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ORIGINAL ARTICLE

Severity of dysphonia in patients during first days after iatrogenic injury

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ABSTRACT:

Introduction: The most common cause of vocal fold paralysis (VFP) is iatrogenic injury. Patients with symptoms of VFP present to the specialist after a couple of weeks or even months since the onset of symptoms. In the literature, the data regarding speech impairment during the first days after a iatrogenic injury is lacking.

Aim: to evaluate the quality of voice during first days of vocal fold paralysis following a iatrogenic injury.

Materials and methods: Twenty-five patients with iatrogenic vocal fold paralysis who presented for phoniatric consultation at the Department of Otolaryngology of the Medical University of Warsaw between May 2015 and December 2016 were enrolled in the study. The patients were examined 1-2 days since the onset of speech deterioration. In all patients, laryngeal videolaryngostroboscopy was performed, based on which the following were assessed: vocal fold mobility, mucosal wave, phonation closure, simultaneity and amplitude of vocal fold vibration. Acoustic analysis was performed, and the following acoustic parameters were evaluated: DSI, Fo, Shimmer, Jitter, NHR. Also, the maximal phonation time of [a] sound (MPT a) was assessed and the voice perception analysis with the GRBAS scale was performed. The patients self-evaluated their voice using a 10-point VAS scale.

Results: Based on the videolaryngostroboscopy, phonatory insufficiency and asymmetrical vocal fold vibration were observed. On perception assessment with GRBAS scale, we noticed slight to mild degree hoarseness, breathiness of sound and weakened voice. In majority of patients, the maximal phonation time of [a] sound was significantly reduced. All patients showed abnormal acoustic parameters. None of them rated their voice as perfectly normal on VAS scale.

KEYWORDS: vocal fold paralysis, dysphonia, functional assessment of voice

INTRODUCTION

The main symptom of laryngeal paralysis is speech impairment. However, the paralysis of laryngeal nerves can disrupt any of the basic functions of the larynx, i.e. phonation, respiration and protection. Dysphonia can manifest itself with high-pitch phonation impediment (in the case of the superior laryngeal nerve paralysis), roughness, airy sound, weakened voice, and even sore throat [1]. Voice symptoms can have varying intensity ranging from mild dysphonia to complete aphonia. The most common cause of laryngeal paralysis is iatrogenic injury following thyroid surgery [2]. Patients presenting acute speech impairment after the procedure visit the specialist a couple of weeks or even months since the onset of the symptoms. In the case of mild symptoms initially after the laryngeal nerve paralysis, the diagnosis can be made even years later.

In the literature, there is lacking information considering voice quality in patients 1-2 days since the onset of laryngeal paralysis. There are reports regarding the etiology, diagnostic management and symptoms in permanent laryngeal paralysis [3,4,5]. Early diagnosis of laryngeal paralysis enables early treatment and speech therapy, which increase the chances of clear speech or even restoration of normal laryngeal function [9,10].

AIM OF THE STUDY

The aim was to evaluate the quality of voice in patients during first days of vocal fold paralysis following a iatrogenic injury.

MATERIALS AND METHODS

Twenty-five patients with iatrogenic vocal fold paralysis, who presented for phoniatric consultation at the Department of Otolar-

yngology of the Medical University of Warsaw between May 2015 and December 2016 were enrolled in the study. The patients were examined 1-2 days since the onset of speech impairment. The examination was conducted according to the functional assessment of voice pathology guidelines of the Committee on Phoniatrics of the European Laryngological Society [6]. In all patients, laryngeal videolaryngostroboscopy was performed using EndoStrobE videostroboscope by XION with rigid 70° optics. Based on videostroboscopy recordings, the following were assessed: vocal fold mobility, mucosal wave, phonation closure, simultaneity and amplitude of vocal fold vibration. The acoustic analysis was conducted using DiVAS 2.6 software by XION and Computerized Speech Lab (CSL) by KAY Model 4150 with MDVP software. The basic acoustic parameters were evaluated: DSI, F_0, Shimmer, Jitter, NHR. Also, the maximal phonation time of [a] sound (MPT a) was assessed and the voice perception analysis with the GRBAS scale was conducted. The patients self-evaluated their voice using the 10-point VAS scale, where 1 denotes totally normal voice, while 10 means the greatest voice change possible.

RESULTS

The studied group consisted of 21 females and 4 males. The mean age of all patients was 39.9 (Tab. 1). Fourteen patients underwent total thyroidectomy, 3 – partial thyroidectomy, while 7 patients underwent paraganglioma removal.

On endoscopic examination of the larynx, immobility of the left vocal fold was observed in 13 patients, immobility of the right vocal fold in 9 patients and both folds were immobile in 3 patients. In almost all patients, we observed glottic insufficiency of varying degree during phonation (Tab. 2). In 19 patients, the stroboscopic effect was observed. In those patients, no relationship between vocal fold immobility and no or limited mucosal wave of the immobilized fold (Tab. 2). Also, asymmetry of phonation vibration of the vocal folds can be observed in majority of patients.

On perception analysis using the GRBAS scale, the following were noticed: hoarseness, breathy voice, weakened voice, ranging from mild to moderate. In none of the patients, the voice was assessed as euphonic (G parameter: mean +/- SD: 1.44 +/- 0.5; median: 1; range: 1-2. R parameter: mean +/-SD 0.68 +/-0.63; median: 1; range: 0-2. B parameter: mean +/-SD 1.6 +/-0.82; median: 2; range: 0-3. A parameter: mean +/-SD 1.16 +/-0.69; median: 1; range: 0-2. S parameter: mean +/-SD: 0.36 +/-0.57; median: 0; range 0-2) (Fig. 1).

In majority of patients, the maximal phonation time of the [a] sound was considerably shorter (Tab. 3).

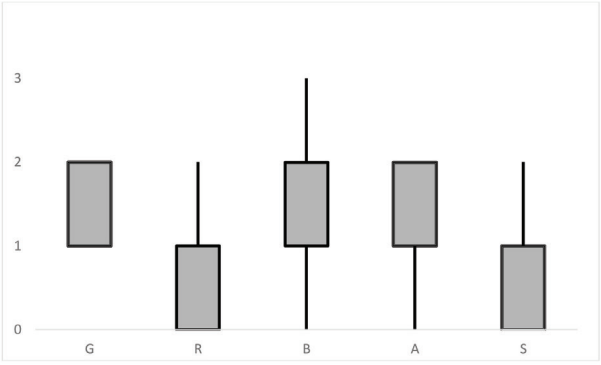

Fig. 1. Perception analysis of voice using the GRBAS scale.

Tab.I. Patients studied.

SEX		AGE		
Females	Males	Mean +/- SD	Median	Range
21	4	49.9 +/- 13.4	53	29 - 75

Tab.II. Videolaryngostroboscopy assessment of the larynx.

VOCAL FOLD VIBRATION PARAMETERS	
No / limited mucosal wave on one or both vocal folds	0
Non-simultaneous phonation vibration	16
Asymmetrical amplitude of vocal fold vibration	3
Phonatory insufficiency:	24
posterior	8
boat-type	11
irregular	5

Moreover, the acoustic parameters were abnormal in all patients (Tab. 3).

None of the patients assessed their voice as completely normal using the VAS scale (mean +/- SD: 6.42 +/- 1.5; median: 6.5; range: 4 – 9) (Fig. 2).

DISCUSSION

Early diagnosis of dysphonia in patients with laryngeal paralysis is crucial for early treatment and speech therapy. More and more authors emphasize the role of early diagnosis and rehabilitation in laryngeal paralysis for the best therapeutic outcomes [9,10].

In the literature, there are no data regarding the degree of dysphonia in patients during first days following the onset of laryngeal paralysis.

In our study, we observed abnormal voice quality on perception analysis in all patients. The highest scores were noticed for the B (breathiness) and A parameters (asteny). In the available reports regarding quality of voice in patients with permanent laryngeal paralysis, high scores on G (grade) and R (roughness) scales were observed [11,12]. Those differences can be explained by a lack of compensation at an early stage of laryngeal paralysis, which is associated with glottic insufficiency. On later stages, compensation mechanisms allow for full phonation closure, however, it is often achieved by vestibular fold involvement during phonation, which results in roughness of the voice.

Perception analysis does not require any equipment, however, it is subjective and requires a well-trained examiner. After proper hearing training, record analysis becomes a simple and quick examination for a physician of every specialty, speech therapists and nurses managing patients with speech impairment.

Direct laryngoscopy allows to evaluate vocal fold immobility. It can be conducted using a laryngeal mirror or a videolaryngostroboscope. The method using laryngeal mirror is widely accessible and can be performed by every laryngologist, however, it does not allow to assess phonation vibration of the vocal folds.

For the assessment of phonation vibration of the vocal folds, videolaryngostroboscopy is used, which requires appropriate equipment and skills by the examiner. In our study, we mainly observed glottic insufficiency and asymmetrical phonation vibration of the vocal folds on videolaryngostroboscopy in patients with early laryngeal paralysis. Our observations are in accordance with those by other authors regarding phonation vibration of the vocal folds in patients with permanent paralysis [13,14,15]. Aerodynamic assessment (MPT a) is an objective and widely available tool. Short duration and no equipment requirements make it possible to perform this study in every clinical setting. The results of less than 10 s is considered abnormal [7]. Mean MPT a value of our patients was 8 s. Similar values were observed by other authors in patients with laryngeal paralysis lasting over a couple of weeks [16,17].

Another objective study for an assessment of quality of voice is the acoustic examination. It requires equipment and a trained examiner [7]. In recent years, the availability of acoustic studies has been increasing, and software to install on every PC as well as mobile applications has been developed. We observed abnormalities in all acoustic parameters (F_0, Shimmer, Jitter, NHR, DSI) in patients 1-2 days after the onset of laryngeal paralysis. Compared to patients with permanent paralysis [16,17], the abnormal Shimmer parameter was noticeable, which described the relative modulation amplitude of the voice sample.

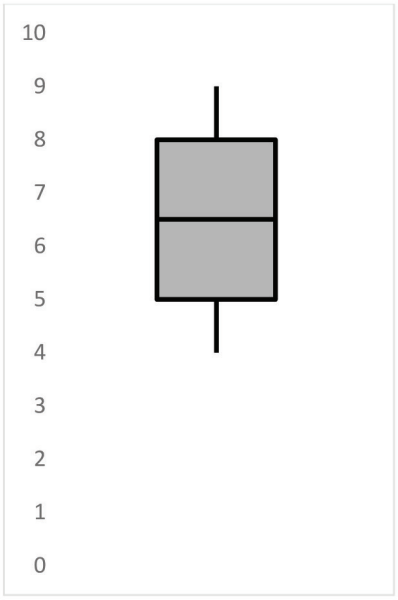

Fig. 2. Self-assessment of quality of voice with the VAS scale.

Tab.III. MPT a values and acoustic parameters.

	MEAN +/- SD	MEDIAN	RANGE
MPT a	8.63 +/- 5.26	8.1	1.8 – 23.6
DSI	-4.67 +/- 13.17	-1.95	-61.8 – 3.92
Fo females [Hz]	241 +/-104.866	225	50 – 490
Fo males [Hz	120 +/- 23.007	117	97 – 149
Jitter	2.972 +/- 2.464	2.237	0.383 – 9.258
Shimmer	7.168 +/- 6.034	5.055	1.886 – 26.756
NHR	0.175 +/- 0.111	0.141	0.078 – 0.497

For the self-assessment of quality of voice in patients with early laryngeal paralysis, it is impossible to utilize the most common questionnaires: VHI and VRQoL. Some questions refer to situations, in which the patient has not yet been on postoperative day 1 or 2. For this reason, we used the VAS scale to assess quality of voice in our study, which is a short, comprehensible and widely available examination tool. No patient scored less than 4 points. It means that all patients assessed their voice to be abnormal moderately or severely.

In summary, assessing degree of dysphonia in patients with early laryngeal paralysis, we achieved the results of the perception analysis and selected acoustic parameters that were different from those reported in the literature considering quality of voice in permanent laryngeal paralysis. In the case of the aerodynamic analysis, videolaryngostrobosco-

py and self-assessment, the results were similar to those reported in other studies on patients with permanent laryngeal paralysis.

CONCLUSIONS

In patients with early laryngeal paralysis, abnormalities of functional voice assessment can be observed on all instrumental diagnostic studies of the quality of voice, including videolaryngostroboscopy, perception analysis, aerodynamic analysis, acoustic analysis and patient's self-assessment.

During first 1-2 days after the onset of laryngeal paralysis, breathiness and asteny of the sound are mainly observed as well as an increased Shimmer parameter, which is characteristic for early laryngeal paralysis. In all patients after head and neck or thoracic surgery, we recommend MPT a study, self-assessment using the VAS scale and at least general perception evaluation in the case of suspected iatrogenic laryngeal paralysis.

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