

## Case Report

# Voice in Thyroid Surgery Without Vocal Fold Immobility

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## Abstract

**Introduction:** Voice outcomes are of central importance in modern thyroid surgery. General Surgeons and Otolaryngologists (ENT) usually have different perspectives and value different criteria for successful assessment of voice issues.

**Objective:** Describe vocal changes in thyroid surgery patients.

**Methods:** Retrospective descriptive study for 171 patients who underwent hemi or total thyroidectomy.

Vocal complaints, vocal handicap indexes (VHI) scores and laryngostroboscopic (LE) results were assessed.

**Results:** 38% of patients reported laryngopharyngeal complaints preoperatively but only one patient had immobility.

**Conclusions:** Care must be taken when assuming that vocal changes in thyroid surgery result only or mainly from recurrent nerve injury. From 38% of patients

with pre-operative vocal complaints only 0.5% of patients had immobility. Vocal changes in thyroid surgery are likely multifactorial and this study demonstrates that vocal fold immobility is not the only etiologic factor. Alternative causes for vocal changes in thyroid pathology and surgery must be investigated.

**Keywords:** Voice; Thyroid surgery; Vocal fold immobility

## **Introduction**

Voice outcomes have a central importance in modern thyroid surgery [1]. Studies have reported a 39% voice and swallowing morbidity rate following thyroidectomy [2]. The thyroid gland is situated in the anterior cervical compartment and has a close relationship with the larynx and proximal trachea. Voice changes associated with thyroid disease may occur from the diseased thyroid gland or from surgery. However, primary laryngeal dysfunction may also coexist in patients with thyroid disease and its effect on vocal changes in patients assessed for thyroidectomy has not been fully quantified.

The American Academy of Otolaryngology Head and Neck Surgery (AAO-HNS) Foundation published the “Clinical Practice Guideline: Improving Voice Outcomes after Thyroid Surgery” in June 2013 [3] which includes full voice assessment prior to surgery. However, these guidelines were questioned by an editorial in *Surgery* in April 2014 [4]. The editorial stated that the AAO-HNS guidelines were considered inadequate by general surgeons due to concerns for overstating the incidence of vocal dysfunction in thyroid surgery, inducing anxiety in patients.

Given the differing views on the incidence of vocal

dysfunction between ENTs and general surgeons, we performed a combined specialty study for clarification. Typically, patients undergo a preoperative complete voice evaluation only if there is current vocal dysfunction or if there is concern for possible damage to the recurrent laryngeal nerve during surgery.

Postulating that primary laryngeal dysfunction coexistent with thyroid disease may predispose thyroidectomy patients to a higher risk of poor voice outcome not related to immobility, we retrospectively revised data from 171 patients who underwent thyroidectomy in order to quantify pre-operative vocal problems.

## **Materials and Methods**

### **Patient Population**

A retrospective descriptive study was performed on 171 consecutive adult patients (> 18 years of age) who underwent hemi or total thyroidectomy over a period of 5 years (2010-2014). Only patients who underwent thyroidectomy with pre-operative assessment in our Voice Clinic were included. None of the 171 patients was excluded as they all had full data recorded pre-operatively.

All patients were routinely instructed to return for a post-operative evaluation if they had disturbing vocal complaints at the end of the first post-operative month. Post-operative data was collected only for these returning patients.

All patients consented and the study was approved by the hospital’s Ethics Committee CES/017/2014/PA.

### **Data Collection**

Since 2010, most thyroidectomy candidates in our

hospital have been pre-operatively evaluated in our Voice Clinic. A full vocal functional evaluation, Voice Handicap Index (VHI) scores [5] and laryngostroboscopic examination (LE) are obtained and registered. Patients are informed of identifying concomitant pre - operatives organic or functional abnormalities and instructed to return post-operatively if they experience any concern regarding vocal quality post-operatively. Patients are evaluated within a maximum of a 7-day delay after their request for re-evaluation. All surgeries are performed by the same thyroid surgeon (general surgeon). Intra-operative neuromonitoring of the recurrent laryngeal nerve was not routinely used as an option of the Surgeon (this study was done before publishing of recurrent nerve neuromonitoring international study group results). ENT and Speech Language Pathologist (SLP) evaluations are all done by same ENT and SLP team.

### **Vocal Symptoms**

Assessed vocal symptoms included chronic, new onset or a change in vocal quality or fatigue.

### **Voice Analysis**

Vocal analysis was performed by the same speech and language pathologist using an headset omnidirectional microphone (PYLE PMEMI), with electret condenser, frequency response of 20Hz- 20KHz and -44dB  $\pm$ 3dB sensitivity, positioned at a constant distance of 4 cm lateral from the speaker's mouth and at a 45° angle from it (Dejonckere et al., 2001); a portable digital 16 bits mono recorder (TASCAM DR-05) was used, with a sample frequency of 44100 Hz; a digital sound level meter, model Rolls SLM305m was used, and ambient noise bellow 50 dB was assured (Dejonckere et al., 2001). Equipment was always tested and calibrated using a reference pure tone of 500 Hz, confirmed by

acoustic analysis at the beginning of each recording day. Voice samples were recorded in a room with speakers, with the patient seated in a comfortable position.

### **Post-operative speech therapy**

When indicated, post-operative speech therapy was given once weekly for 4 consecutive weeks, every other week in the second therapy month and monthly for the next 4 months. Patients were instructed for at home vocal exercises.

### **Laryngostroboscopic Examination**

All patients were evaluated using Kay Pentax RLS 9100 B. Exams were evaluated for the presence of both structural abnormalities, functional changes and immobility. Structural abnormalities included nonspecific laryngeal inflammation and vocal fold lesions. Functional changes included both squeezing and insufficiency. Pitch glide was routinely assessed and registered if not present Statistical Analysis.

### **Statistical analysis**

A descriptive analysis was performed for the pre-operative patients. A comparative analysis was done for patients who returned for post-operative evaluation using Excel for Windows.

## **Results**

### **Demographics**

A total of 171 patients underwent thyroidectomy and pre-operative evaluation. Sex distribution included 29 male and 142 female patients. Patients were stratified by age (table 1) and voice use (table 2). Pathological results refer to post-operative specimen results (Graphic 1). As for surgery type, 135 patients had total thyroidectomy and 36 hemi-thyroidectomy. Tobacco

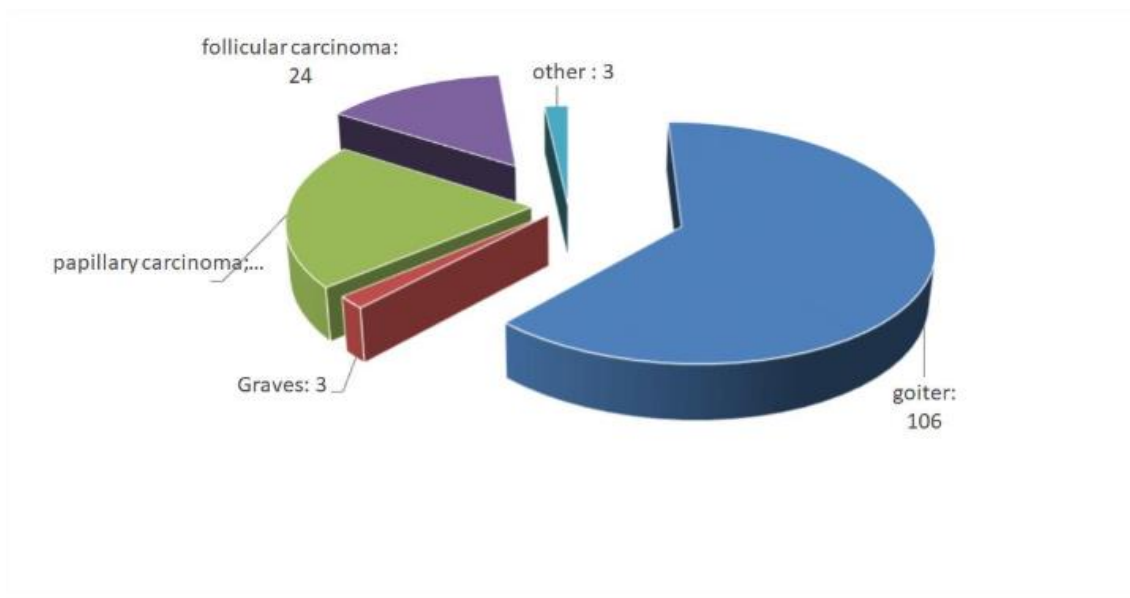
smoking was present in 42 patients (25%). There were 29 patients who returned for re-evaluation post-operatively for relevant vocal complaints (17%).

Age	
<30	8
30-50	78
51-70	80
>70	5

**Table 1:** participant’s distribution according to age.

Voice professional	3
Habitual voice user	37
Sporadic user	131

**Table 2:** participant’s distribution according to voice use



**Graphic 1:** post-operative pathological results

**Preoperative findings**

- **Vocal Symptoms**  
Vocal complaints were present in 65/171 patients(38%), mainly vocal fatigue.
- **Voice analysis**  
VHI total score (VHI-T) median was 32 (normal <33). VHI-T results showed impairment in 5 patients (table 3). Maximal phonation time (MPT) was normal in 74/171 patients (46%) and reduced in 88/171 (54%) patients. Jitter was normal in 93% of the population and Shimmer was normal in 62%.  
All the 5 patients with abnormal VHI-T results had abnormal findings in LE. In 3/171 patients with mild

impairment, LE revealed structural change in 1 patient and laryngeal dysfunction in 2 patients; in 1/171 with moderate impairment, LE revealed structural change and in 1/171 with severe voice impairment, LE revealed laryngeal dysfunction. Interestingly, the patient with vocal fold immobility scored normal for VHI-T.

- **Laryngostroboscopic Examination**  
LE was considered abnormal in 106/171 (72%) patients (Table 4). Pitch glide in LE was present in patients with normal mobility.

VHI-T	
33	3
44	1
61	1

**Table 3:** VHI-T impaired results

Structural abnormality	68
Functional change	37
Vocal fold immobility	1

**Table 4:** Abnormal LE (n=106)

**Post-Operative Results**

- **Vocal Symptomatology**  
A total of 29 patients were re-evaluated for significant subjective post-operative vocal complaints (of which only 47% had pre-operative complaints). The complaints primarily included concerns of a different voice, weak voice or fatigue with vocal use. Twenty-five of these patients had surgery for goiter; as for type

of surgery, 22/29 patients had total thyroidectomy.

All 29 patients underwent voice therapy. At the completion of voice therapy, all patients (100%) had subjective good vocal function (voice considered normal for daily use including professional needs), and no interest in complementary surgical therapy when offered.

- **Laryngostroboscopic Examination**

Of the returning patients (29) with voice complaints, 23 showed positive findings on LE.

Eleven patients had vocal fold immobility (one had pre-operative immobility and 10 were de novo cases). At the 3 months follow up after the completion of voice therapy only one patient regained normal vocal fold mobility. All other patients showed compensated contralateral movement and no interest in complementary surgical therapy when offered.

Of the remaining 18 patients without immobility (62%), 6 had laryngeal dysfunction (2 had this diagnosis pre-operatively), 6 had structural changes (all present pre-operatively) and 6 were normal. Pitch glide was present in all these patients.

## **Discussion**

Voice complaints are common in patients undergoing thyroid surgery [6-9]. Voice results are therefore a primary concern for patients undergoing thyroidectomy. The current standard patient counseling for thyroidectomy is centered around the potential injury to the recurrent laryngeal nerve [10-15]. Most studies on voice and thyroid surgery focus mainly in post-operative results [6,9,10,12,16]. Our study retrospectively described the incidence of vocal and endoscopic changes before thyroidectomy and the underlying etiologies causing vocal complaints.

In the present study, 38% of patients had some sort of vocal complaint prior to undergoing thyroid surgery. Only 0.5% resulted from vocal fold immobility. Interestingly, 72% of all patients had abnormal findings on laryngoscopic exam. It cannot be excluded that primary laryngeal dysfunction coexistent with thyroid disease and/or surgery may predispose thyroidectomy patients to a higher risk of poor voice

outcome not related to immobility. The high percentage of abnormal findings may be reflective of the thyroid patient population, the inclusion of non-specific laryngeal inflammation in the structural changes category, the high population of smokers in the study (25%), or come from confirmation bias, the main limitation of our study (unblinded examiner) [17]. The lack of consistency between voice symptoms and exam findings is likely multifactorial. Both thyroid disease and laryngoscopic abnormalities develop slowly over time, which may cause an imperceptible vocal change for patients. Additionally, many laryngoscopic abnormalities do not cause vocal changes.

Twenty-nine patients returned postoperatively for considered subjectively significant vocal complaints, of which only 10 (35%) had a de novo vocal fold immobility. Therefore, a majority of patients had disturbing vocal complaints without vocal fold immobility, and so, care must be taken when assuming that vocal complaints related to thyroid surgery result only from recurrent nerve injury. This study showed that from our patients with pre-operative vocal complaints (38%), only 0.5% had immobility, and from the total 16.9% of patients with disturbing vocal complaints post-operatively, de novo immobility was present in only 35% of them.

The underlying etiology for these complaints is not fully understood [18]. Interestingly, one third of patients with vocal changes post-operatively without immobility had no abnormal finding on exam. This may be from sensory defects not perceived on typical in-office exam, or else be psychosomatic in nature.

All patients with post-operative voice changes had subjective improvement with voice therapy and no

other procedural intervention. This highlights the high proportion of functional abnormalities in this patient population. Additionally, all patients with vocal fold immobility had subjective good voice quality with therapy alone. Given this finding, early vocal fold injection may not be necessary in every immobility patient and should be left to the shared decision of the surgeon and patient [19].

One limitation of our study was that the classification of the LE results was done by the first author, who also assessed patient complaints and was aware of thyroid pathological results. Another was the possibility that patients were lost for follow up post-operatively. We may think that in some cases, voice change was not considered relevant enough by the patient, and so it didn't trigger a second observation in voice clinic - as demonstrated by Kavookjan [20], patients with lower VHI are less engaged in voice therapy even when prescribed. Distance and accessibility were not a limitation, for patients had an immediate appointment whenever requested, and all lived in a 50 km distance from the Hospital.

## **Conclusion**

Care must be taken when assuming that vocal changes related to thyroid disease result only from recurrent nerve injury. This study showed that from 38% of patients with pre-operative vocal complaints, only 0.5% of patients had immobility and from the total 16.9% of patients with disturbing vocal complaints post-operatively, de novo immobility was present in only 35% of them. Alternative causes for vocal changes in thyroid disease and surgery must always be investigated.

Compliance With Ethical Standards

## **Financial Disclosure**

There are no funders to report for this submission

## **Conflict of Interest**

There is no conflict of interest for the present study.

All the authors declared no conflict of interest for the present study.

## **Research Involving Humans**

This is a retrospective study that received approval from Hospital da Luz Ethical Committee Institutional Board. All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## **Informed Consent**

Informed consent was obtained from all individual participants included in the study

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