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Research

Association between subjective voice Assessment and psychological distress after thyroidectomy

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A B S T R A C T

Purpose: This study aimed to determine the association between postoperative subjective voice function and psychological distress in patients without laryngeal nerve injury after thyroidectomy.
Design: A prospective cohort study.
Methods: We investigated the factors associated with subjective voice function in patients who underwent thyroidectomy without laryngeal nerve injury between October 2018 and July 2020. The Voice Handicap Index was used to assess subjective voice function, the GRBAS (grade, roughness, breathiness, asthenia, strain) scale to assess objective voice, and the Hospital Anxiety and Depression Scale to assess psychological distress.
Findings: Among 39 patients who underwent thyroidectomy, 32 had no postoperative laryngeal nerve injury. Postoperative Voice Handicap Index was significantly associated with Hospital Anxiety and Depression Scale-Anxiety score after surgery (rs = 0.448, $P = .010$).
Conclusions: In this study, an association was observed between subjective voice function and anxiety following surgery. The finding suggested that nurses and medical practitioners need to consider postoperative anxiety when evaluating patients' voice function after thyroidectomy.

Psychological distress occurs during the perioperative period,[1] and anxiety is associated with patients' subjective ratings of physical functioning. Zemla et al reported that surgery-related anxiety was related to patients' subjective ratings of physical functioning.[2] It has also been reported that the greater the patient's perioperative anxiety, the lower the postoperative quality of life score.[3] The assessment of perioperative anxiety and its management is important because anxiety regarding surgery affects the assessment of postoperative subjective physical functioning, and interventions for perioperative anxiety reduce postoperative pain.[4]

Voice disturbance associated with superior and recurrent laryngeal nerve injury is a complication that may occur following thyroidectomy.[5] Although this usually occurs when the superior and recurrent laryngeal nerves are injured, it has also been reported to occur in the absence of nerve injury.[6,7] Postoperative voice disorders that are not a result of nerve injury are temporary and often improve after several months. However, some cases of long-term voice disorders have been reported.[8] Previous studies have also reported the occurrence of speech dysfunction without neurological damage related to age[9] and sex.[10]

However, the association between perioperative psychological distress, including anxiety and subjective voice function, has not been elucidated as a somatic symptom. Perioperative psychological distress is often assessed and managed by nurses,[11] and clarifying the relationship between psychological distress and subjective voice assessment may lead to improved patient care. This study aimed to determine whether perioperative psychological distress after thyroidectomy is associated with postoperative subjective voice function.

Methods

This single-center prospective observational study included 39 adult patients admitted to Hiroshima University Hospital to undergo total or unilateral thyroidectomy for thyroid tumors between October

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2018 and July 2020. Cases with invasion of surrounding organs, tracheal involvement, the need for tracheostomy for thyroidectomy, distant metastases, cognitive dysfunction, and vocal cord paralysis before and after surgery were excluded, and patients from whom consent to participate in the study was not obtained were also excluded. Mobility of the vocal cords was assessed by an otolaryngologist using a pharyngolaryngoscope before and after the surgery to exclude nerve damage. Eligible patients undergoing thyroidectomy participated in questionnaire surveys on subjective voice function, both preoperatively and 1 week postoperatively.

The Voice Handicap Index (VHI)[12] was used to assess subjective vocal function; this is a self-rating scale that assesses individuals based on 30 items related to functional (F), physical (P), and emotional aspects (E), on a 5-point scale ranging from *no problem* to *always*. The total VHI score (from 0 to 120 points) is higher when the patient perceives failure. For each aspect, the score is distributed from 0 to 40 points; the higher the score, the greater the perception of disability.

Psychological distress was assessed using the Hospital Anxiety and Depression Scale (HADS),[13] which was developed as a measure of general symptoms of anxiety and fear and is a clinically important screening instrument for anxiety and depressive symptoms in medical practice. In the present study, the HADS was also used to measure psychological distress in the perioperative period of thyroidectomy.[14,15] The HADS is a self-rating scale that assesses anxiety (A) and depression (D) on a scale from "not at all" to "often", with seven items each for anxiety and depression, for a total of 14 items. Each item is rated on a scale of 0 to 3, with the highest score for each factor being 21. For each factor, a score of 0 to 7 was rated as no anxiety or depression, a score of 8 to 10 as suspected diagnosis, and a score of 11 or higher as confirmed diagnosis.

The GRBAS scale[16] was used by medical professionals to examine the objective and subjective voice evaluations. The GRBAS scale can perceptually evaluate dysphonia. Voice quality is rated as follows: G (Grade), R (Rough), B (Breath), A (Asthenic), and S (Strained). The rating points on the G scale are 0, 1, 2, and 3 for "*normal*", "*mild*", "*moderate*", and "*severe hoarseness*", respectively. The GRBAS assessment was performed by a speech pathologist, physician, or nurse with experience in GRBAS assessment, and the severity assessment was based on the consensus of two or more judges.

Ethical Considerations

This study was conducted with the approval of the Ethical Review Board of Epidemiological Studies, Hiroshima University (No. E-1377). Researchers explained the purpose of the research and relevant details regarding the protection of personal information with the necessary documents, and patients who agreed and provided consent participated in the research.

Statistical Analysis

We calculated sample size using G*Power to determine the association between subjective speech function ratings and age and operation time distress. Assuming an effect size of 0.4, power of 0.80, and alpha error of 0.05, the required sample size was 44. The VHI, HADS, and GRBAS were tabulated as ordinal scales, and the attributes of the subjects were tabulated as nominal scales; the scores of the VHI, HADS-A, HADS-D, and GRBAS scales were tabulated, and the pre-and postoperative results of each scale were compared by Wilcoxon's signed rank-sum test. Mann-Whitney's *U* test was used to compare VHI with sex, histopathology, site of excision, VHI of benign and malignant thyroid tumors, and HADS, and operative time. Spearman's rank correlation coefficient was used to correlate postoperative VHI with age, operative time, and HADS before and after surgery. Additionally, Spearman's rank correlation coefficient was calculated separately for patients with benign and malignant tumors to examine the difference between benign and malignant tumors. *P*-values for all tests were two-sided, and the significance level was set at .05. Statistical Package for the Social Science 25 was used for the analysis.

Results

Summary of the Subjects

The study included 32 of 39 patients who underwent thyroidectomy; 1 patient who could not be evaluated postoperatively, and 6 patients who had postoperative nerve injury were excluded.

The participants included 9 men and 23 women with a mean age of 57 years (range, 34 to 82 years). For thyroid tumor removal, total and unilateral resections were performed in 3 and 29 patients, respectively (Table 1).

Comparison of subjective voice function assessment, objective voice function assessment, and psychological distress before and after surgery

The differences in VHI, HADS-A, HADS-D, and GRBAS scores before and after surgery are shown in Table 2. In terms of changes in psychological anxiety, the HADS-A score increased after surgery, and the HADS-D score decreased after surgery, but there was no significant difference in any of them. Additionally, there was a significant change in the "breathiness" index of the GRBAS, a tool for objective assessment of speech function; however, no significant changes were observed in other indices. In addition, no significant difference in VHI, HADS-A, and HADS-D scores was found between benign and malignant thyroid tumors.

Associated factors with postoperative Voice Handicap Index

Associated characteristics of participants with postoperative subjective voice function are shown in Table 3. The results showed a significant association only between the postoperative VHI, subjective voice assessment, and the postoperative HADS-A score, a psychological anxiety assessment. There was no significant association between postoperative VHI and other factors. In addition, subgroup analysis of benign and malignant tumors showed that there was no significant association between VHI and benign tumor patients (n = 6) (rs = 0.609, *P* = .200); however, there was a significant association between VHI and Post-HADS-A in malignant tumor patients (n = 26) (rs = 0.394, *P* = .047).

Table 1
Characteristics of Participants (N = 32)

Variable	Mean (range) or N
Age (year)	57 (34 to 82)
Sex	
Male	9
Female	23
Smoking status	
never	24
former	7
current	1
Pathology	
Benign	6
Malignant	26
Extent of surgery	
Total thyroidectomy	3
Hemi thyroidectomy	29
Operation time (min)	145 (82 to 289)

Table 2
Postoperative Subjective and Objective Parameters of the Perioperative Course (N = 32)

Parameter	Preoperative Median (range)	Postoperative Median (range)	*P*-value*
VHI	1.5 (0 to 11)	2.5 (0 to 90)	.217
HADS-A	6.0 (2 to 15)	6.5 (0 to 15)	.478
HADS-D	4.0 (2 to 10)	3.5 (0 to 10)	.050
GRBAS			
Grade	0 (0 to 1)	0 (0 to 1)	.999
Roughness	0 (0 to 1)	0 (0 to 1)	.564
Breathiness	0 (0 to 0)	0 (0 to 1)	.046
Asthenia	0 (0 to 0)	0 (0 to 1)	.157
Strain	0 (0 to 0)	0 (0 to 0)	.999

VHI, voice handicap index; HADS-A, hospital anxiety and depression scale-anxiety; HADS-D, hospital anxiety and depression scale-depression.
* Wilcoxon's signed rank sum test

Table 3
Factors Associated With the Postoperative Voice Handicap Index (N = 32)

Variable	Median (range)	*P*-value*
Sex		
Male	2 (0 to 57)	.340
Female	4 (0 to 90)	
Pathology		
Benign	3 (0 to 90)	.933
Malignant	2 (0 to 57)	
Extent of surgery		
Total thyroidectomy	2.5 (0 to 57)	.877
Hemi thyroidectomy	3.5 (0 to 90)	
	rs	*P*-value†
Age	0.010	.956
Operation time	-0.103	.594
Pre-HASD-A	0.181	.322
Post-HASD-A	0.448	.010
Pre-HADS-D	-0.070	.702
Post-HADS-D	0.225	.215

HADS-A, hospital anxiety and depression scale-anxiety; HADS-D, hospital anxiety and depression scale-depression.
* Mann-Whitney's *U* test.
† Spearman's rank correlation coefficient

Discussion

This is the first study investigating the association between postoperative subjective voice function and psychological distress ratings in patients without nerve injury after thyroidectomy. We observed a significant association between VHIs, subjective voice function after surgery, and the HADS-A score of postoperative anxiety ratings. However, there was no significant association between postoperative subjective voice function and other factors.

These results suggest that postoperative anxiety may be associated with postoperative subjective vocal function, even in patients without nerve injury or postoperative vocal fold palsy. Although it is known that intraoperative nerve injury is the main factor in postoperative voice dysfunction, patients without intraoperative nerve injury may also have subjective voice dysfunction. In previous studies, subjective voice disorders have been widely reported to be as high as 16% to 49%.[17,18] It has been noted that older age[9] and sex are associated[10] with subjective voice dysfunction in patients without nerve injury. Anxiety has been found to affect subjective assessments such as postoperative pain, with negative consequences for the body.[19] This shows that comprehensive perioperative management is required.[20] Our results suggest that postoperative anxiety is associated with subjective voice function; therefore, it is helpful to consider the assessment of postoperative psychological anxiety when interpreting subjective postoperative speech function assessment.

We found that postoperative voice function was not associated with patient age or sex. Among patients undergoing thyroid surgery, subjective voice function declined in the group younger than 50 years, and this association was not observed in those older than 50 years.[9] In this study, a high proportion of patients were aged 50 years and older; this did not concur with the average age of subjects in previous studies. In the context of postoperative voice function and sex, Lang et al[21] reported an association between voice dysfunction and male sex, and Park et al[10] reported that postoperative objective voice function impairment is greater in women than in men. Conversely, Kim et al[22] retrospectively investigated 68 patients who underwent thyroid surgery and showed no significant differences between the voice function recovery and non-recovery groups in terms of sex and age. Our results agree with those reported by Kim et al.[22], but the association between sex and voice function requires further investigation.

This study has several limitations. First, in this cohort, the median VHI-measured voice function after surgery was 2.5. Subjective voice dysfunction was not prominent in the present study, as VHI assessing subjective voice function had very low values as compared to cutoff values reported in previous studies.[23] Second, postoperative objective voice function was not adequately assessed in this study as we used the GRBAS scale, which is not physically invasive or economically burdensome. Although the GRBAS scale ensures measurement reproducibility based on inter-observer agreement, acoustic analysis should be incorporated into objective voice function assessment in future studies to allow a more detailed investigation of psychological changes and voice dysfunction. Third, we did not find any significant associations except for that between postoperative HAD-A and VHI, and the reasons for not finding significant associations for many items in the subgroup analysis may be insufficient sample size and power. Further study regarding the association with factors of benign and malignant tumors is needed.

Conclusion

In this study, we investigated subjective voice function in patients without nerve damage after thyroid tumor resection. The results showed an association between postoperative subjective voice function and postoperative anxiety. This study suggests that nurses and health care providers need to assess the voice function of patients after thyroidectomy and provide treatment and care for patients with postoperative anxiety.

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