LARYNGEAL BOTULINUM TOXIN INJECTION WITH ELECTROMYOGRAPHY (EMG) GUIDANCE IN CLINIC

What are the indications for EMG-guided laryngeal botulinum toxin (botox) injection into the vocal folds (vocal cords)?

Patients with movement disorders of the larynx (voice box) often have improved voice control with botulinum toxin treatments. Involuntary laryngeal spasm occurs in patients with movement disorders of the larynx (voice box). These disorders can cause irregular voice breaks, and in certain cases, can impair breathing. Patients may see improvement in voice quality and/or breathing after botulinum toxin injection due to the weakening effects of the drug on the muscles that are moving inappropriately.

LARYNGEAL DYSTONIAS:

Adductor Spasmodic Dysphonia (with or without Tremor) is the most common of the laryngeal dystonias, and the most common type of dystonia we manage with laryngeal botulinum toxin injections at The Voice Clinic of Indiana. The disease involves over-activity and irregular spasms of the laryngeal adductor muscles (the muscles that bring the vocal folds together). These irregular spasms of the adductor muscles interrupt the flow of the voice, making it difficult to communicate. Often vowels are especially affected, so words like “rainbow” comes out as “ray-Ayn-bow” or “Hal” sounds like “Ha- el”. Tremor may be present with adductor spasmodic dysphonia, with the tremor being a continuous rhythmic shaking/movement of the larynx. Tremor generally means the response to botulinum toxin will not be as good. While over 90% of our patients with adductor spasmodic dysphonia without tremor achieve dramatic voice improvement after botulinum toxin injections, dramatic improvement is achieved in about 60% of those with adductor spasmodic dysphonia with tremor. This is believed to be because botulinum toxin eliminates the adductor breaks/spasms, but not the tremor, so a baseline level of voice shakiness is often still present. Depending on the level of laryngeal spasm, adductor spasmodic dysphonia can also be categorized as supraglottic or glottic. Supraglottic involves spasms of the upper vocal folds- the false vocal folds. Glottic involves spasm of the true vocal folds themselves. These subcategories are helpful in designing the best possible treatment regimen, as glottic subtypes typically respond very well to EMG-guided botulinum toxin injections, while the supraglottic subtype sometimes requires injections done through a flexible scope passed from the nose to the throat to directly inject the false vocal folds.
**Abductor Spasmodic Dysphonia** is much less common than adductor spasmodic dysphonia. The disease involves over-activity and irregular spasms of the laryngeal abductor muscles (*the muscles that pull the vocal folds apart*). Generally, the abductor muscles should only pull the vocal folds apart when we are breathing, to permit air to travel through the vocal folds and down to the lungs and back out again. In abductor spasmodic dysphonia the vocal folds are pulled apart while speaking, so this results in severe breathy breaks in the middle of words. For example, “Patty” may come out like “P-hhhaaaa-ty”. The voice essentially goes out right in the middle of words. Words starting with “P” and “B” sounds are often the most difficult. Of the laryngeal dystonias, abductor spasmodic dysphonia has the lowest response rate to botulinum toxin, with only 50% of patients having notable improvement. In those patients who do not respond to botulinum toxin, surgical treatments to remove some of the involved muscle can be considered. However, this procedure weakens the abductor muscle so over time there could be problems with scarring or progressive weakening that could impair breathing. An alternative approach involves placement of implant materials just under the vocal folds to help hold them near one another and therefore help prevent the vocal folds from pulling apart and causing breaks.

**Laryngeal Respiratory Dystonia** is a disease when the vocal folds adduct (come together) during breathing, causing the patient shortness of breath and audible noisy breathing. For treatment, the adductor muscles are injected with botulinum toxin.

**Mixed Spasmodic Dysphonia** indicates that more than one type of laryngeal spasm is occurring (for example, adductor and abductor spasms). These cases often don’t do well with initial traditional injections into one muscle group (adductors or abductor) and ultimately low dose of botulinum toxin into multiple muscle groups may be required for the best possible outcome.

**What can I expect during the EMG-guided laryngeal botulinum toxin injections procedure?**

All injections are performed by our laryngologists, Dr. Stacey Halum or Dr. Noah Parker, and a neurologist, Dr. Jay Bhatt. First a small amount of local anesthetic (1% lidocaine) is injected into the front of your neck, then down into the airway, causing you to cough. This helps numb both the skin and the throat.

If you are concerned that you have a very strong cough or gag reflex, you can request to have a nebulized lidocaine treatment before your botulinum toxin injection, and this provides additional numbing effects. However, most patients find this unnecessary, and many even prefer not to have the local anesthesia injected. After Dr. Bhatt has set up the electromyography (EMG) machine and placed the electrode leads, Drs. Halum or Parker will use a very small needle attached to a syringe filled with a carefully selected amount of botulinum toxin. When the EMG signal indicates that the needle is in the appropriate laryngeal muscle, the botulinum toxin is injected. In rare instances, some immediate swelling of the vocal folds can cause instant hoarseness, but this is temporarily and should resolve within 24-48 hours. Patients, especially if on blood thinners, will occasionally cough up small amounts of blood after the procedure for 24-48 hours. Bruising at the front of the neck is common, and holding gentle pressure to the outer neck at the site for the first 10-20 minutes after the injection may help minimize the size of the bruise.
What can I expect after the EMG-guided laryngeal botulinum toxin injections procedure?

Botulinum toxin typically starts working 48-72 hours after the injection. Most patients will notice they suddenly have a soft, breathy, hoarse sounding voice (sometimes almost a whisper) and it takes more effort to speak.

**Ideally:** With an ideal injection, the initial period of severe hoarseness will improve within 1-2 weeks, and then the voice will remain smoother and stronger (with fewer breaks) until the botulinum toxin wears off. In most patients, the breaks begin to return at 2-6 months after the injection, and they will call to schedule another injection. A few rare patients can go nearly one year between requiring injections.

**Reality:** In reality, the response to botulinum toxin varies dramatically between patients and there is no good way to predict the final dose that will give a patient the “ideal” response. Thus, it is not uncommon that a patient will initially get a dose that is either too high or too low for him/her.

- **What if I remain hoarse for many weeks after my injection?**
  Occasionally injections will leave a patient hoarse for many weeks (6-8 weeks or longer) rather than just 1-2 weeks. Rather than having voice breaks/irregularity, this hoarseness is typically characterized as soft and breathy—sometimes like a whisper, and patients often run out of breath with speaking. Unfortunately, because every patient is unique, finding the right dose of botulinum toxin for each patient often involves periods of trial and error, and **if you are hoarse for too long after the injection, it suggests the dose used was too high for you.** We do not have any way to reverse the effects of the botulinum toxin after the injection, so unfortunately **we just need to wait for it to wear off.** However, it is important that you call our office to give us updates so we can keep a careful record of how your voice responded. Then, at your the next injection we will know to go much lower with the dose of botulinum toxin, so that you don’t have to experience prolonged hoarseness again.

- **What if I do not notice a change in my voice after my injection?**
  If you do not notice a change in your voice after the injection, then we also would like you to call our office. This most often happens because the dose that was injected was too low, and a repeat injection at a higher dose is usually needed to get the desired effect. Rarely the injection will leak out due to movement of the larynx at the time of the injection, so no change in voice is appreciated. Again, repeat injection is the best treatment, sometimes with additional numbing medication, to prevent motion of the larynx during the injection.

- **What if I have persistent “shakiness” of my voice after my injection?**
  Most patients with laryngeal dystonia are very pleased with their outcomes after botulinum toxin injections. Unfortunately, the presence of tremor, and abductor breaks (when the vocal folds pull apart causing breathy voice breaks) are two factors that often lead to a less than “ideal” outcome with botulinum toxin. While the injections may dampen the voice breaks to smooth out the voice quality, an underlying “shakiness” often persists in these cases. If this occurs, Drs. Halum and Parker can sometimes explore different injection doses and sites. However, in certain cases the voice disorder itself will prevent an ideal outcome from being acheived. In such cases, is up to the patient to determine if the level of voice improvement is enough to continue pursuing the injections.

- **What if I develop swallowing problems after my injection?**
  Significant swallowing problems after botulinum toxin are rare and temporary (the problems will resolve as the botulinum toxin wears off). After your botulinum toxin injection, it is important to drink and eat slowly. If drinking is causing you to cough/choke, and it does not resolve with
drinking slowly and tucking your chin, then please contact our office and we can order some thickener ("Thick It") to temporarily add to your thin liquids until your swallowing improves. Alternatively, if food is sticking, call our office and we may be able to advise you on how to position your head to allow you to swallow more easily/safely until the botulinum toxin wears off. Swallowing difficulties related to botulinum toxin will typically improve within 1-3 weeks, so, during that period, it is important to get adequate nutrition and hydration until the swallowing returns to baseline. Also, please let the office know if you have problems, so that the dose of botulinum toxin can be lowered at your next injection.

**Final Words:** After each injection, it is important for you to observe how long the initial hoarseness occurred and how long your voice was better before the breaks started coming back. **Please call our office after your first injection(s) and leave information on how your voice is progressing. Our nurses will be the ones in contact with you, and will keep records in your chart. This will allow Drs. Halum and Parker to tailor your treatment or adjust your next dose appropriately.** While we realize that each patient is unique, and some patients/disorders may have a ceiling on the amount of voice improvement they will get with botulinum toxin, **our goal is to get each patient the best possible outcome after each injection.**