Section: ENT

Research

STUDY ON QUALITY OF VOICE IN BENIGN VOCAL CORD LESIONS BEFORE AND AFTER PHONOMICROSURGERY

Baddam Rachna Reddy[1], I. Sandeep[2], P Srithi Goud[3], Pannati Aparna[3]

[1]Assistant Professor, Department of ENT, Mallareddy Medical college for women, Jeedimetla, Hyderabad, Telangana, India.
[2]Associate Professor, Department of ENT, Mallareddy Medical college for women, Jeedimetla, Hyderabad, Telangana, India.
[3]Resident (PG), Department of ENT, Mallareddy Medical college for women, Jeedimetla, Hyderabad, Telangana, India.

Received : *22/09/2022*
Received in revised form : *26/10/2022*
Accepted : *07/11/2022*

Keywords:
Voice,
vocal cord lesions

Corresponding Author:
Dr. Pannati Aparna,
Email: drpannatiaparna@gmail.com
ORCID: 0000-0002-6286-3069

DOI: 10.47009/jamp.2022.4.5.94

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2022; 4 (5); 453-460

Abstract

Background: Voice is an output of an extremely complex, multidimensional, and variable physiological phenomenon. It is a result of aerodynamic and acoustic vibratory system. Due of these complexities in the production of voice it is not uncommon to find some degree of aperiodicity even in the normal voices. Even a small change in the anatomy of the vocal cords can change the quality of voice, which most commonly presents as Hoarseness of voice. Aim of the study is to find the change in Quality of voice in Benign vocal cord lesions before and after phonomicrosurgery, subjectively by GRBAS Score(Grade, Roughness, Breathiness, Asthenia, Strain) and Voice Handicap Index(VHI), objectively using PRAAT Software in which parameters like intensity, frequency, shimmer, jitter, harmonics to noise ratio are calculated. Maximum Phonation time is also compared. **Materials and Methods:** This is a Prospective interventional study done in symptomatic, clinically suspected patients having benign laryngeal lesions, confirmed to be benign by histopathological examination were considered in the study. **Result:** There was a decrease in the voice handicap index from 63.13 pre-operatively to 26.27 post-operatively thus showing an improvement of 58.38%, which is significant (>50% improvement). There was maximal improvement in functional component (59.22%) and minimal in physical component (57.27%). There was an improvement of 67.64% in mean GRBAS score, which reduced from 6.8 to 2.2 three months after surgery. The improvement in asthenia parameter (75.72%) was maximum and improvement in overall grade was minimum (56.56%) followed by strain parameter (68.2%) was minimum. All the parameters of voice improved 3 months after the surgery, but the improvement in intensity and pitch of voice were not significant. Pitch decreased from a pre-operative value of 160.64 Hz to 144.92Hz post-operatively thus an improvement of 9.78%. Intensity increased by 4.57% from 65.62dB to 68.62dB after the surgery. Shimmer decreased significantly from 2.01 dB to 1.098dB post-operatively, thus an improvement of 45.37%. Jitter improved by 64.23% from a value of 2.6% pre-operatively to 0.931% post-operatively. Improvement in jitter was more as compared to shimmer. **Conclusion:** It shows that Phonomicrosurgery is a definitive means of treatment for benign vocal cord lesions and the recurrence rates are negligible.

INTRODUCTION

Voice is an output of an extremely complex, multidimensional, and variable physiological phenomenon. It is a result of aerodynamic and acoustic vibratory system. Due of these complexities in the production of voice it is not uncommon to find some degree of aperiodicity even in the normal voices. Even a small change in the anatomy of the vocal cords can change the quality of voice, which most commonly presents as Hoarseness of voice. This is the cardinal symptom of laryngeal disease.

Benign vocal fold mucosal disorders are important because of their impact on identity and communication and their commonness. For optimal results, diagnosis should include a skillful history, elicitation of vocal capability, and laryngeal videostroboscopy. More than 50% patients with

ISSN (O): 2687-5365; ISSN (P): 2753-6556

voice complaints have a benign mucosal disorder. This study is aimed at diagnosing the benign vocal cord lesions with the available instruments and to analyze the improvement of voice following therapeutic intervention and objectively. We compared our data to the studies which have been done earlier by others.

MATERIALS AND METHODS

This is a Prospective interventional study done in ENT Department of Yashoda Hospital, Secunderabad, Andhra Pradesh. The duration of the study was for two years from MAY 2011 to MAY 2013. All the patients were followed till date. The study included all the patients (all ages and both sex) who came to the ENT Out Patient Department (OPD) of Yashoda Hospital, Secunderabad with complaint of Hoarseness of Voice and who on clinical examination were given a provisional diagnosis of benign vocal cord lesions (confirmed later by histopathologic examination). A detailed history was taken from all the patients and were clinically examined. Fibreoptic Pharyngolaryngoscopy, Stroboscopy and Voice analysis was done and after proper evaluation were subjected to Microlaryngeal Surgery (MLS). Patients group were evaluated prior to and 15 days, 1 month and 3 months of surgery with above methods.

A total of 30 symptomatic, clinically suspected patients having benign laryngeal lesions, confirmed to be benign by histopathological examination were considered in the study.

Inclusion Criteria

Patients of all age groups and both sex, benign vocal cord lesions confirmed histologically, hoarseness of voice for atleast three months, which did not improve with voice therapy of 6-8 weeks and no previous history of phonomicrosurgery.

Exclusion Criteria

Patients with vocal cord lesions proved malignant by histopathology, previous phonomicrosurgery, recurrent laryngeal papillomatosis, acute infection, vocal cord palsy or other neurological diseases and functional causes of hoarseness of voice.

All the patients who came to our OPD with complaint of Hoarseness of Voice, fulfilling all inclusion and exclusion criterions were considered. A detailed history of all the patients was taken, which included about onset of the symptoms and their progress, aggravating or relieving factors like cold, cough, history of excessive speaking, Diurnal variation, Voice fatigue, and other associated symptoms such as Aspiration, gastro-oesophageal reflux and throat clearing.

All the patients were clinically examined in the OPD. The vocal cords were evaluated by 1) Indirect Laryngoscopy, 2) 700 and 900 Videoendoscopy, 3)Fibreoptic pharyngolaryngoscopy, 4)Stroboscopy. The characteristics of the lesion were also noted.

The mucosal wave pattern was observed during stroboscopy i.e symmetry, amplitude, periodicity or regularity, mucosal wave propagation and closure of vocal cords. Voice analysis of all the patients was done subjectively and objectively after the diagnosis of a benign Vocal Cord Lesion was made.

Subjective analysis of voice was done using Voice Handicap Index(VHI)(32) which is comprised of a series of questions targeting the patient's perception of her/his own voice. It includes the following sets of questions:

Part I-F					
My voice makes it difficult for people to hear me.	0	1	2	3	4
People have difficulty understanding me in a noisy room.	0	1	2	3	4
My family has difficulty hearing me when I call them throughout the house.	0	1	2	3	4
I use the phone less often than I would like to.	0	1	2	3	4
I tend to avoid groups of people because of my voice.	0	1	2	3	4
I speak with friends, neighbors, or relatives less often because of my voice.	0	1	2	3	4
People ask me to repeat myself when speaking face-to-face.	0	1	2	3	4
My voice difficulties restrict my personal and social life.	0	1	2	3	4
I feel left out of conversations because of my voice.	0	1	2	3	4
My voice problem causes me to lose income.	0	1	2	3	4
Part II-P					
I run out of air when I talk.	0	1	2	3	4
The sound of my voice varies throughout the day.	0	1	2	3	4
People ask, "What's wrong with your voice?"	0	1	2	3	4
My voice sounds creaky and dry.	0	1	2	3	4
I feel as though I have to strain to produce voice.	0	1	2	3	4
The clarity of my voice is unpredictable.	0	1	2	3	4
I try to change my voice to sound different.	0	1	2	3	4
I use a great deal of effort to speak.	0	1	2	3	4
My voice is worse in the evening.	0	1	2	3	4
My voice "gives out" on me in the middle of speaking.	0	1	2	3	4
Part III-E					
I am tense when talking to others because of my voice.	0	1	2	3	4
People seem irritated with my voice.	0	1	2	3	4
I find other people don't understand my voice problem.	0	1	2	3	4
My voice problem upsets me.	0	1	2	3	4
I am less outgoing because of my voice problem.	0	1	2	3	4
My voice makes me feels handicapped.	0	1	2	3	4

ISSN (O): 2687-5365; ISSN (P): 2753-6556

I feel annoyed when people ask me to repeat.	0	1	2	3	4
I feel embarrassed when people ask me to repeat.	0	1	2	3	4
My voice makes me feel incompetent.	0	1	2	3	4
I am ashamed of my voice problem.	0	1	2	3	4

Scoring Guidelines of VHI-Mean values (SD) for VHI subscale and total scale scores as a function of self-perceived severity.

Scale		**Group**	
	Mild	**Moderate**	**Severe**
Functional	10.07 (1.99)	12.41 (1.38)	18.30 (1.50)
Physical	15.54 (1.97)	18.63 (1.37)	22.78 (1.48)
Emotional	8.08 (2.31)	13.33 (1.61)	20.30 (1.74)
Total	33.69 (5.60)	44.37 (3.88)	61.39 (4.21)

VHI consist of a total of 30 questions divided into three parts, functional(F), physical(P) and emotional(E). Each part consists of ten questions respectively. It is a useful tool to help gain insight into these components of the voice as well as measure therapeutic outcomes. The patients were asked to grade and circle response to all the questions, where 0 implies patient never had that symptom, 1 implies almost never, 2 implies sometimes, 3 implies almost always, 4 implies symptoms are always present. A subtotal of all three parts was done separately, and total VHI was calculated by adding the total of all three parts. VHI was also calculated pre-operatively and 3 months after the surgery.

1. GRBAS score: it includes

- G (grade of dysphonia), the overall level of vocal involvement;
- R (roughness), the voice quality related to irregular glottic pulses, of a low-frequency noise, roughness or vocal fry component;
- B (breathiness), voice related to the noise due to turbulences created by an insufficient glottis closure;
- A (asthenia), the auditory impression of weakness in spontaneous phonation, hypokinetic or hypofunctional voice;
- S (strain), the auditory impression of excessive strain or tension associated with spontaneous phonation(27).

All items were scored from 0 to 3 (0=normal, 1=mild, 2=moderate, 3=severe) by our speech pathologist and a total of all five parameters was calculated. This analysis was repeated 3 months after the surgery.

PRAAT Software

PRAAT is Dutch word for "talk". It is a Scientific software program for the analysis of speech in phonetics. It was used for speech parameter analysis in our cases. It has been designed and continuously developed by Paul Boersma and David Weenink of the University of Amsterdam.

Maximum Phonation Time

Patient was asked to inhale as deeply as possible and the sustain a steady vowel for as long as possible. This was repeated three times and the longest of three measurements was selected. The objective analysis of voice was done pre-operatively, 1 week, 1 month and 3 months after the surgery.

Voice of all the patients was recorded so as to compare the pre op voice with that after the treatment. All voices were recorded following a standard procedure, both before and after treatment. The recorded voice sample included counting from 1 to 10, prolonged /a/,/o/ and /i/ vowels, and a paragraph in the language patient can read which was kept constant for all the patients. After complete pre-operative evaluation patients were taken up for microlaryngeal surgery(MLS). The lesion was excised and sent for Routine Histopathology in each case.

Each patient was given post operative antibiotic, anti-inflammatory for 1 week and anti-reflux treatment for a period of atleast 1 month. Also absolute voice rest for a period of one week was advised to all the patients which was followed by speech therapy. The speech therapy included vocal hygiene and voice therapy, by our audiologist and speech pathologist. The patients were followed up regularly at interval of 1 week ,15 days,1 month, 3 months and 6 months after the surgery. The assessment of vocal cords by 70o Videoendoscopy was done in each visit. Fibreoptic pharyngolaryngoscopy, Stroboscopy and voice analysis was done at 15 days, 1 month, and 3 months after the surgery and the data obtained pre and post-operatively was used to quantify the improvement in voice.

The improvement in the quality of voice in benign Vocal Cord lesions is expected post surgery as assessed by subjectively by VHI and objectively by improvement in GRBAS Score, Voice Parameters as assessed by PRAAT software and Maximum Phonation Time(MPT) before and after the procedure. No blinding can be done in this study as it is an interventional procedure.

RESULTS

Total number of patients diagnosed as case of Benign vocal cord lesion during the period were 34, of which two are still under observation, one lost for follow up and one case was previously operated elsewhere for papilloma, so it left us with a total of 30 cases. Out of 30 patients selected for the study, 24 were males and 6 were females (Male: Female ratio=4:1). The age range was between 12 and 71 years, with a mean age of 47.03 years. Maximum patients were in the age range of 41 to 50 years.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

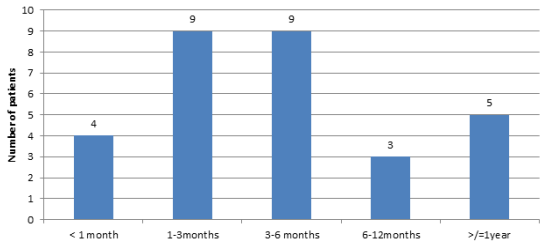

Figure 1: Duration of symptoms in present study

Of the all the cases, maximum cases presented within 1-6 months of onset of symptoms, with minimum duration being 15 days and a maximum being 2 years after onset of symptoms.

All the patients presented with chief complaint of Hoarseness of Voice. Most patients had associated symptoms such as throat pain, cough, frequent throat clearing, foreign body sensation throat, vocal fatigue, throat irritation, etc.Five patients were hypertensive (16.66%), one patient (3.33%) was diabetic, one patient(3.33%) was hypothyroid and three had multiple co-morbidities(10%). The presence of co-morbidities did not have any relationship with the condition, but information regarding them helped us to prepare the patient for surgery. All the patients who presented had a habit of speaking excessively, either due to their occupation or due to their habit. Few patients were smokers, alcoholic or both. None had a habit of chewing tobacco or beetle nut.

It was observed that the benign laryngeal lesions were common among those who were using their voice excessively e.g school teachers/lecturers, business men, radio jockies, doctor marketing executives. All these patients used their voice excessively due to their occupational requirements. Other group including software engineer, student, house wives had a habit of shouting/talking excessively on phone or at home.

In all the cases the lesion was present at the junction of anterior and middle one-third, which is the most common site of phonotrauma except one case in which the lesion (angioma) was present at the anterior one-third in right vocal cord.

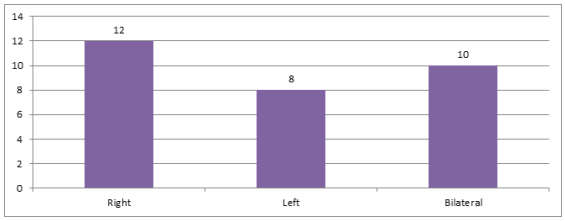

Figure 2: Side of lesion in present study

Of the 30 cases 12 patients had right, 8 patients had left, and 10 had bilateral vocal cord lesion. Of all the bilateral lesions, 4 were Vocal nodules, 1 was bilateral cysts, 1 with nodule on one side and contact ulcer on another side, 2 were nodule on one side and polyp on another, 1 with nodule on one side and cyst on another and 1 had bilateral thickened vocal cord with keratotic debri.

Considering bilateral lesions as two lesions, with bilateral being 10 cases i.e 20 lesions, 12 right and 8 left lesions gives us a total of 40 lesions, of which the various types of lesions as identified on 70o VES and FLP scopy.

Of the 40 lesions most common lesion was nodule, and all the nodules were either bilateral or associated with some other lesion on the contra lateral cord. All the lesions after excision were sent for histopathology and the visual diagnosis was confirmed. It was found that the diagnosis by visual examination coincided with that made on HPE in 35 cases.

In 5 cases (12.5%) the HPE diagnosis contradicted the diagnosis made pre-operatively by visual examination. 2 lesions being unilateral were clinically diagnosed as polyps which turned out to be nodules on HPE. Of the two pedunculated masses, both were diagnosed as polyp. One irregular mass seen on FLP scopy turned out to be granulation on HPE.

On Stroboscopy essentially all lesions showed decreased amplitude of the mucosal waves on the side of lesion, especially over the lesion. In case of cyst, there was no mucosal wave over the lesion, but it was present in case of nodule, though of reduced amplitude. Due to difference in the mechanical properties of the vocal folds due to change in mass, tension, pliability of the superficial layer of the lamina propria, symmetry was absent in all the cases. Lateral excursion of the midmembranous portion of the vocal fold was reduced during vibration in all the cases as seen over one third to one half of the width of the visible fold. In all the cases the mucosal wave was aperiodic. Mucosal wave propagation was present in all the cases, although it was decreased and asymmetric, except in 2 cases where the mucosal wave was absent. Both were the cases of keratotic vocal cord lesions. There was incomplete closure in posterior part of glottis i.e. small posterior glottal chink in almost all the cases due to the presence of the lesion in almost all the cases. In all cases the stroboscopy was repeated 3 months after the surgery and it was found that the mucosal waves returned back at the operated site, which was as good as normal. There was no phonatory gap post-operatively. The amplitude increased, and in most cases symmetry was regained.

Subjective Improvement

The voice of all the patients improved by end of one month and more so by third month, after the edema of vocal cords subsided. Almost all patients reported voice improvement varying 15%-25% at one week after the surgery which further improved by 75%-95% 1-3 months post-operatively. Two patients did not report much improvement even after 15 days of surgery. Of these two one was a case of nodules and other a case of unilateral vocal cyst. These patients were reassured and were referred to our speech pathologist for speech therapy, following which they

ISSN (O): 2687-5365; ISSN (P): 2753-6556

had considerable subjective improvement in voice. One of the patients, who had unilateral vocal polyp, reported the voice to be worse on the follow up after one month after the surgery, on examination who had URTI, and antibiotics and other supportive treatment was advised to him/her. The voice of this patient returned to near-normal in subsequent visits.

There was a decrease in the voice handicap index from 63.13 pre-operatively to 26.27 three months after the surgery, thus showing an improvement of 58.38% in VHI Scores, which is significant(>50% improvement). The improvement was maximal in functional component being 59.22% and minimal in physical component(57.27%). [Table 3]

A total of all parameters was calculated before the surgery and 3 months after surgery. The mean GRBAS score of all reduced from 6.8 to 2.2 three months after surgery, percentage of improvement being 67.64%. Overall Grade(G) improved by 56.56% but there was a maximum improvement (75.72%) was seen in asthenia parameter and minimum improvement in strain parameter(68.2%). [Table 4]

The values of all the parameters were similar to the pre-operative values when documented 1 week post-operatively and gradually showed improvement till 1-3 months in most of the cases. So, the values documented after 3 months of surgery were considered for evaluation purpose. All the parameters of voice changed after phonomicrosurgery. There was a minimal change in the intensity and pitch. [Table 5]

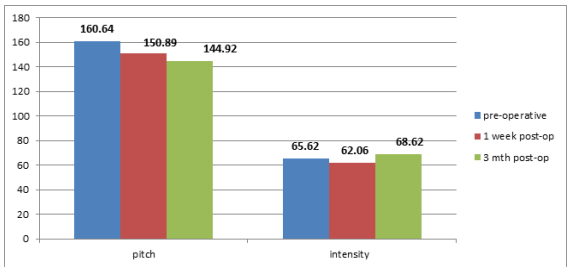

Figure 3: Mean values of pitch and intensity.

Pitch: It was found that the pitch decreased from a pre-operative value of 160.64 Hz to 144.92Hz post-operatively. Overall improvement was about 9.78%. It was seen that the pitch reduced in most cases; but in a few cases there was an increase in the pitch post-operatively.

Intensity: There was not a significant change in intensity. It increased by 4.57% from 65.62dB to 68.62dB after the surgery. There was no consistent change in intensity. 1 week post-operatively there was a slight decrease in intensity of voice; most probably as the patient was on voice rest for a week.

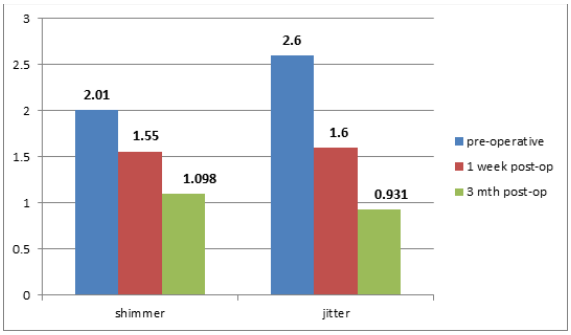

Figure 4: Mean values of shimmer and jitter.

Shimmer: there was a significant improvement in shimmer, it decreased significantly from 2.01 dB to 1.098dB post-operatively. There was an improvement of 45.37%.

Jitter: There was an improvement in jitter of 64.23% from pre-operative perturbations in pitch of 2.6% to 0.931% post-operatively.

Thus the improvement in jitter was more as compared to shimmer i.e. perturbation in pitch improved then perturbation in intensity after the surgery.

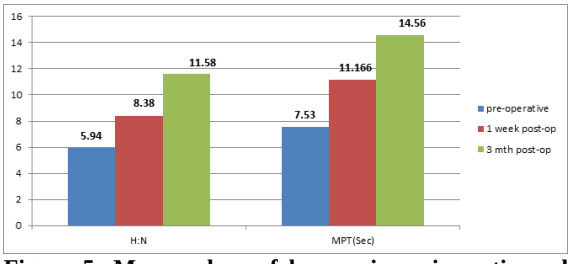

Figure 5: Mean values of hormonic: noise ratio and maximum phonation time.

Hormonic

Noise Ratio(H:N): H:N almost doubled after the surgery from the pre-operative value of 5.93 to 11.58;thus showing an improvement of 94.6%.

Maximum Phonation Time(MTP)

MTP also nearly doubled after the surgery from the pre-operative value of 7.53 seconds to 14.56;thus showing an improvement of 93.35%.

There were no complications in our study group. Only a few patients experienced throat pain for a few days ranging from 1 to 3 days. There was no recurrence after 3 months follow-up.

Table 1: Variables in present study

Presentation	No. of cases	Percentages
Hoarseness of Voice	30	100%
Throat pain	20	66.6%
Cough	12	40%
Frequent throat clearing	15	50%
Vocal fatigue	10	33.3%
Foreign body sensation	9	30%
Throat irritation	14	46.7%

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Habit		
Excessive speaking	30	100%
Smoking	5	16.7 %
Alcohol	2	6.7%
smoking and drinking	2	6.7%
Tobacco/beetle nut eating	0	0
Occupation		
Business	11	36.7%
Teacher/lecturer	5	16.7%
Cement factory worker	1	3.33%
Radio Jockey	1	3.33%
Marketing	1	3.33%
Engineer/job/student	3	10%
Vegetable vendor	1	3.33%
Doctor	1	3.33%
Hotel manager	1	3.33%
House wife/retired	5	16.7%

Table 2: Site of lesion in correlation with site of lesion

Lesion	Right	Left	Total	% of all lesions
Nodule	5	6	11	27.5%
Cyst	6	3	9	22.5%
Polyp	3	7	10	25%
Angioma	1	0	1	2.5%
Angiofibroma	2	1	3	7.5%
Pedunculated mass (papilloma)	2	0	2	5%
Irregular mass	1	0	1	2.5%
Contact ulcer	1	0	1	2.5%
keratosis	1	1	2	5%

Table 3: Mean VHI scores before and after surgery and percentage improvement

Score parameters	Pre-Operative	Post-Operative	Percentage Improvement
VHI	63.13	26.27	58.38%
Physical	22.07	9.43	57.27%
Functional	20.43	8.33	59.22%
Emotional	20.63	8.53	58.65%

Table 4: GRBAS Score

	PRE-operative	POST-operative	Percentage improvement
Total GRBAS score	6.8	2.2	67.64%
G score (Grade of dysphonia)	2.3	1	56.56%
R score (Roughness)	2.3	0.6	73.91%
B score (Breathiness)	0.47	0.133	71.70%
A score (Asthenia)	1.1	0.267	75.72%
S score (Strain)	0.63	0.2	68.2%

Table 5: Parameters of voice by praat software.

Parameter	Pre_Op	1 Week Post-Op	3 Month Post-Op	Percentage Improvement
PITCH(Hz)	160.64	150.89	144.92	9.78%
INTENSITY(dB)	65.62	62.06	68.62	4.57%
SHIMMER(dB)	2.01	1.55	1.098	45.37%
JITTER(%)	2.6	1.6	0.931	64.23%
H:N	5.93	8.38	11.54	94.60%
MPT(seconds)	7.53	11.166	14.56	93.35%

DISCUSSION

The patients who came with chief complaint of Hoarseness of voice diagnosed as having benign vocal cord lesion(confirmed later by histopathology) were included in the study and after taking a detailed history, examining the patient, visualization of the lesion by rigid and flexible Fibreoptic endoscope and voice analyzed subjectively by asking the patient about the improvement, GRBAS Score(Grade, Roughness, Breathiness, Asthenia, Strain) and Voice Handicap Index(VHI) and objectively using parameters like intensity, pitch, shimmer, jitter, harmonics to noise ratio(by PRAAT software) and maximum Phonation time. All these were noted pre- and post-operatively and compared. In the study were included 34 patients, of which 2 were still under observation, one lost for follow up and 1 case was previously operated elsewhere for papilloma, which left us with a total of 30 cases. Of the 30 cases 24 were males and 6 were females giving a Male: Female ratio of 4:1. Age of patients ranged between 12 and 71 years, with a mean age of 47.03 years. While in a study conducted by Sabah Uddin Ahmed

ISSN (O): 2687-5365; ISSN (P): 2753-6556

et al,[1] study had 18 males and 7 females with age of patients ranging from 5 to 41 years with mean age of 25.5 years. All the patients presented with chief complaint of Hoarseness of Voice and few associated symptoms such as throat pain, cough, frequent throat clearing, foreign body sensation throat, vocal fatigue, throat irritation, etc. and most patients presented within 1-6 months of onset of symptoms. In a study related to clinical profile of hoarseness of voice conducted Sambhu Baitha et al study in 200,[2] it was reported that apart from the symptom of change in voice (100%) other common presentations were cough, fever and vocal fatigue in descending order of frequency. In their study Duration of hoarseness ranged from one day to five years. (Mean -three months). Half of the patients (50%), presented with duration in months, which is consistent with the presentation in our patients (~70% presented within 6 months).

Few patients had co-morbid conditions like hypertension, diabetes etc. but this did not have any relationship with the symptoms, and this information helped us to prepare the patient better for surgery. All the patients who presented had a habit of speaking excessively and most (approximately 65%) patients were involved in professions which demanded excessive speaking e.g teaching, marketing, business etc. which was consistent with study conducted by Sabah Uddin Ahmed, Mahbubul Kabiral and Batra et al in 2004.[1,3] In both the studies more than 50% of patients were involved in professions which demand excessive speaking. It was seen that 12 patients had right, 8 patients had left, and 10(33.33%) had bilateral vocal cord lesion, with the lesion located at junction of middle and anterior 1/3rd an all cases except one in which the lesion was present in anterior 1/3rd. most common lesions found were nodules (27.5%), polyps (25%), cysts (22.5%) followed by papilloma, contact granuloma, contact ulcer, keratosis etc.

In all the cases stroboscopy showed variations from normal. There was a decrease in amplitude and in most cases the mucosal waves were decreased over the affected vocal cord. All the cases experienced subjective improvement of voice due to surgery.

It was found that the voice handicap index decreased from 63.13 pre-operatively to 26.27 post-operatively thus showing an improvement of 58.38%, which is significant (>50% improvement). The improvement was maximal in functional component (59.22%) and minimal in physical component (57.27%). While in a study conducted by A. Schindler, F et al,[4] determined the effectiveness of voice therapy in benign vocal cord lesions showed an improvement in total VHI from 25.3 to 23.3 which was not affective as the results by phonomicrosurgery.

The mean GRBAS score of all reduced from 6.8 to 2.2 three months after surgery, percentage of improvement being 67.64% while the study by Raja Salman et al3 showed decrease of GRBAS from 4.2 to 4 post-operatively(44). In a study conducted by A. Schindler et al,[4] determined the effectiveness of voice therapy in benign vocal cord lesions showed that G parameter decreased from 3 pre-operatively to 2 post-operatively, B decreased from 3 to 1, S from 1 to 0, A increased from 1 to 3 and S score was 0 pre- and post-operatively(46). While in our study all five scores decreased. G decreased from 6.8 to 2.2, R from 2.3 to 1, B from 0.47 to 0.133, A from 1 to 0.33 and S from 0.63 to 0.2.

All the parameters of voice changed after phonomicrosurgery. The pitch decreased from a pre-operative value of 160.64 Hz to 144.92Hz post-operatively thus an improvement of 9.78%. While in a study conducted by Toran KC et al,[5] decreased from 212.32 to 196.57 Hz. And in a study done by Piyush Verma, Pal et al6 the fundamental frequency decreased from 207Hz to 144.1Hz. It was seen that Intensity increased by 4.57% from 65.62dB to 68.62dB after the surgery in our cases.

In our cases, a significant improvement was seen in shimmer, which decreased from 2.01 dB to 1.098 dB post-operatively, thus an improvement of 45.37%. a study conducted by Toran KC, Lal BK5 showed that the increased values of shimmer (2.18%±0.78) reduced (1.73%±0.36) significantly after the surgery. Similar results were seen in study done by Piyush Verma, Manisha Pal, Anoop raj where shimmer decreased from 14.3% to 6.5%(1) and in another study conducted by Zheng-Ping Shi, and Hsing-Won Wang the mean value for shimmer reduced from 2.34% preoperatively to 1.56% postoperatively(45). Where as in a study conducted by A. Schindler et al4 to determine the effectiveness of voice therapy in benign vocal cord lesions shimmer reduced from 4.8 to 4.2%.[6,7]

We found an improvement of 64.23% in jitter which improved from pre-operative perturbations in pitch of 2.6% to 0.931% post-operatively. While in a study conducted by Toran KC, Lal BK5 jitter values were decreased from 0.20% to 0.19%(19) and in another study by Piyush Verma, Manisha Pal, Anoopraj 6 jitter decreased from 14.3% to 6.5%(1). The results were also consistent with the study conducted by Zheng-Ping Shi, and Hsing-Won Wang7 showed where the jitter reduced from 0.35% preoperatively to 0.22% postoperatively. Where as in a study conducted by A. Schindler et al to determine the effectiveness of voice therapy in benign vocal cord lesions jitter reduced from 2.3 to 1.9%. The improvement in jitter was more as compared to shimmer in most cases.

Hormonic

Noise ratio(H:N) almost doubled after the surgery from the pre-operative value of 5.93 to 11.58;thus showing an improvement of 94.6% in our cases. Which is consistent with all other studies. In a study by Piyush Verma, Manisha Pal, Anoopraj6 the value increased from 11.8 to 17.5. The results were also consistent with the study conducted by Zheng-Ping Shi, and Hsing-Won Wang showed values were 25.55 dB preoperatively and 28.46 dB postoperatively.[7]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Maximum Phonation Time(MTP) also doubled in our cases after the surgery from the pre-operative value of 7.53 seconds to 14.56 seconds; thus showing an improvement of 93.35%. In a study by Piyush Verma, Manisha Pal, Anoopraj6 the value increased from 12sec to 15.3 sec, The results were also consistent with the study conducted by Zheng-Ping Shi, and Hsing-Won Wang in 2007 values were 11.22 s preoperatively and 14.58 s postoperatively.[7]

There were no complications in our patients. A few patients experienced throat pain for a few days ranging from 1 to 3 days. There was no recurrence in our cases at the end of 3 months as consistent with other studies.

CONCLUSION

The main outcome will always be subjective evaluation of voice by the patient himself as determined by Voice Handicap Index in our study. These tests help in self-evaluation and also documentation, and thus helps to show the results to the patients. Voice problems occur most commonly in professional voice users. Thus, the documentations using the methods used in our study will also help in Medicolegal Cases. Our study clearly shows that Phonomicrosurgery is a definitive means of treatment for benign vocal cord lesions and the recurrence rates are negligible.

REFERENCES

1. Malik P, Yadav SPS, Sen R, Gupta P, Singh J, Singla A, et al. The Clinicopathological Study of Benign Lesions of Vocal Cords. Indian J Otolaryngol Head Neck Surg. 2019;71(Suppl 1):212-220. doi: 10.1007/s12070-017-1240-0.
2. Baitha S, Raizada RM, Singh AK, Puttewar MP, Chaturvedi VN. Clinical profile of hoarseness of voice. Indian J Otolaryngol Head Neck Surg. 2002;54(1):14-8. doi: 10.1007/BF02910998.
3. Khurshid RS, Khan MA, Ahmad R. Clinical profile of Hoarseness and its management options: A 2 years Prospective study of 145 Patients. IJOPL. 2012;2(1):23-29.
4. Schindler A, Mozzanica F, Ginocchio D, Maruzzi P, Atac M, Ottaviani F. Vocal improvement after voice therapy in the treatment of benign vocal fold lesions. Acta Otorhinolaryngol Ital. 2012;32(5):304-8.
5. Toran KC, Vaidhya BK. Objective voice analysis for vocal polyps following microlaryngeal phonosurgery. Kathmandu Univ Med J (KUMJ). 2010;8(30):185-9. doi: 10.3126/kumj.v8i2.3555.
6. Verma P, Pal M, Raj A. Objective acoustic analysis of voice improvement after phonosurgery. Indian J Otolaryngol Head Neck Surg. 2010;62(2):131-7. doi: 10.1007/s12070-010-0024-6.
7. Toran KC, Vaidhya BK. Objective voice analysis for vocal polyps following microlaryngeal phonosurgery. Kathmandu Univ Med J (KUMJ). 2010;8(30):185-9. doi: 10.3126/kumj.v8i2.3555.

ISSN (O): 2687-5365; ISSN (P): 2753-6556