Impact of obesity on complications, infection, and patient-reported outcomes in adult spinal deformity surgery

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OBJECT Adult spinal deformity (ASD) surgery is known for its high complication rate. This study examined the impact of obesity on complication rates, infection, and patient-reported outcomes in patients undergoing surgery for ASD.

METHODS This study was a retrospective review of a multicenter prospective database of patients with ASD who were treated surgically. Patients with available 2-year follow-up data were included. Obesity was defined as having a body mass index (BMI) ≥ 30 kg/m². Data collected included complications (total, minor, major, implant-related, radiographic, infection, revision surgery, and neurological injury), estimated blood loss (EBL), operating room (OR) time, length of stay (LOS), and patient-reported questionnaires (Oswestry Disability Index [ODI], Short Form-36 [SF-36], and Scoliosis Research Society [SRS]) at baseline and at 6 weeks, 1 year, and 2 years postoperatively. The impact of obesity was studied using multivariate modeling, accounting for confounders.

RESULTS Of 241 patients who satisfied inclusion criteria, 175 patients were nonobese and 66 were obese. Regression models showed that obese patients had a higher overall incidence of major complications (IRR 1.54, $p = 0.02$) and wound infections (odds ratio 4.88, $p = 0.02$). Obesity did not increase the number of minor complications ($p = 0.62$), radiographic complications ($p = 0.62$), neurological complications ($p = 0.861$), or need for revision surgery ($p = 0.846$). Obesity was not significantly correlated with OR time ($p = 0.23$), LOS ($p = 0.9$), or EBL ($p = 0.98$). Both groups experienced significant improvement over time, as measured on the ODI ($p = 0.0001$), SF-36 ($p = 0.0001$), and SRS ($p = 0.0001$) questionnaires. However, the overall magnitude of improvement was less for obese patients (ODI, $p = 0.0035$; SF-36, $p = 0.0012$; SRS, $p = 0.022$). Obese patients also had a lower rate of improvement over time (SRS, $p = 0.0085$; ODI, $p = 0.0001$; SF-36, $p = 0.0001$).

CONCLUSIONS This study revealed that obese patients have an increased risk of complications following ASD correction. Despite these increased complications, obese patients do benefit from surgical intervention; however, their improvement in health-related quality of life (HRQL) is less than that of nonobese patients.

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KEY WORDS adult spinal deformity; obesity; complications; outcomes; deformity

ABBREVIATIONS ASD = adult spinal deformity; BMI = body mass index; CCI = Charlson Comorbidity Index; EBL = estimated blood loss; HRQL = health-related quality of life; IBF = interbody fusion; IRR = incidence rate ratio; LOS = length of stay; ODI = Oswestry Disability Index; OR = operating room; SF = Short Form; SRS = Scoliosis Research Society.

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IN 2011, a publication by Finucane et al.²⁰ reported that the worldwide population had gained 0.4–0.5 kg/m² per decade since 1980. The obese (body mass index [BMI] ≥ 30 kg/m²) and overweight (BMI ≥ 25 kg/m²) populations are increasing worldwide, with 4 of 10 adults classified as overweight or obese in 2013, according to the Global Burden of Disease Study.⁴⁴ Obesity is particularly prevalent in the US, where 31.7% of adult men and 33.9% of adult women are classified as obese, accounting for a total of 13% of the global obese population; this number is expected to increase.

Adult spinal deformity (ASD) is common, and its incidence increases with age. The prevalence of ASD in the elderly population has been investigated, with Schwab et al.⁵⁶ reporting rates of ASD up to 68% in patients over the age of 65 years.

Regarding ASD treatment, multiple reports have documented the superiority of surgical intervention and its potential ability to improve pain and disability, the 2 primary presenting complaints of patients with ASD.^{5,23,61,62} However, several authors have identified high complication rates following ASD surgery,^{3,12,13,27,39,57,63,68} with complication rates as high as 95%.³⁹

Several studies have examined the impact of obesity on the surgical treatment of spinal pathologies and reported increased surgical-site infections for obese patients in the context of elective lumbar spinal fusion for degenerative conditions.^{15,47} When looking at overall complications in the context of lumbar and cervical spine surgery, the effect of obesity is more controversial. Whereas some authors have associated obesity with increased complication rates,^{6,32,33,40,58,59} others failed to detect a link between BMI and postoperative morbidity.^{45,65,75} Similarly, there is no consensus on the impact of BMI on patient-reported outcomes. Several authors have reported inferior postoperative outcomes in obese patients undergoing elective degenerative lumbar, cervical, and deformity surgery,^{2,34,76} whereas others did not find that obesity negatively impacts measures of health-related quality of life (HRQL).^{15,26,53,70} In the spinal deformity literature, a publication by Smith et al. identified high BMI as a risk factor for worse postoperative outcomes in both older and younger ASD patients undergoing surgical treatment.⁶⁴ Recently, a subgroup analysis of the Spine Patient Outcomes Research Trial (SPORT)⁵¹ concluded that obese patients with degenerative spondylolisthesis and spinal stenosis experienced similar postoperative improvement compared with nonobese patients. However, nonoperatively treated obese patients reported significantly worse outcomes than nonobese patients. The majority of the body of evidence on the impact of obesity on complications and outcomes in spinal surgery focuses on specific spinal pathologies such as elective lumbar degenerative conditions, spinal stenosis, and cervical-spine deformities. Thus, the clinical relevance of obesity in the context of ASD surgery has not been well defined.

In the present study, our objective was to investigate the impact of obesity on complications, infection, and patient-reported outcomes for adults with spinal deformity undergoing surgical treatment.

Methods

Database

A multiinstitutional prospective database of consecutively enrolled ASD patients was queried to obtain the data. This database included patients enrolled at 11 institutions across the US, each with a high volume of ASD surgery (> 100 cases performed annually). Institutional review board approval was obtained at all participating centers. Inclusion criteria for the database were: age > 18 years, presence of spinal deformity as defined by scoliosis Cobb angle $\geq 20^\circ$, sagittal vertical axis (SVA) ≥ 5 cm, pelvic tilt $\geq 25^\circ$, and/or thoracic kyphosis (TK) $\geq 60^\circ$. Exclusion criteria included spinal deformity of a neuromuscular etiology and presence of active infection or malignancy.

Data Collection

In addition to the aforementioned inclusion criteria for the database, the present study only included the patients with complete HRQL and clinical data at baseline and 2-year follow-up. Patients without recorded baseline BMI were excluded. Specifically, the following demographic and clinical data were obtained for each patient: age, sex, BMI, Charlson Comorbidity Index (CCI) score,⁹ smoking status, comorbidities, and surgical history. Surgical data collected included surgical approach, osteotomies performed, levels fused, operating room time (OR time), estimated blood loss (EBL), use of interbody fusion (IBF) or decompression, and length of hospital stay (LOS).

Obesity was defined as a BMI ≥ 30 kg/m² (<http://www.cdc.gov/obesity/adult/defining.html>). The incidence of specific complications related to the index procedure was evaluated (Table 1) and the timing of the complications was recorded. Complications were categorized as major and minor according to criteria previously reported.²⁷ Standardized HRQL measures included the Oswestry Disability Index (ODI),¹⁷ Scoliosis Research Society-22 (SRS-22),⁴ and Short Form-36 (SF-36)⁷² questionnaires and were collected at baseline and at 6 weeks, 1 year, and 2 years after surgery.

Statistical Analysis

Statistical analysis was performed using Stata v13 (StataCorp.). Univariate testing was performed using Student t-tests or chi-square tests as appropriate. The correlation of obesity and complications (major, minor, overall, radiographic, implant-related, revision surgery, neurological, and wound infection) was examined using multivariate Poisson or logistic regression modeling as appropriate. The impact of obesity on perioperative data (EBL, LOS, and OR time) was examined using multivariate linear regression. The effect of obesity on HRQL measures (SRS-22, ODI, and SF-36 scores) was determined using multivariate repeated-measures mixed models. All models accounted for potential confounders as determined by univariate analysis and expert opinion. The level of significance was $p < 0.05$.

Results

Demographic and Operative Data

A total of 286 patients in the database were eligible for

TABLE 1. Complications checklist for patients undergoing ASD surgery

Complications	Major	Minor
Infection	Deep Pneumonia Sepsis	Superficial Urinary tract infection <i>Clostridium difficile</i>
Implant	Hook dislodgement Interbody fracture Interbody migration Rod fracture Rod dislodgement Screw fracture	Painful implants Prominence Screw malposition Interbody subsidence Crosslink dislodgement Set screw dislodgement Screw–bone interface loosening
Neurological	Visual deficit/blindness Brachial plexus injury Cerebrovascular accident/stroke Spinal cord injury with incomplete deficit Spinal cord injury with complete deficit Nerve root injury with weakness Retrograde ejaculation Bowel/bladder deficit	Neuropathy or sensory deficit Pain (radiculopathy) Peripheral nerve palsy Delirium
Cardiopulmonary	Cardiac arrest Pulmonary embolism Respiratory arrest Deep vein thrombosis Congestive heart failure Myocardial infarction Reintubation Acute respiratory distress syndrome	Coagulopathy Arrhythmia Pleural effusion Pneumothorax
Gastrointestinal	Obstruction Perforation Bleed requiring surgery Pancreatitis requiring surgery Cholecystitis requiring surgery Liver failure Superior mesenteric artery syndrome	Ileus Bleed not requiring surgery Pancreatitis not requiring surgery Cholecystitis not requiring surgery
Radiographic	DJK (requiring surgery) PJK (requiring surgery) Pseudarthrosis	DJK (not requiring surgery) PJK (not requiring surgery) Coronal imbalance Curve decompensation Heterotopic ossification Sagittal imbalance Adjacent-segment degeneration
Renal	Acute renal failure requiring dialysis	Acute renal failure requiring medical intervention
Wound problems	Dehiscence requiring surgery Hematoma/seroma with neurological deficit Hematoma/seroma, no neurological deficit requiring surgery Incisional hernia	Hematoma/seroma not requiring surgery Hernia Dehiscence not requiring surgery
Operative	Retained sponge/instrument Wrong surgical level Unintended extension of fusion Vascular injury Visceral injury EBL >4 L	Dural tear Fixation failure (hook/screw) Implant failure Pedicle fracture Posterior element fracture Vertebral body fracture
Vascular	Vascular injury	Coagulopathy Thrombophlebitis
Mortality	All major	

DJK = distal junctional kyphosis; PJK = proximal junctional kyphosis.

2-year follow-up, of which 45 patients were excluded from the study due to absence of baseline BMI data ($n = 17$) and incomplete HRQL data ($n = 28$). A total of 241 patients met inclusion criteria (175 nonobese, 66 obese). Baseline characteristics and perioperative data for obese and non-obese patients were compared (Table 2). Patients in the obese group had an average BMI of 36.05 kg/m² versus 24.24 kg/m² for the nonobese ($p < 0.0001$). Compared with nonobese patients, the obese group was, on average, older (mean age of 59.8 years vs 53.6 years, $p = 0.0038$), had more baseline comorbidities (mean CCI of 2.01 vs 1.19, $p = 0.0002$), had a higher incidence of previous spine surgery (55.4% vs 38.1%, $p = 0.017$), and a lower incidence of smoking (3.1% vs 11.7%, $p = 0.048$). The 2 groups were similar with regard to sex distribution ($p = 0.46$).

When comparing the magnitude of surgery between the 2 groups, obese patients had a higher incidence of major (3-column) osteotomies (27.3% vs 15.4%, $p = 0.035$) and decompression performed (72.7% vs 49.1%, $p = 0.001$). There were no statistically significant differences between the 2 groups with regard to the number of levels fused ($p = 0.8$), the incidence of IBF ($p = 0.288$), and the surgical approach ($p = 0.34$) (Table 2).

The differences between the 2 groups in regard to demographic data and magnitude of surgery were accounted for in all subsequent analysis through multivariate modeling.

Complications

Overall, a total of 167 patients sustained at least 1 complication (69% overall rate, 65% for nonobese patients, and 78.8% for obese patients), with 94 patients (39% overall rate, 33.7% for nonobese patients, and 53% for obese patients) sustaining at least 1 major complication and 118 patients (49% overall rate, 46.3% for nonobese patients, and 56% for obese patients) sustaining at least 1 minor complication. The impact of obesity on overall, major, and minor complications was analyzed using multivariate Poisson regression, adjusting for the following confounders: age, smoking status, comorbidities, previous spine surgery, and magnitude of surgery (osteotomy, decompression). The results showed that obese patients had a higher rate of major complications (incidence rate ratio [IRR] 1.54, $p = 0.021$, a trend toward higher overall complications (IRR 1.26, $p = 0.054$), and a similar rate of minor complications ($p = 0.62$) (Table 3).

Individual Complications

Based on the entire study population, the infection rate was 5.4% (3.4% nonobese patients, 10.6% obese patients), and 20.7% of patients (18.8% nonobese patients, 25.75% obese patients) sustained at least 1 radiographic complication, 16% of patients (14.3% nonobese patients, 21.2% obese patients) had at least 1 implant-related complication, and 20.3% of patients (19.4% nonobese patients, 22.7% obese patients) had at least 1 neurological complication. The overall 2-year surgical revision rate was 20.7% (20% nonobese patients, 22.7% obese patients). The effect of obesity on specific types of complications was assessed using multivariate Poisson and logistic regression to adjust for potential confounders. This analysis demonstrated that obesity was an independent risk factor for postopera-

TABLE 2. Comparison of baseline demographic data and surgical magnitude between obese and nonobese patients

Variable	Nonobese	Obese	p Value
No. of patients	175	66	
Baseline patient factors			
BMI (kg/m ²)	24.2	36.1	<0.0001
Sex (F)	86.7%	83.1%	0.46
Age (yrs)	53.6	59.8	0.0038
Previous spine surgery	38.1%	55.4%	0.017
CCI	1.19	2.01	0.0002
Smoker	11.7%	3.1%	0.048
Magnitude of surgery			
Major osteotomy	15.4%	27.3%	0.035
Levels	9.54	9.42	0.8
Posterior-only approach	61.1%	62.1%	0.34
IBF	51.4%	59.1%	0.288
Decompression	49.1%	72.7%	0.001

tive wound infection (odds ratio 4.88, $p = 0.02$). However, obesity was not associated with a significantly increased risk of neurological complications ($p = 0.88$), revision surgery ($p = 0.84$), or radiographic complications ($p = 0.62$). Absolute weight (odds ratio 1.16, $p = 0.064$), rather than BMI ($p = 0.80$), showed a trend toward an increased risk of implant-related complications (Table 4).

Operative Data

To study the impact of obesity on operative data, multivariate linear regression modeling was performed, accounting for potential confounders. Results revealed that obesity did not significantly increase average LOS ($p = 0.9$), average EBL ($p = 0.98$), or average OR time ($p = 0.23$) (Table 5).

Patient-Reported Outcomes

The impact of obesity on HRQL was assessed using multivariate repeated-measures mixed models. Models accounted for age, comorbidities, magnitude of surgery, and major complications including revision surgeries. These analyses demonstrated that both obese and nonobese patients experienced significant improvement in their HRQL over time, as measured on the ODI ($p = 0.0001$), SF-36 ($p = 0.0001$), and SRS ($p = 0.0001$) questionnaires. However, the overall magnitude of improvement was less for obese patients (ODI, $p = 0.0035$; SF-36, $p = 0.0012$; SRS, $p = 0.022$). Obese patients also had a lower rate of improvement over time (SRS, $p = 0.0085$; ODI, $p = 0.0001$; SF-36, $p = 0.0001$) (Table 6, Figs. 1–3).

Discussion

Patient Demographic Data

Twenty-seven percent of patients included in this study were obese, with a mean age of about 60 years, which is consistent with obesity rates in the general population as defined by the Global Burden of Disease study⁴⁴ and the

TABLE 3. Multivariate Poisson regression results showing the IRR of overall, major, and minor complications in obese patients*

Complications, 2 Yrs	IRR	p Value
Overall	1.26	0.054
Major	1.54	0.021
Minor	1.08	0.62

* Complications in patients with BMI ≥ 30 . All models accounted for age, smoking status, comorbidities, previous spine surgery, and magnitude of surgery.

worldwide comparative analyses of long-term trends of BMI.²⁰ Obese patients reported higher rates of comorbidities (CCI), consistent with a report from Ezzati et al. and the WHO.^{16,73}

In 2005, obesity overtook smoking as the most common preventable cause of illness in the US.⁴² Notably, these 2 problems are inversely related, with several studies associating obesity with smoking cessation,^{19,28,31} and weight gain being one of the main concerns for individuals who are considering smoking cessation.⁷¹ In the present study, obese patients also reported a lower incidence of smoking, which is consistent with previous reports. In the present study, obese patients were more likely to require a decompression, which is consistent with previous studies that suggested obesity is a risk factor for spinal stenosis.^{21,34,67}

Methodology of Complications Acquisition

The complications rate in spinal surgery literature varies widely. Many factors may contribute to these variations, such as the characteristics of the studied cohort, the type of surgery performed, and the length of the follow-up. Nasser et al.,⁴³ in a systematic review of the spinal surgery literature, reported that the rate of complications for thoracolumbar surgeries ranged from $< 1\%$ to 70% . Notably, retrospective studies have a tendency to underestimate the incidence of complications.^{7,43}

In the present study, all sites prospectively collected complications based on a standardized data-collection form (Table 1). This methodology helped to facilitate higher accuracy and better estimation of the complications. Comparison with published works that have similar methodology, patient population, and follow-up shows that the overall, major, and minor complication rates in the present study are consistent.^{10,11,22,60,66,68}

Obesity Versus Complications, Perioperative Metrics, and Clinical Outcomes

This study identified obesity as an independent risk factor for increased postoperative complications, even after adjusting for confounders such as comorbidities and magnitude of surgery. This is consistent with the results of other works, including a recent meta-analysis of spine surgery patients by Jiang et al.^{12,32,47} Their study demonstrated that obesity is an independent risk factor for surgical-site infections. These findings are consistent with the literature.^{1,8,15,35,40,49,51,59} In a recent study specific to ASD, Puller Gunne and Cohen⁴⁸ identified risk factors for wound infections in the ASD population and found obesity to be associated with both deep and superficial wound infec-

TABLE 4. Multivariate Poisson and logistic regression showing the IRR and odds ratio of specific complications in obese patients*

Complications, 2 Yrs	IRR/Odds Ratio	p Value
Neurological	0.03	0.881
Radiographic	-0.139	0.626
Revision surgery	1.07	0.846
Infection	4.88	0.02
Implant (BMI)	0.08	0.804
Implant (weight)	1.16	0.064

* All models accounted for age, smoking status, comorbidities, previous spine surgery, and magnitude of surgery. Radiographic complications, implant-related complications, and revision surgeries also accounted for rod size and rod material.

tions. Our results are consistent with these findings and contribute to the small body of evidence on this subject. In a publication looking at lumbar fusion surgery, Mehta et al.⁴¹ found that the thickness of subcutaneous fat and the skin-to-lamina distance are risk factors for surgical-site infections. This is probably due to the fact that thicker subcutaneous fat may require further retraction, leading to increased dead space postoperatively, which in turn increases the risk of infection. Further studies should specifically address the relationship between thickness of subcutaneous fat and surgical-site infection in the context of long fusions for ASD.

In the current study, obesity was not associated with radiographic or implant-related complications. This finding is consistent with recent work by Fu et al.²⁴ Weight itself, rather than BMI, showed a trend toward increased implant-related complications. This suggests that there may be an absolute weight threshold that puts more stress on the implants, leading to higher risk of implant failure due to stress fatigue. For example, a short patient classified as obese based on BMI may not meet this weight threshold. Conversely, a very tall patient may not be classified as obese based on BMI but may still have a weight high enough to put significant stress on the implants, leading to increased risk of implant-related complications.

With regard to perioperative metrics, our data suggest that obesity is not an independent factor for increased OR time, EBL, or LOS. These findings are contrary to the results of studies based on the degenerative spine population.^{6,33,40,58,70,77} Our findings may be explained by the fact that ASD surgery is generally of a greater magnitude than surgery for degenerative spinal conditions, often requiring longer fusion levels and osteotomies. For example, adult

TABLE 5. Multivariate linear regression results looking at EBL, OR time, and LOS*

2-Yr Only	Coefficient	p Value
LOS	0.05	0.9
EBL	5.99	0.98
OR time	23.2	0.23

* All models accounted for age, smoking status, comorbidities, previous spine surgery, and magnitude of surgery.

TABLE 6. Multivariate repeated-measures mixed modeling looking at the impact of obesity on HRQL*

Instrument	Group & Score				p Value
	Nonobese	SE	Obese	SE	
SF-36 physical					
Baseline	33.40	0.58	28.84	0.94	Group: 0.0012 Time: 0.00001 G*T: 0.00001
6 wks	28.72	0.78	30.26	1.06	
1 yr	40.84	0.67	38.92	1.13	
2 yrs	42.76	0.71	36.52	1.14	
ODI					
Baseline	40.32	1.09	49.29	1.77	Group: 0.0035 Time: 0.00001 G*T: 0.0001
6 wks	47.15	1.27	46.81	1.95	
1 yr	26.68	1.24	29.74	2.09	
2 yrs	24.18	1.29	33.19	2.11	
SRS-22					
Baseline	2.88	0.042	2.67	0.069	Group: 0.022 Time: 0.00001 G*T: 0.0085
6 wks	3.06	0.048	3.07	0.074	
1 yr	3.71	0.047	3.57	0.078	
2 yrs	3.76	0.050	3.45	0.080	

* Models accounted for age, comorbidities, magnitude of surgery, and major complications including revision surgeries.

deformity procedures typically involve relatively longer and more varied OR times and LOS, which may make detection of the potential impact of obesity on these parameters more difficult and perhaps relatively less significant. However, it is possible that our study may have been underpowered to detect a small difference in these metrics. Further studies with a larger surgical ASD patient population are required to confirm these findings.

In the present study, obese patients had significantly worse HRQL scores prior to the surgical treatment. This finding is consistent with previous reports suggesting that obesity can contribute to back pain, sciatica, disc-height reduction and degeneration, and eventually worse quality of life and disability.^{14,29,30,36–38,52,54,55,69,74} This added baseline compromise did not preclude obese patients from benefiting from surgery. After adjusting for confounders, including the incidence of major complications, our results show

that obese patients do improve after ASD surgery, although not to the same extent as nonobese patients. This was true for all 3 patient-reported outcomes that were assessed (SF-36 physical, ODI, and SRS scores). Previous studies for spinal conditions other than adult deformity have also identified lower rates of improvement in HRQL scores for obese patients.^{11,18,34,76} However, a recent study by Rihn et al.⁵⁰ that assessed a subgroup analysis of the Spine Patient Outcomes Research Trial (SPORT) showed that, in the context of spinal stenosis and degenerative spondylolisthesis, obese patients experience postoperative improvements similar to those of nonobese patients, whereas they do significantly worse with nonoperative treatment, resulting in a larger treatment effect of surgery in obese patients. Our study did not examine how obese patients benefit from nonoperative treatment, and further studies should look at this question in the ASD population.

FIG. 1. Results of multivariate repeated-measures mixed models show the difference between SF-36 physical scores in obese versus non-obese groups at baseline and at 6-week, 1-year, and 2-year follow-up. Figure is available in color online only.

FIG. 2. Results of multivariate repeated-measures mixed models show the difference between ODI scores in obese versus nonobese groups at baseline and at 6-week, 1-year, and 2-year follow-up. Figure is available in color online only.

FIG. 3. Results of multivariate repeated-measures mixed models show the difference between SRS scores in obese versus nonobese groups at baseline and at 6-week, 1-year, and 2-year follow-up. Figure is available in color online only.

Obesity as a Risk Factor for Reoperation

After adjusting for age, smoking status, comorbidities, previous spine surgery, and magnitude of surgery, obesity was not a significant risk factor for reoperation in the current study of ASD patients. This is contrary to the literature in the elective lumbar surgery population,^{25,32} but can be explained by the reality that ASD has an overall high reoperation rate (20.3% in our series). Furthermore, ASD revisions are often due to implant failure, pseudarthrosis, or proximal junctional kyphosis,⁴⁶ complications that may be heightened by the biomechanical impact of excess weight.

Limitations of the Study

This study has several limitations. Due to its observational nature, the obese and nonobese groups were different in regard to baseline patient characteristics and magnitude of surgery. Although we accounted for these variables through multivariate analysis, it is possible that there are some unmeasured sources of bias that we were unable to adjust for. Moreover, due to the relatively small sample size, it is possible that our study was underpowered to detect smaller differences in some of our outcome measures, such as EBL and OR time. Additionally, it would have been interesting to examine if the super-obese patients (obesity Class III) are at even greater risk of postoperative complications. However, we were not able to do any subgroup analysis due to our sample size. Finally, although it would be interesting to follow these patients for a longer period of time to determine the long-term impact of obesity after ASD surgery, our follow-up period was limited to 2 years.

Conclusions

This study found that obese patients are a higher-risk group than the general ASD population and quantifies that risk. Despite increased complications, obese patients do benefit from ASD surgery. However, their improvement in HRQL measures appears to be less than that of nonobese patients. These findings may prove useful as part of the

preoperative discussion with obese patients with ASD who are considering surgical intervention.

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