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Original Research Article

Comparison of voice quality in patients with oral cancer at both pre and post treatment stage

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ABSTRACT

Background: Patients with oral cancer have very common complaints of change in voice. This research is designed to study the effect of oral cancer and its treatment on the various domains of voice like functional, physical, and emotional along with parameters of voice like pitch, loudness and quality.
Method: This study included total 48 participants (34 males and 14 females) with oral cancer. The voice quality of the participants was analysed both before and after treatment using Dr. speech and the voice handicap index (VHI). First, the voice analysis done when the patient was diagnosed as a case of oral cancer by the head-neck oncosurgeon after completion of all required investigations. Patients were recalled for voice analysis after completion of treatment.
Results: There was a significant difference observed in all three domains of the VHI at both before and after treatment. The difference in the functional domain was more prominent. The VHI was not linked to tumor or nodal staging. However, post treatment the voice parameters are greatly affected as compared to pre-treatment stage.
Conclusions: The administration of the VHI should be made mandatory prior to treatment of oral cancer and the findings of the test should be discussed with the patient prior to start of any treatment modality and accordingly the realistic expectations can be set. Therefore, voice analysis using Dr speech will also help in timely assessment and rehabilitation of voice before and after treatment.

Keywords: Definitive treatment, Dr speech, Oral cancer, VHI, Voice therapy

INTRODUCTION

Oral cancer is one of the major health concerns in the Indian subcontinent. The incidence rate of these cancers tops the list amongst all types of head-neck cancers in our country. It includes the cancer of oral cavity and its adjoining structures.[1] The high rate of incidence of oral cancer in developing countries like India leads to higher rate of morbidity and mortality rate and the rate is quite high as compared to developed countries.[2] As the oral cancer depict to a very precise anatomical structure, the prognosis of the disease and its management used to cause a significant impairment to both structural and functional ability of the body, even the basic function of the oral structures such as quite breathing, swallowing, voice and speech are affected.[3,4] From the last fifty years the mortality and five years survival rate have remained the same. During regular clinical practice in the department of ear nose throat and head neck surgery (ENT-HNS), it has been observed that with progress of the disease and the treatment, speech of the patient is getting affected to a great extent. As speech is an overlaid function and the most preferred mode of communication for human, the impairment of speech and/or voice affects the communication ability of the individual and that may

have serious consequences in day to day life and can also lead to emotional outbreaks.[5-8]

There are numerous tools available to assess the subjective notion of the individuals like bodily, emotional and social state with correspondence to the impact of the ailment and its treatment.[9] However, in contemporary practice it's been cited that the prevalence rate of oral cancers has increased with time.[10] So, the importance of study of voice associated quality of life and class of existence is the need of the hour in case of oral cancers. The usage of voice related quality of life (VRQOL) enables in comprehending the subjective perception of voice problem insighted due to oral cancers for those undergoing either surgical and/or non-surgical remedy like radiation therapy and concurrent chemotherapy (CCRT).[11-14] Numerous tools used to examine the effect of oral cancers on the voice of the person are VRQOL, VHI, vocal performance questionnaire (VPQ) and the voice symptom score (VoiSS).

With use of non-surgical treatment technique, patients expect to recuperate a normal or near normal voice once treatment is completed. There are studies which showed a significant change of voice during and after treatment and the change does not vary much with treatment modality whether it is surgical/ non-surgical.[15,16] Agenda of one of aspects of treatment is to maintain the voice quality as far as possible. However, most of patients develop some sort of voice impairments by end of treatment. So, post treatment there is need of voice rehabilitation therapy which help in improving quality of voice.

Therefore, there may be a need for assessment of voice impairment and/or voice ailment brought about because of the treatment undertaken (surgery and/or radiotherapy (RT) and/or chemo-RT) in individual with the oral cancers.

In view of the above, this study was designed to evaluate the effect of oral cancers on voice and to compare the change in quality of voice at both before and after treatment with the usage of VHI. This study also focused on assessment and analysis of voice parameters at both before and after treatment by using Dr. Speech voice analysis software.

METHOD

Study setting, participants and sample size

This study was done at a tertiary care multi-disciplinary teaching hospital of Indian armed forces medical service between Aug 2021 to Aug 2022. A total of 48 participants (34 males and 14 females) with histopathologically confirmed oral cancer who have reported to head-neck oncosurgery unit of department of ENT participated in this study. The subjects were divided into three groups. Group A (Stage I and II) consisted of patients who underwent single modality treatment in the form of surgery. Group B (Stage III/IV) consisted of patients who underwent surgery followed by adjuvant therapy in the form of RT/CCRT. Group C (Stage IV) consisted of patients who underwent non-surgical treatment. Adjuvant treatment protocol involved RT and/or chemotherapy (CT). The treatment modalities were decided in the tumor board meeting by the multidisciplinary team with reference to the tumor staging and its location. The complete subjective demographic data are presented at (Table 1).

Table 1: Demographic data and clinical background of participants.

Age of detection of carcinoma and gender (M/F)	Tumor staging	Treatment recommended [Sx/Sx+Adj/Adj (RT/CCRT)]
42/M	T1	Sx
40/M	T4	Sx+RT
44/F	T3	Sx+RT
56/M	T2	Sx
39/M	T1	Sx
53/F	T1	Sx
52/M	T2	Sx
57/M	T3	Sx + RT
58/M	T4	Sx + CCRT
51/M	T4	Sx + RT
48/M	T3	Sx + RT
56/F	T3	Sx + RT
30/M	T1	Sx
59/M	T3	Sx + RT
37/F	T4	Sx + RT
41/M	T4	Sx + RT
47/M	T3	Sx + RT
44/M	T2	Sx + RT
50/M	T3	Sx + RT

Continued.

Age of detection of carcinoma and gender (M/F)	Tumor staging	Treatment recommended [Sx/Sx+Adj/Adj (RT/CCRT)]
59/M	T4	Sx + RT
51/F	T2	Sx
41/M	T4	CCRT
42/M	T4	Sx + RT
56/M	T3	Sx + RT
33/F	T2	Sx
44/M	T4	Sx + RT
37/M	T3	LTFU
33/F	T1	Sx
44/M	T4	Sx + RT
50/M	T3	Sx + RT
35/F	T1	LTFU
55/M	T3	Sx + RT
46/M	T3	Sx + RT
37/M	T4	Sx + RT
49/F	T4	Sx + RT
57/M	T2	LTFU
48/M	T3	Sx + RT
39/F	T1	Sx
43/M	T4	LTFU
54/F	T4	Sx + RT
33/F	T2	Sx
57/M	T3	Sx + RT
58/F	T4	Sx + RT
47/M	T3	LTFU
46/M	T4	Sx + RT
57/M	T3	Sx + RT
45/M	T4	LTFU
48/F	T2	Sx

All the ages are in year; SN-Serial number; F-Female; M-Male; Sx-Surgery; Adj-Adjuvant; RT-Radiation therapy; CCRT-chemoradiation therapy; LTFU- Loss to follow up.

Inclusion criteria

Patients with age: 18-60 years, all histopathologically proven carcinoma oral cavity patients and patients with no history of previous voice disorders were included.

Exclusion criteria

Patients with history of prior vocal cord surgeries, patients with known psychological disorders, patients with recurrence or residual disease, patients with synchronous or metachronous malignancy and patients who had undergone any modality of treatment outside our institute were excluded.

Ethical considerations

The ethical approval to conduct the study was taken from the institutional ethical committee and informed written consent was taken from all the study participants.

Procedure

Pre-treatment and post-treatment voice assessment was performed using VHI (Table 2). It is a questionnaire based self administered test, which is used to assess the individual's perception regarding the impact due to change of voice. It has 3 domains of voice handicapness namely functional (F), physical (P) and emotional (E). The participants were explained and instructed to read the questionnaire and fill them carefully. The primary investigator or the concern voice expert (Speech language pathologist) collected the questionnaire once it was filled by all the research participants. Then the team of experts analysed the answers and based on the score they divided the groups into four categories namely category-I: Normal (score-0), category-II: Mild voice handicap (score1-30), category-III: Moderate voice handicap (score 31-60) and category-IV: Severe voice handicap (score 61-120).

Pre-treatment assessment was done 7 days prior to the commencement of treatment and post-treatment evaluation was performed at 6 months of completion of treatment.

Then the pre-treatment and post-treatment voice assessment was done by using dr. speech software. Voice parameters were analysed namely pitch, loudness, quality and fundamental frequency (F0).

Pre-treatment assessment was done seven days prior to the commencement of treatment and post-treatment evaluation was performed at six months of completion of treatment protocol.

Data analysis

Data analysis was done by the team of experts by using appropriate statistical tests and results were represented as numbers and percentages.

Table 2: VHI proforma.

VHI proforma	Frequencies				
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, neighbours, 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
Subtotal					
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
Subtotal					
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
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
Subtotal					
Total					
Score range	**Severity**	**Common association**			
0-30	Mild	Minimal amount of handicap			
31-60	Moderate	Often seen in patients with vocal nodules, polyps or cysts			
60-120	Severe	Often seen in patients with vocal fold paralysis or severe vocal fold scarring			

(0-never 1-almost never 2-sometimes 3-almost always 4-always). Name: date: ; These are statements that many people have used to describe their voices and the effects of their voices on their lives. Circle the response that indicates how frequently you have the same experience.

RESULTS

Demographic data

A total of 48 participants (thirty-four males and fourteen females) with histopathologically confirmed oral cancer who had reported to the head-neck oncosurgery unit of the department of ENT participated in this study. Among them, 42 subjects could present until the study's completion. The age range of the subjects is 18 years to 60 years. Among the subjects, seven were in the T1 stage, eight in the T2 stage, seventeen in the T3 stage, and sixteen in the T4 stage of the tumor.

Clinical assessment

VHI scores

The differences in the average score were obtained in all three domains at the pre-treatment and post-treatment stages. Overall, a remarkable difference was seen at both pre-and post-treatment stages but a very significant change was observed in the functional domain of voice. This study also focused to understand the impact of tumor staging and nodal involvement in the perception of voice handicap. However, the results indicate that there are no significant connotations between the perception of voice handicap and tumor staging.

There were seven patients who had no complaints both pre-and post-treatment. Fourteen patients were reported with minimal to a mild level of voice handicap before treatment and thirteen after treatment. There were eleven patients who reported moderate voice handicap at the pre-treatment stage and thirteen at the post-treatment stage. There are ten patients who reported severe voice handicap before treatment and eleven after treatment. The frequency and percentage of the patients across the various severity categories pre-treatment and post-treatment are depicted in Table 3.

Analysis of voice parameters

The voice analysis results have a significant correlation with the functional domain of the VHI scores. There were fourteen patients whose voice analysis result was absolutely normal at the pre-treatment stage. However, at the post-treatment stage seven had developed a hoarse voice and seven had a normal voice. Fifteen had developed a hoarse voice before treatment out of which fourteen continued to have the same at the post-treatment stage but one had developed a husky voice. Eleven patients who developed a breathy voice before the treatment modality was given reported no change in their voice after treatment. Two had reduced breath control with a lowering of the maximum phonation duration (MPD) and the same has been reported after treatment also. The dr speech voice analysis result are presented at (Table 4).

Table 3: The frequency and percentage of the severity of the VHI at both pre-treatment and post-treatment.

Variables		Pre-treatment	Post-treatment	Total score
No complaints	N	7	7	14
	%	16.6	16.6	16.6
Mild	N	14	13	27
	%	33.3	30.9	32.1
Moderate	N	11	10	20
	%	26.1	23.8	23.8
Severe	N	10	11	21
	%	23.8	26.1	50
Total	N	42	42	84
	%	100	100	100

Table 4: Voice analysis result by using Dr speech voice analysis software at both pre-treatment and post-treatment.

Variables	Pre-treatment	Post-treatment
Normal	14	7
Hoarse voice	15	21
Breathy voice	11	11
Husky voice	00	01
Reduced breath control	02	02

DISCUSSION

Voice handicap is one of the foremost inhibitions seen in patients with oral cancer at both pre and post treatment phase. As speech is an overlaid function and voice is the prime means of communication among the homosapiens, voice handicap affects the social life of the individual which leads to emotional breakdown. Now a days India is known as a capital of oral cancers so such studies play a great role in spreading awareness amongst the tobacco and alcohol users. There are different treatment modalities have progressed over time ranging from surgical resection to advance organ preserving strategies with a prime agenda of preservation of voice. Voice therapy and/or voice rehabilitation is also one of the strategies which helps the patients to improve or treat the voice issues in these patients. This research was conducted to study the effect of treatment protocols on voice and to examine the need for voice therapy in these categories of patients post management.

There are contradictory views and research findings on the influence of tumor staging, node and subsite on voice. Some research findings say that these characteristics has no effect on voice while some research findings say voice handicap is attributable to the characteristic of the tumor. In our study we have found that the voice is affected in patients with oral cancer.[17,18] However, impact of tumor on voice has independent impact of stage, node and subsite.

In this study we have compared the VHI findings of patients of all three groups with normal individuals VHI score and we have found that the mean VHI score is higher at both pre and post treatment stages with compare to the VHI score of normal individuals, which means in case of oral carcinoma the chance of voice impairment is quite high.

The VHI score has revealed no significant changes during post treatment follow up after 6 months. However, there was a remarkable voice related impact observed on the quality of life. There are certain secondaries to the treatment effects observed like edema, mucositis, xerostomia, fibrosis. In some cases, otitis media (OME) also seen as effect of radiation and chemotherapy.[19] In oral cancers, the articulators get the exposure of RT in compared to primary lesion.

In case of hefty hypopharyngeal cancers the mobility of the true vocal cords gets affected and may not recover due to damage to the nerve so in such cases voice rehabilitation and/or voice therapy by Speech Language Pathologist will be helpful once the post treatment side effects get subsided. In our study, we have also found that in some patients the voice did not recover or they have not achieved their normal voice throughout the post treatment follow ups, so they were referred for further management in the form of voice therapy. This study also provides a baseline voice assessment in such patients so preventive voice rehabilitation can be started as early as possible and that could help in precautionary measures to protect the vocal apparatus. It also emphasizes the role of ongoing vocal assessments due to dynamic nature of the disease.

In a long term five years research study in case of oral cancers it was found that the patients have VHI mean score of 30.8 and similar result was observed in the present study that the mean VHI was 16.4.[20] We found a mean functional domain score of 13.5, physical domain 14.9 and emotional domain 7.7. In another long-term study similar fashion of worsening trend observed in patients with oral cancers.[18] They have also observed regular deterioration of voice during post treatment follow ups. Which also emphasized on importance of ongoing voice assessment and rehabilitation.

Post treatment, the mostly affected domains in VHI were functional domain and physical domain of voice followed by emotional domain, which means post treatment change of voice was clearly apprehensible to the listeners. As the voice gets affected so this also has impact on psychosocial aspects.

Future directions

The administration of the VHI should be made mandatory prior to treatment of oral cancers and the findings of the test should be discussed with the patient prior to start of any treatment and accordingly the realistic expectations can be set.

Limitations

This study is focused to assess the impact of various treatment modalities on the voice quality in individual with oral cavity. However, it's not emphasizing on the quality of life and the primary functions of the oral structures.

CONCLUSION

Even with the increased use of advanced treatment module, voice changes are dynamic and inevitable. The VHI is a valuable tool which helps both clinicians and patients identify problems in the functional, physical and emotional domains. This would help in initiating timely and overall voice rehabilitation which would impact the quality of voice. The Dr Speech voice analysis result will also help in timely assessments and rehabilitation of voice before and after treatment.

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