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Research article

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Relationship between voice handicap index and reflux symptom index in patients with laryngopharyngeal reflux with dysphonia: A cross-sectional study

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Ethics Committee Approval
The ethics committee approval (Date:04/02/2021-No:114) was obtained from the Ethics Committee for Non-Interventional Clinical Research, Dicle University Faculty of Medicine, for this study. All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

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No conflict of interest was declared by the authors.

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Abstract

Background/Aim: Laryngopharyngeal reflux (LFR) occurs due to the backward traveling of gastric contents through the esophagus, resulting in their contact with the upper respiratory tract and laryngopharynx. It has been determined that more than 50% of patients presenting with voice hoarseness may have a pathology associated with such reflux. Symptoms including hoarseness, difficulty in making high-pitched sounds, and a tired and cracked voice may occur due to changes in the vocal cord mucosa induced by the reflux. The present study investigated the relationship between the Reflux Symptom Index (RSI) and Voice Handicap Index-10 (VHI-10) evaluations of patients with significant findings for LFR.
Methods: Patients with an RSI score of 13 and above and RFS of 7 and above, considered significant for LFR, and patients aged between 18 and 65 years, who met the mandatory requirements, were included in the study. The patients included in the study were divided into three groups, mildly impaired (MII), moderately impaired (MOI), and severely impaired (SEI) based on their response to the question, "How do you feel about your voice?'' VHI-10 was also applied to the patients included in the study. The RSI and VHI-10 scores of the patients were separately recorded and compared using various parameters.
Results: Of the 38 patients included in the study, 18 (47.4%) were female and 20 (52.6%) were male. It was observed that RSI and VHI-10 scores increased significantly as the patients' level of voice disorder increased ($P<0.001$, $P<0.001$). A statistically significant positive correlation was found between the RSI and VHI-10 scores of the patients ($r=0.749$, $P<0.001$).
Conclusion: The high level of significant positive correlation between VHI-10 and RSI scores suggested that VHI-10 could serve as a valuable supportive tool in the evaluation of dysphonia in patients with LFR. RSI and VHI-10 can further play an important role in the initiation of appropriate treatment on diagnosis of LFR.

Keywords: Dysphonia, Laryngopharyngeal reflux, Reflux symptom index, Voice handicap index

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Introduction

The backward traveling of gastric contents via the esophagus causes contact with the upper respiratory tract and laryngopharynx, leading to laryngopharyngeal reflux (LFR). More than 10% of the patients presented to otorhinolaryngology outpatient clinics are considered to have LFR. More than 50% of patients with voice hoarseness are determined to have a pathology associated with such reflux [1]. LFR diagnosis can be overlooked by clinicians as several characteristic symptoms of classical reflux, including indigestion and pyrosis, are not prevalent in LFR [2]. The most common symptoms of LFR include voice disorders, cough, dysphagia, frequent throat clearing, and globus pharyngeus [3]. No gold standard diagnostic test solely intended for this clinical pathology exists; nevertheless, the Reflux Symptom Index (RSI) and Reflux Finding Score (RFS), the validity and reliability of which was demonstrated by Belafsky et al. [4, 5], have been used for the evaluation of patients with LFR symptoms.

Gastric content reflux that reaches the upper levels of the throat frequently affects vocal cords and consequently phonation. Symptoms, such as hoarseness, a tired and cracked voice, and difficulty in making high-pitched sounds may occur due to changes in the vocal cord mucosa. Failure to diagnose LFR for an extended period and the resultant delay in treatment may cause permanent deterioration in the vocal cord mucosa and lasting voice disorders, whereas timely diagnosis based on associated symptoms and appropriate treatment implementation may prevent permanent damage and lead to recovery [6].

In this study, the literature-recommended RSI and RFS values were applied to patients with voice disorders persisting for more than three months and/or accompanying symptoms, such as cough, dysphagia, frequent throat clearing, globus sensation in the throat, etc. We investigated the relationship between RSI and Voice Handicap Index-10 (VHI-10) by applying it to patients, resulting in significant findings for LFR.

Materials and methods

This study was carried out in Mardin State Hospital Otorhinolaryngology Outpatient Clinic between March and August of 2021. Of the 152 patients who applied to the otolaryngology outpatient clinic with the complaint of dysphonia in a six-month period, 38 patients who had significant findings in terms of LFR and agreed to participate were included in the study. The required ethics committee approval (Date:04/02/2021-No:114) was obtained from the Ethics Committee for Non-Interventional Clinical Research, Dicle University Faculty of Medicine, for this study. The patients included in the study underwent physician examinations at the Otorhinolaryngology Outpatient Clinic. Patients with LFR-related symptoms received complete ear, nose, and throat (including larynx) examinations. Akbulut et al. [7] performed the Turkish validity and reliability study of RSI and RFS, which was utilized in this study only for patients presenting with voice hoarseness as a symptom suggesting LFR. The inclusion criteria of the study were as follows: patients with an RSI score of 13 and above and RFS of 7 and above, which were considered significant for LFR, and patients between the ages of 18 and 65 years, who met the mandatory requirements. The patients included in the study were divided into three groups, mildly impaired (MII), moderately impaired (MOI), and severely impaired (SEI) based on their response to the question, “How do you feel about your voice?” All the patients, regardless of their participation in the study, were recommended dietary and lifestyle changes and prescribed proton pump inhibitors. VHI-10 was also administered to the patients included in the study. The RSI and VHI-10 scores of the patients were separately recorded and compared by various parameters.

Study inclusion criteria

The presence of voice disorders, such as hoarseness and a cracked voice, for at least three months and the absence of previous vocal cord surgery, neck radiotherapy, known allergic history, tobacco use, psychiatric and mental health disorders hindering communication were considered inclusion criteria. In addition, a healthy assessment, recent proton pump inhibitor or other antireflux drug use as well as the presence of symptoms suggesting LFR upon examinations and assessments were considered for inclusion in this study.

Exclusion criteria

Presence of any organic laryngeal pathology apart from the findings specified in the RFS, neurological clinical condition that might cause abnormalities in phonation, upper respiratory tract infection in the last three weeks, untreated thyroid gland-related diseases, and chronic exposure to chemical agents were considered as the exclusion criteria of this study.

Data collection tools

VHI-10

Adapted to the Turkish population by Kılıç et al. [8], VHI-10 is a 5-point Likert scale that consists of 30 items scored between 0 and 4 points, where a higher score indicates more severe voice disorder, which is associated with deteriorated daily life quality.

RSI

The RSI is a 6-point Likert scale consisting of nine items, each rated between 0 and 5. The minimum and maximum scores of RSI are 0 and 45, respectively. An RSI score of 13 or above is considered significant for LFR [4].

RFS

The RFS scores eight common symptoms of LFR by the degree of their severity. The minimum and maximum scores of RFS are 0 and 26, respectively. Belafsky et al. [5] suggested a 95% likelihood of LFR in a patient with a total RFS score of 7 or above.

Statistical analysis

IBM SPSS Version 21.0 for Windows software program was used for statistical assessment of the data. The measured variables were presented as mean (standard deviation (SD)) and median, whereas categorical variables were presented as numbers and percentages. Distribution normality hypothesis was tested for the data. The independent t test was used for the comparison of two independent groups with normal distribution. The Kruskal–Wallis H test was used to compare groups without normal distribution, with more than two options. The Mann–Whitney U test was used after Bonferroni correction for post hoc analysis in the binary comparison of the groups. Spearman’s correlation test and simple linear regression analysis were

performed to evaluate the relationship between the continuous variables. The hypotheses were dual and a *P*-value of ≤0.05 was considered as statistically significant.

Results

Of the 38 patients included in the study, 18 (47.4%) were female and 20 (52.6%) were male. No statistically significant difference was observed between the sexes by age and RSI and VHI-10 scores (Table 1).

Table 1: Comparison of age, total RSI score, and total VHI-10 score parameters by sex

Sex	Parameter	N (%)	x̄	SD	DF	*t*	*P*-value
Female	Age (years)	20(52.6)	35.75	9.96	37	0.238	0.814
Male		18(47.4)	34.72	15.73			
Female	RSI	20(52.6)	28.95	9.34	37	1.351	0.185
Male		18(47.4)	24.78	9.69			
Female	VHI	20(52.6)	29.65	10.57	37	1.656	0.106
Male		18(47.4)	23,11	13.71			

N: Number, x̄: Mean, SD: Standard deviation, DF: Degree of freedom, *t*: Independent t test value, RSI: Reflux Symptom Index, VHI-10: Voice Handicap Index-10

The patients were divided into three groups based on their responses to the question, "How do you feel about your voice?" Fourteen patients (36.8%) responded indicating mildly impaired (MII), 10 (26.3%) as moderately impaired (MOI), and 14 (36.8%) as severely impaired (SEI). There was a significant difference in the RSI scores among the three groups (MII median: 20.50; MEI median: 23.50; SEI median: 33.00; $P<0.001$). Upon paired intergroup comparisons, statistically significant differences in RSE scores between SEI and MOI ($P=0.011$) and between SEI and MII ($P=0.001$) were observed, whereas no statistically significant difference between RSE scores of MII and MOI was found (Table 2).

Table 2: Evaluation of the RSI scores based on the patients' responses to the question "How do you feel about your voice?"

Group	N (%)	Median	x̄ (SD)	*H*	*P*-value*
(MII)[1]	14(36.8)	20.50	19.21 (4.49)		<0.001*
(MOI)[2]	10(26.3)	23.50	25.90 (8.14)	21,684	P^{1-3}<0.001
(SEI)[3]	14(36.8)	33.00	35.50 (7.26)		P^{2-3}=0.011, P^{1-2}=0.048

MII: Mildly impaired, MOI: Moderately Impaired, SEI: Severely Impaired, N: number, x̃: mean, SD: standard deviation, *H*: Kruskal–Wallis H test value, *P**: Kruskal–Wallis H test statistical significance value, Mann–Whitney U test used in binary comparisons. Bonferroni correction used ($P<0.016$).

The intergroup comparisons of VHI-10 scores indicated a significant difference among the three groups (MII median: 11.00; MEI median: 32.00; SEI median: 41.00, $P<0.001$). Upon paired intergroup comparisons, statistically significant differences in VHI-10 scores between MII and MOI ($P=0.002$) and between SEI and MII ($P=0.001$) were found, whereas no statistically significant difference between RSE scores of SEI and MOI was observed (Table 3).

Table 3: Evaluation of the VHI-10 scores based on the patients' responses to the question "How do you feel about your voice?"

Group	N (%)	Median	x̄ (SD)	*H*	*P*-value*
(MII)[1]	14(36.8)	11.00	14.93 (9.42)		<0.001*
(MOI)[2]	10(26.3)	32.00	30.30 (7.20)	20,000	P^{1-2}=0.002
(SEI)[3]	14(36.8)	41.00	35.50 (8.56)		P^{1-3}<0.001
					P^{2-3}=0.086

MII: Mildly Impaired, MOI: Moderately Impaired, SEI: Severely Impaired, N: number, x̃: mean, SD: standard deviation, *H*: Kruskal–Wallis H test value, *P**: Kruskal–Wallis test statistical significance value, Mann–Whitney U test used in pair comparisons. Bonferroni correction used ($P<0.016$).

A statistically significant positive correlation was observed between the RSI and VHI-10 scores of the patients ($r=0.749$, $P<0.001$; Table 4, Figure 1).

Simple linear regression analysis found the RSI scores to be a significant predictor of the VHI-10 scores ($F=47.114$, $P<0.001$). The RSI scores predicted 56% of the VHI-10 score variances. A one-unit increase in the RSI scores of the patients led to a 0.974 unit increase in their VHI-10 scores. The equation for predicting the VHI-10 scores was as follows: VHI score= −75.667 + 0.974 × RSI score (Table 5).

Table 4: Result of the Spearman's correlation test evaluating the relationship between the total RSI and VHI-10 scores

	n	*r*	*P*-value
RSI	38	0.749	<0.001
VHI			

RSI: Reflux Symptom Index, VHI-10: Voice Handicap Index-10, N: number, *r*: correlation coefficient, The Spearman's correlation test found a significant positive relationship between total RSI and VHI-10 scores of the patients ($r=0.749$, $P<0.001$).

Figure 1: Correlation between the total RSI and VHI scores

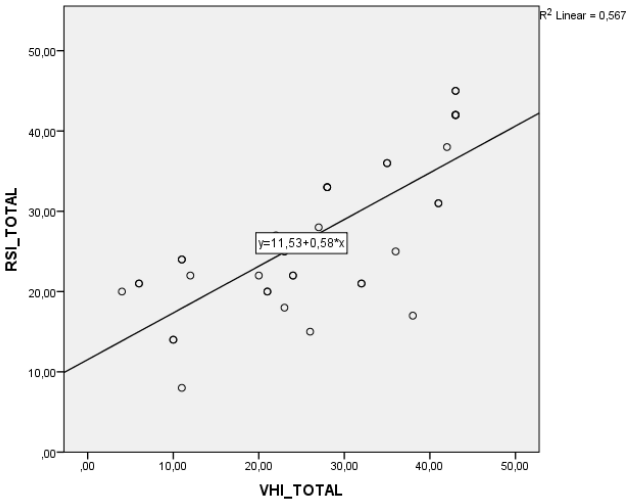

Table 5: Simple linear regression analysis to predict the VHI-10 scores by the RSI scores

	R	R^2	*F*	*P*-value	*B*
RSI	0.753	0.567	47.114	<0.001	0.974

RSI: Reflux Symptom Index, Simple linear regression analysis was performed to predict the VHI-10 scores by the total RSI scores. The RSI scores were a significant predictor of the VHI-10 scores ($F=47.114$, $P<0.001$). The RSI scores predicted 56% of the VHI-10 score variances. A one-unit increase in the RSI score increased the VHI-10 scores by 0.974 units. The equation that predicted the VHI-10 score was as follows: VHI score=−75.667 + 0.974 × RSI score.

Discussion

LFR presentation is quite prevalent in the otorhinolaryngology practice and induces dysphonia in patients [9]. The results of this study suggested a strong and positive relationship between RSI, intended for evaluating LFR, and VHI-10, which is used to investigate the effect of dysphonia on the quality of life. Despite the high prevalence of LFR, no gold standard test or diagnostic method has been developed yet, and research on its pathophysiology, diagnosis, and treatment continues [2]. Although there is no consensus on the standardization of LFR diagnostic criteria, the multichannel intraluminal impedance-pH monitoring can be used in the diagnosis process [10]. However, RSI and RFS are more commonly used in practice due to difficulties with ambulatory pH monitoring [5, 11]. A number of studies in the relevant literature suggest hoarseness as one the most common symptoms associated with LFR [2, 12, 13]. Although the pathophysiology of LFR-related hoarseness is not well-established, the contact of pepsin and acid with the vocal cord surface during reflux was one suggested mechanism of this condition; 55%–79% of the patients with hoarseness persisting for more than three months had LFR [14, 15].

VHI is a tool that investigates the effect of voice disorders on the patient's quality of life [16, 17]. It is one of the most widely used surveys worldwide in the evaluation of voice disorders. The original 30-point VHI (VHI-30) was translated into several languages [17, 18]. Over time, a simplified 10-point version (VHI-10) was developed, reducing the time spent on the

procedure and making it easily implementable in a clinical environment while maintaining statistical significance [16]. In this study, VHI-10 adapted to the Turkish language was used for LFR patients presenting with hoarseness [8].

The VHI-10 scores were suggested to be higher in patients with LFR than in the healthy control group [19]. Lechien et al. [9] reported that VHI could be employed to identify, follow-up, and assess voice disorders in patients with LFR.

A number of studies on the relationship between LFR and RSI and VHI have been adapted to several languages [9, 15, 20-22]. A study investigating the RSI and VHI-30 indexes in patients with LFR, adapted to Arabic, reported a statistically significant correlation between RSI and VHI-30 [23]. Another study by Alanazi et al. [15] suggested that there was a significant relationship between RSI and VHI-10 scores, and thus, these indexes could prove to be valuable tools for monitoring patients with LFR.

Upon evaluating the relationship between the VHI-10 and RSI scores and the responses of the patients to the question, “How do you feel about your voice?” the patients’ perceived severity of their voice impairment and index scores were observed to be significantly affected by their voice disorders. Spearman’s correlation analysis of VHI-10 and RSI scores indicated a strong positive correlation between them. This supports the suggestion that index scores could serve as important tools for the initial evaluation, follow-up, and detection of dysphonic severity in LFR-related dysphonia.

Limitations

The limitations of the study included the restricted number of patients, diagnoses not confirmed by pH monitoring, and the lack of certain measurements, such as acoustic analyses, of patients with dysphonia. Therefore, further multicenter studies with larger samples accommodating objective diagnostic methods would contribute to the ongoing research.

Conclusion

The high level of significant correlation between VHI-10 and RSI scores suggested that VHI-10 could serve as a valuable supportive tool in the evaluation of dysphonia in patients with LFR. Since multichannel intraluminal impedance-pH monitoring technology is currently in limited use due to issues associated with availability, applicability, and cost, RSI and VHI-10 can play an important role in the initiation of appropriate treatment following diagnosis. Furthermore, they can also play an important role as prognostic indicators of LFR. The symptoms of laryngopharyngeal reflux may differ from the symptoms of classical gastroesophageal reflux. Therefore, this should be kept in mind in the differential diagnosis of patients who come to the outpatient clinic with dysphonia. Finally, we recommend long-term studies with larger samples to explore the role of RSI.

References

1. Ford CN. Evaluation and management of laryngopharyngeal reflux. JAMA. 2005 Sep 28;294(12):1534-40. doi: 10.1001/jama.294.12.1534.
2. Sataloff RT, Hawkshaw MJ, Gupta R. Laryngopharyngeal reflux and voice disorders: an overview on disease mechanisms, treatments, and research advances. Discov Med. 2010 Sep;10(52):213-24. PMID: 20875343.
3. Tauber S, Gross M, Issing WJ. Association of laryngopharyngeal symptoms with gastroesophageal reflux disease. Laryngoscope. 2002 May;112(5):879-86. doi: 10.1097/00005537-200205000-00019.
4. Belafsky PC, Postma GN, Amin MR, Koufman JA. Symptoms and findings of laryngopharyngeal reflux. Ear Nose Throat J. 2002 Sep;81(9 Suppl 2):10-3. PMID: 12353425.
5. Belafsky PC, Postma GN, Koufman JA. Validity and reliability of the reflux symptom index (RSI). J Voice. 2002 Jun;16(2):274-7. doi: 10.1016/s0892-1997(02)00097-8.
6. Yorulmaz İ. Larengofaregeal Reflü. KBB-Forum. 2002;1(1):22-34.
7. Akbulut S, Aydinli FE, Kuşçu O, Özcebe E, Yilmaz T, Rosen CA,et al. Reliability and Validity of the Turkish Reflux Symptom Index. J Voice. 2020 Nov;34(6):965.e23-965.e28. doi: 10.1016/j.jvoice.2019.05.015.
8. Kiliç MA, Okur E, Yildirim I, Oğüt F, Denizoğlu I, Kizilay A, et al. Ses Handikap Endeksi (Voice Handicap Index) Türkçe versiyonunun güvenilirliği ve geçerliliği [Reliability and validity of the Turkish version of the Voice Handicap Index]. Kulak Burun Bogaz Ihtis Derg. 2008;18(3):139-47.
9. Lechien JR, Huet K, Khalife M, Fourneau AF, Delvaux V, Piccaluga M, et al. Impact of laryngopharyngeal reflux on subjective and objective voice assessments: a prospective study. J Otolaryngol Head Neck Surg. 2016 Nov 8;45(1):59. doi: 10.1186/s40463-016-0171-1.
10. Lechien JR, Akst LM, Hamdan AL, Schindler A, Karkos PD, Barillari MR, et al. Evaluation and Management of Laryngopharyngeal Reflux Disease: State of the Art Review. Otolaryngol Head Neck Surg. 2019 May;160(5):762-82. doi: 10.1177/0194599819827488.
11. Belafsky PC, Postma GN, Koufman JA. The validity and reliability of the reflux finding score (RFS). Laryngoscope. 2001 Aug;111(8):1313-7. doi: 10.1097/00005537-200108000-00001.i
12. Cohen JT, Bach KK, Postma GN, Koufman JA. Clinical manifestations of laryngopharyngeal reflux. Ear Nose Throat J. 2002 Sep;81(9 Suppl 2):19-23. PMID: 12353427.
13. Siupsinskiene N, Adamonis K, Toohill RJ. Quality of life in laryngopharyngeal reflux patients. Laryngoscope. 2007 Mar;117(3):480-4. doi: 10.1097/MLG.0b013e31802d83cf.
14. Lechien JR, Saussez S, Harmegnies B, Finck C, Burns JA. Laryngopharyngeal Reflux and Voice Disorders: A Multifactorial Model of Etiology and Pathophysiology. J Voice. 2017 Nov;31(6):733-52. doi: 10.1016/j.jvoice.2017.03.015.
15. Alanazi R, Alrahim A, Bayounos S, Al-Ghuwainem A, Al-Bar MH. Association Between Voice Handicap Index and Reflux Symptom Index: A cross-sectional study of undiagnosed general and teacher cohorts in Saudi Arabia. Sultan Qaboos Univ Med J. 2018 Aug;18(3):e350-e354. doi: 10.18295/squmj.2018.18.03.014.
16. Rosen CA, Lee AS, Osborne J, Zullo T, Murry T. Development and validation of the voice handicap index-10. Laryngoscope. 2004 Sep;114(9):1549-56. doi: 10.1097/00005537-200409000-00009.
17. Jacobson BH, Johnson A, Grywalski C, Silbergleit A, Jacobson G, Benninger MS,et al. The voice handicap index (VHI) development and validation. Am J Speech Lang Pathol. 1997;6(3):66-70. doi:10.1044/1058-0360.0603.66
18. Saleem AF, Natour YS. Standardization of the Arabic version of the Voice Handicap Index: an investigation of validity and reliability. Logoped Phoniatr Vocol. 2010 Dec;35(4):183-8. doi: 10.3109/14015439.2010.490851.
19. Pribuisiene R, Uloza V, Kupcinskas L, Jonaitis L. Perceptual and acoustic characteristics of voice changes in reflux laryngitis patients. J Voice. 2006 Mar;20(1):128-36. doi: 10.1016/j.jvoice.2004.12.001.
20. Lapeña JFF Jr, Ambrocio GMC, Carrillo RJD. Validity and Reliability of the Filipino Reflux Symptom Index. J Voice. 2017 May;31(3):387.e11-387.e16. doi: 10.1016/j.jvoice.2016.09.013.
21. Lechien JR, Huet K, Finck C, Khalife M, Fourneau AF, Delvaux V, et al. Validity and Reliability of a French Version of Reflux Symptom Index. J Voice. 2017 Jul;31(4):512.e1-512.e7. doi: 10.1016/j.jvoice.2016.11.020.
22. Calvo-Henríquez C, Ruano-Ravina A, Vaamonde P, Lattomus K, Sebio A, Fernández-Rodríguez R, et al. Translation and Validation of the Reflux Symptom Index to Spanish. J Voice. 2019 Sep;33(5):807.e1-807.e5. doi: 10.1016/j.jvoice.2018.04.019.
23. Kaddah F-AA-H, Hassan SM, Shoeib RM, Jawad J. Laryngopharyngeal reflux: Correlation between reflux symptom index, reflux finding score and voice handicap index. Saudi Journal of Otorhinolaryngology Head and Neck Surgery. 2011;13(1):24.doi: 10.4103/1319-8491.274739.

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