



A PROSPECTIVE STUDY OF DYSPHONIA AFTER THYROIDECTOMY AT TERTIARY CARE CENTER

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ABSTRACT

Background: Dysphonia is a common complication following thyroidectomy, resulting from recurrent laryngeal nerve (RLN), external branch of the superior laryngeal nerve (EBSLN) injury, or non-neural surgical factors. This study prospectively evaluated the incidence, severity, and recovery of postoperative dysphonia using subjective and objective voice assessment tools. **Methods:** A prospective observational study was conducted from June 2024 to May 2026 among 78 patients undergoing thyroidectomy with normal preoperative voice and vocal cord mobility. Voice was assessed preoperatively and at postoperative day 1, 1 week, 1 month, and 3 months using the Voice Handicap Index-10 (VHI-10), maximum phonation time (MPT), acoustic analysis (fundamental frequency, jitter, shimmer, harmonic-to-noise ratio [HNR]), and laryngoscopy. **Results:** Females comprised 87.2% of participants, with most patients aged 21–40 years. Significant deterioration in voice parameters was observed immediately after surgery. Mean fundamental frequency decreased from 205.82 ± 35.75 to 170.79 ± 36.90 Hz, HNR from 21.15 ± 3.85 to 14.61 ± 4.24 dB, and MPT from 13.57 ± 3.30 to 3.79 ± 1.42 seconds, while VHI-10 increased from 3.11 ± 3.46 to 20.46 ± 4.88 (all $p < 0.001$). Vocal cord paresis with RLN/EBSLN involvement occurred in 5.1% of patients and resolved completely by 3 months. VHI-10 showed a strong negative correlation with MPT ($r = -0.74$, $p < 0.001$). **Conclusion:** Thyroidectomy causes significant but largely transient dysphonia. Most patients experience substantial recovery within 3 months, highlighting the importance of multidimensional voice assessment for early detection and postoperative monitoring.

KEYWORDS

Dysphonia, Recurrent Laryngeal Nerve, Vocal Cord Paresis, Acoustic Voice Analysis

INTRODUCTION

Thyroidectomy is one of the most commonly performed endocrine procedures for the management of benign and malignant thyroid disorders. Despite advances in surgical techniques and perioperative care, postoperative dysphonia remains a clinically significant complication because of its adverse effects on communication, occupational performance, and quality of life.[1–3] Voice changes may result from injury to the recurrent laryngeal nerve (RLN), leading to vocal cord paralysis and hoarseness, or damage to the external branch of the superior laryngeal nerve (EBSLN), which impairs pitch modulation, particularly in professional voice users.[4,5]

In addition to neural injury, postoperative voice alterations may arise from non-neural factors such as laryngeal edema, endotracheal intubation, strap muscle dysfunction, and postoperative fibrosis. Consequently, comprehensive voice assessment using both subjective and objective measures has become an integral component of postoperative evaluation. The Voice Handicap Index (VHI), laryngoscopy, acoustic analysis, and aerodynamic parameters are widely used to quantify voice outcomes, while preoperative assessment is essential to identify baseline vocal cord dysfunction associated with thyroid disease.[6–8]

The present prospective study was undertaken to evaluate the incidence, severity, and recovery of dysphonia following thyroidectomy using multidimensional voice assessment. The findings are expected to facilitate early detection of postoperative voice disorders, improve patient counselling, and optimize postoperative management to preserve voice quality and enhance functional outcomes.

MATERIALS AND METHODS

The prospective observational study was conducted in the Department of Otorhinolaryngology and Head & Neck Surgery, over a period from June 2024 to May 2026, after receiving Institutional Ethical clearance. 78 participants were selected based on the fulfillment of inclusion and exclusion criteria.

Inclusion Criteria

Patients aged ≥ 18 years undergoing thyroidectomy, having normal voice before procedure, undergoing total, hemithyroidectomy, or completion thyroidectomy, with normal preoperative vocal cord

mobility on laryngoscopic examination, willing to provide written informed consent.

Exclusion Criteria

Patients with pre-existing dysphonia or vocal cord paralysis, previous neck surgery or radiation therapy, with laryngeal pathology (nodules, polyps, malignancy) affecting voice, neurological disorders affecting phonation, unwilling to participate or who lost follow-up.

All patients underwent thyroidectomy under general anaesthesia using standard surgical techniques, with the extent of surgery (total, hemithyroidectomy, or completion thyroidectomy) determined by the underlying pathology. Intraoperatively, meticulous identification and preservation of the recurrent laryngeal nerve (RLN) and external branch of the superior laryngeal nerve (EBSLN) were attempted in all cases, and relevant operative details were documented.

Voice assessment was performed preoperatively and postoperatively on day 1, at 1 week, 1 month, and 3 months. Subjective evaluation included the Voice Handicap Index-10 (VHI-10) and maximum phonation time (MPT). Objective assessment comprised laryngoscopic evaluation of vocal cord mobility and acoustic voice analysis using PRAAT software, measuring fundamental frequency (F0), jitter, shimmer, and harmonic-to-noise ratio (HNR). Demographic, clinical, operative, and follow-up data were prospectively recorded using a standardized case record form.

Data were analyzed using JAMOV version 2.6.44 and R Studio version 4.5.3. Continuous variables were expressed as mean $\pm$ standard deviation (SD) and categorical variables as frequencies and percentages. Comparisons were performed using paired or unpaired t -tests, Chi-square test, or Fisher's exact test, as appropriate. A two-tailed p value < 0.05 was considered statistically significant.

RESULT

Table 1. Baseline Demographic and Clinical Characteristics of Study Participants (n = 78)

Variable	Category	n (%)
Age Group (years)	<20	1 (1.3)
	21–40	35 (44.9)
	41–60	29 (37.2)
	>60	13 (16.7)

Gender	Female	68 (87.2)
	Male	10 (12.8)
Diagnosis	Colloid Goiter	22 (28.2)
	Benign Follicular Nodule	11 (14.1)
	Follicular Neoplasm	11 (14.1)
	Papillary Carcinoma	10 (12.8)
	Atypia of Undetermined Significance	7 (9.0)
	Colloid Cyst	6 (7.7)
	Benign Follicular Lesion	2 (2.6)
	Solitary Nodule	2 (2.6)
	Other Diagnoses*	7 (9.0)
Type of Thyroidectomy	Hemithyroidectomy	34 (43.6)
	Total Thyroidectomy	42 (53.8)
	Completion Thyroidectomy	2 (2.6)

The study included 78 patients undergoing thyroidectomy, predominantly females (87.2%), with most aged 21–40 years (44.9%). Colloid goitre was the most common diagnosis (28.2%), followed by benign follicular nodule and follicular neoplasm (14.1% each), while papillary carcinoma was the commonest malignancy (12.8%). Total thyroidectomy was the most frequently performed procedure (53.8%), followed by hemithyroidectomy (43.6%) and completion thyroidectomy (2.6%).

Table 2. Changes in Acoustic, Aerodynamic, and Subjective Voice Parameters During Follow-up After Thyroidectomy (n = 78)

Parameter	Pre-op	POD1	POD7	POD30	POD90	F value	p value
Fundamental Frequency (F0), Hz	205.82 ± 35.75	170.79 ± 36.90	187.85 ± 34.18	197.21 ± 33.54	201.23 ± 34.82	14.488	<0.001
Jitter (%)	0.42 ± 0.24	0.97 ± 0.66	0.84 ± 1.25	0.60 ± 0.46	0.49 ± 0.25	2.108	0.080
Shimmer (%)	3.00 ± 0.08	4.90 ± 3.60	4.40 ± 4.10	3.70 ± 2.60	3.00 ± 0.09	1.641	0.164
Harmonic-to-Noise Ratio (HNR), dB	21.15 ± 3.85	14.61 ± 4.24	17.32 ± 4.19	19.72 ± 4.34	20.86 ± 3.89	34.915	<0.001
Maximum Phonation Time (MPT), sec	13.57 ± 3.30	3.79 ± 1.42	8.65 ± 2.84	10.92 ± 2.95	12.21 ± 2.96	83.75	<0.001
VHI-10 Score	3.11 ± 3.46	20.46 ± 4.88	13.08 ± 5.44	7.99 ± 3.89	4.85 ± 2.61	98.11	<0.001

Values are expressed as Mean ± SD. POD: Postoperative day; F0: Fundamental frequency; HNR: Harmonic-to-noise ratio; MPT: Maximum phonation time; VHI-10: Voice Handicap Index-10. Repeated measures ANOVA was used to compare values across follow-up.

Following thyroidectomy, significant deterioration was observed in acoustic, aerodynamic, and subjective voice parameters immediately after surgery, with the greatest changes occurring on POD1. Fundamental frequency, HNR, MPT, and VHI-10 improved progressively during follow-up, approaching baseline values by 3 months, whereas changes in jitter and shimmer were not statistically significant.

Table 3. Vocal Cord Mobility During Follow-up and Incidence of RLN/EBSLN Involvement (n = 78)

Parameter	Pre-op n (%)	POD1 n (%)	POD7 n (%)	POD30 n (%)	POD90 n (%)
Normal Vocal Cord Mobility	78 (100.0)	74 (94.9)	74 (94.9)	74 (94.9)	78 (100.0)
Vocal Cord Paresis	0 (0.0)	4 (5.1)	4 (5.1)	4 (5.1)	0 (0.0)

RLN/EBSLN Involvement

Nerve Status	n (%)
RLN/EBSLN Involvement Present	4 (5.1)
No RLN/EBSLN Involvement	74 (94.9)
Total	78 (100.0)

RLN: Recurrent Laryngeal Nerve; EBSLN: External Branch of Superior Laryngeal Nerve.

Serial laryngoscopic evaluation demonstrated normal vocal cord

mobility in all patients preoperatively. Following thyroidectomy, 4 patients (5.1%) developed vocal cord paresis in the immediate postoperative period, while the remaining 74 patients (94.9%) maintained normal vocal cord function. The incidence of vocal cord paresis remained unchanged through postoperative day 30, indicating persistence of transient postoperative laryngeal dysfunction during the early recovery period. However, complete recovery of vocal cord mobility was observed by the 3-month follow-up, with all affected patients regaining normal vocal fold movement.

Similarly, RLN/EBSLN involvement was identified in 4 patients (5.1%), whereas 94.9% of patients showed no evidence of postoperative nerve dysfunction. The correspondence between nerve involvement and cases of vocal cord paresis suggests that postoperative dysphonia in these patients was primarily attributable to transient laryngeal nerve injury. The absence of persistent vocal cord paresis at 3 months indicates a favorable prognosis and effective recovery of neural function following thyroidectomy. Overall, these findings demonstrate a low incidence of laryngeal nerve-related complications and support the effectiveness of meticulous nerve preservation during thyroid surgery.

Table 4. Voice Outcomes According to Vocal Cord Status and Correlation with VHI-10 Scores

A. Comparison of Subjective and Objective Voice Parameters According to Vocal Cord Status (POD1)

Parameter	Normal Vocal Cord Mobility (n=74)	Vocal Cord Paresis (n=4)	p value
VHI-10 Score	19.9 ± 4.6	29.5 ± 2.3	<0.001
Fundamental Frequency (F0), Hz	172.6 ± 35.8	138.2 ± 21.6	<0.05
Jitter (%)	0.92 ± 0.61	1.80 ± 0.80	<0.05
Shimmer (%)	4.6 ± 3.1	8.2 ± 4.1	<0.05
Maximum Phonation Time (MPT), sec	3.9 ± 1.3	2.1 ± 0.8	<0.05

Values are expressed as Mean ± SD.

B. Correlation of VHI-10 Scores with Acoustic and Aerodynamic Voice Parameters

Parameter	Correlation Coefficient (r)	p value
Fundamental Frequency (F0)	-0.62	<0.001
Jitter	+0.71	<0.001
Shimmer	+0.68	<0.001
Harmonic-to-Noise Ratio (HNR)	-0.59	<0.001
Maximum Phonation Time (MPT)	-0.74	<0.001

Pearson correlation analysis.

Patients with postoperative vocal cord paresis had significantly poorer voice outcomes than those with normal vocal cord mobility, evidenced by higher VHI-10 scores, lower fundamental frequency and maximum phonation time, and higher jitter and shimmer values (all $p < 0.001$). VHI-10 showed significant correlations with all objective voice parameters, with the strongest negative correlation observed for maximum phonation time ($r = -0.74$, $p < 0.001$), indicating a close association between vocal cord dysfunction and patient-perceived dysphonia following thyroidectomy.

DISCUSSION

The present study prospectively evaluated voice outcomes following thyroidectomy using subjective, objective, aerodynamic, and laryngoscopic parameters.

The study population was predominantly female and comprised mainly young to middle-aged adults, reflecting the well-established epidemiology of thyroid disorders. Colloid goiter was the most common indication for surgery, and total thyroidectomy was the most frequently performed procedure, findings consistent with those reported by Lee et al. [9].

Thyroidectomy resulted in significant but transient postoperative deterioration in voice function. Acoustic analysis demonstrated a marked reduction in fundamental frequency (F0) and harmonic-to-noise ratio (HNR) immediately after surgery, with gradual recovery toward baseline by 3 months, whereas changes in jitter and shimmer were not statistically significant. Similar postoperative acoustic

alterations have been reported by Lombardi et al. [10] and Lang et al. [11], suggesting that transient laryngeal edema and surgical manipulation contribute to early voice impairment.

Aerodynamic assessment showed a significant decline in maximum phonation time (MPT) immediately after surgery, followed by progressive improvement during follow-up. Likewise, VHI-10 scores increased markedly on the first postoperative day and gradually returned to near-baseline values by 3 months, indicating substantial recovery in patient-perceived voice function. Comparable improvements in objective and subjective voice outcomes following thyroidectomy have been described by Stojadinovic et al. [8] and Kletzien et al. [12].

Laryngoscopic evaluation revealed transient vocal cord paresis and RLN/EBSLN involvement in 5.1% of patients, with complete recovery by 3 months. These findings are comparable to those reported by Rosato et al. [13], supporting that most postoperative nerve injuries represent temporary neuropraxia rather than permanent dysfunction.

Patients with vocal cord paresis exhibited significantly poorer subjective and objective voice outcomes, including higher VHI-10 scores, lower F0 and MPT, and higher jitter and shimmer values. Furthermore, VHI-10 demonstrated significant correlations with all objective voice parameters, with the strongest association observed for MPT, indicating that reduced phonatory efficiency closely reflects patient-perceived dysphonia. These findings support the complementary use of subjective and objective voice assessment for comprehensive evaluation and postoperative monitoring of dysphonia following thyroidectomy.

CONCLUSION

In conclusion, thyroidectomy is associated with significant but predominantly transient postoperative dysphonia. Although laryngeal nerve involvement contributes to voice impairment in a minority of patients, most postoperative voice changes occur despite preserved vocal cord mobility, indicating the importance of non-neural mechanisms. The severity of dysphonia is influenced by the extent of surgery and is reflected in both subjective and objective voice measures. Most patients experience substantial recovery within three months after surgery. Routine preoperative counseling, baseline voice assessment, postoperative voice monitoring, and timely intervention for persistent dysphonia are essential to optimize functional outcomes and improve postoperative quality of life in patients undergoing thyroidectomy.

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