Geographic Variations in the Operative Approach for Esophageal Adenocarcinoma

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Introduction

Esophageal cancer is the 8th most common cancer globally, with incidence and mortality in the US decreasing while increasing globally. [1] The treatment of this disease is multifaceted, requiring the coordination of many providers. [2] Given the complex nature of caring for these patients, there is variability of practice based on patient geography, with a certain subset of the population more likely to proceed to surgical resection. [3] Additionally, there is conflicting evidence of outcome discrepancies in patients when treated in rural vs urban, and community vs academic settings. [4,5] One factor that has not been well studied in the literature is variations in surgical approaches for esophagectomy in different geographic and facility settings. Robotic-assisted esophagectomy (RAE) was first introduced in 2003 and has been increasingly utilized. [6,7,8] The advantage of RAE and minimally invasive esophagectomy (MIE) over open esophagectomy is well established with improved mortality and morbidity. However, the outcome difference between RAE vs MIE is more controversial, though RAE may provide the benefit of 3-dimensional viewing and wrist flexibility. In this study, we evaluate whether discrepancies exist in the surgical approaches used in rural vs urban and academic vs community settings.

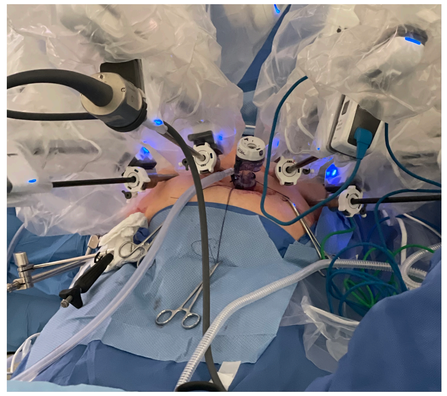

Figure 1. Robotic approach to esophageal surgery [11]

Methods and Materials

Using the National Cancer Data Base (NCDB), we retrospectively analyzed patients who were diagnosed with esophageal adenocarcinoma (EAC) and underwent esophagectomy. Based on NCDB criteria, we stratified patients by geography, rural vs urban, and by facility type, community vs academic. We examined the surgical approach, RAE vs MIE vs Open, in each setting to evaluate any differences. Additionally, we investigated the change in surgical approaches over the years.

Year	Rural (%)	Urban (%)	Community (%)	Academic (%)
2010	3	2.2	1.7	2.4
2011	5.6	4.6	3	5.2
2012	5.6	6.8	3.2	7.6
2013	7.6	6.8	4.2	7.7
2014	6.9	9.4	6.1	10
2015	7.9	8.5	6.7	8.9
2016	9.6	9.2	8.2	9.6
2017	9.6	13.6	12.7	13.2
2018	13.6	16	12.9	16.5
2019	21.2	19.5	17.9	20.2
2020	17.5	21.5	18.5	22
2021	28.8	23	19.4	25.1
2022	25.9	25.9	24.4	26.3

Table 1. Robotic esophagectomy (percent of total)

Results

A total of 4006 (12.6%) patients underwent esophagectomy in the rural setting vs 27740 (87.3%) patients in the urban setting between the years 2010-2022. In regards to the surgical approach, 12.6% of patients underwent RAE in the rural setting compared to 13.4% in the urban setting. The robotic-to-open conversion rates in rural vs urban centers were 4.0% and 4.1%, respectively. Comparing community vs academic centers, 7481 (23.8%) patients underwent esophagectomies in community centers vs 23909 (76.1%) patients in academic centers. The robotic-to-open conversion rates were 5.1% and 6.1%, respectively. The yearly trend in operative approaches is shown in Table 1.

Conclusions

Geographic and facility variations exist in operative approaches when comparing rural vs urban and community vs academic centers. Though there was no statistically significant difference in 90-day mortality in rural (5.4%) vs urban centers (5.9%), patients undergoing esophagectomy had a higher 90-day mortality in community facilities (4.1%) compared to academic centers (2.3%). Patients were more likely to have undergone RAE in urban and academic programs. However, there is no difference in robotic to open conversion rates. Additionally, RAE has been increasingly utilized with no difference in the rate of adoption of this operative approach in all settings. RAE will likely continue to be increasingly used in patients with esophageal adenocarcinoma in all regions and centers.

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