



Reported Quality Metrics in Published Series of Esophageal Resections

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Abstract

Background: The definition of quality in health care in general and in surgery specifically is intensely debated. In this study, we investigated how results of esophageal resection are reported in surgical series.

Methods: A review of the literature was performed, followed by a comprehensive analysis of predefined operative and oncologic quality metrics.

Results: Sixty three studies focused on surgical treatment of esophageal carcinoma. Eighty-three percent provided detailed information on the operative technique used. Thirty-two percent reported recurrence rates, and sixty-two percent provided the number of resected nodes. Residual tumor status was provided in 72%. Graded postoperative morbidity was used in only 6%.

Conclusion: Current clinical studies often fail to report crucial information on surgical quality criteria. The use of standardized platforms for recording complications and quality measures, including long-term outcome data associated with esophagectomy are needed, and can lead to an improvement of therapy and reduction of complications.

Keywords: Esophageal cancer; Surgical resection; Reported quality metrics

Introduction

Esophageal Cancer (EC) is the eighth most common cancer worldwide, with about 604,000 newly diagnosed cases in 2020, and the sixth leading cause of cancer related mortality with approximately 544,000 deaths that year [1]. In the US, 18,440 new cases were expected for 2020, and an estimated 16,170 patients were expected to die from the disease [2]. EC remains a highly fatal disease with a 5-year overall survival rate of around 20%. However, patients with resectable disease now have an overall 5-year survival rate of approaching 50% after multimodality treatment [3]. Optimal treatment includes the integration of several treatment options ranging from endoscopic mucosal resection for early lesions to chemoradiotherapy with or without esophagectomy with oncological lymph node dissection for mid-stage EC. While there are a multitude of studies focusing on the surgical aspects of treating EC, many basic treatment principles are still subject to debate, including the optimal number of lymph nodes to be resected or the appropriateness of oncologic aspects for minimally invasive and robotic procedures. Interpretations of optimal surgical interventions are made more difficult by the fact that many of these studies fail to provide comprehensive quality data. We investigated how surgical results are reported in current EC series. The aim of this study was to identify and evaluate the various reporting parameters that reflect quality of care aspects within surgical series of esophageal cancer treatment. It is hoped that this effort may contribute to the generation and usage of uniformly acceptable surgical quality reporting standards for esophageal resections.

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Methods

A systematic review of the English literature was performed within the PubMed online database from 2000–2018 using the search term “esophageal resection”, published in one of the leading ten surgical or five medical journals with the highest impact factor according to the web of science 2019 (Table 1). The results were then filtered manually to identify articles focusing on surgical aspects of treatment. We then performed a comprehensive analysis of predefined operative and oncologic quality metrics. These metrics included patient demographics, study parameters, pre- and post-operative adjuvant treatment, operative details, operative outcomes, complications, pathologic findings, oncologic data, postoperative hospitalization as well as duration of follow-up (Table 2). Thirty-day mortality and in-hospital mortality were consolidated as 30-day mortality for reporting purposes. The articles were scanned manually, so that synonyms were considered and no exact matching was necessary. Results were compiled in table form, and descriptive data reported in percentages.

Results

We identified 62 studies reporting on surgical issues in the treatment of EC. Eight articles (12%) represented randomized controlled trials. Among all 63 studies, three major groups were identified: 13 articles (21%) focused on minimally invasive operative strategies vs. open esophagectomy, 10 (16%) compared the transhiatal to the transthoracic approach and 6 (10%) focused on trimodality therapy (neoadjuvant chemoradiotherapy followed by surgery). The remaining articles focused on margin status, the handling of anastomotic leakage and anastomotic technique. Patient demographics including median age and study size were provided by most of the studies (93% and 95%, respectively, Table 3). However, a total patient denominator (or a ratio of included to overall number of patients) was only given by 35 (56%). Fourteen percent indicated whether consecutive patients were reported upon.

Preoperative neoadjuvant and postoperative adjuvant therapy details were indicated by more than half of the studies: Forty-eight studies (77%) mentioned additional therapy (neoadjuvant or adjuvant chemotherapy or chemoradiotherapy). Of all possible additional therapy options, neoadjuvant chemoradiotherapy was mentioned most frequently (n=31, 50%). Operative technique was well-documented: 52 of the 62 (83%) identified studies provided detailed surgical information. Ten studies compared a transhiatal approach to open transthoracic esophagectomy. In this subgroup (transhiatal vs. open transthoracic esophagectomy), four studies reported the total number of examined lymph nodes, but only one study reported the number of positive lymph nodes. Data on margin status was provided by 45 studies. In the two studies focused on endoscopic mucosal or submucosal resection, margin status of specimens after endoscopic resection was reported [4]. Histology was identified by all except two studies (97%). Most of the studies included varieties of tumor histology. Studies of singular histology were uncommon (Squamous Cell Cancer (SCC) alone: 4 studies (6%), adenocarcinoma (EAC) alone: 10 studies (16%). Tumors of the Gastro-Esophageal (GE) junction were included by 14 studies (22%), always with both SCC and EAC histologies). Of the 14 studies that included GE-junction tumors, eight (57%) stated the Siewert classification. Anatomic distribution was provided by six studies. Of all studies, 39 (62%) indicated average lymph node yield and 24 (38%) reported a median of >15 resected lymph nodes. Only 15 studies (24%) reported the actual number of positive lymph nodes. Throughout the 62 articles, no consistent

definition of mortality was used. The use of 30 day-mortality was common – indicated by 39 (62%), as was “in-hospital mortality” (n=35, 55%). Thirty-three studies (53%) provided information on morbidity. Of these, four studies (12%) reported on morbidity according to the Clavien-Dindo classification [5]. Of the remaining studies, 22 (73%) sub-classified morbidity as major or minor events. Cardiopulmonary complications were seen most frequently following esophagectomy, and incidence data were provided by 26 (41%) of the articles. Twenty (32%) of the studies indicated overall recurrence rates, while 13 (20%) indicated the local recurrence rate. Survival data were mostly reported in percentage at 1/3/5 years, or less commonly at 2/4/6 years; indication of median length of survival in months was less common (7 studies, 11%). Disease free survival was indicated by 22 studies (35%). The median length of hospital stay was provided in 23 studies (37%). Median follow-up was reported in 24 studies (38%) Maximal follow-up time was provided by 35 (56%) studies. Only 3 (4.8%) studies mentioned readmission rates or indicated a discharge destination. Interestingly, the degree of detail of reporting did not correlate with the impact factor of the journals (Table 4).

Discussion

Quality in health care is currently debated intensively. However, there is no consensus regarding a singular definition of healthcare or surgical quality. The goal of improving healthcare quality, as well as cost and patient experience, has resulted in massive healthcare "quality" measurement initiatives which are driven mostly from the payer perspective [6]. Dividing the measurement of quality into separate domains offers a structured framework to approach assessment and improvement. One such classification frequently referenced is that proposed by Donebedian [7] in which healthcare quality is approached through assessment of structure (those pertaining to hospital infrastructure, organization, volume and physicians), the processes of care, and outcomes [6]. Despite this understanding, there is no consensus regarding reporting parameters that reflect quality of care aspects. Moreover, the correlation between physician determined and administrative data with regard to identifying complications after operations is poor. Regarding

Table 1: List of journals included, *no matching articles found.

Surgical Journals	Impact Factor 2019
Archives of Surgery/JAMA Surgery	13.625
Annals of Surgery	10.130
Endoscopy	7.341
British Journal of Surgery	5.676
Journal of the American College of Surgeons	4.590
Journal of Thoracic and Cardiovascular Surgery	4.451
Annals of Surgical Oncology	4.061
Annals of Thoracic Surgery	3.639
Surgery	3.356
Surgical Endoscopy	3.149
Medical Journals	
New England Journal of Medicine	74.699
Lancet	60.390
Journal of the American Medical Association*	45.540
British Medical Journal*	30.313
Annals of Internal Medicine*	21.317

Impact factor according to InCites Journal Citation Reports

Table 2: Quality measures in esophageal cancer used in this study.

1	Patient demographics	Number of patients, median age
2	Study parameters	Denominator, consecutive patients
3	Neo-/adjuvant treatment	Neo-/adjuvant chemoradiotherapy, chemotherapy, radiation therapy
4	Operative details	Selection criteria for operation, operative method, duration of surgery, conversion rate, reoperation
5	Operative outcomes	Number of lymph nodes resected, number of positive lymph nodes, R0 resection
6	Complications	Non-surgical complications, pulmonary complications, late complications, early surgical complication, leak rate, vocal cord paralysis, overall postoperative complication rate
7	Pathologic findings	Indication of pathologic stage UICC/TNM
8	Oncologic data	Overall survival, disease free survival, tumor recurrence, local tumor recurrence, overall survival, disease free survival
9	Postoperative hospitalisation	Length of stay, readmission, use of Clavien-Dindo classification, discharge destination
10	Follow-up	Max. postoperative follow-up, 30d mortality, mortality, morbidity

Table 3: Total Number and percentage of indicated characteristics in 62 articles reviewed.

	Characteristics		n	%
1	Patient demographics	Number of patients	59	95.1
		Age (median or mean)	58	93.5
2	Study parameters	Consecutive patients	9	14.5
		Denominator	35	56.4
3	Neo-/adjuvant treatment	Neoadjuvant chemoradiotherapy	31	50
		Neoadjuvant chemotherapy	28	45.1
		Neoadjuvant radiation therapy	17	27.4
		Adjuvant chemotherapy	12	19.3
		Adjuvant radiation therapy	10	16.1
4	Operative details	Operative method	52	83.8
		Selection criteria for operation	35	56
		Reoperation	19	30.6
		Duration of operation	20	32.2
		Conversion rate (e.g. laparoscopy to laparotomy)	10	16.1
5	Operative outcomes	R0 resection	45	72.5
		Number of lymph nodes resected	39	62.9
		Number of positive lymph nodes	15	24.2
6	Complications	Leak rate	38	61.3
		Pulmonary complications	31	50
		Overall postoperative complication rate	21	33.8
		Non-surgical complications	18	29
		Vocal cord paralysis	13	20.9
		Early surgical complication	12	19.3
7	Pathologic findings	Late complications	9	14.5
		Indication of pathologic stage UICC	25	40.3
		Indication of pathologic stage TNM	32	51.6
8	Oncologic data	Overall survival	42	67.7
		Tumor recurrence	20	32.2
		Disease free survival	22	35.5
		Local tumor recurrence	13	20.9
9	Postoperative hospitalization	Length of stay	23	37
		Use of Clavien-Dindo classification	4	6.4
		Discharge destination	2	3.2
		Readmission	3	4.8

10	Follow-up	30d mortality	39	62.9
		Max. postoperative follow-up	35	56.4
		Morbidity	33	53.2
		Mortality (not specified)	9	14.5

Table 4: Journal impact factors 2019 and study quality parameter details, ranked by number of detail (average of studies published in Journal).

Journal	IF	Details (av.)
New England Journal of Medicine	74.699	20.5
Surgery	3.359	19
Annals of Surgery	10.130	17.2
Annals of Surgical Oncology	4.061	17
Archives of Surgery/JAMA Surgery	13.625	16.4
Journal of Thoracic and Cardiovascular Surgery	4.451	16
Journal of American College of Surgery	4.590	15.7
Annals of Thoracic Surgery	3.639	14.6
British Journal of Surgery	5.676	14.1
Surgical Endoscopy	3.149	14
Lancet	60.390	13.5

major complications, it has been shown that administrative data are particularly insensitive and lack positive predictive value [8]. In this current climate of emphasis on quality, as well as to help interpret study results, it is imperative for surgeons (and patients) to incorporate standardized quality measurements in published series. We therefore evaluated the Status Quo of reporting parameters that reflect quality of care aspects within a specific surgical subspecialty, the surgical treatment of esophageal cancer, and we have identified that to be highly variable. We speculate that this likely results from a lack of rigorous data collection, or potential disagreement over what truly represents a component of quality in this care process. The treatment of esophageal cancer is very complex and requires well-founded decision making. Standardized reporting of quality metrics is one tool to obtain the data necessary to make this decision. The clinical staging quality metrics reporting goes beyond the scope of this manuscript, but would also include aspects such as use of endoscopic description of highest and lowest tumor extent measurements, EUS, contrasted CT and PET/CT scanning. Unfortunately, many published clinical studies fail to report crucial information on surgical quality criteria. Information on neoadjuvant treatment was only mentioned in less than half of the studies, and detailed information on duration, agents used and dose given was even less common. This is of paramount importance, as neoadjuvant therapy might have direct consequences for surgical outcomes. Furthermore, in regards to proposed definitive bimodal treatment, e.g. chemoradiotherapy without the addition of surgery [9-11] for certain forms of esophageal cancer, more data on neoadjuvant treatment should be reported and comprehensively evaluated. Furthermore, many studies failed to appropriately indicate crucial surgical quality criteria, such as R-category, nodal counts, postoperative morbidity or loco-regional recurrence rate. As the role of surgery is being challenged in the treatment of esophageal cancer, questions of safety, complications and recovery aspects take on a different dimension. The value of esophageal cancer therapy and the role of esophagectomy as part of the treatment plan depend on quality parameters and cost [12]. Decisions made based on high quality data reporting may translate into better treatment results, fewer complications and better allocation of resources. Due to the

complexity of the procedure and the postoperative impairment mostly of cardiopulmonary function, we advocate for the inclusion of detailed data on postsurgical morbidity in standard datasets. To create additional value for surgeons, patients and even payers, studies should not only look at short term criteria such as operative time, length of stay or in-hospital events, but also at factors determining completeness of recovery such as readmission rates or 90-day morbidity and mortality, in addition to overall survival. Well defined and graded morbidity documentation should also be included. Standardized reporting can save time and money. Initial real and opportunity costs may be high, but once a system for data gathering and an algorithm for treatment planning are set up, the process will become more efficient. Furthermore, standardized reporting can also serve as a quality and safety gate. The tools for good documentation practice are already available, such as the standardized platform for recording complications and quality measures associated with esophagectomy by the Esophageal Complications Consensus Group (ECCG) [13], or the Society of Thoracic Surgeons General Thoracic Surgery Database [14]. The development of a Core Outcome Set (COS) for clinical effectiveness trials in esophageal cancer resection surgery is under way [15]. These resources simply need to be more consistently employed in order to gather better and more relevant data. Ultimately, these measures should lead to widespread benefits including potential improvements of therapy, reductions of complications and more profoundly informed patients.

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