ORIGINAL ARTICLE

Idiopathic Vocal Cord Palsies and Associated Neurological Conditions

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Objective: To retrospectively review the clinical case records of patients with idiopathic vocal cord palsies (VCPs) for the presence of preexisting or subsequent development of neurological disease, including multiple sclerosis, motor neuron disease, myasthenia gravis, cerebrovascular disease, and Guillain-Barré syndrome.

Design: Retrospective case review of all patients with VCP presenting sequentially within a 45-month time span.

Setting: Tertiary referral center.

Patients: One hundred ninety-three patients with VCP.

Results: Thirty-five cases of VCP (18.1%) were idiopathic. Eight (22.8%) resolved after a mean time of 5 months. A preexisting central nervous system condition was noted in 9 (25.7%) of 35 patients with idiopathic VCP. A subsequent central nervous system condition developed in 7 patients (20.0%). These included 2 cases of cerebrovascular accidents, 1 case of postpolio syndrome with respiratory failure, and 1 case of polyneuropathy secondary to paraneoplastic syndrome.

Conclusions: A high frequency of neurological conditions was observed in adult patients initially presenting with idiopathic VCP. Patients with VCP but without overt neurological disease may also subsequently develop a serious neurological condition. Careful neurological evaluation of all patients with idiopathic VCP is recommended.

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ADULT UNILATERAL VOCAL cord palsy (VCP) is a relatively common voice disorder characterized by a malfunction of the laryngeal muscles. A number of well known disorders, diseases, and surgical sequelae can cause VCP. However, causes remain idiopathic in approximately 12% of cases.[1,2] Familial VCP exhibits a constellation of polyneuropathies,[3,4] and vocal fold motion impairment is one component of multiple system atrophy.[5,6] This suggests that some cases of idiopathic VCP may involve concomitant disseminated neuronal degenerative processes.

The objective of this study was to determine whether the patients with idiopathic unilateral VCP treated at our otolaryngology specialty clinic might have preexisting or subsequently developed neurological conditions.

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METHODS

We performed a retrospective review of all patients with VCPs seen at the Department of Otolaryngology–Head and Neck Surgery at the Marshfield Clinic, Marshfield, Wis, from January 1996 to October 1999. The clinical records of all patients with idiopathic VCP were reviewed for preexisting, or the subsequent development of, neurological disease. All patients with neurological conditions, including multiple sclerosis, motor neuron disease, and Guillain-Barré syndrome, were examined and evaluated by a neurologist. Additional workup depended on the patient's condition and the decision of the neurologist. All patients were evaluated by an otolaryngologist and received a complete head and neck examination. The diagnosis of idiopathic VCP was made after a complete workup, including a computed tomographic scan of the neck and chest visualizing the path of the vagus and recurrent laryngeal nerves. Findings from blood tests performed for most patients included a complete blood cell count; measures of erythrocyte sedimentation rate, thyroid stimulating hormone, and glucose level; Lyme disease titers; venereal disease research laboratory slide test; and fluorescent treponemal antibody test. Laryngeal electromyography was used when indicated in deciding the appropriate time to perform surgery for rehabilitation of the VCP.

RESULTS

One hundred ninety-three patients were diagnosed with VCPs over a 45-month period (January 1996 to October 1999). Sixty-nine (35.8%) of the diagnoses were related to intubation and/or surgery (the most common cause). Thyroid and tho-

Table 1. Etiology of Vocal Cord Palsy (VCP)

Etiology	No.
Surgical cases, n = 69	
Thyroid	17
Parathyroid	2
Cervical	6
Craniectomy	1
Carotid	19
Skull base	7
Thoracic/cardiac	16
Gastric bypass	1
Trauma, n = 19	
Blunt	13
Aneurysm	5
Cardiomegaly	1
Neurological disorder, n = 17	
Stroke	17
Tumors, n = 46	
Brain	1
Lung	11
Thyroid	8
Glomus	4
Mediastinal mass	12
Metastatic colon	2
Skull base	2
Esophageal	5
Metastatic breast	1
Other, n = 7	
Radiotherapy neuropathy	1
Systemic lupus erythematosus	1
Polio	1
Inflammatory skull base lesions	1
Arnold Chiari malformation	1
Congenital malformation	2
Idiopathic VCP	35
Total	**193**

racic/cardiac surgical procedures were nearly equal causes of VCP (n=33). Forty-six cases (23.8%) were due to tumors, 19 (9.8%) to trauma, 17 (8.8%) to cerebrovascular disease, and 7 (3.6%) to congenital and inflammatory conditions. Thirty-five cases (18.1%) were idiopathic (**Table 1**).

There were nearly equal numbers of men (n=18) and women (n=17) with idiopathic VCP. Mean age was 63.5 years (age range, 22-87 years). The mean follow-up period was 23¼ months (range, 0-116 months). All cases were unilateral. More than twice as many cases of idiopathic VCP were found on the left side as on the right side (24 vs 11). A preexisting central nervous system condition was noted in 9 (25.7%) of 35 patients. A subsequent central nervous system condition developed in 7 patients (20.0%) with a mean time to diagnosis of 17 months (range, 2 weeks to 4 years). Preexisting and subsequently developed central nervous system conditions identified are listed in **Table 2**. Eight cases (22.8%) of idiopathic VCP resolved in a mean time of 5 months (range, 23 days to 26 months).

COMMENT

In this series of adult patients, nearly half of the patients with idiopathic unilateral VCP presented with, or were subsequently diagnosed as having, neurological conditions. Our study confirms and extends evidence for such an association (**Table 3**).

Table 2. Central Nervous System (CNS) Conditions Found in Association With Idiopathic Vocal Cord Palsies in a Series of 35 Patients

Condition	No.
Preexisting CNS lesions	
Recurrent cranial neuropathies	1
Transient ischemic attacks	1
Polio with postpolio syndrome	2
Cranial nerve 9 + 10 palsy	1
Blacking out, numbness, blurred vision	1
Esophageal dysmotility	1
Laryngeal spasms	1
Dementia	1
Total	**9**
Subsequent CNS condition	
Asymmetrical hearing loss and vertigo	1
Stroke	2
Respiratory failure with postpolio syndrome	1
Peripheral neuropathy	1
Polyneuropathy with paraneoplastic syndrome	1
Spontaneous tongue spasms	1
Total	**7**

Table 3. Number of Underlying Neurological Conditions in Patients Diagnosed With Vocal Cord Palsy (VCP)

Source	Patients With VCP, No./Total No. (%)	Patients With Idiopathic VCP, No./Total No. (%)
Daya et al,[7] 2000	16/102 (15.69)*	36/102 (35.29)
de Gaudemar et al,[8] 1996	29/113 (25.66)	42/113 (37.17)
Gupta et al,[9] 1997	0/61 (0)	24/61 (39.34)
Havas et al,[10] 1999	11/108 (10.18)	36/108 (33.33)
Ramadan et al,[11] 1998	8/98 (8.16)†	16/98 (16.33)
Srirompotong et al,[12] 2001	5/90 (5.55)	12/90 (13.33)
Present study	17/193 (8.81)	18/193 (9.33)
Total	**86/765** (11.24)	**184/765** (24.05)

*Seven of 16 patients had Arnold Chiari malformation.
†Cerebrovascular accident.

Several retrospective reviews[7,8] have suggested an association in children between idiopathic VCP and underlying neurological conditions. In a consecutive sample of 102 cases of pediatric VCP, 35% were classified as idiopathic and 16% as having underlying neurologic conditions.[7] Seven patients had Arnold Chiari malformation, 2 exhibited peripheral neurological disease, 1 had hereditary distal spinal muscular degeneration, and 1 had Horner syndrome ipsilateral to the VCP. Of 113 children diagnosed with congenital VCP, excluding postsurgical cases, 37% had idiopathic VCP, and 25% had associated neonatal neurological diseases.[8]

In adults, the rate of idiopathic VCP is similarly high and is sometimes associated with a neurological condition (Table 3). In a series of 61 adult patients with bilat-

eral VCP, 39% of cases were idiopathic.[9] However, in that series, despite detailed ear, nose, and throat, neurological, and radiological examinations, no underlying neurological disorders were disclosed. Havas et al[10] classified etiologies of unilateral VCP in 108 patients. Forty-five cases were iatrogenic, and 36 cases were idiopathic. Of the remaining 27 patients, 6 had a central nervous system disorder or systemic neurological disorder, 3 had vagus neuroma or neurofibroma, and 2 had postpolio syndrome. Ramadan et al[11] evaluated 98 patients with unilateral VCP. The cause was found to be neoplastic disease in 32% of the cases; idiopathic in 16%); or caused by surgery (30%), trauma (11%), central nervous system disorder (8%; all 8 cases were the result of stroke), or infection (3%). Associated cranial nerve injuries were found in 9 patients. Five patients had injuries to cranial nerve 11, and 4 patients, to cranial nerve 12. Srirompotong et al[12] evaluated 90 patients with unilateral VCP, finding that 29% of cases were due to neoplasm; 21%, inflammation; 8%, trauma from endotracheal intubation and external laryngeal trauma; and 5%, central nervous system disease. Twenty-four percent were iatrogenic, and 13% were idiopathic.

PATHOPHYSIOLOGIC CONSIDERATIONS

In our series of patients with unilateral VCP, it is difficult to make a pathophysiological connection between idiopathic VCP and some diagnoses (eg, dementia or presyncope) (Table 2). How and why should a patient with multiple cranial neuropathies or postpolio syndrome be prone to develop VCP? There are isolated forms of idiopathic Guillain-Barré–type illnesses, inflammatory or infiltrative neoplastic skull base diseases, and a variety of other similar disorders that could logically affect both cranial nerves and their various branches. The neurological conditions that preceded VCP (in 5 of 9 cases) seem to be associated with either the brainstem outflow end of the neuraxis or the segmental laryngeal or esophageal anatomy (the neuromuscular disorders, multiple cranial neuropathies, esophageal dysmotility, and laryngeal spasms).

Similarly, it is unclear whether VCP potentially heralds any subsequent neurological diagnosis. The subsequent neurological conditions included hearing loss or vertigo and postpolio neuropathies. These conditions seem to suggest an association of idiopathic VCP with neuromuscular disorders because 9 (26%) of 35 patients have either a neuromuscular or closely aligned otolaryngologic diagnosis before or after VCP is diagnosed.

The left vocal cord is more vulnerable to injury than the right, as noted herein. The left recurrent laryngeal nerve is longer. Typically, there is a 28% difference in length; it can vary from 5 to 15 cm.[13] In addition, there is pronounced variation in the way in which the 2 recurrent laryngeal nerves meet the larynx.[14] In a now-discontinued procedure for the treatment of spasmodic dysphonia, the left recurrent laryngeal nerve was chosen for sectioning more often than the right because the right has a lower risk of subsequent disease.[15] Whether such anatomical differences and susceptibility to disease are evidenced by the 2-fold increased incidence of left-sided VCP in our study remains to be proved.

CENTRAL NERVOUS SYSTEM DISORDERS VS PERIPHERAL NEUROLOGICAL ETIOLOGIES

The neurological disorders reported to be associated with VCP seem to be divisible into central nervous system disorders (cerebrovascular disease, multiple sclerosis, multiple system atrophy, Parkinson disease, progressive supranuclear palsy, and Arnold-Chiari malformation) and peripheral nervous system disorders (eg, Wallenberg syndrome, myasthenia gravis, Guillain-Barré syndrome, postpolio syndrome, congenital hypomyelination neuropathy, Charcot-Marie-Tooth disease, and chronic motor axonal neuropathy).[7,8,16-33] Although cases of idiopathic VCP can occasionally be bilateral, they are usually unilateral. Our series of patients were all adults with unilateral VCP, and nearly half (46%) either had preexisting or subsequently developed comorbid neurological conditions.

Our study validates findings that cerebrovascular disease is a common cause of VCP. Seventeen (9%) of the 69 cases reviewed were caused by stroke. Two patients previously diagnosed as having idiopathic VCP, 1 of whom had a history of transient ischemic attacks, subsequently experienced cerebrovascular accidents.[18]

Two of our 35 patients with idiopathic VCP, 1 of whom subsequently developed respiratory failure, were diagnosed as having postpolio syndrome. Common signs and symptoms include breathing or swallowing problems and sleep-related breathing disorders. Postpolio laryngeal muscle weakness requiring surgical intervention is reported.[26]

LIMITATIONS

In our case series, we were unable to perform extensive medical chart abstractions on an age-matched control group that would enable us to determine rates of the identified neurological conditions in our general population for comparison with the rates seen among our patients with VCP. In addition, the mean time elapsed from diagnosis of VCP to a subsequent neurologic condition in our patients was 17 months (range, 2 weeks to 4 years). Likewise, the time between the diagnosis of a preexisting neurological condition and the subsequent evolution of VCP was not determined. Therefore, any cause-and-effect relationships between neurological conditions and idiopathic VCP cannot be established in our study. Rather, our findings suggest a need for a further prospective cohort study of patients with idiopathic VCP with comparison to an age-matched, population-based control group to ascertain whether a valid epidemiological and temporal association exists between idiopathic VCP and neurological disorders.

In conclusion, the number of patients diagnosed with VCP is rising as physicians become more aware of its prevalence.[20,34] Given the frequency of associated neurological conditions in adult patients with idiopathic VCP, a careful neurological examination should be considered for all patients. A prospective study focusing on serial neurological evaluation in patients with idiopathic VCP should be mounted.

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