Esophagectomy versus endoscopic resection for patients with early-stage esophageal adenocarcinoma: A National Cancer Database propensity-matched study

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ABSTRACT

Objectives: Endoscopic resection has been rapidly adopted in the treatment of early-stage esophageal tumors. We compared the outcomes after esophagectomy or endoscopic resection for stage T1a adenocarcinoma.

Methods: We queried the National Cancer Database for patients with T1a esophageal adenocarcinoma who underwent esophagectomy or endoscopic resection and generated a balanced cohort with 735 matched pairs using propensity-score matching. We then performed a multivariable Cox regression analysis on the matched and unmatched cohorts.

Results: We identified 2173 patients; 1317 (60.6%) underwent esophagectomy, and 856 (39.4%) underwent endoscopic resection. In the unmatched cohort, patients who underwent esophagectomy were younger, more often not treated in academic settings, and more likely to have comorbidities (30.4% vs 22.5%, $P = .002$). They had longer hospital stays and more readmissions than patients who underwent endoscopic resection. Factors positively affecting overall survival were younger age, resection at an academic medical center, and lower Charlson–Deyo comorbidity score. In the matched cohort, patients who underwent esophagectomy had longer hospital stays and were more likely to be readmitted within 30 days (7.0% vs 0.6%, $P < .001$). When a time period–specific partition was applied, endoscopic resection had a lower death hazard 0 to 90 days after resection (hazard ratio, 0.15; $P = .003$), but this was reversed for survival greater than 90 days (hazard ratio, 1.34; $P = .02$).

Conclusions: In patients with early-stage esophageal adenocarcinoma, survival appears equivalent after endoscopic resection or esophagectomy, but endoscopic resection is associated with shorter hospital stays, fewer readmissions, and less 90-day mortality. In patients surviving more than 90 days, esophagectomy may provide better overall survival. (*J Thorac Cardiovasc Surg* 2018;155:2211-8)

Survival of matched patients with T1a tumors after esophagectomy or endoscopic resection.

Central Message

Differences in survival were not seen after endoscopic resection or esophagectomy of stage T1a esophageal adenocarcinoma; endoscopic resection was associated with faster post-operative recovery.

Perspective

In a large database study, we did not find survival differences between patients who underwent endoscopic resection and patients who underwent esophagectomy. Patients who underwent an esophagectomy and survived more than 90 days appear to have better survival than patients who received endoscopic treatment, which may influence treatment planning for T1a tumors exhibiting characteristics linked with lymph node metastasis.

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The incidence of esophageal adenocarcinoma has increased in recent decades.¹ Surveillance of Barrett's esophagus, a known precursor lesion that progresses to adenocarcinoma

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Abbreviations and Acronyms

CDS	= Charlson–Deyo comorbidity score
IQR	= interquartile range
LVI	= lymph-vascular invasion
NCDB	= National Cancer Database
SEER	= Surveillance Epidemiology and End Results

in 0.2% to 0.5% per patient-year, is associated with a diagnosis of esophageal adenocarcinoma at an earlier stage.²⁻⁴ Early-stage esophageal cancer confined to the mucosa (T1a) has a low incidence of nodal metastases (5% in a recent meta-analysis) and can be treated by resection in most patients.⁵⁻⁹ This corresponds to favorable 5-year survival, with rates as high as 77% to 100% for early-stage esophageal cancer.^{5,10}

Endoscopic resection has been slowly replacing esophagectomy in the treatment of T1a esophageal adenocarcinoma.¹¹ Although the recurrence rate is higher after endoscopic resection when compared with esophagectomy (12% vs 7%), recurrent tumors often can be treated with endoscopic reexcision.^{12,13} Previously reported retrospective series have not demonstrated differences in overall survival between esophagectomy and endoscopic resection in patients with early-stage esophageal cancer, but these studies had few patients in each group.^{11,14,15}

The aim of the present study was to compare short-term outcomes and long-term survival in patients with T1a adenocarcinoma treated with esophagectomy or endoscopic resection using a large population-based database allowing for larger matched cohorts.

MATERIALS AND METHODS**Database and Patients**

The National Cancer Database (NCDB) was queried for all patients with T1a esophageal adenocarcinoma who underwent esophagectomy or endoscopic resection from 2006 to 2012 and whose records contained complete pathology data. Patients who received preoperative chemotherapy or radiation therapy or had metastases at diagnosis were excluded. The 7th edition of the American Joint Committee on Cancer Union for International Cancer Control TNM staging was used. The patients were divided into 2 groups for analysis by treatment approach: esophagectomy and endoscopic resection. The NCDB data are completely de-identified; therefore, this study was reviewed by the Institutional Review Board of the University of Tennessee Health Science Center and deemed exempt from the requirements for informed consent.

Statistical Analysis

Patient characteristics are reported using mean $\pm$ standard deviation or median (interquartile range [IQR]) for continuous variables and frequencies and percentages for categorical variables. Pearson's chi-square test was used to compare categorical variables, and Student *t* test was used to compare continuous variables or their nonparametric alternatives.

To balance the clinical characteristics of the 2 treatment groups, we used propensity-score matching without replacement. We used a logistic

regression model based on age, sex, race, insurance status, treatment facility type, Charlson–Deyo comorbidity score (CDS), tumor grade, and tumor size to estimate the propensity score. We used the recommended caliper width of 0.2 times the standard deviation of the logit of the propensity score.¹⁶ Further, we used standardized differences to compare characteristics before and after the match using values less than 10 to indicate an acceptable balance (Figure E1).¹⁷ We tested discrimination of the propensity model with the c-statistic and evaluated the overlap between groups using mirrored histograms (Figure E2).

Short-term outcomes of 30-day and 90-day mortality, 30-day readmission, and length of hospital stay were evaluated with chi-square and Wilcoxon rank sum because length of stay was not normally distributed. Long-term survival was analyzed by the Kaplan–Meier method. Survival analysis was performed using overall survival, defined as the time from diagnosis to death or censoring. In the matched cohort, we used the stratified results to account for the matched pairs. The Kaplan–Meier curves showed a violation of the proportional hazards assumption as the 2 curves crossed. To account for that violation, we partitioned the Kaplan–Meier analysis to examine short-term mortality (0-90 days) and long-term mortality (>90 days) by creating a time-dependent covariate.¹⁸ Finally, we performed a univariable analysis and a multivariable Cox proportional hazards model in both our unmatched and matched cohorts. The variables included in these models were the time-dependent covariates described earlier: age, sex, treatment setting (academic or community), race, CDS, tumor grade, tumor size, and lymph-vascular invasion (LVI). The outcomes of these models are shown as hazard ratios and 95% confidence intervals. In the matched cohort, we stratified the Cox proportional hazards model by the matched pairs and used a robust variance estimator. Missing data for important variables were imputed using multiple imputation methods with sequential regression using the IVEWare software. SAS statistical software package version 9.4 (SAS Institute, Inc, Cary, NC) was used for the analysis.

RESULTS

Of 117,412 patients in the NCDB, we identified 2173 eligible patients with T1a esophageal adenocarcinoma; 1317 (60.6%) underwent esophagectomy and 856 (39.4%) underwent endoscopic resection (Table 1). Their mean age was 65.4 years, and the majority were male (1842/2173, 84.8%). Median follow-up time was 33 months for the endoscopic resection group and 49 months for the esophagectomy group.

Unmatched Comparisons

In the unmatched cohort, patients who underwent esophagectomy were younger, more often not treated in academic settings, and more likely to have a higher CDS (Table 1). Patients who underwent esophagectomy also had longer median hospital stay, more readmissions within 30 days, and higher 30-day and 90-day mortality (Table 2). The number of lymph nodes harvested was 12 (IQR, 6.0-19.0). Median survival was not achieved in this cohort, and 5-year survival estimates were 81.3% in patients who underwent esophagectomy and 70.9% in patients who underwent endoscopic resection (Figure 1). In both univariable and multivariable analyses of factors affecting survival, younger age, resection at an academic institution, and lower CDS were associated with better survival (Tables 3 and 4). Endoscopic resection positively affected survival during the first 90 days after resection, whereas esophagectomy was associated with better survival after 90 days (Tables 3 and 4).

TABLE 1. Patient characteristics in the unmatched and matched cohorts

Variable	Unmatched cohort			Propensity-matched cohort		
	Esophagectomy n = 1317	Endoscopic resection n = 856	Standardized difference, %	Esophagectomy n = 735	Endoscopic resection n = 735	Standardized difference, %
Male sex, n (%)	1116 (84.7)	726 (84.8)	0.2	625 (85.0)	624 (84.9)	0.4
Age, mean in y ± SD	63.5 ± 9.8	68.3 ± 10.3	47.2	66.5 ± 9.1	66.9 ± 9.8	4.3
White, n (%)	1279 (97.9)	804 (97.9)	2.1	700 (96.8)	704 (98.5)	8.6
Community setting, n (%)	428 (32.8)	175 (20.5)	28.4	183 (24.9)	169 (23.0)	4.5
Uninsured or medicaid, n (%)	53 (4.1)	30 (3.5)	2.7	22 (3.0)	28 (3.8)	4.5
CDS			17.8			3.1
0	917 (69.6)	663 (77.5)		545 (74.1)	555 (75.5)	
1	324 (24.6)	143 (16.7)		140 (19.0)	135 (18.4)	
>1	76 (5.8)	50 (5.8)		50 (6.8)	45 (6.1)	
Tumor grade, n (%)			6.0			1.5
Well differentiated	411 (31.2)	284 (33.2)		223 (30.3)	240 (32.7)	
Moderately differentiated	663 (50.3)	437 (51.1)		387 (52.7)	379 (51.6)	
Poorly differentiated	226 (17.2)	128 (15.0)		114 (15.5)	110 (15.0)	
Anaplastic	17 (1.3)	7 (0.8)		11 (1.5)	6 (0.8)	
Tumor size, (median, IQR)	10 (5, 20)	10 (4-20)	3.8	10 (5, 20)	10 (5, 20)	5.1
LVI, n (%)*	20 (5.5)	10 (3.9)	7.5	19 (6.5)	9 (4.5)	8.0

SD, Standard deviation; CDS, Charlson–Deyo comorbidity score; IQR, interquartile range; LVI, lymph-vascular invasion. *Only available from 2010 to 2012.

Matched Comparisons

Propensity matching yielded 735 pairs of patients, and the treatment groups were well matched clinically (Table 1 and Figure E1). In the matched comparison, patients who underwent esophagectomy had longer mean hospital stays, were more likely to be readmitted within 30 days of their procedure, and had higher 30-day and 90-day mortality compared with patients who underwent endoscopic resection (Table 2). The number of lymph nodes harvested was 12 (IQR, 6.0-18.0). Similar to the unmatched cohort, the Kaplan–Meier survival curves crossed at approximately 2 years (Figure 2). Median survival was not achieved in this cohort, and 5-year survival estimates were 78.7% for patients who underwent esophagectomy and 71.8% in patients who underwent endoscopic resection. In univariable and multivariable analyses of factors affecting survival, younger age, resection at an academic institution, and lower CDS were associated with better survival, as was seen in the unmatched cohort

(Tables 3 and 4). When survival was examined using a time-dependent covariate in the propensity-matched cohort, the effect on survival was similar to that seen in the unmatched cohort. Endoscopic resection positively affected survival during the first 90 days after resection, whereas esophagectomy was associated with better survival after 90 days in both multivariable and univariable analyses (Tables 3 and 4 and Video 1).

DISCUSSION

We conducted a propensity-matched study comparing survival after esophagectomy or endoscopic resection in patients with stage T1a esophageal cancer using the NCDB. Patients who underwent esophagectomy were more likely to stay longer in the hospital, to be readmitted after their procedure, and to die within 90 days of the procedure. In a well-balanced, propensity-matched cohort, patients who underwent endoscopic resection had better survival up to 90 days after the procedure; however, patients

TABLE 2. Early outcomes in the unmatched and matched cohorts

	Unmatched cohort			Propensity-matched cohort		
	Esophagectomy n = 1317	Endoscopic resection n = 856	P value	Esophagectomy n = 735	Endoscopic resection n = 735	P value
Readmission within 30 d, n (%)	92 (7.1)	6 (0.7)	<.001	51 (7.0)	4 (0.6)	<.001
Hospital stay, median in days (IQR)	10 (8, 16)	0 (0, 1)	<.001*	10 (8, 16)	0 (0, 1)	<.001*
30-d mortality, n (%)	38 (2.9)	1 (0.1)	<.001	23 (3.1)	1 (0.1)	<.001
90-d mortality, n (%)	57 (4.3)	4 (0.5)	<.001	31 (4.2)	4 (0.5)	<.001

IQR, Interquartile range. *Tested with Wilcoxon rank sum.

FIGURE 1. Kaplan-Meier survival curves for the unmatched cohort. Shaded areas indicate confidence limits.

who underwent esophagectomy and survived at least 90 days had better long-term survival. When the risk of death was examined by calculating hazard ratios either 0 to 90 days or more than 90 days after the procedure, endoscopic resection switched from having a very low hazard ratio for mortality initially to being associated with an increased risk of death after the first 90 days.

Few studies have compared the long-term survival of patients who undergo endoscopic resection with those who undergo esophagectomy. Studies that have compared long-term outcomes after the 2 procedures have been small retrospective series^{11,13} or used the Surveillance Epidemiology and End Results (SEER) registry.^{14,15} Das and colleagues¹⁵ used the SEER registry to compare treatments for Tis (high-grade dysplasia) and T1 tumors (without distinguishing between T1a and T1b tumors). There was no difference in overall survival or

cancer-specific survival between the 2 treatment groups. A more recent SEER registry study found improved survival in patients who underwent esophagectomy in a univariate analysis, but in a multivariate analysis, the type of procedure (endoscopic resection vs esophagectomy) did not reach statistical significance.¹⁴ Both SEER studies had only an unmatched patient cohort and mixed patients with Tis, T1a, and T1b tumors. The SEER registry has limited data fields and no information on comorbidities, insurance status, facility type (academic or other), chemotherapy or LVI—all factors that may influence survival. Thus, both studies did not consider these potentially important variables. These shortcomings make the 2 SEER studies difficult to interpret, and it is unclear how these findings apply to patients with T1a tumors. Prasad and colleagues¹³ compared 132 patients with T1a esophageal adenocarcinoma treated with endoscopic resection with 46 patients treated with esophagectomy. Again, there was no difference in survival between the 2 groups, but recurrence was higher (12%) in the endoscopic group compared with the surgery group (2%). Pech and colleagues¹¹ also compared patients with T1a esophageal cancer who underwent endoscopic mucosal resection or esophagectomy in a large, 2-institution retrospective series. Patients were matched 1:2 on the basis of age, sex, depth of tumor invasion, tumor grade, and follow-up period. There were 38 patients in the surgery group and 76 patients in the endoscopic resection group. There were no differences in 30-day or 90-day survival, but patients who underwent esophagectomy had more complications. Overall survival and disease-free survival were also similar between the groups.

Because all 4 previous studies on long-term survival were small or were retrospective studies that did not include propensity-score matching, they may include a significant selection bias. Yet, endoscopic resection has become the standard of care for patient with T1a esophageal

TABLE 3. Univariable analysis of factors affecting survival

Variable	Unmatched cohort		Matched cohort	
	Hazard ratio (95% CI)	P value	Hazard ratio (95% CI)	P value
Endoscopic resection vs esophagectomy (survival 0-90 d after resection)	0.16 (0.05-0.54)	.003	0.16 (0.05-0.53)	.003
Endoscopic resection vs esophagectomy (survival >90 d after resection)	1.62 (1.32-1.99)	<.001	1.36 (1.06-1.73)	.014
Age, in 10-y increments	1.50 (1.36-1.66)	<.001	1.40 (1.23-1.59)	<.001
Female	1.19 (0.92-1.54)	.185	1.27 (0.93-1.73)	.134
Academic vs not	0.74 (0.60-0.91)	.003	0.65 (0.50-0.83)	.007
White vs not	0.93 (0.58-1.49)	.754	1.17 (0.65-2.08)	.601
CDS, 1 vs 0	1.32 (1.05-1.66)	.019	1.55 (1.16-2.08)	.003
CDS, >1 vs 0	1.98 (1.41-2.80)	<.001	2.10 (1.43-3.08)	.002
Tumor grade, 3-4 vs 1-2	1.21 (0.95-1.54)	.121	1.23 (0.91-1.65)	.174
Tumor size, +5	1.01 (0.99-1.04)	.098	1.01 (0.99-1.03)	.446
LVI	1.79 (0.78-4.11)	.172	2.17 (0.93-5.06)	.072

CI, Confidence interval; CDS, Charlson-Deyo comorbidity score; LVI, lymph-vascular invasion.

TABLE 4. Multivariable analysis of factors affecting survival

Variable	Unmatched cohort		Matched cohort	
	Hazard ratio (95% CI)	P value	Hazard ratio (95% CI)	P value
Endoscopic resection vs esophagectomy (survival 0-90 d after resection)	0.14 (0.04-0.48)	.002	0.15 (0.05-0.52)	.003
Endoscopic resection vs esophagectomy (survival >90 d after resection)	1.43 (1.16-1.78)	.001	1.34 (1.05-1.72)	.020
Age, in 10-y increments	1.45 (1.31-1.61)	<.001	1.36 (1.2-1.54)	<.001
Female	1.17 (0.9-1.51)	.247	1.22 (0.89-1.67)	.221
Academic vs not	1.36 (1.10-1.67)	.004	1.44 (1.11-1.87)	.006
White vs not	0.91 (0.57-1.47)	.701	1.02 (0.57-1.83)	.946
CDS, 1 vs 0	1.34 (1.06-1.69)	.013	1.52 (1.14-2.04)	.005
CDS, >1 vs 0	1.75 (1.24-2.48)	.002	1.86 (1.26-2.74)	.002
Tumor grade, 3-4 vs 1-2	1.16 (0.91-1.49)	.225	1.16 (0.86-1.57)	.329
Tumor size	1.01 (0.99-1.03)	.286	1.01 (0.98-1.03)	.636
LVI	1.61 (0.7-3.72)	.264	1.85 (0.79-4.34)	.159

CI, Confidence interval; CDS, Charlson-Deyo comorbidity score; LVI, lymph-vascular invasion.

adenocarcinoma,¹⁹ and some authors have extended the indications for endoscopic resection to low surgical risk patients with T1b tumors.²⁰ Compared with the previous studies, our study has several strengths, including more than 2000 patients and propensity-score matching to attempt to make the baseline characteristics of the treatment groups more homogeneous, mitigate selection bias, and avoid imbalance.

An important issue in patients with T1a esophageal adenocarcinoma is the ability to assess the risk of nodal metastases before therapy. Several factors increase the risk of nodal metastases in patients with T1a tumors, including depth of invasion, LVI, neural invasion, tumor size, grade of lymphocytic infiltrate, and poor differentiation.^{5,6,8,21} Tumor size, LVI, and tumor grade are the most important of these risk factors for nodal metastases.^{22,23} We have observed that in a small

population of patients with T1a tumors (tumors with LVI, poorly differentiated tumors, and tumors >25 mm), the risk of nodal metastases is greater than 20%.²⁴ In patients with T1a tumors and multiple poor prognostic factors detected after endoscopic resection, consideration should be given to esophagectomy because of the high risk of nodal metastases, which will decrease overall survival. Surgeons also should be mindful that endoscopic ultrasound is only 82% sensitive and 91% specific in the staging of T1 esophageal cancer.²⁵

Study Limitations

The present study had several shortcomings common to large database studies. One of the more important limitations is the inability to verify important data points, such as pathologic diagnosis and T stage. It is possible that some patients with T1b tumors were misclassified as stage T1a. Data on comorbidities are limited to a CDS of 0, 1, or greater than 1. Furthermore, several data points studied had missing information including tumor grade

FIGURE 2. Kaplan-Meier survival curves for the matched cohort. Shaded areas indicate confidence limits.

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VIDEO 1. Esophagectomy versus endoscopic therapy in patients with T1a esophageal adenocarcinoma. Video available at: [http://www.jtcvsonline.org/article/S0022-5223\(18\)30070-9/fulltext](http://www.jtcvsonline.org/article/S0022-5223(18)30070-9/fulltext).

(35.1% missing data) and consolidated primary site (10.7% missing data). Disease-specific survival is not cataloged in the NCDB. Neither the type of surgical resection that was used for esophagectomy (eg, transhiatal, Ivor–Lewis, or McKeown) nor the type of endoscopic procedure (eg, endoscopic mucosal resection, endoscopic submucosal resection) is recorded. In addition, the database does not contain records of local therapies used before esophagectomy, including whether or not an endoscopic resection was performed. Although both groups were well matched, the number of available variables in the NCDB is relatively small, and differences may exist between the groups in unmeasured variables. As in all retrospective studies, there is the potential for selection bias, but we believe that this risk is small in our matched cohort.

CONCLUSIONS

Endoscopic resection of early-stage esophageal tumors is associated with shorter hospital stay, fewer readmissions, and lower 90-day mortality. There may some survival advantage conferred by esophagectomy after the first 90 days. Although a randomized trial is needed to further confirm our findings, it is unlikely to happen considering the low morbidity of endoscopic resection and the ability to salvage patients who develop recurrent cancer.

Webcast

You can watch a Webcast of this AATS meeting presentation by going to: https://aats.blob.core.windows.net/media/17AM/2017-05-03/RM312/05-03-17_Room312_0826_Marino.mp4.

Conflict of Interest Statement

B.W. is a Proctor for Intuitive Surgery. The NCDB is a joint project of the Commission on Cancer (CoC) of the American College of Surgeons and the American Cancer Society. The CoC's NCDB and the hospitals participating in the CoC NCDB are the source of the de-identified data used herein; they have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors. All other authors have nothing to disclose with regard to commercial support.

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Key Words: esophageal cancer, endoscopic resection, esophagectomy

Discussion

Dr H. Chen (*Shanghai, China*). It has been established that endoscopic resection is less invasive and has a better short-term outcome; however, the tumor stage may be underestimated in the endoscopic group. What about disease-free survival between the 2 groups in this analysis?

Dr Katy A. Marino (*Memphis, Tenn*). I do not have those data in my analysis.

Dr Chen. You mentioned in the article the ultrasound sensitivity was 82% and the specificity was 91% for the endoscopic ultrasound in diagnosis for esophageal cancer. For the choice of the treatment, what is the indication

for different treatment?

Dr Marino. I believe that is not available in the NCDB why one arm or the other was chosen.

Dr Chen. Based on the risk factor of lymph node metastasis after endoscopic resection, how many patients in the endoscopic group had this after esophagectomy? Do you believe the overall survival of the endoscopic group was improved by the esophagectomy?

Dr Marino. I think if we could look back at any of those patients who may have gone after endoscopic resection and then went on to esophagectomy, that would be worthwhile investigating, but that is not available in my data set.

Dr Chen. As you mentioned, the types of surgical resection and endoscopic resection were not recorded. Do you think a different procedure will influence a different result, have a different result?

Dr Marino. I think earlier in this forum there was some discussion as to whether the type of procedure made a difference in lymphadenectomy, but the NCDB does not separate that out.

Unidentified Speaker. If you could go back to the slide comparing the endoscopic mucosal resection with the resection, looking at that slide, could you not have

concluded that at 5 years esophagectomy tends to have a survival advantage that is not statistically significant and right around the first year endoscopic mucosal resection does? The question is, because you can't pick up the crossover with your methods, and that crossover is probably in the double digits, right? I think nobody really knows what the number is, but it's probably 20% to 30%. If you make that assumption, would that affect this even more?

Dr Marino. Yes, sir, thank you.

Dr T. Watson (*Washington, DC*). I have one question and a comment for you. I was surprised by an average length of stay after endoscopic resection of 3.6 days. That is an outpatient procedure, so I am curious how the average could be that long. Any ideas?

Dr Marino. I don't have any, but you are correct; in other places you see it is less.

Dr Watson. Second, I suggest that to do a prospective randomized trial of endoscopic resection versus esophagectomy is impossible. The train has left the station; endoscopic resection for early-stage esophageal cancer is now an accepted standard of care in most places. To get patients to agree to participate in a prospective randomized trial in this setting is just never going to happen.

Dr G. Darling (*Toronto, Ontario, Canada*). To carry on with the unlikelihood of a randomized trial, I would agree with Tom that that train has left the station, but perhaps we could look at this a different way and going forward look at the Lee risk prediction model and look at patients that way, because if you offer a patient an esophagectomy versus an endoscopic mucosal resection, it is no decision, right? So if we are going to study this going forward, we should evaluate that risk predictor model and see if it makes a difference. Any thoughts on that?

Dr Marino. There are those patients who have T1a tumors and are higher risk. Qualities such as lymphovascular invasion create an N size that we should look at closer.

Dr Darling. Those data are not available I think in the NCDB, correct?

Dr Marino. They are available.

Dr Darling. Okay. So we could look at that.

Dr B. Weksler (*Memphis, Tenn*). We did present an abstract exactly on that, creating a different scoring system than Dr Hofstetter presented from his group. So these data are available, and we analyzed the data.

Dr. W. Hofstetter (Houston, Tex).

What is interesting about this is not trying to establish surgery and the role of T1a in all T1as. As in the comments we have heard, I think that probably is no longer an argument; no one wants to go through an esophagectomy. But there are subgroups of T1a with long Barrett's, nodular Bar-

rett's, or a burned-out esophagus. Those are probably the cases we should start concentrating on in terms of the data and saying, here's the group with T1a that really needs to see a surgeon, because if you are not doing your own endoscopic mucosal resections and you have an endoscopist trying to remount an esophagus that really needs to be removed that could later hurt them, I think we need to start publishing on those groups and focusing on those.

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Thoracic: Esophageal Cancer

STATE OF THE ART: Quality of Life after Open or Minimally Invasive Esophagectomy in Patients With Esophageal Cancer—A Systematic Review Emanuela Taioli. *Semin Thoracic Surg* 2017:377-390.

ORIGINAL SUBMISSION: Esophagectomy in Patients with Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome: A Viable Option. Michael Mwachiro. *Semin Thoracic Surg* 2017: In press.

FIGURE E1. Histogram of standardized differences before and after propensity matching. *LVI*, Lymph-vascular invasion.

FIGURE E2. Mirrored histograms of the discrimination of the propensity match model.