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Research Article

Surgical Complications in Obese Patients Undergoing Hip Arthroscopy: A Propensity-Score Matched Study

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Abstract

Purpose: The implications of performing hip arthroscopy in obese and non-obese patients have not been well documented in recent literature. Thus, this study assesses 30-day surgical outcomes between obese and matched non-obese patients using a large national database.

Methods: The American College of Surgeons National Surgical Quality Improvement Program database was utilized to identify hip arthroscopy patients from 2008-2016. Inclusion criteria included patients who underwent hip arthroscopy for femoroplasty, acetabuloplasty, arthroscopy with labral repair, and arthroscopy with debridement/shaving of articular cartilage. Patients were categorized as obese/non-obese by BMI of 30 kg/m2 and matched with propensity scores based on demographics (n=830). The following outcomes were assessed: 1) operative time, 2) surgical site infection, 3) wound dehiscence, 4) urinary tract infection, 5) postoperative pneumonia 6) bleeding necessitating transfusion, 7) deep vein thrombosis, 8) unplanned reoperation, and 9) 30-day readmission. T-tests and chi-square were used to compare operative time and 30-day complications between the groups.

Results: The cohorts had a significant difference in operative times (obese = 94.9 minutes vs. non-obese = 103.4 minutes, $p<0.001$), although there was a difference in incidence of procedures between cohorts. However, there were no significant differences in any other 30-day surgical complication between the obese and the non-obese patient groups.

Conclusions: Our results highlight the safety of hip arthroscopy in obese patients. With this information, surgeons reluctant to operate on obese patients for fear of complications will have more data to mitigate their concerns, giving this population greater benefit from appropriate therapeutic measures.

Introduction

In the past several years, the incidence of hip arthroscopy has grown radically, with a national increase of 365% between 2004 and 2009 [1]. This is due in part to broadening of the indications for hip arthroscopy, which includes femoroacetabular impingement, labral tears, and synovial disorders [2-4]. As arthroscopy is performed more frequently, the candidates for this procedure become more diverse with varying health concerns such as obesity. In the United States, more than 93 million adults are obese, with a Body Mass Index (BMI) greater than 30 kg/m^2 [2,5]. Obesity is associated with a variety of comorbidities that contribute an additional $147 billion annually to healthcare costs [2,5]. While this population may be more susceptible to conditions that may benefit from hip arthroscopy, understanding how arthroscopy affects this subset of patients would be important for optimizing outcomes and maintaining operative benefits.

Obese patients have been documented to experience more postoperative complications than normal BMI patients in many procedures, arthroscopy being no exception [6,7]. Reports from the past decade have suggested that obese patients undergoing arthroscopy are at increased risk for bacterial infections and deep venous thrombosis [8-10]. Additionally, patient-reported outcomes have been worse in this population, with reports of increased pain, higher

re-arthroscopy rates and higher rates of conversion to arthroplasty [11,12]. However, a study from the past year has demonstrated similar rates of complications between high and normal BMI patients, and shown a reduction in the risk of adverse postoperative outcomes [15]. Regardless, obese patients substantially benefit from hip arthroscopy, objectively gaining clinical improvement in symptoms such as pain and function [9,13].

Previous studies have been conducted on the surgical outcomes of hip arthroscopy in obese patients. However, none have recently attempted to compare 30-day outcomes while controlling for confounders existing between obese and non-obese patients in a large cohort. Thus, this study employed a large national database containing 30-day outcomes to assess short-term outcomes between similar obese and non-obese patients after hip arthroscopy. Specifically, obese and non-obese cohorts were matched based on propensity-scores derived from patient demographic information and compared on the following 30-day outcomes: 1) operative time, 2) surgical site infection, 3) wound dehiscence, 4) urinary tract infection, 5) postoperative pneumonia 6) bleeding necessitating transfusion, 7) deep vein thrombosis, 8) unplanned reoperation, and 9) 30-day readmission utilizing the American College of Surgeons National Surgical Quality Improvement Program database between 2008 and 2016.

Methods

Data source

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database is a source of data on patients undergoing inpatient or outpatient surgery at over 600 hospitals across the United States [14], Surgical clinical reviewers at participating sites prospectively collect patient demographic data, potential preoperative risk factors, and intraoperative variables. They also document a defined set of 30-day complications after surgical procedures. Data are not obtained from insurance claims.

Patient selection

A retrospective review was conducted utilizing the NSQIP database for the most recently available years from January 1, 2008 to December 31, 2016. Inclusion criteria included all patients who underwent hip arthroscopy for femoroplasty (CPT code: 29914), acetabuloplasty (CPT code: 29915), arthroscopy with labral repair (CPT code 29916), and arthroscopy with debridement/shaving of articular cartilage (CPT code: 29862). Infections, trauma, and emergency cases were excluded (Figure 1).

Data Collection

Patient demographics and surgical specific factors such as age, gender, American Society of Anaesthesiology (ASA) physical status score, and race were reviewed. Patient BMI was calculated utilizing weight and height data made available in the NSQIP database. Groups were separated into non-obese (BMI less than 30 kg/m^2) and obese patients (BMI of 30 kg/m^2 or greater). Operative time and surgical complications in the 30-day period after hip arthroscopy were compared between the two groups. These complications included superficial Surgical Site Infection (SSI), deep SSI, organ space SSI, wound dehiscence, Urinary Tract Infection (UTI), postoperative pneumonia, bleeding needing transfusion, Deep Vein Thrombosis (DVT), unplanned reoperation and 30-day readmission.

Statistical Analysis

To limit the impact of confounders, obese patients were matched to non-obese controls via propensity scores. A 1:1 nearest neighbor match was performed using patient demographic data including age, gender, ASA score and race. Student's T-tests were performed to compare continuous variables, and chi-square or Fisher's exact tests were used to compare categorical data. A value of 0.05 was set as the threshold for statistical significance. All statistical analyses were performed using SPSS version 25 (IBM Corporation, Armonk, New York, USA).

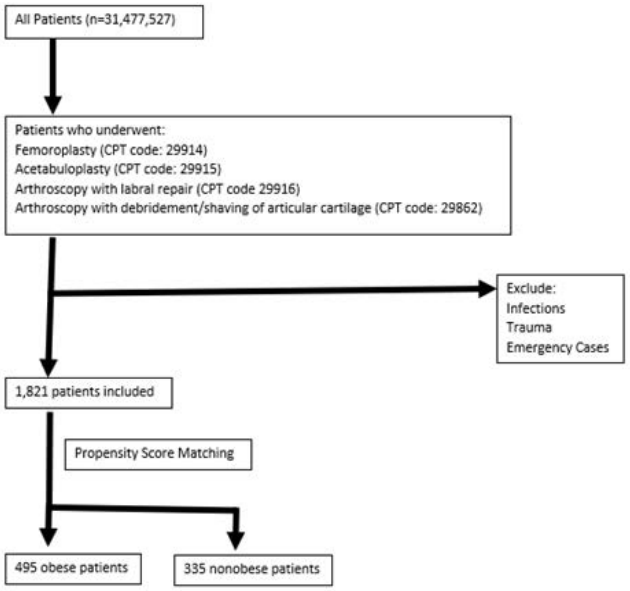

Figure 1. Flow Chart of patient inclusion.

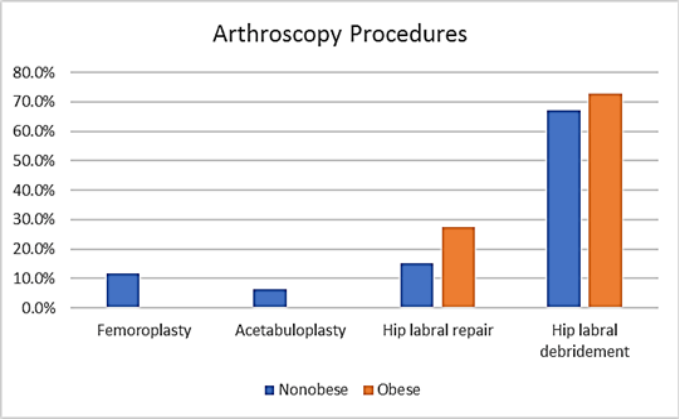

Figure 2. Percentage of patients by arthroscopy procedure.

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Results

After application of inclusion and exclusion criteria, 1,821 hip arthroscopy patients were identified. When obese and non-obese patients were propensity score-matched, a total of 830 patients were included for analysis (Figure 2). There were 495 (59.8%) patients in the obese cohort and 335 (40.4%) patients in the non-obese cohort (Table 1). The mean age was 42 years for the obese cohort, and 40 years for the non-obese cohort (p=0.125). The mean BMI for obese patients was 34.7 kg/m^2, while the mean BMI for non-obese patients was 25.3 kg/m^2 (p<0.001). The majority of patients were female in both the obese and non-obese groups (53.2% vs. 55.8%, p=0.532). There was a significant difference between the cohorts in ASA scores 2 (63.4% obese vs. 75.8% non-obese) and 3 (20.4% obese vs. 7.2% non-obese, p<0.001). Significant differences were also found in race, specifically in White patients (74.9% obese vs. 86.3% non-obese), Black patients (6.3% obese vs. 3.0% non-obese) and Native American or Alaskan Native patients (1.6% obese vs. 0.0% non-obese, p=0.003).

Table 1. Demographics for obese and non-obese hip arthroscopy patients.

	BMI 30 or greater	BMI less than 30	p-value
Number of Patients	495 (59.8%)	335 (40.4%)	
Mean Age (Standard Deviation)	42.4 (12.5)	40.4 (11.5)	0.125
Mean BMI (Standard Deviation)	34.7 (4.8)	25.3 (2.9)	**<0.001**
Gender			
Male	237 (46.8%)	148 (44.2%)	0.523
Female	269 (53.2%)	187 (55.8%)	
ASA score			
1	76 (15.4%)	57 (17.0%)	**<0.001**
2	314 (63.4%)	254 (75.8%)	
3	101 (20.4%)	24 (7.2%)	
4	1 (0.2%)	0 (0.0%)	
Race			
White	371 (74.9%)	289 (86.3%)	**0.003**
Black	31 (6.3%)	10 (3.0%)	
Asian	5 (1.0%)	1 (0.3%)	
Native American or Alaska Native	8 (1.6%)	0 (0.0%)	
Native Hawaiian or Pacific Islander	2 (0.4%)	0 (0.0%)	
Unknown	78 (15.7%)	35 (10.2%)	

ASA: American Society of Anesthesiology physical status score;

Table 2. Surgical complication rates between obese and .non-obese patients

	BMI 30 kg/m^2 or greater	BMI less than 30 kg/m^2	p-value
Mean Total Operative Time (minutes) (Standard Deviation)	94.9 (48.5)	103.4 (56.2)	**<0.001**
Superficial Surgical Site Infection	1 (0.2%)	1 (0.3%)	0.781
Deep Incisional Surgical Site Infection	0 (0.0%)	0 (0.0%)	---
Organ Space Surgical Site Infection	0 (0.0%)	0 (0.0%)	---
Wound Dehiscence	0 (0.0%)	0 (0.0%)	---
Urinary Tract Infection	0 (0.0%)	0 (0.0%)	---
Postoperative Pneumonia	1 (0.2%)	0 (0.0%)	0.410
Bleeding needing transfusion	2 (0.4%)	1 (0.3%)	0.243
Deep Vein Thrombosis	1 (0.2%)	0 (0.0%)	0.410
Unplanned reoperation	2 (0.5%)	0 (0.0%)	0.269
30-day readmission	8 (2.1%)	1 (0.4%)	0.096

BMI: Body Mass Index (kg/m^2)

There was a significant difference in the mean operative time, with obese patients having a mean time of 94.9 minutes, while non-obese patients had a mean time of 103.4 minutes (p<0.001) (Table 2). There were no significant differences found in superficial SSI (0.2% obese vs. 0.3% non-obese, p=0.781), postoperative pneumonia (0.2% obese vs. 0.0% non-obese, p=0.410), bleeding needing transfusion (0.4% obese vs. 0.3% non-obese, p=0.243), DVT (0.2% obese vs. 0.0% non-obese, p=0.410), unplanned reoperation (0.5% obese vs. 0.0% non-obese, p=0.269), or 30-day readmission rates (2.1% obese vs. 0.4% non-obese, p=0.096). There were no instances of deep SSI, organ space SSI, wound dehiscence, UTI in either patient group.

Discussion

The incidence of hip arthroscopy has increased dramatically over the past decade, with a 25-fold increase from 2006 to

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2013 [10]. Consequently, more patients classified as obese are undergoing arthroscopy. Obese patients may have a higher likelihood of complications after hip arthroscopy, but still gain clinical benefit from this procedure [9,13]. To date, no studies have evaluated 30-day outcomes of obese patients and similar non-obese patients using a large national database. Therefore, this study was conducted to assess outcomes between obese patients and matched non-obese patients utilizing the NSQIP database. We found that the only significant outcome between the two cohorts was mean operative time, with obese patients spending less time in the operating room. This may be explained by the absence of femoroplasties and acetabuloplasties, procedures which take a longer operative time in the obese patient cohort (Figure 2). These results seem to support that hip arthroscopy has become safer for obese patients, with no increased incidence of adverse 30-day outcomes.

Our results demonstrate the safety of hip arthroscopy in obese patients, as there were no differences in adverse outcomes compared to matched controls. A recent study by Nicolay et al. [15], also explored how BMI relates to postoperative outcomes in arthroscopy patients. They evaluated 30-day outcomes in 141,335 hip, knee and shoulder arthroscopy patients utilizing NSQIP from 2006 to 2016, stratifying BMI into six categories. They found an overall morbidity rate of 0.92%, most commonly DVTs (0.27%), superficial SSI (0.17%), UTI (0.13%), and pulmonary embolism (0.11%). Readmissions were highest for the hip arthroscopy group (0.79%), but no significant difference in mean operative duration ($p>0.05$). Their univariate regression found increased morbidity was more likely in patients with regular obesity with diabetes ($p = 0.002$), morbid obesity without diabetes ($p = 0.001$), morbid obesity with diabetes ($p = 0.001$) super obesity without diabetes ($p = 0.012$), and super obesity with diabetes ($p < 0.001$). They concluded that arthroscopy is a safe procedure with low complications regardless of BMI. Their findings are congruent with own even though our study did not stratify BMI, choosing instead to separate patients into two groups so they may be matched based on propensity scores so confounding variables may be controlled. However, their data fails to demonstrate the difference in operative time that our results found. They also document an increase in readmissions for obese hip arthroscopy patients, which we did not. This difference in findings may be due to the failure to match obese patients to similar control patients by Nicolay et al. By doing so, we better highlight the lack of differences between the two cohorts on adverse postoperative outcomes.

Reports on the 30-day outcomes of obese patients undergoing hip arthroscopy are scant, and accurate comparisons may be difficult to make since the limited studies available do not control confounding variables with matching. Although we demonstrate that obese patients have a significantly lower operative time than non-obese patients and no increased incidence of complications, previous studies do not support this finding. Collins et al. [9], retrospectively analysed 21 obese patients matched to 18 non-obese patients who underwent hip arthroscopy between 2009 and 2012, and found no difference in operative times between the cohorts ($p=0.79$). They did, however, find that obese patients were 11.1 times more likely than control patients to experience a complication like DVT and superficial SSI (95% Confidence Interval [CI], 1.2 to 99.7). Additionally, a retrospective study by Cooper et al. [16], assessed the effect of obesity on operative times after Anterior Cruciate Ligament Reconstruction (ACLR) with 4,495 patients in the NSQIP database. They found that regular and morbid obesity actually predicted an increased operative time compared to normal patients ($p=0.016$). They also found that morbid obesity was associated with a higher 30-day readmission risk (95% CI, 1.09-8.57). Our results do not reflect the findings of either study. The former study consists of a much smaller sample size which means the study may not be as equipped to handle confounding variables, and while the latter study may be true for ACLR, it may not be the case for obese patients undergoing hip arthroscopy. Our result of decreased operative time for obese patients may be statistically significant, but it may not be clinically significant, as the difference between the means is less than 10 minutes and may be due to the differences in the types of procedures performed. Further testing with better stratification of operative time frames may elucidate a more definitive answer. With regard to complications and readmission risk, our study matches patients for a more similar preoperative profile, and while the Collins study does match patients, it does not have the numbers to counter our findings. The Cooper study does not match patients, and does not analyse arthroscopy patients, making it a poor comparison for the risks of arthroscopy in patients with similar risk profiles. The lack of complications and readmissions seen in the present study are likely to be a reflection of the similarities between our matched cohorts and the large number of patients analysed. The discrepancies seen between the previous literature and this report may be reduced as more large studies are conducted to verify these results.

There were some limitations encountered in this study. The NSQIP database, which we utilized, only has information from participating hospitals, not every hospital in the nation. Additionally, this database only records complications occurring in the first 30 days postoperatively and lacks the ability to assess longer term outcomes. Information regarding functional outcome scores and other orthopaedic specific complications, such as chondrolabral injury, are not contained in this database. However, the NSQIP has been validated and utilized in numerous studies analysing orthopaedic surgery and provides valuable information about surgical outcomes. Another limitation is the significant differences found between our matched patients in ASA score, and race. After propensity score-matching, these variables should have been nonsignificant to show the two groups were indeed similar. However, these differences are expected when patients are stratified by BMI, as previous reports have shown obese patients are more likely to have comorbidities that increase their ASA score [17]. Obesity has also been found to be more common in Black and Native American patients [5,18]. Despite these limitations, this study provides valuable information on the lack of adverse

30-day outcomes in hip arthroscopy for obese patients when compared to similar non-obese patients, which has not been well documented in earlier studies.

Conclusion

As the incidence of hip arthroscopy continues to increase, the number of obese patients undergoing this procedure will concomitantly rise. Our results demonstrated that obese patients do not differ from similar non-obese patients in adverse 30-day outcomes and may in fact spend less time in the operating room due to differences in procedures performed during arthroscopy. These findings are supported by recent data that a higher BMI does not entail an increased risk of complications following hip arthroscopy. With this information, surgeons reluctant to operate on obese patients for fear of worse 30-day complications will have more data to mitigate their concerns, giving this population greater benefit from appropriate therapeutic measures.

References

1. Montgomery SR, Ngo SS, Hobson T, Nguyen S, Alluri R, et al. (2013) Trends and demographics in hip arthroscopy in the United States. Arthroscopy. 29: 661-665. [Crossref]
2. Clohisy JC, Baca G, Beaulé PE, Kim YJ, Larson CM, et al. (2013) Descriptive epidemiology of femoroacetabular impingement: a North American cohort of patients undergoing surgery. Am J Sports Med. 41: 1348-1356. [Crossref]
3. Horner NS, Ekhtiari S, Simunovic N, Safran MR, Philippon MJ, et al. (2017) Hip Arthroscopy in Patients Age 40 or Older: A Systematic Review. Arthroscopy. 33: 464-475. [Crossref]
4. Ross JR, Larson CM, Bedi A (2017) Indications for Hip Arthroscopy. Sports Health. 9: 402-413. [Crossref]
5. Finkelstein EA, Trogdon JG, Cohen JW, Dietz W (2009) Annual Medical Spending Attributable To Obesity: Payer-And Service-Specific Estimates. Health Aff. 28: 822-831. [Crossref]
6. Haverkamp D, Klinkenbijl MN, Somford MP, Albers GH, van der Vis HM (2011) Obesity in total hip arthroplasty--does it really matter? A meta-analysis. Acta Orthop. 82: 417-422. [Crossref]
7. Buerba RA, Fu MC, Gruskay JA, Long WD 3rd, Grauer JN (2014) Obese Class III patients at significantly greater risk of multiple complications after lumbar surgery: an analysis of 10,387 patients in the ACS NSQIP database. Spine J. 14: 2008-2018. [Crossref]
8. Clement RC, Haddix KP, Creighton RA, Spang JT, Tennant JN, et al. (2016) Risk Factors for Infection After Knee Arthroscopy: Analysis of 595,083 Cases From 3 United States Databases. Arthroscopy. 32: 2556-2561. [Crossref]
9. Collins JA, Beutel BG, Garofolo G, Youm T (2015) Correlation of obesity with patient-reported outcomes and complications after hip arthroscopy. Arthroscopy. 31: 57-62. [Crossref]
10. Cvetanovich GL, Chalmers PN, Levy DM, Mather RC 3rd, Harris JD, et al. (2016) Hip Arthroscopy Surgical Volume Trends and 30-Day Postoperative Complications. Arthrosc J Arthrosc Relat Surg. 32: 1286-1292. [Crossref]
11. Bech NH, Kodde IF, Dusseldorp F, Druyts PA, Jansen SPL, et al. (2016) Hip arthroscopy in obese, a successful combination? J hip Preserv Surg. 3: 37-42. [Crossref]
12. Gupta A, Redmond JM, Hammarstedt JE, Lindner D, Stake CE, et al. (2015) Does obesity affect outcomes after hip arthroscopy? A cohort analysis. J Bone Joint Surg Am. 97: 16-23. [Crossref]
13. Gupta A, Redmond JM, Hammarstedt JE, Stake CE, Domb BG (2015) Does obesity affect outcomes in hip arthroscopy? A matched-pair controlled study with minimum 2-year follow-up. Am J Sports Med. 43: 965-971. [Crossref]
14. (2019) ACS NSQIP Participant Use Data File. [Crossref]
15. Nicolay RW, Selley RS, Terry MA, Tjong VK (2019) Body Mass Index as a Risk Factor for 30-Day Postoperative Complications in Knee, Hip, and Shoulder Arthroscopy. Arthroscopy. 35: 874-882. [Crossref]
16. Cooper JD, Lorenzana DJ, Heckmann N, McKnight B, Mostofi A, et al. (2019) The Effect of Obesity on Operative Times and 30-Day Readmissions After Anterior Cruciate Ligament Reconstruction. Arthroscopy. 35: 121-129. [Crossref]
17. Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie AG, et al. (2014) 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. J Am Coll Cardiol. 63: 2985-3023. [Crossref]
18. Anderson KG, Spicer P, Peercy MT (2016) Obesity, Diabetes, and Birth Outcomes Among American Indians and Alaska Natives. Matern Child Health J. 20: 2548-2556. [Crossref]