CLINICAL EVALUATION OF VOICE CHANGES IN ELDERLY SUBJECTS

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Bhagyashree Bokare

Associate Professor, Department of ENT, GMC, Nagpur

Seema Patel*

Associate Professor, Department of ENT, GMC, Nagpur *Corresponding Author

Dinesh

Junior resident, Department of ENT, GMC Nagpur

Velmurugan

Jagannath

Junior resident, Department of ENT, GMC Nagpur

Kulkarni

ABSTRACT

Number of elderly patients who visited out OPD has been increasing in recent years. The aim of the present study was to analyze the trend in the number of patients with aging-related Voice changes, and to assess the characteristics of senile change of vocal function.

KEYWORDS

presbylarynx, vocal fold atrophy, Maximum phonation time (MPT), Voice handicap index(VHI)

INTRODUCTION

The human voice that gives us our identity, personality changes throughout our lives from birth through to senescence.

Advancing age produces physiological changes that affect all parts of the vocal tract and have direct impact on voice quality.⁽¹⁾

The larynx sags down, mucosa thins out. The secretions gets reduced leading to dryness. The elastic tissue is replaced by fibrous tissue reducing the pliability and elasticity of vocal folds and calcification of cartilages as well as stiffening of the laryngeal joints occurs. Hormonal changes cause atrophy of vocal cords in males and edema in females. Reduced vital capacity, decreased muscle vitality, reduced diaphragmatic function adds to the pathophysiology of phonation in elderly.

As of now in elderly people, considerable attention is given to chronic disease and other comorbid medical conditions and lesser priority given to voice changes. Increasing population of healthy elderly who have an active social life. Early recognition of disordered voice and prompt intervention of vocal decompensation, will have a primary effect of improving the quality of life for the patient with age-related vocal changes.

AIMS AND OBJECTIVES

- To study the symptomatology of ageing voice.
- To estimate the percentage of patients symptomatic for voice change amongst the elderly population attending the ENT OPD.
- Assessment of the ageing voice by using subjective methods and objective methods.
- To study laryngoscopic and video stroboscopic findings in presbylarynges

MATERIALS AND METHODS

This is a prospective study.

Duration - 24 months (September 2013 - August 2015)

106 Subjects attending ENT OPD at tertiary care centre with age more than or equal to 60 years with or without any appreciable voice complaints were selected as the subjects for the study.

Exclusion criteria included were Subjects with active upper respiratory tract infections, organic disease & malignancy of the upper aero-digestive tract and Subjects not consenting for the study were excluded from the study.

The subjects selected were further evaluated with a detailed clinical history with special focus on vocal complaints. A detailed clinical examination including General Examination, Systemic Examination, ENT Examination. All routine and other relevant investigations were carried out.

Rigid laryngoscopy and Stroboscopic evaluation done.

- Fundamental Frequency (F0)** measured with the probe mounted microphone assembled with the stroboscope. **Maximum Phonation Time (MPT)** was calculated by instructing the subject to produce a sound of /e/ as long as possible in a frequency and intensity level comfortable to the patient following deep inspiration in sitting position. A reading best of the three readings was taken as the MPT. **GRBAS Scale (GRBAS)** proposed by The Committee for Phonatory Function Tests of Japan Society of Logopedics and Phoniatrics was utilized. The voice recordings were assessed by one expert from the institution. **Voice handicap index (VHI)** The VHI a self-administered questionnaire consisting of 30 items ranked on a 5-point scale with possible scores ranging from 0 to 120. Subjective analysis using the Vocal Handicap Index measures the influence of voice problems on patient's quality of life. **Reflux Symptom index (RSI)** calculation was done using the questionnaire proposed by Belafsky, Postma & Kaufman based on visual analogue scale. A value more than 10 was considered significant. Eventually these subjects were treated accordingly. All the observations and findings were analysed statistically.

OBSERVATIONS AND RESULTS

In present study there were 62 male (58.49%) and 44 female (41.51%) subjects with MEAN age 70.98. Male to female ratio 1.4:1. Highest number of subjects was in 60 - 70 years age group (54.72%).

Table 1 : Gender wise symptom awareness

Symptom awareness	Males	Females	Total
Present	16(15.09%)	08(7.5%)	24(22.6%)
Absent	46(43.40%)	36(34%)	82(77.4%)
Total	62(58.49%)	44(41.5%)	106(100%)

voice change. (25.80% were males compared to 18.18% female).

VHI scores were higher in symptomatic subjects (mean VHI = 56.33) than in asymptomatic (mean VHI = 38.42)

On the basis of voice complaints, hoarseness was found in 14 subjects (58.33%), breathy or husky voice was found in 4 patients (16.66%), vocal fatigue in 3 subjects (12.5%), and loss of projection in 3 subjects (12.5%).

Figure 1: age And F0 Analysis

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In present study the mean Fundamental frequency of voice was 173 Hz (SD = 34.28, range 144 – 223 Hz) in males while 184 Hz (SD = 17.69, range 162 – 194 Hz) in females.

F0 in male population showed a linear correlation ($r = 0.97$) with age. In female population F0 was found to be linearly decreasing as age increase.

In the present study mean MPT was found to be 15.44 seconds (SD = 2.93 seconds) in males and 12.66 seconds (SD = 2.37 seconds) in female subjects. For both male and female subjects it was found to be decreasing with age in a linear trend. (Pearson correlation coefficient = 0.91 in males and 0.81 in females).

Figure 2: MPT Analysis

Average Voice Handicap Index calculation indicated was in current study as 42.5 (SD = 14.8). In males mean VHI was 47.42 (SD = 14.7) and in females it was 35.52 (SD = 14.8).

On the basis of VHI score out of 106 study subjects 68 (64.16%) had a mild vocal handicap 12 (11.32%) scores moderate VHI and 26 (24.52%) subjects normal.

It showed linear correlation with age ($r = 0.97$, $p < 0.001$)

All subjects were dysphonic according to GRBAS rating with $\geq$ grade 0.73 (68.87%) subjects had mild and 33 (31.13%) subjects had moderate grade of dysphonia.

92.5% subjects had mild to moderate degree of roughness, 83% had breathy voice; 78.3% had asthenic voices and 20.8% subjects had strained voice.

(VHI score) We found a significant linear correlation with total GRBAS score (Pearson correlation coefficient = 0.786, $p < 0.01$).

On Hopkins rod laryngoscopy Out of 106 subjects 35 (33.01%) subjects had edema of the vocal cords all were females 58 (54.71%) out of 106 subjects showed vocal fold atrophy. All were males.

66 (62.26%) subjects had features of interarytenoid congestion. Out of them 44 (70.96%) were males and 22 (50%) were females.

Out of 106 subjects 23 (21.70%) had incomplete glottic closure.

7 (53%) of males had incomplete glottic closure with bowing of vocal cord while 6 (60%) female subjects with incomplete glottic with longitudinal slit type of glottis closure pattern.

In present study we found mean RSI score 16.95 (SD + 8.38). In females was 14.04 and 19.01 (SD + 8.40) in males. RSI values were comparatively lower in females as compared to males in all age groups in current study.

Out of 106 subjects 72 (67.92%) Observed mean RSI in subjects with age > 80 years was highest (28.05)

Table :2 Age Distribution Of RSI

AGE GROUP (YEARS)	RSI(MALES)	RSI(FEMALES)	MEAN RSI
60-70	13.7	9.96	11.89
71-80	20.06	18.63	19.5
> 80	28.46	26.8	28.05

DISCUSSION

Evidences strongly supports the fact that ageing causes deterioration of all vocal tract and laryngeal structure and function. Some of these changes are irreversible and others are reversible.

Paulo Pontes *et al* (2005) ⁽⁵⁾ in his study mentioned 61% of elderly female and 64% of elderly male population presented with voice concerns. In contrast in our study

18% females and 25% males were concerned about their voice. The difference could be attributed to differences in the socioeconomic educational status lower in Population selected in current study.

In our study hoarseness was found in (58.33%) was the most common symptom. Similar to the study carried by Hansa Banjara (2012) who also found hoarseness as most common symptom (20.54%). ⁽⁴⁾

Change in vocal pitch characteristics is reflected through change in fundamental frequency F0 values.

Hassam Shaikh ⁽⁷⁾ mentions the range of fundamental frequency in adult male and females being 85 – 180 Hz and 165 – 225 Hz respectively

In current study we found mean Fundamental frequency of voice to be 144 – 223 Hz in males while 162 – 194 Hz) in females.

Current study results are consistent with the study of Rose and Wu (1991) ⁽⁸⁾ who mentioned mean F0 in males to be 170 Hz and 187 Hz in females.

Singh and Murry (1978) ⁽⁶⁾ reported mean F0 level of 115 Hz in males and 220 Hz in females. The difference in F0 values could be attributed to the younger selected subject group in their study (age < 50 years).

Hartmut Traunmuller and Anders Eriksson ⁽⁹⁾ quoted mean F0 of 120 Hz and 210 Hz in males and females of various age groups respectively. Both studies mentioned there is rise in F0 in men from age 55 years while in females it decreases after the age of menopause which is also consistent with present study.

In the current study we found mean MPT male -15.44, female-12.66 consistent with the other studies done by Kruel E.J. (1972) ⁽¹⁰⁾, Ptacek *et al* (1966) ⁽¹¹⁾, Muller (1982) ⁽¹²⁾

Jonathan Maslan *et al* ⁽¹³⁾ found mean MPT in male 23.23 seconds and in females 20.96 seconds substantially longer MPTs than previous studies due to selection of fitter taller and healthier study population.

Maximum Phonation Time depends on many variables, including phonation volume (which varies with age, sex and stature), vital capacity, mean airflow rate, comprehension of the task, and maximal effort applied.

In our study mean VHI was found to be 42.5. males 47.42 and females 35.52.

Studies done by Maria Margreet Hakkesteeft (2009) ⁽¹⁴⁾ shows similar significant difference in mean VHI values in present study. attributed to the selection of subjects who were a group of subjects seeking treatment for voice complaints.

K. Maertens and F. I. C. R. S. de Jong ⁽¹⁵⁾ stated a weak falling tendency of VHI score with age which in contrast to the current study probably due to different voice needs, and expectations in different population subgroups selected. Correlated with the age using Pearson Correlation Coefficient statistically significant correlation were found between age and VHI ($r = 0.97$, $p < 0.001$) there was a steady rise in VHI as age increased which in turn implies increase in derangement of voice parameters as age increases.

Majority of subjects ($n = 68$, 64%) had a moderate VHI score while 26 (25%) subjects had scores normal and had no vocal complaints.

GRBAS score a perceptual rating voice analysis tool, utilized it to assess the degree of voice derangement. In present study we found all the study subjects had at least grade 1 voice change.

we also found a significant linear VHI correlation with total GRBAS

score (Pearson correlation coefficient = 0.786, $p < 0.01$).

Nina W. Zhao *et al*⁽¹⁶⁾ performed similar studies in elderly (age > 65 years) Afro-American otherwise healthy population to assess correlation between severity of dysphonia and GRBAS, V-RQOL, VHI and found interrelation between GRBAS and VHI ($r^2 = 0.47$). They also quoted as VHI may correlate better with GRBAS than V-RQOL.

In present study we used the stroboscopy rating form developed by M. Hirano⁽²⁾. We evaluated on stroboscopy for glottic closure, symmetry, mucosal wave, periodicity, amplitude, non-vibratory portion.

On video laryngoscopy 35 (33.01%) showed vocal fold edema all in female subjects and 58 (54.71%) had vocal fold atrophy. 55(88.70%) were males. 41 (38.67%) subjects showed prominent vocal process. 23 (21.69%) subjects showed vocal fold bowing

7(53%) subjects had incomplete glottic closure pattern with bowing of vocal cord or 6 (60%) females showed longitudinal slit type of pattern in our study.

Prakash Boominathan *et al*⁽¹⁷⁾ (2012) in their study in a group of 20 teachers in the age group 60 -75 years found 50% male and 83.3% female subjects had incomplete glottic closure pattern. These findings are far greater than present study and could be the result of the subject population being symptomatic professional voice users.

Previous study done by Paulo Pontes *et al*, they found vocal fold bowing in 23.8% subjects, prominent vocal process in 29.5% subjects. 19.5% subjects noted to have vocal fold edema. results of the current study are consistent with the previous study.

On stroboscopy 92 (86.79%) majority subjects had normal mucosal wave pattern only 14 (13.2%) subjects showed a reduced mucosal wave.

Nearly all subjects (105 out of 106) showed regular of vocal cord mobility in present study. No aperiodicity and non-vibratory portions on vocal cords.

66 (62.26%) subjects had features of interarytenoid congestion. Out of them 44 (70.96%) were males and 22 (50) were females.

In our study we calculated the reflux symptom index to assess the effect of Laryngo-pharyngeal reflux on the voice.

In present study out of 106 subjects 34(32%) subjects were found to have normal RSI ($RSI \leq 10$) while 72(68%) subjects found to have elevated reflux symptom index with RSI score was 16.95. The mean RSI in females was lesser than in males. The gender specific difference in RSI could be due to the lifestyle, food habits, and addictions.

In the study carried out by Belafsky *PC et al*⁽³⁾ they calculated reflux symptom index for LPR in a sample of subjects clinically diagnosed for LPR in the age group with mean age 57 years (SD = 17 years).

as they selected the group having subjects clinically symptomatic for LPR while our subjects were found to have raised LPR incidentally or on visual analogue scale and 32% of them are with normal RSI values ($RSI \leq 10$).

Correlated with VHI implementing Pearson correlation coefficient there is strong correlation between VHI and RSI ($r = 0.80$, $p < 0.001$) indicating there is coexistence of clinical or subclinical LPR in elderly subjects with proportional vocal aberrations.

The results are consistent with previous study by Belafsky *PC et al*⁽³⁾ who also quoted the linear correlation between the same ($r = 0.81$, $p < 0.001$).

CONCLUSION

This study was undertaken to assess voice changes in the elderly population attending ENT OPD. Considering the results of current study, only 22.64% subjects were aware of a problem with the voice. Hoarseness was the most common complaint among the symptomatic subjects (92.45%). The mean fundamental frequency was found to

increase in males while decrease in females as age increases. Maximum phonation time showed steady declining trend with age in either sexes.. Laryngopharyngeal reflux was found to be a very common incidental finding amongst the subjects (68%) with twice as high scores in males as in females. All study subjects had a dysphonic voice of at least mild grade hoarseness on GRBAS. GRBAS scores were found to be linearly correlated with VHI scores throughout the age range. Video stroboscopy revealed incomplete glottic closure as most common feature. Bowing in males (53.85%) while longitudinal gap type in females (60%).

vocal fold edema in females and vocal fold atrophy in males as the most common feature. Prominent vocal process was a consistent laryngoscopic finding in elderly subjects. Interarytenoid congestion was noted on laryngoscopy.

(67.92%) subjects had RSI values suggestive of LPR. Mean RSI in subjects with age > 80 years was highest.

More studies for gathering normative data regarding voice characteristics in the elderly .Presbyphonia rehabilitation is an upcoming concept and evidence based research and clinical trials, and normative data especially in Indian scenario are needed.

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