

## ■ The Irritable Larynx Syndrome as a Central Sensitivity Syndrome

## ■ Le syndrome du larynx irritable : un syndrome de sensibilité centrale

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### Abstract

The purpose of this study was to demonstrate that patients meeting the diagnostic criteria for irritable larynx syndrome have a high incidence of co-morbidity with irritable bowel syndrome, fibromyalgia, chronic fatigue syndrome and migraine. A second goal of the study was to provide support for the hypothesis that the irritable larynx syndrome represents a central sensitivity syndrome in which laryngeal and paralaryngeal muscle systems overreact to normal sensory stimuli. One-hundred-and-ninety-five consecutive patients given the diagnosis of irritable larynx syndrome between the years 2000 and 2008 were reviewed for symptom distribution, symptom triggers and treatment profiles. Co-morbidity data were recorded for psychiatric diagnoses, irritable bowel syndrome, fibromyalgia, chronic fatigue syndrome, asthma, chronic headache and multiple chemical sensitivity. Many patients in the group had prior or current diagnoses of depression (54%) or anxiety (38%). Other diagnoses included irritable bowel syndrome (57% of patients), fibromyalgia (28%), chronic fatigue syndrome (42%), and chronic headache (49%). More than half of the patients reported two or more of the co-morbidities. We conclude that irritable larynx syndrome is usually seen in patients manifesting a broad picture of disorder due to central nervous system hypersensitivity. Irritable larynx symptoms in patients with central sensitivity syndrome may relate to co-existent gastroesophageal reflux. Caregivers need to be aware of these related disorders and understand how treatment modalities are integrated.

### Abrégé

Le but de cette étude était de démontrer que les patients qui répondent aux critères du syndrome du larynx irritable ont une forte prévalence de comorbidité avec le syndrome du colon irritable, la fibromyalgie, le syndrome de fatigue chronique et la migraine. Un autre objectif de l'étude était d'appuyer l'hypothèse que le syndrome du larynx irritable représente un syndrome de sensibilité centrale, où les appareils musculaires laryngé et paralaryngé réagissent de manière excessive aux stimuli sensoriels réguliers. Cent quatre-vingt-quinze patients consécutifs, qui ont reçu le diagnostic du syndrome du larynx irritable entre les années 2000 et 2008, ont été examinés pour la distribution des symptômes, les éléments déclencheurs des symptômes et les profils de traitement. Des données de comorbidité ont été enregistrées pour les diagnostics psychiatriques, le syndrome du colon irritable, la fibromyalgie, le syndrome de fatigue chronique, l'asthme, le mal de tête chronique et la sensibilité chimique multiple. Plusieurs patients du groupe ont déjà souffert ou souffrent actuellement de dépression (54 %) ou d'anxiété (38 %). D'autres diagnostics incluaient le syndrome du colon irritable (57 % des patients), la fibromyalgie (28 %), le syndrome de fatigue chronique (42 %) et le mal de tête chronique (49 %). Plus de la moitié des patients avait deux comorbidités ou plus. Nous en sommes venus à la conclusion que le syndrome du larynx irritable est généralement présent chez des patients qui présentent de nombreux aspects du trouble causé par une hypersensibilité du système nerveux. Les symptômes du larynx irritable chez les patients ayant un syndrome de sensibilité centrale peuvent être liés au reflux gastro-œsophagien coexistant. Les intervenants doivent connaître ces troubles connexes et comprendre comment les modalités de traitement sont intégrées.

**Key words:** irritable larynx, central sensitivity syndromes, laryngospasm, vocal cord dysfunction, paradoxical vocal cord motion, muscular tension dysphonia, chronic cough

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**T**he irritable larynx syndrome (ILS) is a condition in which a person experiences laryngeal muscle spasms, triggered by a sensory stimulus. A sensory stimulus can trigger an involuntary, often protracted, laryngeal closure reflex that can be bothersome or frightening to the patient. The laryngeal muscle spasm can cause episodes of coughing without apparent cause, a sense of a lump in the throat (globus sensation) and/or a “laryngospasm.” Laryngospasm is a term used to denote airway obstruction, more often inspiratory than expiratory, characterized by adduction of the true vocal folds. Recurring, bothersome laryngospasm is also called “vocal cord dysfunction” (VCD) or “paradoxical vocal fold motion” (PVFM). The laryngeal muscle spasm may lead to muscle misuse voice problems, manifest as episodes of dysphonia and vocal dysfluencies, or a more chronically dysphonic voice, commonly referred to as muscle tension dysphonia (MTD). (Morrison, Rammage, Belisle, Pullan & Nichol, 1983; Morrison & Rammage, 1992). The sudden episodes of laryngospasm and/or chronic cough can be very distressing for patients and are often accompanied by symptoms of anxiety or depression. These episodes may be triggered independently by sensory stimuli. Muscle tension in the laryngopharynx and the laryngeal strap muscles may be visible and palpable and is often audible as MTD.

ILS was originally defined in 1999 as “hyperkinetic laryngeal dysfunction resulting from an assorted collection of causes in response to a definitive triggering stimulus.” (Morrison, Rammage and Emami, 1999). We hypothesized that one or more processes had altered brain stem control of laryngeal sensory-motor processes so that abnormal muscle tension or spasm occurred in response to what would otherwise be normal sensory stimuli. The original inclusion criteria for ILS were episodic laryngospasm and/ or dysphonia and/ or chronic cough with or without globus sensation; visible and palpable evidence of tension or tenderness in laryngeal and paralaryngeal muscles; and a specific symptom-triggering stimulus. Methods and criteria for scoring extra-laryngeal muscle tension by palpation were described by Angsuwaransee & Morrison (2002).

In the original paper, we stated the laryngospasm and dysphonia were “primary” symptoms, and cough and globus were “secondary.” As our clinical experience has grown, we have noted that persons with treatment-resistant chronic cough frequently fit the ILS model, even in the absence of laryngospasm or dysphonia. Consequently, we now accept that cough can be present as a “primary” symptom. Subsequent study of larger samples of patients meeting these criteria revealed that psychological stressors and/or conflicts may play a role in symptom formation or may act as triggers. The detailed inspection of co-existing factors suggests there is often a complex relationship between sensory symptom triggers and their symbolic psychological significance, which explains why the laryngopharynx is often a target area for muscle misuse (Rammage & Morrison, 2009; Rammage, 2009).

## Central Sensitivity Syndromes

Yunus coined the term Central Sensitivity Syndromes (CSS) to denote the co-occurrence of fibromyalgia, myofascial pain syndrome, irritable bowel syndrome, chronic fatigue syndrome, tension-type headaches and restless legs syndrome (Yunus, 2000). Yunus suggested that central sensitivity is the expression of an underlying common neurohormonal pathophysiological mechanism, specifically Neuro-Endocrine-Immune pathology (NEI). In subsequent publications, Yunus demonstrated that central sensitivity in CSS can be verified by testing of certain neurotransmitters or neuromodulators, by the nociceptive spinal flexion reflex (NFR) in the human pain laboratory, and by functional magnetic resonance imaging and cerebral evoked potential recorded by electroencephalography (Yunus, 2005, 2007). In his most recent theory, Yunus (2008) challenged the concept that CSS singularly represents a collection of somatic or hysteric symptoms by demonstrating that CSS does not meet the criteria for somatization disorders presented in the most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM). Biophysiological and psycho-social factors might interact in development and symptom-triggering mechanisms. Yunus emphasized the clinical importance of adopting an accurate, common and unifying nosology for CSS, particularly as a useful paradigm for planning effective comprehensive treatment (Yunus, 2008).

## Irritable Larynx Syndrome as a Central Sensitivity Syndrome

Of the 39 ILS patients presented in the 1999 study (Morrison et al., 1999), some developed ILS symptoms soon after a viral illness so we hypothesized that the viral DNA had altered central neuron responsiveness. Others were suffering from significant gastroesophageal reflux so we hypothesized that chronic noxious stimulation from refluxate produced hypersensitive responses to sensory stimuli, resembling the proposed pathophysiology in chronic pain described by Yunus and others. Many patients in the ILS cohort suffered abuse as a child or later in life, and seemed to exhibit high levels of anxiety and depression. A study of ILS in health care workers, mostly nurses, yielded a significant positive result on standard tests for post-traumatic stress disorder (PTSD) (Cochrane, Morrison & Alden, 2005). All of these symptoms may be part of the pathophysiology of ILS as well as that of other central sensitivity syndromes (CSS), as proposed by Yunus (2008). We believe that several factors contribute to development of the ILS symptom complex.

A review of the literature confirmed that the pathophysiology proposed for other CSS is similar to that proposed for ILS, and that co-morbidities may be common (Yunus, 2008). Although the proposed members of the CSS family proposed by Yunus reflect a wider range than we have examined for the current study, they are all based on a mutual association and the presence of central sensitivity based on NEI.

Since speech-language pathologists and audiologists may not be familiar with the disorder spectrum that may be associated with CSS (and ILS), the following paragraphs will briefly describe related conditions.

### **Fibromyalgia:**

Fibromyalgia (FM) is a chronic pain syndrome of unknown etiology characterized by diffuse pain lasting more than three months, and tenderness in specific sites. Many people with FM also experience symptoms of fatigue, headaches, irritable bowel syndrome, irritable bladder, cognitive and memory problems, temporomandibular joint disorder, pelvic pain, restless leg syndrome, sensitivity to noise and temperature, and/or anxiety and depression. The symptoms can vary in intensity (Clauw & Taylor-Moon, 2006). FM occurs in 2 to 4 % of the population, seven times more frequently in women than in men. Decreased stimulus thresholds and abnormal neuroendocrine tests have been identified in individuals with FM (Desmeules, Cedraschi, Rapiti, Baumgartner, Finckh, Cohen et al., 2003; Neeck & Crofford, 2000; Yunus, 2005; 2007). Abnormal levels of pain signal neurotransmitters may result in poor regulation of the brain's pain centres. Exposure to normal levels of physical, emotional or environmental stimuli may trigger FM symptoms.

### **Chronic Fatigue Syndrome:**

Chronic fatigue syndrome (CFS) is a debilitating disease of uncertain etiology that is characterized by unexplained, severe fatigue associated with typical symptoms. The diagnosis is largely based on subjective complaints in the absence of reproducible and reliable test results. However, several abnormal neuroendocrine tests have been demonstrated (Neeck & Crofford, 2000). Prevalence ranges from 0.2% to 0.7% in the general population. The pathophysiology may include infectious agents as well as immunological, neuroendocrine, and psychiatric factors (Fuller & Morrison, 1998; Miharshahi & Beirman, 2005).

### **Irritable Bowel Syndrome:**

Irritable bowel syndrome (IBS) is defined as abdominal pain and discomfort and altered bowel habits in the absence of any other mechanical, inflammatory, or biochemical explanation for these symptoms. It may affect 8 to 10% of the population to some degree. IBS is more likely to affect women than men and is most common in patients 30 to 50 years of age. Subjects with IBS may frequently exhibit somatic and psychiatric comorbidity. Accentuated decrease of stimulus thresholds and various abnormal laboratory tests have been described in individuals with IBS (Coffin, Bouhassira, Sabate, Barbe & Jian, 2004; Hasler & Owyang, 2003; Vandvik, Lydersen & Farup, 2006).

### **Headache:**

Migraine and Tension-Type headaches and IBS often coexist with FM and other chronic pain syndromes (Mulak & Paradowski, 2005; Yunus, 2000; 2005; 2007; 2008). Pathogenic mechanisms between IBS and migraine involve the brain-gut axis, neuroimmune and neuroendocrine

interactions. Accentuated decreased stimulus thresholds have been identified in individuals with tension-type headaches (Langemark, Bach, Jensen & Olesen, 1993). Stress can lead to hyperactivity of the hypothalamic-pituitary-adrenal axis. Enteric neurotransmitters and visceral reflexes may form a link between IBS and migraine. Serotonin, the main neurotransmitter of the gastrointestinal tract, plays a relevant role. Agonists and antagonists of the serotonergic receptors are the most efficacious drugs for IBS and migraine.

In this study, we conducted a retrospective chart review to look at data on the four co-morbidities noted above, to determine whether ILS should be reframed as a CSS condition. We also wanted to examine our treatment strategies for ILS patients.

## **Methodology**

In a retrospective chart analysis, it was found that 195 patients referred to the Pacific Voice Clinic were assigned the ILS diagnosis from 2000 to 2008. This number represented approximately 3.5% of the 3900 new patient assessments evaluated in the voice clinic during that nine-year period. The information collected from the clinic charts included notes from the referring doctor, copies of relevant consults, a voice related quality of life questionnaire (V-RQOL; Hogikyan & Sethuraman, 1999), and the Pacific Voice Clinic intake questionnaire, which asks about symptoms, past treatments and presence of other identified health problems. Chart notes, reports and treatment plans from the voice professionals involved in patient care were also scrutinized for data.

Data collected included:

- Demographic data (age, gender, occupation)
- Symptoms, clinical signs and results of investigations, including laryngeal palpation
- Symptom triggers
- Other diagnoses (depression, FM, CFS, IBS, headache, or other)
- Treatments

Apart from depression, only data on the co-morbidities FM, CFS, IBS and headache were analyzed. The reason for this was that notes regarding other conditions (e.g., chronic pelvic pain, irritable bladder, multiple chemical sensitivity, temporomandibular joint disorder) had not been collected in the earlier part of the observation period.

Laryngeal tension was scored based on a palpation of the patient's neck. Laryngeal muscle tension manifests as anteroposterior or lateromedial compression of the supraglottic larynx. In anteroposterior compression, the epiglottis and arytenoids are drawn together. Lateromedial compression results in squeezing of either the glottis or supraglottic structures. Glottal and laryngeal tension is palpable and can be quantified in a score. The detailed description of laryngeal muscle palpation and scoring can be found in Angsuwaransee and Morrison (2002). Palpable tension scores were assigned for each of four paralaryngeal

groups, including suprahyoid muscles (mylohyoid, digastric and base of tongue), thyrohyoid muscles, cricothyroid muscles and hypopharyngeal muscles.

Two groups of patients with airway closure due to laryngospasm were excluded from this study:

Young high performance athletes, usually female, who develop laryngospasm during peak exercise stress. These patients do not fit the ILS criteria well and were excluded early in the study period. However, in time this group may be deemed to be a member of the CSS family.

Patients whose primary symptom was restricted to awakening suddenly with laryngospasm that could be attributed to nocturnal gastroesophageal reflux. Patients with this relatively common symptom do not typically meet ILS criteria.

Chart review and data management were conducted by a graduate student of speech-language pathology who was familiar with the inclusion and exclusion criteria for ILS and with assessment and treatment protocols, but who had not met or assessed any of the patients, nor written clinical notes and reports for any of the charts reviewed.

## Results

### Demographic data, signs and symptoms

Of the 195 ILS patients studied, 176 were female and 19 male. Ninety-eight were employed, 33 were retired and 17 were homemakers. Forty-four (23%) were on disability leave or pension due to their illness.

The breakdown of patient data related to age, gender and primary ILS symptom is shown in Table 1. Since airway obstruction due to laryngospasm is typically distressing and debilitating, it was considered the primary symptom even when other symptoms co-existed. Nineteen females with chronic cough and 15 females with muscle tension dysphonia did not experience airway obstruction. However, they still met the inclusion criteria for ILS because their scores for laryngeal and paralaryngeal muscle tension were high and their symptoms were associated with specific triggers. Among the males, 17 presented with episodic laryngospasm and 2 had chronic cough without airway obstruction.

Eighty-four (53%) of the 158 patients for whom laryngospasm was their primary symptom also had muscle tension dysphonia, 71 (45%) complained of cough and 31 (20%) complained of globus sensation.

In the non-laryngospasm patient group, 15 of the 21 (71%) primarily complaining of cough also had dysphonia and 7 (33%) had globus sensation. In 15 patients in whom dysphonia was the primary symptom, 6 (40%) also had

**Table 1**  
Laryngospasm, cough or voice as the primary ILS symptom

Sex	Prime Symptom	# pt	Age (ave)	Other Symptoms
Female	Laryngospasm	141	20 – 76 (50)	Laryngospasm only 29 + voice 75 + cough 59 + globus 27
	Cough	19	42 – 68 (55)	Cough only 4 + voice 13 + globus 7
	Dysphonia	15	37 – 66 (52)	Voice only 5 + cough 6 + globus 7
Male	Laryngospasm	17	24 – 77 (48)	Laryngospasm only 2 + cough 12 + voice 9 + globus 4
	Cough	2	41 – 47(44)	Cough only 0 + voice 2
<b>Total</b>		195	20 – 77 (50)	

cough and 7 (47%) had globus. It should be re-iterated that the “primary symptom” used in the analysis was that which the patient identified as being most distressing.

The analysis of the palpation scores showed that scores of 2, moderately hypertonic, or 3, very hypertonic, were assigned for suprahyoids in 150 (77%), thyrohyoids in 166 (85%), cricothyroids in 144 (74%) and paralaryngeal muscles in 121 (62%) of cases.

The most common trigger of an ILS attack was exposure to odors such as perfume. This was the main trigger in 105, or 54%, of patients. Other triggers reported were stress, 51%, eating, 18%, or lying down, 19% (esophageal trigger), and talking, 21%. Since talking can trigger laryngospasm, we considered it a sensory stimulus. Table 2 shows the incidence of various trigger types for the whole group and for four subgroups, including females complaining of laryngospasm, and males with laryngospasm, cough, and dysphonia.

Gastro-esophageal reflux can be an important co-factor in the development of ILS symptoms. The patient charts contained information about the patient history, physical findings and response to treatment. A 24-hour pH test was administered to 47 patients at some time in their management, and the result was positive in 41 and negative in 6.

### Treatments used in the study group

Table 3 lists various treatment modalities that were used in the 195 ILS patients, either before or after the initial evaluation in the Voice Clinic. Because of the hypothetical bias towards gastroesophageal reflux as a component cause, a large majority of patients, 181/195 (93%) were treated with long-term proton pump inhibitor therapy.

**Table 2**  
Symptom Triggers

Primary Symptom			Female	Male	Cough	Voice
			Laryngospasm	Laryngospasm	20f 2m	all f
<b>Total patients</b>	<b>195</b>	<b>%</b>	<b>141</b>	<b>17</b>	<b>22</b>	<b>15</b>
<b>Odors</b>	106	54%	80 (57%)	7 (41%)	11 (50%)	8 (53%)
<b>Stress</b>	100	51%	71 (50%)	7 (41%)	12 (55%)	10 (67%)
<b>Eating</b>	36	18%	28 (20%)	4 (24%)	2 (9%)	2 (13%)
<b>Lying down</b>	38	19%	31 (22%)	3 (18%)	3 (14%)	1 (7%)
<b>Talking</b>	41	21%	29 (21%)	1 (6%)	9 (41%)	2 (13%)
<b>Exercise</b>	27	14%	19 (13%)	4 (24%)	2 (9%)	2 (13%)

**Table 3**  
Treatment of 195 ILS patients

Proton pump inhibitors	181	93%
Steroid Inhalers	113	58%
Antidepressants	92	47%
Voice therapy	52	27%
Psychotherapy	38	19%
Massage or manual therapy	30	15%
Botox	13	10%
Prednisone (from before ILS diagnosis)	25	13%
Nissen fundoplication	6	3%
Long term tracheotomy	2	1%

**Table 4**  
Other past or present self-reported diagnoses

Depression	106	54%
Anxiety disorder	75	38%
PTSD	9	5%
Irritable Bowel Syndrome	112	57%
Asthma	106	54%
Chronic Fatigue Syndrome	81	42%
Chronic Headache	96	49%
Multiple Chemical Sensitivity	69	35%
Fibromyalgia	55	28%
Temporomandibular Joint Disorder	33	17%

One-hundred-thirteen (58%) patients had previously been treated with steroid or bronchodilator inhalers because of the presumed presence of asthma. These patients were weaned off this treatment once the diagnosis of ILS was established.

Psychotropic medications such as selective serotonin re-uptake inhibitors were used in 92 (47%) patients. This was due to the presence of diagnosed depression or anxiety. An alternative rationale is that a central sensitivity syndrome might be effectively suppressed by them.

Voice therapy, using techniques such as relaxed throat breathing, was only used in 52 (27%) cases. This was due to the shortage of publicly funded speech-language pathologists in our area. Psychotherapy (38 patients, 19%), massage or manual therapy (30 patients, 15%), were used less commonly.

Thirteen (7%) patients were treated regularly with Botox injections to reduce the laryngeal spasms. This was useful for reducing the number of visits to the hospital

emergency room. In two patients (1%), the airway obstruction attacks were disabling to the extent that a long-term tracheotomy was established.

**Co-morbidity in ILS**

The incidence of co-morbidity in our group of ILS patients, based on self-reported diagnoses, is shown in Table 4. Depression (106 patients, 54%) and anxiety disorder (75 patients, 34%) were commonly reported by patients with ILS, but we chose not to include them as part of the central sensitivity syndrome analysis.

One-hundred-and-six (54%) of patients in our chart review had been told at some time that they had asthma. Persons whose symptoms are triggered by odours or other environmental sensations will often claim to suffer multiple chemical sensitivity disorder (69 patients, 39%). As both of these self-reported diagnoses are usually just a part of the ILS picture they will not be discussed further.

The main diagnoses of interest in this study were IBS,

**Table 5**

Prevalence of IBS, FM, CFS or headache co-morbidity in ILS

Number of co-morbid diagnoses	All ILS pts (195)	Female Laryngospasm (141)	Male Laryngospasm (17)	Cough (22)	Voice (15)
None	32 (16%)	23 (16%)	7 (41%)	1 (5%)	1 (7%)
One	61 (31%)	41 (29%)	7 (41%)	6 (27%)	7 (47%)
Two	52 (27%)	39 (28%)	2 (12%)	8 (36%)	3 (20%)
Three or four	50 (26%)	38 (27%)	1 (6%)	7 (32%)	4 (27%)

**Table 6**

Incidence of IBS, FM, CFS and Chronic Headache in patients with Irritable Larynx Syndrome

	Irritable Bowel Syndrome	Fibro-myalgia	Chronic Fatigue Syndrome	Chronic Headache
<b>All ILS patients (195)</b>	<b>112 (57%)</b>	<b>55 (28%)</b>	<b>81 (42%)</b>	<b>96 (49%)</b>
Female Laryngospasm (141)	86 (61%)	44 (31%)	61 (43%)	64 (45%)
Male Laryngospasm (17)	4 (24%)	1 (6%)	5 (29%)	5 (29%)
Cough (22)	15 (68%)	6 (27%)	9 (41%)	16 (73%)
Dysphonia (15)	7 (47%)	4 (27%)	6 (40%)	11 (73%)

chronic recurring headache, FM and CFS. As mentioned above, other CSS were not studied as we did not initiate data collection soon enough to include them. The incidence of co-morbid disorders among our 195 ILS patients was as follows:

- Irritable Bowel Syndrome 57%
- Chronic Fatigue Syndrome 42%
- Fibromyalgia 28%
- Frequent Headaches 49%

As shown in Table 5, 163 (84%) ILS patients complained of one or more of these associated diagnoses, whereas the remaining 32 patients (16%) did not complain of any of these common co-morbidities. Sixty-one (31%) reported one of the diagnoses, 52 (27%) reported two and 50 (26%) reported either three or all four of them. Table 6 shows that the co-incidences were essentially the same between the genders, but male ILS patients seemed to report fewer co-morbidities than the females.

**Discussion**

In this group of 195 patients with ILS, the high rate of co-morbidities with at least one additional CSS pointed towards an etiological relationship between these syndromes. The literature describes similarities among the patterns of symptoms, the possible predisposing factors and the triggering agents. Theories proposed to explain the various symptom complexes focus on neuronal changes, which result in lower response thresholds to symptom triggers. The absence of such co-morbidities in a small

number of ILS patients points to potential diagnostic sub-groups within the ILS spectrum. Alternatively, ILS may be the first presenting CSS symptom in a smaller group of patients, in which case appropriate multidisciplinary treatment of the patient for CSS may minimize development of other hypersensitivity disorders such as IBS, CFS, FM or headache.

Treatment of CSS is typically multidisciplinary and multi-pronged, reflecting the complexity of factors contributing to the problem. Psychotropic medications are commonly used, based on the assumption that the neuronal changes that occurred to create the sensory-motor disorder can be chemically altered.

Based on the belief that ILS is related to a hypersensitive reaction to normal sensory stimuli, we treat patients using a three level strategy.

**Level 1: Minimize sensory stimuli (reflux, odors)**

When patients experience spasm symptoms on exposure to airborne irritants such as perfume or car exhaust, they can avoid exposure, such as making the workplace scent-free. Since it is likely that gastroesophageal reflux is a strong catalyst for laryngeal muscle tension, we feel that reflux should be minimized. The significance of negative 24 hour pH findings is not entirely clear since reflux episodes that may be identified within the “normal” range may trigger ILS attacks in someone with CSS. Most ILS patients stay on proton pump inhibitors for the long term, in addition to undertaking lifestyle and diet modification.

**Level 2: Re-program the habituated (laryngeal) motor response**

In discussing the rationale of treatment with ILS patients, we like to use the analogy of a virus getting into a computer and changing the way a program functions. In ILS, laryngeal sensory-motor control is disordered, and voice therapy and relaxed breathing can re-program the motor behaviour. Specific exercises, such as sniffing or pursed lips breathing are taught to the patient. Cognitive behavioural therapy, with a skilled psychotherapist, may also be used.

**Level 3: Neuroleptics and psychotropic medication**

The rationale given to patients is that the neurons involved in the disordered sensory-motor areas use chemicals to communicate with each other, and that a modification of brain chemistry might improve this communication. Selective serotonin re-uptake inhibitors and combined serotonin and norepinephrine re-uptake inhibitors are the most frequently used preparations. Tricyclic antidepressants, more frequently used in chronic pain and fibromyalgia, have the side effect of xerostomia (dry mouth). Baclofen, a centrally acting spasmolytic drug, and Gabapentin, an antiepileptic, may also be effective.

Other treatment modalities such as Botox injection into the vocal folds are employed in selected cases. A measure for the effectiveness of treatment is reduced health care provider utilization, including ER visits. Considerable benefit can be achieved through regular and progressively increasing exercise. Being in better physical condition improves general body function. Regular production of endorphins during exercises may help wean the patient off anxiolytic drugs.

The results of this study and the review of the literature on CSS provide a justification for expanding our data collection practices. Our clinical intake form, history guidelines and request protocols for obtaining laboratory results have been modified to cast a wider net for CSS disorders. Future collaboration with other investigators studying CSS will elucidate theoretical relationships and enhance effective management strategies.

**Conclusion**

ILS is a centrally regulated overreaction to normal sensory stimuli, resulting in airway obstruction, cough, globus and/or dysphonia. In some cases, it may be post-viral or a somatoform disorder related to anxiety, depression or PTSD. However, in the majority of cases, ILS constitutes a subset of central sensitivity syndromes that include IBS, CFS, FM and others. The presence of gastroesophageal reflux may play a role in development of ILS symptoms in patients with CSS. The goal of treatment for CSS and all of its manifestations is to minimize disability, reduce pain, improve general health and optimize efficacious use of medical resources.



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## Author's Note

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