Comparative Overall Survival Analysis Of Transoral Robotic Surgical Resection Of Glottic Squamous Cell Carcinoma

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Introduction

Transoral oral robotic surgery (TORS) has been leveraged to resect a spectrum of head and neck pathologies, with the explicit goal of minimizing surgical morbidity and improving exposure.[1]

The use of TORS has empirically been more limited in the endolarynx, particularly in relation to the oropharynx, due to the larger size of extant robotic instrumentation, and the potential collateral impact electrocautery might have at the level of the glottis. Conversely, transoral laser microsurgery (TLM) is a minimally invasive surgical technique that improves preservation of normal adjacent tissue, employing an energy source that is perfectly designed to restrict the distribution of heat to the tumor and peritumoral region.[2]

Multiple active studies at the author's institution are exploring the relative benefits of TORS with laser as the energy source in the management of glottic tumors. In this study, however, we aimed to characterize survival implications of using TORS for glottic cancer using a large population cancer database.

Methods

This is a retrospective National Cancer Database (NCDB) review of glottic squamous cell carcinoma between 2010 and 2019, which is sourced from over 1500 cancer centers, allowing for analysis, treatment and outcomes of allcomers with documented malignancies.[3]

Our Inclusion criteria stipulated adult patients undergoing curative intent treatment for pathologically confirmed glottic squamous cell carcinoma (SCCa).

Clinicodemographic characteristics, including TNM staging, patient comorbid status, insurance status, distance to treatment centers, and treatment rendered, were collected (Table 1).

A multivariable Cox regression model was fit to assess predictors of overall survival, and, specifically to evaluate survival implications of a TORS approach. (Table 2)

Results

With a study population of 46,781 glottic cancer patients, a total of 100 patients (0.19% of all patients) underwent a robotic surgical approach. A total of 8430 patients underwent a primary surgical approach across stages for glottic cancer. TLM was the only surgical modality (HR=0.488; 95% CI 0.297-0.800) conveying an overall survival benefit, though there was a trend towards improved overall survival (HR=0.747; 95% CI 0.308-1.806) among TORS patients (Figure 1). There was no significant increase in the incidence of robotic surgical glottic cancer resections by year (Table 2).

Results

Table 1. Baseline clinicodemographic characteristics of patients undergoing surgery.

	All (n = 8430)	Robotic (n = 85)	Open (n = 4094)	TLM (n = 4251)	P value
Age (years)	66.1 (10.8)	67.3 (11.5)	64.1 (10.2)	68.0 (11.0)	0.03
Sex					
Male	7376 (87.5)	74 (87.1)	3656 (89.3)	3646 (85.8)	0.9
Female	1054 (12.5)	11 (12.9)	438 (10.7)	605 (14.2)	0.9
Insurance status					
Not Insured	304 (3.6)	2 (2.3)	241 (5.9)	61 (1.4)	0.5
Private Insurance	2647(31.7)	27 (31.4)	1121 (27.4)	1499 (35.3)	0.9
Medicaid	890 (10.6)	7 (10.6)	669 (16.3)	214 (5.0)	0.5
Medicare	4290 (50.9)	46 (54.1)	1876 (45.8)	2368 (55.7)	0.5
Other Government	148 (1.8)	2 (2.4)	83 (2.0)	63 (1.5)	0.7
NOS	151 (1.8)	1 (1.1)	104 (2.5)	46 (1.1)	0.7
Race					
White	6994 (83.0)	73 (86.0)	3276 (80.0)	3645 (87.0)	0.4
Black	1340(15.9)	9 (10.6)	785 (19.2)	546 (12.8)	0.17
Other	96 (1.1)	3 (3.5)	33 (1.0)	60 (1.4)	0.07
T classification					
Tis, Tx, T0	4(0.05)	0 (0.0)	1 (0.02)	3 (0.1)	>.99
T1	891 (10.6)	10 (11.8)	255 (6.2)	626 (14.7)	0.2
T2	679 (8.1)	7 (8.2)	364 (8.9)	308 (7.3)	>.99
T3	469 (5.6)	4 (4.7)	410 (10.0)	55 (1.3)	0.9
T4	40 (0.5)	0 (0.0)	40 (1.0)	0 (0.0)	>.99
NOS	6347 (75.3)	64 (1.6)	3024 ()	3259 (73.9)	>.99
N classification					
N0	5162 (61.2)	51 (60.0)	2108 (51.5)	3003 (70.6)	0.9
N1	197 (2.3)	1 (1.2)	176 (4.3)	20 (0.5)	0.7
N2	338 (4)	1 (1.2)	319 (7.8)	18 (0.4)	0.3
N3	9 (.10)	0 (0.0)	8 (0.2)	1 (0.02)	>.99
NOS	2724 (32.3)	32 (37.6)	1483 (36.2)	1209 (28.4)	0.3
M classification					
M0	5722 (67.9)	53 (62.4)	2633 (64.3)	3036 (71.4)	0.3
M1	26 (0.3)	0 (0.0)	22 (0.5)	4 (0.1)	>.99
NOS	2682 (31.9)	32 (37.7)	1439 (35.2)	1211 (28.5)	0.3
CCI					
0	5925 (70.3)	59 (69.4)	2690 (65.7)	3176 (39.1)	>.99
1	1699 (20.2)	18 (21.2)	961 (23.5)	720 (16.9)	>.99
2	508 (6.0)	4 (4.7)	274 (6.7)	230 (5.4)	0.8
3	298 (3.5)	4 (4.7)	169 (4.1)	125 (2.9)	0.8
Crowfly	39.5 ± 113.0	34.9 ± 105.0	40.0 ± 89.4	39.1 ± 132.5	0.16

Abbreviation: CI, confidence interval; NOS, not otherwise specified; TLM, transoral laser microsurgery; CCI, Charlson Comorbidity Index; Crowfly, distance in miles from patient's residence to treatment center

Table 2. Cox Regression data of overall treatment modalities

	Hazard Ratio (95% CI)	Standard Error	P value
Age (years)	1.05 (1.04-1.05)	0.001	0
Sex	0.84 (0.76-0.92)	0.04	0
T classification			
T2	1.11 (0.90-1.35)	0.11	0.33
T3	1.41 (1.15-1.75)	0.15	0.001
T4	2.81 (1.60-4.96)	0.81	0
Tis, Tx, T0	1.24 (0.68-2.29)	0.39	0.48
NOS	1.12 (0.95-1.31)	0.09	1.82
N Classification			
N1	1.54 (1.32-1.81)	0.12	0
N2	1.91(1.65-2.21)	0.14	0
N3	1.74 (1.02-2.95)	0.47	0.04
NOS	1.19 (0.96-1.47)	0.13	0.11
M final	2.65 (1.90-3.69)	0.45	0
Treatment Modality			
TLM	0.49 (0.30-0.80)	0.12	0.004
Open	0.69 (0.42-1.14)	0.18	0.15
Robotic	0.75 (0.31-1.81)	0.34	0.52
Primary chemo	1.46 (1.32-1.60)	0.07	0
Adjuvant chemo	1.23 (0.97-1.55)	0.15	0.09
Definitive Radiation	0.73 (0.45-1.20)	0.19	0.22
Adjuvant Radiation	1.18 (1.01-1.38)	0.09	0.04
CCI	1.3 (1.24-1.36)	0.03	0

Abbreviation: CI, confidence interval; NOS, not otherwise specified; TLM, transoral laser microsurgery; CCI, Charlson Comorbidity Index

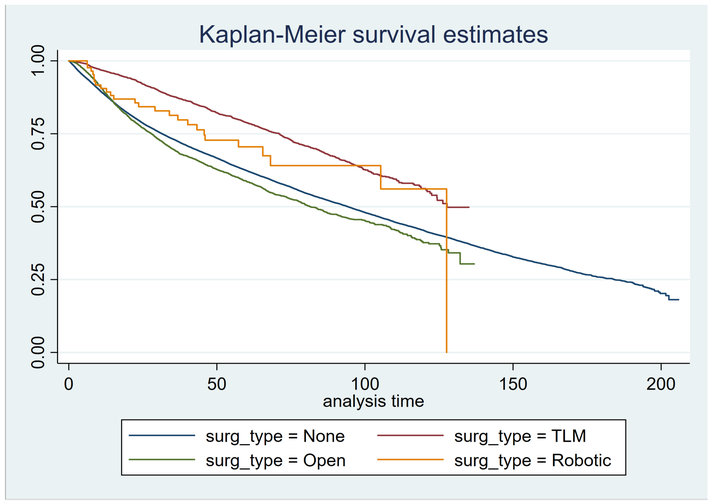

Figure 1. Kaplan Meier curves demonstrating relative overall survival advantage among all glottic tumors (stage independent) favoring TLM and robotic surgery.

Conclusions

TORS conveys important benefits for exposure and ergonomics in the management of head and neck tumors.

This preliminary analysis stipulates that TORS has been used in a small minority of glottic cancer cases nationally but may represent an oncologically tenable approach.

Prospective studies meant to compare TORS to more common treatment modalities are necessary to ascertain the value of TORS in the treatment of glottic cancer.

References

1. Panuganti B, Jeyarajan H. *Transoral Robotic Resection of Large Intramural, Cervical Esophageal Lipoma---Report of a Case and Description of Technique.* Preprints; 2023. doi:10.22541/au.167428445.59701475/v1
2. Zeitels SM, Burns JA. Oncologic Efficacy of Angiolytic KTP Laser Treatment of Early Glottic Cancer. *Ann Otol Rhinol Laryngol*. 2014;123(12):840-846. doi:10.1177/0003489414538936
3. National Cancer Database. 2023. https://www.facs.org/quality-programs/cancer-programs/national-cancer-database/. Accessed August 2023.