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Vocal cord dysfunction diagnosis may be improved by a screening check list

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VCD	vocal cord dysfunction
PVCM	paradoxical vocal cord movement
GERD	gastroesophageal reflux disease

ABSTRACT

Background: Many patients with vocal cord dysfunction (VCD), with or without asthma, receive inappropriate treatment because they are misdiagnosed as having difficult-to-control asthma alone. We developed a clinical screening check list designed to aid the diagnosis of VCD.
Methods: A prospective observational study involving 80 patients aged ≥18 years, diagnosed with severe asthma. After anamnesis and physical examination, physicians completed a check list with 6 questions to identify VCD, for which the answer "yes" counted one point. Then patients underwent spirometry and laryngoscopy. On the basis of the laryngoscopic findings, we created three patient groups: VCD (vocal cord adduction during inspiration, n = 14); unconfirmed VCD (inconclusive findings, n = 29); and control (normal findings, n = 37). We attempted to determine whether any of those groups were associated with the responses to individual questions or sets of questions on the check list.
Results: The proportion of affirmative answers to the question "Does pulmonary auscultation reveal wheezing, predominantly in the cervical region, and/or stridor?" was significantly higher for the VCD group than for the other two groups ($P = 0.006$), notably in elderly patients. The variable "4 or more affirmative answers" was more common in VCD and unconfirmed VCD groups in comparison to controls ($P = 0.022$).
Conclusions: A finding of wheezing or stridor on auscultation of the cervical region is suggestive of vocal cord dysfunction, especially in elderly patients, and such dysfunction can be confirmed through laryngoscopy. Our VCD screening check list proved to be useful in the screening of VCD among patients with severe asthma.

Introduction

Vocal cord dysfunction (VCD) is characterized by episodes of involuntary paradoxical movements of vocal folds, caused by their adduction during inspiration that results in airway obstruction. The clinical profile is characterized by dyspnea and wheezing, principally in the cervical region, as well as by stridor in certain cases. Although VCD is most common in patients with asthma, it can also occur in an isolated form in individuals without respiratory disease.[1–3]

The prevalence of VCD has yet to be precisely determined, but it is estimated to be around 5% in patients with severe asthma and up to 40% in patients with difficult-to-control asthma.[4,5] Because VCD is underdiagnosed, the reported prevalence of the disease at health care facilities is low. A diagnosis of VCD has been made predominantly in young adults, and the incidence of VCD is higher in females than in males (female/male ratio, 3.5:1).[2] The prevalence of VCD is highest in patients with asthma, principally in those with severe asthma, in relatives of patients with asthma, and in health care workers.[2,6,7]

The pathophysiology of VCD is unknown, and no organic cause has yet been found. The hypothesis with more evidences is that its etiology is psychogenic. Emotional factors are known to trigger attacks of VCD and to impair its resolution.[2,6–9] However, nowadays VCD is considered as one form of the "irritable larynx syndrome"

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that has been defined as a hyperkinetic dysfunction.[10–13] The syndrome has been also associated with gastroesophageal reflux disease (GERD), laryngopharyngeal reflux, post nasal drip, respiratory infections, between other factors.[14–16]

It is of note that patients with VCD often receive the treatment for difficult-to-control asthma, including the continuous use of systemic corticosteroids.[17] In addition to producing a limited clinical response, this treatment regimen has undesirable side effects. Two factors make VCD more intriguing and more difficult to diagnose. First of all, there is a confounding overlap between asthma and VCD attacks when they coexist. Secondly, VCD manifests as attacks, which makes it difficult to confirm the diagnosis in between such attacks. Because there are no diagnostic criteria for VCD, clinical suspicion is based on discrepancies among the clinical profile, ancillary test results, and therapeutic response.

In patients with VCD, spirometry typically reveals a flattening of the inspiratory loop of the flow–volume curve, which is seen only during attacks and indicates airway obstruction.[18,19] Reversible airway obstruction can also be observed in patients with VCD, although only in those with concomitant asthma.

A definitive diagnosis of VCD can be established by laryngoscopy, which is considered the gold standard diagnostic technique.[18,20,21] When performed during an attack, laryngoscopy shows the paradoxical vocal cord movement (PVCM) caused by adduction of the anterior two thirds of the vocal cords, forming a cleft with "diamond aspect". Asking the patient to do a variety of maneuvers, or performing provocation studies may help to identify PVCM.[4,22] Although some authors have reported that vocal cord adduction during expiration is suggestive of VCD, this can occur as an adaptive phenomenon in patients with obstructive lung disease. The absence of PVCM does not rule out a diagnosis of VCD. Other diagnostic procedures, as high resolution dynamic volume computerized tomography and endospirometry, are being studied.[23,24]

The underdiagnosis of VCD is attributable to the fact that it is poorly understood. Many patients with VCD are misdiagnosed as having severe asthma and therefore receive inappropriate treatment. The objective of the present study was to develop and validate a VCD screening check list to improve VCD diagnosis.

Methods

This was a prospective observational study involving 80 patients who were ≥18 years of age and had received a diagnosis of severe asthma according to World Health Organization Criteria.[25] Patients who were smokers were excluded, as were those with other laryngeal diseases, unrelated to VCD. Patients were consecutively enrolled in the study, regardless of whether they had suspicion of VCD. Table 1 summarizes main clinical characteristics of the 80 patients.

In addition to clinical anamnesis, which included the application of the VCD screening check list developed in the present study, the patients underwent spirometry and laryngoscopy. Medical histories and the results of previous pulmonary function tests were reviewed. The study was approved by our local human research ethics committee. All participants gave written informed consent.

The VCD screening check list was developed by physicians specializing in treating patients with asthma, based on clinical experience, as well as on review of the literature. The questions were designed to identify discrepancies or inconsistencies among the clinical status of patients, the results of ancillary tests, and the treatment administered. The check list comprised six questions to be answered by physicians on the basis of the clinical history, physical examination findings, and spirometry results (Table 2). All questions were of the yes/no type, affirmative answers indicating suspicion of VCD.

Table 1
Clinical features of the 80 severe asthmatic adults evaluated.

Group	VCD (N = 14) N (%)	Unconfirmed VCD (N = 29) N (%)	Control (N = 37) N (%)	*P*
Gender (female)	10 (71.4)	24 (82.8)	29 (78.4)	0.694
Median age (years of age)	56.5	47.0	47.0	0.153
Exercise attacks	10 (71.4)	22 (81.5)	28 (82.4)	0.694
Rhinitis	10 (71.4)	14 (48.3)*	30 (81.1)	0.02*
GERD	9 (64.3)	12 (41.4)	19 (51.4)	0.36
ICS (daily)	13 (92.9)	28 (96.6)	35 (94.6)	0.99
OCS (last year)	14 (100)*	14 (48.3)	21 (56.7)	0.007*
LABA (daily)	3 (21.4)	9 (31.0)	12 (32.4)	0.77
SABA (≥3 times/week)	14 (100)*	13 (44.8)	19 (51.4)	0.002*
Answer "Yes" to questions 1 to 6 (Q1 – Q6) from the check list				
Q1	12 (85.7)	21 (72.4)	23 (62.2)	0.246
Q2	9 (64.3)	15 (51.7)	15 (40.5)	0.402
Q3	13 (92.8)*	15 (51.7)	20 (54.1)	0.006*
Q4	8 (57.1)	14 (48.3)	16 (43.2)	0.722
Q5	2 (14.3)	2 (6.9)	0 (0.0)	0.005
Q6	6 (42.9)	12 (48.3)	8 (37.8)	0.798

*$P < 0.05$ in comparison to other two groups (Chi-square test).
VCD, vocal cord dysfunction; GERD, gastroesophageal reflux disease; ICS, inhaled corticosteroid; OCS, oral corticosteroid; LABA, long-acting beta-agonist; SABA, short-acting beta-agonist.

Nasal laryngoscopy allows the examination of the pharynx and larynx during near-normal functioning. Laryngoscopy was performed by the nasal route with a 3.7-mm diameter flexible laryngoscope (NAP-LS; Fujinon Corporation, Saitama, Japan). In order to visualize the larynx, we introduced the laryngoscope to a depth of approximately 17 mm and left it in that position for approximately 10 min. The patients were asked to perform normal and forced inspiration and expiration. We observed the following: arytenoid movement; the pyriform sinuses; laryngeal signs suggestive of laryngopharyngeal reflux; the interarytenoid region; the retrocricoid region; and vocal cord mobility and appearance, including the paradoxical movements caused by vocal cord adduction during inspiration and expiration. We also analyzed all of the glottic and supraglottic movements that might reduce the anteroposterior airway diameter and therefore cause airflow obstruction and glottic instability. Laryngoscopy showing paradoxical vocal cord movement (PVCM) caused by vocal cord adduction during inspiration was considered diagnostic of VCD.

On the basis of the laryngoscopic findings, patients were divided into three groups:

- VCD, comprising patients who presented with PVCM caused by vocal cord adduction during inspiration, a finding that was considered diagnostic of VCD

Table 2
Vocal cord dysfunction screening check list.

Q1 – Is there a history of frequent attacks at home, without a consistent clinical profile during medical visits?
Q2 – Does the patient use continuous systemic corticosteroid, or inhaled corticosteroid at high doses (or a combination of the two), without therapeutic response?
Q3 – Does pulmonary auscultation reveal wheezing, predominantly in the cervical region, and/or stridor?
Q4 – Is pulmonary function testing (FEV_1), or peak expiratory flow, inconsistent with the clinical profile?
Q5 – Does pulmonary function testing reveal flattening of the inspiratory loop of the flow–volume curve, which is suggestive of extrathoracic obstruction?
Q6 – Is oxygen saturation measurements inconsistent with the intensity of asthma attacks?

Q, question; FEV_1, forced expiratory volume in one second; PEF, peak expiratory flow.