

Computerized manometry use to evaluate spasm in pharyngoesophageal segment in patients with poor tracheoesophageal speech before and after treatment with botulinum toxin

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Summary

Tracheoesophageal voice (TEV) with voice prosthesis (VP) is an efficient and reproducible method used in vocal rehabilitation after total laryngectomy (TL), prevented by spasms in the pharyngoesophageal segment (PES). Computerized Manometry (CM) is a new, direct and objective method used to assess the PES. **Aim:** to carry out an objective analysis of the PES, with CM, before and after the injection of botulinum toxin (BT). **Study design:** clinical-prospective. **Materials and Methods:** analysis of eight patients consecutively submitted to TL with TEV and VP, without vocal emission, with PES spasms seen through videofluoroscopy, considered the gold standard for spasm detection. All had their spasms treated with the injection of 100 units of BT in the PES. The assessment was based on PES videofluoroscopy and CM, before and after BT injection. **Results:** There was a PES pressure reduction according to the CM after BT injection in all patients. The average pressure in the PES seen through the CM in eight patients before BT injection was 25.36 mmHg, and afterwards it dropped to 14.31 mmHg ($p=0.004$). There was vocal emission without stress and PES spasm improvement seen through the videolaryngoscopy after BT injection. **Conclusion:** We observed a reduction in PES pressure after BT injection, seen through CM in all the patients, with spasms improvement seen through videofluoroscopy.

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INTRODUCTION

Between 9% and 79% of the patients rehabilitated after total laryngectomy (TL) with tracheoesophageal speech (TES) and speech prosthesis (SP) after primary or secondary tracheoesophageal puncture (TEP) present stress-related speech difficulty associated to changes in the motility of the pharyngoesophageal segment (PES), secondary to its pharyngospasm¹⁻¹³. This PES alteration can be treated in three different ways: myotomy of middle and lower pharynx constrictors, neurectomy of the pharyngeal plexus, and the recently published technique of chemically denervating the PES with botulinum toxin (BT)^{6-8,10,11,14-24}. Botulinum toxin is a pre-synaptic blocker that prevents the release of acetylcholine in the neuromuscular junction. PES relaxation after BT application in the region can be seen through videofluoroscopy^{3,4,7,15,25}. However, small variations cannot be quantified. There are indirect assessment methods that use PES pressure, as the modified insufflation test^{4,6,15}, measurement of intratracheal pressure and speech time duration^{7,18}. This study was developed to objectively quantify PES relaxation in spastic total laryngectomy patients after BT injection and relate it to improvements in speech quality. Esophageal manometry was used to measure PES median pressure before and after BT injection in the spastic area.

MATERIALS AND METHOD

Eight consecutive patients seen in our institution between January of 2004 and October of 2006 with TES under stress and speech time of one second or less were included in this study. All had indwelling Blom-Singer (Inhealth®) speech prosthesis inserted after primary or secondary TEP. The patients were included in this study after at least six months of speech rehabilitation sessions. The speech rehabilitation sessions done with the total laryngectomy patients with TES and SP were conducted by one same experienced specialized therapist.

This study was approved by the ethics committee at our institution under permit 546/2005. Informed consent terms were collected from all patients participating in the study.

Tests conducted with the patients included assessment of mean speech time, acoustic analysis, swallowing and speech videofluoroscopy, 4-channel esophageal manometry with pneumocapillary infusion and computerized polygraph before and after injection of 100U of BT (Botox®) in the PES spastic area. Mean speech time was measured using a Tissot® stopwatch after three consecutive takes in which the patients were asked to utter the vowel /a/ in a prolonged manner after maximum air inhalation. Speech acoustic assessment was done at the speech lab using software package MDVP (Multidimensional Voice Program) by Kay Elemetrics Corporation.

Patients were requested to utter and sustain vowel /a/. The acoustic parameter used to assess speech was presence or absence of harmonics. Speech samples were recorded with a Teac W518R recorder in chrome cassette tapes and using a Prologue microphone placed 5 centimeters from the patients' mouths. Speech samples were recorded in a soundproof booth with noise level treatment. Videofluoroscopy was considered the golden standard to diagnose PES spasm. All patients complained of dysphagia. Botulinum toxin injections were applied in each third of the PES (Fig. 1) under electromyographic control of pharyngeal constrictor muscles without local anesthesia. Pharyngeal constrictor muscle punctures were done by the author, and electromyographic tracings interpreted by one same specialist. A Compass Portabook II Nicolet electromyograph connected to a Compaq® workstation was used.

Statistical analysis done for speech time, PES pressure, presence or absence of harmonics, and PES videofluoroscopy findings before and after BT injection was done using the Binomial test. A significance level of 0.05 was considered.

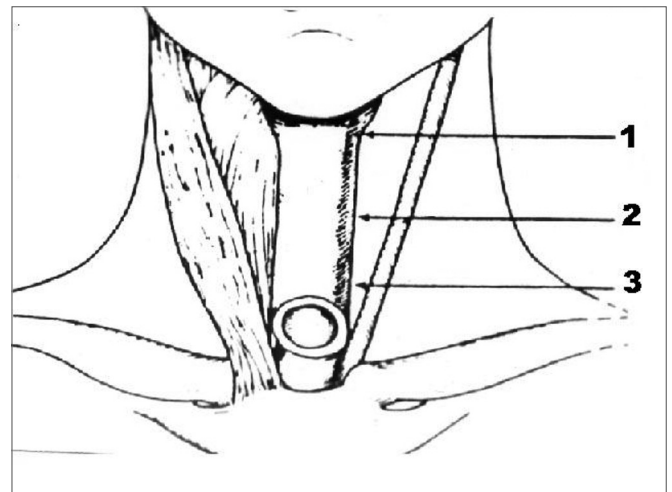


Figure 1. Schematic representation of areas of botulinum toxin injection on the three thirds of the pharyngoesophageal segment.

RESULTS

Manometry findings indicated a reduction in the PES mean pressure after botulinum toxin injection in all eight patients (Table 1 and Fig. 2). Mean PES pressure before BTY injection was 25.36 mmHg. After BT injection the PES mean pressure dropped to 14.31 mmHg ($p=0.004$).

Harmonics were identified in a statistically significant manner ($p=0.004$) in all patients during acoustic analysis after BT injection in the PES (Fig. 3). Before treatment none of the patients could produce harmonics. Effortless voice production was possible in these patients

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