

# Obesity Severity Is Associated with Increased Postoperative Surgical Site Infections and Medical Complications Following Hip Arthroscopy: An Incremental Effect of Increasing Body Mass Index

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## INTRODUCTION:

Clinical guidelines recommending delay of surgery for patients with severe obesity (BMI >40) already exist in the total joint arthroplasty literature due to the risk of an increased complication profile outweighing the functional benefits of surgery. However, in the context of hip arthroscopy, there remains a paucity of data on the effects of BMI on postoperative medical complications, with specific attention to increasing obesity classes of obesity. This study aims to address this gap by analyzing a national database to evaluate the incidence of surgical site infections (SSIs) and medical complications following hip arthroscopy among patients in varying BMI categories. The ultimate goal of systematically evaluating the effects of increasing BMI on postoperative outcomes is to provide valuable insights for risk assessment and management in hip arthroscopic surgery.

**METHODS:** This retrospective cohort study was conducted using a United States insurance claims database from January 1, 2010 to April 30, 2021. The dataset was queried to include all adults aged 18 years and older who underwent primary hip arthroscopy. Patients were identified using Current Procedural Terminology (CPT) codes specific to hip arthroscopy: CPT-29860, CPT-29861, CPT-29862, CPT-29863, CPT-29914, CPT-29915, CPT-29916. Patients were categorized into four BMI classes based on their recorded BMI values within 1 month of surgery: healthy (18.50-24.99 kg/m<sup>2</sup>), overweight (25.00-29.99 kg/m<sup>2</sup>), obese (30.00-34.99 kg/m<sup>2</sup>), and morbidly obese (35.00+ kg/m<sup>2</sup>). This categorization was applied to explore incremental effects of increasing BMI on postoperative outcomes. The primary outcomes of interest were infections and medical complications within a 90-day postoperative period following hip arthroscopy. These included postoperative superficial SSIs, deep wound infections, and other medical complications, including myocardial infarctions (MI), pneumonia, deep venous thromboses (DVT), pulmonary emboli (PE), blood transfusions, acute kidney injuries (AKI), cerebrovascular accidents (CVA), and respiratory failures. These individual complications were also included within an overall category of any medical complications. Descriptive statistics were used to summarize patient demographics and comorbidities. Pearson's Chi-squared test was used to compare categorical variables across different BMI cohorts. Welch's t-test was used to compare overall comorbidity burden, as measured by the Elixhauser Comorbidity Index (ECI), across BMI categories. Multivariable logistic regression models were utilized to assess the odds ratio (OR) and 95% confidence intervals (95% CI) for developing postoperative complications. The models were adjusted for age, sex, and ECI to isolate the effect of BMI on outcomes. Healthy BMI patients served as the reference cohort. Statistical significance was determined using a Bonferroni-corrected *P*-value threshold of <0.001.

**RESULTS:** Overall, 31,202 patients underwent hip arthroscopy were identified, including 5,471 healthy, 8,521 overweight, 9,043 obese, and 8,167 morbidly obese patients. There were significant differences in age, sex, comorbidities, and ECI (all, *P* < 0.0001) among patients of different BMI classes. There was a stepwise increase in odds of all medical complications within 90 days of hip arthroscopy for overweight (OR: 1.73, 95%CI: 1.58-1.89, *P*<0.0001), obese (OR: 1.88, 95%CI: 1.73-2.04, *P*<0.0001), and morbidly obese (OR: 2.98, 95%CI: 2.71-3.28, *P*<0.0001) patients compared to healthy BMI patients. Morbidly obese patients demonstrated the highest odds of superficial SSI (OR: 4.52, 95% CI: 2.97 - 6.96, *P* < 0.0001) and deep wound infections (OR: 3.76, 95% CI: 2.59-5.48, *P* < 0.0001) compared to normal BMI patients

## DISCUSSION AND CONCLUSION:

A stepwise increase in the odds of SSIs and medical complications following hip arthroscopy was observed with increasing BMI severity, with the highest odds consistently in the morbid obesity group. These findings provide guidance on careful patient selection and risk stratification prior to hip arthroscopy.

DEMOGRAPHICS	Healthy (18.50-24.99 kg/m <sup>2</sup> )		Overweight (25.00-29.99 kg/m <sup>2</sup> )		Obese (30.00-34.99 kg/m <sup>2</sup> )		Morbidly Obese (35.00+ kg/m <sup>2</sup> )		P-value <sup>a</sup>
	n	%	n	%	n	%	n	%	
<20	286	3.2	212	2.3	108	1.2	108	1.3	<0.0001
20-24	586	6.7	438	4.7	203	2.3	188	2.3	
25-29	603	6.9	467	5.1	238	2.7	261	3.3	
30-34	602	6.9	422	4.6	202	2.3	199	2.5	
35-39	677	7.8	497	5.4	241	2.7	231	2.9	
40-44	642	7.4	437	4.8	207	2.3	184	2.3	
45-49	648	7.5	438	4.8	203	2.3	184	2.3	
50-54	614	7.1	412	4.5	192	2.2	169	2.1	
55-59	581	6.7	377	4.1	184	2.1	165	2.1	
60-64	285	3.3	185	2.0	84	1.0	65	0.8	
65-69	175	2.0	106	1.2	37	0.4	22	0.3	
70-74	107	1.2	54	0.6	15	0.2	10	0.1	
75-79	58	0.7	28	0.3	8	0.1	6	0.1	
80+	4	0.0	2	0.0	1	0.0	1	0.0	
Sex									<0.0001
Female	443	5.1	330	3.6	165	1.9	154	1.9	
Male	141	1.6	102	1.1	43	0.5	54	0.7	
Comorbidities									<0.0001
COPD	144	1.7	106	1.1	51	0.6	46	0.6	
Depression	232	2.7	166	1.8	80	0.9	72	0.9	
Diabetes Mellitus	709	8.2	515	5.6	244	2.8	212	2.7	
Hypertension	136	1.6	102	1.1	50	0.6	46	0.6	
Tobacco Use	171	2.0	126	1.4	61	0.7	52	0.7	
Current ECT	2	0.0	2	0.0	1	0.0	1	0.0	

Table 1. Demographics of Body Mass Index (BMI) Cohorts Undergoing Hip Arthroscopy. COPD = Chronic Obstructive Pulmonary Disease; BMI = Body Mass Index; ECT = Elective Hip Arthroscopy; Comorbidity Index = Assessed by Pearson's  $\chi^2$  for categorical variables and ANOVA for continuous variables.  
\*11 patients; NA = Unable to be calculated

Outcomes	OR	95% Confidence Interval	P Value
<b>Myocardial Infarctions</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.56	0.89 - 2.67	0.112
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.64	0.98 - 2.72	0.0563
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	2.12	1.33 - 3.73	0.0099
<b>Pneumoniae</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.69	1.41 - 2.01	<0.0001
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.59	1.36 - 1.87	<0.0001
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	3.39	2.82 - 4.07	<0.0001
<b>Deep Venous Thromboses</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.58	1.17 - 2.18	0.0015
Obese (30.00-34.99 kg/m <sup>2</sup> )	2.04	1.53 - 2.72	<0.0001
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	2.72	1.98 - 3.74	<0.0001
<b>Pulmonary Emboli</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	2.01	1.16 - 3.44	0.0114
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.34	0.83 - 2.14	0.2285
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	2.40	1.27 - 4.16	0.002
<b>Transfusions</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.47	1.73 - 1.89	0.067
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.65	1.12 - 2.42	0.0112
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	3.53	2.28 - 5.46	<0.0001
<b>Acute Kidney Injuries</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.65	1.30 - 2.08	<0.0001
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.70	1.38 - 2.09	<0.0001

Outcomes	OR	95% Confidence Interval	P Value
<b>Cerebrovascular Accidents</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.99	1.38 - 2.86	0.0002
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.88	1.33 - 2.64	0.0003
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	3.39	2.31 - 4.25	<0.0001
<b>Surgical Site Infections</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.03	0.65 - 1.59	0.888
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.64	1.16 - 2.32	0.0045
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	4.52	2.97 - 6.96	<0.0001
<b>Deep Wound Infections</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.24	0.85 - 1.79	0.253
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.31	0.95 - 1.78	0.0911
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	3.75	2.59 - 5.48	<0.0001
<b>Respiratory Failures</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.85	1.19 - 2.83	0.006
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.49	1.02 - 2.17	0.0392
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	4.88	3.11 - 7.69	<0.0001
<b>Total Medical Complications</b>			
Healthy (18.50-24.99 kg/m <sup>2</sup> )	Ref.		
Overweight (25.00-29.99 kg/m <sup>2</sup> )	1.73	1.58 - 1.89	<0.0001
Obese (30.00-34.99 kg/m <sup>2</sup> )	1.88	1.73 - 2.04	<0.0001
Morbidly Obese (35.00+ kg/m <sup>2</sup> )	2.98	2.71 - 3.28	<0.0001

Table 2. Comparison of Odds of Ninety-Day Medical Complications for BMI Cohorts Undergoing Hip Arthroscopy. OR = Odds-Ratio; 95% CI = 95% Confidence Interval; Ref = Reference. Healthy BMI were the reference group. Logistic Regression Model Controlled for Age, Sex, and ECT.