



# Thyroid Stimulating Hormone Testing and Outcomes in Total Laryngectomy Patients

James D. Warren BS<sup>1</sup>, Kacie R. Oglesby MD<sup>2</sup>, Carlton R. Homan BS<sup>3</sup>, Edmund Howe BS<sup>3</sup>, Oishika Paul MPH<sup>2</sup>, Patrick Tassone MD<sup>4</sup>, Anne C. Kane MD FACS<sup>2</sup>

University of Mississippi Medical Center School of Medicine,<sup>1</sup> Department of Otolaryngology - Head and Neck Surgery<sup>2</sup>  
University of Missouri School of Medicine<sup>3</sup>, Department of Otolaryngology – Head and Neck Surgery<sup>4</sup>

## INTRODUCTION

- Laryngeal cancer poses a significant burden in the US, with an estimated incidence of 2.8 per 100,000 men and women per year.<sup>1</sup>
- Total laryngectomy (TL) remains a mainstay in treatment in both the upfront and salvage settings.
- TL can result in post-operative hypothyroidism and pharyngocutaneous fistula (PCF) formation, which both negatively impact wound healing and outcomes.<sup>2</sup>
- A history of chemoradiotherapy or radiotherapy predisposes patients to the development of post-operative hypothyroidism.<sup>3</sup>
- There is currently no algorithm for post-operative monitoring of TSH following TL.
- In this dual-institution study, we identified rates of hypothyroidism following TL and examined its relationship with PCF formation.

## MATERIALS and METHODS

**Participants:** Retrospective analysis of 256 total laryngectomy patients from two academic medical centers.

**Data Collection:** We collected patient characteristics and treatment-related factors including extent of thyroid removal, post-operative laboratory values, post-op interval for TSH testing, and post-operative complications including PCF. Pre- and post-operative thyroid-stimulating hormone (TSH) values were categorized into low (< 0.27 mIU/mL), normal (0.27 – 4.20 mIU/mL), and high (> 4.20 mIU/mL) ranges.

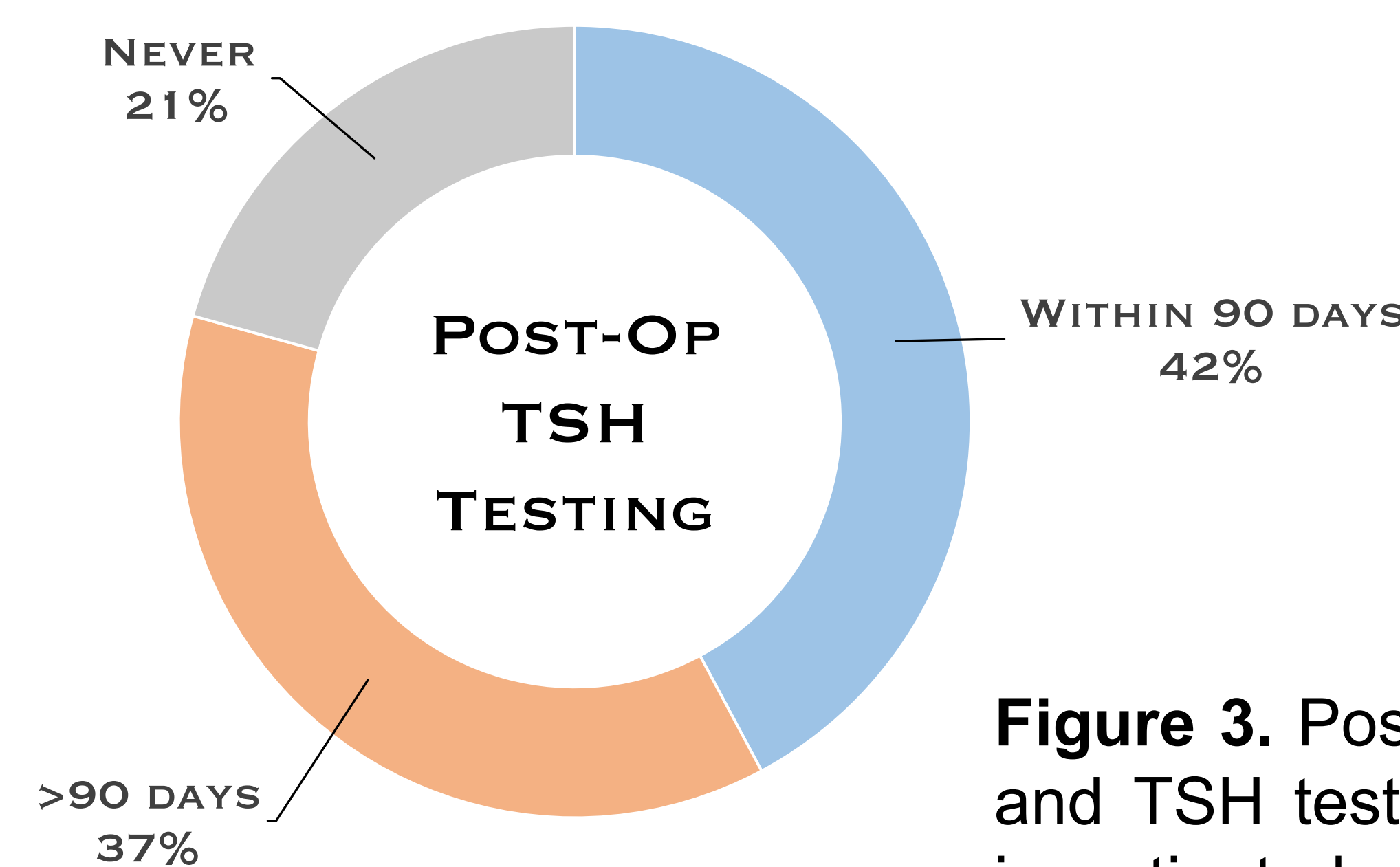
**Statistical Analysis:** Descriptive variables were summarized by mean (SD) values for continuous variables and frequency (percentage) for categorical variables. Chi square test was conducted to assess relationships between categorical variables, including pre/post-op TSH, PCF formation, and thyroid removal. Significant associations were subsequently adjusted for using logistic regression models to determine their relationship with pre/post-op TSH. Binary logistic regression analysis was performed to assess the combined effects of multiple independent variables on PCF formation, including pre/post-op TSH and history of chemotherapy or radiation. Statistical significance was set at p<0.05. Statistical analysis and data management was performed using IBM SPSS v28.

## DISCUSSION

- Hypothyroidism is a common diagnosis in total laryngectomy patients, especially in instances where radiotherapy is utilized.
- Risk of post-operative hypothyroidism more than doubled with any thyroid removal during surgery.
- Rate of PCF formation in TL patients is consistent with established literature. Odds of PCF development following surgery was significantly increased in patients with high post-operative TSH or with a history of radiation therapy, further demonstrating the impact of hypothyroidism and radiation exposure on post-operative healing.
- Hypothyroidism's negative impact on wound healing supports the need for standardized post-operative TSH testing protocols.
- Further research is needed to validate findings and establish optimal monitoring strategies.

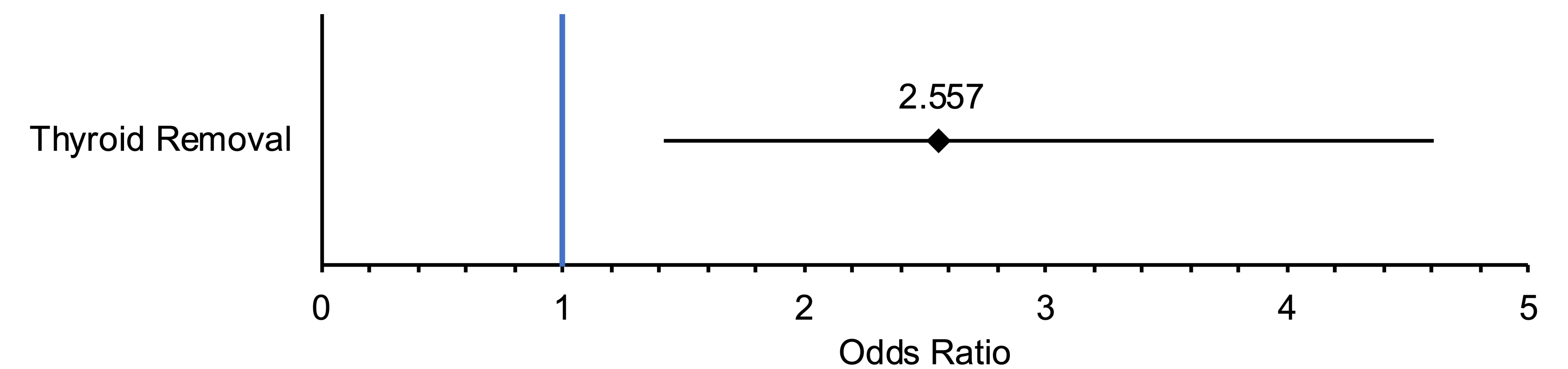
**Table 1.** Patient characteristics and TSH values

|                         |               | N(%)        |
|-------------------------|---------------|-------------|
| Gender                  | Male          | 191 (74.6%) |
|                         | Female        | 65 (25.4%)  |
| Fistula Formation       | No            | 189 (73.8%) |
|                         | Yes           | 66 (25.8%)  |
| History of Radiation    | No            | 125 (48.8%) |
|                         | Yes           | 130 (50.8%) |
| History of Chemotherapy | No            | 159 (62.1%) |
|                         | Yes           | 97 (37.9%)  |
| Thyroid Removal         | No            | 98 (38.3%)  |
|                         | Yes           | 158 (61.7%) |
|                         | Hemi-thyroid  | 134 (52.3%) |
|                         | Total Thyroid | 24 (9.4%)   |
| Pre-operative TSH       | Normal        | 55 (74.3%)  |
|                         | High          | 13 (17.6%)  |
|                         | Low           | 6 (8.1%)    |
| Post-operative TSH      | Normal        | 79 (38.7%)  |
|                         | High          | 118 (57.8%) |
|                         | Low           | 7 (3.4%)    |

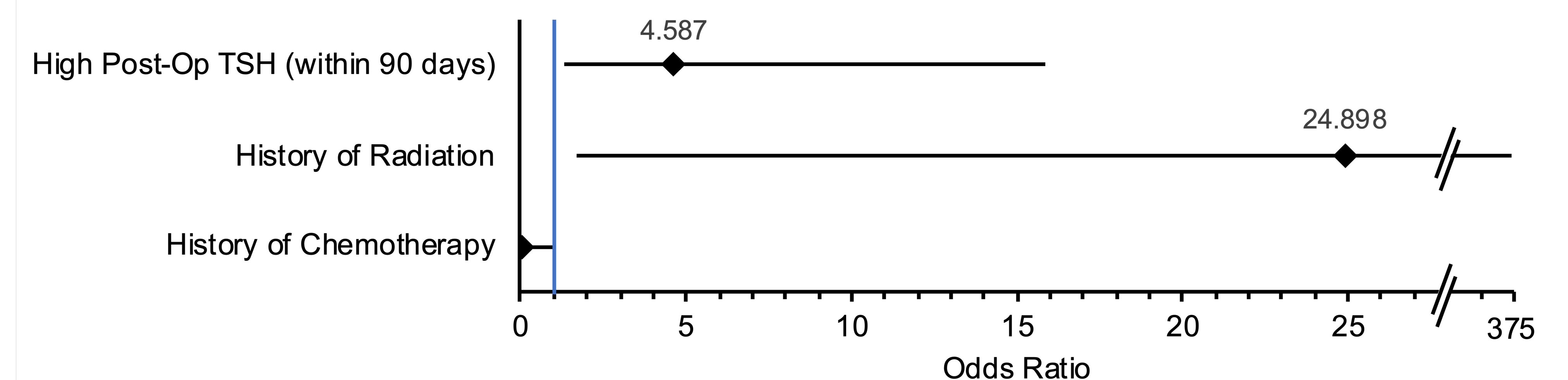


**Figure 3.** Post-operative TSH testing interval. The mean interval between surgery and TSH testing was 214.29 days overall (SD 390.830). Of the 256 TL patients investigated, 108 (42.2%) patients received post-operative TSH testing within 90 days of surgery.

## RESULTS



**Figure 1.** Odds of developing post-operative hypothyroidism following TL. Any thyroid removal during surgery more than doubled the risk of postoperative hypothyroidism (OR= 2.557, p=.002, 95% CI [1.419, 4.609]) compared to no thyroid removal (blue line).



**Figure 2.** Odds of PCF formation following TL if high post-operative TSH, history of radiation, or history of chemotherapy is present. Patients with a history of radiation or high post-op TSH had a significantly higher risk of PCF formation (OR= 24.898, p=.020, 95% CI [1.662, 373.067]; OR= 4.587, p= 0.016, 95% CI [1.326, 15.860], respectively) compared to patients without (blue line).

## CONCLUSION

- These findings underscore the importance of monitoring thyroid function in post-operative TL patients
- Radiation history, extent of thyroid removal, and post-op thyroid function may be important factors to consider in managing post-operative complications.
- Further research is needed to fully understand the underlying mechanisms and to develop optimal post-operative monitoring strategies for thyroid function in patients undergoing TL.

## REFERENCES

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## CONTACT

James D. Warren, BS.  
University of Mississippi Medical Center  
jwarren6@umc.edu