Formal Psychological Testing in Patients With Paradoxical Vocal Fold Dysfunction

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Objective: The etiology of paradoxical vocal fold dysfunction (PVFD) has been unclear, but it has long been hypothesized that there is a significant psychological component. The purpose of this study was to elucidate the psychological profiles of patients newly diagnosed with PVFD using psychometrically-sound psychological assessment instruments.

Study Design: Prospective cohort study of 45 adults newly diagnosed with PVFD at a tertiary university referral center.

Methods: The Minnesota Multiphasic Personality Inventory (MMPI-2) was administered to test for psychopathology. The Life Experiences Survey (LES) was administered to investigate levels of stress. Demographic, medical, and social histories were reviewed. MMPI-2 and LES scores for the PVFD cohort were compared with scores previously established for normative populations.

Results: The study population included 81% female and 60% who were age 50 or older. Compared to the normative population for the MMPI-2, significant differences were noted for both male and female PVFD patients; on average, scores were highly elevated on the hypochondriasis scale and hysteria scale and less elevated on the depression scale. This pattern was consistent with conversion disorder. In MMPI-2 subset analysis, 18 patients had a classic conversion profile while 13 others had elevated scores in the three scales of interest, but not in the classic conversion disorder pattern. Also, 11 patients had normal scores, suggesting no psychopathology. PVFD patients with a psychological history scored significantly higher on the depression and anxiety scales than PVFD patients without a psychological history. Patients with a history of asthma or gastroesophageal reflux disease (GERD) achieved significantly higher scores on the hypochondriasis scale than those without that medical history. On the LES assessment, overall levels of stress are not higher in PVFD patients compared to a general population. However, females report more negative stress, and both males and females may have trouble coping with the amount of stress that they do have. PVFD is more common among women, more prevalent among older individuals, and can be comorbid with asthma, GERD, and previous abuse. These results have implications for treatment—psychotherapy directed for somatoform and conversion disorders may be added to traditional speech therapy for increased efficacy.

Key Words: PVCD, paradoxical vocal cord dysfunction, vocal cord dysfunction, airway obstruction, voice, conversion disorder, somatoform disorder, depression, anxiety, stress, abuse, asthma, gastroesophageal reflux disease, reflux laryngitis.

INTRODUCTION

Paradoxical vocal fold dysfunction (PVFD) is a condition involving paroxysmal adduction of the anterior two-thirds of the vocal cords during inspiration.1–4 This episodic glottic obstruction results in distressing shortness of breath, respiratory stridor, and breathy dysphonia.1–4 PVFD is most frequently misdiagnosed as asthma since both conditions are associated with breathing difficulties, audible respiratory sounds, and attacks, which begin and end suddenly.2–5 However, patients with PVFD do not respond to antiasthma therapy and most often demonstrate normal pulmonary function testing.2–5
PVFD can also be misdiagnosed as adductor spasmodic dysphonia (ADSD) or adductor laryngeal breathing dystonia (ALBD), which are considered neurologic disorders of central motor processing.\textsuperscript{4,6,7} In ADSD, there are spasms of the vocal cords that produce an abnormal voice quality; in ALBD, the vocal cord spasms result in inspiratory stridor and breathing difficulties with normal voice.\textsuperscript{4,6,7} Patients with these disorders are highly resistant to speech therapy.\textsuperscript{4,6,7} They are successfully treated with botulinum toxin injections which confirms the neurologic etiology.\textsuperscript{4,6,7} In contrast, PVFD is treated favorably by speech therapy and does not respond well to botulinum toxin injections.\textsuperscript{4,5}

To date, the etiology of PVFD has been unclear. Some have provided a neurologic explanation, suggesting that different vagal motor innervation is intermittently activated.\textsuperscript{7} In this way, the threshold is lowered for stimuli to produce vocal cord spasm.\textsuperscript{7} However, no abnormal neurologic testing has ever been reported in PVFD patients. Several clinical reports have documented an association with laryngopharyngeal reflux.\textsuperscript{4,6} Loughlin and Koufman described resolution of PVFD symptoms in 10 patients treated with a daily proton pump inhibitor.\textsuperscript{8}

Another explanation is that PVFD represents a psychological conversion reaction.\textsuperscript{3,7,9} Conversion disorders are characterized by alterations in physical functioning that are rooted in psychological conflict and have no known physiologic basis.\textsuperscript{10,11} According to the Diagnostic and Statistical Manual for Mental Disorders IV (DSM-IV), a conversion disorder is associated with deficits in voluntary motor or sensory functioning (other than pain) with symptoms that are not intentionally produced or feigned.\textsuperscript{10} Also, after appropriate investigation, these symptoms cannot be fully explained by a general medical condition or from the effects of a substance.\textsuperscript{10} The explanation that PVFD is a conversion disorder purports that the abnormal laryngeal movement serves the purpose of enabling the patient to avoid confrontation with an unpleasant life situation or emotion (primary gain).\textsuperscript{9,12} In addition, the PVFD attacks yield attention and sympathy (secondary gain).\textsuperscript{9,12}

It is interesting that PVFD was originally described by Patterson in 1974 as Munchausen’s stridor, suggesting a nonorganic and psychological etiology.\textsuperscript{1,3} Leo and Konaknachi reviewed 171 cases of PVFD from various other reports that were diagnosed between 1966 and 1998.\textsuperscript{12} Psychosocial history had been elicited in 49%, and 78% of all patients were female.\textsuperscript{12} In the review, associated conditions included: conversion disorders (12%), anxiety disorders (11%), histrionic and other personality disorders (6%), family/school conflicts (4%), depression (4%), psychosomatic disorders (2%), factitious disorders (2%), and somatization disorders (1%).\textsuperscript{12} Altman and colleagues conducted a retrospective review of 10 patients with PVFD and found that 7 had histories of psychological disorders.\textsuperscript{1} These included anxiety, depression, personality disorder (unspecified), and stress disorder.\textsuperscript{1}

To date, despite the numerous reports suggesting a nonorganic etiology for PVFD, there has been no psychologic evaluation of patients using psychometrically-sound instruments. This study was designed to elucidate the psychological profiles of patients newly diagnosed with PVFD using psychometrically-sound, psychological assessment instruments. The Minnesota Multiphasic Personality Inventory–2 (MMPI-2) was chosen to assess for various types of psychopathology. It is the most widely researched and broadly used personality instrument in psychology, with scales that assess for depression, anxiety, somatoform disorders, psychosis, etc.\textsuperscript{10,11} The null hypothesis was that patients newly diagnosed with PVFD would not test positive for any psychopathology. We also investigated stress in PVFD patients using the Life Experiences Survey (LES), a standardized assessment. The null hypothesis was that PVFD patients would not have higher levels of stress compared to a standard population. In addition, a demographic questionnaire was administered and medical histories were reviewed to explore any relations between PVFD, asthma, and gastroesophageal reflux disease (GERD).

**METHODS**

**Study Design**

This was a prospective cohort study of patients newly diagnosed with PVFD. Patients were administered the entire MMPI-2, LES, and a demographic questionnaire. The institutional review board approved the study.

**Inclusion Criteria**

All adult patients diagnosed with PVFD in the Department of Otolaryngology clinics at the Ohio State University Medical Center between May 2006 and March 2007 were invited to participate. Videostroboscopy or fiberoptic nasolaryngoscopy was performed in the clinic setting by one of the speech pathologists involved in this study. Criteria for diagnosing PVFD were as follows:

1) absence of gagging or coughing during nasolaryngoscopy,
2) adduction of the vocal cords during inspiration or during both inspiration and expiration,
3) presence of an open glottic chink during adduction

If the patient met the diagnosis of PVFD, a flyer was given inviting that person to participate in the study. All patients were offered $20 to complete the study.

**Exclusion Criteria**

Treatment for PVFD consisted of three sessions of speech therapy involving techniques of biofeedback, stress reduction, and breathing control—this was termed “laryngeal control therapy.” Any patient who had completed a full course of laryngeal control therapy (three sessions) was excluded from the study to avoid the effect of treatment on the results.

**Study Conditions**

Each patient was tested individually at a time mutually agreed on by the patient and the study psychologist. Patients were given a desk and chair in a quiet room in one of the clinics of the Department of Otolaryngology. Consent forms were completed, and the study psychologist read an introductory statement explaining the tests that would be subsequently administered. The study psychologist then sequentially administered a demographic questionnaire, the MMPI-2 assessment, and the LES assessment. On completion, patients were given a debriefing sheet and offered $20. The debriefing sheet explained the main purpose of the study and provided contact information.
Demographic Questionnaire

A demographic questionnaire was used to assess each participant’s gender, age, race/ethnicity, marital status, education, vocation, duration of PVFD symptomatology, and previous formal psychological diagnoses.

Psychological Assessment Instruments

Minnesota Multiphasic Personality Inventory-2 (MMPI-2). The MMPI-2 was used to screen for various types of psychopathology. There were a total of 567 items on the MMPI-2, all written in a “true” or “false” format. These items were scored with regard to several validity indices, clinical scales, and additional supplementary scales. Only profiles interpreted as valid were included in the study. The scoring was based on a criterion-key test construction method, meaning that scale membership was based on selecting items that discriminated a clinical (criterion) group from a group of normal. All scale scores were expressed as T-scores, calculated on the basis of normative data. For each scale on the MMPI-2, the mean T-score was 50 with a standard deviation (SD) of 10. Scores were considered elevated at 65 or higher. Elevated scores were examined and the subscale components that primarily contributed to these elevations were noted. The scores on the supplementary scales were also examined to elaborate on the personality dynamics and diagnostic status of the patients. Some of the scales measured related disorders. Many other items involved a denial of problems with the body. A sample item was, “I do not worry about catching diseases.”

Scale one (Hs: hypochondriasis) was initially developed on a group of patients who had many somatic complaints with little or no organic basis and great concern about their physical health. There were 32 items in this scale. Some of the items on this scale reflected specific complaints or a general preoccupation with the body. A sample item was, “I do not worry about catching diseases.”

Scale two (D: depression) was initially developed on psychiatric patients with various forms of depression. The items in this scale reflected feelings of discouragement, hopelessness, and pessimism that characterized clinically depressed individuals. There were 57 items in this scale. A sample item was, “At times I think I am no good at all.”

Scale three (Hy: hysteria) was originally constructed on patients who displayed signs of a motor or sensory disorder for which no organic basis could be established. There were 60 items in this scale that reflected specific physical complaints or related disorders. Many other items involved a denial of problems in one’s life or a lack of social anxiety. A sample item was, “My neck spots with red often.”

The A scale (anxiety) had 39 items. High scores on the A scale reflected anxiety, discomfort, distress, and emotional upset. High scorers tended to be overcontrolled, inhibited, and had difficulty making decisions without uncertainty. Additionally, these individuals were prone to becoming easily upset and conforming in social situations. A sample item was, “I have nightmares every few nights.”

Life Experiences Survey (LES). To assess the relation between levels of stress and PVFD, the LES was used. The LES was a 50-item self-report measure that asked respondents to rate events they experienced in the last year. It was separated into two different sections. Items represented life changes that are frequently experienced in the general population in a variety of situations. The assessment was comprised of 47 specific events plus 3 blank spaces to fill in other events not previously listed. Sample items included “serious injury or illness of close friend” and “change of residence.”

The format of the LES asked respondents to indicate events that occurred within the previous 12 months. Additionally, respondents specified 1) whether they viewed the event as positive or negative, and 2) the perceived impact of the event in their life at the time of the occurrence. Ratings were based on a seven-point scale, ranging from extremely negative (–3) to extremely positive (+3). A positive change score was calculated by summing the ratings of those events designated as positive. A negative change score was calculated by summing the impact ratings of those events rated as negative. A total change score was obtained by adding the positive change score to the absolute value of the negative change score; this represented the total amount of rated change. All three scores were considered in the study. The control group for the study was represented by the normative data provided for this standardized assessment.

Medical and Social History

Clinic charts in the Department of Otolaryngology were reviewed for each patient. All patients filled out a medical and voice questionnaire prior to the initial PVFD evaluation. Patients were determined to have asthma if they had a history of positive results on pulmonary function testing or equivocal results with continued symptoms and use of inhalers. They were determined to have GERD if they had a history of positive endoscopy or pH probe testing or if they self-reported the condition and used antacids. No distinction was made between GERD and laryngopharyngeal reflux. One question specifically asked if there was a history of any verbal, emotional, physical, or sexual abuse. Patients also listed medical diagnoses, surgical history, and current and past medications. They were determined to have a psychological history if they specifically listed a diagnosis or if they reported being on medication with psychotropic effects, including antidepressants and antianxiolytics.

Statistical Analysis

Descriptive statistics were calculated for the data to identify group means based on gender for each of the constructs studied. Raw-score and T-score distributions were derived separately for males and females for the MMPI-2 scales. Positive, negative, and overall stress scores for the LES were also analyzed separately by gender. Z-tests were performed to assess significant differences between the means of the present study and those of the general population for each of the constructs studied. A two-way univariate analysis of variance (ANOVA) was performed to examine possible differences among different subgroups of patients on the MMPI-2 scales of interest: one, two, three, and A. In addition, Cohen effect size values (d) were calculated for each comparison. Effect size measured the amount of practical significance in assessing the magnitude of the differences between mean scores of the present sample and those of the standardization sample. In assessing the magnitude of the differences in group means, effect sizes between 0.2 and 0.5 indicated a small to moderate difference, while effect sizes of 0.5 to 0.8 reflected large differences.

RESULTS

At The Ohio State University Medical Center, 62 patients over the age of 18 were diagnosed with PVFD between May 2006 and March 2007. All patients were invited to participate in the study. Seven patients expressed interest in completing the study but could not due to time and travel constraints. Eight patients declined to participate. Thus, 47 patients completed the study, and all accepted the $20 payment. Validity scores for the MMPI-2 assessment were interpreted, and 45 of the 47 returned as valid. For these 45 patients, all MMPI-2, LES, demographic, and medical history results were scored and analyzed. Demographic and history results were summarized in Table I. Overall, 37 (81%) patients were women.
and the average age was 53. The incidences of asthma, GERD, psychological/psychiatric history, and abuse history were 65%, 51%, 49%, and 38%, respectively.

Mean T-scores, standard deviations, comparison Z-scores (z), and Cohen effect size values (d) for the four MMPI-2 scales were separated by gender and shown in Tables II and III. There were significant differences between males in this study and males in the general population on scales one, two, and three. Specifically, the mean (M) for the study group (M = 68.5, SD = 17.7) on scale one (Hs) was significantly higher than the mean for the general population (M = 55, SD = 10) (z = 3.20, P < .001). The effect size for this comparison was moderate (d = 0.55). Regarding scale two (D), the mean for the study group (M = 67.9, SD = 7.3) was significantly higher than the general population (M = 55, SD = 10) (z = 3.20, P < .001). The effect size for this comparison was large (d = 1.29). Conversely, the mean for the A scale (anxiety) in the study group males (M = 56.5, SD = 20.0) was not significantly higher than the general population (M = 55, SD = 10).

Results for the female cohort (Table III) were parallel to those found for the male group. Specifically, on scale one (Hs), the mean for females in the study group (M = 68.1, SD = 10.6) was significantly higher than the general population (M = 55, SD = 10) (z = 3.20, P < .001). The effect size for this comparison was large (d = 1.31). The mean for scale two (D) for the study group females (M = 58.6, SD = 13.0) was also significantly higher than the mean for the general population (M = 55, SD = 10) (z = 2.33, P < .01). For this comparison, the effect size was small (d = 0.36). The mean for the study group for scale three (M = 65.9, SD = 11.3) was significantly higher than the mean for the general population (M = 55, SD = 10) (z = 3.20, P < .001). The effect size for this comparison was large (d = 1.09). There were no significant differences found between the female groups for the A scale. The mean for the study group (M = 52.2, SD = 10.8) was similar to the values for the general population (M = 55, SD = 10).

According to MMPI-2 criteria, a “conversion-V” profile involves highly elevated scores on the hypochondriasis (one) and hysteria (three) scales and a less elevated score on the depression (two) scale. This is also known as the “one, three” or “three, one” profile with a slightly lower two (the classic “conversion-V”). For both the male and female groups in this study, the overall results on average were consistent with the conversion-V pattern (Fig. 1). Although the mean scores for the entire study group were consistent with a conversion disorder, there were some differences in subset analysis. Individually, 18 patients had greatly elevated scores on scales one and three and slightly elevated scores on scale two, consistent with the classic conversion disorder profile. Five patients had elevated scores on scales one, two, and three, but the scores on scales one and three were not both higher than scale two. Six patients had significantly elevated scores on scale three (hysteria) but normal scores on all other scales. Two patients had elevated scores on scale one (hypochondriasis).

**Table I. Demographic and History Results of 45 Patients Newly Diagnosed With Paradoxical Vocal Fold Dysfunction (PVFD).**

<table>
<thead>
<tr>
<th>History of abuse</th>
<th>17 of 45 (38%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of ER visits over 12 months</td>
<td>2.4</td>
</tr>
<tr>
<td>Psychological history</td>
<td>22 of 45 (49%)</td>
</tr>
<tr>
<td>Gastroesophageal reflux disease</td>
<td>23 of 45 (51%)</td>
</tr>
<tr>
<td>Asthma</td>
<td>29 of 45 (65%)</td>
</tr>
<tr>
<td>Age 50 or older</td>
<td>27 of 45 (60%)</td>
</tr>
<tr>
<td>Average age</td>
<td>53</td>
</tr>
<tr>
<td>Women</td>
<td>37 of 45 (81%)</td>
</tr>
<tr>
<td>Men</td>
<td>8 of 45 (19%)</td>
</tr>
</tbody>
</table>

**Table II. Results for Male Paradoxical Vocal Fold Dysfunction (PVFD) Patients on the MMPI-2 Scales of Interest.**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean T-Score</th>
<th>Standard Deviation</th>
<th>Z-Score</th>
<th>Cohen Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale one (Hs)</td>
<td>68.5</td>
<td>16.7</td>
<td>9.06†</td>
<td>1.35</td>
</tr>
<tr>
<td>Scale two (D)</td>
<td>60.5</td>
<td>13.8</td>
<td>3.69†</td>
<td>0.55</td>
</tr>
<tr>
<td>Scale three (Hy)</td>
<td>67.9</td>
<td>17.2</td>
<td>8.64†</td>
<td>1.29</td>
</tr>
<tr>
<td>Scale A</td>
<td>56.5</td>
<td>19.9</td>
<td>1.01</td>
<td>0.15</td>
</tr>
</tbody>
</table>

**Table III. Results for Female Paradoxical Vocal Fold Dysfunction (PVFD) Patients on the MMPI-2 Scales of Interest.**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean T-Score</th>
<th>Standard Deviation</th>
<th>Z-Score</th>
<th>Cohen Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale one (Hs)</td>
<td>68.1</td>
<td>10.6</td>
<td>8.81†</td>
<td>1.31</td>
</tr>
<tr>
<td>Scale two (D)</td>
<td>58.6</td>
<td>12.9</td>
<td>2.43*</td>
<td>0.36</td>
</tr>
<tr>
<td>Scale three (Hy)</td>
<td>65.9</td>
<td>11.2</td>
<td>7.29†</td>
<td>1.09</td>
</tr>
<tr>
<td>Scale A</td>
<td>52.2</td>
<td>10.7</td>
<td>-1.91</td>
<td>0.28</td>
</tr>
</tbody>
</table>

Mean = 55; standard deviation = 10 for normative group on each scale.

*P < .01; † P < .001.

Hs = hypochondriasis; D = depression; Hy = hysteria; A = anxiety.

![Fig. 1. MMPI-2 mean results for paradoxical vocal fold dysfunction (PVFD) patients showing the “conversion-V” profile.](image-url)
but normal scores on the other scales. One patient had a greatly elevated scale three score with a slightly elevated scale two score and a normal scale one score. Overall, these 14 patients demonstrated conversion and/or somatoform features on their MMPI-2 testing, but the classic conversion disorder profile was not achieved. Two patients had significantly elevated scores on scale two (depression) but normal scores on all other scales. The remaining 11 patients had normal scores on all scales of the MMPI-2, suggesting an absence of any psychopathology.

Comparison means for the Life Experiences Survey (LES) are displayed in Table IV and Table V. For males, the mean positive stress score (M = 2.25, SD = 2.1) was significantly lower than the mean reported for the normative population (M = 6.9, SD = 6.0) (z = 2.59, P < .01). The effect size for this comparison was large (d = 0.77). The mean for negative stress scores for the male study group (M = 2.1, SD = 2.6) was also significantly lower than that reported for the general population (M = 4.7, SD = 4.4) (z = 2.59, P < .01). Regarding total stress scores, the mean for the study group (M = 4.4, SD = 3.7) was also significantly lower than the normative group (M = 11.53, SD = 8.0) (z = 2.59, P < .01). The effect size for this comparison was large (d = 0.89).

For females (Table V), the mean positive stress score (M = 4.9, SD = 4.7) was significantly lower than the mean for the general population (M = 6.7, SD = 5.5) (z = 1.96, P < .05). The effect size for this comparison was small (d = 0.33). Conversely, the mean negative stress score in the study group (M = 8.5, SD = 10.7) was significantly higher than the normative female group (M = 5.6, SD = 6.4) (z = 2.59, P < .01). The effect size for this comparison was moderate (d = 0.40). However, the total stress score for the female study group (M = 13.0, SD = 13.1) was not significantly different from the mean for the general population (M = 12.4, SD = 8.8).

### Table IV.

<table>
<thead>
<tr>
<th>Stress</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Z-score</th>
<th>Cohen Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive score</td>
<td>2.25</td>
<td>2.05</td>
<td>-5.19*</td>
<td>0.77</td>
</tr>
<tr>
<td>Negative score</td>
<td>2.13</td>
<td>2.64</td>
<td>-3.89*</td>
<td>0.58</td>
</tr>
<tr>
<td>Total score</td>
<td>4.38</td>
<td>3.74</td>
<td>-6.01*</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Mean scores compared with normative group.
*P < .05.

### Table V.

<table>
<thead>
<tr>
<th>Stress</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Z-score</th>
<th>Cohen Effect Size (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive score</td>
<td>4.87</td>
<td>4.72</td>
<td>-2.24‡</td>
<td>0.33</td>
</tr>
<tr>
<td>Negative score</td>
<td>8.19</td>
<td>10.71</td>
<td>2.66*</td>
<td>0.40</td>
</tr>
<tr>
<td>Total score</td>
<td>13.03</td>
<td>13.06</td>
<td>0.52</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Mean scores compared with normative group.
*P < .05; †P < .01.

A two-way analysis of variance (ANOVA) with two factors was used to perform multiple comparisons between different subgroups of patients on scales one, two, three, and A of the MMPI-2. Patients were categorized into one of four nonmutually exclusive groups: 1) medical: patients with a history of asthma, GERD, or a comorbid condition of both, 35 (78%); 2) nonmedical: patients with no history of asthma or GERD, 10 (22%); 3) psychological: patients with a psychological history, 22 (49%); and 4) nonpsychological: patients without a psychological history, 23 (51%).

Those in the medical group (M = 70.6, SD = 11.9) had a significantly higher mean on scale one (Hs) than those in the nonmedical group (M = 59.9, SD = 5.9) (F = 8.328, P < .05). There was no main effect for the psychological subgroup, meaning there were no significant differences found between those with a psychological history and those without. On scale two (D), the mean for the psychological subgroup (M = 65.4, SD = 13.5) was significantly higher than the mean for the nonpsychological subgroup (M = 54.7, SD = 10.9) (F = 7.58, P < .05). There was no main effect for the medical subgroup, meaning there were no significant differences found between those patients with a history of asthma or GERD and those without.

The results of the ANOVA for scale three (Hy) revealed no interaction or main effects between the medical and psychological subgroups. This signified no significant differences between patients with a medical history and those without, and there were no significant differences between patients with a psychological history and those without. For the A scale (anxiety), the mean for the psychological subgroup (M = 59.7, SD = 12.7) was significantly higher than the mean for the nonpsychological subgroup (M = 47.9, SD = 10.1) (F = 7.31, P < .05). There was no main effect for the medical subgroup, meaning there were no significant differences found between those with a medical history of asthma or GERD and those without.

The results supported a difference between subgroups of patients, whereby patients with a medical history of asthma, GERD, or both had significantly higher scores on the hypochondriasis scale (Hs) than those that did not have a medical history of these conditions. Further, patients with a previous psychological history had significantly higher scores on the depression (D) and anxiety (A) scales than patients without a psychological history.

**DISCUSSION**

PVFD has long been considered a rare diagnosis, but our experience at The Ohio State University has taught us that it is not uncommon. Given the large population in central Ohio, approximately 300 patients are referred each year for PVFD evaluation. Most of these patients had been treated for asthma for years, had normal pulmonary function tests, and were eventually referred by a pulmonary physician. In this group, the average number of emergency room visits during the previous year for PVFD symptoms was 2.4. This is a reminder that PVFD can be disabling and adversely affect quality of life for many individuals.

To date, the etiology of PVFD has been unclear. Many series in the literature have demonstrated a high inci-
idence of psychological diagnoses in PVFD patients. We sought to investigate whether PVFD patients would demonstrate specific psychopathology on psychometrically-sound, psychological assessments. Over a 10-month period, 47 patients with a new diagnosis of PVFD completed the psychological assessments: 45 of these were interpreted as valid and included in the analysis.

Remarkably, the male and female PVFD patient groups achieved equivalent average results on each of the four main MMPI-2 scales evaluated. Compared to the general population, male and female PVFD patients' scores were highly elevated on the hypochondriasis scale (one), mildly elevated on the depression scale (two), highly elevated on the hysteria scale (three), and not elevated on the anxiety scale (A). These results for the first three scales look like a “V” when graphed, and this is known as the “conversion V” profile. Thus, in both males and females, PVFD appears to be, on average, associated with conversion disorder. Since scale two (the scale measuring depressive symptoms) was significantly elevated in these patients, the supplementary depression content scale was also scored. This scale was not significantly elevated, suggesting that PVFD was not associated with a depressive disorder. In addition, both males and females did not score higher on the anxiety scale than the general population. According to these results, while patients appear to have slightly higher depressive symptoms than the general population, PVFD is not associated with a mood disorder (depression or anxiety).

Of course there were variations among individual results on the MMPI-2. While 18 patients individually achieved the conversion disorder code type, an additional 14 patients demonstrated somatoform and/or conversion features but did not meet the strict MMPI-2 criteria for conversion disorder. These individuals may still qualify for a diagnosis of conversion disorder, but this would require additional testing and evaluation by a psychologist. Of interest, 11 patients had normal results on the MMPI-2, suggesting that there is a subset of PVFD patients in whom the disorder is not associated with symptoms of psychopathology. In these patients, PVFD attacks may be associated with laryngopharyngeal reflex, intermittent bronchospasm, or some other physiologic factor that has yet to be elucidated.

A conversion disorder is a specific somatoform disorder. Somatoform disorders are psychological difficulties in which there are symptoms of a physical disorder without a physical cause. A conversion disorder is defined as a deficit in voluntary motor or sensory functioning other than pain, with symptoms that are not intentionally produced. It is thought that a conversion disorder helps reduce stress by allowing the person to avoid unpleasant or frightening situations. PVFD seems to be a psychological conversion reaction where the abnormal laryngeal movement may serve the purpose of avoiding an unpleasant life situation or emotion (primary gain). For example, the respiratory distress and other associated difficulties with speaking may temporarily resolve the conflict of otherwise expressing anger or other unpleasant emotional state, as was suggested by Leo and Konakanchi in 1999. In addition, PVFD may give the patient secondary gain through attention and sympathy. By analyzing PVFD as a conversion disorder, it suggests that patients suffering from PVFD do not consciously produce their symptoms and are generally unaware of the psychological concerns underlying their symptoms. Conversion disorder patients often make excessive use of denial and projection, and prefer medical explanations for their symptoms. We have found that one of the most difficult aspects is to help PVFD patients understand that it is a change in behavior and thinking, rather than a quick medication or surgery, that is most likely to alleviate the condition.

The symptoms of conversion disorders often have some particular relevance to the individual patient. This may be the case for PVFD patients as individuals may have witnessed a traumatic respiratory event, such as a family member who is ill with asthma. There have also been reports of PVFD arising in patients with a history of sexual abuse or forced oral sex—perhaps for these patients, PVFD may represent a more symbolic meaning.

People who suffer from a conversion disorder typically have physical symptoms that increase during times of stress. The Life Experiences Survey (LES) was used to assess the levels of positive, negative, and total stress affecting these patients over the last 12 months. To maximize optimal well-being, it would be desirable to have high levels of positive stress and low levels of negative stress. High or low levels of total stress could be associated with optimal well-being, depending on how active one desires his or her life to be and what ratio of positive to negative stress one experiences.

In this study, female PVFD patients had lower levels of positive stress and higher levels of negative stress than the general population. In other words, with respect to relationships and events in the lives of these people, most things had not gone well during the prior year. The total level of stress, however, was not significantly different that the general population. Thus, female PVFD patients overall do not experience any more stress than others—however, the stress they do experience is more negative. Male PVFD patients had lower levels of positive stress, lower levels of negative stress, and lower levels of total stress than the general population. Our analysis found this to be a large difference. This result was surprising, suggesting that male patients may experience less busy, eventful, or “chaotic” lives than others. While males and females with PVFD do not appear to have excessive levels of stress, their mechanisms to deal with that stress may be poorly developed or less effective.

Comparisons were made between multiple subgroups of these patients. Almost half of the patients (49%) had a psychological or psychiatric history, suggesting that other psychological diagnoses were also prevalent. In
addition, 78% had a history of GERD, asthma, or both, showing that these medical conditions were common comorbidities with PVFD. Review showed that 44 of 45 patients had carried a diagnosis of asthma at some point in time. Fifteen of these patients had normal pulmonary function tests and were eventually determined to not have asthma—these patients were placed in the nonasthma group. The remaining 29 patients had a history of positive or equivocal pulmonary testing and still carried a diagnosis of asthma. In these patients, PVFD appears to coexist with asthma and may exacerbate the ability to control asthma symptoms.1,2,4

Subgroup analysis revealed that patients with a medical history of asthma and/or GERD scored higher on the hypochondriasis scale than the nonmedical group. This suggests that PVFD patients with the common comorbidities of asthma and GERD complain more about physical symptoms. It may be that patients with more physical complaints visit physicians more often, and this naturally leads to more diagnoses and a more extensive medical history (PVFD, asthma, GERD). The other significant finding was that PVFD patients with a psychological history scored higher on the depression and anxiety scales than patients without a psychological history. This suggests that PVFD patients with a psychological history demonstrate more abnormal mood characteristics. They appear to have more depressive and anxious thoughts or features than other PVFD patients have.

This is the first known study examining PVFD utilizing psychometrically-sound psychological assessment instruments. Further studies could examine PVFD as a psychological disorder using a different patient base. For example, one could investigate this among adolescents to see if the psychological presentation is similar. The "conversion V" code type is more common among women and older persons than among men and younger persons, as we found in our study.11 It will be interesting to see if pediatric patients diagnosed with PVFD show similar results on the MMPI-A, the form of the Minnesota Multiphasic Personality Inventory normed for adolescents and children. As 38% of patients reported being victims of abuse, it might be useful to further investigate prior abuse as a possible contributor to symptoms of PVFD. In the current study, the type of abuse suffered by the patient was not specified in the majority of cases.

In addition, it would be beneficial to investigate different psychological treatment options for this population. The literature suggests that the most effective treatment to date is a form of speech therapy focusing on patient education, comprehension of mental control over breathing using biofeedback, and stress reduction.2,4,7 Further, psychotherapy, including cognitive-behavioral therapy and personal construct therapy, has been shown to be effective for the treatment of PVFD.2,4,7 In considering PVFD as a conversion reaction, it would be helpful to investigate treatment options that have been shown to be effective for somatoform disorders. For example, behavioral treatment, relaxation techniques, and hypnosis have been found to be helpful in treating somatoform disorders, specifically conversion disorders and pain disorders.15 It may be that the proper combination of speech therapy (done by a speech pathologist) and psychotherapy (done by a mental health professional) will be the most effective treatment for PVFD.

CONCLUSIONS
This is the first study to investigate PVFD using psychometrically-sound psychological instruments. Results of MMPI-2 assessment for both adult men and women show that on average, PVFD is associated with conversion disorder (P < .01). However, there also appears to be a subset of PVFD that is not associated with any psychopathology. By MMPI-2 criteria, PVFD is not associated with a mood disorder, namely depression or anxiety. However, PVFD patients with a psychological history are found to demonstrate more depressive and anxious symptomatology than PVFD patients without a history of psychological disorder. In addition, PVFD patients with a history of asthma or GERD are found to have higher hypochondriasis scores than other PVFD patients. This suggests that patients with a more extensive medical history are more likely to complain about physical symptoms. PVFD patients do not have higher levels of stress than the general population, but they may not cope with their stress effectively. In fact, male PVFD patients have lower overall levels of stress, while female patients have more negative stress and less positive stress.

PVFD is more common among women (81%) and is common among older individuals (60% age 50 or older). Patients visited the emergency room for PVFD symptoms an average of 2.4 times in the previous 12 months. GERD, asthma, and other psychological conditions are common comorbidities. In addition, a history of abuse is very common among these patients (38%). PVFD is often misdiagnosed as asthma but certainly may coexist with asthma. A combination of history, awake laryngoscopy, pulmonary function tests, and response to various treatments can help sort this out. The most effective treatment for PVFD to date has been a form of speech therapy that includes biofeedback, teaching mental control over breathing, and stress reduction. With the knowledge that PVFD is associated with conversion disorder, adding more formal psychotherapy to the treatment regimen may prove to be important for these patients.

BIBLIOGRAPHY


