Office-Based Botulinum Toxin Injections

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KEYWORDS

• Botulinum toxin • Botox • Spasmodic dysphonia • Dystonia • Ambulatory surgery

KEY POINTS

- Office-based botulinum toxin injections are well-tolerated and easy to perform with appropriate equipment and experience.
- Botulinum toxin injections have been demonstrated to be effective in the treatment of various laryngeal disorders, including spasmodic dysphonia (SD), vocal tremor, bilateral vocal fold paralysis, paradoxic vocal fold motion, ventricular dysphonia, and cricopharyngeal achalasia.

INTRODUCTION

Botulinum toxin is a natural neurotoxin produced by clostridial bacterial species that causes muscular paralysis.[1] The primary mechanism of action of the toxin is via inhibition of calcium-dependent exocytosis and release of acetylcholine at the neuromuscular junction. Other indirect mechanisms of action may also explain the clinical effect of the toxin. Inhibition of intramuscular gamma motor neurons and lack of feedback to motor neurons due to muscle weakening may have an effect on afferent feedback to the central nervous system.[1] The effect of botulinum toxin is reversible because the nerve terminals do recover the ability to release acetylcholine into the neuromuscular junction.

There are seven serotypes of the botulinum toxin; only type A and type B have been developed for clinical use in humans:

- Type A has the longest duration of effect and diffuses less from the point of injection compared with type B. These differences may be secondary to differences in the preparation of the toxin as opposed to inherent differences in the serotypes themselves.[1]

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- The dosing differs significantly between type A and type B preparations. The focus of information in this article is based on the use of type A (Botox, Allergan Irvine, USA; Dysport, Ipsen, Ltd, Slough, UK).

There are numerous indications for botulinum toxin injection in the treatment of laryngeal disorders. The most common use of botulinum toxin is for the treatment of spasmodic dysphonia (SD), a focal dystonia affecting the laryngeal musculature. SD is classified as primarily adductor (ADSD), abductor (ABSD), or of a mixed nature. Distinguishing between these conditions can often be subtle and difficult (a fully detailed discussion of this is beyond the scope of this article). This determination is essential to the effective treatment with targeted botulinum toxin injections, which is the mainstay of management for this condition.[2] The thyroarytenoid-lateral cricoarytenoid (TA-LCA) muscle complex is targeted for ADSD while the posterior cricoarytenoid (PCA) muscle is targeted for ABSD.

Essential tremor and age-related disease that involves involuntary muscle contraction can affect the upper aerodigestive tract muscles with varying degrees of impact on voice production. Symptoms can range from mild to severe vocal disability. Systemic pharmacologic intervention for vocal tremor is generally ineffective; however, botulinum toxin injections have proven to be helpful in selected patients.[3,4] Tremor can also be observed in other neurologic conditions, such as Parkinson's disease, and can coexist with SD.[5]

Plica ventricularis refers to hyperfunction of the supraglottic larynx and excessive adduction of the false vocal folds with phonation, resulting in poor voice quality. This may arise secondary to an underlying pathologic condition at the level of the true vocal folds that is resulting in glottal insufficiency or impaired vocal fold vibration. However, it may also be functional in origin.[6] Traditional management typically involves a combination of treatment of any underlying cause at the level of the true vocal folds and aggressive voice therapy. Voice therapy aims to teach patients to reduce false vocal fold phonation and resume phonation with the true vocal folds; however, some patients may continue to have problems despite aggressive therapy. In these cases, weakening the contraction of the false folds, that is, the aryepiglottic muscle, via a botulinum toxin injection may help facilitate more effective therapy.[5,6]

The use of botulinum toxin has been recently described as a potential treatment of patients with bilateral vocal fold paralysis and posterior glottic stenosis.[7] By weakening the TA-LCA muscle complex, the PCA muscle has less opposition and can lead to a more lateralized position of the vocal folds, thus improving the caliber of the airway. Although this technique had good success in treating patients with bilateral vocal fold paralysis, results in patients with PGS were mixed.[7]

The management of vocal fold granulomas can be challenging and typically involves voice therapy and aggressive management of laryngopharyngeal reflux. Surgery plays a minimal role because it is often ineffective.[8] Various investigators have found that botulinum toxin injection into the ipsilateral vocal fold can be an effective adjunctive treatment of recalcitrant granulomas[8–10] by preventing forceful contact between the arytenoids during phonation and coughing.

Paradoxic vocal fold motion is characterized by the inappropriate adduction of the true vocal folds during inspiration. There are a wide range of proposed causes and treatments[11,12] (further discussion is beyond the scope of this article). It is often a very difficult condition to treat effectively and botulinum toxin injections have been proposed as an effective adjunctive treatment in severe or refractory cases.[11,13,14]

Botulinum toxin injections into the cricopharyngeus muscle can also be effective in the treatment of dysphagia secondary to increased tone and delayed relaxation of this