Rigid Esophagoscopy for Head and Neck Cancer Staging and the Incidence of Synchronous Esophageal Malignant Neoplasms

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**IMPORTANCE** Rigid esophagoscopy (RE) was once an essential part of the evaluation of patients with head and neck squamous cell carcinoma (HNSCC) due to the high likelihood of identifying a synchronous malignant neoplasm in the esophagus. Given recent advances in imaging and endoscopic techniques and changes in the incidence of esophageal cancer, the current role for RE in HNSCC staging is unclear.

**OBJECTIVE** To analyze the current role of RE in evaluating patients with HNSCC, and to determine the incidence of synchronous esophageal malignant neoplasms in patients with HNSCC.

**DESIGN, SETTING, AND PARTICIPANTS** In this retrospective study performed at an academic tertiary care center, 582 patients were studied who had undergone RE for HNSCC staging from July 1, 2004, through October 31, 2012. To assess the incidence of synchronous esophageal malignant neoplasms, a literature review was performed, and the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) data set was queried.

**MAIN OUTCOMES AND MEASURES** The primary outcome measure was the incidence of synchronous esophageal malignant neoplasms, as measured by retrospective review at our institution, SEER data set analysis, and literature review. Secondary outcome measures were RE complications and nonmalignant findings during RE.

**RESULTS** A total of 601 staging REs were performed in 582 patients. The mean age was 60.2 years and 454 (78.0%) were men. There were 9 complications (1.5%), including 1 esophageal perforation (0.2%). Rigid esophagoscopy was aborted in 50 cases. Of the 551 completed REs, no abnormal findings were noted in 523 patients (94.9%), and nonmalignant pathologic findings were identified in 28 patients (5.1%). No synchronous primary esophageal carcinomas were detected. The incidence of synchronous esophageal malignant neoplasms found on screening endoscopy based on literature review and on SEER data set analysis was very low and has decreased from 1980 to 2010 in North America. The incidence reported in South America and Asia was relatively high.

**CONCLUSIONS AND RELEVANCE** Rigid esophagoscopy is safe, but the utility is low for cancer staging and for detection of nonmalignant esophageal disease. Review of the literature and analysis of a large national cancer data set indicate that the incidence of synchronous esophageal malignant neoplasms in patients with HNSCC is low and has been decreasing during the past 3 decades. Thus, screening esophagoscopy should be limited to patients with HNSCC who are at high risk for synchronous esophageal malignant neoplasms.
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anendoscopy, including laryngoscopy, bronchoscopy, and esophagoscopy, has historically served as the standard in the evaluation of patients with head and neck squamous cell carcinoma (HNSCC) to stage the primary tumor, assess for synchronous malignant neoplasms, and/or locate unknown primary tumors. Bronchoscopy has been eliminated as part of the routine evaluation because of clear demonstration that, in the absence of pulmonary symptoms and with normal chest radiography results, finding a synchronous lung cancer is rare.

The approach to esophageal evaluation has also evolved. Although esophageal evaluation was historically performed using rigid esophagoscopy (RE), barium esophagography and flexible esophagoscopy, including transnasal esophagoscopy (TNE), are current alternative methods to detect synchronous esophageal malignant neoplasms. In addition, high-resolution computed tomography (CT) and positron emission tomography (PET)/CT are sensitive for detecting esophageal disease. Despite these advances, many institutions still use RE during initial workup of HNSCC.

As alternatives to staging RE become more popular, the number of cases of RE will decrease. It is important to understand this change because RE has utility in other settings, such as esophageal dilation and foreign-body removal, and fewer REs may alter resident training. In the present study, we sought to ascertain the real value of RE by assessing a large number of RE procedures for trends in detection of synchronous esophageal malignant neoplasms in patients with HNSCC. We hypothesized that, as an element of staging endoscopy for HNSCC, rigid esophagoscopy is safe but has little impact on patient management and that this may, in part, be owing to a reduction in the number of synchronous esophageal malignant neoplasms over time.

Methods

This study was approved by the University of Virginia Institutional Review Board. Patients who underwent RE for HNSCC staging from July 1, 2004, through October 31, 2012, were identified using the University of Virginia Head and Neck Cancer Research Database. During this time, standard staging examination included RE; no flexible esophagoscopy was performed for HNSCC staging. Operative notes, postoperative progress notes, discharge summaries, and clinic notes were reviewed. It was noted when patients had insufficient documentation or if their procedure was aborted. In addition, the medical record was searched for emergency department visits or readmissions within 1 week after surgery.

A literature search was conducted for studies documenting synchronous esophageal malignant neoplasms in patients with head and neck cancer. The MEDLINE database was queried using medical subject headings (MeSH) and keyword searches: head & neck cancer (MeSH) + esophagoscope (MeSH) [second primary neoplasm or multiple primary neoplasm] and head & neck cancer (MeSH) and esophageal neoplasm (MeSH). Studies were included if the study population included patients initially diagnosed as having HNSCC and if the study documented the incidence of synchronous esophageal malignant neoplasms detected by rigid or flexible screening endoscopy. A synchronous second primary neoplasm was defined as a neoplasm diagnosed simultaneously or within 6 months of the index cancer diagnosis. Appropriate studies referenced by review articles identified by the MEDLINE search were included. Studies were excluded if they used registries or included limited head and neck subsites.

The calendar year incidence of synchronous esophageal malignant neoplasms in patients with HNSCC was calculated using the Multiple Primary – Standard Incidence Ratio session of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) registry between January 1973 and December 2009. Patients included were diagnosed as having oral cavity or pharynx cancer and subsequently diagnosed as having malignant esophageal neoplasm within 6 months. To maximize inclusion, patients diagnosed as having an index malignant esophageal neoplasm and subsequently diagnosed as having oral cavity or pharynx cancer within 6 months were also included.

Results

A total of 601 REs were performed for staging purposes in 582 patients (Table 1); all were performed in conjunction with direct laryngoscopy. There were 454 men (78.0%) and 128 women (22.0%). The mean age was 60.2 years. Of the 50 aborted staging REs (Table 1), 25 patients underwent alternative studies that revealed no esophageal abnormalities before treatment: 5 underwent barium esophagography, 16 underwent chest CT, and 4 underwent whole-body PET/CT.

Of the 551 completed examinations, 523 (94.9%) detected no disease, whereas nonmalignant disease was found in 28 (5.1%) (Table 2). There were 9 complications (1.5%); 1 major complication occurred (esophageal perforation) for a rate of 0.2%. No pneumothorax, postoperative bleeding, or postoperative death occurred. Two minor anesthesia-related complications (prolonged sedation) occurred, and 1 patient had temporomandibular joint dislocation after direct laryngoscopy and esophagoscopy (Table 2).

Figure 1 shows the annual and decade incidence of synchronous esophageal malignant neoplasms in patients with HNSCC based on assessment of the SEER database; the incidence has consistently decreased during the past 3 decades.

<p>| Table 1. Reasons for Abortion of Rigid Esophagoscopy |</p>
<table>
<thead>
<tr>
<th>Reason</th>
<th>No. of Cases (n = 601)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aborted</td>
<td>50</td>
</tr>
<tr>
<td>Osteophytes</td>
<td>19</td>
</tr>
<tr>
<td>Stricture</td>
<td>13</td>
</tr>
<tr>
<td>Positioning</td>
<td>10</td>
</tr>
<tr>
<td>Obstructive pharyngeal tumor</td>
<td>5</td>
</tr>
<tr>
<td>Vertebral hardware</td>
<td>1</td>
</tr>
<tr>
<td>Inadequate documentation</td>
<td>2</td>
</tr>
<tr>
<td>Completed</td>
<td>551</td>
</tr>
</tbody>
</table>

Figure 1: Annual and decade incidence of synchronous esophageal malignant neoplasms in patients with HNSCC.
The mean rate of synchronous esophageal malignant neoplasms in the 1980 to 1989 decade was 0.36%; this trended down to 0.19% for the 2000 to 2010 decade, representing a nearly 50% reduction in incidence.

**Table 3. Esophageal Findings and Complications of Rigid Esophagoscopy**

<table>
<thead>
<tr>
<th>Finding or Complication</th>
<th>No. (%) of Cases (n = 551)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esophageal findings</td>
<td></td>
</tr>
<tr>
<td>Reflux esophagitis</td>
<td>15 (2.7)</td>
</tr>
<tr>
<td>Inflammatory lesion</td>
<td>3 (0.5)</td>
</tr>
<tr>
<td>Barrett esophagus</td>
<td>3 (0.5)</td>
</tr>
<tr>
<td>Hiatal hernia</td>
<td>2 (0.4)</td>
</tr>
<tr>
<td>Esophageal varices</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Esophageal web</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Esophageal candidiasis</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Patulous esophagus</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Benign neoplasm</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Malignant neoplasm</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Total findings</td>
<td>28 (5.1)</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
</tr>
<tr>
<td>Dental injury</td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Anesthesia related</td>
<td>2 (0.4)</td>
</tr>
<tr>
<td>TMJ dislocation</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Readmission for dehydration</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Esophageal perforation</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Total complications</td>
<td>9 (1.6)</td>
</tr>
</tbody>
</table>

Abbreviation: TMJ, temporomandibular joint.

First, as use of thoracic CT, whole-body PET/CT, and flexible TNE increases, a higher percentage of synchronous esophageal malignant neoplasms may already be identified before formal staging endoscopy. However, thoracic CT and PET/CT miss esophageal cancers that are identified by esophagoscopy, and it is not clear that these techniques can substitute for visualization of the esophageal mucosa.

Second, the incidence of esophageal squamous cell carcinoma (ESCC) in the United States has decreased during the past several decades, probably because of a decrease in tobacco and alcohol use combined with an increased intake of fresh fruits and vegetables. This trend may not apply to patients with HNSCC, given that tobacco and alcohol abuse are highly prevalent in this population. There is substantial geographic variation in the incidence of esophageal cancer, with Chinese and Japanese populations being at much higher risk. Wang et al published their results in 315 patients with newly diagnosed HNSCC in China; they found synchronous esophageal neoplasia (ranging from squamous dysplasia to invasive ESCC) in 69 of 315 patients (21.9%). Thus, although the prevalence of synchronous esophageal malignant neoplasms may now be extremely low in populations such as those outlined in Table 3 (eg, American, Canadian, and Swiss), high-risk populations may continue to warrant careful esophageal examination.

Third, the incidence of human papillomavirus (HPV)-related oropharyngeal squamous cell carcinoma (OPSCC) has increased significantly from 1973 to 2004, whereas the incidence of HPV-unrelated OPSCC has significantly decreased during the same period. At our institution, 62% to 68% of OPSCC cases are HPV related. Patients with HPV-related HNSCC have a significantly lower rate of tobacco and alcohol use, and there is a very low prevalence of HPV DNA in ESCC samples. Studies have found a decreasing rate of syn-
chronous and metachronous esophageal malignant disease in OPSCC over time, whereas other head and neck subsites remained without significant change. It therefore follows that patients with HPV-related HNSCC have a low propensity for synchronous esophageal malignant neoplasms and that, as this population has increased, the overall rate of synchronous esophageal malignant neoplasm has decreased.

The present study reveals a low incidence of nonmalignant findings compared with other published reports: reflux esophagitis (2.7%), Barrett esophagus (0.5%), and esophageal candidiasis (0.2%). Farwell et al49 published findings from TNE in 100 patients with HNSCC recruited during routine posttreatment follow-up. The rate of peptic esophagitis was 63% (37% grade 1-3), the rate of Barrett esophagus was 8%, and the rate of esophageal candidiasis was 9%. Postma et al100 reported a series of more than 700 TNEs for all indications in the otolaryngology clinic setting. The rates of esophagitis, Barrett esophagus, and esophageal candidiasis were 16.5%, 4.6%, and 3.9%, respectively. There is little doubt that the narrow field of view afforded by the RE hinders the detection of subtle mucosal change compared with the wider and better illuminated field of view of modern flexible esophagoscopes. This finding likely explains the large difference in rates of nonmalignant disease detected by TNE compared with RE.

We had a low incidence of complications in our series. Although there were 4 dental injuries and 1 temporomandibular joint dislocation, all esophagoscopies were completed in conjunction with direct laryngoscopy, so it is uncertain that these complications are directly related to the esophagoscope. One patient (0.2%) had the major complication of esophageal perforation. Perforation rates in the literature are typically low for staging endoscopy but higher in patients undergoing dilation or biopsy of esophageal lesions. In a retrospective review by Kubba et al30 of 434 esophagoscopies completed for diagnos-
Artificial intelligence systems are likely to address some of the limitations that RE has, but in the meantime, RE remains the gold standard for those trained in the technique. The introduction of virtual RE training systems to otolaryngology residencies is another interesting area of investigation. Developing, refining, and validating an RE simulator would be an efficient way to prepare trainees for possible unexpected situations in the operating room. However, it is important to recognize that virtual technology will never replace the face-to-face interaction between the surgeon and the patient, even with the best simulation systems available. For now, we must continue to develop the skill set needed for the approach of HNSCC.

ARTICLE INFORMATION

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Study concept and design: McGarey, Shonka, Jameson.

Acquisition, analysis, or interpretation of data: McGarey, O’Rourke, Owen, Reibel, Levine, Jameson.

Drafting of the manuscript: O’Rourke, Owen.

Critical revision of the manuscript for important intellectual content: McGarey, Shonka, Reibel, Levine, Jameson.

Statistical analysis: McGarey, O’Rourke, Jameson.

Administrative, technical, or material support: Shonka, Reibel, Jameson.

Study supervision: Shonka, Levine, Jameson.

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REFERENCES


Conclusions

Staging RE for cancer staging can be performed safely in patients with HNSCC, but the utility is low. Routine use of RE imparts unnecessary costs, and serious complications can occur. In North America, the incidence of synchronous esophageal malignant neoplasms has been decreasing during the past 3 decades, and routine esophagoscopy is no longer warranted, except in high-risk patient groups. On the basis of current literature, factors to consider may include esophageal symptoms, degree of tobacco and alcohol use, HNSCC subsite, and patient ethnicity, but further study is required to clearly delineate these parameters. More selective use of RE will result in a reduction in training opportunities that may be addressable with simulation to preserve this necessary skill set.
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