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THE SPEECH OF LARYNGECTOMIZED PATIENTS: ESOPHAGEAL SPEECH AND TRACHEOESOPHAGEAL VOCAL PROSTHESIS

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SUMMARY

Introduction: *The speech of laryngectomized patients can be rebuilt by developing the esophageal speech skills or by applying the vocal prosthesis. Practice shows that the best voice is achieved by appling the tracheoesophageal prosthesis.*

The aim *of this manuscript was to examine the acoustic and perceptive voice characteristics of patients with esophageal speech and of patients with built in tracheoesophageal prosthesis.*

Methodology: *The research is done on the sample of 48 examinees from 48 to 78 years old. In the research we used Computer laboratory of voice analysis. In data processing we used the descriptive statistics methods. The differences between the groups were determined by the t-test for large independent samples. Pirson's correlation coefficient was used to examine the correlation between two variables. To examine the effect of independent variables on dependent one, we used the Multiple linear regression.*

The results*: Patients with esophageal speech had statistically significant higher values of parameter A-Asthenia (1.21±1.13) comparing to tracheoesophageal patients (.60±.59), while the patients with tracheoesophageal vocal prosthesis had significantly higher values of MPT parameter (7.25±2.40) comparing to esophageal patients (2.82±.90), as well as significantly higher values of WPM parameter (88.75±22.80) comparing to esophageal patients (71.89±29.83).*

Conclusion*: The progress of science and technology brought the expansive development of tracheoesophageal technique. That made the speech of laryngectomized patients qualitatively better and therefore more applicable in speech rehabilitation. The results of this research have also showed this.*

Key words: voice analysis, esophageal speech, tracheoesophageal speech

INTRODUCTION

Speech is the most powerful communication instrument, it represents the integral function of whole organism and it is an expression of ones personality. The loss of speech ability is a big shock for a patient because it directly disturbs his/hers social, psychological and professional integrity (Petrović-Lazić & Kosanović, 2008).

Larynx cancer is one of the most present malignant tumors of head and neck wich causes change of normal anatomic balance of organs that are involved in the speech production process. Causes of malignant diseases are not precisely defined so far. We can speak only about predisposing factors. Former researches on causes of the origin

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of malignant diseases say that malignant illnesses occur as a result of interaction between genetic and environment factors. Epidemiological studies indicate the strong connection between smoking and precancerous conditions and larynx cancer (Nešić, 2012).

Total laringectomy is done in large larynx cancers when all the other options of partial procedures are not possible. After a total laryngectomy, tracheotomy is done. That is a surgical procedure to make an opening in the front neck part of trachea. Breathing is done through tracheostoma with temporarily or permanently build in cannula, and the loss of speech requires therapeutic procedures to establish alaryngeal voice and speech. New source of voice (neoglottis) is formed on the esophagus entry and from the structures of upper esophageal sphincter. Total laryngectomy leads to physical and functional changes which may affect emotional state and some of the basic life functions, including breathing, swallowing and communication (Attieh, Searl, Shahaltough, Wreikat & Lundy, 2008).

The main possibilities of a voice rehabilitation after total laryngectomy are: developing the skill of esophageal speech, tracheoesophageal puncture with the use of vocal prosthesis and the use of electrolarynx. It is necessary to explain the patient the alternative methods for postoperative speech because it is important that he/she knows that there are several possibilities to regain the ability to speak (Petrović-Lazić & Kulić, 2014).

After laryngectomy the patient uses new airways and new sound sources to speak. The esophageal voice is the oldest and the most natural form of alaryngeal voice. Standard for voice rehabilitation, that is the base for all other techniques, is the esophageal speech. By swallowing, injection or aspiration the air gets in the esophagus and then from the tank in esophagus it gets back in the area of pharyngoesophageal (PE) segment where creates the mucosal vibration. It is the best if the new air tank is formed in the upper part of esophagus and lower parts of hypopharynx. Sound source are vibrations of PE segment or neoglottis which is formed in area of esophageal junction.

Vibrations are created by straining the pharynx walls. In making the esophageal voice, esophagus takes part as the air tank and neoglottis, located in the upper part of esophagus that is the source of vibrations. The air located in esophagus releases with control which leads to vibrations of PE segment and sound production. Speech is then adapted by the movements of articulator (Globlek, Stajner-Katusic, Musura, Horga & Liker, 2004; Jassar, England & Stafford 1999; Liu, Wan, Wang, Wang. & Lu, 2005).

Considering that the esophageal patients use PE segment as neoglottis, vibration process of this segment is drastically different from vibrations of real vocal cords of laryngeal speakers. That difference occurs due to physiological limits in the production of esophageal speaker. PE segment vibrates with higher aperiodical grade and with more abnormallities which reduces quality and clarity of speech. That can be explained by lower volitional control over pharyngoesophageal segment of esophageal speakers (Liu & Manwa, 2009; Robbins, Fisher, Blom & Singer, 1984).

Pharyngoesophageal segment has different structure than the real vocal cords, has significantly bigger mass and it is not physiologically adjusted for the vibration process. That leads to irregular and slower movement of PE segment and makes significant

differences in the acoustic parameters of voice comparing to normal and regular vibrations of vocal cords.

The main characteristics of esophageal speech are reduced tone height, decreased strength, changed voice quality (hoarse and rough voice). Esophageal speech is also characterized by shorter length of phrase articulation and longer pause periods due to lower capacity of esophagus (Attieh et al., 2008; Blom, Singer & Hamaker, 1998; Graham, 2005).

Vibrations are created by straining the pharynx walls. This kind of vibrations produce voices. Esophageal speech has lower tonality then the normal one due to lower vibrational frequency of pharyngeal walls. The advantages of this technique is that it doesn't require any prosthesis or hand moving. In esophageal speech learning it is the most important to functionally enable new air tank and neoglottis (Petrović-Lazić, Kosanović & Vasić, 2010).

When the patient is not able to manage the technique of esophageal speech it is necessary to train him/her to use some of the laryngeal prosthesis. There are different kinds of those prosthesis, they are very popular worldwide and frequently used in voice rehabilitation of laryngectomized patients. Nowadays, voice prosthesis implantation in tracheoesophageal fistula formed by direct punction is the part of modern surgical methods of rehabilitation.

In 1980 in America Blom and Singer constructed the first silicone prosthesis that was set by punction in the hole of tracheoesophageal fistula. Vocal prosthesis is actually a silicone tube with one way valvulae that is opened to esophagus. Tracheoesophageal puncture is a surgical procedure of putting the conductor between the trachea and esophagus and keeping it by silicone prosthesis. Vocal prosthesis directs the air from lungs to neopharynx, due to air pressure the voice is produced by the vibration of pharyngoesophageal mucosa.

Today, tracheoesophageal speech became one of the methods in the rehabilitation of laryngectomized patients (Tićac & al., 2009). The air from lungs is suitable for the production of voice, it gives better strength, better span, tone, better sound stability and better quality. Speech with vocal prosthesis is almost natural by tempo and fluent articulation.

Rehabilitation of speech is a complex and active process which requires engagement and teamwork of laryngectomized person and voice pathologist. The success of therapy greatly depends on their collaboration (Kraal, Manestar & Sučić, 2004; Petrović-Lazić & Kulić, 2014).

THE AIMS OF THE RESEARCH

1. To examine the acoustic and perceptive voice parameters of patients with esophageal speech and of patients with built in tracheoesophageal prosthesis.
2. To examine if there are any statistically significant differences between perceptive and acoustic voice parameters of patients with esophageal speech and of patients with built in tracheoesophageal prosthesis.

3. To examine the influence of smoking time and patient's age on acoustic and perceptive voice parameters.

RESEARCH METODOLOGY

The sample of examinees

The research was done on 48 laryngectomized patients from 48 to 78 years old (an average age: 62,64 yrs). Considering the smoking status, there were 45 smokers and 3 non-smokers. The average period of smoking time was 32,1 years. The sample was divided into two groups. In the first group there were 28 examinees (58,3%) with esophageal speech, and in the second group 20 examinees (41,7%) with built in tracheoesophageal prosthesis (Table 1).

Table 1 *Sample structure*

		N	%
Group	Esophageal patients	28	58.3
	Patients with prosthesis	20	41.7
Smoking status	Smoker	45	93.8
	Non smoker	3	6.3
Smoking time period (AS±SD)		32.1±13.15	
Age (yrs) (AS±SD)		62.64±7.81	

The procedure and data processing

Data acquisition from patients is done in several clinical centers in Belgrade. Analysis and data processing is done in The Clinical centre "Zvezdara". In this research data on age, smoking status and smoking time period were acquired in oral interview of examinees before the evaluation and testing. The evaluation of the acoustic and perceptive voice and speech characteristics was done at the end of the rehabilitation. The examination was done individually, and voice and speech recording was done in a quiet room isolated from noise. Before testing examinees got precise instructions and explanations.

In the research we used Computer laboratory of voice analysis, model 4300 of "Kay Elemetrics" Corporation with the software for multidimensional voice analysis. The Sony ECM-T150 microphone attached to the headphones was placed 5 cm away from the examinee's mouth. The signal was recorded directly to the computer. Each group repeated the long vocal »A« in a intensity and height that was the most adequate for them, for at least 5 seconds, three times, and the median produced value was taken for the analysis.

In the process of speech and voice analysis the basic elements that we followed were: variation of primary frequency (vFo), maximum phonation time of vocal "A" (MPTa), the length of the phrase measured by the number of the words produced in a minute (WPM).

Perceptive voice characteristics were analyzed by GRBAS scale. That is a standardized scale for subjective evaluation of voice quality and the most widespread voice scaling method which enables comparison and monitoring of voice. The scaling method has proven successful in the evaluation of voice quality as well as in determining the level and garvity of voice disorders. Subjective assessment of voice quality means analyzing the voice with own hearing, that is listening. Perceptive voice characteristic were evaluated by the three vocal pathologist which did the evaluation independently.

GRBAS scale is auditory-perceptual scale developed in Japan that describes the voice quality by five qualitative voice parameters (Yamaguchi, Shrivastav, Andrews & Niini, 2003). The scale assesses: a) the general grade of hoarseness *(Grade-G),* b) voice roughness or irregular glottal pulses from the breathiness component in the area of low frequency *(Roughness – R),* c) breathiness in voice came from the turbulence accrued because of the irregular glottal wave (*Breathiness – B*), d) voice weakness i.e. auditory impression of hypokinetic functioning or hypo function in spontaneous phonation (*Asthenia – A)* as well as e) voice tension i.e. auditory impression of extreme effort, strain and tension in spontaneous phonation (*Strain – S*) (Bonetti, 2011).

The parameters were assessed on the four level scale with the grade from 0-3 (0-normal, 1-mild, 2-moderate, 3- distinct alteration) during standard text reading.

Statistical data processing

The descriptive statistics is used for the research (arithmetic mean with the following standard deviation, as well as with minimum and maximum). The differences between groups were determined by the t-test for the independent samples. The Pearson's correlation coefficient was used to examine the correlation of two continuous variables. To examine the effects of independent variables on the dependent ones we used Multiple linear regression.

RESULTS OF THE RESEARCH

The differences in values of the acoustic and perceptive parameters are shown in the Table 2, as well as the differences in smoking time period and examinees' age and their type of verbal communication. The examinees have statistically significant differences in parameters: A (of Grbas scale), MPT (sec), and WPM (min). The average value of parameter A of Grbas scale with esophageal patients is 1,21±1,13 and in patients with the vocal prosthesis is ,60±,59. The difference is statistically significant in level of 0,05. The average value of MPT parameter with esophageal patients is 2,82±,90, while with the patients with vocal prosthesis is 7,25±2,40. The difference is statistically significant in level of 0,01. The average value of WPM (min) with esophageal patients is 71,89±29,83, while with the patients with vocal prosthesis is 88,75±22,80. The difference is statistically significant in level of 0,05.

Table 2 *Difference in measured voice parameters considering the level of verbal communication and the results of one-factor analysis of variance*

	Group	AS±SD	p
Smoking time period (yrs)	Esophageal patients	30.50±15.58	>0.05
	Patients with prosthesis	34.50±8.55	
Age (yrs)	Esophageal patients	61.78±8.11	>0.05
	Patients with prosthesis	63.85±7.39	
G	Esophageal patients	1.78±.62	>0.05
	Patients with prosthesis	1.50±.48795	
R	Esophageal patients	1.60±.62	>0.05
	Patients with prosthesis	1.45±.68	
B	Esophageal patients	1.14±1.14	>0.05
	Patients with prosthesis	.60±.94	
A	Esophageal patients	1.21±1.13	***<0.05***
	Patients with prosthesis	.60±.59	
S	Esophageal patients	1.17±1.09	>0.05
	Patients with prosthesis	.80±.95	
Fo	Esophageal patients	449.9±90.37	>0.05
	Patients with prosthesis	5815.30±25125.80	
MPT (sec)	Esophageal patients	2.82±.90	***<0.01***
	Patients with prosthesis	7.,25±2.40	
WPM (min)	Esophageal patients	71.89±29.83	***<0.05***

AS- arithmetic mean; SD- standard deviation; p – statistical signification;

In the Table 3 the Pearson's correlation coefficients are shown to determine the correlation between the examinees' age and voice parameters on subsamples with esophageal patients and patients with vocal prosthesis. Statistically significant negative correlation between MPT and age (-,404; ,033) is determined in esophageal patients. There is a positive correlation between age and G parameter (,41; ,027), and age and R parameter of Grbas scale (,396; ,037).

Table 3 *Correlation of acoustic and perceptive voice parameters and age with esophageal patients and patients with vocal prosthesis*

Parameter	Esophageal patients	Patients with prosthesis
	r (p)	r (p)
G	***.418 (.027)***	.201 (.395)
R	***.396 (.037)***	.127 (.176)
B	.143 (.468)	.056(.593)
A	.142 (.471)	.271 (.247)
S	.143 (.469)	-.034 (.885)
Fo	-.162 (.410)	-.249 (.289)
MPT (sec)	***-.404 (.033*)**	-.125 (.599)
WPM (min)	-.185 (.345)	-.038 (.873)

r – Pearson's correlation coefficients; p – statistical signification

Analyzing the results we determined that the smoking time period was not correlated with any voice parameter neither with esophageal patients nor with patients with vocal prosthesis (Table 4).

Table 4 *Correlation of acoustic and perceptive voice parameters and smoking time with esophageal patients and patients with vocal prosthesis*

Parameter	Esophageal patients	Patients with prosthesis
	r (p)	r (p)
G	-.147 (.455)	-.006 (.980)
R	-.006 (.977)	.081 (.734)
B	-.176 (.369)	.134 (.575)
A	-.054 (.783)	.292 (.211)
S	-.147 (.455)	.066 (.782)
Fo	-.029 (.885)	-.264 (.260)
MPT (sec)	.046 (.816)	-.194 (.412)
WPM (min)	.107 (.588)	-.052 (.826)

r – Pearson's correlation coefficients; p – statistical signification

The influence of smoking time period and age on the measured voice parameters in esophageal patients and patients with vocal prosthesis is examined by the Multiple linear regression. On the subsample of esophageal patients the regression model, made of age and smoking time period variables, was statistically significant in the score prediction on R scale of Grbas scale (voice roughness). By this model 15% of criteria variance is explained, where only the variable "age" gives an independent effect to prediction. The influence of age on MPT scale is also determined. The regression model of age variable was statistically significant in score prediction on MPT scale. By the model 10% of criteria variance is explained (Table 5).

Table 5 *The influence of smoking time period and age on measured voice parameters*

		Esophageal patients		Patients with prosthesis	
		R^2	β (*p*)	R^2	β (*p*)
G	Smoking time period (yrs)	0.21	-.189 (.299)	0.07	-.230 (.461)
	Age (yrs)		.436 **(**.022)		.349 (.268)
R	Smoking time period (yrs)	0.15	-.044 (.812)	0.12	-.205 (.497)
	Age (yrs)		***.401 (.039)***		.447 (.150)
B	Smoking time period (yrs)	0.05	-.192 (.335)	0.02	.088 (.781)
	Age (yrs)		.161 (.416)		.071 (.824)
A	Smoking time period (yrs)	0.02	-.069 (.731)	0.09	.201 (.513)
	Age (yrs)		.149 (.461)		.142 (.641)
S	Smoking time period (yrs)	0.04	-.162 (.416)	0.10	.150 (.640)
	Age (yrs)		.158 (.428)		-.130 (.683)
Fo	Smoking time period (yrs)	0.05	-.013 (.948)	0.08	-.178 **(**.566**)**
	Age (yrs)		-.161 (.425)		-.135 **(**.661**)**
MPT	Smoking time period (yrs)	0.10	.086 (.403)	0.03	-.193 (.541)
	Age (yrs)		-.001 ***(.033)***		.170(.997)
WPM (min)	Smoking time period (yrs)		.126 (.526)	0.11	-.047 (.883)
	Age (yrs)		-.198 (.323)		-.008 (.980)

R^2- adjusted determination coefficient; β – β coefficient; *p*- statistical signification

The correlation between subjective and objective scale is examined on both samples. In esophageal patients there is no correlation between subjective and objective scale. In patients with vocal prosthesis the MPT scale has statistically significant negative correlation with G parameters of Grbas scale (hoarseness grade) and R of Grbas scale (roughness grade). Statistically significant correlation is determined between parameters G of Grbas scale (hoarseness grade) and S of Grbas scale (voice strain) and WPM variable in the group of patients with vocal prosthesis. Correlation is statistically significant in level of 0,05 (Table 6).

Table 6 *Correlation of perceptive voice parameters and voice acoustic analysis parameters time with esophageal patients and patients with vocal prosthesis*

	Esophageal patients			Patients with prosthesis		
	Fo	MPT (sec)	WPM	Fo	MPT (sec)	WPM
	r (*p*)	r (*p*)	r (*p*)	r (*p*)	r (*p*)	r (*p*)
G	-.160 (.416)	-.070 (.725)	.062 (.755)	-.229 (.332)	-.534 **(.015)**	-.448 **(.048)**
R	.056 (.777)	-.063 (.751)	.051 (.797)	-.155 (.515)	-.487 **(.030)**	-.406 (.076)
B	-.286 **(**.141)	-.189 (.336)	-.026 (.897)	-.151 (.524)	-.326 (.161)	-.400 (.080)
A	-.096 (.628)	-.250 (.199)	-.102 (.605)	-.236 (.317)	-.293 (.210)	-.228 (.334)
S	.044 (.824)	-.154 (.433)	-.010 (.961)	-.198 (.402)	-.644 (.002)	-.582 (**.007**)

r – Pearson's correlation coefficients; p – statistical signification

DISCUSSION

The results of acoustic voice analysis show that there is statistically significant difference in values of parameter A of Grbas scale (voice asthenia) with esophageal patients and patients with tracheoesophageal prosthesis. Patients with esophageal voice had statistically significant higher values of parameter A *(Asthenia)* comparing to tracheoesophageal patients, which indicates that esophageal patients have more expressed voice asthenia then tracheoesophageal patients.

The results acquired in this research showed that the average values of examined MPT parameter (maximum phonation time) had statistically significant difference in esophageal patients and patients with vocal prosthesis. The MPT value was significantly higher (7,25 sec.) in patients with vocal prosthesis than in esophageal patients (2,82 sec.), which indicates that patients with vocal prosthesis can phonate vocals for a longer time. The researches of other authors also show that tracheoesophageal patients can hold the phonation for a longer time then esophageal patients (Baggs & Pine, 1983; Kazi et al., 2009; Robbins et al., 1984; Torrejano & Guimaraes, 2009).

The average value of MPT parameter of patients with vocal prosthesis in the manuscripts of the group of authors (Singh et al., 2008) ranged in the interval of 7-12 sec, and with esophageal patients the MPT value was 1,3-,5,3 seconds (Berlin, 1965), similar to the results of our research. Researches of the group of authors (Sedory, Hamlet & Connor, 1989) showed that the value of MPT parameter with esophageal patients was from 0,71-1,59 sec., and with tracheoesophageal patients ranged from 9,20-14,54. Prolonged phonation of tracheoesophageal patients certainly enables more fluent speech, more quality prosodic characteristics therefore more intelligible speech.

The average value of WPM (min) parameter with esophageal patients was 71,89±29,83, while with patients with vocal prosthesis was 88,75±22,80. Patients with

vocal prosthesis had the value of WPM parameter significantly higher than patients with esophageal speech. The obtained result shows that patients with vocal prosthesis can produce more words in one minute then esophageal patients.

The average value of WPM parameter with patients with vocal prosthesis in the manuscripts of the group of authors (Singh et al., 2008) ranged from 95-133 words per minute, similar to the results of our research. Patients that use vocal prosthesis are able to maintain phonation significantly longer (they statistically have significantly higher MPT values), produce more syllables in one breath, establish higher speed of speech with shorter pauses and speak with stronger intensity comparing to the esophageal speakers whose speech is slower and interrupted by often breaks (Robbins et al., 1984; Sedory et al., 1989, according to Baggs & Pine, 1983; Wetmore, Krueger & Wesson, 1981).

Analyzing the results we established that with esophageal patients there was statistically significant correlation of parameter MPT and age. Therefore, as the patients are older MPT parameter is lower and possibility of continuous vocal phonation decreases. As the patient is getting older maximum phonation time shortens and shows decreasing tendency. Large number of researches worldwide (D'Alatri, Bussu, Scarano, Paludetti & Marchese, 2012; Johns & Cantrell, 1981; Singh et al., 2008; Wetmore et al., 1981) also indicate the correlation between MPT parameter and age with esophageal patients.

The results show that with esophageal patients there is positive correlation between age and parameter G (,41; ,027), then age and parameter R of Grbas scale (,396; ,037). In subsample of esophageal patients the values of parameter *G (Grade) and R (Roughness)* are getting higher as the patient is getting old. So, changes in the quality of voice that refers to the level of hoarseness and roughness of voice are more expressed with esophageal patients and they are getting worse as the patient is getting old. As the patients are older the values of this parameters increase i.e. the voice quality of esophageal patients is significantly changed.

The results of our research show that there is no statistically significant correlation between the smoking time period and age and acoustic and perceptive voice parameters in patients with vocal prosthesis, which indicates that voice parameters, in this group of patients, do not alter with the change of smoking time period or age.

By Multiple linear regression we examined the influence of smoking time period and age on the acoustic and perceptive voice parameters in esophageal patients and patients with vocal prosthesis. In subsample of esophageal patients there is a statistically significant influence of age on variable R of Grbas scale (voice roughness). As the examinee is older, the voice roughness is more expressed. The influence of age on MPT scale is also determined. As the examinee is older the value of MPT parameter is getting low. This indicates that in group of esophageal patients the maximum phonation time depends on patient's age, so younger patients show better results.

On both samples we also examined the correlation between the subjective and objective scale. In patients with vocal prosthesis, the MPT scale has significantly negative correlation with parameters G of Grbas scale (hoarseness grade) and R of Grbas scale (voice roughness). Patients that show lower grade of hoarseness and roughness in voice have better results of MPT parameter, and the possibility of phonation is significantly prolonged.

The grade of hoarseness and voice roughness are less expressed and with the decreasing tendency as the MPT parameter grows. The research results of the group of authors (Finizia, Dotevall, Lundström & Lindström, 1999) show that there is statistically significant correlation between MPT parameters in objective scale and perceptive voice parameters with patients that use vocal prosthesis, similar to the results of our research. Perceptive voice evaluation in the rehabilitation process has an advantage over objective evaluation (Finizia et al., 1999). Objective analysis, in their opinion, tends as a backup and support to perceptive voice quality evaluation, and it also can be use to follow the success of the rehabilitation after total laryngectomy.

Statistically significant negative correlation is determined between parameter G of Grbas scale (hoarseness grade) and S of Grbas scale (voice strain) and WPM variable in the group of patients with vocal prosthesis. As the value of WPM parameter increases hoarseness and voice strain are less expressed and with decreasing tendency. The result of patients with vocal prosthesis shows that with lower grade of hoarseness and roughness in voice increases the possibility to pronounce higher number of words per minute. In esophageal patients there is no correlation between subjective and objective scale.

Besides, the researches of Wetmore et al., (1981) show that tracheoesophageal patients have better results comparing to esophageal patients in assessment of parameters: MPT-maximum phonation time, the number of sillables in one breath, the number of words in one expirium. Many studies (Attieh, et al., 2008; Benazzo, Bertino, Lanza, Occhini & Mira, 2001; Bilewicz, Burduk, Kopczyhiski & Wierzchowska, 2007; Moerman, Pieters, Martens, Van der Borgt & Dejonckere, 2004; Moukarbel et al., 2011; Robbins et al., 1984; Singer et al., 2013; Van Gogh et al., 2005) documented that tracheoesophageal speech is finer and has better quality from esophageal speech, based on the results of acoustic and perceptive analysis.

CONCLUSION

This research aimed to examine acoustic and perceptive voice parameters of laryngectomized patients with tracheoesophageal and esophageal speech in order to evaluate which speech has better qualities. The results of both analyses, acoustic and perceptive, showed that the speech of tracheoesophageal patients had better qualities. In accordance with our conclusion many authors point out that the tracheoesophageal speech with vocal prosthesis is a golden standard in today's speech rehabilitation of laryngectomized patients.

Both acoustic and perceptive voice analysis are recommended for voice analysis, because their complementary relation increases accuracy in vocal dysfunction defining and enables better choice of acoustic measuring instruments which will confirm or reject, in the most accurate way, the perceptive assessment of voice disorder.

Significant life quality improvement of laryngectomized patients is obtained by a sistematic, planned and multidisciplinary rahabilitation of patient as well as his nearest.

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