Review Article

Obesity and outcomes for esophagectomy

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Abstract: Obesity is increasing worldwide. At the same time, the prevalence of esophageal cancer markedly increased in Western countries during recent decades. Several studies on the influence of a high body mass index (BMI) on the postoperative course and survival after esophagectomy have shown contradictory results. This study is a narrative overview of the literature on esophagectomy outcomes in obese patients. Obesity is technically challenging to surgeons mostly in complex procedures. Although it cannot be an independent contraindication to esophagectomy visceral fat seems to worsen perioperative morbidity; therefore, surgeons should ensure meticulous management of co-morbidities and maintain a low threshold for the investigation and management of complications.

Keywords: Esophagectomy; obesity; outcomes; morbidity; mortality

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Introduction

Obesity is increasing worldwide. In the USA, it is estimated that 69% of the population is overweight and 36% are obese (1). In the majority of European countries, the number of overweighed individuals can reach 40–50% of the population (2). At the same time, the prevalence of esophageal cancer markedly increased in Western countries during recent decades (3). Esophageal cancer is the eighth most common cancer and the sixth leading cause of cancer death in the world (4). Consequently, esophageal surgeons will face more obese patients (OB) with malignant diseases of the esophagus or gastric junction who are candidate for surgical treatment.

Esophagectomy is associated to elevated morbidity and mortality (5). It is still not fully elucidated if obesity may contribute to a worsening of these parameters. Obesity may affect clinical decision and outcomes. Most surgeons considered obesity as a technical challenge and may change their operation options when facing high body mass index (BMI) patients. Furthermore, OB may have hypoventilation, reduction of residual volume capacity and expiratory reserve volume due to elevated abdominal pressure (6,7) and comorbidities which can be a cofounder when analyzing surgical outcomes.

This study aims to review the possible impact of obesity in the outcomes of esophagectomy.

Methods

A narrative overview of the literature on esophagectomy outcomes in OB was performed using PubMed database from 2007–2019. The search included human studies and the key words were “esophagectomy”, “obesity and esophagectomy”, “esophagectomy and outcomes”.

Obesity and complications

Some studies demonstrated that esophagectomy in OB patients is feasible with similar morbidity and mortality than normal weigh (NW) patients. Nevertheless, higher rates of specific complications suggest that operation in the OB may be technically more difficult.

Some Western studies found higher rates of perioperative blood loss (6,8), anastomotic leakage (6,9), and recurrent laryngeal nerve injury (8) in the OB. Reinforcing those findings, a meta-analysis performed by a UK group demonstrated rates of anastomotic leakage up to 35% in patients with BMI greater than 30, as opposed to patients with BMI lower than 30 (P=0.003; RR: 0.857; 95% CI: 0.497, 0.867) (10). Likewise, excessive subcutaneous fat seems to climb up the risk of wound infections (11,12). On the East, a Japanese group, who used CT scan to define patients with mediastinal fat adiposity (MFA) before minimal invasive esophagectomy, demonstrated similar findings. They obtained a positive correlation between MFA and longer operative time. The authors also found a higher rate of recurrent laryngeal nerve palsy in the OB (13). They completed their study at the same hospital 1 year after. Again, they used CT scan to evaluate patients' profile and found positive correlation between high visceral obesity (HVO), prolonged surgical time and blood loss (14), suggesting that excessive fat tissue should be a hindrance to the surgical procedure. At the same time, a recent meta-analysis from China demonstrated that anastomotic leakage where higher in OB group as well as thromboembolic and pulmonary complications as compared to the NW group (15). It makes sense because OB may have worse pulmonary capacity and worse immunological response, besides higher thromboembolic risks as evidenced by Virchow triad.

On the other hand, some studies did not find a significant impact of obesity in surgical complications. A Scandinavian series found similar rates of major complications even anastomotic leakage (16) according to BMI. Comparably, other studies also did not correlate perioperative morbidity, mortality, blood loss, operative time and the rate of R0 resection to BMI despite increasing percentage of diabetes, hiatal hernia and Barret Esophagus in the OB group (17,18). A meta-analysis encompassing esophagectomies from 1980–2012 agreed with those results and had no difference on overall complications, reoperation, mortality or wound infection. However, when diabetes and obesity were present the incidence of anastomotic leakage raised. The authors draw attention to the fact that OB have more comorbidities than NW, consequently a great number of OB may be considered as high-risk patients and were excluded for surgical treatment (19).

Naturally, surgeons tend to be less aggressive and indicate less surgical treatment depending on patients' comorbidities, therefore, these surely is a clear bias that could justify the contradictory results. Besides, adopting only BMI as classification, the authors ignore the difference between visceral obesity and peripheral obesity. The only study that evaluated visceral obesity found higher perioperative morbidity according to visceral fat accumulation (14).

Obesity and survival

Once more, the same Japanese group demonstrated that HVO was associated with poor preoperative treatment response and worse overall survival (14). He suggests that results should be correlated to chronic tissue inflammation and greater surgical inflammatory response in obese patients (20). He based on recent studies that have shown intensified acute inflammatory response in visceral obesity (21,22). Visceral obesity is associated with higher serum levels of proinflammatory cytokines than that of anti-inflammatory cytokines and higher 90-day mortality in septic patients (22). Moreover, VFA was reported to correlate with the development of systemic inflammatory response syndrome and disease severity in patients with acute pancreatitis (21).

Obesity may influence the number of lymph nodes retrieved in the lymphadenectomy. A Chinese group in 2013 compared the outcomes for esophagectomy in patients with esophageal squamous cell cancer. There was no difference in 3 years overall survival according to BMI, but disease recurrence was higher in the high BMI group although it did not reach statistical significance. The authors suggest that those findings should reflect the technical difficult to lymph nodes resection related to mediastinal fat tissue since the number of retrieved lymph nodes was lower in the high BMI group (23). Oppositely, other studies contradicted those results demonstrating that the number of retrieved lymph nodes was equal regardless of BMI (9,17,18). Although we are not sure if there is a difference in the number of lymph nodes resected, this fact seems not to be fundamental in the overall survival.

The majority of studies agree that obesity did not influence mortality (9,10). A Chicago group studied patients from 2010–2013 who were submitted to esophagectomy. They found same overall survival in all groups contradicting some other western studies who observed greater overall survival on the OB *vs.* underweight (UW) group. They suggest that malnutrition is a worse condition than

obesity and needs nutritional support before surgery (24). Europeans reported similar results with no overall survival difference in 1–2 and 5 years follow-up (16). A Chinese group corroborate western findings. Esophageal squamous cell cancer was the majority and patients were operated by Ivor Lewis technique. The follow-up was 30 months and there was no difference in morbidity or mortality (17). We understand that these findings may be correlated with better nutritional status and lower cachexia in the BMI high group.

Revoking previous western and Asian studies, a Chinese meta-analysis described worsen 5-year overall survival after esophagectomy in OB with squamous cell esophageal cancer. The 5-year overall survival was respectively NW 40.8%, OW 44.7%, OB 24.8% P=0.03 (25). However, Asian groups define OB with lower BMI and they have more squamous cell cancer than adenocarcinoma, which can be a bias. In addition, Okamura demonstrated that HVO was associated with poor preoperative treatment response and worse overall survival (14), once again, visceral fat playing an important role in the analysis of the results.

Conclusions

Obesity is a chronic disease increasing worldwide mainly in the Western world (1,2). There is no doubt that esophagectomy is a very demanding operation and the majority of surgeons fear to operate obese patients. Nevertheless, it still unclear if obesity is an independent factor for worse morbidity and mortality.

Obesity is technically challenging to surgeons mostly in complex procedures and probably are associated to worse perioperative morbidity when considering visceral fat besides BMI classification (14). Moreover, OB patients have more comorbidities than NW patients (19) and it should be a selection bias when to decide for surgical treatment.

Most studies demonstrated same overall survival in the OB (9,10), that can be explained due to the better nutritional status and lower cachexia.

Although it cannot be an independent contraindication to esophagectomy, visceral fat seems to worsen perioperative morbidity; therefore, surgeons should ensure meticulous management of co-morbidities and maintain a low threshold for the investigation and management of complications.

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Footnote

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References

1. Garvey WT, Garber AJ, Mechanick JI, et al. American Association of Clinical Endocrinologists and American College of Endocrinology Consensus Conference Obesity: Building An Evidence Base for Comprehensive Action. Endocr Pract 2014;20:956-76.
2. Gloy VL, Briel M, Bhatt D, et al. Bariatric Surgery versus Non-surgical Treatment for Obesity: A Systematic Review and Meta-analysis of Randomized Controlled Trials. BMJ 2013;347:f5934.
3. Brown LM, Devesa SS, Chow WH. Incidence of adenocarcinoma of the esophagus among white Americans by sex, stage, and age. J Natl Cancer Inst 2008;100:1184-7.
4. Ferlay J, Shin HR, Bray F, et al. Estimates of worldwide

burden of cancer in 2008: GLOBOCAN 2008. Int J Cancer 2010;127:2893-917.
5. Hulscher JB, Van Sandick JW, De Boe AG, et al. Extended transthoracic resection compared with limited transhiatal resection for adenocarcinoma of the esophagus. N Engl J Med 2002;347:1662-9.
6. Healy LA, Ryan AM, Gopinath B, et al. Impact of obesity on outcomes in the management of localized adenocarcinoma of the esophagus and esophagus gastric junction. J Thorac Cardiovasc Surg 2007;134:1284-91.
7. Adams JP, Murphy PG. Obesity in anesthesia and intensive care. Br J Anaesth 2000;85:91-108.
8. Scipione CN, Chang AC, Pickens A, et al. Transhiatal esophagectomy in the profoundly obese: implications and experience. Ann Thorac Surg 2007;84:376-82; discussion 383.
9. Blom RL, Lagarde SM, KlinKlenbijl JH, et al. A high body mass index in esophageal cancer patients does not influence postoperative outcome or long-term survival. Ann Surg Oncol 2012;19:766-71.
10. Mengardo V, Pucetti F, Mc Cormack O, et al. The impact of obesity on esophagectomy: a meta-analysis. Dis Esophagus 2018. doi: 10.1093/dote/dox149.
11. Bhayani NH, Gupta A, Dunst CM, et al. Does morbid obesity worsen outcomes after esophagectomy? Ann Thorac Surg 2013;95:1756-61.
12. Mullen JT, Davenport DL, Hutter MM, et al. Impact of body mass index on perioperative outcomes in patients undergoing major intra-abdominal cancer surgery. Ann Surg Oncol 2008;15:2164-72.
13. Okamura A, Watanabe M, Kurogochi T, et al. Mediastinal Adiposity Influences the Technical Difficulty of Thoracic Procedure in Minimally Invasive Esophagectomy. World J Surg 2016;40:2398-404.
14. Okamura A, Watanabe M, Yamashita K, et al. Implication of visceral obesity in patients with esophageal squamous cell carcinoma. Langenbecks Arch Surg 2018;403:245-53.
15. Wang P, Li Y, Haibo S, et al. Predictive Value of Body Mass Index for Short-Term Outcomes of Patients with Esophageal Cancer After Esophagectomy: A Meta-analysis. Ann Surg Oncol 2019;26:2090-103.
16. Kruhlikava I, Kirkegård J, Mortensen FV, et al. Impact Of Body mass Index On complications and survival after surgery for esophageal and gastro-esophageal-Junction cancer. Scand J Surg 2017;106:305-10.
17. Miao L, Chen H, Xiang J, et al. A high body mass index in esophageal cancer patients is not associated with adverse outcomes following esophagectomy. J Cancer Res Clin Oncol 2015;141:941-50.
18. Melis M, Weber J, Shridhar R, et al. Body mass index and perioperative complications after oesophagectomy for adenocarcinoma: a systematic database review. BMJ Open 2013. doi: 10.1136/bmjopen-2012-001336.
19. Kayani B, Okabayashi K, Ashrafian H, et al. Does Obesity Affect Outcomes in Patients Undergoing Esophagectomy for Cancer? A Meta-analysis. World J Surg 2012;36:1785-95.
20. Okamura A, Watanabe M, Fukodome I. Relationship Between Visceral Obesity and Postoperative Inflammatory Response Following Minimally Invasive Esophagectomy. World J Surg 2018;42:3651-7.
21. Yashima Y, Isayama H, Tsujino T, et al. A large volume of visceral adipose tissue leads to severe acute pancreatitis. J Gastroenterol 2011;46:1213-8.
22. Pisitsak C, Lee JG, Boyd JH, et al. Increased ratio of visceral to subcutaneous adipose tissue in septic patients is associated with adverse outcome. Crit Care Med 2016;44:1966-73.
23. Cheng Y, Wang N, Wang K, et al. Prognostic value of body mass index for patients undergoing esophagectomy for esophageal squamous cell carcinoma. Jpn J Clin Oncol 2013;43:146-53.
24. Wightman SC, Posner MC, Patti MG. Extremes of body mass index and postoperative complications after esophagectomy. Diseases of the Esophagus 2017;30:1-6.
25. Duan XF, Tang P, Shang XB. High Body Mass Index Worsens Survival in Patients with Esophageal Squamous Cell Carcinoma after Esophagectomy. Dig Surg 2017;34:319-27.

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