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Comparison of oral pH-metry with RFS and RSI

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Abstract

The diagnosis of LPR makes a lot of difficulties, and the relationship between acid reflux and mucosal lesions of the throat and larynx is a bone of contention among many specialists. In clinical practice there is no diagnostic test that would clearly help identify and confirm the diagnosis of LPR. The objective of the following study is to evaluate the efficacy of RFS and RSI in diagnosing LPR. The analysis comprises 64 outpatients, 45 males and 19 females, aged 13 to 75, who presented to the Clinic with the symptoms of LPR. Prior to endoscopy, all patients filled in a RSI questionnaire. The changes in the larynx were reviewed independently by two laryngologists. The endoscopic images of the larynx were evaluated on the basis of the RFS. Then pharyngeal pH-metry was performed.

The statistically significant differences were found between pH-metry, RSI and RFS. The difference between RSI and RFS was at the verge of statistical significance. LPR cannot be conclusively recognized on the basis of RSI and RFS evaluations if other examinations do not confirm the diagnosis. PH-metry with Dx-pH may be useful in diagnosing LPR.

Introduction

The diagnosis of extraesophageal reflux disease makes a lot of difficulties, and the relationship between acid reflux and mucosal lesions of the throat and larynx is a bone of contention among many specialists. Gastroesophageal reflux disease (GERD) is a condition in which retrograde movement of gastric content causes a troublesome symptom and/or complications [1,2]. Symptoms caused by reflux disease include globus pharyngeus, sore throat, nonproductive throat clearing, hoarseness or cough. Yet, the laryngopharyngeal symptoms, as they are called [LPS] [3-5], are not typical of gastroesophageal reflux only. Similar manifestations may be caused by other respiratory diseases such as asthma or chronic sinusitis [6].

In clinical practice there is no diagnostic test that would clearly help identify and confirm the diagnosis of LPR. Most frequently, the diagnosis is made on the basis of characteristic symptoms such as LPS and endoscopic examinations of the larynx [7]. Evaluation of LPS in the larynx requires experience in diagnosing this pathology, remains subjective and therefore requires standardization. PH - metric examination of the esophagus is not sensitive enough to detect, during a 24 -hour test, small acid exposure likely to cause LPR [8]. To improve the efficiency and reduce invasiveness of diagnostic tests new probes have been designed which are placed at the border of the nasopharynx and oropharynx [9-11].

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To systematize gathered information, Belafsky et al [12] proposed a scale of endoscopic evaluation of the larynx called the Reflux Finding Score (RFS). It assesses the endoscopic abnormalities of the larynx, which could be referred to when suspecting LPR. Obtaining at least 8 points on the scale makes the diagnosis of LPR likely (Table 1). Another helpful tool in the diagnosis of LPR is the Reflux Symptom Index (RSI) [13]. With this questionnaire, the patient assesses symptoms such as hoarseness, throat clearing, cough. Gaining above 13 points indicates the probability of LPR (Table 2).

Aim of study

The objective of the following study is to compare the efficacy of diagnosing LPR on a basis of RFS, RSI compered to oropharyngeal pH-monitoring.

Material and method

He analysis comprises 64 outpatients, 45 males and 19 females, aged 13 to 75, who presented to the Clinic with the symptoms of LPR. Prior to endoscopy, all patients filled in a RSI questionnaire (Table 2). Endoscopy was performed with a camera TELECAM SL connected to a rigid endoscope by STORZ 70 and a 100W 24V halogen light source. The images were recorded on a PC computer. The changes in the larynx were reviewed independently by two laryngologists. The endoscopic images of the larynx were evaluated on the basis of the RFS (Table 1).

The next stage was a 24h pH-metric test carried out with Dx-pH by ResTech (DX-pH). An antimony probe was used to measure pH in real time every 0,5 s, both in liquid and gas environment. LPR was diagnosed on the basis of the Ryan Composite Score in the vertical and horizontal position (upright and supine). The threshold for pathologic acid exposure in the pharynx was assumed to be pH<5.5 in the vertical position and pH<5.0 in the horizontal position [9]. The original software of Dx-pH made it possible to calculate the percentage of time below baseline, the number of episodes and the time of the longest episode (Table 3). The above three parameters were referred to the Ryan Score, which contributed to the final interpretation of the study. The cut-off for the recognition of LPR was assumed to be Ryan Score >9,41 in the vertical position and/or Ryan Score>6.8 in the horizontal position [14]. The overall evaluation of each patient included a pH-metric test according to the Ryan Score in the upright (norm<9, 41) and supine (norm<6,8) position, a RSI questionnaire point score (norm<14), and a RFI point score of larynx endoscopy provided by two laryngologists (norm<8). LPR was diagnosed if at least one pH-metric test (upright or supine) was positive.

The data were statistically verified with Statistica R, version 2.13.0. Cochrane's Q test and the Wilcoxon signed-rank test were used with the statistical significance level p <0,05.

Results

The data from 64 patients were analyzed. LPR was confirmed on pH-metric tests in 47 patients (73,44%), 32 males and 15 females, and ruled out in 17 cases (26,66%) (Table 4).

The mean Ryan Score value for patients with confirmed LPR was 100,05 in the upright position (3,5 in patients with no LPR) and 20,25 in the supine position (2,58 in patients with no LPR). The symptoms the patients with and without LPR had reported during the month preceding the examination were analysed on the basis of the questionnaires. In that way the RSI was calculated. The RSI was positive for 36 patients (56,25%) and negative in 28 cases (43,75%). The mean RSI value for patients with LPR was 14,62 and 16,06 for those without LPR. No statistically significant differences in the RSI were found between those with LPR and those without it. Table 5 presents mean RSI values for particular symptoms (Table 5).

Endoscopy of the larynx was evaluated according to the RFS and compared with the results of the pH-metric test. One of the laryngologists (RFS I) diagnosed LPR on RFS (in accord with pH-metry) in 12 cases (25%), the other (RFS II) in 15 cases (32%). Both specialists recognized 4 false positive LPR cases. The mean RFS score in patients with confirmed LPR granted by one laryngologist was 5,19 and by the other it was 6,4. In patients with no LPR it was 4,88 and 5,47 respectively. The differences between the two groups were not found statistically significant. Table 6 compares RSI evaluation with RFS evaluation (Table 1).

In order to compare the results of three diagnostic methods (pH-metry, RSI, RFS) Cochrane's Q test was used. The test result (Q= 39,649; p<0,001) revealed that there were differences between these methods. The Wilcoxon signed-rank paired difference test was used to compare different types of diagnostic pairs (significance/confidence level of 5%). The statistically significant differences were found between pH-metry, RSI and RFS. The difference between RSI and RFS was at the verge of statistical significance. The doctors' assessments (RFS I, RFS II) can be considered as equal (Table 7).

Table 1: The reflux finding score (RFS): A score greater than 7 in the proper clinical situation is strongly suggestive of laryngopharyngeal reflux (LPR).

Subglottic edema	2= present; 0 = absent
Ventricular obliteration	2= partial; 4 = complete
Erythema/hyperemia	2=arytenoids only; 4= diffuse
Vocal cord edema	1= mild ; 2= moderate 3= severe ;4 = polypoid
Diffuse laryngeal oedema	1= mild; 2= moderate 3= severe; 4 = obstructing
Posterior commissure hypertrophy	1 = mild ; 2 = moderate 3 = severe; 4 = obstructing
Granuloma/granulation	2 = prezent; 0 = absent
Thick endolaryngeal mucus/other	2 = prezent; 0 = absent

Table 2: Belafsky RSI-Reflux Symptoms Index.

	How much you were influenced by this problem through last month? *Chose the correct level of impact*	0 = no influence 5 = significant influence					
1.	Hoarseness or other vocal problems	0	1	2	3	4	5
2.	Hawking	0	1	2	3	4	5
3.	The feeling of excess mucus or mucus flow to nasopharyngeal	0	1	2	3	4	5
4.	Dysphagia	0	1	2	3	4	5
5.	Coughing after eating or when lying down	0	1	2	3	4	5
6.	Breathlessness	0	1	2	3	4	5
7.	Cough (annoying, irritating)	0	1	2	3	4	5
8.	Feeling the obstacles in his throat, feeling "compressed throat"	0	1	2	3	4	5
9.	Heartburn, chest pain, functional dyspepsia / indigestion, acid feeling in throat	0	1	2	3	4	5
	TOTAL						

Table 3: Ryan Composite Score.

	Upright pH < 5,5	Supine < 5,0
% Time Below Baseline	< 0.13	< 5,15
Number of Episodes	< 1,2	< 4,0
Longest Episode	< 0.71	< 18.97
Ryan Composite score	< 9,41	< 6,8

Table 4: Results of throat pH-metry according to the Ryan scale (upright – normal value <9.41 and supine position – normal value <6.8) in RSI positive patients.

	Ryan positive	Ryan negative
Upright	39 (60,94%)	25 (39,06%)
Supine	31 (48,44%)	33 (51,56%)

Table 5: The mean value for each RSI symptom in patients with Ryan positive and negative.

	Ryan + n=47	Ryan - n=17
Hoarseness or other vocal problems	1,96	2
Throat clearing	2,40	2,47
The feeling of excess mucus or mucus flow to nasopharyngeal	1,96	2,41
Dysphagia	0,43	0,53
Coughing after eating or when lying down	1,21	0,71
Breathlessness	0,66	0,82
Cough (annoying, irritating)	1,64	1,59
Feeling the obstacles in throat, feeling "compressed throat"	2,11	2,88
Heartburn, chest pain, functional dyspepsia / indigestion, acid feeling in throat	2,26	2,65

Table 6: Patient's evaluation (RSI) versus doctor's evaluation (RFS).

	Positive result	Negative result
RSI	36 (56,25%)	28 (43,75%)
RFS_I	16 (25,00%)	48 (75,00%)
RFS_II	19 (29,69%)	45 (70,31%)

Table 7: p-value for each LPR evaluation methods.

	pH-metry	RSI	RFI_I
RSI	0,062	-	-
RFS_I	<0,001	0,002	-
RFS_II	<0,001	0,017	0,607

Discussion

It is estimated that 4-10% of patients presenting to a laryngologist suffer from LPR [15]. LPR may even occur in 50% of patients with laryngeal diseases and vocal problems [16]. The most common manifestations of LPR are laryngopharyngeal symptoms, of which hoarseness is the most frequently reported (71% of cases). 47% of patients complain of constricted pharynx or globus pharyngeus; 51% suffer from cough [4,17]. However, the above symptoms may also be caused by other diseases such as asthma or allergy and may be connected with a postnasal drip [6]. The diagnosis of LPR is often based on a patient's history and endoscopy of the larynx. Yet, the data obtained in that way have been reported as nonspecific and contradictory [18,19]. The values of the RSI in the following study were established on the grounds of the analysis of the symptoms our patients had complained of for a moth preceding the examination. However, this symptom-related indicator was at the verge of statistical significance in diagnosing LPR, and is not fully reliable.

Hicks et al. examined 105 healthy people with no symptoms of GERD or LPR and found changes lesions in the lower pharynx typical of LPR [20]. Milstein et al. carried out endoscopy in 52 healthy non-smokers with no symptoms of GERD who volunteered for the examination. In 93% of cases characteristic irritation of the mucosa in the larynx was observed [21]. Vavricka et al. compared the incidence of laryngeal lesions presumed to have been caused by GERD in patients with diagnosed LPR and in healthy people. The changes located in various parts of the upper throat and larynx such as the posterior pharyngeal wall, the interarytenoid bar, the posterior commissure, the posterior cricoid wall, the arytenoids complex, the true vocal folds, the false vocal folds, the anterior commissure, the epiglottis and the aryepiglottic fold were evaluated.

Abnormalities in the larynx were fund in both groups but changes presumably indicating LPR were also observed in healthy people, who had not reported any symptoms [22]. Similar results have been obtained in the following study. The evaluation of laryngeal endoscopy based on the RFS did not differ significantly between patients with diagnosed LPR and healthy people. The evaluations by two different specialists were similar, which might suggest comparable experience in diagnosis and management of laryngological patients.

Lundell et al.'s findings can explain the above results. Their research demonstrated that acid refluxate rarely caused LPS unless additional manifestations of GERD were present [23]. Ang et al. observed abnormal gastric acid exposure only in 14% of patients with suspected extraesophageal symptoms of GERD [24]. In our research patients with LPR felt heartburn as often as those in whom the disease was not recognized, which indicates little differential value of this symptom.

Oesophageal pH-metry and multichannel intraluminal impedance pH-metry – MII pH-metry are said to be useful in diagnosing LPR. In our research we performed pH-metry in the pharynx using DX-pH. This method seems controversial. The advantage of the Dx-pH system is that it measures pH in gas. Microaspiration of acid aerosolized droplets is considered one of the most important mechanisms of laryngeal inflammation. It has not been explained yet how gas reflux causes LPS. Gas

reflux is assumed to contain aerosolized droplets with hydrogen and pepsin which cause unpleasant symptoms in the eoeophagus, larynx and pharynx. Hydrochloric acid evaporates easily. Thus its concentrated vapors may get into the airways [25]. Kamura et al observed that gas reflux of little acidity was more common in patients with LPR than in patients with GERD or in the control group [26]. According to Becker et al, the pH drop in the pharynx was not related to the pH drop in the oesophagus [27]. Wiener et al., on the other hand, showed that pH values measured in the pharynx with Dx-ph corresponded to those obtained in standard oeohageal pH-metry [28].

Friedman et al. compared the therapeutic results of patients diagnosed with LPR on pharyngeal pH-metry and on the basis of effective empirical antireflux treatment. In patients diagnosed with Dx-pH system the therapeutic results were better and the symptoms were lessened [29]. In our research the position of the patients affected the result of the ph-metric test. More often it was positive in the upright position. This finding has not been observed in the previous studies.

Conclusions

The methods analysed in the study (RSI, RFS and ph-metry) yeld statistically significant results. LPR cannot be conclusively recognized on the basis of RSI and RFS evaluations if other examinations do not confirm the diagnosis. PH-metry with Dx-pH may be useful in diagnosing LPR. The position of the patient affects pH measurements. The test is more often positive in the upright position.

All authors disclose any actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within three years of beginning the submitted work that could inappropriately influence, or be perceived to influence, their work.

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