Factors Associated with Minimally Invasive Esophagectomy for esophageal cancer from the National Cancer Database

Background

Esophageal cancer (EC) is the sixth leading cause of cancer-related deaths worldwide[1]. Although less common than SCC overall, esophageal adenocarcinoma (ACC) is the fastest growing cancer within the US.[2–4] Esophagectomy is the only surgical treatment than can provide attempt at cure for incompletely resected T1 lesions, or more invasive SCC or ACC for which endoscopic resection is not an option. Esophagectomy was traditionally performed as an open procedure, either in a transhiatal, thoracic (Ivor Lewis) or three-hole (McKeown) approach, depending on the location of the tumor and comfort of the surgeon. Laparoscopic and robot-assisted minimally invasive esophagectomy (MIE) have been developed in various approaches.[5] When compared to open esophagectomy (OE), MIE has been shown to provide less blood loss, less postoperative pulmonary complications and shorter hospital stay with no difference in disease-free status or long-term survival.[6-8]

Objectives

While there has been much investigation into factors, such as year of diagnosis, gender, economic status and race, that likely explain differences in EC survival, there has been little investigation into the variables that influence adoption of MIS.[19–23] Differences in poorer economic status, increased distance to high volume hospitals, African American race and male gender have correlated with poorer health quality metrics and increased mortality due to EC.[22,24] The purpose of this study was to use the National Cancer Data Base (NCDB) to look at factors contributing to rates of MIS versus OE, and see if these factors were similar to overall mortality from EC.

Methods

A retrospective cohort study of all patients of all patients with esophageal cancer was performed using the NCDB, which included patients from 2004 to 2015 and more than 1,500 institutions across the US . Minimally invasive surgery (MIE) was defined using the NCDB category that specified Surgical Approach (DD_category: Surgery, PUF Data Item Name: RX_HOSP_SURG_APPR_2010, NAACCR Item #:668). Continuous variables were compared using the linear trend test, and categorical variables were compared using Mantel-Haenszel tests. Clinically relevant variables were entered into the regression model manually. Binomial regression was performed using pairwise deletion to maximize all data available.[25] Statistical significance was set at alpha = 0.05 for all measures.

Figure 1: Multivariable predictors of Minimally Invasive Esophagectomy (MIE); Af Am, African American; Education Q4 vs Q1, Education of the persons with highest percent *without* high school diplomas (first quartile- Q1= least educated) versus lowest percentage of persons without a high school diplomas (fourth quartile-Q4= most educated); CDCC, Charlson-Deyo Comorbidity Class; NCDB, National cancer Data Base.

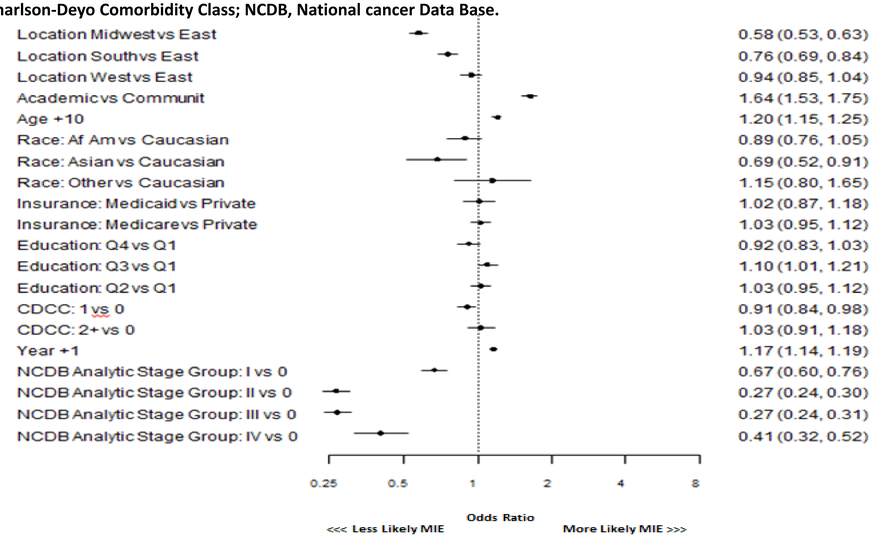
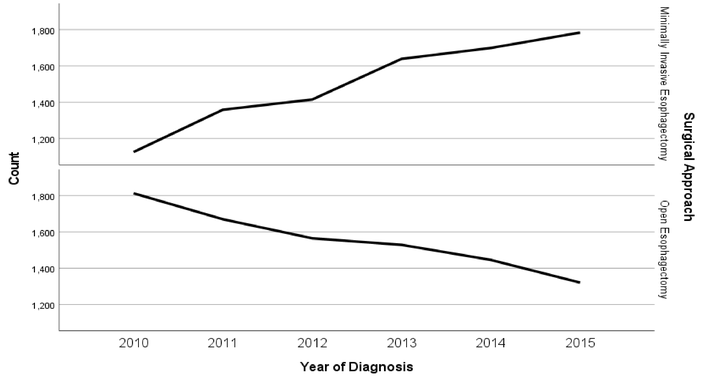


Figure 2. Rate of Minimally Invasive Esophagectomy over Time (2010-2015)



Results

There were 18,366 patients included in the analysis, with a mean age of 64.5 (±10.1) years old. The majority of the patients treated had either Medicare (49.6%) or Private Insurance (41.1%), with few having no insurance (1.8%), Medicaid (5.5%) or other Government-based insurance (2.1%). Patients who had undergone MIE were more likely to live in the Eastern US, compared to the Midwest (Odds Ratio 1.72; 95% CI 1.58, 1.88) or the South (OR 1.31; 95% CI 1.19, 1.44, Figure 1). They were also more likely to be treated at an Academic center (OR 1.64; 95% CI 1.53, 1.75) compared to a Community center, and to be of Caucasian race compared to Asian (OR 1.46; 95% CI 1.10, 1.92, Figure 1). There was not a significant difference in the rates of MIE between Caucasian and African American patients (OR 1.12; 95% CI 0.96, 1.32, Figure 1). Higher TNM stages of cancer were less likely to be treated with MIE as compared to open esophagectomy: Stages II and III had the greatest likelihood of being performed open, with OR 0.27 (95% CI 0.24, 0.30 for Stage II) and OR 0.27 (95% CI 0.24, 0.31 for Stage III, Figure 1). MIE was more likely with each passing year with a mean 9.9% increase in new cases each year (P<0.0001 for all, Figure 2).

Conclusions

The use of MIE was not associated with race. It was associated with geographic location, type of facility (academic or not), and disease stage. These non-clinical factors can be further explored to help increase access to MIE in the treatment of esophageal cancer.

Key References

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