Voice Function and Voice-Related Quality of Life in the Elderly

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Key Words

Voice • Elderly • Quality of life • Dysphonia Severity Index

Abstract

Background: Many studies have referred to the effects of age on voice and the consequences of these changes. However, only little is known about the adverse effects of voice changes on quality of life in the elderly. **Objective:** This study focuses on self-perception of voice in seniors as assessed by the Voice-Related Quality of Life (V-RQOL) questionnaire, on voice quality as measured by the Dysphonia Severity Index (DSI) and on the correlation between these parameters. **Methods:** V-RQOL and DSI were measured as previously described in 107 non-treatment-seeking test persons without voice complaints (76 women and 31 men; mean age 78.7 ± 6.8 years, range 66–94 years). **Results:** The mean V-RQOL value was $94.4 \pm 9.8\%$. The mean value of the DSI in all participants was 1.2 ± 2.4 . There was no significant correlation between the V-RQOL and DSI, either in women ($p = 0.11$), men ($p = 0.58$) or the whole study group ($p = 0.26$). **Conclusion:** Both the V-RQOL questionnaire and the DSI may be applied to seniors. As self-perception of voice and voice function do not correlate, both parameters have to be measured for voice assessment.

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Introduction

Old age may affect the voice, with changes in vocal pitch, loudness and quality being the most relevant [1]. These changes are caused both by modification of laryngeal structures, such as atrophy and degeneration of laryngeal muscles, atrophy of mucous glands, stiff cartilages and joints, and physiologic age-related changes of more general functions, such as respiratory limitation, cardiovascular problems, skeletal and muscular changes, hormonal fluctuation and neurological disorders [2–5]. At present there is no consensus on when to classify these changes as a disease, e.g. dysphonia in the elderly or presbyphonia [6–11], or as normal, i.e. without medical consequences [5].

As voice changes in seniors may be regarded as multi-dimensional, in cases of complaints, therapy must also cover different aspects [7, 11, 12]. According to Sataloff et al. [12], ‘in treating age related dysphonia, we combine traditional voice therapy, singing training, acting voice techniques and aerobic conditioning to optimize neuromuscular performance’. However, phonosurgery may be indicated in selected cases, such as professional voice use with age modifications refractory to other kinds of therapy [7, 12].

Surprisingly, little is known about the adverse effects of voice changes on quality of life in the elderly. However, it is assumed that they may cause a tendency to avoid so-

cial gatherings and deterioration of self-esteem [13]. The lack of more data may be at least partly due to methodological shortcomings with regard to the question of how to measure self-perception of voice. According to the recommendations of the European Laryngological Society [14], voice assessment comprises not only laryngeal morphology and voice function but self-perception of voice changes as well. However, there is currently no consensus on how to measure this self-perception. At present, the Voice Handicap Index (VHI) questionnaire is regarded as the gold standard [14–18]. For German-speaking individuals, the results of the shorter Voice-Related Quality of Life (V-RQOL) questionnaire are equivalent [18–22].

Thus, this study focuses on (1) voice-related quality of life in seniors without voice complaints and not seeking voice treatment, (2) voice quality as assessed by the Dysphonia Severity Index (DSI) and (3) the question of interaction between these 2 parameters.

Participants and Methods

Participants

German-speaking adults ≥ 65 years of age were recruited from senior community centers, senior meetings and assisted living facilities. Those currently receiving voice-related medical treatment, in need of skilled nursing care and/or with relevant cognitive limitations (e.g. dementia) were excluded from the study; the Mini-Mental State Examination was used to identify those with a cutoff value of 24 [23].

In total, 107 voluntary participants were included in the study after obtaining informed consent. Mean age was 78.7 ± 6.8 years (range 66–94; normally distributed). There were 76 females with a mean age of 78.7 ± 7.3 years (range 66–94) and 31 males with a mean age of 78.7 ± 5.5 years (range 67–88; fig. 1).

Methods

Voice-related quality of life was assessed by the German version of the 10-item V-RQOL questionnaire [19]. Each item can be rated from 1 ('not a problem') to 5 ('a problem as bad as it can be'). The total score was calculated for all test persons according to the original test instructions [19, 20, 22]. It can range from 0 to 100%, with high values indicating high voice-related quality of life.

The DSI is a calculation of different voice measurements which express the degree of voice problems, i.e. highest frequency (in hertz), lowest intensity (in decibels), maximum phonation time (in seconds) and jitter (as a percentage) [24, 25]. For analysis, voices were recorded as previously described [26]. This study refers to the graduation of the DSI established by Nawka and Wirth [27] (fig. 2).

For statistical analysis, the commercially available software packages Matlab® Software release 7.6 and Microsoft Excel® 2003 were used. Normal distribution of age was proved by applying the Kolmogorov-Smirnov test. Spearman's algorithm was used for correlation analysis. Differences between gender groups were analyzed using the t test. A p value of ≤ 0.05 was assumed to be statistically significant.

Fig. 1. Age distribution of our study participants.

Fig. 2. DSI categorization of 107 elderly persons without voice complaints (arrangement according to Nawka and Wirth [27]), comparing women and men.

Results

The mean total score on the V-RQOL questionnaire was $95.6 \pm 7.9\%$ in women and $91.6 \pm 12.8\%$ in men (fig. 3). These results do not differ at a statistically significant level ($p = 0.06$). The mean total V-RQOL score of all participants was $94.4 \pm 9.8\%$. No age dependence was found ($p = 0.32$).

The DSI value was 1.6 ± 2.1 in women and 0.2 ± 2.6 in men (fig. 4). These values differ at a statistically significant level ($p = 0.01$; fig. 2). The mean DSI value of all

Fig. 3. V-RQOL [19] results in 107 elderly persons without voice complaints.

Fig. 4. DSI [24] results in 107 elderly persons without voice complaints.

participants was 1.2 ± 2.4 . The DSI was independent of age ($p = 0.26$).

Comparing the V-RQOL and the DSI, there was no significant correlation between these parameters, either in women ($p = 0.11$), in men ($p = 0.58$) or in the entire study group ($p = 0.26$); nor was there correlation when the participants were divided into age groups ($p = 0.47$ for the 65–74 years age group; $p = 0.53$ for the 75–84 years age group; $p = 0.55$ for the 85–94 years age group).

Discussion

Contemporary society is a society of communication [28, 29], with voice being the parameter focused on in this study. The increasing number of elderly people in Western societies gives cause for scientific medical interest in voice assessment and evaluation in this age group in particular [6–12].

The gold standard for self-assessment of voice is the VHI, a 30-item questionnaire examining functional, physical and emotional aspects of voice disorders [14–18]. An alternative is the V-RQOL questionnaire [18–22], which gives almost identical results [21]. The latter is recommended for clinical application as it only comprises 10 items, while the VHI consists of 30 questions, and it is considered more practicable [18, 20]. Furthermore, Golub et al. [6] proved that the V-RQOL may be used in elderly patients. Hence, it was applied in the present study. The DSI served as an assessment tool for voice function [24, 25]. Results ‘usually’ range between –5 (very hoarse) and +5 (very good). The DSI has a nearly straight course [25]. It is a valid instrument to distinguish between pathological and nonpathological voices [24, 25] and has been proven to be appropriate for clinical purposes [30–33].

The age cutoff was set at 65 years, in accordance with the present statutory retirement age in Germany, because retirement is typically associated with various changes in

daily activities [34, 35] and in communicative requirements. The participants were recruited from urban community centers and senior meetings in order to enrol 'active' and 'vigorous' people who still take part in social life and use their voice. Progressive immobility because of different diseases obstructs many of the 65+ seniors from continuing their social life. The Mini-Mental State Examination [23] was used to ensure that test instructions and the questionnaire were understood by all participants, because the prevalence of dementia increases in persons older than 65 years. Thus, the study group may not be an entirely representative cross section of the 65+ subpopulation in Germany. However, at least the gender distribution reflects the larger German 65+ population [35].

In previous studies, V-RQOL results depended on age [36, 37] and gender [36, 38]. This could not be proven in this study, as neither gender ($p = 0.06$) nor age ($p = 0.32$) correlated with V-RQOL results at a significant level. On the one hand, this difference may be due to the fact that those former studies focused on patients, whereas the present study deals with a non-treatment-seeking population. On the other hand, test persons over 65 show different results to a younger or mixed-age population; Murry et al. [38] reported that the severity of a voice disorder and voice-related quality of life correlate more clearly in participants younger than 66 than in persons over 66. So in fact, data obtained in this study are not comparable with those previously presented.

Furthermore, the V-RQOL results of women were previously found to be worse than those of men [36, 38]. In this study, the results in women and men did not differ at a significant level. This again is mainly due to differences in study groups. So, further studies should investigate elderly persons with voice problems and compare their voice-related quality of life with those of younger dysphonic patients.

Nearly all seniors in this study had high V-RQOL values (fig. 3). According to the validation study presented by Hogikyan and Sethuraman [19] on the basis of data obtained in a clinical cohort, V-RQOL outcomes may be categorized into 3 levels. In addition to the V-RQOL, patients were asked to give a self-rating of their voice (poor, fair, good, very good, excellent). Comparing both, the V-RQOL results could be grouped into 'poor/fair' (V-RQOL $53.1 \pm 22.4\%$), 'good' (V-RQOL $83.1 \pm 15.3\%$) and 'excellent/very good' (V-RQOL $95.0 \pm 8.7\%$). In the present study, 95% of the test persons were in the highest category of 'excellent/very good', with values of $94.4 \pm 9.8\%$. In a previous study from our group [39], 3 categories could

be identified with health-related quality of life as external criterion; according to those cutoff values, 97% of the V-RQOL values in the present study may be classified as 'normal' (V-RQOL values over 80%). However, at present there is no consensus on how to classify V-RQOL results, but even against the background of this restriction, the number of non-treatment-seeking persons achieving the best results in the present study does not differ much using the different classification systems.

The DSI showed varying results in previous studies. In one study [40], it did not depend on gender ($p < 0.01$), in contrast to the results obtained in this work ($p = 0.01$) with higher values in women (fig. 2). With regard to the DSI, Hakkesteegt et al. [40] showed a significant effect of age, especially in women ($p < 0.01$). In the present study, this could not be reproduced ($p = 0.26$). Maybe this is again due to differences in study groups (age, voice pathology, non-treatment-seeking participants). Thus, in fact, more data are necessary. Moreover, it should be considered that the DSI does not make a distinction between young and old voices. In its calculation, age is disregarded. This could also have an effect on the results of the current study and should be taken into account in further studies, especially in clinical cases.

A normal value of DSI would be +1 and a very good value +5 [25]. The seniors in this study had nearly normal values, with women having a mean DSI outcome of 1.6 ± 2.1 , but men having a mean DSI value of 0.2 ± 2.6 . Hence, overall the outcome of the DSI in the whole study group was moderately good.

Compared to the high results of the V-RQOL, it is surprising that the results of the DSI are only mediocre. In some studies, the severity of voice dysfunction and V-RQOL correlated [21, 38, 41]. According to Wuyts et al. [24], the severity of a voice dysfunction and DSI values correlate. In this study, the results of the 2 assessment tools did not correlate ($p = 0.26$), perhaps because the study group was dominated by elderly people, in contrast to the younger groups in previous studies. Recent data from our group [42] showed similar results, i.e. absence of a correlation between V-RQOL and DSI in test persons with benign dysphonia ($p > 0.5$). Using different voice parameters, for example the Roughness, Breathiness, Hoarseness scale, other outcomes could be shown; V-RQOL and the Roughness, Breathiness, Hoarseness scale correlate at a significant level ($p < 0.05$) [43]. Thus, it is far from certain that different voice assessment tools correlate similarly to quality of life, which shows the necessity of further evaluation of methods applied for voice assessment.

Voice changes in the elderly do not necessarily emerge suddenly. Thus, maybe the changes are not noticed easily, especially in elderly people, most of whom are retired and for whom voice may not be as important as during professional voice use [13]. Moreover, it is possible that elderly people do not notice the changes in their voice as much as other physical changes.

The present study allows for the following conclusion: as voice function and self-perception of voice do not correlate, both parameters have to be assessed specifically, both in young and elderly persons. Both the V-RQOL questionnaire and the DSI are applicable in seniors.

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