Essential voice tremor

Voice tremor (VT) is the involuntary and rhythmical phonatory instability of the voice.

It is a common feature of essential tremor (ET) that is difficult to treat medically and significantly affects quality of life.

Treatment

Botulinum toxin chemodenervation (BTX) is used to treat essential voice tremor (EVT), but results are not uniformly satisfactory [1)].

Findings suggest that unilateral deep brain stimulation of the ventral intermediate nucleus (Vim-DBS) can sometimes be effective for VT.

Unilateral dominant-side thalamic stimulation and bilateral thalamic stimulation were equally effective in reducing VT. Nondominant unilateral stimulation alone did not significantly improve VT [2)].

Case series

In a exploratory analysis, Avecillas-Chasin et al., from The University of British Columbia, investigated the effect of Vim-DBS on voice tremor (VT) and tested the hypothesis that unilateral thalamic stimulation is effective for patients with VT.

Seven patients with VT and previously implanted bilateral Vim-DBS were enrolled in the study. Each patient was randomized and recorded performing sustained phonation during the following conditions: left thalamic stimulation, right thalamic stimulation, bilateral thalamic stimulation (Bil-ON), and no stimulation (Bil-OFF). Perceptual VT ratings and an acoustic analysis to find the rate of variation of the fundamental frequency measured by the standard deviation of the pitch (f0SD) were performed in a blinded manner. For the purposes of this study, a “dominant” side was defined as one with more than twice as much reduction in VT following Vim-DBS compared to the contralateral side. The Wilcoxon signed-rank test was performed to compare the effect of the dominant side stimulation in the reduction of VT scores and f0SD. The volume of activated tissue (VAT) of the dominant stimulation side was modelled against the degree of improvement in VT to correlate the significant stimulation cluster with thalamic anatomy. Finally, tractography analysis was performed to analyze the connectivity of the significant stimulation cluster.

Unilateral stimulation was beneficial in all 7 patients. Five patients clearly had a “dominant” side with either benefit only seen following stimulation of one side or more than twice as much benefit from one side compared to the other. Two patients had similar benefit with unilateral stimulation from either side. The Wilcoxon paired test showed significant differences between unilateral dominant and unilateral nondominant stimulation for VT scores ($p = 0.04$), between unilateral dominant and Bil-OFF ($p = 0.04$), and between Bil-ON and unilateral nondominant stimulation ($p = 0.04$). No significant differences were found between Bil-ON and unilateral dominant condition ($p = 0.27$), or between Bil-OFF and unilateral nondominant ($p = 0.23$). The dominant VAT showed that the significant voxels associated with the best VT control were located in the most ventral and medial part of the Vim

nucleus and the ventralis caudalis anterior internus nucleus. The connectivity analysis showed significant connectivity with the cortical areas of the speech circuit.

Unilateral dominant-side thalamic stimulation and bilateral thalamic stimulation were equally effective in reducing VT. Nondominant unilateral stimulation alone did not significantly improve VT [3].

Patients with essential voice tremor (EVT) underwent Botulinum toxin chemodenervation (BTX. After washout patients underwent IA. Multidimensional assessment carried out prior to and 30 days after each treatment included 1) videostroboscopy graded by the Vocal Tremor Scoring System (VTSS), 2) acoustic and aerodynamic assessment (cepstral peak prominence, cepstral spectral index of dysphonia, cepstral peak prominence fundamental frequency, airflow, peak air pressure and intensity, maximum phonation time, and amplitude/frequency of tremor), 3) audio-perceptual assessment via Consensus Audio-Perceptual Evaluation of Voice (CAPE-V), and 4) patient self-assessment via Voice Handicap Index-10 (VHI-10) and Percent of Normal Function (PNF) scale. Findings were analyzed via paired t tests and Wilcoxon rank sum tests.

Seven patients (five female and two male; mean age 67 years old; range, 46-82 years old) participated. VTSS grading showed divergent outcomes for certain individual sites of tremor, but without significant differences. Airflow increased following BTX and decreased following IA, and VHI-10 scores indicated slight improvement post-BTX (26.29-23.57), and decline post-IA (25.86-29.86), although differences were not significant. Only changes in audio-perceptual ratings of loudness achieved significance, which decreased with BTX and increased with IA. Five patients chose to resume BTX; two elected long-term IA. No findings supported patient preferences.

IA demonstrated no advantage over BTX in the treatment of EVT [4].

The objective of Kundu et al., was to retrospectively evaluate whether Vim-DBS used to treat patients with essential motor tremor also effectively treated underlying concurrent voice tremor and assess whether particular lead locations were favorable for treating vocal tremor.

MATERIALS AND METHODS: In this retrospective cohort study, patients had unilateral or bilateral lead placement and were monitored for up to 12 months. We used the Fahn-Tolosa-Marin (FTM) subscore to assess vocal tremor. Changes in vocal tremor before and after stimulation and over several sessions were assessed.

RESULTS: Of the 77 patients who met the inclusion criteria and were treated for essential tremor, 20 (26%) patients had vocal tremor prior to stimulation. Active Vim-DBS decreased the amplitude of voice tremor by 80% ($p < 0.001$). The mean FTM score as 1.24 pre-operation, 1.08 post-implantation (consistent with a lesion effect), and 0.25 with stimulation. The effect magnitude was maintained at last follow-up with slight improvement over time ($p < 0.05$). Unilateral and bilateral stimulation resulted in similar degrees of tremor reduction. A model of the centroid of stimulation showed that Vim thalamic stimulation that is more anterior on average yielded better voice tremor control, significantly so on the left side ($p < 0.05$). Additionally, there was improvement in head, tongue, and face tremor scores ($p < 0.05$).

Unilateral and bilateral Vim-DBS targeted to treat the motor component of essential tremor also dramatically decreased the amplitude of voice tremor in this group of patients, suggesting a potential benefit of this treatment for affected patients [5].

Case reports

A 72-year-old female with a history of essential tremor was noted preoperatively to have a moderate vocal tremor (3 on a scale of 1-5). Following bilateral DBS of the thalamus, the vocal tremor rating improved to 1. Acoustic analysis demonstrated her vocal tremor to be affecting the amplitude of her voice at 5.58 Hz preoperatively, at 1. 93 Hz postoperatively with both leads on and at 1.54 Hz with only the left lead on. A videotaped endoscopic view of the patient's vocal cords (presented at the 1999 ASSFN meeting) clearly illustrated the dramatic changes apparent in the vocal tremor when the stimulators were turned on and off [6].

References

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