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Retrospective Analysis of Survival Outcomes for Advanced Laryngeal Cancer Using Modern Radiation Techniques

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Abstract

Introduction: RTOG 91-11 established concurrent chemoradiation (cCRT) as the standard for laryngeal preservation in locally advanced laryngeal cancers, demonstrating a 10-year laryngeal preservation rate of 81.7% and 10-year overall survival (OS) of 27.5%. Notably, this landmark study, conducted between 1992 and 2000, primarily utilized two-dimensional radiation therapy (RT). Over the past two decades, advancements in radiation oncology have enabled more precise and conformal treatment approaches, aiming to improve disease outcomes while reducing toxicities. Herein, we provide a single-institution analysis of outcomes for locally advanced laryngeal cancer in the era of intensity modulated RT (IMRT), comparing them to historical outcomes.

Methods: This single-institution retrospective cohort study analyzed 62 patients with locoregionally advanced laryngeal cancer, diagnosed and treated from 2014 to 2024. Inclusion criteria included AJCC Stage III-IVB squamous cell carcinoma of the larynx treated with definitive cCRT.

Key endpoints included larynx preservation, disease-free survival (DFS), overall survival (OS), local control, and distant control. Statistical analysis was performed using Kaplan-Meier curves and log-rank testing, with appropriate censoring for survival rates. A Z-test for proportions was performed to compare survival rates with historical outcomes using results from RTOG 91-11.

Results: Of the 62 patients, 56.5% had stage III, 41.9% had stage IVA, and 1.6% had stage IVB, respectively. Clinical tumor and nodal stage were distributed as followed: T2, 1.61%, T2, 19.4%, T3, 64.5%, T4a, 14.5%, T4b, 0%, N0, 41.9%, N1, 19.4%, N2, 37.1%, N3, 1.6%. All patients were treated with IMRT, with median RT dose was 7000 cGy. Concurrent chemotherapy with cisplatin was administered to 90.3% of patients. Median follow-up time was 2.95 years (0.45 to 12.5 years).

5-year and 10-year larynx preservation rate was 84.2%. 5-year and 10-year locoregional control were 68.1%. 5-year and 10-year distant control were 90.5% and 72.4%, respectively. 5-year and 10-year DFS were 56.9% and 42.6%, respectively. 5-year and 10-year OS were 73.5% and 64.6%, respectively.

Z-test for proportions revealed improvement in OS and DFS with modern RT compared to historical outcomes. $Z = 3.19$ ($p = 0.00142$) for 10-year DFS and $z = 5.19$ ($p < 0.00001$) for 10-year OS. Interestingly, comparison of 10-year laryngeal preservation rates was not statistically significant with $z = 0.44$ ($p = 0.65994$).

Conclusion: Although limited by sample size, this study suggests that modern RT techniques result in significant improvements in survival outcomes for locally advanced laryngeal cancer compared to historical outcomes. Additional studies comparing survival outcomes of primary surgical management versus definitive cCRT in this patient population are needed in the context of modern RT.