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Research Week 2024

Metabolic Syndrome is Associated with Increased Rate of Complications Following Minimally Invasive Esophagectomy for Esophageal Adenocarcinoma

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Keywords

Metabolic Syndrome; Retrospective Studies; Esophagectomy; Obesity; Adenocarcinoma; Esophageal Neoplasms; Multivariate Analysis; Adenosine Triphosphate; Intensive Care Units

Abstract

Introduction
It has been reported that obesity is associated with adverse outcomes following esophagectomy for resectable esophageal adenocarcinoma (EAC). To our knowledge, however, no study has investigated the direct impact of underlying metabolic syndrome (MetS) on peri-operative outcomes following minimally invasive esophagectomy.

Methods
This is a retrospective, chart-review analysis of our institutional esophageal cancer database combined with institutional NSQIP data between the years of 2013 – 2023. The definition of MetS was based on a modified version of the 2001 NCEP ATP III definition. Univariate analyses were performed via chi-squared for categorical variables and Student's t-test for continuous data. Multivariate analysis was conducted including variables, with $p < 0.2$ or clinically relevant, for complications and 90-day mortality.

Results
There were 247 patients included in this study, of which 79 (32.0%) met criteria for MetS. Table 1 reports demographics. The MetS group reported a significantly higher complication rate (64.6% vs. 37.9%, $p < 0.001$) and 90-day mortality (8.9% vs 2.4%, $p = 0.02$) along with a trend toward more prolonged ICU stay (45.6% vs. 33.7%, $p = 0.07$), compared to non-MetS group. MetS was a significant predictor of post-operative complications (OR = 2.49, $p = 0.005$) and 90-day mortality (OR 4.48, $p=0.04$) in the multivariate analysis.

Conclusion
Our data suggest that the presence of underlying MetS increases the likelihood of experiencing a perioperative complication and 90-day mortality following minimally invasive esophagectomy for EAC.

Table 1. Demographics of the Patient Population and Select Complications Following MIE.

	Non-MetS, n (%)	**MetS, n (%)**	**p-value**
N	168 (68)	79 (32)	
Age (STD)	65.4 (9.2)	66.8 (8.7)	0.24
BMI (STD)	26.7 (4.9)	29.7 (6.0)	**<0.001**
Male Sex	139 (82.2)	76 (96.2)	**0.003**
Current Smoker	26 (15.4)	15 (19)	0.48
ASA class 3 or 4	143 (84.6)	75 (94.9)	**0.02**
Race			**0.02**
White	167 (98.8)	74 (93.7)	**0.02**
Non-white	2 (1.2)	5 (6.3)	
Clinical stage			
Stage 1	10 (6)	8 (10.1)	**0.037**
Stage 2	19 (11.3)	8 (10.1)	
Stage 3	97 (57.7)	55 (69.6)	
Stage 4	42 (25)	8 (10.1)	
Neoadjuvant Chemoradiotherapy	156 (92.9)	71 (89.9)	0.52
Pathologic complete response	33 (19.6)	14 (17.7)	0.74
Any complications	64 (37.9)	51 (64.6)	**<0.001**
Clavien-Dindo classification grade >IIIA	40 (23.8)	27 (34.2)	0.08
ICU stay > 3 days	57 (33.7)	36 (45.6)	0.07
Hospital stay > 30 days	8 (4.7)	6 (7.6)	0.36
90-day Mortality	4 (2.4)	7 (8.9)	**0.02**

BMI, Body mass index; ASA, American Society of Anesthesiologists Physical Status Score; STD, standard deviation; ICU, intensive care unit

Table 2. Multivariate Model for Complication following MIE

	Odds Ratio	Confidence Interval	p-value

Age	1.01	(0.98-1.04)	0.46
Race (white)	0.51	(0.09-2.88)	0.45
Sex	1.35	(0.60-3.01)	0.47
BMI	1.02	(0.96-1.07)	0.55
Current Smoker	0.54	(0.26-1.11)	0.09
Clinical Stage			
Stage 1			0.27
Stage 2	0.21	(0.02-2.70)	
Stage 3	0.49	(0.04-6.11)	
Stage 4	0.51	(0.04-6.54)	
nCRT	1.29	(0.12-13.97)	0.84
Operative Time	1.00	(0.997-1.004)	0.83
Metabolic Syndrome	2.49	(1.31-4.72)	**0.005**

BMI, Body mass index; nCRT, neoadjuvant chemoradiotherapy