Safety of Simultaneous Bilateral Botulinum Toxin Injections for Abductor Spasmodic Dysphonia

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**Objective:** To review the safety of simultaneous bilateral posterior cricoarytenoid muscle botulinum toxin injections.

**Design:** Retrospective case series review.

**Setting:** Tertiary care academic clinic.

**Patients:** Twenty-one patients with abductor spasmodic dysphonia.

**Interventions:** Patients received 100 simultaneous bilateral posterior cricoarytenoid muscle botulinum toxin injections for isolated abductor spasmodic dysphonia over a 6-year period.

**Main Outcome Measures:** Major and minor complications, injection dosing, and demographics.

**Results:** The total bilateral botulinum toxin injection dose per session ranged from 2.50 to 7.50 U, and the average total bilateral dose per patient was 4.70 U. There were no major complications, and minor complications were self-limited. There was a 5% incidence of significant dyspnea and a 2% incidence of dysphagia, and all patients were treated conservatively. The average doses at which dyspnea and dysphagia occurred were 4.97 and 5.56 U, respectively.

**Conclusions:** This case series demonstrates that simultaneous bilateral posterior cricoarytenoid muscle botulinum toxin injection is safe up to the highest doses reported. Complications with this approach are consistent with those previously reported using other methods. Prospective studies on vocal outcome measures are needed for simultaneous bilateral posterior cricoarytenoid muscle botulinum toxin injections to evaluate the efficacy of this technique.


**SPASMODIC DYSPHONIA (SD)** is a neuromuscular disorder with 2 main subtypes: adductor SD and abductor SD. Adductor SD accounts for approximately 80% to 90% of cases and abductor SD, approximately 10% to 20%. There are also mixed types in which the symptoms depend on the more affected muscle groups. Spasmodic dysphonia usually occurs as a focal dystonia but may occur in conjunction with global dystonias and neuromuscular impairments, as well as with drug toxicities.

Abductor SD is characterized by breathy voice quality with pitch and phonatory breaks and difficulty coordinating respiration with phonation. Spasms commonly occur during a change from voiceless to voiced phonemes. Examples of voiceless to voiced phonemes are *she, he, and me.* While the gold standard for diagnosis is perceptual voice evaluation, acoustic assessment can be used in making the diagnosis, and laryngeal imaging may help determine the more active posterior cricoarytenoid (PCA) muscle and the side initially treated.

Botulinum toxin (BT) injections have become the treatment of choice for spasmodic dysphonia. It has been previously reported that the duration of effect of BT injections can vary from 3 to 6 months. Aductor SD has been well studied, and there is a report of a 90% overall improvement rate after injecting the thyroarytenoid muscles bilaterally. The results of BT for abductor SD have been less successful. Blitzer et al reported that 20% of patients improved with an initial unilateral PCA muscle injection. The remainder of the patients required subsequent injection of the contralateral PCA muscle for improvement in voice quality. Because of potential breathing difficulties, bilateral PCA muscle BT injections are commonly staged 2 weeks apart.
Meleca et al previously reported a series of simultaneous bilateral PCA muscle BT injections for the treatment of abductor SD. The total amount injected bilaterally in the study was less than 3 total units per session. A total of 6 patients were included in the study, and no major complications were reported. They did report a patient who underwent a tracheotomy for airway compromise and who was not included in the study outcome data. Meleca et al described this patient in the discussion section of the article, raising potential concerns for simultaneous PCA muscle injections. At our institution, most patients with abductor SD have undergone simultaneous bilateral PCA muscle BT injections over the past 6 years. This article reports on the safety of this technique.

**METHODS**

This study was approved by the institutional review board of Emory University and is a retrospective study. We reviewed medical records from all patients undergoing BT injections for abductor SD. In each patient, the diagnosis of abductor SD was made using perceptual voice evaluation and a detailed head and neck examination that included either transnasal flexible laryngoscopy or laryngeal videostroboscopy. The 21 consecutive patients included for analysis had undergone simultaneous bilateral BT injection for isolated abductor SD.

Patients underwent BT injections into the PCA muscles using monopolar electromyographic needle guidance. Injections were performed percutaneously using BT type A (Botox; Allergan, Irvine, Calif). For 18 patients an anterior, transcriboid approach through the cricothyroid membrane was used, and for 3 patients a posterolateral approach was used. Patients underwent separate injections into the right and left PCA muscles at the same clinic visit and were followed up by telephone interview 1 to 2 weeks after the injection to subjectively assess the response of symptoms to injection. Patients who did not report adequate improvement were evaluated with endoscopy at 2 to 4 weeks, and additional injections were performed. The timing of subsequent injections was determined collaboratively between the physician and patient and was based on recurrence of symptoms and their severity. Records were reviewed for major and minor complications. Major complications were defined as tracheotomy, intubation, or admission for airway observation. Minor complications were dyspnea that limited activities of daily living and dysphagia. Objective vocal outcome measures were not studied in this investigation.

**RESULTS**

Twenty-one patients (18 women and 3 men) underwent 100 simultaneous bilateral PCA muscle BT injections over 6 years. The average age of the study population was 44 years, with an age range of 32 to 62 years. There were no intubations, tracheotomies, or admissions for airway observation. There were 2 complaints of transient dysphagia, which we thought was caused by diffusion of BT into the inferior pharyngeal constrictor muscles. Although mild shortness of breath was frequently reported and is a desired result of injection, there were 5 complaints of significant dyspnea. Significant dyspnea was defined as breathing difficulty that interfered with activities of daily living. If warranted, patients were reexamined. They were instructed to modify their activities, and all were treated conservatively. These patients’ symptoms lasted 2 to 3 weeks with gradual resolution. The cases of dyspnea account for an overall minor complication rate of 7%; a 5% rate of significant dyspnea with exertion and 2% rate of dysphagia. These results are consistent with previous reports. The average total bilateral dose per session was 4.70 U, with a range of 2.50 to 7.50 U. The average dose at which dyspnea and dysphagia occurred was 4.97 and 5.56 U, respectively, and the average interval between injections was 3.5 months. Only 3 patients required reinjection within 1 month of their initial injection for subjectively inadequate voice improvement. Our reported doses do not include the additional injections for inadequate response.

**COMMENT**

Most of the literature on BT injections for abductor SD addresses staged rather than simultaneous bilateral injections. Previously, Blitzer et al reported a 20% improvement rate with an initial unilateral injection of 3.75 U of BT using a posterolateral technique. The rest of the patient population required injection of the contralateral PCA muscle with doses ranging from 0.63 to 2.50 U for improved voice quality. Improved outcomes are likely to be seen with bilateral PCA muscle BT injections compared with unilateral injections alone. A common injection technique for abductor SD, as previously reported by Ludlow et al and Bielamowicz et al, is to inject 5 U of BT into the more active PCA muscle, as determined by fiberoptic laryngoscopy. If there is no subjective improvement in voice quality at 2-week follow-up, and there have been no airway symptoms, then the opposite PCA muscle is injected with an additional 5 U. The technique most commonly used at our institution is to start with 2.0 to 2.5 U in each PCA muscle simultaneously. If patients report inadequate results on follow-up, then an additional unilateral dose is injected into the more active PCA muscle within 2 to 4 weeks as determined by laryngoscopy. Subsequent dosing is titrated based on the results of previous injections.

Based on prior work, it seems most appropriate to treat symptoms with bilateral BT injections. Simultaneous bilateral PCA muscle injections can be performed at a single office visit, a convenience for patients who travel long distances. In addition, patient anxiety and the number of uncomfortable procedures patients must undergo are reduced.

Symptom relief intervals vary according to authors. Blitzer et al reported their duration of benefit to be 10.5 weeks. The average injection interval at our institution was 3.5 months. However, voice outcomes were not assessed in this investigation, and whether the technique described herein compares favorably is currently under investigation.

In conclusion, this case series demonstrates that simultaneous bilateral PCA muscle BT injections are
safe up to the highest doses reported and that complica-
tions are minimal. This technique minimizes patient travel for treatment and the number of procedures that they must undergo. A prospective study is curr-
ently under way to evaluate objective voice quality outcome measures in patients with abductor SD who have undergone simultaneous bilateral PCA muscle injections.

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