



VOICE DISORDERS

SPASMODIC DYSPHONIA

Spasmodic Dysphonia: Highlights

In Brief

Spasmodic dysphonia is a voice disorder resulting from involuntary movements (or spasms) of the voice box muscles. These spasms interrupt normal voice (dysphonia) in "abrupt spurts" with a strained, strangled voice, with breathy, soundless voice, or with a mixture of both.

- **Spasmodic:** spasms or involuntary movements
- **Dysphonia:** abnormal voice

A Neurological Disease

- SD is a type of dystonia, a disorder of the central nervous system that causes involuntary movement of the vocal folds during voice production.
- SD is not a psychiatric or psychological disease.
- Swallowing and breathing, the other important functions of the voice box, are almost never affected.

Three Types of Spasmodic Dysphonia

Type	What Happens	How the Voice Sounds
Adductor SD (80% to 95% of cases)	Vocal folds come together (close) tightly at the wrong time during speech, making it difficult to produce voice	Strained, strangled breaks while speaking
Abductor SDM	Vocal folds move apart (open) at the wrong time during speech, causing air leaks	Breathy or soundless breaks while speaking
Mixed SD	Combination of abductor and adductor SD	Sometimes strained, strangled breaks; sometimes breathy or soundless breaks

Unknown Cause, but Treatment Can Improve Voice Problem

For spasmodic dysphonia, like all dystonias:

- The cause is unknown
- There is no specific test for diagnosis
- There is no known cure—but treatment can and does improve symptoms

Mainstay of Treatment

Botulinum toxin injections into muscles of the voice box can alleviate symptoms – although relief is only temporary. Treatments are usually repeated approximately every three months.

Outlook on Treatment

In almost every case of spasmodic dysphonia, symptoms can be improved with treatment.

Understanding Spasmodic Dysphonia

What is spasmodic dysphonia (SD)?

Spasmodic dysphonia (SD) is a voice disorder in which abrupt, involuntary movements (spasms) in the voice box cause abnormal voice (dysphonia).

Spasmodic dysphonia (SD) is a type of **dystonia**, a class of disorders caused by problems in the part of the brain that controls movement, resulting in involuntary movements in the affected body part.

Key Information

A Note on Dystonias

- Dystonias can affect the entire body (generalized dystonia) or just one part (focal or segmental dystonia).
- SD is a focal dystonia that is limited to the voice box (larynx).
- Examples of other focal dystonias include blepharospasm (involuntary eye blinking) and torticollis (wry neck).
- Among neurologists, SD is known as focal laryngeal dystonia.
- Spastic dysphonia is an older term that is synonymous with spasmodic dysphonia.

Three Types of Spasmodic Dysphonia

1. Adductor Spasmodic Dysphonia (Ad-SD)
Most common type: 85 to 90 percent of cases
Affects muscles that bring together (adduct) the vocal folds during speech
2. Abductor Spasmodic Dysphonia (Ab-SD)
Affects the muscles that move apart (abduct) the vocal folds during speech
3. Mixed Spasmodic Dysphonia
Has components of both Ad-SD and Ab-SD

(For more information, see Anatomy & Physiology of Voice Production.)

Key Information

Usually Not Part of Serious Neurologic Disease

Spasmodic dysphonia usually occurs by itself, and is very rarely associated with other, more serious neurologic diseases.

How does spasmodic dysphonia affect voice?

Voice production depends on precise vocal fold closure and vibratory capacity. The voice box muscle spasms that characterize spasmodic dysphonia alter the precise closure of vocal folds during speech.

- When spasms result in closing or squeezing the vocal folds tight as in Ad-SD, a strained, strangled voice results as the patient strains to force air to produce vocal fold vibration.
- When spasms during speech cause vocal folds to open when they should be closed as in Ab-SD, a loss of sound or a breathy sound results.
- When no spasms occur, the patient's voice is normal.

What are other common observations in patients with SD?

Thirty-Something Group

SD usually affects adults. Symptoms typically begin in the 30s, although onset earlier or later in life is not unusual.

Usually Identified in Women

Women are more often affected than men.

No Known Hereditary Component

Although SD has been diagnosed in all ethnic groups and does not seem to be hereditary, there is a greater incidence of SD in Caucasians who are of the Ashkenazi Jewish ethnic background.

Irregular Irregularities

In both Ad-SD and Ab-SD, voice interruption ("breaks") or spasms in the voice occur irregularly. The voice will usually break on specific sounds and parts of the word, such as "t" and "p" sounds followed by a vowel (a, e, i, o, u).

For example, when an Ab-SD patient says the sentence "Pay Paul a penny," a breathy, voice break will usually occur immediately after each "P".

Who is likely to develop SD?

No Known Risk Factors

There do not appear to be any behaviors or environmental factors that increase the chance of contracting SD. Although a gene defect has been found for generalized dystonia, no such component has yet been identified for SD.

What are the causes of SD?

Unknown Cause

Spasmodic dysphonia, like all focal dystonias, is a disorder of unknown cause.

Problem Likely in One Part of the Brain

Researchers believe abnormal brain cell activity in a part of the brain called the **basal ganglia** is most likely involved in SD.

Some Anecdotal Associations

Patients with SD have reported the onset of symptoms following:

- Trauma to the head
- Common upper respiratory infections
- Routine intubation for general anesthesia and dental work

However, no clear relationship between any of these conditions and SD exists.

How might you notice SD?

Effort Speaking in the Beginning

Most people gradually become aware that their speech is requiring more conscious effort.

Voice Breaks Follow

The severity of the voice disturbance may vary considerably in the initial stage of the disorder. Over time, it becomes more consistent.

Voice Problem Is Not Progressive, but Does Not Go Away

- There is no evidence that the disorder worsens over the course of a person's life.
- Unfortunately, there is also no evidence that it improves or resolves.
- Patients with SD almost never lose completely the ability to communicate.

What are the symptoms of SD?

Spasms of the vocal folds cause the typical voice changes of SD—a strained strangled voice for AD-SD, and breathy or soundless breaks in AB-SD. These are represented below.

Normal Voice

- "Smooth" movement of voice box muscles
- Fluid voice

AD-ductor SD

- "Closure Type": vocal folds come together with too much force, interrupting speech
- Strained, strangled voice

AB-ductor SD

- "Open Type": vocal folds move apart, interrupting speech
- Breathless or soundless breaks in voice

Mixed Spasmodic Dysphonia: combination of symptoms

Patients with mixed SD have voice changes typical of adductor SD and abductor SD.

- There is no characteristic voice sound for mixed SD, but a careful evaluation of the voice will identify both the strained, strangled voice characteristics of adductor SD and the breathless or soundless voice breaks of abductor SD.

Pattern of Symptoms

Severity of Symptoms Varies

- The severity of the symptoms usually varies from day to day—and even over the course of a single day.
- Sometimes, voice may be normal, while at other times it is abnormal.

Anxiety Usually Worsens Voice Problem

- Anxiety or fatigue causes symptoms to be more noticeable.
- Speaking to strangers, public speaking, or speaking in unaccustomed situations often make symptoms worse, probably because all of these situations increase anxiety.

Telephone Conversations Tough

- Most people with SD report that using the telephone is especially difficult.

Being Calm Can Improve Symptoms

- Symptoms are usually mildest in familiar situations.
- A glass of wine or beer can improve symptoms.

Voice Problems are Task-Specific

SD, like most focal dystonias, is task-specific. Voice problems occur only during specific voice tasks.

- In the case of SD, this is virtually always conversational speech.
- The singing voice may remain normal.

Other Symptom Patterns

- Sometimes, symptoms will disappear in highly emotional situations, such as when the affected person is extremely upset, angry, or laughing.
- Swallowing and breathing, the other important functions of the larynx, are almost never affected.

Symptoms of Spasmodic Dysphonia

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- Fluid voice

Adductor SD

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Abductor SD

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Pattern of Symptoms

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- Voice may sometimes be normal, abnormal at other times.

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Diagnosis of Spasmodic Dysphonia

How is SD diagnosed?

No Specific Test for Diagnosis

There is no specific test to diagnose SD.

- Diagnosis is based on the patient's description of the symptoms, the sound of the voice, and the physician's observation of the vocal folds during speech.
- For this reason, the physician will likely take a detailed history that touches on the features of the disorder mentioned in the previous section.
- In addition, a patient may be asked about associated neurologic symptoms, such as weakness or tremor, and about the use of certain medicines or drugs that have been associated with movement disorders. These include anti-psychotic medications, neuroleptic medications, and illegal intravenous drugs.

Physical Examination

As part of the physical examination, a patient may be asked to repeat certain phrases designed to bring out voice breaks.

- Because SD is a central nervous system disorder, the physical exam should include a careful neurologic examination. Some otolaryngologists will ask that a person with suspected SD see a neurologist for this exam.

Fiberoptic Laryngoscopy – Visualizing the Voice Box in Action

The most important part of the examination is observation of the vocal folds during speech using a flexible fiberoptic laryngoscope inserted through the nose.

- The vocal folds will demonstrate the abnormal behavior typical of SD as the patient speaks.
- This part of the examination serves to distinguish SD from conditions that can cause similar voice changes.

(For more information, see Laryngoscopy/Stroboscopy.)

Acoustic and Aerodynamic Measurements

In addition to a careful history and physical examination, some otolaryngologists may use acoustic and aerodynamic measurements and/or electromyography to help diagnose unusual cases.

Key Information

No One Specific Test for SD

It is important to understand that there is no specific finding on any test that identifies SD. Although these tests may be helpful, the diagnosis of SD is ultimately a matter of expert opinion based on information gathered from the patient history, physical examination, and, most importantly, the otolaryngologist's assessment of the nature of the sound of speech.

Cautionary Notes in Diagnosing SD

Ruling Out a Generalized Neurological Disease

Once a diagnosis of SD is made, limited further testing may be performed to eliminate the possibility of associated neurologic conditions. These tests may include:

- Imaging of the brain (usually by magnetic resonance imaging [MRI] with gadolinium)

- Blood tests (to check blood levels of thyroid stimulating hormone [TSH], homocysteine, B12 and folate)

In the overwhelming majority of cases, the results of these studies will prove normal.

Wilson's Disease May Mimic Spasmodic Dysphonia

- A disorder of copper metabolism ([Wilson's disease](#)) can present with symptoms similar to spasmodic dysphonia.
- This disorder can be distinguished from SD by doing a blood test. Patients with Wilson's disease will have increased blood levels of [copper](#) and [ceruloplasmin](#).

SD Must Not Be Confused With Psychiatric or Psychological Disorders

- The symptoms of SD are so variable and some compensatory behaviors so unusual that a psychological or psychiatric disorder might be the first thing that comes to mind – for both family and professionals.
- Patients must seek medical consultation with a specialized voice doctor.
- Beyond question, SD is a physical disorder of the motor processing centers of the brain, not a psychological problem.
- Although psychiatric or psychological intervention sometimes is suggested in managing the anxiety that often makes symptoms worse, it is not a useful treatment for SD.

SD May Be Mistaken for Essential Vocal Tremor

Ad-SD can also be confused with [essential vocal tremor](#). They must be distinguished from each other since their treatment interventions are different. Key features that differ between SD and essential voice tremor are presented in the following table.

Differences Between Adductor Spasmodic Dysphonia and Voice Tremor

	Ad-SD: "closure type" Strained, strangled voice	Voice Tremor "Wobbly" or "shaky" voice
Pattern of Voice Breaks	Voice breaks and stops are irregular	Voice breaks and stops occur with rhythmic regularity
Voice Activity Affected	Voice breaks and stops usually occur only in conversational speech	Voice breaks and stops occur in all types of voice activity: speech, singing, sustained vowels
Muscles Involved	Involuntary movements are limited to the muscles of the vocal folds	Involuntary movement affects vocal fold muscles, muscles of the throat and neck strap muscles
Role of Medications	Medications helpful to patients with voice tremor have little benefit in SD	Tremor is primarily treated with medications

In approximately one-third of SD cases, dystonic tremor occurs. This is a combination of spasmodic dysphonia with tremor, which can make the diagnosis confusing.

Ad-SD Can be Mistaken for Muscle Tension Dysphonia

The squeezing together (hyperadduction) of the vocal folds that is the hallmark of muscle tension dysphonia is very similar to that of SD.

- SD is, by definition, spasmodic, meaning that squeezing is irregular; with dysphonia, however, squeezing is generally sustained in muscle tension.
- This distinction can be unclear; in some cases a physician may elect to proceed with treatment for one disorder or the other, using the outcome of treatment to arrive at a definite diagnosis.
- The primary treatment for muscle tension dysphonia is voice therapy, which is only of limited benefit to patients with SD

when used as a sole treatment modality.

Key Information

The Two Types of SD May Occasionally Be Mistaken for One Another

- For instance, a person with Ab-SD may unconsciously learn to squeeze the vocal folds together tightly to counteract their tendency to move apart so that the appearance of the larynx resembles that of Ad-SD.
- Sequential examinations, or even a trial of treatment, may help in making the diagnosis.

SD Can Be Present Simultaneously With Other Voice Disorders, Making the Diagnosis Difficult

SD Is Often Seen With Voice Tremor

When this occurs, the patient's speech has both spasmodic speech breaks during speech (SD) and a tremulous "wobble" or "shake" to the voice.

Muscle Tension Dysphonia and SD Can Often Occur Together

Most physicians believe the muscle tension dysphonia is the body's attempt to compensate for SD. The concurrent presence of these two disorders can make the diagnosis of SD difficult.

- The primary disorder will usually become evident after an otolaryngologist takes a careful history, listens to the voice, and performs a physical examination. An evaluation by a speech language pathologist or a brief trial of voice therapy may be recommended.
- Patients with SD as the main problem will not significantly improve with voice therapy as the sole treatment, while those with muscle tension dysphonia will benefit from voice therapy.

Red Flag

Examination via Rigid Telescope May Mask SD, Thus Missing the Diagnosis

Stroboscopy via a rigid telescope inserted through the mouth is an extremely useful examination in most cases of voice disturbance, but it may "mask" a case of SD.

Reason: Examination with a rigid telescope requires the examiner hold the patient's tongue out of the mouth. Sometimes, holding the tongue causes the behavior of the voice box muscles to change such that they do not undergo involuntary movements or spasms. (*For more information, see Laryngoscopy/Stroboscopy.*)

Examination via Flexible Fiberoptic Laryngoscope Necessary – A Reliable Exam for SD

As with other voice disorders caused by a problem in the nerves and/or brain, the larynx should be examined under conditions that least disturb normal speech activity. Flexible fiberoptic examination through the nose will prove the most reliable exam, since the patient can speak and sing during the examination.

Treatment of Spasmodic Dysphonia

How is SD treated?

No Cure for SD, but Treatment Options Improve Symptoms

- Although there is no cure for SD, in most cases treatment can improve symptoms.
- However, treatment that improves voice symptoms does not affect the course of the disorder. In other words, if a person elects not to be treated, the SD will not become worse.

Patient Self-Help Strategies

Some people with SD find ways to improve their voice on their own. These can include chewing something while talking, speaking while laughing, and speaking in falsetto or in a "cartoon-character" voice.

- **A trick to the brain:** It is thought that maneuvers like these take advantage of the task-specific nature of SD to "fool" the brain into thinking that the person is using the larynx for something other than connected speech. However, over time these strategies generally become less effective.

Botulinum Toxin Injection – Main Therapy for SD

Laryngeal injections of botulinum toxin are the main therapy for SD. Botulinum toxin is a naturally occurring substance that weakens muscle by blocking the release of acetylcholine from nerve endings. Acetylcholine is a substance that triggers muscle contraction.

Effects Are Temporary

The effects of botulinum toxin are temporary, lasting about three months, and dose-dependent, so that the muscle weakness is proportional to the amount of toxin used. Research has found that there is a "plateau effect" at higher doses of botulinum toxin; however, at the typical low doses used for the treatment of SD, there is a consistent dose-dependent response.

Different Types of Botulinum Toxin

Of the eight types of botulinum toxin that exist, two are available for use in humans – botulinum toxin, type A and botulinum toxin, type B.

- **Botulinum toxin, type A:** Has been used to improve voice symptoms of patients with SD in the United States since 1984. In this period, it has been shown to be safe, it improves voice symptoms of SD, and it is recognized as such by the American Academy of Otolaryngology–Head & Neck Surgery.
- **Botulinum toxin, type B:** Is now available for unrestricted use. It may be used in those people for whom type A no longer has any effect.

How Botulinum Toxin Treatment Works for SD

The principle behind botulinum toxin treatment of SD is to weaken the muscles that are hyperactive or involved in the involuntary movements or spasms. The muscles that undergo spasms are therefore the ones injected – weakening them will minimize the effects of the spasms on voice.

Type of SD	Muscles Injected with Botulinum Toxin, Type A
Ad-SD <i>Adductor SD</i>	Adductor muscles, which close the vocal folds

Ab-SD <i>Abductor SD</i>	Abductor muscles, which open the vocal folds
Mixed SD <i>Ad + Ab</i>	Injection into both sets of muscles

How Botulinum Toxin Treatment Is Performed

Injections Through the Skin

- Botulinum toxin is usually injected through the skin of the neck into the appropriate spots with the aid of electromyography (EMG).
- The procedure is performed in a physician's office. Afterwards, the patient may usually go on with the normal activities of the day.
- The discomfort associated with the injection commonly disappears after a day or two.
- More rarely, botulinum toxin may be injected through the mouth under a general or local anesthetic.

(For more information, see LEMG.)

Low Dose in the Beginning

- The physician can arrive at the correct amount only through experience with each individual case and feedback from the patient. For this reason, a record of the dose and its effect is usually kept.
- Because there is no means of correcting botulinum toxin muscle weakening before it runs its course, most physicians prefer to begin with a low dose and add toxin as necessary.

Staggered Injections for Ab-SD to Avoid Breathing Difficulty

- In Ab-SD, the toxin is directed at weakening the muscles that open the vocal folds. Inadequate parting of the vocal folds could result in breathing difficulty, so injections are often staggered, with one vocal fold injected one or two weeks after the first.
- Sometimes, a treating physician may prefer to treat just one side per three-month "cycle" to minimize these effects.

Adjusting Dose and Frequency of Injections

- Often, the dose of botulinum toxin can be adjusted to minimize unwanted effects in both types of SD.
- In the case of Ad-SD, for instance, decreasing the dose can usually shorten the duration of the breathiness, but the overall length of benefit may be decreased. Obviously, each person prefers to be injected as infrequently as possible, but each has a different tolerance for the breathy voice period following the injection. People for whom voice is crucial, like lawyers or schoolteachers, may opt for smaller doses at more frequent intervals.

Determining Side to Inject – One-Sided or Both Sides?

Currently there are no standard rules for injecting botulinum toxin to one or both sides.

Two-Sided Injections for Ad-SD

Most commonly, injections to both sides are done for Ad-SD. This is based on the notion that the disorder is bilateral and symmetric. However, in certain patients a unilateral injection may be preferable to minimize side effects.

Usually One-Sided for Ab-SD

Injections for Ab-SD are typically either on one side only or on one side with a large dose and the other side a small dose. The patient will then return approximately three weeks later for a repeat injection, depending upon the response to the first injection.

Measuring Treatment Success

Because the aim of SD treatment is to relieve symptoms rather than cure the condition, the patient's self-rating of speech and voice is probably the best measure of its effectiveness.

Common Observations on Treatment Response

	Measuring How Much Voice Improved On a scale of 1-10, with normal voice being 10	How Long Improvement Lasts
Ad-SD	Injections can improve voice from a score of 5 (Ad-SD without treatment) to 9 after treatment	Benefit lasts about 15 weeks
Ab-SD (usually harder to treat)	Lower improvement rating: Usually voice improves from a score of 5 (Ab-SD without treatment) to 7 after treatment	Benefit lasts about 10 weeks

What does it feel like to have a botulinum toxin injection?

Done Through the Neck

Most botulinum toxin injections are done through the skin of the neck using EMG guidance. The otolaryngologist may or may not inject the skin overlying the voice box with a small amount of numbing medicine. *(For more information, see LEMG.)*

Injection for Ad-SD

- For the injection procedure, patients are placed in a completely reclining or semi-reclining position, and a very thin needle is then passed through the skin overlying the voice box into the voice box muscle responsible for moving the vocal folds to the midline (adductor muscles).
- Once the needle has been verified by LEMG to be in the targeted muscle, the botulinum toxin is injected. The patient will experience a small amount of discomfort from the needle going through the skin and must try not to swallow during the procedure.
- The patient will often hear the EMG activity, which sounds like television static, and should not be startled by this sound.

Injection for Ab-SD

- The muscle to be injected is localized by LEMG.
- The needle is then passed through the skin of the neck, in a similar fashion as for Ad-SD except that the voice box is slightly rotated to allow the EMG needle to find the appropriate muscle (posterior cricoarytenoid muscle) on the posterior part of the larynx.

(For more information, see LEMG and Anatomy & Physiology of Voice Production.)

What to Expect After Injections

Typical Pattern Observed in SD patients

Basis of pattern not understood but probably related to process of nerve recovery after weakness from botulinum toxin, type A injections

First 1-3 days	4 days to 2 weeks	2 weeks to three months – main effect of treatment
<ul style="list-style-type: none"> • Usually no effects observed 	<ul style="list-style-type: none"> • Period of marked improvement or effect 	<ul style="list-style-type: none"> • Leveling off of improvement • Improvement level lasts about 3 months

Key Information

A Note on Aftereffects of Injection

In Ad-SD, because the muscles that bring the vocal folds together are initially "over-weakened," injection is normally followed by a period of breathy, whispery voice and sometimes coughing when drinking liquids. This may last for up to two weeks. Most otolaryngologists aim to adjust the botulinum toxin dose to limit the "breathy" period to one week.

What dose of botulinum toxin should I receive?

There is no standard botulinum toxin dose. The dose and injection sites for each patient with SD must be customized according to the severity of the condition, the patient's voice demands and response to botulinum toxin.

What are the common complications of SD treatment?

There may be some complications with botulinum toxin, type A injections, or none at all. The risk of complications is best discussed with your otolaryngologist.

Complications observed after botulinum toxin, type A injections for SD are described below.

Difficulty Swallowing

Difficulty swallowing is probably the most common side effect of botulinum toxin injections. Since the larynx (voice box) lies next to the entrance of the esophagus, and since laryngeal muscles are small and located fairly deep within the neck, toxin may inadvertently reach the esophageal or pharyngeal muscles. Weakening of these muscles, when added to the weakening of the vocal folds that results from treatment, can result in altered or impaired swallowing.

- **More an inconvenience than a danger:** Some temporary change in swallowing is reported by up to 17 percent of patients. In the vast majority of cases, this is more of an inconvenience than a danger. However, it is possible to impair swallowing more severely, and even theoretically cause a lung infection from food entering the trachea (windpipe). Because the effect of botulinum toxin is temporary, it is usually necessary only to exercise caution while eating or drinking until the situation returns to normal. This is usually a matter of days or weeks, although in very rare cases the problem may persist for the entire three months that the toxin has effect.
- **Usually observed after the first injection, thereafter not so often:** Difficulty with swallowing (especially liquids) following botulinum toxin injection is often most noticeable with the first injection and may decrease with subsequent injections.

Infection

Although always a possibility when a needle is passed through the skin, there have been no reported cases of infection as a result of botulinum toxin injection performed in a physician's office with normal attention to cleanliness and sterile technique.

Minor Bleeding

Minor bleeding and bruising at the injection site may occur, especially in those patients who take aspirin or blood thinners. Serious bleeding has not been reported.

Side Effects

Overall experience with botulinum toxin injections reveals that the treatment remains effective over time and seems to have no important side effects for the patient. It is best for patients to consult their physicians about possible side effects.

Muscles treated with botulinum toxin have been shown to decrease in size, but in the larynx this is not noticeable. This decrease in size appears to reverse once treatment is discontinued.

Red Flag

The safety of botulinum toxin in pregnancy and during breast feeding has not been established. Thus injection should not be administered in these situations.

Muscle-Specific Side Effects

Side effects are specific to whether the injected muscle is an adductor or abductor muscle.

In Ad-SD, adductor-specific side effects include:

- Soft, breathy voice
- Difficulty drinking liquids

Both of these side effects occur because the treated vocal folds are unable to come together completely.

In Ab-SD, abductor-specific side effects include:

- Some breathing restriction (since the treated vocal fold is not able to move aside fully)

How to Minimize Side Effects

Side effects can be minimized and sometimes even eliminated by altering dose or injection pattern. Feedback information from the patient's experience with the previous injection is essential in making the necessary adjustments. Therefore, each new injection should be preceded by a discussion between the patient and the physician about the effects of the previous injection.

How long will botulinum toxin type A injections be effective?

Developing Tolerance – Loss of Drug Effect

Loss of drug effect, or **resistance**, to botulinum toxin can occur after many treatments.

- Higher doses and more frequent treatments increase the likelihood that a person will become resistant.
- Resistance is rare among people with SD since the dose used is very small.

Key Information

Resistance to botulinum toxin is not well understood, but it has been found to occur when the body forms antibodies (the body's defense mechanism) to the botulinum toxin or associated substances, thereby neutralizing their effectiveness. The body forms antibodies to any foreign substance introduced to it, including the botulinum toxin (which originates from one type of bacteria).

Resistance to botulinum toxin can be tested by injecting botulinum toxin into the muscle in the forehead and observing the muscle's response.

Surgical Treatment – A Second-Choice Treatment

Surgery for SD, like surgery for all dystonias, is a second-choice treatment – recommended for patients in whom botulinum toxin treatment is for one reason or another impossible, ineffective, or poorly tolerated. Unfortunately a disappointingly large number of patients have had a recurrence of symptoms months to years following surgery.

Aim of Surgery to Weaken Muscles That Go Into Spasms

The goal of surgery for SD is the same as for botulinum toxin treatment: to weaken the muscles that spasm.

Types of Surgical Interventions for SD

Cutting Recurrent Laryngeal Nerve (RLN)

- Surgeons initially cut or crush the nerve to the vocal fold, called the **recurrent laryngeal nerve**.
- Despite encouraging initial results, about two-thirds of patients develop symptoms of SD again within three years.
- Furthermore, although the SD symptoms return, the paralysis that results from the cutting of the RLN remains – a condition

that has its own drawbacks.

(For more information, see *Vocal Fold Paresis/Paralysis*.)

Cutting Superior Laryngeal Nerve (SLN) and Manipulating the Larynx to Reduce Effect of Spasms on Voice

- Surgeons have also tried cutting the secondary nerve to the larynx, known as the **superior laryngeal nerve**, and manipulating the larynx so the vocal folds lie farther apart (**lateralization thyroplasty**) or are under less tension (**anterior commissure release**). None of these techniques have resulted in satisfactory long-term control of symptoms.

Cutting Both Nerve and Muscle: Thyroarytenoid (TA) Neuromyomectomy

- One surgical procedure being done in Japan involves removing some of the **thyroarytenoid** muscle (the muscle within the vocal fold) and nerve innervating it. This surgery is called a TA neuromyomectomy.
- The results of this procedure have been very favorable. However, the long-term success of this surgical procedure in other countries has yet to be demonstrated.

(For more information, see *Anatomy & Physiology of Voice Production*.)

Selective Denervation-Reinnervation – Cutting the Nerve That Causes Spasms and Replacing It With Normal Nerve

- Currently, a procedure known as **selective laryngeal adductor denervation-reinnervation** is being carefully studied. In this operation, nerves to two of the muscles that close the vocal folds (adductors) are cut (denervation) and replaced (reinnervated) with nerves from muscles that are normal (not involved in the dystonia, i.e., no spasms). Initial results, as in other surgical approaches, have been promising.
- Long-term results are not yet well known.

Key Information

Non-Treatment Not Harmful

Available treatments for all forms of SD are able only to improve or minimize symptoms. Opting not to be treated has no effect on the underlying central nervous system disorder. Patients should only continue with treatment if they feel it is beneficial.

Other Treatments

Voice Therapy

Voice therapy by itself has not been useful in controlling the symptoms of SD. However, voice therapy can help control the side effects of treatment and help the patient manage the anxiety that often worsens the symptoms of SD.

Voice therapy may be helpful following botulinum toxin treatment by helping the person:

- Eliminate the body's poor compensation behaviors
- Adjust to the changes in the voice from treatment
- Maximize the beneficial effects of the botulinum toxin treatment

Psychological/Psychiatric Treatment

SD is an organic disorder of the central nervous system. As a result, psychological/psychiatric treatment is not an effective primary treatment.

However, any chronic condition can be emotionally and psychologically draining. SD is especially so because it affects the voice. A mental health professional may help SD patients better handle the stresses associated with SD.

Oral Medication Treatment

Many medications that act on the central nervous system may be beneficial in dystonia. Unfortunately, at doses that relieve symptoms, significant side effects—like sedation and memory loss – are common.

- In most cases of SD, oral medication is not used at all or is used only as an auxiliary therapy. A neurologist specializing in movement disorders is usually the most appropriate person to consult regarding medication. For this reason, many otolaryngologists who specialize in SD recommend evaluation by such a specialist at some point.

A Final Word

SD Can Be Frustrating

SD is a frustrating, chronic condition for which no cure is currently known. However, it is only rarely associated with other diseases. In most cases, treatment can substantially improve symptoms, often resulting in a near-normal voice.

Open Patient-Physician Communication Important

Because, in the end the affected person is the best judge of his or her voice function, honest and open communication between the doctor and patient is essential in getting the most out of treatment and overcoming the disorder.

Further Information Is Available

Patient Associations and Support Groups

National Spasmodic Dysphonia Association

<http://www.dysphonia.org/nsda/>

Dystonia Medical Research Foundation

<http://www.dystonia-foundation.org/>

National Institutes for Deafness and Communication Disorders page on SD

http://www.nidcd.nih.gov/health/pubs_vsl/spasdysp.htm

Spasmodic Dysphonia: Vocabulary

Spasmodic Dysphonia (SD)

A voice disorder resulting from involuntary movements (spasms) of the voice box muscles

Dystonia

A nervous system problem that causes involuntary movement; dystonia is not a psychological problem; SD is a type of dystonia

Adductor SD (Ad-SD)

Spasms in muscles that close vocal folds, which interrupt speech and cause strained or strangled voice breaks

Abductor SD (Ab-SD)

Spasms in muscles that open vocal folds, which interrupt speech and cause breathy or soundless voice breaks

 **Advisory Note**

Patient education material presented here does not substitute for medical consultation or examination, nor is this material intended to provide advice on the medical treatment appropriate to any specific circumstances.

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