Thoracic Surgery Considerations in Obese Patients

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KEYWORDS

• Obesity • Thoracic surgery • Comorbidities • Complications • Outcomes

KEY POINTS

- Obese patients pose special risks for thoracic surgery procedures because of physical body habitus and obesity-related comorbidities.
- Special intraoperative considerations are required when performing thoracic surgery on obese patients in order to minimize the risk of unanticipated adverse events.
- Postoperative care should be directed toward optimizing pain control, pulmonary hygiene, and ambulation.

INTRODUCTION

Obesity in the United States has been a growing epidemic for the past several decades. In 2014, 37.8% of adults 20 years of age and older were classified as obese (body mass index [BMI] $\geq$30), which was a steady increase from 22.9% in 1988[1] (**Fig. 1**). The percentage of adults with grade 3 obesity, or morbid obesity (BMI $\geq$40), more than doubled from 2.9% in 1988 to 7.6% in 2014. This increasing trend has been more dramatic over the last decade among women, with 40.4% categorized as obese.[2] In addition to gender, other factors associated with obesity include age, ethnicity, geographic location, and socioeconomic status.[3] The incidence of obesity-related diseases, such as hypertension, cardiovascular disease, diabetes mellitus (DM), and chronic kidney disease, have similarly increased over the same time span.[4] At present, approximately 1 in 10 adults in the United States are diagnosed with DM, with 90% to 95% of cases being type 2.[5] More recently, obstructive sleep apnea (OSA) has been recognized as a growing problem alongside the obesity epidemic given its important clinical associations with cardiovascular disease.[6] Higher BMI is also associated with increased mortality from all causes and therefore decreased life expectancy, particularly in the young adult population.[7,8] All of these obesity-related comorbidities have important implications regarding the risks associated with surgical interventions.

In addition to the direct deleterious health effects of obesity, other significant medical conditions in the spectrum of thoracic surgery diseases are more prevalent in obese patients compared with the general population. Several studies have shown a dose-dependent relationship between increasing BMI and symptoms of gastroesophageal reflux disease (GERD),[9,10] particularly in women.[11,12] A study by Che and colleagues[13] using upper gastrointestinal contrast studies on 181 morbidly obese patients revealed the presence of hiatal hernia in 37% of patients

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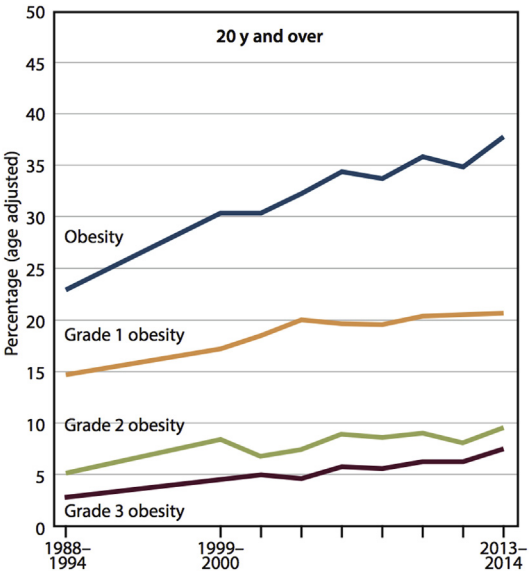

Fig. 1. Obesity trend in the United States for adults aged 20 years and older from 1988 to 2014. (*From* National Center for Health Statistics. Health, United States, 2016: with chartbook on long-term trends in health. Hyattsville (MD): 2017. p. 21. Available at: https://www.cdc.gov/nchs/data/hus/hus16.pdf.)

and GERD in nearly 40%. The high frequency of reflux disease also implies an increased incidence of Barrett esophagus in obese patients. Although data on this association have been mixed,[9,10,14] 2 pooled meta-analyses showed that increased BMI was associated with increased risk of esophageal adenocarcinoma.[10,15] Molecular and genetic studies also showed this relationship,[16,17] although the exact mechanism remains unclear and is likely multifactorial. Lung cancer is unusual in that it has consistently shown an inverse relationship with BMI.[18,19] The exception is a case-control study on patients who never smoked, or who had stopped smoking for at least 10 years, which found a positive relationship between BMI and lung cancer risk.[20] Nonetheless, the percentage of obese patients with lung cancer who present for major pulmonary resection has increased over the last several decades.[21] Many other cancers whose primary therapy is surgery have also been linked to obesity.[22] Overall, the prevalence of obesity alone makes it likely that thoracic surgeons will see obese patients routinely in their practices.

This article summarizes some of the key elements regarding the preoperative, intraoperative, and postoperative management of obese patients undergoing thoracic surgery. The importance of proper preoperative evaluation of obesity-related comorbidities is highlighted. Careful planning of the entire operation is discussed, which includes selection of the procedure, anesthesia and airway strategy, patient positioning in the operating room, and extubation plan. Postoperative pain control, pulmonary hygiene, and prevention of venous thromboembolic events are reviewed. In addition, literature on outcomes after surgical resection of lung and esophageal cancer in the obese population is presented.

PREOPERATIVE ASSESSMENT OF COMORBIDITIES AND RISK FACTORS FOR SURGERY

Obesity is associated with a variety of medical conditions that can affect the risk of undergoing major surgery and the occurrence of postoperative complications.[4,5,8] **Table 1** shows the accepted definitions of obesity based on BMI, and a list of important obesity-related comorbidities is presented in **Table 2**. Preoperative assessment of obese patients for thoracic surgery begins with a careful history and examination, with particular attention to signs or symptoms that could be associated with any of the conditions listed in **Table 2**. Findings from the history and examination should direct further preoperative testing.

Obesity is an independent risk factor for cardiovascular disease[23,24]; therefore, evaluation of underlying heart conditions should be a major focus of the preoperative assessment.[25] A thorough history should evaluate for the presence of hypertension, hyperlipidemia, DM, and other symptoms of coronary artery disease equivalents, including claudication or neurologic symptoms suggestive of transient ischemic attack. Dyspnea, fatigue, and lower extremity edema, although common and nonspecific in the obese population, should be noted given that increased BMI is associated with left ventricular diastolic dysfunction[26,27] and right ventricular dysfunction even in the absence

Table 1
Classification of body mass index

Classification	BMI (kg/m^2)
Underweight	<18.5
Normal	18.5–24.9
Overweight	25–29.9
Obese	≥30
Grade 1	30–34.9
Grade 2	35–39.9
Grade 3 (morbid obesity)	≥40
Grade 4	≥50
Grade 5	≥60