A follow-up study of surgically managed benign vocal cord lesions using vocal handicap index – 10 score

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ABSTRACT

Background and Objectives: Benign lesions of the vocal cords not only impair the patient’s ability to communicate due to poor pronunciation and voice capabilities, but they also cause a variety of psychological and social problems, worsening their quality of life. To assess voice handicap, Voice Handicap Index (VHI-10) is an easy-to-administer, valid and reliable tool. The present study was conducted to compare the pre-operative and post-operative well-being of patients with benign vocal cord lesions using VHI-10 among patients attending our Outpatient department. Materials and Methods: The study was a hospital based observational study with prospective study design, conducted over a period of 17 months (August 2019 to December 2020) on 53 patients who were clinically diagnosed to have benign vocal cord lesion and underwent micro laryngeal surgery followed by histopathological confirmation. Follow-up of the participants was done on 4th and 8th week post-operatively. Visualization of the condition of the laryngeal structures using laryngoscope assessment of VHI-10 score was done at each follow-up visit. Results: In our study, out of 53 study participants, approximately one-third of the cases were seen in the 5th decade, that is, 40-49 years. The mean (±SD) age of the study participants was 43.2 (±12.1) years. There was male predominance (73.6%) with male to female ratio of 2.78:1. Majority of the patients had voice-demanding profession with history of vocal abuse. In cases of non-professional voice users, the highest incidence was noted in homemakers (11.4%). Smoking was noted in nine male patients while all the female patients were non-smokers. Habit of alcohol consumption was seen in 15.1% patients and 7.5% patients had habit of other substance abuse such as tobacco chewing, betel nut chewing, etc. Vocal polyps were the most common benign lesions found in 43.3% of the patients. Pre-operatively mean (± SD) VHI-10 score was 20.7 (±3.5) which significantly decreased to 12.6 (±2.5) at 4th week post-operatively and 8.5 (±2.3) at 8th week post-operatively. Mean differences between pre-operative and post-operative scores were statistically significant (P < 0.01), depicting that there was improvement in the voice of the patients post-operatively. Conclusion: The VHI-10 scale is shown to be a good and convenient tool for assessing patient voice handicap and determining improvement post-operatively. Wider studies with larger sample size in different parts of the country may be recommended to validate the findings of the study. In addition to surgical excision of lesion, speech therapy, and patient counselling are indubitably essential measures that should be undertaken for each patient so as to alleviate the handicapping effect of voice disorder and improve the overall quality of life of the individuals.

Keywords: Benign vocal cord lesions, micro laryngeal surgery, vocal handicap index

Introduction

Speech is unique to humans, and their ability to communicate is an important part of day-to-day activity. During speech, the larynx, and especially vocal folds, is the primary source of sound. A voice is said to be healthy when it fully meets the professional and personal needs and keeps an individual's life without any difficulty.[1] Hence, vocal cords are important for sound production, definably known as phonation.
The vocal cord complex is a delicate and complex structure that allows a person to breathe, phonate, and sing. Being a microstructure, its functions are extremely precise; even a minor change in it, such as a lesion or a growth, can result in a significant change in its function. The basement membrane zone (BMZ) is histologically the most vulnerable layer of the vocal cord to an injury due to vibration and shearing forces.\(^2\text{,}3\)

Non-malignant growths of an aberrant tissue on the vocal cords are known as benign lesions of the vocal cords.\(^4\) Lesions such as vocal polyps, cysts, nodules, keratosis, granuloma, and Reinke's edema are among them.\(^4,5\) Vocal abuse (“phonotrauma”), overuse or misuse of the voice, chronic infections of the upper airway, allergy, smoking, and gastroesophageal reflux are all possible causes of benign vocal cord lesions.\(^6\text{,}7\)

These lesions are common causes of dysphonia and can be treated surgically.\(^8\) Surgical correction may be recommended in patients whose voice/phonation has not shown any improvement after medical or voice therapy.\(^5,8\) Micro laryngeal surgery (MLS) is the most demanding surgery for such lesions recently. MLS is a minimally invasive procedure that uses various micro laryngeal instruments and has a magnified view of the larynx using a video laryngoscope or an operating microscope for diagnostic and therapeutic purposes.\(^8\text{,}9\) The goal of MLS is to improve the vibratory characteristics of the vocal fold's layered microvascular structure.\(^1\text{,}1\text{,}2\text{,}3\)

Voice disorders result in psychosocial issues and a poor quality of life by impairing communication.\(^9\text{,}1\text{,}1\text{,}3\text{,}1\text{,}8\) Several scales, such as the Voice/Vocal Handicap Index (VHI), Voice Related Quality of Life (V-RQOL), Voice Activity and Participation Profile (VAPP) and The Voice Outcome Survey (VOS) have been developed to assess voice handicap.\(^9\) Of all these the Voice Handicap Index (VHI), developed by Jacobson et al.,\(^2\) is one of the most widely used dysphonia-specific quality of life questionnaire. VHI-10 is a powerful representation of the VHI that takes less time to complete while retaining its validity. The measurement properties of VHI-10 have also been validated in other languages, making the tool indispensable for better understanding the impact of dysphonia in a variety of life areas.\(^7\text{,}1\text{,}8\) As the saying goes “the human voice is an organ of our soul”, one of the goals of laryngologist is preservation or restoration of good voice. There is a dearth of literature related to outcome analysis of MLS in terms of quality of life of patients with benign lesions of vocal cords in India. With this background, the present study was conducted to compare the pre-operative and post-operative well-being of patients with benign vocal cord lesions through assessment of functional outcome score using VHI-10 score in patient undergoing MLS by cold steel technique in our hospital.

### Materials and Methods

This study, a hospital-based prospective observational study, was conducted by our Department after the necessary clearance from the Ethics Committee. The period of study was for seventeen months starting from August 2019 to December 2020. All patients presenting to our OPD were screened for inclusion in the study. All eligible patients were invited to participate in the study. Informed written consent for participation in the study was obtained separately after explaining the purpose of the study in details in their local language. Also, the participants were assured that the data provided by them would be kept confidential and anonymous.

On enrolment in the study, complete history including that of presenting complaints, past history, personal history, family history and any treatment history was taken. Clinical examination followed by pre-operative evaluation using fibre optic laryngoscope was undertaken and thereafter VHI-10 score was assessed for each participant. MLS was done. The intra-operative findings were noted. The excised specimen was sent for histopathological examination (HPE) to differentiate the vocal cord lesion into benign and malignant lesions. All the participants who were reported to have malignant lesions of the vocal cord were excluded from the study. Follow-up of the participants was done on 4th and 8th week post-operatively. Visualization of the condition of the laryngeal structures using fibre optic laryngoscope and assessment using VHI-10 score was done at each follow-up visit. Pictorial data of the vocal cord lesion and consent for the same was taken pre-operatively, intra-operatively and post-operatively at 4th and 8th week. All details were recorded in a pre-designed, pre-tested case record form (CRF).

The collected data were organized and tabulated in Microsoft Excel 2016 (Microsoft Office 2016 package) and statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 16.0 (IBM Corp., Illinois, Chicago). The data were analysed by appropriate statistical tools and represented by various tables, graphs, diagrams, etc., In the entire study, Voice Handicap Index (VHI-10) was used interchangeably with Vocal Handicap Index.

A total of 53 patients underwent MLS using cold steel technique and were confirmed to have benign lesions of the vocal cords by HPE.

VHI-10 was used to quantify the level of handicap the individual faces as a result of voice changes arising from benign lesions of the vocal cord. It comprises 10 independent statements which needs to be scored subjectively on a scale of 0 to 4 (0 = never, 1 = almost never, 2 = sometimes, 3 = almost always, 4 = always). The scores of individual statements were summed to get the VHI-10 score. The higher the score, the more is the handicapping impact of dysphonia on quality of life. VHI-10 score was calculated for each patient three times (pre-operatively, 4th week post-operatively and 8th week post-operatively) during the entire study period.

Continuous variables (age, duration of symptoms, and VHI-10 score) were expressed as mean ± standard deviation (SD),
and categorical variables (gender, comorbidity, occupation, presenting symptoms, surgical history, dietary habit, addiction history, benign vocal lesions, and nature of vocal cord involvement) were expressed as relative frequency and percentage. T-test was used to compare two independent groups of normally distributed continuous variables. In the present work, T-test was used to check the association between VHI-10 score and gender, association between VHI-10 score and smoking status. A “p-value” <0.05 was considered as statistically significant.

**Results**

Out of 53 study participants, 18 (34.0%) were in the age group of 40-49 years, followed by 30-39 years (26.4%). Also, 7 (13.2%) participants were <30 years of age, while another 5 (9.2%) were ≥60 years age. The mean (±SD) age of the study participants was 43.2 (±12.1) years with minimum and maximum age of 18 years and 72 years, respectively [Table 1]. There was also a male preponderance as 39 (73.6%) were male, while the rest 14 (26.4%) were female.

Occupation was categorized into voice-demanding professions and others where vocal overuse/abuse did not take place. Of the 53 patients, 28 (52.9%) had voice-demanding profession. Majority of the patients were street vendors or shopkeepers (15.1%) who gave history of screaming and shouting. Also, an equal proportion of patients (15.1%) were factory workers or retired factory workers who also gave history of talking loudly. There were four patients who were singers by profession and four were teachers/professor with history of vocal abuse. There was also one patient who was a social worker (1.9%) and three others were security guard/wage workers (5.7%) who also gave history of talking loudly. The other 25 patients (47.1%) comprise homemakers (11.4%), businessman (3.8%), accountant/engineer/lawyer/retired bank employee/retired army officer (15.1%), clerk/technician/telephone operator (9.4%), and student (7.5%). These patients did not give any history of vocal overuse/abuse [Table 2].

Out of 53 study participants, 19 (35.8%) were addicted to either tobacco chewing, and/or smoking and/or alcohol intake. There were two individuals who had more than one addiction. Nine (17.0%) patients gave history of smoking either cigarette or bidi. 4 (7.5%) patients were addicted to chewing tobacco either in the form of paan or khaini. Also, eight (15.1%) patients were alcoholic [Table 3].

Benign vocal lesions were visualized preoperatively with the help of fibre optic laryngoscopy (FOL) and confirmed by HPE of the specimen following excision intraoperatively. Out of 53 study participants, 16 (30.1%) patients had vocal nodule and 15 (28.3%) patients had sessile polyp. Vocal cyst and pedunculated polyp were present in eight (15.1%) patients each. Granuloma was seen in three (5.7%) patients. Also, keratosis, papilloma and Reinke’s oedema was found in one patient each [Table 4].

VHI-10 scores were computed at different time intervals – pre-operatively, at 4 weeks post-operative and at 8 weeks post-operatively. The mean (± SD) VHI-10 score was 20.7 (± 3.5) pre-operatively, which decreased to 12.6 (±2.5) at 4th week of surgery and 8.5 (±2.3) at 8th week of surgery. Upon undertaking tests of associated (paired t-test), it was inferred that there was improvement in the VHI-10 scores at 4th week and 8th week post-operatively as compared to pre-operative scores, and the improvement was statistically significant [Table 5].

| Table 1: Age-wise distribution of study participants (n=53) |
|-------------|----------|
| AGE         | REMARKS  |
| <30 years   | 7 (13.2) |
| 30-39 years | Mean (±SD) – 43.2 (±12.1) |
| 40-49 years | Minimum – 18 |
| >60 years   | Maximum – 72 |

| Table 2: Distribution of study participants according to their occupation (n=53) |
|-------------|-------------|
| Occupation  | No. (%)     |
| Voice ‑ demanding |  |
| Singer      | 4 (7.5) |
| Teacher/Professor | 4 (7.5) |
| Factory worker/Retired factory worker | 8 (15.1) |
| Street vendor/Shopkeeper | 8 (15.1) |
| Security guard/Wage worker | 3 (5.7) |
| Social worker | 1 (1.9) |
| Others (homemaker, businessman, accountant/engineer/lawyer/retired bank employee/retired army officer, clerk/technician/telephone operator, and student) | 25 (47.2) |

| Table 3: Addiction history of the study participants (n=53) |
|-------------|-------------|
| ADDICTION HISTORY* | No. (%)     |
| Smoking     | 9 (17.0) |
| Tobacco chewing | 4 (7.5) |
| Alcohol intake | 8 (15.1) |
| No addiction | 34 (64.2) |

*One participant may have more than one addiction

| Table 4: Benign vocal lesions in the study participants (n=53) |
|-------------|-------------|
| Benign Vocal Lesions | No. (%)     |
| Vocal nodule | 16 (30.1) |
| Vocal cyst  | 8 (15.1) |
| Sessile polyp | 15 (28.3) |
| Pedunculated polyp | 8 (15.1) |
| Granuloma   | 3 (5.7) |
| Keratosis   | 1 (1.9) |
| Papilloma   | 1 (1.9) |
| Reinke's edema | 1 (1.9) |
Table 5: Voice Handicap Index (VHI) –10 scores in study participants (n=53)

| TIME               | Mean (±SD) VHI-10 score | P*   |
|--------------------|-------------------------|------|
| Pre-operative      | 20.7 (±3.5)             |      |
| Post-operative 4 weeks | 12.6 (±2.5)             | <0.001|
| Post-operative 8 weeks | 8.5 (±2.3)              | <0.001|

*P value was calculated using paired t-test and P<0.05 was considered to be statistically significant.

Discussion

Over the last few decades, breakthroughs in basic science and clinical research have led to a better knowledge of benign lesions of the vocal cord. The larynx’s physiological involvement in the acoustic expression of human intellect and behavioural diversity, carrying out particular vocational activities, and protecting the lower airways is unparalleled in the body. Hyperkinetic phonation movements, variations in psychosomatic makeup in the form of emotional instability aggressive nature of frustration, persistent irritation from tobacco smoke, fumes, and dust, and contact with infected secretions can all affect these structures’ ability to perform normal physiological functions. These factors may contribute to the development of new benign growth on the vocal cords, such as vocal nodules and polyps, by causing, predisposing, precipitating, or aggravating the condition. The aetiology of these common benign lesions shows that most of these problems can be avoided if proper attention is paid to the correction of basic etiological factors rather than just treating the symptoms. In light of these facts, the factors implicated in the aetiology of these benign lesions have been investigated and explored in this work, in addition to the clinical and pathological characteristics of benign lesions of the vocal cords in general. Further, a comparison of the pre- and post-operative well-being of patients with benign vocal cord lesions using Vocal Handicap Index (VHI)-10 was also done. In our study, age of patients with benign vocal lesions ranged from 18 years to 72 years with approximately one-third of the cases were seen in the 5th decade, that is, 40-49 years. The mean (±SD) age of the study participants was 43.2 (±12.1) years. There was male predominance (73.6%) with male to female ratio of 2.78:1, which was comparable with the results of Mobarsa V et al.[25] and Prakash O et al.[25] The second point on which a number of authors agree is that the “hyperkinetic movements of phonation” cause direct mechanical trauma.[21,24] Benign vocal lesions were more common in patients engaged in voice demanding occupation. Majority of the patients were street vendors or shopkeepers (15.1%) who gave history of screaming and shouting. These results are at par with the findings of other studies conducted earlier by Prakash O et al. in Jammu, Singhal P et al. in Jaipur, Baitha S et al. in Wardha, and Sareen S et al. in Bengaluru.[23,25] The most common complaint was hoarseness present in two-thirds of the study participants. Singhal P et al., Baitha S et al., Sareen S et al., and Hegde MC et al. reported similar findings.[23,24] Smoking was found in nine male patients, contributing to erythema, oedema, and widespread inflammation of the vocal cords. Habit of alcohol consumption was seen in 15.1% patients and 7.5% patients had habit of other substance abuse such as tobacco chewing, betel nut chewing, etc., These figures are lesser as that reported by Sareen S et al.[23] Benign vocal lesions were visualized preoperatively with the help of FOL and confirmed by HPE of the specimen following excision intraoperatively. Vocal polyps (sessile and pedunculated) were the most common benign lesions found in 43.3% of the patients followed by vocal nodule in 30.1% of the patients. Likewise, studies by Mobarsa V et al.,[23] Malik P et al.[9] and Sareen S et al.[23] reported vocal 55 polyps and nodules as the commonest benign vocal lesions. The quality of one's voice is subjective, and benign lesions of the vocal cords not only impact one's ability to pronounce words correctly, but also cause psychological and social problems, affecting one's quality of life. The VHI developed by Jacobson et al.[10] and adapted by Rosen et al.[17] to design VHI-10 effectively reflects patient’s perception of the problem in daily life. In our study, VHI-10 scores were computed at different time intervals – pre-operatively, at 4 weeks post-operative and at 8 weeks post-operatively. Pre-operatively mean (±SD) VHI-10 score was 20.7 (±3.5) which significantly decreased to 12.6 (±2.5) at 4th week post-operatively and 8.5 (±2.3) at 8th week post-operatively. Mean differences between pre-operative and post-operative scores were statistically significant (P < 0.01), depicting that there was improvement in the voice of the patients post-operatively. Findings from other studies also inferred that addressing the benign vocal lesions surgically resulted in remarkable improvement in voice.[12,24] This scoring system hence is simple and easy to understand for even our general physicians or primary care providers who are usually the first touchpoints for such patients. They can easily, through this questionnaire, assess the severity of the disease and can refer to an ENT surgeon for further management.[27]

Conclusion

The human voice is a remarkable achievement that can express not just complicated thoughts but also nuanced emotions. The most common benign lesions of the vocal cords are polyps and nodules, which appear in the fifth decade of life with a male predominance. The benign lesions of vocal cords may produce symptoms, of which the most common is hoarseness. This can have a substantial emotional effect on social functioning and work performance.

The VHI-10 scale is shown to be a good and convenient tool for assessing patient voice handicap and determining improvement both pre- and post-operatively. The ease of use of this questionnaire or scoring system will go a long way in proper assessment of patients with hoarseness even at grassroots levels by primary care providers. However, wider studies with larger sample size in different parts of the country may be recommended to validate the findings of the study. In addition, speech therapy and patient counselling are indubitably essential measures that should be undertaken for each patient so as to alleviate the handicapping effect of voice disorder and improve the overall quality of life of the individuals.

Financial support and sponsorship

Nil.
Conflicts of interest

There are no conflicts of interest.

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