



Case Report

Volume 4 Issue 4 - June 2019
DOI: 10.19080/JETR.2019.04.555644

J Endocrinol Thyroid Res

Copyright © All rights are reserved by Reuben Thomas Varghese

Efficacy of Voice Therapy in Total Thyroidectomy: A Single Case Study



Reuben Thomas Varghese^{1*} and Yeshoda K²

¹Department of Speech –Language Sciences, All India Institute of Speech & Hearing, India

²Department of Speech- Language Sciences , All India Institute of Speech & Hearing, India

Submission: February 15, 2019; **Published:** June 14, 2019

***Corresponding author:** Reuben Thomas Varghese - Scientist- B, Department of Speech –Language Sciences, All India Institute of Speech & Hearing, Manasa gangothri, Mysuru, India

Abstract

Background: Thyroidectomy is known to cause changes in voice. However limited studies have been done examining the effects of voice therapy on persons with thyroidectomy.

Aim: The present study is aimed at garnering evidence for the efficacy of voice therapy post near total thyroidectomy.

Method: The participant was a thirty-six-year-old female client diagnosed as having Severe Hoarse Voice with right vocal cord paralysis secondary to near total thyroidectomy (multi nodular goitre). A detailed voice evaluation was done followed by structured therapy techniques.

Results: The results revealed positive changes in the vocal behaviour of the subject pre- and post-therapy as revealed by qualitative and quantitative measures.

Conclusion: These findings support that voice therapy is crucial as a major treatment options to improve voice quality for individuals post thyroidectomy. Further research with more evidences in a greater number of clients is warranted in this area.

Keywords: Thyroidectomy; Voice; Multidimensional Voice Program

Introduction

Thyroidectomy is a surgical procedure which results in total or partial removal of the thyroid gland [1]. Thyroid gland produces thyroid hormone which has several physiological effects and is essential for normal growth, functioning, and development of various tissues as well as larynx [2]. As a result, thyroid gland diseases affect almost all structures engaged in voice production, such as larynx, trachea, laryngeal muscles and nerves [3]. Voice changes after thyroidectomy are often linked with recurrent (inferior) laryngeal nerve impairment and rarely with superior laryngeal nerve impairment [4]. Laryngeal nerve impairment can cause different vocal and laryngeal symptoms during thyroidectomy [5], such as: changes in voice, respiration, swallowing and coughing which is usually ineffective and silent [6]. Voice changes can vary from mild to severe aberrations or from dysphonia to aphonia. Studies have also reported that thyroidectomy affects the steadiness of the vocal tract which may lead to changes in voice [7]. The characteristics of vocal changes in patients who have undergone thyroidectomy mainly include symptoms such as vocal fatigue, reduced vocal range,

reduced speaking fundamental frequency, hoarseness, and reduced vocal strength [8]. Voice disorders after thyroidectomy can significantly affect the quality of life [9]. No matter how much individuals depend on their voice in their profession, quality of life is disrupted if they use their voice in everyday communication. In that way, dysphonia affects not only the professional, but also the social aspect of life. The above review indicates that objective and subjective evaluation of the patient's vocal state is required in patients who undergo thyroidectomy procedures. Since most of the studies deal with the diagnosis aspects, limited studies are done examining the effect of voice therapy on persons with thyroidectomy in the Indian context. The present study is aimed at garnering evidence for the efficacy of voice therapy post near total thyroidectomy.

The present study has the following objectives

- i. To investigate and compare the qualitative measures using qualitative protocol, Consensus Auditory Perceptual Evaluation of Voice (CAPE-V) before and after 15 sessions of voice therapy.

ii. To investigate and compare the quantitative measures in terms of aerodynamic & acoustic measures using quantitative methods before and after 15 sessions of voice therapy.

Case History

A single subject time series design was carried out. A thirty-six years old female client diagnosed as having Severe Hoarse Voice with right vocal cord paralysis secondary to near total thyroidectomy (multi nodular goitre) by a team of Speech-Language Pathologist (SLP), Otorhinolaryngologist and Phonosurgeon was considered for the study. The client complained of reduced loudness and strained voice post near total thyroidectomy. A detailed voice assessment was carried out in terms of both qualitative and quantitative measures. The qualitative evaluation using Consensus Auditory – Perceptual Evaluation of Voice (CAPE-V) [10]. revealed that the client had severe hoarse voice with asthenia and aphonia being present. The quantitative evaluation included both aerodynamic and acoustic measurements. The ae-

rodynamic measures had Maximum Phonation Duration (MPD) and s/z ratio (Table 1). For both the measures, the duration was measured using a stopwatch and out of three trials the phonation with the maximum duration was considered. For the second task the client was seated in a noise free recording room and was asked to phonate /a/ at her comfortable pitch and loudness, and it was recorded using a microphone with 10 cm and 45o off axis positioning. A 3 sec steady portion of the phonated vowel was subjected to acoustic analysis using the Multidimensional Voice Program (MDVP). The graphical representation and the measured values are depicted in (Figure 1) (Table 2). Red indicates affected parameters.

Table 1: Aerodynamic measures of the client during assessment (before voice therapy).

Measures	/a/	/i/	/u/
MPD	2 sec	1 sec	3 sec
s/z	/s/= 5 sec, the client was unable to phonate /z/		

Table 2: Values of MDVP parameters of the client before therapy.

Sl no	MDVP Parameters	Values
1	Average Fundamental Frequency (Fo)	279 Hz
2	Average Pitch Period (To)	3.6
3	Highest Fundamental Frequency (Fhi)	506 Hz
4	Lowest Fundamental Frequency (Flo)	200 Hz
5	Standard Deviation of Fo (STD)	42
6	Phonatory Fo- Range in Semitones (PFR)	17
7	Fo- Tremor Frequency (Fftr)	4.08
8	Amplitude Tremor frequency (Fatr)	6.25
9	Length of analyzed Sample (Tsam)	3.75
10	Absolute Jitter (Jita)	265.3
11	Jitter Percent (Jitt)	7.17
12	Relative Average Perturbation (RAP)	3.83
13	Pitch Perturbation Quotient (PPQ)	4.72
14	Smoothed Pitch Perturbation Quotient (sPPQ)	6.74
15	Fundamental Frequency Variation (vFo)	15.103
16	Shimmer in dB (ShdB)	19.32
17	Shimmer Percent (Shim)	19
18	Amplitude Perturbation Quotient (APQ)	13.94
19	Smoothed Amplitude Perturb Quotient (sAPQ)	17.55
20	Peak Amplitude Variation (Vam)	45.25
21	Noise to Harmonic Ratio (NHR)	0.52
22	Voice turbulence Index (VTI)	0.24
23	Soft Phonation Index (SPI)	9.78
24	Fo- Tremor Intensity Index (FTRI)	0.73
25	Amplitude Tremor Intensity Index (ATRI)	4.38
26	Degree of Voice Breaks (DVB)	68.1
27	Degree of Sub harmonic Segments (DSH)	0
28	Degree of voiceless (DUV)	90.32

29	Number of voice breaks (NVB)	5
30	Number of Sub-Harmonic Segments (NSH)	0
31	Number of unvoiced Segments (NUV)	112
32	Number of Segments Computed (SEG)	124
33	Total Pitch Periods Detected (PER)	273

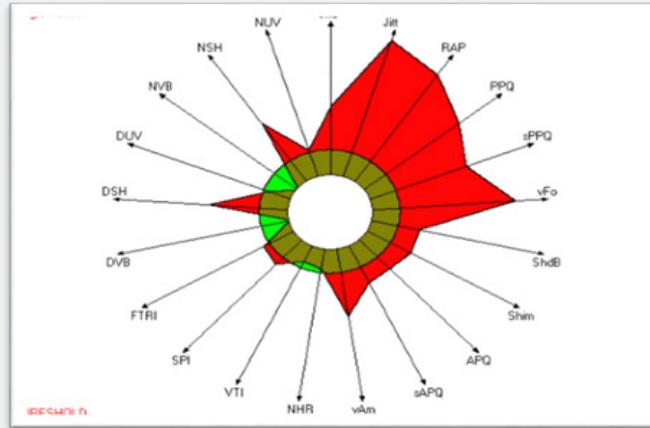


Figure 1: Graphical Representation of MDVP parameters of the client before voice therapy.

Voice therapy program

A comprehensive review of recent voice therapy programs was done to systematically develop the therapy program for the client. The therapy program focussed on improving the respiratory capacity and efficiency, improving the voice quality and elimination of voice abuse. Combinations of techniques were used.

For improving Respiratory Capacity

The client was advised to follow diaphragmatic & abdominal breathing exercises. The client was able to follow the technique correctly and slight improvement was noticed in her respiratory skill. Hence after 15 days of rest period her breathing capacity and efficiency was found improved in terms of duration to 6 sec.

To Improve her Voice

The client was asked to inhale deeply and hum. She was advised to hum after a comfortable inspiration and concentrate on the sound. Humming was audible and louder (comfortable for the client even) for the head upward and right-side position and the duration for both the directions were similar after 15 sessions.

For elimination of vocal abuse

The client was advised vocal hygiene/ re-education by increasing awareness of potentially abusive vocal behaviours and implement a lifestyle plan that minimizes potentially abusive vocal behaviours which the client was following strictly.

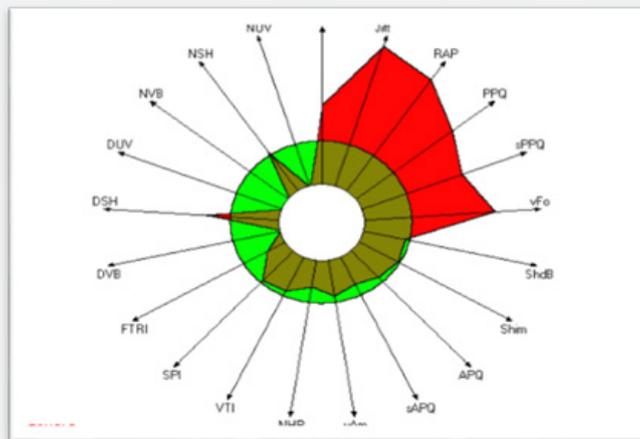


Figure 2: Graphical Representation of MDVP parameters of the client after voice therapy.

Results and Discussion

After 15 sessions of voice therapy, a re-evaluation was done to find the efficacy of voice therapy in this client. The qualitative evaluation using Consensus Auditory – Perceptual Evaluation of Voice (CAPE- V) revealed that the client had moderate -severe hoarse voice with asthenia and aphonia being significantly reduced. The quantitative measurements in terms of Aerodynamic (Table 3) and MDVP parameters showed significant improvement as shown in (Figure 2) (Red indicates affected parameters) and (Table 4), which can be due to the effect of voice therapy for this client. The client improved her speaking

voice and she was audible to people. She began attending her professional commitments after discharge from therapy. She was followed up after 4 weeks and 8 weeks post therapy discharge. The client opined her voice improved over time and she faced occasional hoarseness when exposed to dust/ wind due her professional commitments. She continued practicing the techniques and maintained vocal hygiene regularly.

Table 3: Aerodynamic measures of the client after voice therapy.

Measures	/a/	/i/	/u/
MPD	7 sec	6sec	5sec
s/z	S= 7 sec, the client was not able to phonate z		

Table 4: Values of MDVP parameters of the client after voice therapy.

Average Fundamental Frequency (Fo)	253 Hz
Average Pitch Period (To)	3.9
Highest Fundamental Frequency (Fhi)	305 Hz
Lowest Fundamental Frequency (Flo)	219 Hz
Standard Deviation of Fo (STD)	8.02
Phonatory Fo- Range in Semitones (PFR)	7
Fo- Tremor Frequency (Fftr)	6.3
Amplitude Tremor frequency (Fatr)	3.7
Length of analyzed Sample (Tsam)	3.7
Absolute Jitter (Jita)	122
Jitter Percent (Jitt)	3.09
Relative Average Perturbation (RAP)	1.8
Pitch Perturbation Quotient (PPQ)	1.8
Smoothed Pitch Perturbation Quotient (sPPQ)	1.8
Fundamental Frequency Variation (vFo)	3.1
Shimmer in dB (ShdB)	0.4
Shimmer Percent (Shim)	4.5
Amplitude Perturbation Quotient (APQ)	3.6
Smoothed Amplitude Perturb Quotient (sAPQ)	4.8
Peak Amplitude Variation (Vam)	19.4
Noise to Harmonic Ratio (NHR)	0.12
Voice turbulence Index (VTI)	0.04
Soft Phonation Index (SPI)	27.7
Fo- Tremor Intensity Index (FTRI)	0.97
Amplitude Tremor Intensity Index (ATRI)	0
Degree of Voice Breaks (DVB)	0
Degree of Sub harmonic Segments (DSH)	0
Degree of voiceless (DUV)	0
Number of voice breaks (NVB)	0
Number of Sub-Harmonic Segments (NSH)	0
Number of unvoiced Segments (NUV)	0
Number of Segments Computed (SEG)	124
Total Pitch Periods Detected (PER)	939

Conclusion

The present study was a preliminary attempt to chronicle evidence for the efficacy of voice therapy in a single subject post thyroidectomy. The results revealed positive changes in the vocal behaviour of the subject pre- and post-therapy as revealed by qualitative and quantitative measures. These findings support that voice therapy is crucial as a major treatment options to improve voice quality for individuals post thyroidectomy. Further research with more evidences in a greater number of clients is warranted in this area.

References

1. Chandrasekhar SS, Randolph GW, Seidman MD, Rosenfeld RM, Angelos P, et al. (2013) Clinical practice guideline: improving voice outcomes after thyroid surgery. *Otolaryngology-Head and Neck Surgery* 148(6): S1-37.
2. Birkent H, Karacalioglu O, Merati AL, Akcam T, Gerek M (2008) Prospective study of the impact of thyroid hormone replacement on objective voice parameters. *Annals of Otolaryngology & Laryngology* 117(7): 523-527.
3. Mcivor NP, Flint DJ, Gillibrand J, Morton RP (2000) Thyroid surgery and voice-related outcomes. *Australian and New Zealand Journal of Surgery* 70(3): 179-183.
4. Stojadinovic A, Shaha AR, Orlikoff RF, Nissan A, Kornak MF, et al. (2002) Prospective functional voice assessment in patients undergoing thyroid surgery. *Annals of surgery* 236(6): 823-832.
5. Soylu L, Ozbas S, Uslu HY, Kocak S (2007) The evaluation of the causes of subjective voice disturbances after thyroid surgery. *The American Journal of Surgery* 194(3): 317-332.
6. Finck C (2006) Laryngeal dysfunction after thyroid surgery: diagnosis, evaluation and treatment. *Acta Chirurgica Belgica* 106(4): 378-87.
7. Timon CI, Hirani SP, Epstein R, Rafferty MA (2010) Investigation of the impact of thyroid surgery on vocal tract steadiness. *Journal of Voice* 24(5): 610-613.
8. Myers EN, Hong KH, Kim YK (1997) Phonatory characteristics of patients undergoing thyroidectomy without laryngeal nerve injury. *Otolaryngology Head and Neck Surgery* 117(4): 399-404.
9. Rohde SL, Wright CT, Muckala JC, Wiggleton J, Rousseau B, et al. (2012) Voice quality after recurrent laryngeal nerve resection and immediate reconstruction. *Otolaryngology Head and Neck Surgery* 147(4): 733-736.
10. Kempster GB, Gerratt BR, Abbott KV, Barkmeier-Kraemer J, Hillman RE (2009) Consensus auditory-perceptual evaluation of voice: development of a standardized clinical protocol. *American Journal of Speech-Language Pathology* 18(2): 124-132.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/JETR.2019.04.555644](https://doi.org/10.19080/JETR.2019.04.555644)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>