

## Original Article

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# Surgical and Non-Surgical Treatment Outcome Assessed by Voice Handicap Index of Patients with Vocal Fold Nodule

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### Abstract:

**Background:** Vocal nodules are a frequently occurring type of laryngeal disorder. Vocal fold nodules are usually bilateral swellings of variable size (< 3mm) found at the mid-part of the membranous vocal cords. Vocal abuse, misuse and overuse are frequently claimed to be the causes of vocal nodules and mostly affect professional voice users. It has important public health implications and impact on patient quality of life (QoL). Voice handicap index (VHI) is an important tool for quality of life assessment and outcome of intervention in voice disordered patients.

**Objective:** To compare the outcome of Voice handicap index (VHI) score after surgical and non-surgical intervention of vocal cord nodule.

**Methods:** In this prospective study 30 patients with vocal nodules refractory to the first session of voice therapy were diagnosed by fiber optic laryngoscopy. After simple random allocation management was done either by voice therapy or surgery. VHI (Voice Handicap Index) was applied as outcome measures for assessing the efficiency of intervention between surgical and non-surgical groups.

**Results:** The mean value of Voice handicap index total (VHI<sub>t</sub>) was 54.40 (± 8.56) before voice therapy which significantly changed to 25.80 (± 6.23) after voice therapy in non-surgical group ( $n_2$ ).

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And in the surgical group( $n_1$ )VHIt was 54.27( $\pm$  8.21) which changed to 26.16 ( $\pm$  7.15) after micro laryngeal surgery.

**Conclusion:** The study result had shown that all the cases with vocal cord nodule got a better Voice handicap index (VHI) score after intervention irrespective of their age, sex and occupation. The treatment options, voice therapy and surgery both were useful and helped the patients getting a better outcome but there was no statistically significant difference between these two.

**Key words:** Voice Handicap Index (VHI), Voice Handicap Index total (VHIt) Vocal Fold Nodule(VN), Laryngopharyngeal Reflux (LPR).

### Introduction:

Vocal fold nodules are common, benign lesions of the vocal folds, known to be associated with voice overuse, vocal misuse or abuse<sup>1,2</sup>. Their incidence appears to be related to occupation and occur mostly in women<sup>3,4</sup>. Ultimately, the presence of vocal fold nodules and changes to vocal behavior can lead to lost time at work, reduced productivity and impaired quality of life<sup>5</sup>.

The prevalence of nodules in the general population is not known but it has been reported as being the cause of hoarseness in up to 23.4% of children<sup>6</sup>. The prevalence of nodules in female teachers was found to be 43% with dysphonia in Spain<sup>7</sup>. Several previous reports have focused on the same problem using self-administered questionnaires, with a prevalence of voice disorders of 32.1% to 68.7% of teachers. A 3.5-fold increased risk of developing voice disorders during their occupational life<sup>8</sup>.

Clinicians use a variety of therapy approaches to treat vocal nodules. Main goal of the treatment techniques is to reduce muscle tension & hyper function. Optimizing vocal behavior to reduce the trauma to the vocal folds<sup>9</sup>. The options for the treatment of nodules are non-surgical and surgical. Rates of surgical intervention vary widely and the exact criteria for surgery are not clearly defined<sup>10</sup>. Non-surgical treatments are administered by speech and language

therapists and are based on behavior modification<sup>11,12</sup>. They include vocal hygiene measures, abuse reduction and vocal retraining<sup>13,14</sup>. Otorhinolaryngologists and phoniatricians are involved in the diagnosis, the treatment of concomitant medical conditions and the surgical management of the patient.

In previous studies there is no clear evidence which patients would benefit from surgery and which from speech therapy techniques<sup>10</sup>. There is evidence that the more conservative speech therapy techniques are effective. However, there is also evidence that surgery is beneficial. But it is not clear how useful it is in those that have failed voice therapy. It may be that failures of voice therapy will also fail all types of intervention. Even if the nodules are removed & causative factors are not addressed, the nodules may recur. Alternatively, one could argue that in resistant cases the damage to the mucosa is irreversible. This damage can only be corrected by surgical excision to a extent that allows speech therapy techniques.

In a study the effects on vocal function of voice therapy for vocal nodules were observed<sup>9</sup>. The results of decreased nodules and improved voice quality suggest that the voice therapy had a positive effect for a majority of the nodule clients.

A comparison of three methods for the management of vocal fold nodules was

conducted by a retrospective study of 59 patients showing 4 recurrences after surgical and non-surgical intervention<sup>12</sup>. But they didn't mention the outcome of the voice.

There are few studies about the outcome of vocal nodule (VN) treated only by surgery or speech therapy alone. However, there is no reported study which compares the outcome of patients with vocal nodule (VN) treated only with voice therapy and surgery followed by speech therapy. Most of the study was concerned with recurrence but very few with quality of life outcome assessed by Voice handicap index (VHI). There is a need for carefully designed prospective study to determine the place of surgery compared with non-surgical treatment of vocal nodules. Solving this problem with effective treatment may reduce cost, time and complication. The research is theoretically important and interesting as outcome can implicate future treatment options of vocal nodules.

#### Methods:

**Study design:** Prospective observational study.

**Place of study:** Department of Otolaryngology-Head & Neck Surgery and Audiology & Speech therapy unit of Bangabandhu Sheikh Mujib Medical University, Shahbagh, Dhaka

**Study period:** June 2017 to October 2018.

**Sample size:** Total sample was 30. A representative sample size of before and after intervention were determined by the following statistical formula-

#### Minimum number of patients-

$$n = \frac{(Z_1 + Z_2)^2 \times (\sigma_1^2 + \sigma_2^2)}{(\mu_1 - \mu_2)^2}$$

**Procedure:** After obtaining clearance and approval from the Institutional Review Board, professional voice users with a history of one session of previous voice therapy were recruited for this study. Patients with bilateral vocal fold nodules who were agreed for follow up & surgery; having normal hearing and language skills were included in this study. Patients with other than nodule on vocal cord histopathology; suffering from acute or chronic RTI (Br. asthma, COPD), Laryngopharyngeal Reflux (LPR), Gastroesophageal reflux disease (GERD,) nasal allergy, hypothyroidism were excluded from the study. Patients on psychoactive medications were also excluded from the study. After recruitment, each subject with vocal nodule was examined by an otolaryngologist with a full case history and fiber optic evaluation.

After simple randomization voice therapy was applied to Group A. Vocal hygiene was provided as an initial step of voice therapy. Vocal hygiene included education on how the normal voice is produced, identification of individual vocal abuse patterns, education on how to reduce/eliminate the vocal abuse, emphasis on the importance of hydration, education on the adverse effects of irritants and the influence of laryngopharyngeal reflux and certain medications. The voice therapy techniques applied varied according to phonatory behavior of the patient. It was aimed to reduce associated hyperkinetic behaviors and to obtain the best possible vocal fold vibration. All the patients were prescribed anti reflux medication for 8 weeks.

One speech-therapist of BSMMU, who was expert in voice disorder provided 45-minute sessions of voice therapy program. The program is known as vocal function exercises (VFEs). It is of 08 weeks (one session per week) duration, as described by university protocol. The vocal function exercises (VFEs) were performed two times for 15 minutes on

a daily basis (morning and evening) per week at home by patients except therapy day.

Group B was treated by surgery followed by voice therapy. Surgical removal of nodules includes excision with microsurgical instruments by cold steel method under general anesthesia. Endotracheal intubation was done with smallest tube considered being safe by the attending anesthesiologist. Surgery was performed by assistant professor and above with an operating microscope at 400-mm focal length through a suspension laryngoscope. All dissections were carried out in the most superficial plane possible, to avoid trauma to sub mucosa & vocal ligament. Complete excision was ensured. Microsurgical laryngeal forceps, scissors and other microsurgical laryngeal instruments were included as cold steel instruments. In all cases specimen were sent for histopathology. Oral dexamithasone 0.5mg was prescribed eight hourly. Voice rest was advised post surgically for 07 days along with cough suppressant. Voice therapy was started from 7 th POD gradually after fiber optic assessment.

There were two intervention groups: surgery combined with voice therapy (Group B) and non-surgical (Group A). Voice handicap index

(VHI) was applied to each patient before and 08 weeks after intervention. After analysis of pre & post Voice handicap index (VHI) score between group A and group B they were categorized as improved & not improved. Final analysis was done by CHI-SQUARE ( $\div 2$ ) test between tow intervention group".

Patients were communicated weekly to ensure avoiding of smoking, alcohol, voice abuse & other confounding variable that may affect outcome.

#### Statistical Analysis:

Data were processed and analyzed by using Microsoft Office Excel, 2007 software. Data were presented as mean $\pm$ standard deviation (SD) or percentages. To compare between intervention groups, a CHI-SQUARE ( $\div 2$ ) was used and Voice handicap index (VHI) score before and after intervention was compared using a paired t-test. A P value less than 0.05 was considered statistically significant.

#### Result:

Mean age was 33.53 years with SD ( $\pm 7.72$ ). Maximum respondents were between 32 to 51 age group & 60% of respondents were female. Occupations of the respondents were 40% teacher, 23% student, 17% sales man, 7% singer & 13% other.

**Table I :**  
*VHI data (before and after voice therapy) in group A.*

VHI (Sub scale)	Before voice therapy score (SD)	After voice therapy score (SD)	t-value	p-value
Functional	15.13 (3.29)	8.87 (3.24)	6.33	<0.05
Physical	23.13 (3.78)	12.00 (3.78)	8.97	<0.05
Emotional	15.73 (3.26)	6.27 (2.73)	9.56	<0.05
Total (VHIIt)	54.40 (8.56)	25.80 (6.23)	9.14	<0.05

p - values on paired t test, mean, standard deviation before and after voice therapy measures are reported. Abbreviations: SD, standard deviation; VHI, Voice Handicap Index.

Total VHI score was improved significantly as well as functional, physical, emotional scale. Maximum improvement was observed in physical scale after voice therapy.

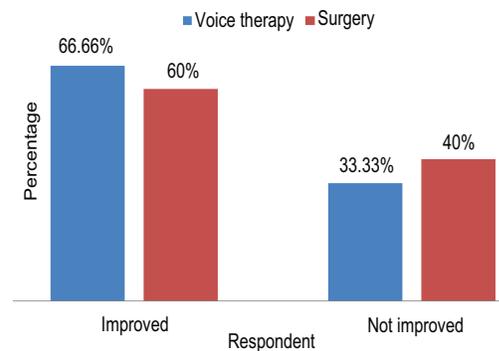
**Table II:**  
*VHI data (before and after surgery) in group B.*

VHI (Sub scale)	Before surgery score (SD)	After surgery score (SD)	<i>t</i> -value	<i>p</i> -value
Functional	14.67 (3.26)	6.47 (2.23)	7.13	<0.05
Physical	23.67 (3.45)	12.33 (3.51)	7.45	<0.05
Emotional	14.33 (3.13)	6.67 (2.77)	6.73	<0.05
Total (VHI <sub>t</sub> )	54.27 (8.21)	26.16 (7.15)	7.77	<0.05

*p*- values on paired t test, mean, standard deviation before and after surgery measures are reported. Abbreviations: SD, standard deviation; VHI, Voice Handicap Index

Total VHI score was improved significantly as well as functional, physical, emotional scale. Maximum improvement was observed in physical scale after surgery.

**Outcome of respondents after intervention:** Maximum improvement was observed after voice therapy. Bar diagram showing 66.66% of patients were improved after VT and 60% patients after surgery.



**Figure 1:** *Outcome of respondents after intervention.*

**Table III:**  
*Comparison of outcome between two intervention groups.*

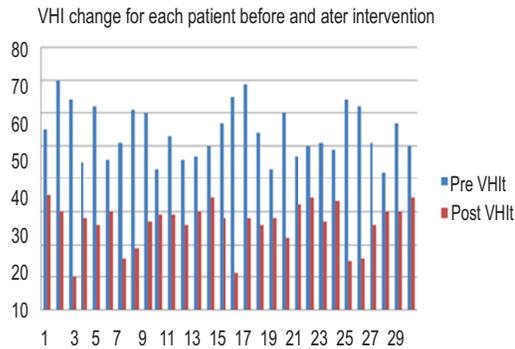
Intervention	VHI score status		Column total	$\chi^2$	<i>p</i> -value
	Improved	Not improved			
Group A	10	5	15	0.14	>0.05
Group B	9	6	15		
Row total	19	11	30		

CHI-SQUARE ( $\chi^2$ ) = 0.14; *p*-value >0.05.

Change is not significant. There is no statistical difference between surgical and non-surgical intervention

**Change of VHI score after intervention:** Bar diagram shows Voice handicap index (VHI) changes among the individual

respondents after intervention. Highest change (54) was observed in a singer and lowest (12) in a teacher.



**Figure 2:** VHI score change after intervention in individual subject.

### Discussion:

Improvement of Voice handicap index (VHI) after of intervention was observed in this study. The total population was 30 (n=30). The respondents were within 14-61 years of age. Mean age was 33.53 years with SD ( $\pm 7.72$ ). 60% respondents were between 32 to 51 years age group. Ten of them were 32 to 41 years of age and eight were 42 to 51 years of age. This finding is supported by study of Fitzell (1996)<sup>3</sup>. Author of this article state that third to fourth decade is most productive age group of society and vulnerable for voice disorder.

According to this investigation, vocal nodule revealed to be much more common in females than in males (1.5:1). 60% of study populations were female. Recent studies suggest that females are more vulnerable for vocal nodule<sup>15</sup>. The greater susceptibility of the female larynx can be explained by its anatomy & being subject to hormone-related effects, which appear around menses.

In this study majority of respondents were teacher followed by madrasa student. 40% of the total respondents were teacher and 24% were madrasa student. Some studies suggest that prevalence of voice disorders is 32.1% to 68.7% in teachers and a 3.5-fold increased risk of developing voice disorders

during their occupational life<sup>8</sup>. Author concluded that chances of voice disorder among professional voice user depend on working hours, teaching facilities & personal habits.

Based on the findings, for group A patient, participants had a significant improvement from an average pretreatment Voice handicap index total (VHI<sub>t</sub>) of 54.40( $\pm 8.56$ ) to post treatment Voice handicap index total (VHI<sub>t</sub>) of 25.80( $\pm 6.23$ ) ( $p < 0.05$ ), which is a score reduction of 28.60. The functional score was on average decreased from 15.13 to 8.87 ( $p < 0.05$ ), which is a score reduction of 6.26; the physical score from 23.13 to 12.00 ( $p < 0.05$ ), which is a score reduction of 11.13 and the emotional score from 15.40 to 6.27 ( $p < 0.05$ ), which is a score reduction of 9.13. Maximum improvement 11.13 was observed in physical sub scale. In a study vocal function exercises (VFEs) is used as a treatment method for voice disorder teacher<sup>16</sup>. In this study voice-disordered teachers were randomly assigned to one of three groups: vocal hygiene, vocal function exercises (VFEs), and a non-treatment control group, with the purpose of assessing the functional effects of two voice therapy approaches. Likewise, in the current study, the subjects completed the Voice handicap index (VHI) before and following a 6-week treatment phase. Afterward, they reported a significant reduction in mean Voice handicap index (VHI) scores before and after vocal function exercises (VFEs). Consequently, the results of our study are in agreement with the positive findings reported by that study<sup>16</sup>.

For group B patients, participants had also a significant improvement from an average pretreatment Voice handicap index total (VHI<sub>t</sub>) of 54.27( $\pm 8.21$ ) to post treatment Voice handicap index total (VHI<sub>t</sub>) of 26.16( $\pm 7.15$ ) ( $p < 0.05$ ), which is a score reduction of 28.11. The functional score was on average

decreased from 14.67 to 6.47 ( $p < 0.05$ ), which is a score reduction of 8.20; the physical score from 23.67 to 12.33 ( $p < 0.05$ ), which is a score reduction of 11.34 and the emotional score from 14.33 to 6.67 ( $p < 0.05$ ), which is a score reduction of 7.66. This finding does not correlate with the finding of Murry & Woodson 1992 as Voice handicap index (VHI) was applied after surgery of vocal fold polyps<sup>12</sup>.

Nagata et al 1983 treated 137 vocal nodule (VN) patients in Japan with surgery & conservative treatment with control group<sup>17</sup>. 89% was improved and 11% was unimproved on surgery. Beside 70% was improved and 30% was unimproved on conservative. This finding doesn't support my study. Author concludes that regular voice therapy is hardly available in Japan because there are few voice therapists. Under this condition, it is natural that surgical treatment yielded better result than conservative treatment. In my study 66.66 % patients were improved in voice therapy and 66.00 % were improved by surgery. There was no significant ( $CHI \pm 2 = 0.14$ ;  $p > 0.05$ ) difference between voice therapy and surgery.

However, data from present study indicate that voice improvement is possible with voice therapy and surgery. As surgery carries risk of scarring and anesthetic complications, it should be considered only if conservative approach fail to produce desired results.

#### Conclusion:

The study result had shown that there was no difference of outcome between surgical and non-surgical intervention.

#### References:

1. Colton R, Casper J. Understanding voice problems: a physiological perspective for diagnosis and treatment. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2006.
2. Holmberg E, Doyle P, Perkell J, Hammarberg B, Hillman R. Aerodynamic and acoustic voice measurements of patients with vocal nodules: variation in baseline and changes across voice therapy. *Journal of Voice*. 2003;17(3):269-282.
3. Fritzell B. Voice disorders and occupations. *Logopedics Phoniatrics Vocology*. 1996;21(1):7-12.
4. Hirano M. Clinical examination of voice. 1st ed. Wien; New York: Springer-Verlag; 1981.
5. Kunduk M, McWhorter A. True vocal fold nodules: the role of differential diagnosis. *Current Opinion in Otolaryngology & Head & Neck Surgery*. 2009;17(6):449-452.
6. Silverman E, Zimmer C. Incidence of Chronic Hoarseness among School-Age Children. *Journal of Speech and Hearing Disorders*. 1975;40(2):211-215.
7. Urrutikoetxea, A., Ispizua, A., & Matellanes, F. Pathologie vocale chez les professeurs: une étude vidéolaryngo-stroboscopique de 1.046 professeurs [Vocal pathology in teachers: a videolaryngostroboscopic study in 1046 teachers]. *Revue de laryngologie - otologie - rhinologie*, 1995;116(4), 255–262.
8. Lira Luce F, Teggi R, Ramella B, Biafora M, Girasoli L, Calori G, Borroni S, Proto E, & Bussi M. Voice disorders in primary school teachers. *Acta otorhinolaryngologica Italica: organo ufficiale della Societa italiana di otorinolaringologia e chirurgia cervico-facciale*, 2014;34(6), 412–418.
9. Holmberg E, Hillman R, Hammarberg B, Södersten M, Doyle P. Efficacy of a Behaviorally Based Voice Therapy

- Protocol for Vocal Nodules. *Journal of Voice*. 2001;15(3):395-412.
10. Pedersen M, & McGlashan J. Surgical versus non-surgical interventions for vocal cord nodules. *The Cochrane database of systematic reviews*, 2012(6), CD001934. <https://doi.org/10.1002/14651858.CD001934.pub2>
  11. McFarlane S, Watterson T. Vocal Nodules: Endoscopic Study of Their Variations and Treatment. *Seminars in Speech and Language*. 1990;11(01):47-59.
  12. Murry T, Woodson G. A comparison of three methods for the management of vocal fold nodules. *Journal of Voice*. 1992;6(3):271-276.
  13. Verdolini-Marston K, Sandage M, Titze I. Effect of hydration treatments on laryngeal nodules and polyps and related voice measures. *Journal of Voice*. 1994;8(1):30-47.
  14. Fex B, Fex S, Shiromoto O, Hirano M. Acoustic analysis of functional dysphonia: Before and after voice therapy (accent method). *Journal of Voice*. 1994;8(2):163-167.
  15. Brown J, Betsy P. Vinson B, Crary M. *Organic Voice Disorders: Assessment and Treatment*. 1st ed. Cengage Learning; 1996.
  16. Roy N, Gray S, Simon M, Dove H, Corbin-Lewis K, Stemple J. An Evaluation of the Effects of Two Treatment Approaches for Teachers with Voice Disorders. *Journal of Speech, Language, and Hearing Research*. 2001;44(2):286-296.
  17. Nagata K, Kurita S, Yasumoto S, Maeda T, Kawasaki H, Hirano M. Vocal Fold Polyps and Nodules. A 10-Year Review of 1,156 Patients. *Auris Nasus Larynx*. 1983;10: S27-S35.