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ORIGINAL ARTICLE

The prevalence of dysphonia and dysphagia in patients affected by immunomediated diseases and the role of psychometric tests

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Abstract

This cross-sectional investigation examined the prevalence and severity of dysphonia, globus pharyngeus, and dysphagia in patients affected by immunomediated (IM) diseases. Seventy subjects were administered the *Voice Handicap Index* (VHI) (scale 0–4), *Glasgow-Edinburgh Throat Scale* (GETS) (scale from 0 to 7) for globus pharyngeus assessment, and modified *Swallowing Outcomes After Revised Laryngectomy* (SOAL) (scale 0, 1, 2) to test swallowing symptoms. VHI: the mean percentage of answers with a score greater than 1 (corresponding to a frequency of situation's occurrence "sometimes," "almost always," or "always") was 25.7, 26.7, and 44.1% for functional, emotional, and physical groups of sub-items respectively. GETS: the mean percentage of answers with a score ≥ 3 was 60.85%, significantly higher if compared with that of answers with a score < 3 (40.14%). The mean percentages of answers with a score 0–2, 3–4, and 5–7 were 40.1, 16.7, and 43.7% respectively. SOAL: a mean of 57.9% of answers gained a symptomatic score (1 ["a little"] or 2 ["a lot"]) and 41.9%, the score 0. The difference was statistically significant ($p < 0.05$). The first two most recurrent items with a score 2 ("a lot") were "Do you have a problem swallowing dry food?" (46%) and "Do you have a problem swallowing solid food?" (36%). The study represents the first to describe the globus pharyngeus symptoms in IM population. Moreover, it allows to confirm the recurrence of dysphonia and dysphagia in this type of patients. Particularly, it has been demonstrated that the alteration of swallowing function is related to solid and dry food. The self-assessment questionnaires proved as a useful tool to early detection of dysfunctions in order to avoid further deterioration of quality of life and to prevent serious life-threatening complications.

Keywords Dysphonia · Dysphagia · Globus pharyngeus · Immunomediated diseases

Introduction

As widely reported in the literature, inflammatory or non-inflammatory rheumatological diseases commonly manifest with voice and/or swallowing disorders due to the disease itself or the treatment administered [1, 2]. Immunomediated (IM) diseases may affect laryngeal function and vocal fold vibration sometimes with observed vocal cord abnormalities (e.g., bamboo nodules in rheumatoid arthritis). Nevertheless, the most common disease-modifying antirheumatic drugs (DMARDs) have side effect profiles that may cause or exacerbate voice symptoms. Examples include methotrexate (oral mucositis), sulfasalazine (stomatitis, cough), leflunomide (mucositis), and sodium aurothiomalate (stomatitis) [3]. The dysphonia produced by such modifications, at least in part related to an association with depression and perception of emotional and physical well-being [4], is an impairment that worsens the quality of life [5–7].

On the other hand, the swallowing disorders observed in IM diseases mostly involve the oral-pharyngeal and esophageal phases and globus pharyngeus that is a common related symptom. It is defined as the feeling of a lump in the throat; it has an uncertain origin. The unfortunate common feature of connective tissue disorders (systemic sclerosis [SS], Sjogren

I. Olivieri passed away during the preparation of this study.

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syndrome [SjS], rheumatoid arthritis [RA]) is the lack of adequate salivary flow (xerostomia) [8]. Dry laryngopharyngeal mucosa may increase the residue with solid and semi-solid foods during swallowing. However, the pathologic mechanisms responsible for the solid-food IM dysphagia are not well understood. Most patients do not have esophageal motility abnormalities while in some cases non-specific esophageal motility abnormalities have been documented [9–11]. In SjS patients, esophagus atrophy and motor coordination problem may occur. RA patients may develop cricoarytenoid joint dysfunction [12], laryngeal synovitis, pharyngeal segment immobility, and secondary amyloidosis or dysfunction owing to inflammation and destruction of the cervical spine and mandible as well [13]. Dysphagia is most commonly related to pill-induced esophagitis form the nonsteroidal antiinflammatory drugs (NSAIDs) or the bisphosphonates used to retard bone loss secondary to corticosteroid use but in patients affected by vasculitis the oral and esophageal ulcers, the worsening of pulmonary functions and the severity of reflux could contribute to swallowing dysfunctions. Moreover the anomalies of the esophageal motility can be associated [14]. Aspiration, pneumonia, malnutrition, increased mortality, prolonged hospitalization, advanced disability, and declined quality of life may accompany the difficulty in swallowing making its early diagnosis and treatment a fundamental issue in preventing such life-threatening complications.

The primary objective of this study was to investigate the prevalence of voice and swallowing symptoms in rheumatic patients, as well as its impact on their quality of life by means of self-assessment questionnaires. The secondary aim was to assess the prevalence and severity of globus-type symptoms, as measured by the Glasgow-Edinburgh Throat Scale (GETS) score and, finally, to evaluate the role of psychometric tests in recognizing the features of voice and swallowing quality impairments.

Materials and methods

From April to November 2017, at the clinics and the rheumatology department of Potenza St. Carlo's Hospital, we did the survey recruiting patients affected by IM diseases. The exclusion criteria were the following: age over 65 and under 18 years; thyroid, laryngeal, esophageal, gastric, or respiratory diseases or previous surgery; past or present swallowing or voice rehabilitation therapy. All patients routinely underwent ENT evaluation including flexible fiber optic rhinolaryngoscopy to evaluate the anatomical integrity of pharynx and larynx. From a series of 86 patients, 16/86 met exclusion criteria and 70/86 patients were considered. Fifty-nine cases were female and 11 were males with a mean age of 53 years (min. 40 max. 64). Forty-one patients were affected by SS, 14 cases by SjS, 5 by vasculitis, and 10 by other autoimmune diseases. In order to assess the quality of voice and swallowing function, we selected three questionnaires, illustrated below, translated into Italian, and tested in a preliminary set of 30 patients, different from those recruited for the present study. The interviews were done to the patients by two trained researchers (DC, DM). A written informed consent was obtained from all the participants included in the study.

Voice Handicap Index questionnaire

It is a long-standing validated screening self-reported measure of patient's perceived handicap or impairment from their voice [15]. It encompasses 30 questions, divided into three groups according to the situation (functional, physical, or emotional). Each of the last ones includes ten specific situations or questions, identified by their frequency of occurrence through a progressive numeric scale: 0 (never), 1 (almost never), 2 (sometimes), 3 (almost always), and 4 (always). We calculated a partial score for each of the three parameters and a total score, the latter varying between 0 and 120. A score above 11 is defined as abnormal [16].

Glasgow-Edinburgh Throat Scale

The GETS was widely used from 1995 to measure the presence and severity of globus pharyngeus (GF) symptoms. It is a ten-item questionnaire, based on an 8-grade Likert scale, from 0 (absent) to 7 (unbearable). In order to obtain an outcome more clinically oriented, we divided the distribution of the GETS scores into three classes: 0–2 (absent), 3–4 (mildly symptomatic), 5–7 (strongly symptomatic). The total GETS score computed summing the score of 12 items, so the highest possible score is 70. Each item explores a different symptom in the domain of globus pharyngeus (Table 1). In its original form, the GETS showed a good reliability, with a Cronbach alpha value of 0.83. Factor analysis revealed the presence of three subscales, grouping set of items: related to swallowing, related to globus sensation, related to painful throat. Two more items are present, whose scores were not computed in the total of GETS score but accounts for the somatic distress reaction to symptoms (SDR score: "How much time do you spend thinking about your throat?" and "At present, how annoying do you find your throat sensation?").

Swallowing Outcomes After Revised Laryngectomy questionnaire

This is a questionnaire [17, 18] usually employed to assess dysphagia after laryngectomy. Basing on the pre-established

Table 1 Glasgow-Edinburgh Throat Scale (GETS)

Items	0 (absent)	1	2	3	4	5	6	7 (unbearable)
1. Feeling of something stuck in the throat								
2. Pain in the throat								
3. Discomfort/irritation in the throat								
4. Difficulty in swallowing food								
5. Swelling in the throat								
6. Throat closing off								
7. Catarrh down throat								
8. Can't empty throat when swallowing								
9. Want to swallow all the time								
10. Food sticking when swallowing								

quality criteria by Terwee CB et al. [19], we made a psychometric reassessment of Swallowing Outcomes After Revised Laryngectomy (SOAL) in order to obtain sufficient validity and reliability (Table 2). Within the context of oropharyngeal dysphagia assessment, the questionnaire aims to quantify the symptomatic severity of dysphagia as experienced by the patient. It consists of 17 items using three response options "no" (score 0), "a little" (score 1), or "a lot" (score 2). The total lowest score is 0 (last impaired), whereas the highest possible one is 34.

Statistical analysis was performed using commercially available software (Excel–Microsoft Corporation, Redmond, Washington, USA). Numerical data were compared applying Student's *t* test. The level of significance was set at $p < 0.05$.

Results

Voice Handicap Index

The mean percentage of answers with a score greater than 1 (corresponding to a frequency of situation's occurrence "sometimes," "almost always," or "always") was 25.7, 26.7, and 44.1% for functional, emotional, and physical groups of sub-items respectively. Nevertheless, these frequencies were statistically lower ($p < 0.05$) if compared with those of answers with a score between 0 and 1 (74.3, 73.3, and 55.9% for functional, emotional, and physical groups of sub-items respectively). In the functional section, a score greater than 1 occurred most frequently for item F1 (16%) that is "My voice

Table 2 Swallowing Outcomes After Revised Laryngectomy (SOAL) questionnaire modified

Items	Score 0 (absent)	Score 1 (a little)	Score 2 (a lot)
1. In your opinion, do you have a swallowing problem now?			
2. Do you have a problem swallowing thin liquids (tea, water, juice)?			
3. Do you have a problem swallowing thick liquids (soup, milkshake, drinks)?			
4. Do you have a problem swallowing soft/mashed foods (pasta, shepherds pie)?			
5. Do you have a problem swallowing solid food?			
6. Do you have a problem swallowing dry solid food (bread, biscuits)?			
7. Do you have a problem swallowing saliva?			
8. Do you have a problem starting to swallow?			
9. Does food stick in your throat when you swallow?			
10. It never happens that you cough when you swallow solid food?			
11. It never happens that you cough when you swallow liquid food?			
12. Does it take longer to eat a meal?			
13. Does food or liquid come back up into your mouth or nose when you eat or drink?			
14. Do you need to swallow many times to help the food/drink go down?			
15. Do you ever spit or cough food or liquids during a meal?			
16. In your opinion, how serious is your swallowing problem?			
17. Does your swallowing problem interferes with your quality of life?			

makes it difficult for people to hear me" followed by item F2 "People have difficulty understanding me in a noisy room" that occurred in 14.4% of cases. Moreover, E3 "I find other people don't understand my voice problem" was the most frequent (14.4%) sub-item with a score above 1 reported in emotional section, followed by E4 "My voice problem upsets me" (13.3%). Finally, in the physical section, the P1 and P4 sub-items respectively "I run out of air when I talk" and "My voice sounds creaky and dry" were the most frequent (22.2 and 21.1%) with a score above 1. Table 3 showed the frequency of all items in decreasing order. Comparing the frequencies of the answers in patients affected by SjS, SS, vasculitis, and other IM diseases, those with SjS showed the greater number of answers with a score > 1 in all sections of sub-items (functional, emotional, and physical) (Table 4).

Glasgow-Edinburgh Throat Scale

The mean percentage of answers with a score ≥ 3 was 60.85%, significantly higher if compared with that of answers with a score < 3 (40.14%). Most of the answers had a score within 5 and 7 (strongly symptomatic). Particularly, the mean percentages of answers with a score 0–2, 3–4, and 5–7 were 40.1, 16.7, and 43.7% respectively. The differences, comparing the mean percentages of answer categories 3–4 vs 5–7 and 0–2 vs 3–4, were significant ($p < 0.05$). The most frequent sub-items with 5–7 points were "Difficulty in swallowing food" and "Feeling of something stuck in the throat" with a recurrence rate of 54.3 and 52.9% respectively. The frequencies of the remaining answers are shown in a decreased order in Table 5. About the two items for SDR, more than half of the answers (52.9%) revealed

Table 3 Mean prevalence (%) of VHI items with score > 1 in decreased order

		Prevalence %
Functional		
F1	My voice makes it difficult for people to hear me	16.1
F2	People have difficulty understanding me in a noisy room	14.4
F6	I speak with friends, neighbors, or relatives less often because of my voice	11.1
F5	I tend to avoid groups of people because of my voice	10.6
F10	My voice problem causes me to lose income	10.6
F4	I use the phone less often than I would like to	8.9
F8	My voice difficulties restrict my personal and social life	8.9
F3	My family has difficulty hearing me when I call throughout the house	6.7
F9	I feel left out of conversation because of my voice	6.7
F7	People ask me to repeat myself when speaking face-to-face	6.1
Emotional		
E3	I find other people don't understand my voice problem	14.4
E4	My voice problem upsets me	13.3
E2	People seem irritated with my voice	12.2
E7	I feel annoyed when people ask me to repeat	11.1
E8	I feel embarrassed when people ask me to repeat	10.6
E5	I am less outgoing because of my voice problem	10.0
E1	I am tense when talking with others because of my voice	9.4
E6	My voice makes me feel handicapped	8.3
E9	My voice makes me feel incompetent	7.2
E10	I am ashamed of my voice problem	7.2
Physical		
P1	I run out air when I talk	22.2
P4	My voice sound creaky and dry	21.1
P2	The sound of my voice varies throughout the day	20.6
P3	People ask, "What's wrong with your voice?"	20.0
P6	The clarity of my voice is unpredictable	16.1
P5	I feel as though I have to strain to produce voice	15.6
P9	My voice is worse in the evening	15.0
P10	My voice "gives out" on me in the middle speaking	14.4
P7	I try to change my voice to sound different	13.9
P8	I use a great deal of effort to speak	12.8

Table 4 VHI: distribution of answers with a score > 1 for each section of sub-items in different groups of IM disease

	Functional (%)	Emotional (%)	Physical (%)
Sjögren syndrome	33	37	51
Systemic sclerosis	26	24	50
Vasculitis	20	20	28
Others	19	21	23

the presence of symptoms, precisely the 17.1% of answers were included in "mildly symptomatic" class and the remaining 35.7% in the "strongly symptomatic" one.

The results for each IM disease are shown in Table 6. The patients affected by SjS answered overall with a score "strongly symptomatic" (57%) following by the cases of SS (41%), vasculitis (35%), and other IM diseases (25%).

Swallowing Outcomes After Revised Laryngectomy questionnaire (modified)

A mean of 57.9% of answers gained a symptomatic score (1 ["a little"] or 2 ["a lot"]) and 41.9%, the score 0. The difference was statistically significant ($p < 0.05$). The mean percentages of the answers with the scores 0, 1, and 2 were 41.9, 35.8, and 22.1% respectively. The mean percentage of answers with a score 2 was significantly lower comparing to that with scores 0 and 1. The first two most recurrent items with a score 2 ("a lot") were respectively "Do you have a problem swallowing dry food?" (46%) and "Do you have a problem swallowing solid food?" (36%). The frequencies of the remaining answers are shown in Table 7. Comparing the frequencies of the answers in patients affected by SjS, SS, vasculitis, and other IM diseases, those with SjS showed the greater mean number of answers with a score 2 ("a lot") (Table 6).

Table 5 Mean prevalence (%) of GETS items with score 5–7 in decreased order

Items		Prevalence (%)
4	Difficulty in swallowing food	54.3
1	Feeling of something stuck in the throat	52.9
3	Discomfort/irritation in the throat	51.4
7	Catarrh down throat	47.1
8	Cannot empty throat when swallowing	44.3
10	Food sticking when swallowing	42.9
6	Throat closing off	38.6
5	Swelling in the throat	37.1
2	Pain in the throat	34.3
9	Want to swallow all the time	34.3

Discussion

Patients with severe IM diseases are more aware of their rheumatic abnormalities than voice or swallowing disorders, although the latter, as evidenced in few researches [5, 20–24], do influence their quality of life. Dysphonia or dysphagia may be the first sign of an autoimmune disease [5, 22, 23] even if all the cases studied here were previously diagnosed. The current epidemiological investigation describes self-reported data from 70 participants. In our cohort, the majority of subjects (60.85 and 57.9% respectively in GETS and SOAL *mod.* tests) suffered from dysphagia. The percentages are at the upper range of 32–71% previously described by other studies [25–27] and higher than that observed in the general adult population (12%) [28].

Over time, there have been a number of tools developed focusing on dysphagia-related symptoms and dysphagia-related quality of life. The SOAL questionnaire was shown to have good discrimination power and a strong correlation with instrumental measures also for non-laryngectomized dysphagic groups testing as demonstrated by Govender et al. [29]. So, currently, SOAL is a simple and accessible screening test widely used to detect and characterize the swallowing disorders. The percentage of IM patients that complain dysphagia varies depending on the specific disease. The literature reports 87% for SS [30–33], 32–85% for SjS, and about 33% for RA [34]. In our sample, a mean of 57.9% of answers reached a symptomatic score. Of the 17 swallowing items, 12 were indicated by more than 50% of participants and 6 recurred with the greatest score in about one third of answers (see Table 7). From the detailed analysis of each answer, dysphagia for solid consistencies was established as the most common problem. Analogous result was obtained by Rosas et al. [35] in patients with SjS. The first six "strong" symptoms are usually observed both in upper and lower types of dysphagia. Most cases of upper dysphagia are due to a failure of pharyngeal contraction or cricopharyngeal relaxation, or both, while lower dysphagia is more often caused by obstruction. It has been reported that multi-factorial mechanisms lead to dysphagia in inflammatory rheumatic diseases. Both striated and smooth muscles of the oropharynx and esophagus can be affected. Studies have shown an increase in pharyngeal transit time from oral cavity to esophageal sphincter. This is likely related to decreased contraction of sub-mental muscles with reduced hyo-laryngeal elevation [36]. Moreover, the results were tried to be explained by lack of saliva, laryngeal synovitis, esophageal web, achalasia, low-grade myositis, and parasympathetic function and exocrine gland involvement damage especially in SjS [34]. It is interesting to note that about 30% of our respondents reported "a lot" of interference with quality of

Table 6 GETS and SOAL tests: distribution of answers basing on the score in different groups of IM disease

	GETS test			SOAL test		
	Score 0–2 (%)	Score 3–4 (%)	Score 5–7 (%)	Score 0 (absent) (%)	Score 1 (a little) (%)	Score 2 (a lot) (%)
Sjögren syndrome	27	16	57	33	37	30
Systemic sclerosis	41	18	41	39	37	24
Vasculitis	38	27	35	51	41	8
Others	63	12	25	65	22	13

life. Although dysphagia symptoms are common in IM population, they are often overlooked. Both the diagnosis and treatment of them is an issue to be considered carefully as they will lead to an apparent improvement in the patient's quality of life. In clinical practice, patients are typically referred for further assessment when they report swallowing difficulties that impact nutrition. Otherwise, they may miss out on potential interventions to optimize their ability to eat and drink. A validated screening questionnaire to assess swallowing status at clinic checkups could lead to early and appropriate intervention and avoid complications in an already compromised population [29]. Concerning GP prevalence, we hypothesized that it increases in these patients because of disease-related xerostomia, pharmacotherapy, and other less well-understood processes involving immune-mediated mucosal changes and altered sensory perception. In this regard, we found 60.85% of answers suggestive of GP versus 5–45% estimated in the general population respectively for persistent and intermittent GP [37, 38]. We found the prevalence of strong symptoms (43.7%) significantly greater when comparing to mildly symptomatic answers (16.7%). Specifically, the most frequent unbearable symptoms were "Difficulty in swallowing food" (54.3%) and "Feeling of something stuck in the throat" (52.9%) whose recurrences were close at the results reported by Pierce et al. [39]. The greatest percentage of responders with a score "strongly symptomatic" was that of SjS cases (57%) confirming the possible role of xerostomia in the pathogenesis of GP. Excluding organic pathologies, the comorbidities more suggested in GP patients include post-nasal drip, laryngopharyngeal reflux, and

Table 7 Mean prevalence (%) of SOAL items for each score

Items	Prevalence		
	Score 0 (absent) (%)	Score 1 (a little) (%)	Score 2 (a lot) (%)
1. In your opinion, do you have a swallowing problem now?	7	60	23
2. Do you have a problem swallowing thin liquids (tea, water, juice)?	73	14	13
3. Do you have a problem swallowing thick liquids (soup, milkshake, drinks)?	71	19	10
4. Do you have a problem swallowing soft/mashed foods (pasta, shepherds pie)?	63	27	10
5. Do you have a problem swallowing solid food?	33	31	36
6. Do you have a problem swallowing dry solid food (bread, biscuits)?	23	31	46
7. Do you have a problem swallowing saliva?	46	36	19
8. Do you have a problem starting to swallow?	37	34	29
9. Does food stick in your throat when you swallow?	34	37	29
10. It never happens that you cough when you swallow solid food?	31	40	29
11. It never happens that you cough when you swallow liquid food?	31	70	23
12. Does it take longer to eat a meal?	5.7	70	21
13. Does food or liquid come back up into your mouth or nose when you eat or drink?	79	13	2.9
14. Do you need to swallow many times to help the food/drink go down?	40	33	27
15. Do you ever spit or cough food or liquids during a meal?	67	29	4.3
16. In your opinion, how serious is your swallowing problem?	27	46	27
17. Does your swallowing problem interferes with your quality of life?	34	37	29

abnormal tonicity in the upper esophageal sphincter [40]. Based on our findings, we showed that autoimmune processes could be added to this list of possible explanations for GP bearing in mind that the relationship between GP symptoms and IM diseases is correlational but not necessarily causal.

Regarding dysphonia using the quality-of-life scale Voice Handicap Index (VHI), we also determined the prevalence of dysphonia in patients with IM diseases. In our study, 32.16% experienced a voice disorder. This result was similar to that obtained by Sanz et al. [41] (28–32%) and higher than the one published elsewhere (6.6%) [42]. By contrast, in a similar study, the prevalence of dysphonia was 12–27% [43]. Furthermore, basing on our results, it appears that, just as with dysphagia, voice symptoms are most frequent in SjS followed by SS and vasculitis. Ruiz Allec et al. [25] described in SjS subjects the presence of neurological deficits and clear alterations of mucosal wave vibration probably due to a loss of elasticity of the vocal folds secondary to their dryness. In this regard, not without reason, in our sample, one of the most frequent symptom was "My voice sounds creaky and dry." Moreover, a patient cohort with IM disease is likely to have multiple comorbidities. "I run out of air when I talk" is the other one most frequent symptom that may be explained by underlying pulmonary diseases like asthma or bronchiectasis widely recognized as features of some autoimmune conditions [44]. Case series of directly visualized vocal cord abnormalities suggest that IM disease may be not only a risk marker but also a causative factor in voice disorder [25, 45, 46]. Furthermore, the emotional impact of dysphonia is not negligible. In our study, the items "I find other people don't understand my voice problem" and "My voice problem upsets me" are reported with the highest frequency. In this regard, the main importance of our results is the ability to corroborate, in IM disorders, the risk of dysphonia, already described in the literature, thanks to which it is possible to explain and reassure the patients at the consultation reducing patient stress and anxiety, which may be additional factors that can further compromise the quality of life.

In conclusion, this study represents the first to examine globus pharyngeus symptoms in IM population—it still represents a relatively small sample size. Moreover, our results allow to confirm the large recurrence of dysphagia and dysphonia in IM patients. Particularly the administration of selected questionnaire could provide specific features of swallowing alterations (i.e., solid or liquid dysphagia) that address the diagnostic and therapeutic strategies.

Several limitations should be considered when interpreting the data of this investigation. In addition to the cross-sectional nature of the study, it should be listed principally the lack of control group and comparison with instrumental swallowing assessment or multidimensional analysis of the voice. In this regard, further studies will be helpful in defining the exact screening role of the self-tests.

Compliance with ethical standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Disclosures None.

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