

ORIGINAL ARTICLE

Evaluating the incidence, clinical significance and predictors for vocal cord palsy and incidental laryngopharyngeal condition before elective thyroidectomy – is there a case for routine laryngoscopic examination?

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ABSTRACT

Background: Routine preoperative laryngeal examination remains controversial. We aimed to assess the utility of preoperative routine flexible laryngoscopy (FL) by looking at the incidence, clinical significance and predictors for preoperative vocal cord paresis (VCP) and incidental laryngopharyngeal condition (LPC) in our consecutive cohort.

Methods: Three hundred and two patients underwent laryngeal examination by an independent otorhinolaryngologist and were specifically asked about voice/swallowing symptoms suggestive of VCP one day before surgery. Apart from vocal cord (VC) mobility, the naso-pharynx and larynx were examined using FL. Any VCP and/or LPC was recorded. VCP was defined as reduced or absent movement in ≥ 1 VC. A LPC was considered clinically significant if the ensuing thyroidectomy was changed or deferred.

Results: Seven (2.3%) patients had preoperative VCP while an additional 7 patients had incidental LPC. Of the 7 VCPs, 5 were caused by previous thyroidectomy while 2 were by a benign goiter. The incidence of asymptomatic VCP in a previously non-operated cohort was 1/245 (0.41%). Voice/swallowing symptoms ($p=0.033$) and previous thyroidectomy ($p<0.001$) were the two significant predictors for VCP. The 7 incidental LPC were vallecular cyst ($n=1$), VC scar and polyp ($n=2$), nasopharyngeal cyst and polyp ($n=3$) and redundant arytenoid mucosa ($n=1$) but since they were benign, all 7 patients proceeded to thyroidectomy as planned.

Conclusions: Given the low incidence (0.41%) of asymptomatic VCP in a previously non-operated cohort and none of the 7 LPCs were considered clinically significant, routine preoperative laryngoscopic examination should be reserved for those with previous thyroidectomy and/or voice/swallowing symptoms.

INTRODUCTION

Thyroidectomy is one of the most commonly-performed surgical procedures¹ and because postoperative vocal cord palsy (VCP) is an important and serious procedure-related complication, some authors have advocated routine laryngeal examination of the vocal cords (VC) before and after thyroidectomy.²⁻⁵ However, the opinion for routine preoperative examination remains somewhat divided.⁶⁻⁸ Those who advocate routine preoperative examination would argue that in case of a unilateral VCP, the patient could be informed more appropriately about certain operative risks such as bilateral VCPs and tracheostomy (as both occur rarely in patients without preoperative VCP).^{2,3} At the same time, the operating surgeon could take “greater care” on the contralateral recurrent laryngeal nerve (RLN) to avoid bilateral VCPs and tracheostomy.^{2,3} In addition, it has recently reported that when a flexible laryngoscopy (FL) for laryngeal examination before elective thyroidectomy is used routinely, about a third of patients would have one or more incidental laryngopharyngeal condition (LPC) of which some require to be managed at the time of the elective thyroidectomy.⁹ Therefore, routine examination not only provides a more accurate assessment of operative risks but also additional information which may change the planned thyroidectomy.⁹ However, laryngeal examination using FL generally increases patient discomfort and medical cost.^{8,10,11} Furthermore, given the low incidence of preoperative VCP, a majority of patients are subjected to unnecessary examination and because it is possible to assess preoperative VC function less invasively,^{11,12} some view that a more selective approach to preoperative laryngeal examination would be more appropriate. Given these findings, our study aimed to assess the value of routine laryngeal examination using FL before elective thyroidectomy by looking at the incidence, clinical significance and predictors for preoperative VCP and LPC in our unselected consecutive cohort. Perhaps, by knowing the predictors, a more selective approach could be adopted.¹³

METHODS AND PATIENTS

From July 2009 to April 2012, 307 consecutive patients at Queen Mary Hospital underwent a laryngoscopic examination by an independent expert otorhinolaryngologist (ENT) using a flexible laryngoscopy (FL) (Olympus P4 flexible laryngoscope with 3.8mm diameter, Olympus®, Tokyo, Japan) one day before elective thyroidectomy. During the laryngoscopic examination, the mobility of the two VCs was carefully assessed. Any reduced or absent movement in one VC relative to the other was defined as VCP. The degree of VCP was graded into I (reduced movement) and II (no movement). At the same time, the entire pharynx, larynx and VCs were examined for any incidental laryngopharyngeal condition (LPC) such as laryngopharyngeal reflux (LPR), VC nodule, polyp, sulcus or scar, Reinke's edema and nasopharyngeal cyst or nodule. Before the laryngeal examination, all patients were specifically asked for any voice/swallowing complaints which might be suggestive of VCP and they included weakened or husky voice, change in voice quality, hoarseness or occasional choking symptoms. For this study, 5 (1.6%) patients were excluded because they were previously known to have an ENT problem and were being followed up at an ENT clinic. These problems were sphenoid sinusitis (n=1), tongue lichen planus (n=1), recurrent epistaxis (n=1) and nasal polyp (n=2). None of them had preoperative VCP. Therefore, 302 patients were eligible for analysis. Of these 302 patients, 7 (2.3%) patients were found to have preoperative VCP (VCP+ group) while an additional 7 (2.3%) patients had an incidental LPC (LPC+ group) on FL. The rest of the cohort (n=288) did not have either VCP or LPC. For VCP, it was considered clinically significant if the paretic side was contralateral to the planned thyroidectomy (i.e. posing risk of bilateral VCP) while for LPC, it was considered clinically significant if it was either considered a pre-malignant or malignant condition or if it was deemed necessary to have it surgically managed either before or during the ensuing thyroidectomy or to have the ensuing thyroidectomy deferred as a result. To determine

possible predictors for preoperative VCP, patient baseline characteristics, fine needle aspiration cytology (FNAC) and preoperative biochemical parameters were compared between VCP+ group and those who had no VCP (VCP- group, n=295) while for predictors of LPC, only patient baseline characteristics (including smoking and drinking history) were compared between the LPC+ group and those with no incidental LPC (LPC- group, n=295).

Patient selection and subsequent surgical management

Patient selection for elective thyroidectomy remained unchanged throughout the study period. The criteria for FNAC and surgery had been previously described.^{14,15} Surgery was generally offered to relapsed Grave's disease, an indeterminate or malignant FNAC, retrosternal goiter, nodule size > 4 cm and / or causing pressure symptoms. Those with preoperative VCP were reassessed by FL postoperatively every 8 weeks for 6 months or until full VC recovery, whichever was earlier. All data including patient demographics, FNAC and biochemistry were prospectively recorded.

Statistical analysis

For comparison of dichotomous variables between two groups, chi-square tests and Fisher's exact tests were used. The Mann-Whitney U non-parametric test was used for comparison of continuous variables between two groups. All statistical analyses were conducted using SPSS version 18.0 (SPSS, Inc., Chicago, IL, USA). P<0.05 was considered statistically significant.

RESULTS

Table 1 shows patient characteristics and preoperative laryngoscopic findings including VCP and incidental LPC. The median age was 59.2 (7.3 – 90.9) years old while the mean (+/-SD) was 58.1 +/- 16.1 years old. The male to female ratio was 65:237 or 1:3.6. Thirty-three (10.9%) patients had some sort of voice or swallowing complaints. The median weight of excised benign goiter was 44.0 (7.1 – 660.8) grams. Thyroid cancer was a surgical indication in 101 (33.4%) patients. Table 2 shows details of the 7 patients with preoperative VCP. Two had grade I while the other 5 had grade II. Three of the 5 (60.0%) grade II VCPs had voice/swallowing complaints while none of the two grade I VCPs had voice/swallowing complaints before laryngoscopic examination. In the former group, all 5 VCPs were believed to be caused by previous thyroidectomy because firstly, the paretic side was ipsilateral to the previously operated side and secondly, they all suffered a variable period of postoperative hoarseness and were documented to have VCP at the 2-week postoperative FL examination. However, none had reassessment FL. Of the 2 grade I preoperative VCPs without previous thyroidectomy, the cause was probably due to stretching of the RLN by a benign goiter as both patients had a prominent cystic nodule compressing on the trachea-esophageal groove at the time of operation. In our cohort, there was no patient with a preoperative VCP caused by a thyroid carcinoma. On the other hand, there were 7 patients who had RLN involved by a thyroid carcinoma (i.e. T4 tumor) but none had a preoperative VCP. In all these 7 cases, the tumor was shaved off from the involved RLN and none suffered from RLN injury afterwards. Although one grade I VCP did have previous thyroidectomy (i.e. patient no 1.), the paretic side was contralateral to the previously operated side and so the VCP was thought to be unrelated to previous thyroidectomy. Both grade I VCPs recovered spontaneously (i.e. 100%) within 8 weeks of surgery whereas none of the grade II VCPs recovered even after 6 months (i.e. 0%). When the 29 (9.6%) patients with previous thyroidectomy were excluded, the

incidence of preoperative VCP was 1/273 (0.37%) and when the 57 (18.9%) patients with preoperative voice/swallowing symptoms and / or previous thyroidectomy were excluded, the incidence of preoperative VCP became 1/245 or 0.41%. In terms of significance, 6 of the 7 VCPs (i.e. patient no. 1 and 3 to 7) were considered clinically significant as the paretic side was contralateral to the planned thyroidectomy. However, since only one patient with VCP (i.e. patient no. 3) did not have previous thyroidectomy and was asymptomatic before examination, routine laryngeal examination would have hypothetically detected only one extra clinically significant VCP over selective examination if history of previous thyroidectomy and/or voice/swallowing were used as screening criteria.

There were 7 (2.3%) additional patients who had incidental LPC on preoperative FL. There was no patient with LPR. The 7 LPCs were VC scar (n=1), vallecular cyst (n=1), VC polyp (n=1), nasopharyngeal cyst (n=2), nasopharyngeal polyp (n=1) and redundant arytenoid mucosa (n=1). All 7 incidental LPC were considered benign and so none were considered clinically significant enough to have it surgically managed at the time of the thyroidectomy or to have the scheduled thyroidectomy deferred. Therefore, all patients proceeded to elective thyroidectomy as planned. One patient with VC polyp underwent endoscopic resection 2 months later. The other 6 LPC were managed conservatively.

Table 3 shows a comparison of baseline characteristics, FNAC, biochemical parameters and final pathology between VCP+ group and VCP- group. The VCP+ group had significantly higher proportion of patients with voice/ swallowing symptoms than the VCP- group (42.9% vs. 10.2%, $p=0.033$). Interestingly, 4/7 of VCP did not complain of any voice/swallowing symptoms before examination. Using voice/ swallowing symptoms as a screening test or predictor for VCP, the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were 3/7 (42.8%), 265/295 (89.8%), 3/33 (9.1%) and 265/269 (98.5%), respectively. Also the VCP+ group had significantly greater proportion of patients

with previous thyroidectomy than the VCP- group (85.7% vs. 7.8%, $p<0.001$). The median (range) time from previous thyroidectomy to preoperative FL was 29.5 (14 – 98) months.

There were no other significant predictors / associated factors found. All 7 patients with RLN invasion did not present with VCP.

Table 4 shows a comparison of baseline characteristics between LPC+ group and LPC- group.

There were no other significant predictors or associated factors found.

Table 5 shows a comparison of baseline characteristics, FNAC and biochemical parameters between those with either VCP or LPC (n=14) and those with neither (n=288). Only the presence of voice / swallowing symptoms ($p<0.001$) and history of previous thyroidectomy ($p=0.001$) remained significant predictors for VCP or LPC. There were no additional significant factors found.

DISCUSSION

Although it is well recognized that preoperative knowledge of VCP allows more appropriate patient counseling and the surgeon taking “greater care” on the contralateral unaffected RLN and avoiding bilateral VCP and tracheostomy, routine preoperative laryngeal examination remains controversial. In particular, some would consider the latter argument for routine examination not valid because each and every thyroid surgeon should always take greatest care on the RLN regardless of what the contralateral nerve function is. Furthermore, as shown in our study, 2/7 preoperative VCP recovered shortly after surgery and so a potential risk of having routine preoperative examination is that it may mislead the surgeon into sacrificing a ‘dysfunctional’ nerve which is potentially recoverable. In summary, therefore, regardless of the presence or absence of preoperative VCP by FL, each and every RLN should be preserved as careful as possible.

The American Thyroid Association revised guidelines for management of thyroid nodules and thyroid cancer made no mentioning on preoperative laryngeal examination.¹⁶ From our data, it appeared that the case for routine laryngeal examination is not justified because of the very low incidence (1/245 or 0.41%) of asymptomatic VCP in a previously non-operated cohort. Perhaps, a more selective approach of only reserving laryngeal examination to those with previous thyroidectomy and/or with voice/swallowing complaints would be more practical and reasonable. Of the 7 preoperative VCPs, 5 were believed to be caused by previous thyroidectomy while when the 29 patients with history of previous thyroidectomy were excluded, the overall incidence of preoperative VCP was significantly reduced from 7/302 (2.3%) to 1/273 (0.37%). This finding is consistent with what others have reported in a unselected patient cohort.^{4,9,17} Schlosser et al. reported their experience of 695 patients and found that of the 13 preoperative VCPs found, 12 (92.3%) had previous thyroidectomy and/or voice/swallowing complaints.⁴ Therefore, only 1 of 420 (0.2%) had asymptomatic

preoperative VCP.⁴ Our data seemed to concur with this as after the 57 (18.9%) patients with previous thyroidectomy and preoperative voice/swallowing symptoms were excluded, the incidence of preoperative VCP was only 1/245 or 0.41%. Although some authors have reported higher rates of up to 9.6% in previously non-operated cohorts,^{3,5,18} this difference or variability might be a combination of case-mix, referral and selection biases. Nevertheless, it is important to emphasize that our cohort was an unselected group of consecutive patients and so in our opinion, the low rate truly reflects the actual preoperative VCP rate that we encounter in our clinical practice.

Although some authors and management guidelines such as the National Comprehensive Cancer Network and the British Thyroid Association have recommended preoperative laryngeal examination for patients with proven or suspected thyroid malignancy, our results did not support this.^{2,3,18-20} In our study, there was no patient who had preoperative VCP directly caused by a locally invasive carcinoma (i.e. T3 or T4 tumor) whereas there were two preoperative VCPs directly caused by the pressure effect arising from a benign goiter. In fact, of the 10 thyroid carcinoma with gross extrathyroidal extension (i.e. T4 tumor) (including the 7 patients with RLN invasion), none had preoperative VCP. Wang et al. found that the rate of VCP was actually higher in the benign group than the malignant group (4.3% vs. 2.1%) and there was no significant association between VCP and thyroid malignancy ($p=0.472$).⁵ Therefore, a thyroid swelling or nodule with preoperative VFP does not equal to thyroid malignancy and in our opinion, thyroid malignancy alone should not be considered not an absolute indication for preoperative laryngoscopy.

Similar to others, our data found that using voice/ swallowing symptoms as a screening test or predictor for VCP was not reliable. Of the 7 preoperative VCPs, only 3 had some voice/swallowing complaints with the other 4 patients had no voice/swallowing complaints. As a screening test for VCP, the sensitivity and PPV were 42.9% and 9.1%, respectively and

appeared similar to what others had reported.^{2,3} However, it should be emphasized that regardless of these results, of all the patient baseline characteristics, FNAC and biochemical parameters, the presence of voice/swallowing was one of the two significant predictors for preoperative VCP. In our univariate comparison between VCP+ and VCP- group, only presence of voice/swallowing symptoms ($p=0.033$) and history of previous thyroidectomy ($p<0.001$) were the two significant factors and these findings further reinforced our earlier statement that routine preoperative laryngoscopy is only justified in those with a history of previous thyroidectomy and/or voice/swallowing complaints suggestive of VCP. Unlike previous studies, age, sex and history of diabetes were not significant predictors or risk factors.^{5,13,21}

In contrast to a recent study which found up to one third of patients scheduled for elective thyroidectomy had at least one LPC found on FL with some requiring surgical intervention before and during thyroidectomy,⁹ the incidence of incidental LPC in our cohort was significantly less (7/302 or 2.3%) and none required operation before or during thyroidectomy. Our finding appeared consistent to another study which also reported a incidence of 2.1% if other non-specific findings such as pharyngitis and edema had been excluded.¹⁷ One important reason why our rate might be lower than that of a recent study is because none of our 302 patients were found to have LPR whereas that particular study found a quarter of their patients had LPR.⁹ However, it should be noted that the methodology used to diagnose LPR in this particular study was based on a subjective score rather than the gold standard of pH monitoring²² and that's why there were significant more patients with LPR in that study. In our opinion, LPR could not be reliably diagnosed by FL. However, even if there were cases of LPR, none would have been considered clinically significant because of its relative benign nature. More importantly, none of the 7 LPC was considered pre-malignant or malignant and so all 7 patients proceeded to elective thyroidectomy as planned. Therefore, we

do not think routine examination by FL is indicated based on the ground that perhaps a treatable LPC could be detected earlier and during the planned thyroidectomy.

The other argument for routine preoperative laryngeal examination is the benefit of continuing surgical quality assessment or audit which leads to improved surgical outcomes.³ Since knowing the preoperative VC function would allow a more rational interpretation of postoperative laryngeal assessment, some authors have used this as an argument for routine preoperative laryngeal examination. Although this might be true, given the extremely low incidence of asymptomatic VCP in our previously non-operated cohort (1/245 or 0.4%) as well as the low incidence and non-significance of incidental LPC found on routine FL, we do not believe routine laryngeal examination by FL is necessary and justified.

However, despite these findings, we do acknowledge the possible referral and selection biases. Perhaps patients with more significant vocal/swallowing complaints or more locally-advanced thyroid carcinoma requiring laryngeal or radical resection might have been more likely referred to our ENT / head and neck colleagues. Also given the low incidence of RLN invasion by thyroid carcinoma,^{23,24} a much larger study would be required to see if thyroid malignancy should be a criterion for routine preoperative examination. We also would like to acknowledge that due to the relatively small number of VCP and LPC found, some of the sensitivities and negative predictive values may dramatically change as the numbers increase.

Conclusions

In our experience, the incidence of asymptomatic VCP in a previously non-operated cohort was extremely low (0.41%) and none of the 7 (2.3%) incidental LPCs found on FL was considered clinically significant and required intervention either before or during the ensuing thyroidectomy. Given these findings and the fact that history of previous thyroidectomy and presence of voice/swallowing complaints were the two significant predictors for preoperative

VCP, routine preoperative laryngoscopic examination should be reserved for those with a history of previous thyroidectomy and/or voice/swallowing complaints suggestive of VCP.

Table 1. Patient demographics and preoperative laryngoscopic findings by flexible laryngoscopy (n=302)

	No. (% or range)
Age at operation (years)	59 (7 – 91)
Sex (Male : Female)	65 : 237
Size / weight of excised benign goiter (grams)	44.0 (7.1 – 660.8)
Size of dominant nodule (cm)	2.0 (0.5 – 15.0)
Size of thyroid cancer (cm)	1.5 (0.2 – 9.0)
Thyroid cancer with extrathyroidal extension	18 (17.8)
Patients with voice or swallowing symptoms	33 (10.9)
Side of vocal cord paresis (n=7)	
- Right	5 (1.7)
- Left	2 (0.7)
Grade of vocal cord paresis (n=7)	
- I	2 (0.7)
- II	5 (1.7)
Incidence of vocal cord paresis	
- overall (n=302)	7 (2.3)
- after excluding patients with previous thyroidectomy (n=273)	1 (0.4)
- after excluding patients with previous thyroidectomy and/or voice/swallowing complaints (n=245)	1 (0.4)
Incidental laryngopharyngeal condition	
- Vocal cord scar	1 (0.3%)
- Vallecular cyst	1 (0.3%)
- Vocal cord polyp	1 (0.3%)

- Nasopharyngeal cyst	2 (0.7%)
- Nasopharyngeal nodule	1 (0.3%)
- Redundant arytenoids mucosa	1 (0.3%)

Table 2. Data of the 7 patients with unilateral preoperative vocal cord palsy by flexible laryngoscopy

Patient no.	Previous thyroidectomy	Side of previous thyroidectomy	Side and grade of preoperative VCP	Type of planned thyroidectomy	Side of planned thyroidectomy	Presence of Voice/swallowing symptoms	At risk of postoperative bilateral VCP
1	Yes	L	R / grade I	Completion TT	R	No	Yes
2	Yes	B	L / grade II	Completion lobectomy	L	Yes	No
3	No	-	R / grade I	TT	B	No	Yes
4	Yes	R	R / grade II	Completion TT	L	Yes	Yes
5	Yes	B	R / grade II	Completion TT	B	Yes	Yes
6	Yes	L	L / grade II	Completion TT	R	No	Yes
7	Yes	R	R / grade II	Completion TT	L	No	Yes

Abbreviations: R = right; L = left; B=bilateral; TT = total thyroidectomy; VCP = vocal cord paresis / palsy

Grade I = reduced cord movement; Grade II = no cord movement

Table 3. A comparison of baseline characteristics, fine needle aspiration cytology, preoperative biochemical parameters and final pathology between those with vocal cord palsy (VCP) (VCP+ group) and those with no VCP (VCP- group) on preoperative flexible laryngoscopy.

	VCP+ group (n=7)	VCP- group (n=295)	<i>p</i> -value
Age at operation (year)	49 (20 – 83)	59 (7 – 91)	0.618
Sex (Male : Female)	0 : 7	65:230	0.353
Presented as CSN or dominant nodule in a MNG	3 (42.9)	123 (41.7)	1.000
Presence of voice/swallowing symptoms	3 (42.9)	30 (10.2)	0.033
History of thyrotoxicosis	1 (14.3)	23 (7.8)	0.457
History of diabetes mellitus	3 (42.8)	53 (18.0)	0.122
History of non-thyroidal malignancy	0 (0.0)	30 (10.2)	1.000
History of previous thyroidectomy	6 (85.7)	23 (7.8)	<0.001
Time from previous thyroidectomy (months)	22.5 (14.0 – 67)	32.0 (17.0 – 98.0)	0.153
Size of the largest nodule (cm)	2.6 (0.9 – 3.4)	2.0 (0.5 – 15.0)	0.863
FNAC			0.445
- Not done	1 (14.3)	47 (15.9)	
- Benign	3 (42.9)	79 (26.8)	
- Indeterminate	2 (28.6)	131 (44.4)	
- Malignant	1 (14.3)	38 (12.9)	

Preoperative free T4 (pmol/L)	16.5 (15 – 18)	16 (5 – 24)	0.517
Preoperative serum TSH (mIU/L)	1.55 (0.50 – 1.90)	0.98 (0.03 – 14.0)	0.692
Anti-Tg antibody (titres)			0.952
- < 100	5 (71.4)	199 (67.5)	
- 100 – 400	1 (14.3)	40 (13.6)	
- > 400	1 (14.3)	56 (19.0)	
Anti-TPO antibody (titres)			0.914
- < 100	5 (71.4)	201 (68.1)	
- 100 – 400	1 (14.3)	34 (11.5)	
- > 400	1 (14.3)	60 (20.3)	
Final pathology			1.000
- Benign	5 (71.4)	196 (66.4)	
- Malignant	2 (28.6)	99 (33.6)	
- localized / intra-thyroidal	2 (28.6)	81 (27.5)	
- Minimal ETE (or T3)	0 (0.0)	8 (2.7)	
- Gross ETE (or T4)	0 (0.0)	10 (3.4)*	

Abbreviations: CSN = clinically-solitary nodule; MNG = multinodular goiter; FNAC = fine needle aspiration cytology; TSH = thyroid stimulating hormone; anti-Tg = anti-thyroglobulin; anti-TPO = anti-thyroid peroxidase; ETE = extrathyroidal extension

* 3 patients had tracheal +/- esophageal invasion while 7 patients had recurrent laryngeal nerve invasion but none had preoperative VCP.

Table 4. A comparison of patient characteristics between those with a coincidental laryngopharyngeal condition (LPC) (LPC+ group) and those with no coincidental LPC (LPC- group) by preoperative flexible laryngoscopy.

	LPC+ group (n=7)	LPC- group (n=295)	<i>p</i>-value
Age at operation (year)	63 (45 – 72)	59 (7 – 91)	0.847
Sex (Male : Female)	2:5	63:232	0.646
History of tobacco smoking	2 (28.6)	49 (16.6)	0.336
History of heavy drinking*	0 (0.0)	8 (2.7)	1.000
Presence of voice symptoms	2 (28.6)	31 (10.5)	0.172
History of non-thyroidal malignancy	0 (0.0)	30 (10.2)	1.000
History of previous radiotherapy or radiation exposure to neck	0 (0.0)	0 (0.0)	-

*more than 1 drink a day

Table 5. A comparison of baseline characteristics between those with vocal cord palsy (VCP) or laryngopharyngeal condition (LPC) (group I) and those with neither (group II) on preoperative flexible laryngoscopy.

	Group I (n=14)	Group II (n=288)	<i>p</i>-value
Age at operation (year)	59 (20 – 83)	59 (7 – 91)	0.826
Sex (Male : Female)	2:12	63:225	0.742
History of tobacco smoking	2 (14.3)	49 (17.0)	1.000
History of heavy drinking*	0 (0.0)	8 (2.8)	1.000
Presence of voice/swallowing symptoms	5 (35.7)	28 (9.7)	<0.001
History of non-thyroidal malignancy	0 (0.0)	30 (10.4)	1.000
History of previous thyroidectomy	6 (42.9)	23 (8.0)	0.001
History of previous radiotherapy or radiation exposure to neck	0 (0.0)	0 (0.0)	-

*more than 1 drink a day

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