

# MEDICAL TREATMENT AND SPEECH THERAPY FOR SPASMODIC DYSPHONIA: A LITERATURE REVIEW

## *Tratamento médico e fonoaudiológico da disfonia espasmódica: uma revisão bibliográfica*

Eliana Maria Gradim Fabron <sup>(1)</sup>, Viviane Cristina de Castro Marino <sup>(2)</sup>, Talyssa de Carvalho Nóbile <sup>(3)</sup>,  
Luciana Tavares Sebastião <sup>(4)</sup>, Suely Mayumi Motonaga Onofri <sup>(5)</sup>

### ABSTRACT

Spasmodic dysphonia (SD) is a voice disorder characterized by a strained-strangled voice, with sound breaks and has implications in one's communication. The purpose of this study is to present a bibliographic review of the speech therapy and medical treatment suggested for SD from 2006 to 2010. The speech therapy and medical treatments described are: botulinum toxin injection, myectomy, neurectomy, denervation and reinnervation selective laryngeal adductor, thyroplasty, radiofrequency thyroarytenoid myotherapy, injection of lidocaine, homeopathy and speech therapy. The use of botulinum toxin injection showed results that indicated the satisfaction of the patients who were treated, although some of the articles presented the frequent need of reapplication of the toxin as a disadvantage. The surgical procedures were considered long-lasting and indicated to patients who didn't want to get botulinum toxin injections. The studies, however, presented a restricted contingency of patients, and the outcomes in many studies were based in the patient's own judgment on his/her voice quality. The treatments using lidocaine and homeopathy had positive results in relation to the voice quality of the patients and were suggested as an option for those who wouldn't like to undergo surgical treatment or have botulinum toxin injection. The few studies which discourse on voice therapy presented good results in association with botulinum toxin injection, showing the shortage of information in this field. A study on the literature review pointed out the need of developing researches to help us understand the neurological functioning in spasmodic dysphonia. Future study involving speech therapy in the treatment of ED is still necessary.

**KEYWORDS:** Dysphonia; Spastic Dysphonia; Dystonia

<sup>(1)</sup> Speech Pathologist; PhD Professor at the Department of Speech Pathology, UNESP, Marília, São Paulo, Brazil; PhD in Education from UNESP.

<sup>(2)</sup> Speech Pathologist; PhD Professor at the Department of Speech Pathology, UNESP, Marília, São Paulo, Brazil; PhD in Communication Sciences and Disorders from the University of Florida

<sup>(3)</sup> Speech Pathologist; B.A. in Speech Pathology from UNESP Marília, São Paulo, Brazil.

<sup>(4)</sup> Speech Pathologist; PhD Professor at the Department of Speech Pathology, UNESP, Marília, São Paulo, Brazil; PhD in Education from UNESP.

<sup>(5)</sup> Medical Doctor; Assistant Professor at the Department of Speech Pathology, UNESP, Marília, São Paulo, Brazil; Master's Degree.

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### ■ INTRODUCTION

First described by Traube in 1871, spasmodic dysphonia (SD) was classified as a spastic form of nervous hoarseness. This disorder was discussed in literature as two types of spastic dysphonia: adductor spasmodic dysphonia (AdSD) and abductor spasmodic dysphonia (AbSD)<sup>1</sup>. Adductor spasmodic dysphonia is characterized by the strained-strangled voice, with interruption in word production or difficulty in starting<sup>2</sup>. Abductor spasmodic dysphonia was described as maintaining normal vocal quality followed by moments of breathy or whispery voice<sup>1</sup>. The term spastic dysphonia was

subsequently discussed in literature and considered inadequate because it is not an alteration related to injury in the pyramidal or extrapyramidal tract<sup>3</sup>. Currently SD is classified as a focal laryngeal dystonia with a neurological etiology<sup>2</sup>.

The standard treatment for SD, according to that presented in literature, is the injection of type A botulinum toxin (BT-A)<sup>4,5</sup> which can be combined with speech therapy<sup>3</sup>. Speech therapy as the only proposed treatment is considered ineffective mainly due to the fact that emotional states influence the control of speech production in patients diagnosed with SD<sup>7</sup>. However, studies show that following BT injection, speech therapy may help in prolonging its effectiveness, providing longer intervals between applications<sup>8-10</sup>.

Several other forms of treatment (medical and/or surgical) for SD were presented in the literature, however, none showed lasting effectiveness. Despite the various proposals presented for surgical treatment, literature indicates that some patients with SD go to speech therapy in an attempt to minimize communication disorders when other treatments are not effective<sup>7,11</sup>.

The search for treatment options for SD is caused by the need to find a better quality of life for the patients. Given the difficulty in obtaining conclusive information from literature about treatments available for SD, an updated search in

recently published articles is essential in determining the best approach in the treatment and prognosis of this devastating communication disorder. Thus, this study aims to review literature on medical and speech pathology treatment for SD from the period between 2006 and 2010.

## ■ METHOD

The study was conducted by searching national and international journal articles available in the databases *Lilacs*, *Medline*, and *Scielo*, which after careful analysis were incorporated into the study.

The criteria used for inclusion were articles that presented data for SD treatment (medical and/or speech therapy) reported within the last five years, i.e. between 2006 and 2010. Articles on SD that included investigation with animals were disregarded.

In the search for articles, terms related to the theme “spasmodic dysphonia” were chosen and found in the Health Sciences Descriptors (HSD). These terms were used in isolation and cross reference as shown in Figure 1. The filters “year of publication” and “word” were used in each search. And with the database *Medline* it was possible to use the filter “subject description”, which allowed the search for the terms “voice”, “focal dystonia” and “spastic dysphonia”.

Search number	Crossed words and descriptors
01	Voz
02	Voice
03	Voz and tratamento
04	Voice and treatment
05	Disfonia espasmódica
06	Spasmodic dysphonia
07	Disfonia espasmódica and tratamento
08	Spasmodic dysphonia and treatment
09	Distonia focal laríngea
10	Laryngeal focal dystonia
11	Distonia focal laríngea and tratamento
12	Laryngeal focal dystonia and treatment
13	Disfonia espástica
14	Spastic dysphonia
15	Disfonia espástica and tratamento
16	Spastic dysphonia and treatment

**Figure 1 – List of words and subject descriptors used in the search**

## ■ LITERATURE REVIEW

A total of 3833 articles were found in the survey of the databases Scielo, Lilacs, and Medline. Each article was presented in one or more databases.

From the analysis of the abstracts of these articles, we excluded those that had previously been selected in another database, those that did not meet the inclusion criteria, and also those from journals that did not provide the full article. Thus, we included 30 articles related to the study. These articles reported on treatment for SD by means of medical and speech pathological procedures with: (a) 11 (37%) articles on BT injection; (b) 10 (33%) on surgical procedures, such as myectomy (2, 7%), neurectomy (2, 7%), selective laryngeal adductor denervation and reinnervation (1, 3%), thyroplasty (4, 13%), and thyroarytenoid myotherapy (1, 3%); (c) 2 (7%) on other medical treatments, such as homeopathy and lidocaine injection; and (d) 1 (3%) speech therapy. In addition to these, there were 6 (20%) literature review articles on the treatment of SD.

The information on the proposed treatments for SD, as shown in the literature, is summarized below.

Botulinum toxin is a protein produced by *Clostridium botulinum* bacteria with a potent neurotoxic action that blocks the release of acetylcholine from nerve endings at the neuromuscular joint. BT has been a treatment option for SD since the 1980s. The injection of BT into the intrinsic muscles of the larynx results in a temporary paresis or paralysis of the injected muscle. The toxin may be injected into one or both vocal folds simultaneously.

Several injection techniques may be used for BT, some of which are performed with the support of percutaneous electromyography or nasalaryngoscopy. The injection of BT is usually carried out in the thyroarytenoid muscle (TA)<sup>4</sup>, however there are also reports of injection in other laryngeal muscles, such as the lateral cricoarytenoid muscle (LCA).

One of the drawbacks of BT is the fact that the effect is temporary and it is necessary to reapply every three to six months. There is also the possibility of the body developing antibodies against BT which reduces its effectiveness. The following complications have been reported regarding the use of BT: transient dysphonia, glottic incompetence with an extremely hoarse voice, dysphagia, and asthenia.

### **Surgical treatments**

The five reported surgical procedures include: myectomy, neurectomy, laryngeal denervation and reinnervation, thyroplasty, and radiofrequency thyroarytenoid myotherapy.

### *Myectomy*

The treatment with myectomy has been described since the 1990s. The surgical procedure is performed with an incision on the lateral surface of the vocal fold which exposes the TA muscle, followed by resection. This surgical treatment is irreversible and, in consequence, has the advantage of maintaining the long-term positive effect. Studies have shown that the TA muscle does not regenerate after resection<sup>12</sup>.

Myectomy of the TA and LCA muscle may be performed with local anesthesia and intravenous sedation so that the voice and function of the vocal folds may be evaluated during the procedure<sup>13</sup>.

### *Neurectomy of the thyroarytenoid branch of the inferior laryngeal nerve associated with the partial myectomy of the TA muscle*

Upon completion of the partial myectomy of the TA muscle with CO<sub>2</sub> laser, there is the sectioning by electrocoagulation of the thyroarytenoid branch of the recurrent laryngeal nerve (RLN), located between the internal perichondrium of the thyroid cartilage and the fascia of the TA and LCA muscles. The procedure described by the authors is performed in both vocal folds<sup>14</sup>.

### **Selective laryngeal adductor denervation and reinnervation**

Selective adductor denervation interrupts the abnormal neural signals to the TA and LCA muscles. The adductor branch of the RLN is divided at its insertion in the TA and LCA muscles and the proximal stump is exteriorized from the larynx to prevent the regeneration of axons in this anatomical structure. The ansa cervicalis of the cervical nerve is then anastomosed to the distal stump of the TA to maintain muscle tone and volume and also prevent the regeneration of axons in the RLN endplates of the TA and LCA muscles<sup>15</sup>.

### *Thyroplasty*

Type II thyroplasty, as described in the consulted literature, is carried out with local anesthesia followed by a midline incision of the thyroid cartilage holding the underlying tissue intact. During speech, the edges of the cartilage are separated from 2 to 6 mm, average 4 mm, to verify any voice change<sup>16,17</sup>. A variety of material has been described for securing the edges of cartilage, such as pieces of silicon or cartilage, and titanium plates and bridges above and below the anterior commissure<sup>16-18</sup>.

#### *Radiofrequency thyroarytenoid myotherapy*

This procedure involves the insertion of a bipolar radiofrequency probe at two points of the vocal folds, one in the membranous portion and the other in the anterior-lateral portion of the vocal process, 2 cm from the surface of the vocal fold mucosa. The authors have described an ablation from a depth of 20 to 11 mm to protect the vocal fold mucosa and that it was carried out five times during the procedure<sup>19</sup>.

#### **Other medical treatments**

In addition to the surgeries described, treatments with injection of lidocaine, homeopathy, and speech therapy were published.

#### *Injection of lidocaine*

The authors described the injection of lidocaine 1% into the RLN in doses that varied from 2.5 to 5 ml. For this a syringe and 27 gauge needle was used to penetrate the neck to the right along the tracheoesophageal groove, below the cricothyroid articulation in the region of the RLN entry point into the larynx<sup>20</sup>. After injection, laryngoscopy was performed on all subjects to confirm vocal fold paralysis on the right.

#### *Homeopathy*

The literature reported on the use of *Argentum nitricum*<sup>21</sup> in the treatment of SD.

#### *Speech Therapy*

Although the articles comment that speech therapy is a possible treatment for SD, there are no reports in these articles on the strategies used in speech therapy sessions.

After a brief exposition of the information on the treatment proposed for SD, the following are the results of the literature reviewed, classified by type of treatment, presented in tables that include: the year of publication, the author(s) involved, the objective(s) of the study, and the results.

Table 1 shows the articles found in the bibliographic survey with the proposed treatment of BT injection.

Table 2 presents the articles that include surgical procedures for the treatment of SD.

Table 3 presents the articles categorized as other medical treatments for SD.

Table 4 presents articles that contemplate speech therapy in the treatment for SD.

Table 5 presents the articles that contemplate studies of literary review in the treatment of SD.

The literature review on the proposed topic showed that in the last five years the medical treatments and speech therapy described in the literature were: BT injection, myectomy, neurectomy, selective laryngeal adductor denervation and reinnervation, thyroplasty, radiofrequency thyroarytenoid myotherapy, lidocaine injection, homeopathy and speech therapy.

**Table 1 – Articles on the use of botulinum toxin (BT) injection for the treatment of spasmodic dysphonia**

Injection of BT (n = 11)	Year	Author(s)	Objective(s)	Results
Botulinum toxin: unilateral application (n = 1)	2006	Santos; Mattioli; Mattioli; Daniel; Cruz <sup>22</sup> .	Report the case of a patient with adductor type laryngeal dystonia treated with BT and discuss the advantages and the reports presented in the literature.	Efficiency, generated fluency and comfort during phonation. Breathy voice, initially, rising to stabilize the fundamental frequency, increased breathing capacity, increased maximum phonation time and coordination between breathing
Botulinum toxin: bilateral application (n= 3)	2006	Thomas; Siupsinskiene <sup>23</sup>	Compare the efficacy and side effects of treatment with fresh or refrozen and reconstituted type A Botulinum toxin in the treatment of laryngeal dystonia. 43 patients between 30 and 70 years old were studied.	The use of refrozen BT-A was effective in the treatment. There was no statistical difference in comparing the duration of medicine effect, the self-evaluation on the voice of the patients studied and no different side effects of vocal breathiness and dysphagia. The authors stressed the cost-benefit relationship.
	2006	Cantarella; Berlusconi; Maraschi; Ghio; Barbieri <sup>24</sup>	Analyze the effects of BT applied bilaterally in the stability of AdSD airflow through oral phonatory flow measurements. The study was carried out in 24 patients (19 women and 5 men) and 23 controls.	The injection of BT increased the phonatory airflow, but there was no significant difference between the measurements of patients with SD and the control group
		Paniello; Barlow; Serna <sup>25</sup>	Quantify the period of greatest benefit experienced by patients after treatment with BT, after 4 weeks of BT application among 3 cycles used. In this study the voice-related quality of life questionnaire (VRQOL)	The highest score reported by patients in the best phase of the treatment cycles was lower than 80. The
				was used to analyze the effects of treatment. The study was performed with twenty-two patients.
Botulinum toxin: both unilateral and bilateral application (n= 4)	2006	Woodson; Hochstetler; Murry <sup>26</sup>	Present the clinical trial in treating AbSD with BT applied bilaterally in the PCA muscle with asymmetric staggered dosing. The authors considered the left side as having the stronger spasms, therefore initiated application with a dosage of 1.25 units to the non-dominant side and 5 units to the dominant, gradually increasing 5 units until achieving elimination of breaks with breathiness, abductor paralysis of the dominant side or compromise airflow. The study was conducted with seventeen patients.	The result of treatment of AbSD with BT injection into the PCA muscle may reduce the spasms, with a persisting breathy voice due to inadequate glottic closure. Fourteen patients achieved good or reasonable voice quality with dosage between 10 and 25 units in the dominant side.
	2008	Cannito; Kahane; Chorna <sup>27</sup>	Analyze the response to BT injection in patients of different ages with AdSD. The study was conducted with 42 patients aged between 20 and 79. The voices were analyzed by perceptual judgment of auditory recordings before and after BT application.	There was no statistical difference between the younger and older voices in the judgement of recordings before the application of BT. Response to treatment was effective in most age groups, with the exception of those aged 70-79.
	2009	Birkent; Maronian; Waugh; Merati; Perkel; Hillel <sup>28</sup>	Investigate the dosage consistency of BT injections in patients with long-term treatment of laryngeal dystonia. A case study was conducted with 55 patients submitted to 20 injections into the TA muscle.	The dosage of BT in treating laryngeal dystonia may be reduced during treatment without harming the interval between applications and duration of vocal quality effectiveness.
	2009	Upile <i>et al</i> <sup>29</sup>	Compare the effects of uni- and bilateral BT injection in the TA muscle for the treatment of AdSD. The study was conducted with 31 patients (16 women and 15 men) who had received 5 or more consecutive uni- or bilateral applications of Dysport. Self-evaluation protocols were used for the analysis.	There was no significant difference in the results with low doses of uni- or bilateral BT injection when considering the duration of the toxin action, the self-evaluation vocal score, and the complication rate. However, only in the unilateral treatment was there no report of loss of voice after BT application. The authors recommend the unilateral use of BT for treatment.

**Table 1 (continuation)**

Injection of BT (n = 11)	Year	Author(s)	Objective(s)	Results
Botulinum toxin: undefined side of application (n=3)	2007	Chang; Chabot; Thomas; Warrenton; Warwick; Portland <sup>30</sup>	Objectively evaluate the type A Botulinum Toxin dosage by means of statistical relationship between the amount of injection, duration of side effects, and the normal voice in AdSD. There were 101 patients (70 women and 31 men) that participated in the study at a private clinic. The doses varied from 0.5 to 15 units of BT.	There was a significant and foreseeable correlation between the duration of side effects and the duration of normal voice quality after BT injection. The smaller the side effects, the lower the durability of normal voice quality. The most severe tendency of side effects was found in higher dosages of BT injections.
	2009	Paniello; Edgar; Perlmutter <sup>31</sup>	Test the effect of muscle activity immediately after intramuscular injection of BT for AdSD. The study included nine patients.	The achievement of high intensity in vocalization by reading immediately after the application of BT improves the effectiveness of the injection.
	2010	Braden; Johns; Klein; Delgaudio, Gilman; Hapner <sup>32</sup>	Examine the correlation between the clinical assessment and that of patients with AdSD on the effects of Botox in the voice quality and quality of life. The responses from self-assessment of voice impairment, EIS ( <i>Equal Interval Scale</i> ), and the CAPE-V ( <i>Consensus Auditory Perceptual Evaluation of Voice</i> ) and V-RQOL ( <i>Voice-Related Quality of Life</i> ) protocols were used. Charts from 199 patients (149 women and 50 men) with ages from 18 to 90 years with AdSD who received two consecutive injections of Botox were reviewed. A retrospective study from 2004 to 2007.	There was a correlation in the relationship between the perception of vocal impairment reported by the patient and the voice quality and quality of life in the mild to moderate and moderate to severe dysphonia group, and also a weak correlation between patient assessment and the clinician's perceptual judgement with the use of the CAPE-V only in the moderate to severe dysphonia group. Another issue that was studied was the correlation between the patient's quality of life data and the clinical judgement on vocal quality. There was a weak correlation in the moderate to severe dysphonia group. There was no significant difference between genders in any of the measurements.

**Table 2 – Articles with surgical procedures for treatment of spasmodic dysphonia divided by year, author (s), objective (s) and results**

Surgical treatment n = 10	Year	Author (s)	Objective (s)	Results
Myectomy (n=2)	2006	Koufman; Rees; Halum; Blalock <sup>13</sup>	Discuss the surgical procedure for AdSD involving myectomy of the TA and LCA muscle. Five patients (2 men and 3 women) participated in the study.	The authors suggested that monitoring must be done over time to determine if this is the treatment that should be offered to patients.
	2008	Nakamura; Muta; Watanabe; Mochizuki; Yoshida; Suzuki <sup>12</sup>	Describe the efficacy of bilateral thyroarytenoid myectomy under microlaryngoscopy. The study was performed with seven patients (1 man and 6 women) who underwent bilateral thyroarytenoid myectomy.	Bilateral thyroarytenoid myectomy under microlaryngoscopy was a technique used for AdSD with two key points: the cervical incision was not necessary and a long-term effectiveness was obtained.
Myectomy e neurectomy (n=2)	2006	Tsuji; Chrpsim; Imamura; Sennes; Hachiya <sup>14</sup>	Report the preliminary results of the impact on voice quality of neurectomy of the thyroarytenoid branch of the inferior laryngeal nerve, via endoscopy, combined with partial myectomy of the TA muscle using CO <sub>2</sub> laser. The study was conducted with 7 patients (6 women and 1 man) between 22 and 75 years old.	There was vocal improvement in all patients and the need for surgery in one. Post-surgery follow-up time was 23.7 months.
	2007	Su; Chuang; Tsai; Chiu <sup>33</sup>	Investigate the effectiveness of transoral approach to laser thyroarytenoid mioneurectomy for treatment of AdSD. The study was conducted with 14 patients (12 women and 2 men) between 33 and 69 years old.	Moderate and marked vocal improvement was observed in 92% of patients with a follow-up period of 17 months.

Table 2 (continuation)

Surgical treatment n = 10	Year	Author (s)	Objetive (s)	Results
Selective laryngeal adductor denervation and reinnervation (n=1)	2006	Chhetri; Mendelsohn; Blumin; Berke <sup>15</sup>	Describe the long-term results of laryngeal adductor denervation and reinnervation surgery in patients with AdSD. Outcome was evaluated using perceptual voice assessment. Data were collected from 1996 to 2003 and included 83 patients (23 men and 60 women) who underwent surgery during this period and responded to participate in the research.	Surgery provided lasting relief from the symptoms of dysphagia in most patients. And 91% of them agreed that their voices were more fluent after surgery and the VHI score also improved.
Thyroplasty (n=4)	2007	Sanuki; Isshiki <sup>16</sup>	Analyze the effectiveness of type II Thyroplasty using a titanium plate in AdSD. The review was conducted with a questionnaire in which patients responded on the ease of phonation and vocal quality before and after surgery. Forty-one patients participated in the study.	The answers to the questionnaire showed that 70% of the patients reported having achieved excellent results.
	2009	Sanuki; Isshiki <sup>17</sup>	Identify the factor or factors that suggest a need to review type II thyroplasty for AdSD by means of an individually detailed analytical analysis of seven cases with unsatisfactory results.	The main factors for failure in surgery were: a) inadequate indication for surgery. Individuals in need of a high intensity voice should not undergo this surgical procedure; b) patients with other dystonias or associated diseases, such as essential tremor; c) voices that did not present sufficient strangled voice quality; for the authors, the tension level in the vocal emission quality must be large enough to indicate this surgery and, d) inadequate technique in placing the bridge separating the anterior commissure from the thyroid cartilage; it appears that there is the need to use two titanium bridges in the surgical procedure.
	2010	Sanuki; Yumoto; Minoda; Kodama <sup>34</sup>	Report analysis findings of aerodynamic and acoustic evaluations before and after type II thyroplasty in patients with AdSD. The study was conducted with ten women from 20 to 76 years old who underwent surgery and performed examinations before and six months after surgery.	After surgery, patients did not present voice strangulation and expressed satisfaction. There was no significant difference among the aerodynamic measurements after surgery, however the acoustic measurements (jitter, shimmer, HNR, SDFO and DVB) improved significantly. The study demonstrated that type II thyroplasty is indicated for patients who were treated with BT and obtained either poor results or none. Surgery is also indicated for patients who desire permanent results.
	2010	Isshiki; Sanuki <sup>18</sup>	After analyzing the dissatisfaction of patients undergoing type II thyroplasty, the researchers presented the possible causes of failure and, in this article, described the changes made in the surgical procedure for treating AdSD. The authors also reflect on the poor acceptance of surgery in AdSD patients.	The authors stated that the review of the unsuccessful cases in the surgical procedure was important for the proposed changes. For them type II thyroplasty has advantages, such as: a) stable effect with no recurrence of dystonia; b) the possibility of making intraoperative adjustments; c) there is no change in the vocal fold itself; d) does not develop an iatrogenic disorder; and e) the procedure is reversible and readjustable. The disadvantage is the low acceptance of the procedure.
Radiofrequency thyroarytenoid myotherapy (n=1)	2008	Kim; Choi; Lim; Choi; Lim <sup>19</sup>	Study the treatment of AdSD by means of a modification in the Remacle surgical procedure. The study was conducted with twenty women with spasmodic dysphonia who had already received BT injection with success in the treatment.	The result of treatment with radiofrequency thyroarytenoid myotherapy was considered an alternative treatment, however the results were effective for two months after surgery. After six months a reduction in the results was noted in 50% of the patients.

**Table 3 – Articles categorized as other treatments for spasmodic dysphonia divided by year, author (s), objective (s) and results**

Other treatments (n=2)	Year	Author (s)	Objetives	Results
Lidocaine (n=1)	2006	Smith; Roy; Wilson <sup>20</sup>	Investigate the effects on speech by using lidocaine to block the RLN in treating AdSD. The study was conducted with twenty-one patients with spasmodic dysphonia.	The results showed that during the blockage of RLN, the patients reported a reduction in the severity of the symptoms and vocal effort. In the perceptual-auditory evaluation, judges verified that the voices were breathier and less tense.
Homeopathy (n=1)	2009	Xue; Schepper; Hao <sup>21</sup>	Describe the perceptual and physiological changes in the vocal function of patients treated with classical homeopathy. The study was conducted with a 57 year-old male patiente diagnosed with AdSD. The medicine was offered after analysis of the initial medical interiew ( <i>Argentum Nitricum – 30C from Borion</i> ). Perceptual analysis was performed with the CAPE-V protocol and analysis of some acoustic parameters.	The findings show that after three months of treatment there was a significant reduction in the severity of the strained-strangled voice quality. The number of breaks in the voice was reduced and the patients demonstrated increased control of the speech mechanism, as well as reporting an emotional well-being. This may be a possible treatment for those patients who desire to not use botox.

**Table 4 – Articles categorized as speech pathology (speech therapy) treatment for spasmodic dysphonia divided by year, author (s), objective (s), and results**

Year (n=1)	Author (s)	Objetive (s)	Results
2009	Haselden; Powell; Drinnan; Carding <sup>35</sup>	Examine the <i>Health Locus of Control (HLoC)</i> , a protocol for evaluating the patient's locus of control over their health in three groups of patients: 1 – spasmodic dysphonia, 2 – functional dysphonia, and 3 – a group without dysphonia and without laryngeal dystonia (control group). The study showed that in spasmodic dysphonia, the relationship between the frequency of injection and the health locus of control may be an interesting focus study. The study demonstrated the effect of vocal therapy on health control or the validity of health control as an indicator for prognosis of treatment.	The authors argued that when the patient has a high value of internal control (Internal LoC), the voice therapy may have a positive outcome because the patient will be able to increase the sense of voice control. The LoC protocol was chosen as a good prognostic indicator for treatment in Speech therapy. However, they suggest that the use of BT before therapy may help the results.

Among the articles found, 37% reported medical treatment with BT injection and results indicated an improvement in the vocal quality analyzed by means of vocal and quality of life self-evaluation protocols. However, the observed results demonstrated the temporary effectiveness of the treatment and the need to reapply the toxin<sup>22-32</sup>

The articles that reported on surgical procedures (33%) were based on the premise that surgery would be a long-lasting treatment option for SD, without the need to return to control pathology symptoms.

Among the surgical procedures, myectomy alone or combined with neurectomy was presented as an option in cases in which the patient desires a long-lasting outcome. The results presented were positive in most cases and the scholars stressed the irreversibility of the surgery<sup>12-14,33</sup>.

Regarding selective laryngeal adductor denervation and reinnervation surgery, two articles from the same group of researchers were found. While

one of these articles addressed a literature review<sup>36</sup>, the other reported on the satisfactory outcome of the surgical procedure from the vocal analysis done by the voice handicap index protocol<sup>15</sup>.

In relation to thyroplasty, the results of this treatment were analyzed in more than one article showing the concern of a surgical team in improving the surgical procedures initially proposed. In general, the researchers discussed the indication and contra-indication of this surgery, presented modifications to the surgical technique, and pointed to the patient's own satisfaction in his/her voice quality<sup>16-18</sup>.

The use of the Remacle modified radiofrequency thyroarytenoid myotherapy was reported on in one study. The result was described as a good alternative to treat SD, though not considered effective in all cases since 50% of the patients had BT injection one year following myotherapy<sup>19</sup>.

There was only one single study that used lidocaine injection (lidocaine block of the RLN)



**Table 5 – Articles categorized as literature review of spasmodic dysphonia treatments divided by year, author(s), objective(s), and results**

Year (n=6)	Author (s)	Objective	Results
2006	Chhetri; Berke <sup>36</sup>	Present, with literature support, the modifications in selective adductor laryngeal denervation and reinnervation since its proposal. Furthermore, the article presents step-by-step surgical procedure and research results of the impact on vocal quality and patient satisfaction.	The research results of the impact on vocal quality and patient satisfaction showed that the surgery is an alternative therapy in treating SD, and patient satisfaction is high, and most patients managed voice fluency with minimum breathiness. The complications could be minimized by conservative LCA myotomy.
	Truong; Bridayasiri <sup>37</sup>	Review in the literature about laryngeal muscle hyperactivity syndromes, techniques and types of toxin injections available, as well as doses used.	In the literature, the use of BT is the most often described treatment for AdSD, especially applied in the TA muscle. It also described its application in the LCA and interarytenoid muscles depending on whether it is adductor or abductor SD. The studies presented results of uni or bilateral applied BT. In addition, the authors found the description of intramuscular toxin injection techniques as: percutaneous, transoral, transnasal, and point touch. Studies with type and toxin dosage control were also found.
2006	Watts; Nye; Whurr <sup>4</sup>	Determine the efficacy of BT in the treatment of SD through a randomized systematic analysis in the <i>Cochrane</i> database.	The evidence of the results based on randomized and controlled studies is lacking in the literature surveyed
2008	Watts; Truong; Nye <sup>38</sup>	Review in the literature which high quality methodology researches were developed to show the effectiveness of BT treatment for AdSD in the period from 1973 to December 2006.	Articles with studies classified as class I and II, which showed evidence on the effectiveness of BT, were published between 1991 and 2001, and pointed out the effectiveness of the application of BT in treating AdSD. According to the article, no high quality study has been published since 2001
2009	Ludlow <sup>39</sup>	Raise the advance of surgical approaches in recent years that aim to provide long-term control of SD symptoms	The authors argue that the use of BT is considered the standard treatment for SD, but many surgical techniques have been proposed with both benefits and side effects, such as breathy voice and dysphagia. They concluded that it is necessary to develop studies aimed at understanding central neurological abnormality.
2009	Delnooz; Horstink; Tijssen; Warrenburg <sup>40</sup>	Systematic review of studies on paramedical strategies for the treatment of primary dystonia. Analyzed the studies based on evidence according to EBRO classification. Only articles published in English from 1970 to July 2008, from the databases Pubmed, <i>The Cochrane Library</i> , MEDLINE, EMBASE, PsycINFO, CINAHL and ISI-SCI and used clinical outcome measures were included.	For laryngeal dystonia three articles were found: one of them, classification B, pointed out that vocal therapy combined with BT is beneficial to the patient and prolonging the interval of Botox injection improved respiratory measurements and the acoustic parameters. The other studies, with classification B, showed conflicting results, one of which suggested that speech therapy improved intelligibility, speech functionality, and patient confidence. The other concluded that speech therapy, psychotherapy, and <i>biofeedback</i> had not positive effect on SD.

in the AdSD in order to investigate the effects on phonation. The results showed that blockage is possible, however the study did not present length of effect. The authors pointed out that this procedure may be used as a differential diagnostic resource for SD<sup>20</sup>.

Homeopathy treatment was found in only one article which aimed to describe the perceptual and physiological changes in the vocal function of patients treated with classic homeopathy. The results found in this study showed that after three months of treatment, a significant reduction in the strained-strangled severity and quality of the voice was observed. The number of voice breaks was reduced and the patients demonstrated greater control of the speech mechanism, as well as a reported emotional well-being. For the authors, this

may be a possible treatment for those patients who do not wish to use botox<sup>21</sup>.

Regarding speech pathology treatment, no articles that discussed the effects of vocal technique action in the treatment of SD during the period studied were found. Only one article commented on achieving positive results with speech therapy associated with BT injection in patients with good results in the *Health Locus of Control* “internal control” index (evaluation protocol of the patient’s locus of control in his/her health)<sup>35</sup>. Another literature review article pointed to two studies that discussed speech therapy as a treatment for SD. One of these studies reported that speech therapy improved speech intelligibility, voice functionality, confidence of the patient, when the therapy was combined with BT injection. In the other study, it was concluded

that speech therapy, as well as psychotherapy and biofeedback did not bring positive effect in controlling pathological symptoms<sup>40</sup>.

In this survey, there were six literature review articles and half of them attempted to learn about treatment options published in a given period of time, whose scientific methodology could prove the effectiveness of treatments<sup>4,38,40</sup>. The others also tried to obtain the knowledge of proposed treatment of SD by only considering the results of surgery or the use of BT<sup>36,37,39</sup>.

A single literature review identified the need for further studies in the understanding of neurological functioning in SD, for then it would be possible to attempt a treatment without side effects<sup>39</sup>.

## ■ CONCLUSION

This study presents a bibliographic review on the proposed medical treatment and speech pathology for SD in the period between the years 2006 and 2010. The reported medical treatments included BT injection, surgical procedures, lidocaine injection

and homeopathy. The use of BT injection showed results that indicated the satisfaction of the patients treated, although some of the articles point out the disadvantage of this treatment, i.e. the need to reapply BT after a few months. With regard to surgical procedures, they may be considered long-lasting and suitable for patients that do not wish to undergo BT injections. The studies, however, presented contingency of restricted patients and the results were based on the patient's own judgement as to his/her vocal quality. The use of lidocaine and homeopathy showed positive results in relation to the vocal quality of the patient and was suggested as an option for those patients who would not like to submit to surgery or BT injection. The few studies that did contemplate speech therapy showed positive results from this treatment when combined with BT injection. However, it is clear the lack of evidence on the effects of speech therapy in treating SD, although associated with medical treatment. Thus, there is the need for further research involving speech therapy in SD in associated with clinical and/or surgical treatment.

## RESUMO

A disfonia espasmódica (DE) é um distúrbio vocal caracterizado por voz tensa-estrangulada, com quebras de sonoridade e que compromete a comunicação do indivíduo. O objetivo deste estudo é apresentar uma revisão bibliográfica dos tratamentos médico e fonoaudiológico proposto para a DE no período entre 2006 e 2010. Os tratamentos descritos foram: injeção de toxina botulínica (TB), miectomia, neurectomia, denervação e reinervação laríngea seletiva adutora, tireoplastia, miotermia tiroaritenóidea com radiofrequência, injeção de lidocaína, homeopatia e tratamento fonoaudiológico (fonoterapia). O uso de injeção de TB mostrou resultados que indicaram a satisfação dos pacientes tratados, embora alguns dos artigos apontassem a necessidade de reaplicação da toxina frequentemente, como desvantagem. Os procedimentos cirúrgicos foram considerados duradouros e indicados para os pacientes que não quiseram se submeter às aplicações de TB. Tais estudos, no entanto, apresentaram contingência de pacientes restrita e os resultados foram baseados, na maioria das investigações, no julgamento dos próprios pacientes sobre a sua qualidade vocal. Os tratamentos, com uso de lidocaína e homeopatia, mostraram resultados positivos em relação à qualidade vocal dos pacientes e foram sugeridos como uma opção, também, para aqueles que não gostariam de ser submetidos ao tratamento cirúrgico ou à aplicação de TB. Os poucos estudos que reportam fonoterapia assinalaram bons resultados quando a mesma foi associada à injeção de TB, mostrando a escassez de informações nesta área. Futuras pesquisas envolvendo a fonoterapia no tratamento da DE são necessárias.

**DESCRITORES:** Disfonia; Disfonia Espástica; Distonia

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Mailing address:

Eliana Maria Gradim Fabron  
Avenida Santa Helena, 909 – casa J214 –  
Jardim Alvorada – Marília – SP  
CEP: 17513-322  
E-mail: [elianaf@marilia.unesp.br](mailto:elianaf@marilia.unesp.br)