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RELIABILIY AND CLINICAL VALIDITY OF THE ITALIAN REFLUX SYMPTOM INDEX

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Abstract

Objectives: currently, there is no Italian version of the Reflux Symptom Index (RSI). The aim of this study is to develop an Italian RSI and to evaluate its internal consistency, reliability and clinical validity.

Study design: cross-sectional survey study.

Methods: 80 patients with a Reflux Finding Score (RFS) > 7, and 193 asymptomatic subjects were included in the study. For the RSI reliability analysis, the appositely developed Italian RSI was filled twice, with a week interval, by the 80 patients and 80 control subjects. The test-retest reliability was assessed through the Pearson correlation test, while the Cronbach α coefficient was used for internal consistency analysis. For the clinical validity assessment, the scores obtained in the pathological group were compared with the data from the asymptomatic individuals through the Student's *t*-test. Finally, the correlation between RSI and RFS in the 80 patients was assessed.

Results: all of the patients filled in the entire questionnaire autonomously. The test-retest reliability in the patients, as well as in the control group, was very high ($r > .90$); the internal consistency also showed very high values ($\alpha = .99$). The mean RSI score in the patients was 21.1 ± 6.6, while in the control group it was 6.3 ± 5.6; the difference was statistically significant ($p = .0001$). The mean RFS score in the 80 patients was 9.2 ± 2.7 and the correlation between RFS score and RSI score was rather high ($r = .89$).

Conclusion: the Italian RSI is easily administered, highly reproducible, and exhibits excellent clinical validity.

Introduction

Laryngopharyngeal reflux (LPR) is the retrograde movement of gastric contents into the larynx, pharynx, and upper aerodigestive tract [1] and differs from gastroesophageal reflux disease (GERD), which is excessive reflux of stomach contents into the oesophagus, with tissue damage (oesophagitis) and/or clinical symptoms (eg, heartburn) [2]. It appears that the mechanisms of LPR are different from those of GERD; patients with LPR are predominantly upright (daytime) refluxers, whereas GERD patients are predominantly supine (nocturnal) refluxers. There are several differences between LPR and GERD, including the presentation; while heartburn and regurgitation are common symptoms of GERD, such symptoms are not present in most LPR patients [3-4-5]. Symptoms of LPR include muscle tension dysphonia, laryngospasm, hoarseness, vocal fatigue, excessive throat clearing, globus pharyngeus, chronic cough, postnasal drip, and dysphagia [6-7]. LPR has been implicated in the etiology of many laryngeal disorders, including reflux laryngitis, subglottic stenosis, laryngeal carcinoma, contact ulcers and granulomas, vocal nodules, and arytenoid fixation [8-9]. The treatment options available in patients with LPR include the combination of dietary and behaviour modification, antacids, H2-receptor antagonists, proton pump inhibitors (PPI), and fundoplication surgery [10-11].

The gold standard for the diagnosis of LPR is ambulatory 24-hour double-probe (simultaneous esophageal and pharyngeal) pH monitoring; however, the diagnosis of LPR can be made on the basis of the symptoms and laryngeal findings. Currently, there are two English validated tools with the purpose of assessing the symptoms and documenting the physical findings and severity of LPR. The first one, the Reflux Symptom Index (RSI), is a self-administered nine-item questionnaire. For each item the scale ranges from 0 (no problem) to 5 (severe problem), with a maximum total score of 45 [12]. The second tool, the Reflux Finding Score (RFS), is an 8-item clinical severity scale, based on findings observed during fiberoptic laryngoscopy. The items included in the scale are subglottic edema, ventricular obliteration, erythema/hyperemia, vocal fold edema, diffuse laryngeal edema, posterior commissure hypertrophy, granuloma/granulation tissue, and excessive

endolaryngeal mucus. The scale ranges from 0 (no abnormal findings) to a maximum of 26 (worst score possible) [13]. It has been suggested recently that an empirical therapeutic trial, including lifestyle modifications, diet and high dose PPI, should be prescribed to patients with an RSI score greater than 13 and an RFS score greater than 7 [14]. A validation of the RSI for each language is therefore necessary for the clinical management of patients complaining of symptoms suggestive for LPR in different countries.

Currently there is no Italian version of the RSI. The aim of this study is to develop an Italian RSI and to evaluate its internal consistency, reliability and clinical validity.

Materials and Methods

Participants

One-hundred-and-ninety-three asymptomatic control subjects, 90 males and 103 females, with no history of voice disorder, GERD or LPR were included to establish normative data. The mean age was 43.6 ± 20.5 years (range 18-96). On the basis of the age, the cohort of asymptomatic individuals was divided into four groups: 30 subjects with an age between 18 and 30 years (group 1), 62 subjects with an age between 21 and 40 years (group 2), 51 subjects with an age between 41 and 60 (group 3), and 50 subjects aged more than 61 years.

Eighty patients, 42 males and 38 females, with symptoms of LPR, an RSI score greater than 13 and an RFS greater than 7, were enrolled in a cross-sectional survey study. The mean age was 54.1 ± 16.4 years (range 27-80). All patients with a clinical diagnosis of LPR or GERD treated with antacids, H2-receptor antagonists or PPI were excluded.

Reliability analysis

An Italian version of the original English RSI was developed for the present study (see Appendix A). Items of the questionnaire were translated into Italian, translated back into English and compared with the original items by a qualified professional translator. Wordings of the questionnaire were modified on the basis of patients' suggestions, involved in a pilot study. For the RSI reliability analysis, the Italian RSI was filled in twice, with a week interval, by the 80 patients and 80 control subjects; these 80 subjects were randomly selected, 20 from each of the four age groups. The test-retest reliability was assessed for the total score as well as for each item score of the RSI.

Validity analysis

For the RSI clinical validity assessment, the scores obtained in the pathological group were compared with the normative data obtained by 193 asymptomatic individuals. Finally, the correlation between RSI and RFS in the 80 patients was assessed.

Statistical Analysis

Statistical tests were performed using the SPSS 12.0 statistical software (SPSS, Inc., Chicago, IL). Pearson product-moment correlation was used to evaluate the test-retest reliability of the RSI by comparing the baseline and retesting responses. Internal consistency of the questionnaire was assessed by Cronbach's α coefficient; for this analysis the first completion RSI scores of the 80 patients were used. The independent-samples of Student *t*-test were used to compare the RSI values in the patients with LPR and in the control group. Pearson product-moment test was used in order to evaluate the correlation between the RSI total score and the RFS score. The Pearson product-moment test was also used to assess the correlation between each item of the RSI and the RFS total score, as well as two items and subsequently three items of the RSI and the RFS total score.

Results

All of the 193 subjects and the 80 patients included in the study managed to complete the RSI without any need of assistance; the time required to fill in the questionnaire never exceeded 5 minutes. The mean scores obtained from the subjects with no history nor symptoms of LPR, GERD or dysphonia are reported in Table 1; the mean RSI was 6.3 ± 5.6. A slight difference across the life-age was seen; as age increased, a slight rise in both the mean score and the standard deviation was visible.

Reliability analysis

The RSI scores obtained for the intra-rater reliability analysis in both the patient and control groups are showed in Table 2. A minor decrease of the mean RSI score in the re-test condition was visible in both groups; however, the Pearson correlation score was very high (> .90) for each group and no difference was found in the age spectrum.

The test-retest correlation data obtained through the Pearson test for each item of the RSI in the whole population studied (n =273) are reported in Table 3. In six out of nine items, the correlation score reached the value of .90, while for only one item (excess throat mucus or postnasal drip) was it was less than 0.8. The overall Cronbach α coefficient for the questionnaire for the 80 patients was extremely high (α = .99).

Validity analysis

The mean RSI score for the patients with LPR was 21.1 ± 6.6, while for the control group (n = 193) it was 6.3 ± 5.6; the difference for the Student's t-test was statistically significant (p = .0001).

The mean RFS score for the 80 patients was 9.2 ± 2.7 (range 7-18) and the correlation between RFS score and RSI score was rather high (r = .89). The correlation between each item of the RSI and the

RFS total score, as well as those between the sum of two items and subsequently three items of the RSI and the RFS total score are shown in Table 4. For the correlation between the sum of two items of the RSI and the RFS, as well as for that between the sum of three items of the RSI and the RFS, only values above .6 have been reported. The fourth item (difficulty swallowing food, liquids or pills) showed the highest correlation with RFS score (r = .72), while in the first three items the correlation was poor. By summing the scores obtained in two and afterwards three items of the RSI, there was an increased correlation with the RFS.

Discussion

The clinical dichotomy between LPR and classic GERD is based on differences in symptoms, manifestations, patterns, mechanisms and responses to therapy [15]. Because of the clinical differences, the same assessment tools cannot be used for both LPR and GERD. The RSI is a nine-item self-administered questionnaire, which is very useful for the documentation of symptoms in LPR patients. The psychometric properties of the Italian RSI were studied in a group of 80 patients and in a control group of almost 200 subjects; the results showed strong internal consistency, high test-retest reliability and optimal clinical validity.

Specific findings related to the Italian RSI are noteworthy. Firstly, each of the 433 questionnaires was completed fully, suggesting that all of the subjects understood all of the questions and were comfortable answering all of them. It might therefore be speculated that the RSI is not a burdensome instrument, being easily self-administered and requiring no more than five minutes to complete.

Also noteworthy are the findings for the control group. To the best of our knowledge, there are no studies reporting normative data of asymptomatic subjects analysed with the RSI. In fact, both the studies of Cohen [16] and of Belafsky [12] included small control groups of respectively 9 and 25 subjects. The mean RSI score of the control group in our study was lower than the threshold value of 13; however, a slight difference across the life-age was visible. In fact, as the age increased, a slight rise in the mean score was visible. Those findings suggest that the differences related to age could be an important factor in consideration of the evaluation of subjects with a suspected LPR.

As far as the reliability of the Italian RSI is concerned, the scores obtained in the test-retest condition in both the patient and control groups support the idea that the RSI has a high stability and reproducibility over time across the age spectrum. In fact, the Pearson correlation scores in both the patient and control groups was always higher than .9, a value considered optimal for both group comparison and individual measurements over time [17]. In the original study of Belafsky [12] the reliability of the RSI was also very high (r = .81), even if did not reach the threshold value of .9,

requested for individual measurements over time. It has to be considered that the small number of patients included in the original study might have influenced the reliability analysis. In the present study the high reproducibility was also found for each item of the RSI, suggesting that not only the RSI total score, but also each item score should be considered in the re-evaluation of patients with LPR.

The internal consistency appeared extremely high; again, the value obtained appeared optimal for both group comparison and individual measurements over time [17]. To our knowledge, the internal consistency has not been calculated in other studies and this further supports the psychometric properties of the Italian RSI.

The comparison between the RSI scores obtained in the pathological and the control group was statistically significant; thus the Italian RSI allows the distinguishing of symptomatic subjects from asymptomatic subjects. Also in the Belafsky's study the mean RSI score of the patients with LPR was significantly higher than in the control group, confirming similar psychometric properties in the two versions of the RSI.

The high correlation between these two instruments suggests that the RSI and the RFS investigate some integrated aspects of the same disease from two different points of view. Finally, the correlation analysis between each item of the RSI and the RFS total score suggests that no single symptom of the RSI can be associated with the presence of LPR. For this reason it is unlikely that a patient complaining of a single symptom will present LPR. On the contrary, as the presence of different symptoms increased, the correlation with RFS was higher; this datum suggests that the probability to find laryngoscopic signs of LPR increases if different symptoms are simultaneously present in a patient with a suspect LPR. In particular, a complaint of the following three symptoms might be considered indicative of LPR: difficulty swallowing food, liquids, or pills; troublesome or annoying cough; and sensation of something sticking in the throat or a lump in the throat.

Conclusion

The Italian RSI is easily administered, highly reproducible, and exhibits excellent clinical validity. Thus, the Italian RSI appears to be a useful self-administered questionnaire for the initial symptoms assessment in subjects with LPR as well as for its evaluation over time. As suggested by other authors [12], the RSI should be used together with the RFS in the everyday management of patients with LPR.

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Table 1: Normative data of the RSI in 193 subjects with no history of GERD, LPR or dysphonia.

Age group	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
< 20 years; (n = 30)	4	2.1	0	8
21-40 years; (n = 62)	5.3	2.5	0	9
41-60 years; (n = 51)	7	7.9	0	27
> 60 years; (n = 50)	8.9	7.1	0	23
Total (n = 193)	6.3	5.6	0	27

Table 2: Test-retest reliability in the 80 patients with LPR and in the control group assessed by Pearson test.

Population	**Test mean value**	**Retest mean value**	**Pearson test**
Control group: age < 20 years (n = 30)	4.0 ± 2.1	3.9 ± 2.1	0.94
Control group: age 21-40 years (n = 62)	5.3 ± 2.5	5.0 ± 2.4	0.93
Control group: age 41-60 years (n = 51)	7.0 ± 7.9	6.3 ± 7.3	0.98
Control group: age > 61 (n = 50)	8.9 ± 5.6	8.7 ± 5.6	0.93
Control group (n = 193)	6.3 ± 5.6	5.9 ± 5.0	0.95
LPR group (n = 80)	21.1 ± 6.6	19.6 ± 7.1	0.91

Table 3: Test-retest reliability of each of the 9 items of the RSI.

ITEM	Pearson Test
Hoarseness or a problem with your voice	0.85
Clearing your throat	0.80
Excess throat mucus or postnasal drip	0.78
Difficulty swallowing food, liquids, or pills	0.95
Coughing after you ate or after lying down	0.91
Breathing difficulties or choking episodes	0.90
Troublesome or annoying cough	0.90
Sensation of something sticking in your throat or a lump in your throat	0.94
Heartburn, chest pain, indigestion, or stomach acid coming up	0.90

Table 4: Correlation between one, the sum of two and three RSI items and RFS total score.

RSI item	Correlation with total RFS	RSI item	Correlation with total RFS	RSI item	Correlation with total RFS
Item 1	0.11	Item 1+4	0.60	Item 2+4+5	0.79
Item 2	0.24	Item 2+4	0.73	Item 2+4+6	0.79
Item 3	0.20	Item 3+4	0.67	Item 2+4+7	0.80
Item 4	0.72	Item 4+5	0.76	Item 3+4+5	0.77
Item 5	0.47	Item 4+6	0.73	Item 3+4+7	0.76
Item 6	0.50	Item 4+7	0.79	Item 4+5+6	0.77
Item 7	0.45	Item 4+8	0.69	Item 4+5+7	0.75
Item 8	0.41	Item 4+9	0.62	Item 4+5+8	0.79
Item 9	0.33	Item 6+8	0.61	Item 4+6+7	0.78
		Item 6+9	0.64	Item 4+6+8	0.76
		Item 7+8	0.65	Item 4+7+8	0.84

Appendix A: The Reflux Symptom Index

Whitin the last month, how did the following problems affect you? *Circle the appropriate response*		0 = No problem 5 = Severe problem					
Nel corso dell'ultimo mese in che modo è stato colpito dai seguenti sintomi? *Segnare la risposta corretta*		0 = Nessun problema 5 = Problema severo					
1	Hoarseness or a problem with your voice Raucedine o un problema vocale	0	1	2	3	4	5
2	Clearing your throat Schiarirsi la gola	0	1	2	3	4	5
3	Excess throat mucus or postnasal drip Eccesso di muco in gola o caduta retronasale di secrezioni	0	1	2	3	4	5
4	Difficulty swallowing food, liquids, or pills Difficoltà a inghiottire cibo, liquidi o pillole	0	1	2	3	4	5
5	Coughing after you ate or after lying down Tosse dopo aver mangiato o essersi sdraiato	0	1	2	3	4	5
6	Breathing difficulties or choking episodes Difficoltà a respirare o episodi di soffocamento	0	1	2	3	4	5
7	Troublesome or annoying cough Tosse problematica o fastidiosa	0	1	2	3	4	5
8	Sensation of something sticking in your throat or a lump in your throat Sensazione di qualcosa bloccato o di massa in gola	0	1	2	3	4	5
9	Heartburn, chest pain, indigestion, or stomach acid coming up Bruciore di stomaco, dolore toracico, cattiva digestione o acido gastrico che risale	0	1	2	3	4	5
		TOTAL TOTALE					