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FACTORS THAT MAY AFFECT THE SUCCESS OF THE ESOPHAGEAL VOICE AND SPEECH EDUCATION IN LARYNGECTOMIZED PATIENTS

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ABSTRACT: Introduction: The most humane, economically most justified, and according to many authors, also the first method of choice in vocal rehabilitation of totally laryngectomized patients is the use of esophageal voice and speech. While mastering this method, it is necessary to train the patients to form and use the air reservoir in the upper third of esophagus that serves as a voice activator whose airstream causes the vibrations of the pharyngoesophageal segment as the new voice generator. Objective:To investigate the factors that may affect the success of esophageal voice and speech education in clinical practice and emphasize the importance of knowing them in order to further improve this method of rehabilitation. Methods:Comprehensive review of the literature was performed by using the following databases: Google Scholar, SCIndex, PubMed and ResearchGate. The search was based on the following terminology: laryngectomy, esophageal speech, education, factors, success, treatment outcome, and their counterparts in Serbian language. Results: There are numerous factors that may affect the success of esophageal voice and speech education (anatomical-physiological, psychosocial, patient related, treatment and rehabilitation related factors, socio-demographic, physiological and others), among which the motivational status of the patient is of the greatest importance. Conclusion:There are still no clearly defined, generally accepted and comprehensive criteria for assessing the degree of success of mastered esophageal voice and speech, and consequently the lack of defined uniform factors affecting this success, positively or negatively, is present. Of the numerous observed factors, the importance of the patient's motivational status is most often emphasized.

Key words:laryngectomy, esophageal speech, factors, education, rehabilitation success.

1. INTRODUCTION

Malignant laryngeal tumors are among the most common tumors that affect the upper aerodigestive tract [1,2]. It is important to point out that they make 1-3% of all malignant tumors in human body, and 20% i.e., 25-35% of all malignant tumors of head and neck in general, where Serbia and its region Vojvodina report one of the greatest incidences in Europe [3,4]. One also needs to emphasize that it is 8 to 10 times more common in men than in women, occurring most likely at the age from 61 to 70 [4,5,6,7]. The outcome of the treatment and patient survival rate mostly depend on the stage of the tumor at the time when it is discovered [8]. However, recognition of malignant laryngeal tumors in late, advanced stage is common, despite the symptoms being present and visible even in the early stage [3,9]. Total laryngectomy is a radical and most comprehensive surgery of malignant laryngeal tumors that is applied for advanced stages of the disease, and involves complete removal of the larynx [2,10]. In physiological phonation, the role of the voice activator is performed by lungs. After the total laryngectomy, breathing is performed directly through the created permanent tracheostoma. Larynx i.e., its part – glottis, represents the voice generator, so it is obvious that the removal of the same will disable the phonation, and the change in the anatomical organization and separation of the activator from the resonator will also contribute to the change in resonance, because besides the larynx, it also depends on pharynx, nasal and oral cavity, but the trachea itself and the lungs [4,11]. The integral part of the treatment of patients with malignant laryngeal growths is certainly the voice and speech rehabilitation i.e., mastering any form of alaryngeal communication. It is important to point out the significance of the speech rehabilitation of these patients which does not only lead to the improvement of the communicational aspects, but also the psychological, social, emotional and professional ones [12,13]. There are three main

rehabilitation methods; esophageal voice and speech education, surgical implantation of voice prosthesis with the development of the tracheoesophageal voice and speech and the use of electrolarynx [4,14,15]. The most humane, economically most justified, and according to many authors, also the first method of choice in rehabilitation of totally laryngectomized patients is the use of esophageal voice and speech [4,16]. In esophageal voice, the air, placed in the upper third of the esophagus, is used as an activator and therefore, when acquiring it, it is most important to ensure the functional capacity of this air reservoir, as well as the functionality of the pharyngoesophageal segment (PE), acting as the new glottis/pseudo-glottis [12]. In esophageal voice and speech, the voice generator i.e., pseudo-glottis, is created on the same vibrational segment as in the tracheoesophageal voice and speech after the implantation of the speech prosthesis, and the difference between them is the place and the force of the activator; in esophageal voice it is the air in the esophagus whose volume is far smaller, while in the tracheoesophageal voice the activator is still the airstream from the lungs as in physiological phonation [4,12]. Besides the advantages of the esophageal voice and speech that definitely reflect in independency of prosthetic aids, free hands, economic cost-effectiveness and inconspicuousness by the environment, it is also necessary to mention the deficiencies which mostly relate to the duration of education, lower success rate, discontinuity and insufficient intensity of speech in noisy environments, very small air volumes that may be deposited in esophagus (not more than 60-70 ml), with somewhat worse melody, short duration of phrases and poorer comprehensibility of sounds from the group of nasal consonants [6,15,17]. In developed countries around the world, the most often used method for voice and speech rehabilitation in laryngectomized patients is the implantation of voice prosthesis as the gold standard in voice and speech rehabilitation in laryngectomized patients [18]. Voice prosthesis implantation in developed countries is most often primary i.e., in the same act with laryngectomy, while in the developing countries, with more patients with advanced laryngeal carcinoma and often financial inability to provide primary implantation of vocal prostheses, it is most often implanted secondarily, after an unsuccessful esophageal voice and speech education [13].

The objective of this paper was to investigate the factors that may affect the success of the esophageal voice and speech education in clinical practice around the world and in our region, obtained from the available literature data, as well as to point out the significance of observing them during vocal rehabilitation of laryngectomized patients, in order to further improve this rehabilitation method.

2. METHODS OF WORK

Comprehensive review of the literature was performed by using the following databases: Google Scholar, SCIndex, PubMed and ResearchGate. The search was based on the following terminology: laryngectomy, esophageal speech, education, factors, success, treatment outcome, and their counterparts in Serbian language, with focus on the most recent references available. This paper was created by using 30 sources, mostly research scientific papers, as well as a few professional books, meta-analyses, PhD theses but also one final paper.

3. RESULTS

3.1. Success of the Esophageal Voice and Speech Education

As there are no clear objective and subjective criteria for assessing the success rate of esophageal voice and speech, consequently a very wide range of success rates of this method of rehabilitation can be found in the literature. According to Stanković, the success rate is 86.1% [7], Krejović Trivić et al. [19] report similar rate - 86.3%, while according to Frith et al. [20], this percentage is much smaller and is only 25%. Gates [21] shares the opinion with the previously mentioned author, pointing out that the real picture of the success of education in this type of alaryngeal communication ranges from 26% to 34%. In her PhD thesis, Dragičević [4] states that 66.7% of patients achieve adequate esophageal speech.

3.2. Factors That May Affect the Esophageal Voice and Speech Education

Different data can be found in the literature about the factors that may affect the success of the esophageal voice and speech education. Namely, Salmon et al.[22] group them as psychosocial and anatomic-physiologic, where the distinction occurs within these as well, into those that are positive and stimulate success and those that are negative i.e., reduce or completely halt the education success. In addition, it was also emphasized that psychosocial factors are more susceptible to control and that they can be much more influenced compared to anatomic-physiologic ones [22]. Kresić et al. [16], as well as Del Rio Valerias et al. [14] present a division of factors

into 3 groups i.e., patient-related, treatment-related and rehabilitation-related ones. Next, Singer et al. in their meta-analysis [23] label these factors as socio-demographic, psychosocial and treatment-related ones, while Frith et al. [20] group them as surgical, psychological, social and physiological. In connection to that, in positive anatomic-physiologic factors, according to Salmon [22], emphasized is the significance of soundness and mobility of the oropharyngoesophageal region i.e., function of lips, tongue and velopharyngeal mechanism in order to provide a sufficient amount of air and overcome the PE segment resistance, but also to achieve an adequate relaxation of the same which is of utmost importance if the inhalation method is used in rehabilitation. It is generally known and mentioned that upon using the esophageal voice and speech the esophagus acts as an air reservoir, and therefore, Salmon [22], but also Singer et al. in their meta-analysis [23], point out that for the success of its education, soundness of the function of all its sphincters is needed in order to enable stopping i.e. proper flow of the airstream. Stanković [7] also mentions the hearing status as a significant positive factor which affects the education success, since the adequate hearing function enables auditory control of one's own speech as well as the instructions relating to the techniques and education while, on the other side, Singer et al. [23] mention the lack of connection of this factor with the success itself. According to Dragičević [4], patients with moderately severe hearing impairment pronounce fewer number of syllables in one minute and, in line with the previously mentioned studies, the same author also mentions worse audio-vocal feedback in them. Salmon [22] points out that the age is proved to be a success predictor i.e., that younger individuals master the esophageal voice and speech with more success because they are more motivated, determined, flexible. Similarly, Singer et al.[23]mention this factor in their meta-analysis as an important one i.e., pointing out that, the older the patient is, the more pronounced the negative relatedness to education success is. Such citations are confirmed by Frith et al. [20] in their research. On the other hand, according to data from the study of Del Rio Valeiras et al. [14], patients between age 51 and 60, mostly female population, showed greater success of the esophageal voice and speech education but, however, gender- and age-related factors did not prove to be significant success predictors in this case. Same data relating to these factors were also mentioned by Dragičević [4]. With regards to gender, in their study, Keszte et al. [9] stated that in the female population there is a higher level of stress and that the feeling of stigma is more present because of the low frequency of the esophageal voice that is 60-70 Hz, which significantly differs compared to the frequency of the healthy laryngeal female voice which can reach 220Hz [9]. Accordingly, Stanković [7] provides a detail that only 33.7% of laryngectomized women accept the education of esophageal voice and speech as a possible method and, according to the study conducted by Frith et al [20], they spent much more time in rehabilitation, rating it as extremely hard. In addition, Singer et al. [23] also mention that the patients consider eructation inappropriate, and therefore all mentioned factors may affect the success. It is also important to point out the good general condition as a significant factor that will definitely enable the success and contribute to it, dictating actually the very beginning and the flow of the education [22,23]. On the other hand, according to Salmon [22], negative anatomic-physiologic factors are a combination of radiotherapy and additional surgical treatments on bigger tumors because postsurgical radiotherapy contributes to the dryness of mouth cavity, frequent inflammations, discomfort when swallowing, which all reflect on the very act of esophageal voice and speech education which is also the case in swallowing disorders as such. Singer et al. [23] mention swallowing disorders as negative predictors of unsuccessful esophageal voice and speech education which reduce it significantly. In their study, Del Rio Valeiras et al. [14] also present data supporting the idea that the quality of the voice of patients who received radiotherapy is worse compared to patients who did not, while Cocuzza et al. [18] put forward that it improves with time because the tissue itself is less flexible in early postradiotherapy period and therefore it increases with time. Negative effect of radiotherapy is recorded by Dragičević and Stanković[4,7]. According to Singer et al.[23], radiotherapy as such does not affect the success of the education. Furthermore, by introducing radiotherapy, the vocal rehabilitation process is interrupted and so the significant time period suitable for learning is lost. Salmon and Stanković [22,7] point out that in cases of extended surgical interventions, the structures that affect the esophageal speech adoption itself,

such as a part of pharynx, tongue or velum, are removed as well. In this case, the education will be aggravated and its success limited. Unlike Salmon's [22], Del Ria Valerias et al.'s [14] study provides an interesting detail that the radicalism of the surgical resection does not significantly affect the success. The same conclusion was reached by Dragičević [4] while, on the other hand, Sokal et al. [24] suggest that the patients who underwent radical surgical interventions have greater education success compared to those who only underwent laryngectomy. Unfortunately, what often happens, limiting the education, and even leading to its regression, is the recurrence of the tumor, presence of metastases and various complications. In that case, it is of primary importance to remove the mentioned and stabilize the general condition of the patient. In addition, according to Salmon [22], velopharyngeal incompetence as well as velum paresis, may negatively affect the esophageal voice and speech education by injection method. However, in such case, it is possible to use the aspiration method, but it is important to mention that the intelligibility of speech may be impaired. What might negatively affect the air intake are definitely the reduced tongue mobility and the presence of the anterior pharyngeal diverticulum. These factors contribute to that fact that the patient employs much more force than usual in order to achieve the adequate pressure level and voice whose quality is similar to one which requires less force. In their meta-analysis, Singer et al. [23] also point out good tongue mobility as the factor that positively correlates with the success. It is also important to point out the effect of the presence of esophageal stenoses as well as contraction of the inferior pharyngeal constrictor instead of relaxation, hypertonicity of the PE segment, which further lead to air retention in the hypopharynx but also its inadequate entry and exit. All the mentioned affect the success of the esophageal voice and speech education techniques [22]. The focus shifts to psychosocial factors, where among the positive ones i.e., those that accelerate the success of the esophageal voice and speech education, Salmon [22] but also Singer et al. [23] mention readiness to practice, which is more often long-lasting and intensive, presence of motivation which has been mentioned in many papers by different authors as the factor that affects the success of the education, and also the acceptance of such voice, with all its characteristics, which contributes to the increase of the level of its use in communication, and also affects the patient's self-confidence. Interestingly, personality traits are mentioned in the Salmon's [22] study as an important factor, which leads to a situation that the extroverts i.e., those who are more open for communication, have contact with more people, achieve greater success in education compared to introverts who possess opposite traits. Additionally, the support of the family was mentioned as an important factor, but also the importance of characteristics and features of the expert who conducts the rehabilitation, which all together improves and increases motivation that positively correlates with the education success. The social activity itself, according to Singer et al. [23], did not prove to be a significant factor that affects the success of the esophageal voice and speech education, while, on the other hand, personality traits of the patient are stated as significant positive factors. Besides all positive factors, negative ones are also very common, and mentioned meta-analysis as well as the study of Del Rio Valeiras et al. [14] primarily put forward the lack of motivation, presence of depression (which is often the result of the radical surgery itself i.e. laryngectomy and loss of the verbal communication function) and anxiety which impedes the success itself that was also confirmed by Singer et al. [23] in their meta-analysis. The lack of success may also be the result of the patient's inability to accept the current situation, lack of support by the family and community, but also continued use of alcohol and cigarettes, which are listed as main risk factors in occurrence of malignant laryngeal tumors, may negatively affect the education itself. However, the very use of alcoholic beverages, according to papers comprised by Singer et al. [23] in their meta-analysis, was mentioned as a factor with a lack of any relatedness to success. Factors that are put forward as patient related by Del Rio Valerias et el. [14] are his/her age and marital status at the time of treatment, level of education, employment before the intervention, current employment, place of residence, where the focus is primarily on whether it is urban or rural environment, and also the presence of some other diseases like alcoholism, depression and others. In addition, these authors also mention rehabilitation-related factors like the very technique used in rehabilitation, the starting time, as well as the number of its sessions. Singer et al. [23] found that the duration and frequency of rehabilitation as such, do not

significantly affect the very success of the education. With regards to marital status at the time of treatment and employment itself, according to Dragičević [4] and Del Rio Valerias et al. [24] they are primarily related to the motivation itself, self-confidence, amount of communication, quality of social interactions the patient has, as well as the faster adaptation to the current condition and situation. When we speak about the education-related factor, according to Bunijevac et al. [12], it does not affect the success of the education, which is also confirmed by Singer et al. [23] and Dragičević [4], but he/she can achieve it on the perception and evaluation of the quality of life and therefore the patients with higher level of education rated the quality of their lives as better in most cases [12]. According to Del Rio Valerias et al. [14], the place of residence is related to the remoteness of hospital centers where the treatment and rehabilitation take place, and therefore the life in rural areas, away from these centers, significantly complicates conducting and success of esophageal voice and speech education. In addition, Dragičević [4] mentions that the incidence rate of malignant laryngeal tumors is higher in rural areas, and so we can draw a parallel with the abovementioned. In their meta-analysis, Singer et al. [23] singled out papers that mention even 24 factors that may affect the success of the esophageal voice and speech education and emphasized their positive and negative relatedness, non-compliance and lack of relatedness with the success of education, and such factors are primarily as follows: age, socio-economic status, marital status, employment, support of the family and community, personality traits, intellectual abilities and cognitive status, motivation, psychosocial adaptability, communication behavior, social activity, mental health, use of alcohol, length and quality of rehabilitation, extended surgical interventions, stadium in which malignant tumor was identified, its location, what type of alaryngeal voice was used, patient's hearing status, presence of swallowing issues, tongue mobility, radiotherapy, postoperative complications, general physical condition of the patient. Positive relatedness to the success of the esophageal voice and speech education was found when analyzing factors that are related to the communication behavior, employment, tongue mobility, motivation, psychosocial adaptability and personality traits. It is also important to mention discordant results i.e., that in some studies factors related to intellectual abilities, cognitive status, socio-economic status and social support proved to be very significant success predictors, while in others they were not mentioned as significant ones [23]. When it comes to intellectual abilities and cognitive status, according to Dragičević [4], there is a positive correlation between this factor and perseverance in rehabilitation i.e. more intelligent patients and those with better cognitive status are more persistent in it, and this can also be associated with the fact that the mentioned strive towards establishing of the alaryngeal voice as soon as possible because in most cases they are employed and in high positions that require greater use of speech. On the other hand, according to Singer et al. [23], negative relatedness to success occurs in factors related to general physical condition of the patient, age, presence of swallowing issues, occurrence of mental health problems (most often depression), and also the occurrence of complications after the surgery, while the lack of relatedness was noticed in factors like use of alcohol, marital status, social activities, stadium and location of the tumor, hearing status, education, duration and quality of rehabilitation, extension of the surgery, radiotherapy. In the research conducted by Kresić et al. [16], the impact of motivation, gender, age, education and profession of the patient, volume of the surgical resection, time of starting and duration of the vocal rehabilitation, as well as the method used during the course on the esophageal voice and speech education, were analyzed. What is interesting is the fact that, according to this study, motivation and duration of rehabilitation are considered as factors that affect the education success, while in others such impact was not manifested, which is in line with the previously mentioned studies. In addition, mentioned is a detail that it is never too late to begin with rehabilitation, which is by all means a motivating piece of information for the patients, while Del Rio Valeiras et al. [24] stated that is should be conducted as soon as possible, emphasizing that it, as a factor, does not significantly affect the success of the education itself. In addition, what also stands out is the information that the duration will greatly depend on the individual characteristics of the patient. In their study, Frith et al. [20] came across results that are in line with the results of Del Rio Valeiras et al. [24], whereby they emphasized that the duration of rehabilitation and the time elapsed after the surgical intervention do not affect the success. In their study, Sokal et al. [24] point out that the patients

whose rehabilitation lasts longer, show greater success in esophageal voice and speech education, which is in line with the research of Kresić et al. [16]. Some authors investigated if the way of conducting the esophageal voice and speech education affects its success and in connection to that, they compared individual and group work with patients. According to Veselinović [25], individual approach has great importance in the very beginning of the education because in that period the patient is becoming familiar with and introduced to the way the air is deposited in esophagus, act of eructation and esophageal voice techniques as well as speech in general, but after that, it would be useful for him/her to join the group in which patients are similar, based on criteria like age, education, time elapsed after the surgical intervention, intellectual and cognitive status. In addition, this author points out that the approach i.e., factor related to group or individual education, does not have much impact on its success while, on the other hand, Quing et al. [26] in their research, came to the results that speak in favor of the fact that group education significantly affects the success and this is attributed to the increase in patient's self-efficacy. Namely, when this type of education is conducted, Quing et al. [26] mention that patients develop the sense of belonging, because they meet people who have an identical or at least similar problem like they do, which leads to significant increase in self-confidence and motivation, and decrease of negative emotions and other factors that limit them. In addition, there is an exchange of experience both between the patients and between their families, which is a very important factor in the overall rehabilitation process. Another factor that is being mentioned as one of those that may affect the success of the esophageal voice and speech education is the presence of the gastroesophageal reflux. In his study, Mathis [27], mentions that the lower esophageal sphincter competence disables adequate air retention, which is also contributed by the leak backward of the stomach content, and resulting in acid causing contractions of the upper esophageal sphincter, and even its spasm. The research showed that the gastroesophageal reflux does not affect the success of the esophageal voice and speech education i.e., that the skilled, less skilled or completely unskilled users of the esophageal voice and speech had the same incidence of the gastroesophageal reflux after all trials, which was also confirmed by Dragičević [4] in her PhD thesis. What stands out as important is the fact that the esophageal reflux as such occurs more often in patients who use esophageal speech in order to communicate, which brings it into connection with the eructation itself [27].

The most significant factors affecting the success in mastering the esophageal voice and speech are shown in table 1.

Table 1: Presentation of factors that affect the success of the esophageal voice and speech education

Authors	Positive effect	Negative effect	No effect
Frith C. et al. 1985.	Lower age of patients.	Higher age of patients; longer rehabilitation.	Time elapsed since the surgical resection; length of rehabilitation.
Salmon S. 1988.	Good mobility of the oro-pharyngeal-esophageal region; esophageal sphincter preservation; adequate hearing; lower age of patients; readiness of patients for intensive and long-term practicing; motivation; extroversion of patients; presence of support by the family and community.	Reduced mobility of the oro-pharyngeal-esophageal region; hyper and hypotonic esophageal sphincter; hearing impairment; higher age of patients; presence of radiotherapy; additional surgical treatments; swallowing disorders; radicality of surgical resection; velopharyngeal incompetence; velum paresis; presence of anterior pharyngeal diverticulum; presence of esophageal stenoses; introversion of patients.	
Stanković P. 1997	Male patients; adequate hearing in patients.	Female patients; attitude towards huge complexity of rehabilitation, additional resection of base of tongue and pharynx, radiotherapy	
Del Rio Valerias M. et al. 2002	Presence of motivation in patients.	Presence of radiotherapy; lack of motivation; presence of	Age of patients; radicality of surgical resection; time elapsed

		depression and anxiety in patients.	since the surgical resection; length of rehabilitation.
Singer S. et al. 2007. (meta-analysis of 56 publications)	Stable general condition of patients; preserved tongue mobility; readiness of patients for intensive and long-term practicing; motivation; personality traits.	Unstable and poor general condition of the patients; considering eructation inappropriate; presence of primary disease complications; presence of anxiety; lack of support from the family and community.	Hearing status; presence of radiotherapy; number and quality of social interactions; length and frequency of rehabilitation; use of alcohol beverages; patients' level of education.
Dragičević D. 2013	Preserved hearing; intellectual abilities; cognitive status of patients.	Moderately severe degree of hearing impairment; presence of radiotherapy; presence of gastroesophageal reflux.	Age of patients; gender of patients; level of education; radicality of surgical resection.
Kresić et al. 2015	Presence of motivation; length of rehabilitation.	Lack of motivation.	Group/individual education; gender of patients; age of patients.

4. DISCUSSION

The questionable issue and the reason why we come across different data about success, but also about factors that impact them, is dissimilarity i.e., lack of uniform criteria for its evaluation. Authors of research and meta-analyses comprised with this review used different criteria for evaluation of success, depending on their country of origin and those they considered most suitable for the evaluation itself. Different criteria also resulted in different interpretation of the factors which positively i.e., negatively affect the success.

Criteria that have most often been mentioned in literature relate to satisfactory phonation when needed, length of air insufflation, short latency between inhalation and beginning of phonation, good intelligibility [4,28]. When it comes to overall impression, Stanković [7] provides a five-level scale, which evaluates the quality of esophageal voice i.e. evaluates the parameters related to the quality, roughness, clarity, weakness of the voice and vocal strain, and the levels are as follows: 1. excellent – full automatism in speech production; 2. good – continuous speech with occasional soundlessness of certain syllables; 3. mediocre – the technique is present, but without longer continuity; 4. Poor- production of short phrases only and 5.very poor/failed - production of only certain two-syllable and multi-syllable words or no sound at all. The same scale was also used by Mumović et al. [28] as well Vekić et al. [29].

According to Kresić et al. [16], excellent success in esophageal voice and speech education was achieved by patients who have fully automatized it, while the success rated as good implies establishing continuous speech with soundlessness of certain syllables, which matches Stanković' [7] criteria. Somewhat more elaborately defined criteria are found in Veselinović et al.'s [13] paper, where the success is rated as excellent in cases when a patient has the ability to spontaneously and effortlessly produce esophageal voice and speech in every communication situation, which is fully automatized and with a steady rhythm and melody, barely noticeable, deprived of the noise of cannula, and without too much unnecessary gesturing. On the other hand, one finds a definition arising from the fact that the education is considered successful if the patient has the ability to communicate with his/her environment in any way, and that such communication is also socially acceptable. In addition, the criterion of success is, on one hand, also rated based on whether the patient uses the learnt voice and speech at all, what their qualities are, whether he/she uses such way of communication as the only one while, on the other, it is rated by estimating phonation parameters like intelligibility, pitch, loudness, speed, but also the satisfaction of the patient with his/her own voice and speech [4]. Criteria for assessment of success used by Del RioValeiras et al. [14] imply three levels i.e., good success of the esophageal voice and speech education is achieved when a person always uses it, it is medium if the person uses it sometimes and poor if he/she does not use it at all.

From the above said, we can realize that by watching the criterion which implies that the patient spontaneously and effortlessly produces esophageal voice and speech in every communication situation, in a fully automatized way and with a steady rhythm and melody, barely noticeable, deprived of the noise of cannula, and without too much unnecessary gesturing, the success can be characterized as significantly smaller compared to one whose criterion is that the patient can communicate in

any way that is socially acceptable, and therefore the factors that affect it will be observed differently [4,13].

Besides the lack of consistent criteria, the reasons for divergence of results and different recording of the impact of individual factors on the success itself are also the use of different measuring instruments, which are often not standardized i.e., rules for their use, scoring and interpretation of data are not defined beforehand [23]. It is preferable to use the objective analysis which reduces the probability that it will produce its own conclusion, different processing and interpretation, which will definitely affect the improvement of success evaluation, but the perception of the factors' impact as well. However, its drawback is that it requires the use of voice sample only, but not speech [4,23]. When speaking about the instruments for self-assessment by the patients, a problem arises, implying different perception of the quality of voice and speech, and therefore the success of the education. For that reason, the esophageal voice and speech that was rated as excellent according to a therapist's evaluation, the patient shall consider unsatisfactory because he/she makes the comparison against the former, premorbid characteristics, while, on the other hand, voice and speech that were rated as very poor by a therapist, could be very satisfactory and excellent to the patient because for him/her the quality is not of primary importance. In connection to that, according to Dragičević et al. [30], patients who use esophageal voice and speech as a method of alaryngeal communication, rated its quality significantly worse compared to those who use tracheoesophageal voice and speech. In addition, disagreement with regards to the impact of factors on the success of education also results from inclusion of small number of examinees in the studies, and therefore the results cannot be largely generalized with regards to the entire population of laryngectomized patients who were educated for the use of esophageal voice and speech. What has been put forward as significant is also the need for a multi-variant analysis in order to perceive the manifestation and realization of the impact of factors on one another [23].

5. CONCLUSION

When taking into account all effects of the total laryngectomy and loss of numerous laryngeal functions on a person, among which is the most important one for them – phonation function, esophageal voice and speech education represents the most natural and humane type of reestablishment of verbal communication, despite the fact that in developed countries it has been completely replaced by the primary implantation of vocal prosthesis, especially in last 30 years. As pointed out, there are still not clearly defined, generally accepted and comprehensive criteria to evaluate to what extent the esophageal voice and speech education was successful, and this results in different understanding of the same, and then different understanding of positive i.e., negative impact of different factors. Despite the abovementioned, most of the conducted studies examining the factors that may affect the success of the esophageal voice and speech education, speak in favor of the fact that the patient's motivation is the key to the same. In all other factors, different data were obtained, and in some cases, they do affect the success, but in some, their impact is completely absent.

What needs to be done in the future is to clearly define the success criteria, but also define and apply standardized instruments in order to enable more adequate examination of the success of the esophageal voice and speech education, and compare the results of different studies. In addition, an evaluation with objective assessments of various voice and speech parameters on representative sample of participants is required.

6. LITERATURE

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