Improvements in Survival and Disparities for Advanced-Stage Laryngeal Cancer

Blake Joseph LeBlanc, MD; Runhua Shi, MD, PhD; Vikas Mehta, MD; Glenn Mills, MD; Federico Ampil, MD; Cherie-Ann O. Nathan, MD

IMPACTANCE Laryngeal cancer survival rates have declined over the past 2 decades. Primary surgical therapy may increase survival rates in advanced-stage tumors.

OBJECTIVE To compare survival outcomes for initial surgical treatment of advanced-stage primary tumors in the Louisiana health system with outcomes in the National Cancer Database (NCDB).

DESIGN, SETTING, AND PARTICIPANTS Retrospective analysis was conducted at an academic tertiary referral hospital. Patients diagnosed as having laryngeal carcinoma between 1998 and 2007 were identified via a tumor registry. Louisiana State University Health—Shreveport (LSU Health) data and national data from 2000 to 2010 were obtained from the NCDB of the American College of Surgeons.

INTERVENTIONS Treatment of laryngeal cancer.

MAIN OUTCOMES AND MEASURES Age, sex, race/ethnicity, socioeconomic status, laryngeal subsite, stage, primary treatment modality, and observed survival were analyzed and compared.

RESULTS A total of 165 patients treated at LSU Health met the inclusion criteria. One hundred seventeen (70.91%) presented with advanced-stage (III/IV) disease, compared with 46.67% nationwide (P < .01). For stage IV disease our 5-year survival rate was 55.54% (95% CI, 43.35%-66.11%) compared with 31.60% (95% CI, 30.40%-32.90%) nationally (P < .05). Our proportion of uninsured patients was 23.73% vs 5.05% of patients nationally (P < .001), and our patients traveled further distances for care with 60.47% traveling 50 miles or more, compared with 15.87% nationally (P < .001). Sixty-four of the patients with advanced-stage disease (54.70%) underwent primary surgical therapy to include total laryngectomy. Data from the NCDB indicate that the rate of laryngectomy declined from 40% to 60% in the 1980s to 32% in 2007.

CONCLUSIONS AND RELEVANCE Louisiana State University Health—Shreveport treated more uninsured patients with advanced-stage laryngeal cancer compared with national data but demonstrated higher survival rates for those with advanced-stage disease. The results also demonstrate that we have continued a high rate of primary surgical therapy for advanced-stage disease, despite the national trend toward organ preservation. We believe that upfront laryngectomy may explain our higher survival rates for advanced-stage laryngeal cancer.

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Author Affiliations: Department of Otolaryngology–Head and Neck Surgery, Louisiana State University Health–Shreveport, Shreveport, Louisiana (LeBlanc, Mehta, Nathan); Department of Medicine, Louisiana State University Health–Shreveport, Shreveport (Shi); Department of Oncology, Louisiana State University Health–Shreveport, Shreveport (Mills); Department of Radiation Oncology, Louisiana State University Health–Shreveport, Shreveport (Ampil).

Corresponding Author: Cherie-Ann O. Nathan, MD, Department of Otolaryngology–Head and Neck Surgery, LSU Health–Shreveport, 1501 Kings Hwy, PO Box 33932, Shreveport, LA 71130-3932 (cnatha@lsuhsc.edu).
The larynx is the most common subsite affected in head and neck cancer, with over 10,000 cases occurring annually. Over the past 2 decades, treatment of advanced-stage laryngeal cancer has undergone a paradigm shift from primary surgical therapy to an organ-preserving approach. The Department of Veteran Affairs laryngeal cancer study group of 1991 suggested that chemotherapy and radiation is an option in treating advanced-stage laryngeal carcinoma, with survival rates similar to those of surgical therapy. This was further supported with the publication of the Radiation Therapy Oncology Group 91-11, which compared differing modalities of organ preservation. The recently published long-term results of this study show superior survival rates for concomitant chemoradiation, with improved locoregional control and laryngeal preservation, over radiation alone. Between 1997 and 2008, the number of laryngectomies in the United States decreased by 48%, consistent with the trend toward organ preservation. Interestingly, there has also been a concomitant decrease in survival rates among patients with laryngeal cancer in the United States during the past 2 decades.

Louisiana has a unique state-wide public/charity health care system (Louisiana State University [LSU] Health) in which patients have access to health care irrespective of socioeconomic class and insurance status. In 2011, the US Census Bureau published data showing that 938,000 Louisiana citizens (20.8% of the population) were uninsured. Insurance status has previously been shown to influence survival in laryngeal cancer. The purpose of the present study was to evaluate laryngeal cancer survival outcomes at a single academic tertiary hospital in the LSU Health care system and to compare our data with nationally published data. We hypothesized that continued aggressive primary surgical therapy for advanced laryngeal tumors would result in improved survival rates despite the increased socioeconomic burden of our patient population.

Results

Between 2000 and 2010, 316 LSU Health patients were identified and compared with 117,463 patients in the NCDB. Sex analysis revealed that LSU Health treated fewer males (74.68%) compared with the NCDB (79.61%) (P < .04). At LSU Health, 161 of the patients (50.95%) were white, 154 (48.73%) were African American, and 1 (0.32%) was Hispanic, compared with 92,069 (78.59%) white and 16,604 (14.17%) African American in the national data (P < .001). Among the LSU Health patients, 75 (23.73%) were uninsured and 64 (20.25%) were on Medicaid, compared with 5991 (5.05%) and 10,115 (8.58%) nationally, respectively (P < .001). Our patients’ income was less than $33,000 for 70.26% of the time (215 patients), compared with 31.10% nationally (34,360) (P < .001). Our patients traveled further distances for care, with 179 (60.47%) traveling 50 miles or more, relative to the 15.87% nationally (P < .001). The disease of 94 patients (31.44%) was clinically early stage (I/II), and 199 (66.55%) had advanced-stage (III/IV) disease, compared with 54,880 (49.98%) and 48,022 (43.73%), respectively, nationwide (P < .001). Of the 316 LSU Health patients, 80 (25.32%) underwent total laryngectomy in stark contrast to the 13,132 (11.21%) in the NCDB cohort (P < .001) (Table). Data from the NCDB indicate that the rate of laryngectomy had declined from 60% in the 1980s to 32% in 2007.

A separate analysis was performed of 165 patients with laryngeal carcinoma in the LSU Health tumor registry from 1998 to 2007. Sex analysis revealed 132 male patients (80.00%) and 33 female patients (20.00%). The mean age was 55.5 years (range, 35-74 years). Racial demographics demonstrated 84 white patients (50.91%), 80 African American patients (48.48%), and 1 Hispanic patient (0.61%), compared with 92,069 white patients (78.59%) and 16,604 African American patients (14.17%) nationally (P < .001). Of the patients studied, 48 (29.09%) had clinically early-stage (I/II) disease and 1(276,959),(668,991)(414,960),(585,973) (0.61%). The survival rate at 5 years and its base, which now has more than 29 million records spanning the United States. Data were extracted from the NCDB based on histologic characteristics and site codes. The data evaluated in the study included the 5-year overall survival (OS), TNM classification, treatment modality (including surgical therapy–partial vs total laryngectomy), chemotherapy, radiation therapy, age, sex, and race/ethnicity. Socioeconomic data were also analyzed, including insurance status, household income as well as distance traveled. Staging was conducted in accordance with American Joint Committee on Cancer classification, 7th edition. Observed survival was determined on the date of last contact, which was calculated using the interval of time between the date of diagnosis and death. Fisher exact test or χ² test methods were used where appropriate to compare data. The Kaplan-Meier survival method was used to calculate the 5-year survival rate. P < .05 was considered statistically significant. Statistical analysis was performed using SAS software (version 9.3; SAS Institute Inc.).
95% confidence interval were compared with data in the NCDB (cases diagnosed in 2003-2005) by stage. Our OS (all stages) rate of 59.14%, was very similar to the nationwide reported OS rate of 55.40% ($P > .05$). The improvement in survival was significantly higher for stage IV disease at 55.54% for 5-year survival compared with 31.60% nationally ($P < .05$) (Figure). Of 117 patients with advanced-stage disease (stage III/IV), 64 (54.70%) underwent primary surgical therapy to include total laryngectomy or pharyngolaryngectomy.

**Discussion**

The treatment of advanced-stage laryngeal carcinoma has undergone a paradigm shift over the past few decades. Increasing emphasis has been placed on organ preservation, functional status, laryngectomy-free survival, and quality of life. One study demonstrated these concepts through a survey of healthy volunteers, which concluded that some participants would decline total laryngectomy in favor of alternative therapy, despite it diminishing their chance for cure. Thus, research efforts have been focused on developing the treatment associated with the morbidity while still preserving survival rates. The prospective, randomized study performed by the Department of Veterans Affairs Laryngeal Cancer Study group in 1991 suggested that induction chemotherapy followed by radiotherapy offered organ preservation without compromising survival. The timing of this study correlates well with the expanded use of chemoradiation as well as the decline in the number of laryngectomies performed. The decline in total laryngectomies is not solely attributable to decreasing rates of laryngeal cancer and may reflect a shift toward organ preservation protocols. Between 1997 and 2008, the number of laryngectomies performed decreased by 48%. Orosco et al showed that the number of hospitals in the United States performing laryngectomies has decreased, with the South and Midwest showing higher case volumes. It has also been demonstrated that laryngeal cancer survival has decreased in the past 2 decades, with Hoffman et al suggesting that it may be related to the change in treatment at most institutions. The 5-year survival rate for patients with T3N0M0 laryngeal cancer was significantly better with primary surgery (67.5%) than it was with organ preservation protocols (54.7%) ($P < .05$).

Dziegielewski et al analyzed data for 258 patients with T3 and T4a laryngeal cancers and compared total laryngectomy...
tomy plus adjuvant therapy, chemoradiation, and radiation alone. They found that total laryngectomy plus adjuvant therapy provides superior survival compared with chemoradiation and radiation alone. While it seems logical that triple modality therapy would confer improved survival at the expense of increased morbidity, the question arises as to whether we should be advising upfront surgical therapy more frequently for the advanced T-stage tumors. Current National Comprehensive Cancer Network guidelines display the options of concurrent systemic therapy vs laryngectomy vs induction chemotherapy for advanced T-stage glottic and supraglottic carcinomas. At our institution, T4 tumors with cartilage and extralaryngeal involvement are uniformly offered total laryngectomy in favor of organ preservation, which resulted in a higher percentage of primary surgical patients at LSU Health when compared with the NCDB. Our results indicate that LSU Health treats a significant higher proportion of advanced-stage laryngeal cancer. The reason for this is likely multifactorial. Louisiana State University–Health Shreveport is a public hospital with a large proportion of uninsured and Medicaid and those with low socioeconomic status. Based on our demographic data, we had significantly more uninsured patients as well as patients traveling further distances for care, likely owing to their lack of insurance. These limitations, however, do not seem to affect our patients’ survival. Chen et al demonstrated that treatment in high-volume community cancer centers was associated with improved survival. In addition, socioeconomic-related factors have been known to contribute to survival differences. Health insurance status, unequal access to medical care, and treatment compliance are all factors that affect outcomes. Chen and Halpern found that black race as well as uninsured status, Medicare, and Medicaid were associated with decreased survival, possibly reflecting lack of access to care. Our data suggest that despite of disparities in insurance and socioeconomic status, improvements in survival can be achieved with primary surgical treatment.

Limitations of this study must be addressed. It is a single academic center’s experience with unique patient and institutional characteristics. Two databases were used, the LSU Health tumor registry and the NCDB, potentially introducing bias. Treatment algorithms for laryngeal cancer depend on multiple patient characteristics. We analyzed observed survival and not cause-specific survival. We also did not address comorbidities, which certainly influenced the modality of treatment. Despite these limitations, this study prompts investigation into further defining the optimal treatment for laryngeal carcinoma. In the era of chemoradiation, the presence of cartilage invasion and/or extension into the soft tissues of the neck often prompts surgical intervention. Gourin et al recently found that surgery with postoperative radiation for laryngeal cancer significantly improved survival as well as lowered costs when compared with chemoradiation. Further research is needed to compare treatment modalities and to investigate decreasing laryngeal cancer survival rates.

Conclusions

This study shows that LSU Health treats a high percentage of patients with advanced-stage laryngeal carcinoma who have lower socioeconomic status, yet still has improved survival rates compared with the NCDB over the study time period. This contributes to a growing body of literature that suggests that initial surgical therapy for advanced-stage disease may result in increased survival compared with organ preservation protocols.

Despite LSU Health treating more patients with advanced-stage laryngeal cancer and with disadvantaged socioeconomic status, our institution demonstrated higher survival rates for advanced-stage disease when compared with national data within the NCDB. These results suggest that primary surgical therapy for advanced-stage disease may improve OS.
ARTICLE INFORMATION
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Study concept and design: Mehta, Nathan.
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Drafting of the manuscript: LeBlanc, Shi, Mills, Ampil, Nathan.
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REFERENCES