

Assessment of Voice Outcomes after Thyroidectomy Using Voice Handicap Index Questionnaire

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ABSTRACT

Background: Voice disturbance is a recognized complication following thyroidectomy and may occur despite preservation of vocal cord mobility. The Voice Handicap Index (VHI) is a validated patient-reported outcome measure that comprehensively evaluates the functional impact of postoperative voice changes and facilitates early identification of voice impairment.

Objective: To determine voice outcomes following total thyroidectomy for benign thyroid disease using the Voice Handicap Index questionnaire and to identify factors associated with postoperative voice impairment and vocal cord palsy.

Methods: This descriptive study was conducted in the Department of General Surgery, Jinnah Postgraduate Medical Centre, Karachi, over six months after institutional ethical approval. A total of 174 adult patients undergoing total thyroidectomy for benign thyroid disease were enrolled through non-probability consecutive sampling. Preoperative and postoperative voice outcomes were assessed using the validated Voice Handicap Index questionnaire and indirect laryngoscopy. Significant voice impairment was defined as an increase of ≥ 18 points in VHI score. Data were analyzed using SPSS version 26. Continuous variables were summarized as mean $\pm$ standard deviation or median (interquartile range), while categorical variables were expressed as frequencies and percentages. Associations were evaluated using the Chi-square test or Fisher's exact test, with $p < 0.05$ considered statistically significant.

Results: The mean age was 39.8 ± 10.7 years, and 103 (59.2%) participants were female. The median VHI score increased from 11 (IQR: 7–16) preoperatively to 18 (IQR: 11–28) postoperatively. Significant postoperative voice impairment was observed in 39 (22.4%) patients, whereas postoperative vocal cord palsy occurred in 9 (5.2%). Diabetes mellitus was significantly associated with postoperative voice impairment (34.9% vs. 18.3%; $p = 0.024$). No significant associations were observed between postoperative voice impairment and age, gender, body mass index, or residential status. Postoperative vocal cord palsy showed no significant association with any evaluated demographic or clinical variable.

Conclusion: Postoperative voice impairment is relatively common following total thyroidectomy despite a low incidence of postoperative vocal cord palsy. Routine assessment using the Voice Handicap Index together with laryngoscopic examination may facilitate early detection of voice dysfunction, improve postoperative counselling, and support timely rehabilitation. Diabetes mellitus may be associated with an increased risk of postoperative voice impairment and warrants further investigation.

Keywords Thyroidectomy; Voice Handicap Index; Dysphonia; Voice Disorders; Vocal Cord Paralysis; Benign Thyroid Disease.

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1. INTRODUCTION

Thyroidectomy is a common surgery. It is the primary therapy of such disorders as multinodular goiter and Graves' disease. Surgery has become safer with the advances in surgical methods and technologies. Unfortunately, changes in voice after surgery is one of the many complications related to surgery. (1) Avoiding the removal of the recurrent laryngeal nerve (RLN) does not imply that surgery will not have some impact on vocalization. Voice changes are due to complications arising with intubation, laryngeal swelling, and even laryngeal changes following surgery. Vocal cord palsy after surgery is 2-5%. Voice complaints are also more prevalent than reported cases of vocal cord paralysis. A large study conducted on 800 patients revealed vocal cord palsy in 4.6% of the patients who had surgery. Among the patients, 19.7% experienced a material voice impairment two months following a total thyroidectomy. Other studies indicate that 37% of the patients had persistent voice complaints following surgery and did not experience nerve damage, and 7.1% of patients scored high in a Voice Handicap Index (VHI-10) (2,3). These investigations demonstrate the shortcomings when the voice complaints are considered via a laryngoscopic examination only. Patient-reported outcomes have turned out to be critical in measuring functional recovery post-surgical. The Voice Handicap Index (VHI) goes beyond the basics with coverage of the physical, functional, and psychosocial aspects of voice disorders, and offers value for capturing outcomes that matter from the perspective of the patient. (4,6) The use of validated tools to assess patients' voices postoperatively allows for the timely enactment of voice rehabilitation, in addition to improvements in the quality of counseling provided to the patient. One of the most common surgeries carried out in Pakistan is thyroid surgery. Regrettably, the literature of local research exploring the results of voice surgery through the lens of patients who have undergone voice surgery using standardized tools is lacking (5). This research is aimed at bridging that gap with the help of the Voice Handicap Index to contribute to the better knowledge of voice outcomes and help refine and develop patient-centered services and approaches to the counseling, monitoring, and treatment of patients in the setting of thyroid surgery.

2. METHODOLOGY

This study was descriptive and approved by College of Physicians and Surgeons Pakistan (CPSP) and is of six months duration. It was based at Jinnah Postgraduate Medical Centre, Karachi in the Department of General Surgery. Patients included in the study were those who were adults, had total thyroidectomy for benign thyroid disease. The prevalence of voice impairment (20.5%) after surgery, based on World Health Organization (WHO) sample size calculator, was determined with a 6% margin of error at 95% confidence interval. A sample size of 174 was determined as the target sample. Non-probability consecutive sampling was used for participant recruitment. All patients undergoing total thyroidectomy for benign thyroid disease with ASA physical status I or II aged 18–60 years of both genders were recruited into the study. Patients with prior surgery on the neck, thyroid cancer, vocal cord palsy before surgery, long intubation periods, smoking, bronchial asthma, upper respiratory tract infections and multiple sclerosis were excluded. CSPP and the Institutional Ethics Review Committee approved the study, allowing the identification of eligible patients in the General Surgery Department. Study objectives and procedures were explained in detail and the eligible patients were recruited after signing informed consent form. Demographical and clinical information was obtained such as age, sex, height, weight, BMI, ASA status, diabetes mellitus, residence, pre-operative VHI score etc. This was achieved by using a pre-structured data collection sheet. Pre-operative laryngoscopy was performed in all patients to exclude vocal cord palsy. The voice-related QOS was evaluated by the VHI in the pre-operative. Post-optimization of the patient by the anaesthetist and the surgeons, total thyroidectomy was carried out. The surgeons had over five years of experience as consultants and they employed their own techniques. Post-operative management was done as per the protocols of the institution. All patients were followed up for two months. Indirect laryngoscopy was done to assess the post-operative mobility of the vocal cords. The VHI was re-administered for the same follow-up. The postoperative vocal cord palsy was defined as the inability of vocal cord movement after indirect laryngoscopy either unilateral or bilateral. If the difference between the VHI score and post-operative and pre-operative values was 18 or more, then there was significant voice impairment. The main outcome variables were post-operative voice impairment and significant voice impairment. The other variables were assumed to be independent variables. The data were imported to SPSS version 26. The Shapiro-Wilk test was performed to check the normality of continuous variables. Continuous variables expressed as mean $\pm$ SD or median $\pm$ IQR (if not normally distributed); categorical variables expressed as n (%). Stratified analyses were conducted for age, gender, BMI, ASA status, DM, smoking status, and residency as potential effect modifiers, and baseline VHI score. Associations of categorical variables were presented with the use of either the chi-square test or, Fisher's exact test and the p-value threshold of <0.05 . The study was carried out in accordance to the Declaration of Helsinki and both the Institutional Ethical Review Committee of Jinnah Postgraduate Medical Centre and the Research Evaluation Unit of the College of Physicians and Surgeons Pakistan granted ethical clearance. The Principal Investigators provided an explanation of the study. Written consent was obtained and patient data was maintained by anonymizing patient data, limiting patient study data to authorized personnel only.

3. RESULTS

A total of 174 patients with complete records after total thyroidectomy for benign thyroid diseases were included in this analysis. This study was based on all data available. Normally distribution of age and BMI was confirmed by Shapiro-Wilk test ($p = 0.214$, $p = 0.087$). The VHI score at pre and post-surgery was not normally distributed ($p < 0.001$). Thus, age and

BMI were expressed as mean $\pm$ SD and VHI scores as median (IQR). Thyroidectomy patients aged 39.8 ± 10.7 years, with a BMI of 26.4 ± 3.8 kg/m². There were 103 (59.2%) females and 71 (40.8%) males. The majority of patients were ASA II ($n = 104$). ASA I was reported in 70 (40.2%) patients. 43 (24.7%) patients had diabetes mellitus. Most of the cohort resided in urban ($n = 109$, 62.6%) compared to rural areas ($n = 65$, 37.4%). Table 1 shows the baseline demographic and clinical features. The median preoperative VHI score was 11 (IQR 7–16), and postoperative was 18 (IQR 11–28). The median increase in the VHI score was 8 (IQR 3–19) after thyroid surgery. Based on the defined criteria in this study, there were 39 (22.4%) patients who had significant voice impairment and 135 (77.6%) who did not. Postop VC palsy was observed in 9 patients (5.2%) and 165 (94.8%) had normal VC function postop. Voice outcome data post surgery is presented in Table 2. After stratification, the frequency of significant postoperative voice impairment for patients aged ≥ 40 years was higher compared to the patients aged < 40 years (27.8% and 17.1% respectively; $\chi^2 = 2.89$, $p = 0.089$). After stratification, the frequency of significant voice impairment for females was higher compared to males (26.2% and 16.9% respectively; $\chi^2 = 2.18$, $p = 0.140$). There was a significant difference between patients who had diabetes mellitus and those who did not regarding the frequency of postoperative voice impairment (diabetes mellitus: 34.9%, no diabetes mellitus: 18.3%, $\chi^2 = 5.12$, $p = 0.024$). No statistically significant difference was found between the residential status and the postoperative voice impairment ($\chi^2 = 0.34$, $p = 0.561$) and no statistically significant difference was found between the BMI category and the postoperative voice impairment ($\chi^2 = 2.37$, $p = 0.308$). The stratified analysis can be found in Table 3. Nine (5.2%) patients had postoperative vocal cord palsy. This frequencies was higher among diabetic (9.3%) than non-diabetic (3.8%) patients but this was not statistically significant (Fisher's Exact test $p = 0.181$). No significant correlation was found between postoperative vocal cord palsy and age ($p = 0.427$), gender ($p = 0.612$), BMI ($p = 0.544$), ASA class ($p = 0.389$) or residential status ($p = 0.723$). In Table 4, these findings are listed.

Table 1. Baseline Demographic and Clinical Characteristics (n=174)

Variable	n (%) / Mean $\pm$ SD
Age (years)	39.8 $\pm$ 10.7
BMI (kg/m ²)	26.4 $\pm$ 3.8
Female	103 (59.2)
Male	71 (40.8)
ASA I	70 (40.2)
ASA II	104 (59.8)
Diabetes Mellitus (Yes)	43 (24.7)
No Diabetes	131 (75.3)
Urban	109 (62.6)
Rural	65 (37.4)

Table 2. Postoperative Voice Outcomes

Outcome	n (%)
Significant voice impairment	39 (22.4)
No significant voice impairment	135 (77.6)
Postoperative vocal cord palsy	9 (5.2)
Normal vocal cord mobility	165 (94.8)
Preoperative VHI, Median (IQR)	11 (7–16)
Postoperative VHI, Median (IQR)	18 (11–28)

Table 3. Stratification of Significant Voice Impairment

Variable	Voice impairment n/N (%)	P-value
Age ≥ 40 years	25/90 (27.8)	0.089
Age < 40 years	14/84 (16.7)	
Female	27/103 (26.2)	0.140
Male	12/71 (16.9)	
Diabetes Mellitus	15/43 (34.9)	0.024
No Diabetes	24/131 (18.3)	
Urban	23/109 (21.1)	0.561
Rural	16/65 (24.6)	

Table 4. Stratification of Postoperative Vocal Cord Palsy

Variable	Vocal cord palsy n/N (%)	P-value
Age ≥ 40 years	6/90 (6.7)	0.427
Age <40 years	3/84 (3.6)	
Female	6/103 (5.8)	0.612
Male	3/71 (4.2)	
Diabetes Mellitus	4/43 (9.3)	0.181*
No Diabetes	5/131 (3.8)	
ASA II	7/104 (6.7)	0.389
ASA I	2/70 (2.9)	

*Fisher's Exact Test used where appropriate.

4. DISCUSSION

In the present study, the effect of total thyroidectomy on voice was explored and the Voice Handicap Index (VHI) was used as a means of measuring the effect. In patients, it was determined that 22.4% of patients had postoperative voice disturbances and 5.2% had vocal cord paralysis. Finally, it should be noted that the incidence of subjectively impaired voice is higher than the incidence of vocal cord palsy. This finding implies that the population of patients might have clinically important voice symptoms even if the vocal cords are actually functioning normally. These results concur with those of Borel and colleagues, and extend the literature by reporting that the incidence of vocal cord palsy is low and that clinically significant impairment of voice after surgery occurs frequently (7). This indicates that there may be more than just voice problems when evaluating a patient following surgery, and that the larynx might not be enough. The median VHI score was seen to rise to 18 (IQR: 11-28) postoperatively. This discovery bolsters the idea that thyroid surgery can have a negative influence on the quality of life with regards to voice. Although the vocal cords function, dysphonia may still occur as a result of many factors including trauma from intubation (8,9). Recent research has shown that there is a benefit to using the Voice Handicap Index and other similar validated patient reported outcome measures, to identify subtle voice changes as an outcome of surgery and that these measures should be used regularly as laryngoscopic examinations are not sufficient to identify these changes (10). After stratified analysis, women and patients aged ≥ 40 years showed more cases of post-operative voice impairment than patients aged <40 years and males. This however was insignificant. Although the age and sex have not been specifically cited as independent predictors of post-thyroidectomy (post-op) dysphonia, previous studies have shown similar results (9,11). In this study, BMI and residential status also showed no association with post-operative voice impairment, suggesting that these demographic factors had little effect on post-operative voice outcome for this population. A significant finding in the present study was that a relationship was found between diabetes mellitus and voice impairment post surgery. In post-operative period, diabetic patients impaired their voice more than non-diabetic patients (34.9% vs. 18.3%; $p=0.024$). Current study showed that there is little or no evidence to suggest that having diabetes is an independent risk factor for post-thyroidectomy voice impairment, highlighting the potential risk for this group and the need for further research and studies on this area to improve the monitoring of these patients in the post-operative period (12). 5.2% of patients had voice cord paralysis post-operatively, which was not further studied as a function of age, sex, BMI, ASA class, residential status or diabetes mellitus. These results also agree with the previous studies that proposed that post-operative voice cord paralysis is related to the main operative factors, limbs of anatomy, extent of surgery, skills of the surgeon and not related to the base line status of the patients (13-15).

5. CONCLUSION:

Voice changes are a common problem following thyroid surgery, although very unusual is voice change due to vocal cord palsy. Using the Voice Handicap Index in conjunction with a laryngeal examination is helpful to identify and treat the impairment that exists following surgery and to help manage the patient after the surgery. Increased risk for voice problems following surgery may be a potential complication associated with Diabetes Mellitus and an increased emphasis should be placed on the more beneficial and larger future studies.

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