions	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Deep vein thrombosis	1 (0.03%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Sepsis	1 (0.03%)	0 (0.00%)	—	1 (0.07%)	.526	2 (0.28%)	.059	0 (0.00%)	—
Septic shock	0 (0.00%)	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—	0 (0.00%)	—
Readmission	16 (0.44%)	0 (0.00%)	—	3 (0.20%)	.215	7 (0.97%)	.080	8 (1.49%)	**.005**
Reoperation	11 (0.30%)	0 (0.00%)	—	5 (0.34%)	.842	5 (0.70%)	.123	6 (1.12%)	**.010**
Non–home discharge	6 (0.17%)	0 (0.00%)	—	3 (0.20%)	.774	1 (0.14%)	.872	4 (0.75%)	**.020**
Mortality	0 (0.00%)	0 (0.00%)	—	1 (0.07%)	.983	2 (0.28%)	.982	1 (0.19%)	.982

Boldface *P* values indicate statistical significance with $P < .05$.

Table 3
Multivariate Analysis of 30-Day Postoperative Complications, Adjusted for Significantly Associated Demographics and Comorbidities

Complication	Obese		Severely Obese		Morbidly Obese	
	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
Superficial incisional SSI	2.11 (1.00–4.44)	**.050**	2.48 (0.96–6.39)	.060	—	—
Readmission	—	—	—	—	3.35 (1.15–9.74)	**.026**
Reoperation	—	—	—	—	3.40 (1.04–11.11)	**.043**
Non–home discharge	—	—	—	—	1.57 (0.37–6.73)	.544

Boldface *P* values indicate statistical significance with $P < .05$.

metabolic and structural modifications, immune system dysregulation, and nutrient deficiencies.[18,19] In hip and knee arthroplasties, numerous studies reported associations between obesity and postoperative complications, including infection, dislocation, poor implant survival, medical complications, increased length of stay, readmission, and low absolute functional scores.[14,15] In upper extremity procedures, the effect of obesity on postoperative complications is less certain.[20–24]

Our findings that obesity is a significant risk factor for superficial incisional SSI, readmission, reoperation, and non–home discharge following CMC arthroplasty were consistent with studies in total shoulder arthroplasty, total hip arthroplasty (THA), and total knee arthroplasty (TKA).[14,15,25] Although superficial incisional SSI was significantly associated with obesity and severe obesity, it was not significantly associated with morbid obesity. However, as shown in our post hoc power analysis, the morbid obesity cohort was likely insufficiently powered to identify differences in the rates of superficial incisional SSI. Additionally, our study did not reflect an increased risk of postoperative medical events and prolonged admission in any BMI cohort. This may be explained by the significantly lower baseline postoperative complication rates of CMC arthroplasty and other hand procedures, compared with larger joint arthroplasties.[21,23,24,26–30]

Our finding that morbid obesity (BMI > 40 kg/m^2) was independently associated with readmission and reoperation is consistent with that of the study by London et al,[31] who evaluated the impact of obesity on postoperative complications following elbow, forearm, and hand surgeries. London et al[31] found a significant increase in the overall complication risk (ie, delayed incision healing, nerve injury, wound dehiscence, antibiotics for infection, hematoma, and reoperation) specifically in patients with BMI > 45 kg/m^2, but not in patients with BMI > 35 kg/m^2. These findings suggest a possible positive correlation between obesity and complication rates that has been described in studies involving total joint arthroplasties. Kotzur et al[32] evaluated 529,737 patients undergoing THA and TKA and found that overall 30-day postoperative complication rates significantly increased with each BMI classification. Similarly, large studies by Wagner et al[29] and Cogan et al[33] reported increased odds of postoperative complications with increasing BMI after total shoulder arthroplasty.

Interestingly, our finding that obesity is a significant risk factor for postoperative complications following CMC arthroplasty contrasts with several studies on hand and upper extremity procedures. Specific to CMC arthroplasty, a study by Shah et al[21] found that BMI > 30 kg/m^2 was not associated with an increased risk of 30-day postoperative complications, reoperation, or readmission. They did find, however, that SSI was the most common overall infection complication. Concerning other upper extremity procedures, Lipira et al[23] analyzed postoperative complications associated with 208 hand-specific Current Procedural Terminology codes. They similarly found that superficial SSI was the most common overall complication but did not find an association between obesity and any postoperative complication. Another study by Golan et al[20] did not find any relationship between obesity and postoperative complications following grouped and subgroup analyses of 8,477 patients who had undergone upper extremity surgery (shoulder arthroplasty, fractures of shoulder, wrist fractures, open reduction internal fixation forearm fracture, and elbow arthroplasty).

Table 4
Post Hoc Power Analysis Using One-Way Analysis of Variance for Common Complications Between Cohorts

Complication	BMI Category		Significance
Superficial incisional SSI	Normal	Underweight	.634
		Obese	**.042**
		Severely obese	**.041**
		Morbidly obese	.414
Wound dehiscence	Normal	Underweight	.796
		Obese	.860
		Severely obese	.620
		Morbidly obese	.521
Urinary tract infection	Normal	Underweight	.698
		Obese	.191
		Severely obese	.457
		Morbidly obese	.810
Sepsis	Normal	Underweight	.923
		Obese	.603
		Severely obese	**.014**
		Morbidly obese	.811
Readmission	Normal	Underweight	.597
		Obese	.285
		Severely obese	.072
		Morbidly obese	**.002**
Reoperation	Normal	Underweight	.683
		Obese	.863
		Severely obese	.137
		Morbidly obese	**.006**
Non–home discharge	Normal	Underweight	.758
		Obese	.796
		Severely obese	.890
		Morbidly obese	**.007**
Mortality	Normal	Underweight	1.000
		Obese	.379
		Severely obese	**.006**
		Morbidly obese	.106

Boldface P values indicate statistical significance with P < .05, indicating sufficient power.

These differences may be explained by certain limitations inherent to these studies. Specifically, Shah et al[21] and Lipira et al[23] did not stratify by obesity classifications. Therefore, they could not account for any increasing effects of morbid obesity vs severe obesity vs obesity. Additionally, given the low complication rate of CMC arthroplasty, it is possible that the larger sample size provided our study with enough power to identify differences in complication rates specific to each obesity cohort. Our study identified 2,733 patients with BMI > 30 kg/m^2, compared with 1,441 in the study by Shah et al.[21] The studies by Lipira et al[23] and London et al[31] reported an analysis of multiple upper extremity procedures, without a specific focus on CMC arthroplasty. The low baseline complication rates for common hand procedures are significantly lower than that of CMC arthroplasty, which may make it difficult in a pooled analysis to identify significant complication rates.[26,34]

Our novel findings require interpretation with caution for several reasons. The associations between BMI and outcomes are potentially confounded by the limited information available in the NSQIP database. For example, it was not possible to discern operative variables such as institutional differences, regional differences in standard of care, surgeon level of experience, surgical technique, and postoperative rehabilitation. As shown in TKA and THA, lower volume hospitals and surgeons can have longer operative times and worse postoperative outcomes.[35] Given the low complication rates of CMC arthroplasty, our inability to assess for surgeon-related factors is a notable limitation to consider. Furthermore, the NSQIP database does not include data from designated ambulatory surgery centers, instead pooling data from outpatient and inpatient surgical centers.[21] Given that lower risk procedures, such as CMC arthroplasty, are often performed at ambulatory surgery centers, it is possible that the patients in the NSQIP database were not representative of the overall population of patients undergoing CMC arthroplasty. Therefore, the generalizability of our findings may be limited to the in-hospital setting. Additionally, evaluating long-term postoperative complications such as loosening, dislocation, and instability was limited by a 30-day postoperative period. Although we stratified obesity by BMI classification, we did not account for possible differences among obese patients on the basis of metabolic health. A study by Kotzur et al[32] evaluated 529,737 patients for the impact of metabolic syndrome (low high-density lipoprotein, abdominal obesity, hypertension, insulin resistance, and hypertriglyceridemia) on postoperative outcomes after total joint arthroplasty. This study found that postoperative complications increased with metabolic syndrome, compared with obesity alone. Given that the reported prevalence of metabolic syndrome in obese patients is 61.6%, further studies may be conducted to explore the effect of metabolic syndrome on both short- and long-term outcomes following CMC arthroplasty.[36]

Overall, CMC arthroplasty carries a lower risk profile relative to other arthroplasty procedures. Therefore, our findings that morbid obesity is independently associated with 30-day readmission and reoperation are not meant to discourage operating on these patients. Rather, given the elective nature of CMC arthroplasty, morbidly obese patients may benefit from preoperative weight loss counseling. Of note, the association between preoperative weight loss and reduction of complications is controversial and unclear in the literature. Studies have found that preoperative weight loss of 20 pounds or bariatric surgery before TKA and THA can lead to a shorter length of stay and decreased operative time.[37,38] Other studies did not find statistically significant differences in complications following weight loss before total joint arthroplasty.[39,40] Nevertheless, those who choose to undergo CMC arthroplasty despite morbid obesity can be counseled on their elevated risk for short-term complications.

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