LARYNGEAL MORPHOLOGICAL CHANGES DUE TO GASTROESOPHAGEAL REFLUX DISEASE (GERD) (Abstract): Chronic laryngitis may have life impact on professional voice users. Besides smoking and excessive alcohol intake, GERD is a determining factor in the etiology of dysphonia. 

**Aim:** To evaluate the laryngeal alteration due to GERD in professional voice users. 

**Material and methods:** The study included 96 vocal professionals (teachers, actors, singers and priests), 58 males and 38 females, with a mean age of 38.3 ± 7.5 years, presented for chronic laryngeal symptoms. The patients filled out a standardized questionnaire and were examined laryngoscopically. 

**Results:** Laryngeal changes were scaled 0 (absence) to 7 (maximum) – arytenoid edema (5.07±1.08), interarytenoid edema (6.18±1.12), vocal folds edema (5.67±1.04), ventricular bands edema (4.96±0.97), laryngeal edema (4.12±0.83). 

**Conclusions:** Laryngoscopic changes may suggest the concomitance of GERD in professional voice users with dysphonia. 

**Keywords:** GERD, DYSPHONIA, VOCAL PROFESSIONALS.

Even though most otolaryngologists are aware of the pathology induced by gastroesophageal reflux disease (GERD), this relationship was more intensely studied during the last two decades (13, 14). Otolaryngologists have become extremely cautious when performing the clinical ENT examination and look for reflux signs (rashes, edema in the arytenoid mucosa and interarytenoidian area) even when they prescribe treatment for chronic laryngitis. According to the most recent surveys, laryngopharyngeal reflux (LPR) displays a complex spectrum of pathological signs (1, 2, 3, 5).

Reflux laryngitis occurs as a result of a backward flow of acid and other stomach contents into the esophagus to the larynx, resulting in a chemical burn of the lining. The diagnosis of LPR is based on a combination of symptoms and findings in the larynx during physical examination (4, 7, 8).

The opening of the esophagus sits behind the arytenoids in the posterior part of the larynx, and that is why these areas are the most affected by reflux. The larynx shows signs of irritation and inflammation, as evidenced by the presence of redness.
(erythema) and swelling (edema) of the arytenoids, interarytenoid region (the area between the arytenoids, also referred to as the posterior glottis, or, incorrectly, as the posterior commissure), and the post-cricoid region (the area behind the arytenoids that separates the larynx from the esophageal opening).

In severe cases, the reflux material can contact other parts of the larynx causing erythema and edema of the folds.

The presence of edema of the true vocal cords is highly suggestive of LPR, even in the absence of laryngeal erythema (6, 9, 10, 11).

Any activity that increases intra-abdominal pressure may exacerbate the symptoms of LPR. Such activities may include weight lifting, sit-ups, abdominal crunches, sexual intercourse, running, dancing, aerobics, public speaking, acting, and singing.

Reflux-related symptoms and clinical presentation have been identified in 4 to 10% of all the patients seen by otolaryngologists (15, 16, 17), and most likely, as these estimates are not accurate, the percentage could be even much higher. Regarding the patients with laryngeal pathology, LPR is related with these conditions or represents an etiological factor in approximately 50% of the cases (11, 13).

The most common symptoms and clinical presentations of the reflux laryngitis are:

- morning hoarseness
- the voice warms in more than 20-30 minutes
- halitosis
- throat clearing
- oral dryness
- white tongue
- globus faringeus
- dysphagia
- regurgitations of the gastric content
- recurrent cough
- laryngospasm,
- complication of asthma
- acute upper airways infection in children.

In addition to longer vocal warm up time, the vocal professionals and actors may also suffer other interferences in their vocal practice – frequent throat clearing, abundant expectoration, especially during the first 10-20 minutes of vocal training (16).

Some authors noticed that LPR patients do not present esophagitis-related changes, so dyspepsia and heartburn are usually absent (8, 12, 17).

The prevalence of esophagitis is relatively low, as the esophageal mucosa of the distal esophagus has its own antacid protection mechanisms which include the following:

peristalsis (quickly pushing the acid off the surface of the esophageal mucosa)
structure of the mucosa (tolerating the intermittent contact with the gastric acid)
capacity of the saliva to neutralize the acid

However, the larynx and the pharynx do not have such protective mechanisms, thus exposure to acid and pepsin may cause substantial changes at this level, whereas the esophagus may not be affected at all. According to the preliminary data reported by Axford (14), the lining of the larynx has a cell defense mechanism which is different from the esophageal mucosa and there are specific differences in the expression of the MUC genes and carbonic anhydrase in the larynx and pharynx (1, 3, 8).

If the mucosa is affected, either directly or through secondary mechanisms, changes in the laryngeal mucosa may result. Thus, it
may be directly affected by the contact with the laryngeal lining with acid and pepsin, which results in mucosal lesions. Alternatively, the irritation of the distal esophagus by the gastric acid may activate a reflex mediated by the vagus nerve, which leads to chronic cough and throat clearing, affecting the larynx lining as well (16, 17).

The bile reflux may also affect the larynx. Additionally, according to recent surveys, there are a lot of question marks concerning the pathophysiology of reflux laryngitis. Some authors consider that the decrease in salivary epidermal growth factor may be associated with reflux laryngitis (14, 15, 17).

The aim of this research study was to evaluate the laryngeal alterations due to gastroesophageal reflux disease in professional voice users.

**MATERIAL AND METHODS**

**Selection of patients groups**

The cases included in the research study were selected among the patients of the “Sf. Spiridon” Emergency Hospital Iasi, ENT Department. As study material, we used a group of 96 vocal professionals (teachers, actors, singers, priests) diagnosed with chronic laryngitis between 2008 and 2010. All patients filled out a standardized questionnaire and patient meeting the clinical criteria of gastroesophageal reflux disease were included in the study. A written informed consent was obtained from all patients. The control group included 54 age-, sex- and profession- matched ENT patients with no laryngeal complaints (16,17).

Selection criteria:
- vocal professionals (teachers, actors, singers, priests)
- dysphonia for at least 3 months (chronic dysphonia)
- absence of laryngeal benign or malignant lesions
- no drug treatment that could alter the esophageal motor function or acid secretion (anticholinergics, sedatives, prostaglandins, calcium channel blockers, potassium, antibiotics, NSAIDs)
- symptomatic GERD

Exclusion criteria:
- active smokers
- chronic alcohol intake
- upper airways infections during the last month (before inclusion in the research study)
- prior history of anti-reflux surgery
- asthma

**Statistical analysis**

Statistical analysis was performed using SPSS 16.0, on Windows XP Professional platform.

**RESULTS**

This research survey included 58 males and 38 females, aged between 21 and 60 years, mean age 38.3 years (±7.56) and median age 39 years.

The most affected professionals considering laryngeal changes - were teachers (37.5%), followed by singers (28.12%). There was no statistically significant difference between priests and actors, considering that priests are a male-only category.

The analysis of laryngeal changes revealed the prevalence of changes in the true vocal folds, as well as in the interarytenoid area (p<0.001), closely followed by changes at arytenoid level, false vocal folds, and laryngeal mucosa in general (table I).

Diagnostic sensitivity of laryngoscopy for laryngeal changes was of over 50% for 8 of the 10 laryngeal signs suspected to occur following the action of the reflux.
Interarytenoid and arytenoid edema followed by vocal folds edema and erythema were the changes with the highest sensitivity (83-97%).

**TABLE I**

**Laryngeal changes (flexible endoscopic laryngoscopy)**

<table>
<thead>
<tr>
<th>Laryngeal change</th>
<th>Research group</th>
<th>Control group</th>
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<tbody>
<tr>
<td></td>
<td>$\bar{x}$ $\pm$SD</td>
<td>$\bar{x}$ $\pm$SD</td>
</tr>
<tr>
<td>Arytenoid edema/ erythema</td>
<td>5.07 $\pm$1.08</td>
<td>1.15 $\pm$0.92</td>
</tr>
<tr>
<td>Interarytenoid edema/ erythema</td>
<td>6.18* $\pm$1.12</td>
<td>0.93 $\pm$0.89</td>
</tr>
<tr>
<td>Vocal folds edema/ erythema</td>
<td>5.67* $\pm$1.04</td>
<td>0.98 $\pm$0.91</td>
</tr>
<tr>
<td>Ventricular bands edema/ erythema</td>
<td>4.96 $\pm$0.97</td>
<td>0.87 $\pm$0.73</td>
</tr>
<tr>
<td>Laryngeal edema/ erythema</td>
<td>4.12 $\pm$0.83</td>
<td>0.77 $\pm$0.69</td>
</tr>
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</table>

$\bar{x}$ - arithmetic mean, $\pm$SD-standard deviation

*p<0.001

Specificity was highest in the patients with true vocal folds and ventricular bands erythema, followed by ventricular bands edema and laryngeal erythema (90-94%).

**DISCUSSION**

According to our findings, laryngeal changes were more common at the level of the vocal and interarytenoid folds (p<0.001), followed by arytenoid area and ventricular bands both before, as well as after treatment. Interarytenoid and arytenoid edemas, followed by edema and erythema of the vocal folds were found to be the changes with the highest sensitivity (83 - 97%) (16, 17).

Despite numerous studies on reflux symptoms, those mentioned above as well as many others (16, 17), there is no objective data to support the significance of the various patient complaints and changes (as a result of the performed tests) in terms of diagnosis. This issue arose as there has not been any consensus as regards “normal” among the groups of patients included in the survey. Interdisciplinary debates (most particularly, otorhinolaryngology and gastroenterology), as well as multicentric surveys are necessary to accurately determine the sensitivity and specificity of the results frequently associated with laryngopharyngeal reflux, as well as the impact of LPR on the quality of life and general health status.

**CONCLUSIONS**

Patients presenting with laryngeal reflux symptoms must be treated in multidisciplinary way (otolaryngologist/gastroenterologist). The positive diagnostic requires modern and accurate testing methods: flexible endoscopic laryngoscopy, pH monitoring, esophageal impedance study, upper gastrointestinal endoscopy (UGIE).

Because there is no consensus on diagnosis and treatment, this condition is frequently either over diagnosed (resulting in various invasive, useless and expensive tests, as well as the application of inefficient treatment plans), or under diagnosed (resulting in the progression of symptoms because of the lack of adequate treatment).
REFERENCES