

Clinical short communication

A suggested minimum standard deep brain stimulation evaluation for essential tremor

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ABSTRACT

Background: A comprehensive, multidisciplinary screening process for deep brain stimulation (DBS) candidates is recommended, but is often time-consuming.

Objective: To determine the number of essential tremor (ET) referrals excluded from surgery and why, in order to develop recommendations for a minimum standard DBS evaluation process.

Methods: We reviewed the referrals of 100 consecutive potential DBS candidates with presumed ET at our center, identified reasons for excluding patients from DBS, and the point at which they dropped out of our evaluation process.

Results: Of the 100 tremor patients referred for DBS, 36 patients were approved for surgery. Patients were mainly excluded because of the movement disorders neurologist and neuropsychologist evaluations. Reasons included an inadequate medication trial ($n = 20$), incorrect diagnosis ($n = 3$), dementia ($n = 3$), and antagonistic interactions with the team ($n = 1$). 37 patients did not present, were uninterested or lost to follow-up. Neither neurosurgical evaluation nor brain imaging excluded candidates in this study, but are needed to proceed with DBS.

Conclusions: Our suggested minimum standard DBS screening process begins with a movement disorders neurologist and neuropsychologist evaluation in order to determine eligibility. Neurosurgical evaluation and brain imaging can then be performed if candidates are deemed eligible.

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1. Introduction

Essential tremor (ET) is the most common adult movement disorder and can cause significant functional disability [1]. Unfortunately, medications improve tremor in only 50% of patients [2]. For those patients who respond poorly to medications and experience decreased quality of life, an effective treatment option is deep brain stimulation (DBS) of the ventral intermediate (VIM) nucleus of the thalamus [2,3].

Because not everyone is an appropriate candidate for DBS and because the success of DBS depends on patient selection, institutions performing DBS have adopted comprehensive, multidisciplinary screening evaluations to ensure the selection of appropriate candidates [4]. This critical process may be extensive and time-consuming. A recent report looking at reducing a full DBS screening evaluation for Parkinson disease (PD) concluded that a comprehensive process, including neurological,

neurosurgical, neurocognitive evaluations, and intracranial imaging was still necessary [4]. However, PD is a more complex disorder and certain targets, such as the subthalamic nucleus, may be associated with adverse cognitive and psychiatric outcomes [5]. Such outcomes have not been associated with unilateral VIM stimulation for ET, suggesting that the DBS screening process for ET may not need to be as comprehensive.

Using the University of Michigan Surgical Therapies Improving Movement (STIM) Program referral database, we examined our DBS screening process for ET. The main goal of this study was to see the proportion of ET referrals to our STIM program that were excluded from surgery and why, so that recommendations for a minimum standard DBS evaluation process could be developed.

2. Subjects and methods

This was a retrospective cohort study of consecutive patients with presumed ET who were referred for DBS evaluation at the University of Michigan STIM Program from 9/1/2007 to 12/31/2013. This study

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was approved by the Institutional Review Board of the University of Michigan.

STIM program referrals were logged at the time of referral and patients were initially scheduled for a screening evaluation in clinic with a Movement Disorders Neurologist. At this initial visit, patients were considered to be candidates for further DBS evaluation if 1) they had an action tremor that interfered with their quality of life and 2) they had failed propranolol, primidone and topiramate. A medication failure was defined as reaching a substantial dose of these medications (240 mg of propranolol, 300 mg of primidone, 400 mg of topiramate) without clinically meaningful effect on tremor, or experiencing intolerable side effects at any dose. A relative contraindication to using an ET medication, such as severe asthma preventing the use of propranolol, also counted as a medication failure. If patients had clear dementia or an inadequate medication trial, no further pre-surgical evaluation was performed. Recommendations for further medication trials were communicated to the referring physician, and patients could be scheduled for a repeat movement disorders evaluation once they met our medication criteria.

Those individuals who passed this initial screening clinic evaluation then underwent a standardized multidisciplinary work-up, including a standardized video evaluation using portions of the Fahn–Tolosa–Marin (FTM) Tremor Rating Scale to assess severity of tremor [6], a comprehensive neuropsychological evaluation with a neuropsychologist [7],

neurosurgical evaluation (including 3T magnetic resonance imaging of the brain), a formal speech evaluation, and social work consultation. After these evaluations were completed, a consensus formal decision by the STIM team was made about whether to offer the patient DBS surgery. Our team considered many factors including age and the severity of motor, cognitive, or psychiatric symptoms. We did not utilize strict cut-offs on any measures to exclude patients.

We identified reasons for excluding patients from consideration for DBS and the point at which they dropped out of our evaluation process (Fig. 1). The main reasons for exclusion were: 1) inadequate medication trials, 2) inappropriate diagnosis, 3) dementia, and 4) patients with antagonistic interactions with the multidisciplinary STIM team. Other reasons that patients dropped out of our evaluation process included loss of interest in DBS and loss of the patient to follow-up.

3. Results

100 tremor patients were referred for DBS evaluation between 9/1/2007 and 12/31/2013. 13 patients did not show up for their initial appointment, leaving 87 new tremor patients (52 men/48 women) for consideration of DBS (Fig. 1). The mean age of these 87 patients was 68.1 ± 10.1 years with a mean duration of symptoms of 22.6 ± 19.7 years. 38 (44%) were referred by movement disorders neurologists, 35 (40%) by general neurologists, and 14 (16%) by non-neurologists.

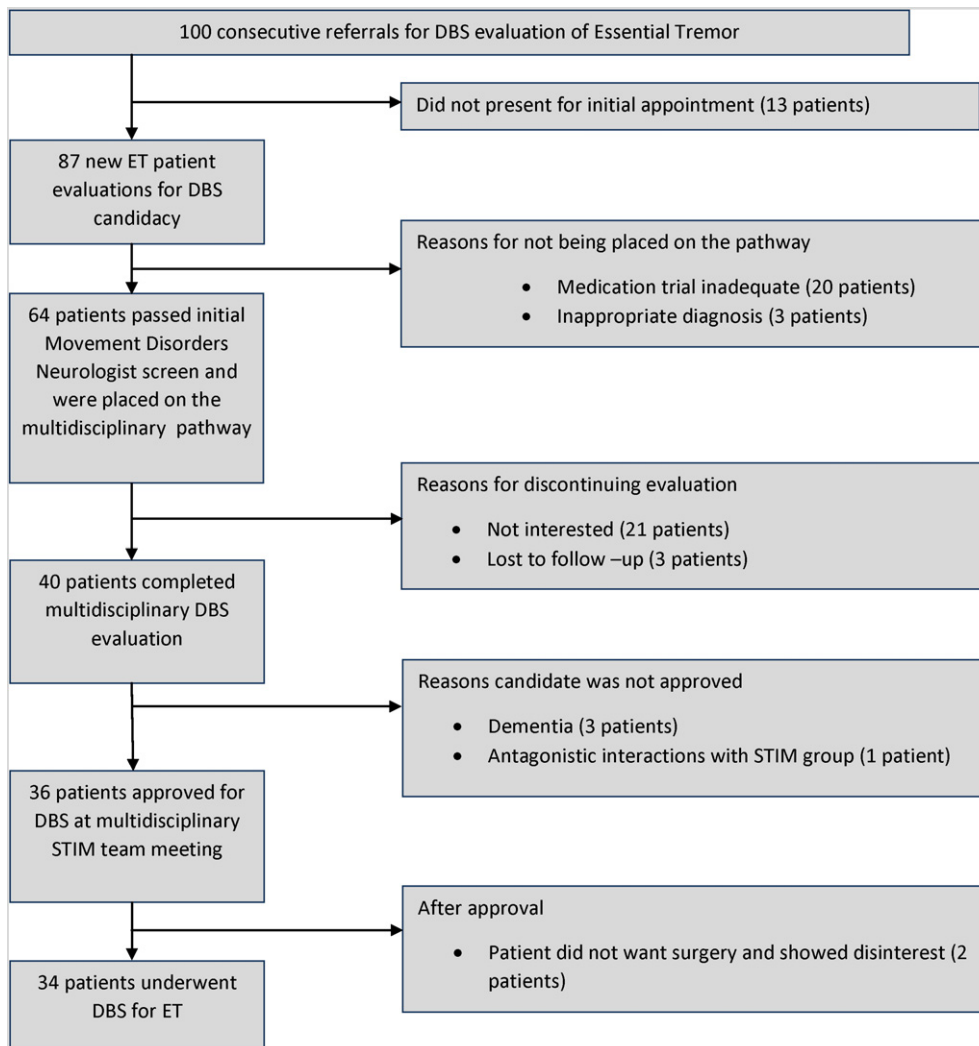


Fig. 1. DBS evaluation flowchart for patients with essential tremor.

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