

ROLE OF VOICE THERAPY IN POST THYROIDECTOMY VOCAL PARESIS

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Abstract

Background: The objective is to find out the incidence of Vocal cord paresis among post thyroidectomy patients and to assess the role of voice therapy in post thyroidectomy vocal cord paresis. **Materials and Methods:** This prospective study includes 20 patients visiting ENT OPD at Gadag Institute of Medical Sciences, Gadag, Karnataka, India, with thyroid swelling with or without thyroid dysfunction who subsequently are counselled for thyroid surgeries. Pre and post operatively voice assessed, subjectively by patient complaints, and Voice Handicap Index scale; Objectively by GRBAS scale and visualization of vocal cords by indirect laryngoscopy examination and video diagnostic laryngoscopy using 70° rigid endoscope. Voice improvement is assessed by comparison of pre, postoperative and post voice therapy parameters. Risk factors for vocal cord paresis were identified and studied. **Result:** Among 20 patients undergoing thyroidectomy, 3(15%) were male and 17 (85%) were female indicating female predominance. Mean age of patients was 35.9, with youngest being 22 years and oldest being 60 years. Surgeries consisted 16 (80%) hemi thyroidectomies for 16 colloid goiters, 2 (10%) total thyroidectomies 1 for multinodular goiter and 1 for colloid goiter with probably benign category and 2(10%) completion thyroidectomies done for recurrent goiter and follicular carcinoma respectively. Intra operative recurrent laryngeal nerve identification done in 18 (90%) cases. Voice Handicap Index-30 scale showed 8 out of 20 (40%) patients developed postoperative vocal dysfunction with 6(30%) transient and 2(10%) permanent changes. Intraoperatively RLN could not be identified in the latter. Voice Handicap Index scale and glottic dysfunction improved in 7 out of 8(85%) patients following voice therapy. **Conclusion:** Vocal paresis after thyroidectomy can be prevented by surgical techniques. Voice Handicap Index-30 score complimented by vocal cords visualization by indirect or direct laryngoscopy makes accurate parameter for voice assessment. Hence early referral for voice therapy of patients with vocal paresis helps in improvement of vocal dysfunction.

INTRODUCTION

Thyroid swellings both benign and malignant have impact on quality of life. Contributing factors causing the burden are thyroid hormone dysfunction, compression symptoms of thyroid swelling such as dysphagia, dyspnea, dysphonia, cost of medical and surgical intervention and post thyroidectomy complications. Thyroidectomy indicated in both benign and malignant thyroid swellings can lead to complications such as postoperative vocal paresis, temporary or permanent dyspnea, dysphagia, need for lifelong medication, thyroid suppression, radioactive scanning/treatment, temporary and

permanent hypoparathyroidism. Voice disturbance though identified at least temporarily in up to 80% of patients after thyroid surgery, the prevention, evaluation, and management are incompletely defined. Hence this study aims to estimate prevalence of post thyroidectomy vocal paresis and to assess role of voice therapy in improving voice outcomes of post thyroidectomy vocal paresis. The study emphasizes early detection and management on improving voice related quality of life.

MATERIALS AND METHODS

Type of study: Prospective study

Sample size: 20

Sampling method: Convenient sampling

Study duration: September 2022 to December 2023 (16 months)

Patients visiting ENT OPD at Gadag Institute of Medical Sciences, Gadag, Karnataka, India presenting with thyroid swelling with or without thyroid dysfunction who are counselled for hemithyroidectomy or total thyroidectomy are included in the study. Informed consent is taken. Clinical history and examination includes-onset, duration, progressive size of swelling, any features suggestive of hypothyroidism or hyperthyroidism, and pressure symptoms of dysphagia, dyspnea and dysphonia; examination of swelling noting size, shape, extent, mobility and consistency of the swelling, Lahey's method for palpation of nodules, Kocher's test for assessing compression on trachea. Neck examination to note position of trachea, bilateral carotid artery pulsation, laryngeal crepitus and other lymph nodes. Percussion over sternal manubrium checks for retrosternal extension. Voice assessment is done subjectively by patient complaints of change in voice, and Voice Handicap Index-30 scale; Objectively by GRBAS- Grade, roughness, breathiness, asthenia and strain scale. Vocal cords visualized by indirect laryngoscopy examination or video diagnostic laryngoscopy using 70° rigid endoscope and mobility, position of vocal cords and laterality of vocal paresis are noted.

In our study, we performed 20 thyroid surgeries, documenting critical steps of individual operative procedure. Operative notes included exposure of recurrent laryngeal nerve(s) (RLN), exposure and protection of parathyroid glands, ligation of superior thyroid vessels and inferior thyroid vessels close to capsule, division of strap muscles and presence of retrosternal extension. We used standard surgical set and diathermy. Post operatively patients are assessed for any subjective and objective voice changes, difficulty in swallowing and breathing difficulty, wound site examination and drain output calculation. Postoperative subjective and objective voice assessment done by Voice Handicap Index-30, Perceptual voice analysis by GRBAS scale respectively. Video laryngoscopy (VDL) or Indirect laryngoscopy findings of phonatory gap (incomplete glottic closure) and mobility of vocal cords were compared. Assessment is done at follow up visits at 2 weeks and 2 months. Pre and postoperative parameters are compared. Early voice therapy at or before 1 month post thyroidectomy surgery was established in all patients with vocal paresis. All patients with vocal dysfunction were taught voice therapy by Siemen's digital pressure on larynx and abdominal breathing and intrinsic muscle strengthening exercises.

We collected data including gender, age, side and position of the paralyzed vocal cord on laryngoscopy, etiology, comorbidities, and Voice Handicap Index (VHI)—30 questions, before and after voice therapy. (Table 1). Each patient completed the VHI-30

questionnaire, before and after voice therapy, with 30 questions to have self-assessment data on the perceived quality of life. Glottal insufficiency was also evaluated by indirect or direct laryngoscopy pre and post operatively and after completion of voice therapy. Clinical parameters are entered in Microsoft Excel sheet. Improvement is assessed by comparing parameters, pre, postoperative and post voice therapy.

RESULTS

Out of 20 patients undergoing thyroidectomy, 3(15%) were male and 17(85%) were female indicating female predominance. Mean age of patients was 36, with youngest being 22 years and oldest being 60 years. Surgical types consisted 16 (80%) hemithyroidectomies for 16 colloid goiters, 2 (10%) total thyroidectomies for 1 multinodular goiter and 1 colloid goiter with probably benign category and 2(10%) completion thyroidectomies done for recurrent goiter and follicular carcinoma respectively. Intra operatively recurrent laryngeal nerve identification was done in 18 (90%) cases, nerve could not be identified in 2 (10%) cases. Bipolar cautery for hemostasis was used in all cases. Drain was placed in all cases. Postoperative complaints were transient voice change in 6(30%) patients, difficulty in swallowing in 8(40%). No patients complained of breathing difficulty. 2 patients had more prolonged voice changes. 4 of 20 (20%) patients had postoperative hypocalcemia. Post operatively VHI-30 questionnaire scores of the patients showed negative changes in 8 patients. Indirect laryngoscopy of 8 patients complaining voice changes showed findings of - unilateral fixed vocal cord in 1 patient, unilateral decreased mobility of a vocal cord in 1 patient (Figure 4)

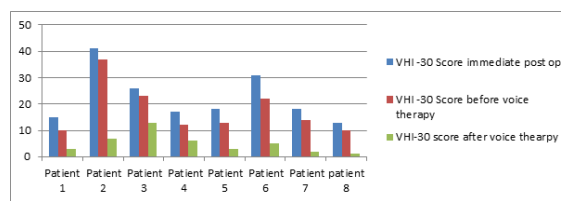


Figure 1: Comparison of Voice Handicap Index -30 Score

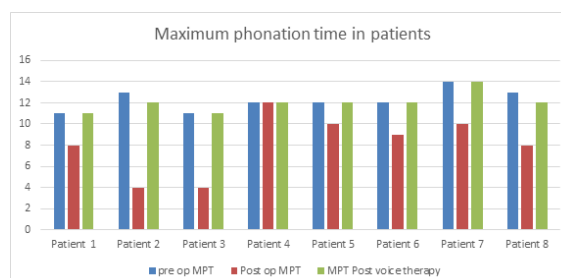


Figure 2: Comparison of Maximum Phonation Time in Patients

Voice Handicap Index-30 questionnaire at 1 week post operatively showed mean score of 22 with minimum score 15 and maximum score of 41. All 8 patients who were subjected to voice therapy at 1 week of postoperative period, showed significant improvement of Voice Handicap Index -30 score with mean score of 5. Mean maximum phonation duration of 8 seconds before voice therapy increased to 12 seconds after voice therapy. Improvement in roughness, breathiness, strain score seen in all patients. Improvement of glottal gap in indirect

laryngoscopy seen in all patients post voice therapy at 1 month. Complete closure of glottal gap seen in 7/8(85%) patients, improved but still incomplete closure in 1/8 (15%) patient.

We found that 2(10%) patients had hypertension, 1 (5%) patient with both hypertension and smoking history and 2(10%) patients with history of previous hemithyroidectomy. No patients had RLN invasion preoperatively. Intraoperatively Recurrent laryngeal nerve identified in 18 cases.

Table 1: Demographic data of the patients

SL.no	Demographic parameters	No of Patients (Percentage)
1	Mean Age – 36	20
2	Sex- Female	17 (85%)
	Male	3(15%)
3	Risk factors/comorbidities- Hypertension	2(10%)
	Diabetes	None
	Smoking history / COPD	1(5%)
	Pre op RLN invasion	None
	Previous hemithyroidectomy	2(10%)
4	Clinical examination – Pre op vocal paresis on VDL	None
5	Type of surgery- Hemithyroidectomy	16(80%)
	Total thyroidectomy	2(10%)
	Completion thyroidectomy	2(10%)
6	Intra operative RLN identification	18 (90%)
7	Indication for voice therapy-minimal phonatory gap	7(45%)
	Vocal cord Palsy	1(5%)
8	Subjects of Voice therapy	8(40%)

DISCUSSION

Thyroidectomy is the common surgery for both benign and malignant types of thyroid swellings. Voice disturbance can be seen at least temporarily in up to 80% of patients after thyroid surgery.^[1,2]

About 1 in 10 patients experience temporary laryngeal nerve injury after surgery, with longer lasting voice problems in up to 1 in 25.^[3] Impaired function of the RLN results in impaired function of laryngeal muscles causing onset of difficulties with breathing during daily activities in 75% of those with unilateral vocal fold immobility (UVFI), dysphagia in as many as 56% of those with UVFI, observed aspiration in 44%, and dysphonia in 80% of individuals with UVFI after thyroid surgery.^[3] The most common sign of UVFI, dysphonia, significantly impacts individuals' ability to work and their QOL, whether or not their occupation relies heavily on voice production.^[4] Individuals suffering from dysphonia may require more days off to recover or may need to change their job to accommodate a permanent dysphonia. Other factors affecting quality of life are need for lifelong medication, thyroid suppression, radioactive scanning/treatment, temporary and permanent hypoparathyroidism. Thus prevention, evaluation, and management of post thyroidectomy vocal paresis is essential.

Study by Mayur. G Rabari et al,^[4] observed recurrent laryngeal nerve palsy as the most serious complication in thyroid surgery, resulting in significant impairment of the quality of life. Out of 47 patients who underwent thyroidectomy,

Hypocalcemia in 6 Patients, Laryngeal Nerve Palsy in 2 Patients, Traumatic Vocal Cord Paresis in 1 was recognized by the study. Similarly, Postoperative complications in our study were transient voice change in 6(30%) patients, prolonged voice changes in 2(10%) patients, difficulty in swallowing in 8(40%), postoperative hypocalcemia in 4 of 20 (20%) patients.

Voice disturbances in thyroid swellings can exist pre operatively, either as result of infiltration of recurrent laryngeal nerve by thyroid malignancy, or thyroid hormone dysfunction associated with the swelling. Extra nodal extension infiltrating the recurrent laryngeal nerve can be predicted by history, clinical examination, ultrasound and CT/MRI findings; thus prepares both surgeon and the patient for postoperative voice assessment.

Voice dysfunction post thyroid surgery is due to complete or partial, transient or permanent recurrent laryngeal nerve injury, superior laryngeal nerve injury, injury to cricothyroid joint, injury or denervation of strap muscles, Intubation-related injuries and concurrent nonrelated URTI. Operating surgeon must assess the change in voice routinely and when indicated must refer the patient for video laryngoscopy which confirms the glottis dysfunction. Nollaig O Donohoe et al^[5] conducted a prospective study in 42 patients undergoing thyroidectomy and compared various thyroidectomy outcomes with the perioperative variables such as skill of the surgeon, working diagnosis, type and steps of performed surgery, thyroid gland size, operative duration. An outcome i.e., RLN paralysis found to have low-

powered association where total thyroidectomy was performed (0.005) and where thyroid size was smaller ($p = 0.04$). Three patients developed permanent RLN paralysis in this study. All of these cases were total thyroidectomies including one redo surgery for MNG performed by a trainee surgeon. Two cases were for cancer, performed by the consultant surgeon and the nerve was clearly identified intraoperatively. Our study found 1(5%) patient with RLN paralysis post total thyroidectomy, 1 patient developed vocal cord paresis as intubation related injury to cricoarytenoid joint. 6(30%) patients had transient vocal dysfunction due to other causes. Surgery was performed by a team of senior surgeons. The above study observed the limitations of international thyroid guidelines from high-income countries in a resource-limited setting due to logistical challenges or the advanced pathology faced by the surgeon in resource-limited setting.^[5] Similarly, our study identified comorbidities and risk factors for vocal dysfunction. 2(10%) patients had hypertension, 1 (5%) patient with both hypertension and smoking history and 2(10%) patients with history of previous hemithyroidectomy. No patients had RLN invasion preoperatively.

Sujana S Chandrashekar et al,^[6] observed underreported vocal cord paresis rates following thyroid surgery due to lack of routine laryngeal examination. They proposed the preoperative and postoperative assessment of voice 1 week prior and at 1week, 4 weeks, 2 months and 6 months post operatively. They developed international guidelines for early actions classified into laryngeal examination, voice assessment, nerve management, and interventions. They found that appropriately timed laryngeal examination after thyroidectomy helps determine both the cause of voice change and the optimal management.

Preoperative status of patients' voice is assessed conveniently by asking them to report any changes in their voice pitch, loudness, quality, or endurance. Some examples of this approach have been described in the literature.^[7] We used various multidimensional voice outcome measures were including voice Handicap Index-30, Maximum phonation time, GRBAS scale for perceptual analysis of voice, vocal cord visualization by video laryngoscopy. Video laryngoscopy or flexible laryngoscopy documented findings of phonatory gap and mobility of vocal cords as found in the literature.

Alexander Stojadinovic et al,^[8] conducted a prospective study including 50 patients undergoing thyroid surgery. Baseline voice parameters assessed preoperatively by self-reported voice case history and Voice handicap index score-30, clinician reported Consensual Auditory Perceptual evaluation-Voice (CAPE-V) and laryngeal examination, are compared with parameters measured post operatively. Vocal dysfunction in first postoperative visit is defined by laryngeal abnormalities on-VDL done in patients complaining subjective voice change. Transient and permanent voice dysfunction was found in 16% and

2% of patients respectively warranting early referral to speech pathology and laryngology in patients with a change in VHI ≥ 25 from preoperative baseline. Our study showed comparative results with transient and permanent voice dysfunction in 30% and 10% of patients respectively, and all 8 patients underwent voice therapy.

An update on behavioral management of unilateral vocal cord paralysis and paresis developed by Sarah L. Shneider et al,^[9] observed various voice therapy techniques for improving vocal function in dysphonia. They include Relaxation exercises to reduce tension in neck, shoulder, upper back and chest; Half swallow boom to enhance vocal intensity and closure of vocal cords; circum- laryngeal massage for neutral laryngeal reposturing and relaxation; Abdominal breathing support exercises, exercises improving vocal function and resonant voice therapy. Early voice therapy at or before 1month post thyroidectomy surgery was established in all patients with vocal paresis. We followed these voice therapy techniques including Siemen's-digital pressure on larynx and abdominal breathing and intrinsic muscle strengthening exercises, with voice assessment at regular follow ups.

Vocal therapy is the practical method of vocal rehabilitation as many patients refuse surgical treatment. Efficacy of different techniques are studied and implemented in post thyroidectomy vocal paresis. Principle of vocal therapy is by improving efficiency of the weakened system to improve vocal cord approximation and to improve glottic closure without supraglottic hyperfunction. Voice therapy techniques included Siemen's digital pressure on larynx and abdominal breathing and intrinsic muscle strengthening exercises.

We found comparable results to that of study by R Kumar et al,^[10] a cohort study of 40 study participants, with 20 cases of unilateral vocal cord palsy, with 20 normal age matched healthy adults. Out of 20 cases grouped into 10 males and 10 females, they found reduction in score for all components of VHI. Before voice therapy, mean VHI score was 83 in males and 68 in females. After voice therapy, mean VHI score reduced to 17 in males and 3 in females. Mean maximum phonation duration was 4 seconds and 3 seconds in males and females respectively, before therapy, increasing to 11seconds and 10 seconds after therapy in males and females respectively. Similarly mean GRBAS scores significantly reduced after voice therapy. In our study, 8 out 20 patients developed vocal cord paresis. Mean VHI score was 22 before voice therapy and 5 after voice therapy. Mean maximum phonation duration of 8 seconds before voice therapy increased to 12 seconds after voice therapy. Improvement in roughness, breathiness, strain score seen in all patients.

Our study parameters for multidimensional voice assessment were limited and patients with voice problems were needed to be referred to voice therapy. Literature study helped us finding and using such

parameters for patient self-reported and clinician reported assessment of voice.

This study highlights the importance of early diagnosis and early treatment of vocal cord paresis by voice therapy.

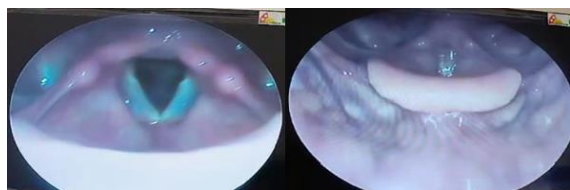


Figure 3: VDL showing normal vocal cords



Figure 4: VDL showing left vocal cord paresis a) vocal cord in abduction b) vocal cords in adduction

CONCLUSION

Vocal paresis occurring post thyroidectomy surgery is most common complication but often underreported by the surgeons. Voice Handicap Index -30 score complimented by indirect or direct laryngoscopy can be accurate parameters for voice assessment. Early detection of vocal paresis and early voice therapy helps in improvement of Voice dysfunction. Hence surgeons must have instinct about the patient reported voice dysfunction. Early and prompt voice therapy in patients with vocal paresis showed improvement hence improving voice related quality of life. Identification of risk factors and their modification helps reducing the vocal

paresis. Intra operative recurrent laryngeal nerve identification is the necessary step to reduce the risk of postoperative vocal paresis.

REFERENCES

1. Wilson JA, Deary IJ, Millar A, Mackenzie K. The quality of life impact of dysphonia. *Clin Otolaryngol Allied Sci.* 2002;27(3):179-182
2. Jones SM, Carding PN, Drinnan MJ. Exploring the relationship between severity of dysphonia and voice-related quality of life. *Clinical Otolaryngology.* 2006 Oct;31(5):411-7.
3. Jeannon JP, Orabi AA, Bruch GA, Abdalsalam HA, Simo R. Diagnosis of recurrent laryngeal nerve palsy after thyroidectomy: a systematic review. *International journal of clinical practice.* 2009 Apr;63(4):624-9.
4. Rabari MG, Malaviya PS, Patel SD. Study of Early Postoperative Complications After Thyroidectomy. *National Journal of Integrated Research in Medicine.* 2020 May 1;11(3).
5. O Donohoe N, Kintu-Luwaga R, Bolger J, Odubu Fualal J. A prospective analysis of thyroidectomy outcomes in a resource-limited setting. *World Journal of Surgery.* 2015 Jul;39:
6. Chandrasekhar SS, Randolph GW, Seidman MD, Rosenfeld RM, Angelos P, Barkmeier-Kraemer J, Benninger MS, Blumin JH, Dennis G, Hanks J, Haymart MR. Clinical practice guideline: improving voice outcomes after thyroid surgery. *Otolaryngology—Head and Neck Surgery.* 2013 Jun;148(6_suppl):S1-37.
7. Meek P, Carding PN, Howard DH, Lennard TW. Voice change following thyroid and parathyroid surgery. *Journal of Voice.* 2008 Nov 1;22(6):765-72
8. Stojadinovic A, Henry LR, Howard RS, Gurevich-Uvena J, Makashay MJ, Coppit GL, Shriver CD, Solomon NP. Prospective trial of voice outcomes after thyroidectomy: evaluation of patient-reported and clinician-determined voice assessments in identifying postthyroidectomy dysphonia. *Surgery.* 2008 Jun 1;143(6):732-42.
9. Schneider SL. Update: behavioral management of unilateral vocal fold paralysis and paresis. *Perspectives of the ASHA Special Interest Groups.* 2019 Jun 19;4(3):474-82.
10. Kumar R, Banumathy N, Sharma P, Panda NK. Normalisation of voice parameters in patients with unilateral vocal fold palsy: is it realistic?. *The Journal of Laryngology & Otology.* 2019 Dec;133(12):1097-102.