



## ORIGINAL ARTICLE



# A Comparative Study on the Outcomes of Early and Delayed Type-1 Thyroplasty Following Unilateral Vocal Cord Palsy

## OPEN ACCESS

Received: 06.04.2022

Accepted: 27.04.2022

Published: 05.07.2022

N B Prahlada<sup>1</sup>, S Raisa<sup>2\*</sup>

<sup>1</sup> Professor, Department of ENT, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India

<sup>2</sup> Post graduate student, Department of ENT, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India

**Citation:** Prahlada NB, Raisa S. (2022). A Comparative Study on the Outcomes of Early and Delayed Type-1 Thyroplasty Following Unilateral Vocal Cord Palsy. International Journal of Preclinical & Clinical Research. 3(2): 31-36. [https://doi.org/10.51131/IJPCCR/v3i2.22\\_19](https://doi.org/10.51131/IJPCCR/v3i2.22_19)

\* **Corresponding author.**

[bubbles.raisa@gmail.com](mailto:bubbles.raisa@gmail.com)

**Funding:** None

**Competing Interests:** None

**Copyright:** © 2022 Prahlada & Raisa. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Published By Basaveshwara Medical College & Hospital, Chitradurga, Karnataka

**ISSN**

Print: XXXX-XXXX

Electronic: 2583-0104

## Abstract

Unilateral Vocal cord palsy typically presents with dysphonia, shortness of breath and swallowing difficulty. It can be iatrogenic, idiopathic or may occur secondary to damage to recurrent laryngeal nerve following trauma, impinging mass lesions, neurological disorders or neuro-musculoskeletal diseases, or infectious in aetiology. To study and compare the effects of Type I Thyroplasty depending on the time of presentation, that is, early and delayed presentation. Ambispective Study Design. Our study included 32 patients who presented to our Institution with history of dysphonia, diagnosed with unilateral vocal cord palsy. Depending on the duration of symptoms on presentation, patients were categorised into 2 groups, which is early subgroup who presented within 1 year of symptom onset, 21 patients and delayed subgroup who presented after 1 year of symptom onset, 11 patients. Complete preoperative evaluation including perceptual analysis of voice quality, acoustic measures of voice quality, Aerodynamic measures of voice quality, quality of life measure, tele laryngoscopy was done. All patients underwent Type I Thyroplasty and were followed up at 2 weeks, 1 months, 3 months and 6 months, with follow up criteria including perceptual analysis of voice, MPT and VHI-10. Out of 32 patients, Male to female ratio was 26 : 6, with mean age of presentation being 47 years. The laterality of the palsy was R: L→4: 28. When compared to the Delayed subgroup, early Subgroup had significant improvement in outcomes with respect to GRBAS Scale, VHI-10 and MPT.

**Keywords:** Unilateral vocal cord palsy; Early & Delayed

## Introduction

Unilateral Vocal cord palsy typically presents with dysphonia, shortness of breath and swallowing difficulty<sup>(1)</sup>. It has multiple etiologies, namely iatrogenic, idiopathic, and secondary to trauma, neoplasia or neurological disorders<sup>(1,2)</sup>. The UVC Palsy may also be due to temporary or permanent surgical injury to recurrent laryngeal nerve. The glottal insufficiency secondary to Recurrent Laryngeal Nerve (RLN palsy) results in weakened cough, dysphonia, increased risk of aspiration and pneumonia<sup>(1-4)</sup>.

Management of UVCP requires a well-defined therapeutic approach, taking into account the lifestyle and needs of patients, age, comorbidities, patient's expectations, clinician's skill and knowledge, and real stated goals of intervention<sup>(5)</sup>. A variable degree of restoration of RLN function occurs extending from 6 to 12 months, depending on the severity of nerve damage ranging from temporary neuropraxia to complete neural disruption<sup>(5-7)</sup>.

Corrective surgical procedures are done to move the edge of paralysed vocal fold, closer to midline, for facilitation of glottal closure during phonation<sup>(6-9)</sup>. Surgical interventions are usually done after a watchful waiting period of 6-12 months and/or speech therapy to restore voice and improve glottic competence<sup>(5,6)</sup>. Type I Thyroplasty is a well-established surgical procedure to manage unilateral vocal cord paralysis, to improve voice and prevent aspiration<sup>(10)</sup>.

This study is aimed to evaluate and compare the results of Type I Thyroplasty depending on the time of the surgery, whether short-term, i.e., within one year or long-term, i.e., after one year.

## Materials and Methods

This ambi-spective study enrolled 32 patients who presented to our Institution with Unilateral Vocal cord palsy for a period of 211 years from 2001 to 2021. Patients were grouped depending on duration of symptoms on presentation. Twenty one patients presented within 1 year of symptoms and eleven patients presented after 1 year of symptoms. Detailed history regarding symptom onset, duration, progression, associated symptoms were taken. General Physical Examination and ENT Examination including telarlaryngoscopy and flexible laryngoscopy was done. Voice quality analysis in terms of Perceptual analysis of voice quality, acoustic measures of voice quality and Aerodynamic measures of voice quality was done.

Rigid laryngoscopy to rule out other causes of vocal cord of fixation, i.e., post-traumatic causes, crico-arytenoid fixation was done.

Perceptual analysis of voice quality in terms of GRBAS Scale Scoring was done. Grade of hoarseness, Roughness, Breathiness, Asthenia, Strain scale were assessed where each dimension was rated on a 4-point scale (Table 1)<sup>(7,9)</sup>.

**Table 1.** GRBAS Scale (Ref).

0	No perceived abnormality
1	Mild
2	Moderate
3	Severe abnormality

In case of acoustic measures of voice quality, quantitative measures, based on the voice signal (waveform and spectrum) were recorded using a microphone. Few voice characters observed are Fundamental frequency, which is a measure of rate of vibration of vocal folds; Jitter, which is variation/ perturbation in frequency; Shimmer, measures of variation/perturbation in intensity as well as Harmonic to noise ratio<sup>(8,9,11)</sup>.

Aerodynamic measure of voice quality includes Maximum phonation time (MPT) which is measured by asking the subject to inhale as deeply as possible and then sustain a steady state vowel sounds "ee / aa" as long as possible. The highest of the 3 values are taken<sup>(10-14)</sup>.

Quality of life measures in terms of Voice Handicap Index (VHI-10) was taken. Impact of the voice disorder on different aspects of the patient's quality of life, namely, Physical, Functional and Emotional were assessed based on the scoring system between 0-4<sup>(14-17)</sup>.

Tele-laryngoscopy using 10 mm, 90 degree rigid laryngoscope or 4.3 mm flexible nasopharyngo-laryngoscopy was done.

The Inclusion criteria of the study included patients with Unilateral Vocal cord palsy who were available for regular follow up. The exclusion criteria included cases of post-traumatic vocal fixation, laryngotracheal malignancy, previous vocal cord surgery, multiple cranial nerve palsies, laryngo-tracheal trauma, and failure to follow-up, extrusion of prosthesis.

Intraoperative subjective improvement of voice was assessed for all the cases. Patients were followed up at 2 weeks, 1 months, 3 months and 6 months. Follow up criteria included Tele – rigid/flexible laryngoscopy, Perceptual analysis of voice, MPT and VHI-10.

Surgical technique: Patient is positioned with neck extended at atlanto-occipital joint. A horizontal skin incision is put along the inferior border of thyroid cartilage. Superior and inferior flaps elevated in the sub-platysmal plane, superiorly extending up to the level of hyoid and inferiorly upto lower border of cricoid cartilage. The deep cervical fascia is divided in the midline and the strap muscles are retracted laterally. The thyroid cartilage is visualised. The height and width of the thyroid cartilage were measured using callipers to calculate dimensions of the thyroid window. The thyroid window is incised using a No. 15 surgical blade and window drilled out using a microdrill. Depth of

the window is measured using a measuring zig. Silastic block is cut to appropriate size and inserted into the window. Intra-operative feedback about the voice was obtained from the patient and the block is adjusted until the patient was satisfied with his/her voice. The block is fixed using Vicryl 3-0. The wound is closed in three layers.



Fig 1. Elevating superior and inferior subplatysmal flap



Fig 2. Dividing deep cervical fascia in midline

## Results

Out of 32 patients, 26 were males and 6 were females. The age of presentation varied from 19 years to 76 years with the mean age being 47 years. The laterality of the palsy showed preponderance on the left side in majority of patients (R:L :: 4:28). Coming to the etiological factors, out of 4 patients who had Right vocal cord palsy, 3 were iatrogenic, secondary to Thyroid surgery, 1 of idiopathic origin. Out of the 28 patients with Left sided vocal cord palsy, 15 cases were idiopathic in

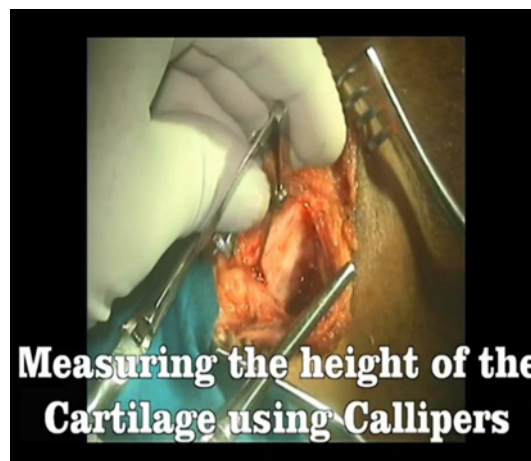


Fig 3. Measuring dimensions of thyroid cartilage



Fig 4. Incising Thyroid Window

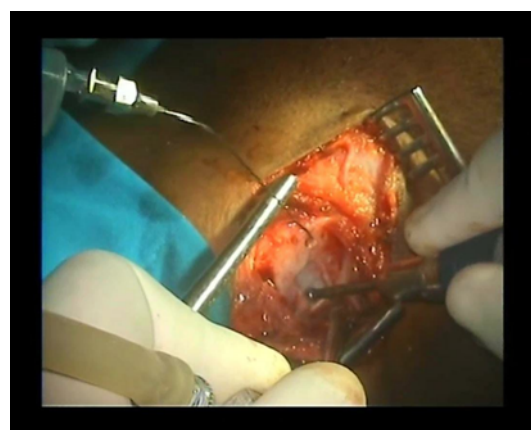


Fig 5. Drilling Thyroid window with microdrill

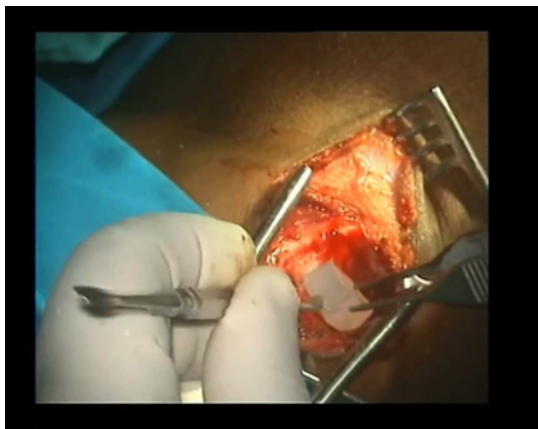


Fig 6. Inserting Silastic block

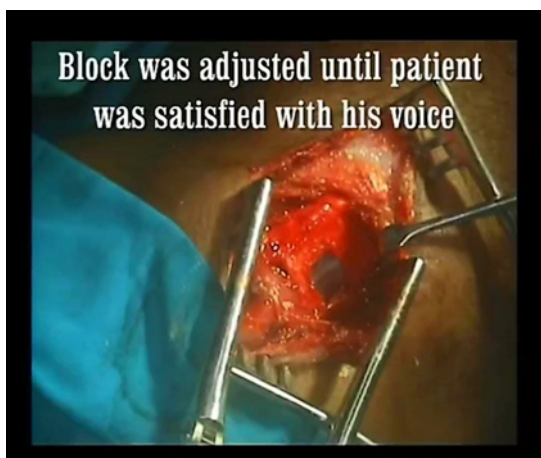


Fig 7. Silastic block adjusted



Fig 8. Fixing the Silastic block with Vicryl 3-0

origin, 11 cases iatrogenic, which included 9 cases of post thyroid surgery, 1 case each of skull base surgery and spine surgery, and 2 cases of Mediastinal lesion (Figure 9).

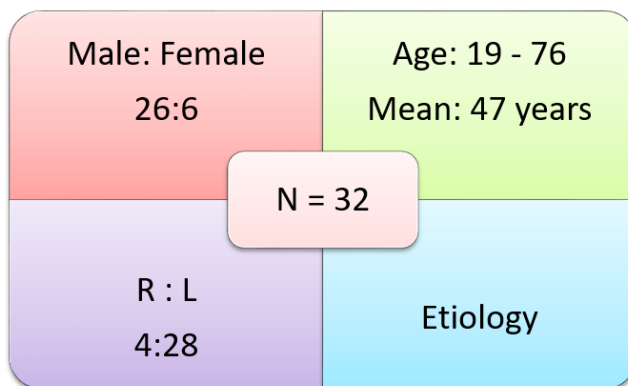


Fig 9. Demographic and clinical characteristics

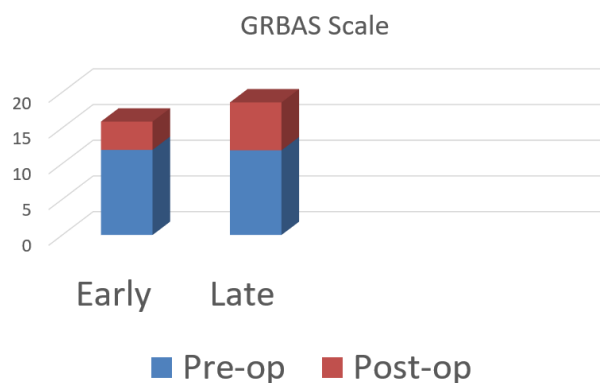


Fig 10. GRBAS Scale

On comparing the GRBAS Scoring between the Early subgroup and Late subgroup of patients, there is comparable decrease in scores in both the groups but with better results in early group (Figure 10).

On comparing the results of Maximum phonation time, the Early subgroup has a substantial improvement in duration when compared to the Late group (Figure 11).

Similarly with the Voice Handicap Index -10, the early subgroup shows tremendous improvement post surgery when compared to the Late subgroup (Figure 12).

On tele- rigid/ flexible laryngoscopy, patients who underwent late thyroplasty showed varying degrees of compensation, atrophic vocal cord, hanging vocal cord, different levels of approximation with vertical phonetic gap.

Overall results were good in patients who underwent surgery within a year. Though the procedure prevented aspiration, subjective improvement in voice is not satisfactory among the delayed group.

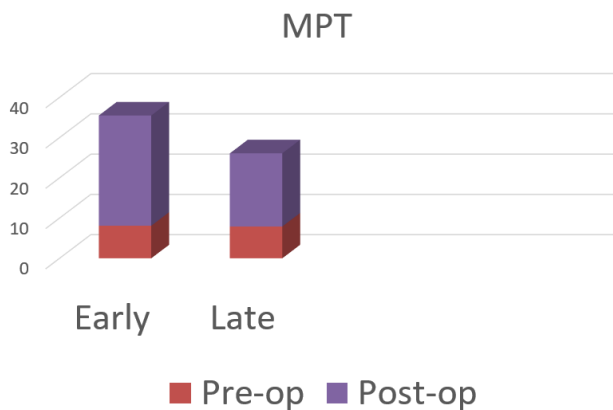


Fig 11. MPT

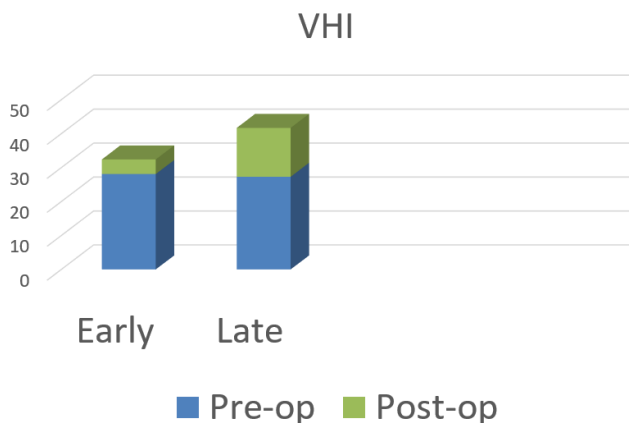


Fig 12. VHI

## Discussion

The first attempt at true medialization thyroplasty was done in 1915, by a German surgeon named Erwin Payr (1). Issihiki et al at Kyoto University first described the technique now known as type I thyroplasty in 1974, with a study describing a series of procedures on dogs. Instead of approaching the vocal cords directly, which causes mucosal scarring, reduced vocal cord compliance and hindered vibration<sup>(18)</sup>, he aimed to change the position and physical property of the vocal

cord by actively changing the cartilaginous framework of the larynx, on which the vocal cords were suspended<sup>(19)</sup>.

Type I thyroplasty involves creating a window into ala of anterior thyroid cartilage, and inserting a prosthesis which pushes the paralyzed vocal cord medially, allowing it to make contact with the non paralyzed vocal cord and thus restoring its function<sup>(20)</sup>.

Pal et al in their study had stated higher incidence among males, with male:female ratio of 1.50:1<sup>(21)</sup>, whereas it was 2:1 as per study of Baitha et al<sup>(22)</sup>.

Defining a time window for the beginning and end point for synkinetic reinnervation is admittedly difficult, especially when there exists disparity in the cause of denervation, spectrum of anatomic injury and variations in reinnervation patterns. Crumley described a chronic phase of RLN regeneration following complete transection injury, during which regeneration starts to occur and clinical evidence of improvement may be observed within 4 to 5 months post-injury<sup>(23)</sup>.

Friedman et al. hypothesized that with early intervention, the implant material allows the vocal fold to be in a more appropriate resting position during the time window of synkinetic reinnervation. It is possible that synkinetic reinnervation permanently maintains a medialized and more favorably positioned vocal fold<sup>(24)</sup>.

Early medialization of a vocal cord allow better final resting position once synkinetic reinnervation is completed. A paralyzed, but medialized vocal cord may also experience the sensory (vibro-tactile) stimulation from physical contact with the contralateral, mobile vocal cord<sup>(23)</sup>.

Thus in our study, the inferior results of Type-1 Thyroplasty in Delayed Group is mainly due to high patient expectations, different degrees of compensation by the normal vocal cord, primary aetiology, atrophy and sagging of the paralyzed vocal cord.

There are certain drawbacks in this study, as this is a small study population, with unequal study group, further study involving greater sample size is required.

## Conclusion

When compared to the early subgroup, the results were sub-optimal among the delayed subgroup, hence concluding that Early Thyroplasty yields better results.

## References

- 1) Kwak PE, Tritter AG, Donovan DT, Ongkasuwan J. Long-term Voice Outcomes of Early Thyroplasty for Unilateral Vocal Fold Paralysis Following Aortic Arch Surgery. *Annals of Otolaryngology, Rhinology & Laryngology*. 2016;125(7):559–563. Available from: <https://doi.org/10.1177/0003489416636127>.
- 2) Desuter G, Dedry M, Schaar B, van Lith-Bijl J, van Benthem PP, Sjögren EV. Voice outcome indicators for unilateral vocal fold paralysis surgery: a review of the literature. *European Archives of Oto-Rhino-Laryngology*. 2018;275(2):459–468. Available from: <https://doi.org/10.1007/s00405-017-4844-9>.
- 3) Chowdhury K, Saha S, Saha VP, Pal S, Chatterjee I. Pre and Post Operative Voice Analysis After Medialization Thyroplasty in Cases of Unilateral Vocal Fold Paralysis. *Indian Journal of Otolaryngology and Head & Neck Surgery*. 2013;65(4):354–357. Available from: <https://doi.org/10.1007/s12070-013-0649-3>.
- 4) Karine S, Carla AC, Nêdio S, Geraldo PJ, Jéferson B. Voice and vocal fold position in men with unilateral vocal fold paralysis. *Brazilian Journal of Otorhinolaryngology*. 2011;77(6):761–767. Available from: <https://pubmed.ncbi.nlm.nih.gov/22183283/>.
- 5) Patel R, Parsram K. Acoustic analysis of subjects with vocal cord paralysis. *Indian journal of otolaryngology and head and neck surgery*. 2005;57(1):48–51. Available from: <https://doi.org/10.1007/BF02907629>.
- 6) Hartl DM, Hans S, Vaissière J, Riquet M, Brasnu DF. Objective Voice Quality Analysis Before and After Onset of Unilateral Vocal Fold Paralysis. *Journal of Voice*. 2001;15(3):351–361. Available from: [https://doi.org/10.1016/s0892-1997\(01\)00037-6](https://doi.org/10.1016/s0892-1997(01)00037-6).
- 7) Vij S, Gupta AK, Vir D. Voice Quality Following Unilateral Vocal Fold Paralysis: A Randomized Comparison of Therapeutic Modalities. *Journal of Voice*. 2017;31(6):774.e9–774.e21. Available from: <https://doi.org/10.1016/j.jvoice.2017.02.015>.
- 8) Tarika B, James LP, G D. Perceptual evaluation of voice quality and its correlation with acoustic measurements. *Journal of Voice*. 2004;18(3):299–304. Available from: <https://doi.org/10.1016/j.jvoice.2003.12.004>.
- 9) Maryn Y, Roy N, De Bodt M, Van Cauwenberge P, Corthals P. Acoustic measurement of overall voice quality: A meta-analysis. *The Journal of the Acoustical Society of America*. 2009;126(5):2619–2634. Available from: <https://doi.org/10.1121/1.3224706>.
- 10) Se-Jin C, Choi, Hong-Shik, Kim J, Choi YL. Comparison of Maximum Phonation Time Associated with the Changes in Vocal Intensity in Patients with Unilateral Vocal Fold Palsy and Sulcus Vocalis. *Journal of the Korean society of speech sciences*. 2012;4:125–131.
- 11) Lundy DS, Casiano RR, Xue JW. Can Maximum Phonation Time Predict Voice Outcome after Thyroplasty Type I? *The Laryngoscope*. 2004;114(8):1447–1454. Available from: <https://doi.org/10.1097/00005537-200408000-00025>.
- 12) Webb AL, Carding PN, Deary IJ, Mackenzie K, Steen N, Wilson JA. The reliability of three perceptual evaluation scales for dysphonia. *European Archives of Oto-Rhino-Laryngology*. 2004;261(8):429–434. Available from: <https://doi.org/10.1007/s00405-003-0707-7>.
- 13) Renée S, Hans B, Valeria LP, Nel R. Maximum Phonation Time: Variability and Reliability. *Journal of Voice*. 2009;24(3):281–285. Available from: <https://doi.org/10.1016/j.jvoice.2008.10.004>.
- 14) Karnell MP, Melton SD, Childes JM, Coleman TC, Dailey SA, Hoffman HT. Reliability of Clinician-Based (GRBAS and CAPE-V) and Patient-Based (V-RQOL and IPVI) Documentation of Voice Disorders. *Journal of Voice*. 2007;21(5):576–590. Available from: <https://doi.org/10.1016/j.jvoice.2006.05.001>.
- 15) Rosen CA, Lee AS, Osborne J, Zullo T, Murry T. Development and Validation of the Voice Handicap Index-10. *The Laryngoscope*. 2004;114(9):1549–1556. Available from: <https://doi.org/10.1097/00005537-200409000-00009>.
- 16) Ryu IS, Nam SY, Han MW, Choi SH, Kim SY, Roh JL. Long-term Voice Outcomes After Thyroplasty for Unilateral Vocal Fold Paralysis. *Arch Otolaryngol Head Neck Surg*. 2012;138(4):347–351. Available from: <https://doi.org/10.1001/archoto.2012.42>.
- 17) Ali I, Khalid F, Shafi OM, Makhdoomi O. Voice outcome after type-I thyroplasty for unilateral vocal cord paralysis: our experience at tertiary care hospital. *International Journal of Otorhinolaryngology and Head and Neck Surgery*. 2020;6(8):1449. Available from: <https://dx.doi.org/10.18203/issn.2454-5929.ijohns20203193>.
- 18) Isshiki N. Vocal mechanics as the basis for phonosurgery. *The Laryngoscope*. 1998;108(12):1761–1766. Available from: <https://doi.org/10.1097/00005537-199812000-00001>.
- 19) Isshiki N, Morita H, Okamura H, Hiramoto M. Thyroplasty as a New Phonosurgical Technique. *Acta Oto-Laryngologica*. 1974;78(1-6):451–457. Available from: <https://doi.org/10.3109/00016487409126379>.
- 20) Harries ML. Laryngeal framework surgery (thyroplasty). *The Journal of Laryngology & Otolaryngology*. 1997;111(2):103–105.
- 21) Pal KS, Kaushal AK, Nagpure PS, Agarwal G. Etiopathological Study of 100 Patients of Hoarseness of Voice: In a Rural Based Hospital. *Indian Journal of Otolaryngology and Head & Neck Surgery*. 2014;66(1):40–45. Available from: <https://doi.org/10.1007/s12070-013-0660-8>.
- 22) Baitha S, Raizada RM, Singh AKK, Puttewar MP, Chaturvedi VN. Clinical profile of hoarseness of voice. *Indian Journal of Otolaryngology and Head and Neck Surgery*. 2002;54(1):14–18. Available from: <https://doi.org/10.1007/BF02910998>.
- 23) Crumley RL. Unilateral recurrent laryngeal nerve paralysis. *Journal of Voice*. 1994;8(1):79–83. Available from: [https://doi.org/10.1016/s0892-1997\(05\)80323-6](https://doi.org/10.1016/s0892-1997(05)80323-6).
- 24) Friedman AD, Burns JA, Heaton JT, Zeitels SM. Early versus late injection medialization for unilateral vocal cord paralysis. *The Laryngoscope*;120(10):2042–2046. Available from: <https://doi.org/10.1002/lary.21097>.