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# Outcomes after endoscopic versus surgical therapy for early esophageal cancers in an older population



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**Background and Aims:** Endoscopic treatment of early esophageal cancer provides an alternative to esophagectomy, which older patients may not tolerate. Population-based data regarding short-term outcomes and recurrence after endoscopic treatment for esophageal cancer are limited. We compared short-term outcomes, treated recurrence, and survival after endoscopic versus surgical therapy for early esophageal cancers in an older population.

**Methods:** We conducted a retrospective cohort study identifying patients aged  $\geq 66$  years with Tis or T1a tumors without nodal involvement diagnosed from 1994 to 2011 from the linked Surveillance, Epidemiology, and End Results (SEER)-Medicare database.

**Results:** Of 2193 patients, 41% ( $n = 893$ ) underwent esophagectomy, and 12% ( $n = 255$ ) underwent endoscopic treatment within 6 months of diagnosis. Those treated endoscopically were older and more likely to have a Charlson comorbidity score  $\geq 2$ . A composite endpoint, hospitalization and/or adverse events at 60 days, was higher in surgical patients than in the endoscopic treatment group (30% vs 12%;  $P < .001$ ). In a Cox model stratified by histology, adjusting for other factors, endoscopic treatment was associated with improved 2-year survival (hazard ratio 0.51; 95% CI, 0.36-0.73).

**Conclusions:** In this older population, a composite short-term endpoint was worse in the surgical group. Endoscopic treatment was associated with improved survival through 2 years. These results suggest that endoscopic treatment is a reasonable approach for early esophageal cancers in the elderly. (Gastrointest Endosc 2016;84:232-40.)

(footnotes appear on last page of article)

Esophageal cancer carries a poor prognosis, with a 40% 5-year survival rate for localized disease.<sup>1</sup> In the United States, this cancer predominantly affects older individuals, with a median age at diagnosis of 67.<sup>2</sup> Although esophagectomy provides the best chance of cure for early stage I esophageal cancer (T1N0M0)<sup>3</sup> and high-grade dysplasia (TisN0M0), it is a technically demanding, invasive operation with potentially high rates of short-term mortality (7%-13%)<sup>4</sup> and morbidity. In elderly patients who often have comorbid conditions, short-term risks may outweigh the benefit of long-term cure offered by esophagectomy.

Endoscopic treatment with resection, often performed with ablation, is gaining acceptance and may be better tolerated in elderly patients. Endoscopic treatment can be used particularly for high-grade dysplasia and superficial cancers confined to the lamina propria or muscularis mucosae (T1a) because of low likelihood of lymph-node metastasis.<sup>5</sup> Endoscopic methods may, however, raise concerns about inadequate resection because they yield markedly limited tissue specimens compared with esophagectomy. Assessment of tumor depth of invasion and nodal involvement by EUS may guide the treatment approach.<sup>6</sup>

Previous research assessing esophagectomy in older patients has not compared its effectiveness with endoscopic treatment. We therefore aimed to compare short-term and long-term outcomes among older patients undergoing endoscopic treatment versus esophagectomy. We hypothesized that endoscopic treatment of early esophageal cancer provides comparable long-term outcomes and



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favorable short-term outcomes compared with esophagectomy in elderly patients. Our primary outcome was 2-year survival. Other outcomes of interest included hospitalizations, adverse events, death at 60 days, need for dilation, and use of EUS.

## METHODS

We performed a retrospective cohort study by using the Surveillance, Epidemiology, and End Results (SEER) tumor registry data linked to Medicare claims (SEER-Medicare) to identify patients with early esophageal cancer or high-grade dysplasia. The study protocol was approved by the University Hospitals Case Medical Center Institutional Review Board and the National Cancer Institute (NCI).

### Data sources

NCI's SEER program provides reliable data regarding cancer incidence from cancer registries which, after its latest expansion in 2010, now covers approximately 28% of the U.S. population.<sup>7</sup> SEER collects data regarding patients with a confirmed cancer diagnosis including demographic information, presenting stage, lymph node involvement, histology, surgery and radiation treatment within 4 months of diagnosis, and survival. Linkage of SEER to Medicare claims data allows identification of comorbidities and treatment beyond the first 4 months after cancer diagnosis. Procedures can be identified in SEER and from Medicare hospital inpatient claims, physician-supplier claims (national claims history), or standard analytical file outpatient claims. Procedures in Medicare hospital inpatient claims are identified through International Classification of Diseases, 9th Revision-Clinical Modification (ICD-9-CM) procedure codes. Procedures from national claims history and standard analytical file are identified through Current Procedural Terminology (CPT) codes (© American Medical Association copyright 2009. All rights reserved. Courtesy of the American Medical Association).

### Study population

Patients with incident cases of high-grade dysplasia or early esophageal cancer diagnosed between 1994 and 2011 who underwent esophagectomy or endoscopic treatment within 6 months of diagnosis were identified. In order to capture comorbid conditions and outpatient procedures, patients had to participate in Medicare Part A and B from 6 months before diagnosis until 9 months after diagnosis or death. Patients aged  $\geq 66$  at diagnosis were included to assess comorbid conditions and to evaluate use of EUS before cancer diagnosis. We excluded patients enrolled in a health maintenance organization from 6 months before to 3 months after cancer diagnosis, because of incomplete claims data; patients not enrolled in

Medicare Part B, because of lack of outpatient claims data; and patients with prior cancer.

## MEASURES

### Patient, hospital, and tumor characteristics

Patient demographic characteristics including age, race, marital status, SEER registry, and sex were obtained from SEER. Cases with anatomic site recorded as esophagus were included. Histology as reported by ICD-O-3 coding was classified as adenocarcinoma or squamous cell carcinoma according to the Collaborative Stage Data Collection System Version 02.04.<sup>8</sup> Cases with tumor depth classified as in situ (Tis) or extending into the mucosa (T1a) were included based on SEER variables for tumor extension (e10ex1 for cases diagnosed 1994-2003, coded as 00 or 10-12 and csex1 for cases diagnosed 2004-2011, coded as 000, 100, 110, or 120). Cases with T1b and greater tumor depth, lymph node involvement, or metastatic disease at presentation were excluded.

### Geographic characteristics

County-level Area Health Resources Files (AHRF) data regarding education (% residents with a college education) and median income were used as proxy for socioeconomic status. County-level gastroenterologist and primary care provider density per 1000 population were characterized by using AHRF data. Cases missing AHRF data were excluded. AHRF data were categorized into quartiles because of their skewed distribution. SEER registries were grouped into 4 geographic regions (Northeast, Midwest, South, and West).

### Comorbidities

A modified version of the Deyo adaptation of the Charlson comorbidity index was used to identify comorbid conditions by using ICD-9-CM diagnosis codes from inpatient, outpatient, and physician-supplier claims.<sup>9</sup> Malignancy was excluded from the Charlson calculation.

### Treatment approach

Patients with early esophageal cancer undergoing esophagectomy or endoscopic treatment (ablation, local tumor destruction, or EMR) from 1 month before to 6 months after diagnosis were included. Because use of both SEER (which records the most invasive cancer-directed treatment) and Medicare claims may enhance identification of cancer surgery,<sup>10</sup> patients receiving endoscopic treatment according to SEER with no Medicare claims for esophagectomy 1 month before to 6 months after cancer diagnosis were classified in the endoscopic treatment group. Treatment approach was identified from Medicare inpatient, outpatient, and physician-supplier claims. Patients undergoing both endoscopic treatment and esophagectomy within 6 months of diagnosis were included in the esophagectomy group. Procedure codes

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