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TREATMENT OF REINCKE'S EDEMA AMONG DIFFERENT PROFESSIONAL GROUPS: PRESENTATION OF RESULTS

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Abstract.
Objectives: Reincke's edema is one of the most common voice disorders in adults. The main purpose of our study, was to analyze factors that may influence the development of this disease. We also estimated the results of surgical treatment. **Materials and Methods:** The research was performed on a group of 261 patients with Reincke's edema treated in the ENT Department of the Medical University of Wrocław in the years 1994–2000. In the study population, women were in a majority and teachers formed the largest occupational group (30%) followed by salespersons (15%). Most of the patients (86%) were tobacco smokers. All of the patients underwent detailed videostroboscopic examination of the larynx and perceptual analysis of the voice quality before and after treatment. **Results:** The symmetry of vocal cords before and after treatment was found in 75 patients. Lack of symmetry before treatment, and proper symmetry after surgery was observed in 71 subjects. Fifty patients showed less symmetry after treatment, and 65 patients were asymmetric before and after surgery. The difference between the symmetry of vocal folds before and after treatment was at the border of statistical significance ($p = 0.069$). The number of patients with full vocal cords closure increased after treatment. This difference was statistically significant ($p = 0.032$). The periodicity of vocal cord movements was significantly higher after treatment ($p < 0.001$). **Conclusions:** The perceptual assessment of voice, before and after treatment, revealed statistically significant post-treatment improvement in voice quality.

Key words:
Reincke's edema, occupation-related voice effort, treatment

INTRODUCTION

Although Reincke's edema (RO) is one of the most common voice disorders in adults, the number of publications addressing this issue is rather limited. Reincke's edema is usually categorized together with other benign laryngeal pathologies causing voice disorders [1–4]. In the RO pathogenesis, harmful environmental factors together with excessive vocal effort, play a fundamental role.

The main purpose of our study, was to analyze factors that may influence the development of Reincke's edema. We also estimated the results of surgical treatment [5,6].

MATERIALS AND METHODS

The research was performed on a group of 261 patients with Reincke's edema treated in the ENT Department of the Medical University of Wroclaw in the years 1994–2000. The examined group consisted of 203 women and 58 men. Teachers formed the largest occupational group (30%) followed by salespersons (15%).

The mean age of patients was 49 years (48 for women and 51 for men). The youngest patient was 18 years old, and the oldest was 74. The disease affected mostly people between the age of 40 and 60 years (195 patients, 74% of

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all patients). The examined group with Reincke's edema included 146 white-collar workers and 125 blue-collar (manual) workers. Most of the patients (86%) were tobacco smokers. Among 223 smokers, 32 smoked over 20 cigarettes per day for no more than 10 years. One hundred smoked 20 cigarettes per day for 10–20 years, and 91 smoked 20 cigarettes for over 20 years.

All of the patients underwent detailed videostroboscopic examination of the larynx. Rigid Storz 70° endoscope, Panasonic video camera and Bruel & Kjaer stroboscope were used during the examination. The endoscopic image of the larynx before and after treatment was digitally stored on a hard drive in the Phoniatric Laboratory at the ENT Department. Based on the endoscopic findings, we distinguished small (Bart I and Bart II) and large (Bart III and Bart IV) edematous changes.

Perceptual assessment of voice quality was performed using the method presented by Heipcke et al. [7]. The voice quality scale embraces the following categories:

Normal Voice

1 – discreet changes of voice

1.5 – discreet changes of voice, hard voice

2 – voice covered, hoarseness

2.5 – voice covered, hoarseness

3 – rough voice, hoarseness

3.5 – hoarse voice, puffing

4 – voice barking, pushing, puffing

Voice changed on account of the illness.

The patients were treated surgically. In the general anesthesia, we used Hirano's approach. The surgery was performed on the cord with larger edema. In patients with large edema at both vocal cords, the surgery was performed twice, with the inter-operation time lag of one and three months. The double-surgery was performed in 74 patients.

The control examination was performed 1–2 months after the treatment. The examination included videostroboscopic examination of the larynx and perceptual voice quality assessment. In the group of 216 patients with Reincke's edema another control examination was performed 2–4 years after the treatment.

The relations between variables were evaluated with the Chi-square test. For all the calculations Statistica software was used. Values of $p < 0.05$ were considered statistically significant.

RESULTS

Bilateral edema was found in 187 (71%) patients. The edema on the right vocal cord was found in 53 (20%) patients, and on the left cord in 21 (9%) patients.

Small edema (Bart I and Bart II) was found in 47 (19%) cases, while large edema (Bart III, Bart IV) in 214 (81%) patients. The large edema was more common in women ($p = 0.01$) (Table 1). There was no correlation between the patient's age and the size of the edema. Patients who smoked over 10 years, had more advanced changes than those who smoked for a shorter period of time ($p = 0.02$) (Table 2).

In the study population, there were no patients with laryngeal dyspnea. The edematous changes were usually found on the upper side of vocal cords. The edema in the endoscopic image could be divided into two groups: typical edema (thin layer of mucosa covering space filled with fluid) and edema with visible productive changes (thickened mucosa, usually redden, with smaller content of fluid). The movement of vocal folds was mostly asymmetrical and often aperiodical. The mucosal wave was usually increased.

The symmetry of vocal cords before and after treatment was found in 75 patients. Lack of symmetry before treatment, and proper symmetry after surgery was observed in 71 patients. Fifty patients showed less symmetry after treatment, and in 65 patients asymmetry of vocal cords was observed before and after surgery. The difference between

Table 1. Relation between patient's gender and the edema size in endoscopic examination

Gender	Small edema	Large edema	P
Women	37 (14.17%)	165 (63.21%)	
Men	10 (3.83%)	49 (18.71%)	0.01
Total	47 (18.01%)	214 (81.9%)	

P – Chi-square test.

Table 2. Relation between the duration of tobacco smoking and the edema size in endoscopic examination

Tobbaco smoking (years)	Small edema	Large edema	P
Non-smokers	17 (6.51%)	21 (8.04%)	
Less than 10 years	12 (4.59%)	20 (7.66%)	
10-20 years	10 (3.83%)	90 (34.48%)	0.02
Over 20 years	8 (3.06%)	83 (31.8%)	
Total	47 (18.01%)	214 (81.9%)	

P – Chi-square test.

the symmetry of vocal folds before and after treatment was at the border of statistical significance (p = 0.069) (Table 3). The number of patients with full vocal cords closure was increased after treatment. This difference was statistically significant (p = 0.032) (Table 4). The periodicity of vocal cord movements was significantly higher after treatment (p < 0.001) (Table 5).

The endoscopic evaluation performed in 216 patients 2–4 years after the surgery revealed that the pathological changes in the larynx were present more often in tobacco smokers than in non-smokers (Table 6).

Table 3. Videostroboscopic evaluation of the laryngeal status before and after treatment (symmetry)

Before treatment \ After treatment	Symmetry	No symmetry	Total	P
Symmetry	75 (28.73%)	50 (19.15%)	125 (47.9%)	
No symmetry	71 (27.2%)	65 (24.9%)	136 (52.1%)	0.069
Total	146 (55.55%)	115 (44.45%)	261 (100%)	

P – Chi-square test (McNemar).

Table 4. Videostroboscopic evaluation of the laryngeal status before and after treatment (closure)

Before treatment \ After treatment	Full closure	No closure	Total	P
Closure	105 (40.22%)	41 (15.7%)	146 (55.93%)	
No closure	64 (24.52%)	51 (19.54%)	115 (44.06%)	0.032
Total	169 (64.75%)	92 (35.24%)	261 (100%)	

P – Chi-square test (McNemar)

Table 5. Videostroboscopic evaluation of the laryngeal status before and after treatment (periodicity)

Before \ After	Periodioc	No periodicity	Total	P
Periodic	74 (28.35%)	20 (7.66%)	94 (36.02%)	
No periodicity	133 (50.95%)	34 (13.03%)	167 (63.98%)	< 0.001
Total	207 (79.31%)	54 (20.69%)	261 (100%)	

P – Chi-square test (McNemar).

Table 6. Endoscopic evaluation of the larynx in 216 patients performed 2–4 years after surgical treatment in smokers and non-smokers

Endoscopic findings	Non-smokers N = 180	Smokers N = 36	P
Normal	170	3	
Redden mucosa	2	10	< 0.001
Thickened mucosa	6	9	
Edema of vocal cords	2	14	

P – Chi-square test (Yates).

Table 7. The voice quality in 261 patients with Reincke's edema treated surgically, before and after surgery (voice quality estimated using Heipcke's scale)

Voice quality	Mean	Min	Max	SD	P
Before treatment	3.00	1	4	1.01	< 0.05
After treatment	1.62	0	4	0.9	

P – Wilocoxon's test.

The perceptual assessment of voice performed before and after treatment revealed statistically significant post-treatment improvement in voice quality (Table 7).

DISCUSSION

Reincke's edema is a common cause of severe voice disorders in people at the age between 40 and 60 years. Lehman and Guyot [8] analyzed a group of 655 patients with laryngeal disorders and concluded that RO was the third most common disorder after laryngeal polyposis and chronic laryngitis.

Clinical studies of patients with RO have been described by the Polish [1,9–11] and foreign authors [8,12–17]. Most of the publications focus on particular, single problems associated with this disease. They discuss histological as-

pects [3,17,18], or results of acoustic voice analyses [13] and treatment [19].

The studies were usually performed on groups of several patients. The largest groups of patients were examined by Fuchs [4] (307 persons) and Remacle et al. [17] (119 persons).

In the United States and in Europe, women frequently suffer from RO [8,13,20]. In the group of 140 patients with Reincke's edema analyzed by Fritzell and Hertegard [21] there were 94% of woman. In Japan, the proportion of woman and men with diagnosed RO follows the same pattern [22]. In our study, 78.5% of examined patients were females, which is in agreement with the observations presented by other European authors.

There are two major factors responsible for the development of RO, tobacco smoking [1,5,7,23–25] and excessive voice effort [1,5,23–25]. The latter plays particularly important role in occupations involving excessive use of voice.

In the group of patients with RO, analyzed by Bochnia et al. [2], excessive voice effort concerned only 9% of subjects, although the influence of harmful environmental factors played a major role in 56% of them. Our research confirm the fact that tobacco smoking predisposes to the development of Reincke's edema. Eighty six percent of examined patients were tobacco smokers, while 54% of patients were using their voice professionally, which confirms the role of hyperfunctional voice disorders in the development of the disease. It is important to note that many of our patients were teachers and salespersons – two occupations that rely on using the voice, and excessive voice effort in these groups is particularly high. Our study did not provide sufficient evidence to prove the effect of harmful environmental factors present in patients' workplaces on the development of the disease.

Endoscopic examination is the essential tool used in the RO diagnosis. Up to date, the classic indirect laryngoscopy (mirror examination) is often substituted by optical endoscopy. The videostroboscopy is the most useful examination technique, providing very good visibility. It allows to store data, and to assess the mucosal wave. Many authors have reported the importance of videostroboscopic examination in the process of diagnosing laryngeal disorders [26–34]. Casiano et al. [35] reports that videostroboscopy enables early diagnosis of RO, frequently not visible during ordinary endoscopic examination. In our study, videostroboscopy proved to be very effective in early diagnosis and assessment of the treatment results. The most important elements of videostroboscopic examination are mucosal wave, periodicity and closure of the vocal cords. The mucosal wave is very useful in evaluating early edematous changes, poorly visible during classical endoscopy. The symmetry and closure play a very important role in evaluating the treatment outcome. Good voice quality after the surgery is mostly dependent on the presence of the mucosal wave.

Voice quality assessment plays also an important role in the diagnosis of Reincke's edema. Such evaluation is very important in assessing the results of phonosurgical procedures, which if performed by an experienced clinician proves to be very effective.

Treatment of Reincke's edema depends on the size of pathological changes and on requirements of patient regarding voice quality. In the advanced phase of the disease it is recommended to stop smoking, limit vocal effort and undertake vocal therapy. In case of further progress of the disease, surgical treatment is advised.

Today there are three basic surgical approaches: decortication (stripping) of the vocal cords, laser surgery and Hirano's approach (an incision of the epithelium and sucking out the content from Reincke's space). Our results confirmed that Hirano's approach is a less traumatizing surgical method and guarantees best voice quality after the surgery. This observations are in agreement with the results reported by other authors [13,15].

Our study proved that surgical treatment of RO is very effective and provides significant improvement in the voice quality, which is confirmed by other observations [11,14,24,25]. Discontinuing of tobacco smoking was a very important condition, influencing the final results of the treatment. We showed that long-term effects of treatment in patients, who decided to quit smoking were better than in patients not able to take such decision. Other authors have reached similar conclusions [5,9,11,15].

To sum up, it should be stressed that RO is a growing problem in the group of non-malignant laryngeal disorders. Occurrence of this disease is correlated with tobacco smoking and excessive vocal effort. Reincke's edema is very often responsible for significant reducing of the voice quality that can be greatly improved due to surgical treatment. A possible failure of treatment may occur mainly due to continued tobacco smoking by patients after the surgery.

CONCLUSIONS

Reincke's edema is more common in women than in men. The disease is directly correlated with tobacco smoking. Development of Reincke's edema is connected with voice abuse in the group of patients with professions demanding excessive voice production. Surgery is an effective method in treatment of Reincke's edema.

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