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MAIN ARTICLE

The point-touch technique for botulinum toxin injection in adductor spasmodic dysphonia: quality of life assessment

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Abstract

Background: Botulinum toxin injection under electromyographic guidance is the 'gold standard' for adductor spasmodic dysphonia treatment. The point-touch technique, an alternative injection method which relies on anatomical landmarks, is cheaper, quicker and more accessible, but has not yet gained widespread acceptance due to concerns about patient satisfaction.

Objective: To assess swallowing and voice-related quality of life following point-touch botulinum toxin injection in adductor spasmodic dysphonia patients.

Setting: Stanford University Voice and Swallowing Center.

Design: Prospective case series (evidence level four).

Methods: Consecutive adductor spasmodic dysphonia patients with a stable botulinum toxin dose–response relationship were recruited prospectively. The Eating Assessment Tool and Voice-Related Quality of Life questionnaires were completed pre-treatment and at 10 and 30 per cent completion of the injection cycle, respectively.

Results: Thirty-seven patients completed follow up. The mean total botulinum toxin dose was 0.88 units. Pre-treatment Voice-Related Quality of Life questionnaire results reflected the burden of disease. Post-treatment Eating Assessment Tool and Voice-Related Quality of Life questionnaire results were collected at 2.53 and 7.84 weeks, respectively; the former showed an increase in dysphagia, albeit statistically insignificant, while the latter showed significantly improved scores (both domain and total).

Conclusion: The point-touch technique is a viable alternative for botulinum toxin injection in the treatment of adductor spasmodic dysphonia.

Key words: Spasmodic Dysphonia; Neurologic Adductor; Quality Of Life; Larynx; Botulinum Toxins

Introduction

There are a variety of treatments for adductor spasmodic dysphonia, but periodic intramuscular injections of botulinum toxin type A (Botox; Allergan, Irvine, California, USA) is the current 'gold standard'.[1–3] Approximately 70 per cent of all botulinum toxin injections for this condition are administered under electromyography (EMG) guidance.[4] Electromyography can also support the diagnosis of adductor spasmodic dysphonia by identifying involuntary spasms.[5] Electromyography enables accurate needle localisation,[6] and the strength of the EMG signal may predict a favourable outcome.[7] Limitations of EMG include access and interpretation. In addition, EMG is not widely available to the community-based laryngologist, and the interpretation of results is often subjective.[8] In some cases, this prevents patients from receiving therapy.

Alternative injection techniques have been described in an attempt to address these issues. Rhew *et al.*[9] reported the administration of botulinum toxin through the operative channel of a flexible fibre-optic laryngoscope, with good results. Ford *et al.*[10] described an indirect laryngoscopic approach to botulinum toxin injection.

Green *et al.*[11] reported a technique based on anatomical landmarks, known as the point-touch technique. In a group of 13 patients, they demonstrated the speed and efficiency of their new injection method, which also enabled significant improvements in phoniatric and acoustic results, compared with conventional EMG-

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guided botulinum toxin injection. However, their method has not yet gained widespread acceptance due to concerns regarding improper needle placement (with a consequent increased risk of side effects), higher dose requirements and lower patient satisfaction and quality of life (QoL).

This study aimed to assess patients' swallowing and voice-related QoL following use of the point-touch technique for botulinum toxin injection, in cases of adductor spasmodic dysphonia.

Methods

Ethical approval for this study was obtained from the institutional review board of Stanford University.

From September 2009 to March 2010, we prospectively recruited consecutive patients with adductor spasmodic dysphonia who had previously shown successful responses to botulinum toxin injection. Adductor spasmodic dysphonia was diagnosed by an experienced voice clinician (EJD) based on previously published vocal and laryngeal findings.[12] Inclusion was based on subjectively assessed responses to two previous consecutive injections with no dose adjustments, indicating a stable dose–response relationship. All patients received unilateral or bilateral percutaneous thyroarytenoid muscle injection performed by the senior author (EJD), utilising the point-touch technique.[11]

As described by Green *et al.*,[11] the injection was administered with a 27 gauge needle through the thyroid cartilage into the ipsilateral thyroarytenoid muscle. The anterior commissure was estimated at the midpoint between the thyroid notch and the inferior border of the thyroid cartilage, in the midline (Figure 1). The needle was placed 5 mm lateral and 5 mm inferior to this point (Figure 2). In cases in which the cartilage was ossified, the injection was performed through the cricothyroid membrane (Figure 3). The needle was placed just below the inferior border of the thyroid cartilage, approximately 1.5 cm lateral to the midline and directed superiorly, medially and posteriorly.

Immediately prior to injection, patients completed the EAT-10 and Voice-Related Quality of Life questionnaires.

Following treatment commencement, the Eating Assessment Tool questionnaire was completed again when 5–10 per cent of the injection cycle had been completed (based on a survey of adductor spasmodic dysphonia patients receiving botulinum toxin every three months who reported dysphagia at weeks one to two (E J Damrose, unpublished data)). The length of the injection cycle was determined by averaging the two time intervals between the two previous injections.

The Voice-Related Quality of Life questionnaire was also completed again, when 30 per cent of the injection cycle had been completed. This follow-up period was based on Paniello and colleagues'[13] finding that, during an average injection cycle, maximum benefit is observed when 30 per cent of the cycle has been completed.[13]

Patients were sent both post-treatment QoL questionnaires via email attachment or regular mail, and instructed to complete and return them immediately.

An a priori sample size calculation was performed to determine the number of subjects required to detect a 25 per cent difference in QoL scores, utilising values of $\alpha = 0.05$ and $1 - \beta = 0.8$. A 25 per cent post-treatment QoL difference was thought to be clinically significant. Utilisation of a two-tailed, paired-sample

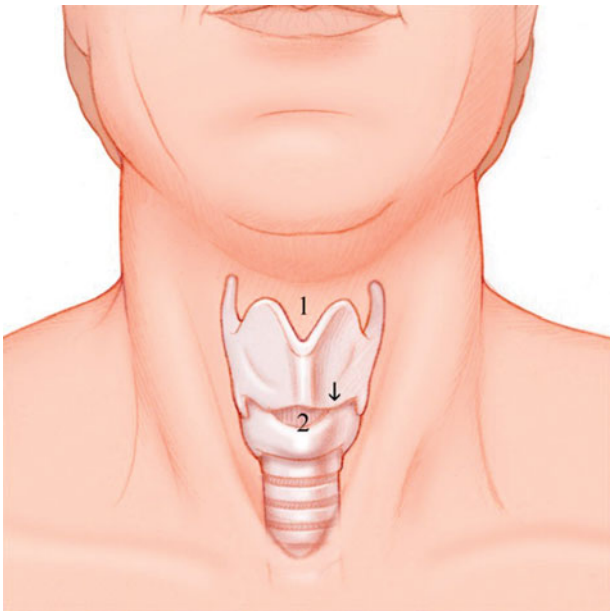

FIG. 1

Anatomical landmarks required to administer botulinum toxin using the point-touch technique. 1 = thyroid notch; 2 = cricothyroid membrane; arrow = site of needle placement for sub-thyroid ala injection.

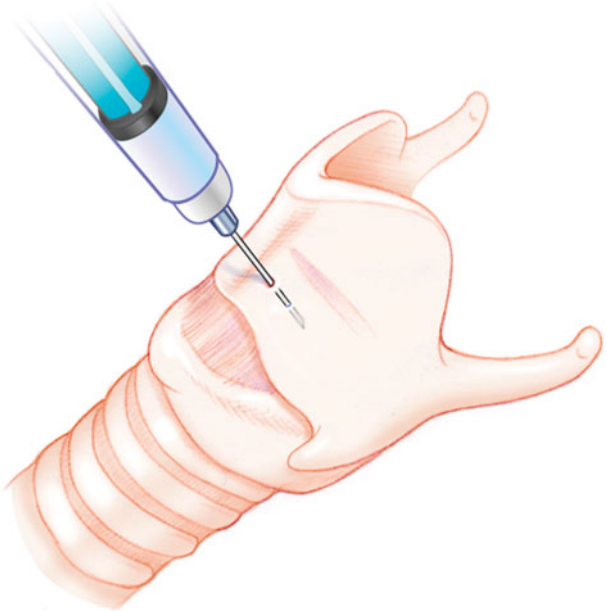

FIG. 2

Trans-thyroid ala injection.

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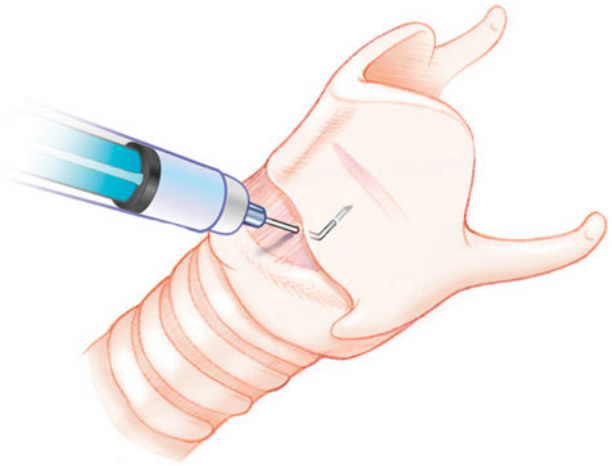

FIG. 3
Sub-thryoid ala injection.

t-test indicated that a minimum of 30 patients would be required. A paired *t*-test was used to compare QoL indices, while an independent samples *t*-test was used to compare studies. Correlation was determined using Pearson and Spearman rank analyses for parametric and non-parametric data, respectively. The Statistical Package for the Social Sciences version 11.0 for Windows software (SPSS Inc, Chicago, Illinois, USA) was used for statistical analysis. Significance was determined at $p < 0.05$.

Results

Forty-one patients met the inclusion criteria and were recruited into the study. Four patients did not complete follow up and were thus excluded from analysis. There was no systematic difference between the experimental cohort and those patients lost to follow up.

Thirty-seven patients were available for analysis. They comprised 11 men and 26 women, with mean ages of 56.3 years (range 31–74 years) and 56.1 years (range 43–69 years), respectively.

The mean ± standard deviation (SD) duration of injection (defined as the time from palpation of external landmarks to withdrawal of the needle) was 33.51 ± 24.09 seconds (range 5–90 seconds). The mean total botulinum toxin dose was 0.88 units (range 0.06–5.0 units). Injections were bilateral in 19 patients and unilateral in 18 patients. The mean ± SD time between injections was 26.08 ± 11.59 weeks (range seven to 73 weeks).

The mean ± SD follow-up time for Eating Assessment Tool questionnaire completion was 2.53 ± 1.18 weeks (0.7 to seven weeks). The mean ± SD follow-up time for Voice-Related Quality of Life questionnaire completion was 7.84 ± 3.49 weeks (range two to 22 weeks).

The mean ± SD Eating Assessment Tool questionnaire score was 7.54 ± 3.71 before treatment and 7.78 ± 3.15 after treatment (Figure 4). This difference was not statistically significant ($p = 0.40$).

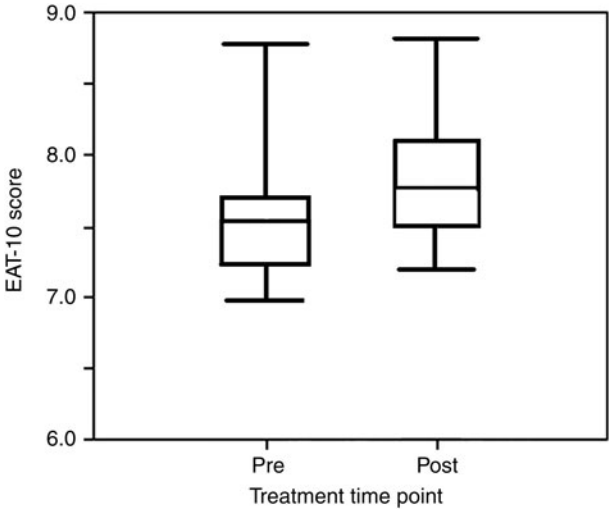

FIG. 4
Box-plots showing Eating Assessment Tool questionnaire (EAT-10) scores before and after botulinum toxin therapy. Box indicates range, horizontal bar indicates mean and outliers represent standard deviations. There was no statistically significant difference between the pre- and post-treatment means.

Before treatment, the mean ± SD Voice-Related Quality of Life questionnaire domain and total scores were: social-emotional, 41.22 ± 24.50; physical-functioning, 43.70 ± 22.10; and total, 47.50 ± 19.26. After treatment, scores had improved to: social-emotional, 80.27 ± 18.73; physical-functioning, 83.36 ± 15.18; and total, 87.64 ± 12.05 (Figure 5). The mean ± SD improvement in Voice-Related Quality of Life total score was 40.14 ± 13.80. Improvements in both domain and total scores were statistically significant ($p < 0.001$).

Discussion

In order to assess the outcome of botulinum toxin injection utilising the point-touch technique, we used the

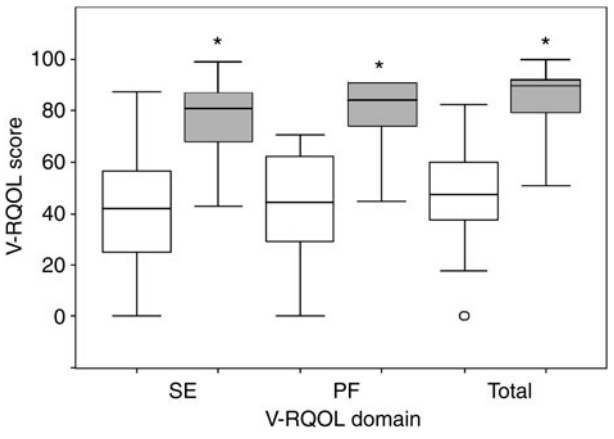

FIG. 5
Box-plots showing Voice-Related Quality of Life questionnaire (V-RQOL) domain and total scores before (white box) and after (grey box) botulinum toxin therapy. Higher scores are associated with improved voice outcomes. *$p < 0.05$, comparing pre- *vs* post-treatment score means. SE = social-emotional domain; PF = physical-functioning domain.

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Voice-Related Quality of Life questionnaire, a 10-item outcome assessment instrument with two domains: social-emotional and physical-functioning.[14] Of the available voice-related QoL instruments, the Voice-Related Quality of Life questionnaire is highly responsive to botulinum toxin therapy,[15] and has been well validated in patients with adductor spasmodic dysphonia.[13,16–19]

Our patients' pre-treatment Voice-Related Quality of Life questionnaire scores reflected the significant morbidity associated with adductor spasmodic dysphonia; their scores were far worse than those reported for unaffected individuals, and comparable to those reported for unilateral vocal fold paralysis.[20] Botulinum toxin therapy resulted in a 40-point improvement in our patients' Voice-Related Quality of Life questionnaire mean total score. This was a significant clinical improvement, comparable to the reported response following correction of unilateral vocal fold paralysis.[20] Our patients' Voice-Related Quality of Life questionnaire score improvement was similar to that reported by other studies utilising EMG guidance for botulinum toxin injection (Table I).

Our mean botulinum toxin dose was 0.88 units; again, this was comparable to that reported by other studies utilising EMG guidance. In Green and colleagues' series,[11] three patients who had previously undergone botulinum toxin injection using EMG guidance subsequently underwent injection with the same dose using the point-touch technique, with the same effective response.

To assess patients' dysphagia risk, we used the Eating Assessment Tool questionnaire. This is a 10-item, symptom-specific outcome assessment instrument with excellent internal consistency, test–retest reproducibility and criterion-based validity.[21] Normative data suggest that an Eating Assessment Tool questionnaire score of 3 or greater is abnormal. Before treatment, our patients' mean Eating Assessment Tool questionnaire score was 7.54; this is above normal but within the range for patients with 'voice disorders' (established in the initial validation study). Following 10 per cent completion of the injection cycle, this score had increased to 7.78. However, this difference was neither clinically nor statistically significant.

TABLE I

BOTULINUM TOXIN DOSE AND V-RQOL IMPROVEMENT: PRESENT STUDY *VS* OTHER STUDIES WITH EMG

Study	EMG?	Pts (*n*)	V-RQOL score			Dose (U)
			SE	PF	Total	
Present	N	37	40	41	41	0.88
Paniello *et al.*[13]	Y	22	27	25	26	1–5
Rubin *et al.*[16]	Y	42	47	48	49	1
Paniello *et al.*[17]	Y	9	13	17	14	1–5
Hogikyan *et al.*[18]	Y	27	54	52	51	1–2

V-RQOL = Voice-Related Quality of Life questionnaire; EMG = electromyographic guidance; pts = patients; SE = social-emotional domain; PF = physical-functioning domain; N = no; Y = yes

- **Botulinum toxin injections under electromyographic (EMG) guidance are the 'gold standard' for adductor spasmodic dysphonia treatment**
- **Limitations of EMG include access and interpretation**
- **An alternative injection technique which relies on anatomical landmarks, the point-touch method, is comparable to EMG-guided injection regarding dose and voice-related outcomes, with no appreciably increased dysphagia risk**

A potential limitation of the point-touch technique is failure to identify anatomical landmarks. Although not required in this series, we have previously utilised nasal endoscopy in some patients in order to confirm needle position. Another potential limitation of this technique is the required learning curve; assessment of this effect represents an avenue for further study.

Conclusion

In patients with adductor spasmodic dysphonia, botulinum toxin injection utilising the point-touch technique is comparable to EMG-guided injection with respect to dose and voice-related outcome, with no appreciable dysphagia risk. We recommend that laryngologists add this technique to their armamentarium of treatment approaches for this challenging condition.

References

1 Sulica L. Contemporary management of spasmodic dysphonia. *Curr Opin Otolaryngol Head Neck Surg* 2004;**12**:543–8
2 Blitzer A, Brin MF, Stewart CF. Botulinum toxin management of spasmodic dysphonia (laryngeal dystonia): a 12-year experience in more than 900 patients. *Laryngoscope* 1998;**108**:1435–41
3 Watts C, Nye C, Whurr R. Botulinum toxin for treating spasmodic dysphonia (laryngeal dystonia): a systematic Cochrane review. *Clin Rehabil* 2006;**20**:112–22
4 Chang C, Chabot P, Walz CM. A survey of current practices of physicians who treat adductor spasmodic dysphonia in the U.S. *Ear Nose Throat J* 2009;**88**:E18
5 Rodriquez A, Ford C, Bless D, Harmon R. Electromyographic assessment of spasmodic dysphonia patients prior to botulinum toxin injection. *Electromyogr Clin Neurophysiol* 1994;**34**:403–7
6 Woo P. Laryngeal electromyography is a cost-effective clinically useful tool in the evaluation of vocal fold function. *Arch Otolaryngol Head Neck Surg* 1998;**124**:472–6
7 Casserly P, Timon C. Botulinum toxin A injection under electromyographic guidance for treatment of spasmodic dysphonia. *J Laryngol Otol* 2008;**122**:52–6
8 Woodson G. Clinical value of laryngeal EMG is dependent on experience of the clinician. *Arch Otolaryngol Head Neck Surg* 1998;**124**:476

https://doi.org/10.1017/S0022215111000739 Published online by Cambridge University Press

9 Rhew K, Fiedler DA, Ludlow CL. Technique for injection of botulinum toxin through a flexible nasolaryngoscope. *Otolaryngol Head Neck Surg* 1994;**111**:787–94
10 Ford C, Bless DM, Lowery JD. Indirect laryngoscopic approach for injection of botulinum toxin in spasmodic dysphonia. *Otolaryngol Head Neck Surg* 1990;**103**:752–8
11 Green D, Berke GS, Ward PH, Gerratt BR. Point-touch technique of botulinum toxin injection for the treatment of spasmodic dysphonia. *Ann Otol Rhinol Laryngol* 1992;**101**:883–7
12 Blitzer A, Brin MF, Fahn S, Lovelace RE. Clinical and laboratory characteristics of laryngeal dystonia: a study of 110 cases. *Laryngoscope* 1988;**98**:636–40
13 Paniello R, Barlow J, Serna JS. Longitudinal follow-up of adductor spasmodic dysphonia patients after botulinum toxin injection: quality of life results. *Laryngoscope* 2008;**118**:564–8
14 Hogikyan N, Sethuraman G. Validation of an instrument to measure voice-related quality of life (V-RQOL). *J Voice* 1999; **13**:557–69
15 Morzaria S, Damrose EJ. A comparison of the VHI, VHI-10 and V-RQOL for measuring the effect of Botox therapy in adductor spasmodic dysphonia. *J Voice* 2010; Oct 15 [epub ahead of print]
16 Rubin A, Wodchis WP, Spak C, Kileny PR, Hogikyan ND. Longitudinal effects of Botox injections on voice-related quality of life (V-RQOL) for patients with adductory spasmodic dysphonia: part II. *Arch Otolaryngol Head Neck Surg* 2004;**130**: 415–20
17 Paniello R, Edgar JD, Perlmutter JS. Vocal exercise versus voice rest following botulinum toxin injections: a randomized crossover trial. *Ann Otol Rhinol Laryngol* 2009;**118**:759–63
18 Hogikyan N, Wodchis WP, Spak C, Kileny PR. Longitudinal effects of botulinum toxin injections on voice-related quality of life (V-RQOL) for patients with adductory spasmodic dysphonia. *J Voice* 2001;**15**:576–86
19 Braden M, Johns MM 3rd, Klein AM, Delgaudio JM, Gilman M, Hapner ER. Assessing the effectiveness of botulinum toxin injections for adductor spasmodic dysphonia: clinician and patient perception. *J Voice* 2010;**24**:242–9
20 Hogikyan ND, Wodchis WP, Terrell JE, Bradford CR, Esclamado RM. Voice-related quality of life (V-RQOL) following type I thyroplasty for unilateral vocal fold paralysis. *J Voice* 2000;**14**:378–86
21 Belafsky P, Mouadeb DA, Rees CJ, Pryor JC, Postma GN, Allen J *et al*. Validity and reliability of the Eating Assessment Tool (EAT-10). *Ann Otol Rhinol Laryngol* 2008;**117**:919–24

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