Essential vocal tremor

Essential vocal tremor (EVT) is the presence of a tremulous voice that is commonly associated with essential tremor.

The larynx, or voice box, is not the only structure which can cause essential tremor of the voice. Tremor of the voice can be caused when any of the structures in the speech system is affected. Essential tremor of the voice may be caused by tremor in the soft palate, tongue, pharynx, or even muscles of respiration.

Essential tremor of the voice can often be confused with another neurologic voice disorder known as spasmodic dysphonia.

Patients with EVT often report a necessary increase in vocal effort that significantly worsens with stress and anxiety and can significantly impact quality of life despite optimal medical and behavioral treatment options.

Treatment

Deep brain stimulation (DBS) has been proposed as an effective therapy for vocal tremor, but very few studies exist in the literature that comprehensively evaluate the efficacy of DBS for specifically addressing EVT.

In 1999 Yoon et al. presented a case illustration of the significant effect that deep brain stimulation (DBS) of the thalamus can have on vocal tremor. 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 [1)].

An 81-year-old female patient suffering from disabling Holmes' tremor affecting both upper extremities, the head and additionally the vocal apparatus underwent bilateral thalamic ventralis intermedius nucleus (v.i.m.) stimulation. With the stimulation ON, the patient experienced complete suppression of the limb and head tremor and thorough voice normalization. Acoustic and electroglottographic (EGG) analysis showed a tendency towards hyperfunctional phonation with the stimulation ON as well as OFF, but a less disturbed vocal cord vibration pattern with the stimulation ON in comparison with a group of normal female speakers. This example shows that long-term

monitoring of the vocal apparatus under deep brain stimulation therapy (DBS) of movement disorders must be planned in order to modify the stimulation parameters, if necessary, or to initiate logopaedic treatment [2].

In 2016 described a multidisciplinary procedure for awake, frameless DBS with optimal stimulation targets as well as acoustic analysis and laryngoscopic assessment to quantify tremor reduction [3].

In 2005 Ho et al. presented a technical report on there multidisciplinary, comprehensive operative methodology for treatment of EVT with frameless, awake deep brain stimulation (DBS) [4]

Erickson-DiRenzo et al. aimed to conduct a multiparametric assessment of the effect of deep brain stimulation (DBS) of the thalamic ventral intermediate nucleus (VIM) on essential vocal tremor (EVT) and investigate the relation between DBS lead location and EVT outcomes.

Nine participants underwent DBS for essential tremor and were diagnosed with co-occurring EVT in this prospective cohort study. Objective measurements including acoustic evaluation of vocal fundamental frequency (F0) and intensity modulation and subjective measurements including physiologic evaluation of the oscillatory movement of the laryngeal muscles and vocal tract and perceptual ratings of tremor severity were collected PRE and POST DBS. Finally, we investigated the relation between DBS lead location and EVT outcomes.

Acoustic modulations of F0 and intensity were significantly improved POST DBS. Physiologic assessment showed a POST DBS reduction of oscillatory movement in the laryngeal muscles and vocal tract, but not significantly. Listener and participant perception, of EVT severity was also significantly reduced. Finally, our results indicate better EVT control with increased distance to midline of left VIM thalamic stimulation.

By employing a battery of objective and subjective measures, the study supports the benefit of DBS for the treatment of EVT and specifies the acoustic and physiologic mechanisms that mediate its positive effect. They further provide preliminary results on the relation between lead location and EVT outcomes, laying the foundation for future studies to clarify the optimal DBS target for the treatment of EVT [5].

They conducted a intraoperative voice assessments during Vim-DBS implantation in order to evaluate immediate voice outcomes in medication-refractory essential tremor patients with co-occurring EVT.

Seven adult subjects diagnosed with EVT undergoing Vim-DBS surgery participated in this investigation. Voice samples of sustained vowels were collected by a speech-language pathologist preoperatively and intraoperatively, immediately following Vim-DBS electrode placement. Voice evaluation included objective acoustic assessment of the rate and extent of EVT fundamental frequency and intensity modulation and subjective perceptual ratings of EVT severity. Results The rate of intensity modulation, extent of fundamental frequency modulation, and perceptual rating of EVT severity were significantly reduced intraoperatively as compared to preoperatively. Moderate, positive correlations were appreciated between a subset of acoustic measures and perceptual

severity ratings. Conclusions The results of this study demonstrate a speech-language pathologist can conduct intra-operative evaluation of EVT during DBS surgery. Using a noninvasive, simple acoustic recording method, we were able to supplement perceptual subjective observation with objective assessment and demonstrate immediate, intraoperative improvements in EVT. The findings of this analysis inform the added value of intraoperative voice evaluation in Vim-DBS patients and contribute to the growing body of literature seeking to evaluate the efficacy of DBS as a treatment for EVT [6].

In a 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.

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 [7].

References

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