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The Primary Type of Tremor in Essential Tremor is Kinetic Rather than Postural: Cross-Sectional Observation of Tremor Phenomenology in 369 Cases

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Abstract

Background—Essential tremor (ET) is among the most commonly misdiagnosed neurological diseases. The current aim was to provide observational data on a basic characteristic of ET, namely, the relative severity of postural to kinetic tremor.

Methods—369 ET cases were enrolled in a cross-sectional study. Postural tremor scores (0–3) and kinetic tremor scores (0–3) were assigned during a standardized neurological examination.

Results—In the vast bulk of cases (~95%), kinetic tremor was more severe than postural tremor. In nearly one-in-three cases (32.8%), the kinetic tremor score was >1 points higher than the postural tremor score. Conversely, in only a few cases (~5%) was postural tremor even marginally (<1 point) more severe than kinetic tremor, and in no case was the postural tremor score >1 point higher than the kinetic tremor score. At each postural tremor score, nearly all cases had that amount of kinetic tremor or more.

Conclusion—The primary type of tremor in ET is kinetic rather than postural. Recognition of the simple, empirical features of tremor phenomenology has potential diagnostic value for practicing clinicians.

Keywords

essential tremor; clinical; examination

INTRODUCTION

Although essential tremor (ET) is among the most common neurological diseases [1], there is a tendency for neurologists to over-assign the diagnosis. Indeed, as many as 30–50% of supposed ET cases have other diagnoses [2]. Thus, ET is also likely to be one of the most commonly misdiagnosed neurological diseases. Why is this the case and can we do better?

Canonically, ET has been defined based on “postural tremor” (i.e., tremor while the arms are outstretched against gravity) [3]. Yet ET has also been defined as a “kinetic tremor” (i.e., arm tremor during voluntary movements) [4]. At other times, ET is more loosely described as a disorder characterized by either tremor type. Thus, there is an inconsistency even in this

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COMPETING INTERESTS

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elemental regard. Empirically, what does the bedside examination of ET patients reveal? If one attempts to find published data to address this issue, there are surprisingly few [4].

The aim of this cross-sectional study of >350 ET cases was to provide observational data on a basic characteristic of ET, namely, the relative severity of postural to kinetic tremor. A further requirement was that the data be accessible and of practical value to clinicians (i.e., the use of a simple 0 – 3 bedside rating rather than computerized accelerometry or other complex metrics).

METHODS

ET cases were enrolled in a clinical-epidemiological study at the Neurological Institute of New York, Columbia University Medical Center (CUMC)(2000-2009) [5]. ET diagnoses were consistent with the Consensus Statement of the Movement Disorders Society regarding classic ET [6]. Cases signed informed written consent approved by the CUMC Institutional Review Board. Each underwent a medical history and standardized, videotaped neurological examination, which included one test for postural tremor and five tests for kinetic tremor (pouring, using spoon, drinking, finger-nose-finger, drawing spirals) performed with each arm (12 tests total). A senior neurologist used a clinical scale to rate postural and kinetic tremor during each test: 0 (absolutely no oscillations), 0.5 (intermittent, low-amplitude oscillations), 1 (consistent, mild tremor), 1.5 (mild to moderate tremor), 2 (moderate tremor), 3 (severe tremor) [5, 7]. The mean postural tremor score (potential range = 0-3) was the mean of the right and left arm postural tremor ratings. The mean kinetic tremor score (potential range = 0-3) was the mean of the right and left arm kinetic tremor ratings. Also, a total tremor score (range = 0-36) was assigned to each case. There are 369 ET cases [5]; none had diagnoses of Parkinson's disease (PD) or dystonia.

RESULTS

The 369 ET cases (mean age 67.1 ± 15.4 years, 188 [50.9%] women, mean age of onset 44.4 ± 22.6 years) had a mean tremor duration of 22.9 ± 18.6 years and a mean total tremor score = 18.9 ± 7.2 . One hundred-ninety-six (53.1%) were taking ET medication.

A paired t-test comparing mean kinetic and postural tremor scores was highly significant ($p < 0.001$). Indeed, in the vast bulk of cases ($n = 349$, nearly 95%), kinetic tremor was more severe than postural tremor (Table). In nearly one-in-three cases ($n = 121$, 32.8%), the mean kinetic tremor score was 1 points higher than the postural tremor score. Conversely, in only a few cases ($n = 16$, ~5%) was postural tremor even marginally (<1 point) more severe than kinetic tremor, and in no case was the mean postural tremor score 1 point higher than the mean kinetic tremor score (Table). The large number of ET cases had no, minimal or mild postural tremor (mean postural tremor score = 0, 0.5 or 1.0) and at each mean postural tremor score, nearly all of the cases had that amount of kinetic tremor or more (Figure 1).

The findings were the same when we stratified ET cases based on medication use vs. non-use. Age was correlated with both the mean kinetic and mean postural tremor scores (Pearson's $r = 0.23$ and 0.18 , both $p < 0.001$).

DISCUSSION

These data, from a carefully-examined cohort of >350 ET cases who were enrolled in a clinical study, indicate that the primary type of tremor in ET is kinetic rather than postural. Indeed, the presence of isolated postural tremor or postural tremor that was greater in severity than kinetic tremor was rare. As a general rule, kinetic tremor was of equal or greater severity to postural tremor, indicating that the relative severity of postural vs. kinetic

tremor might be a useful clue to the diagnosis. In fact, some data suggest that the presence of isolated postural tremor may be a predictive marker for other diagnoses such as early PD [8].

In an earlier study, we assessed clinical tremor scores in a far smaller sample of 50 ET clinic cases, but the clinical ratings of tremor were less precise, not including the intermediate values of 0.5 and 1.5, which aid in clinical characterization [4].

Given the diagnostic score card in ET, and the high rate of mis-diagnosis, as well as the discrepant statements in the literature about the basic features of tremor, it is hoped that the use of these data on clinical phenomenology will lessen the mis-diagnosis of this common disorder. Indeed, confusion over this basic feature of ET is likely to be responsible for much of the poor diagnostic accuracy.

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Figure 1.

Kinetic tremor score by category of postural tremor (0, 0.5, 1, 1.5, 2, 2.5, 3). The top panel shows the mean kinetic tremor scores in cases with mean postural tremor score=0. The bottom panel shows the mean kinetic tremor scores in cases with a mean postural tremor score=3. The yellow background indicates cases in whom the mean kinetic tremor score was greater or equal to the mean postural tremor score. For example, among 131 cases with a mean postural tremor score=1, only 2 (1.5%) had a mean kinetic tremor score <1.

Table

Severity of kinetic tremor vs. postural tremor in 369 ET cases

Mean kinetic tremor score – mean postural tremor score	Kinetic tremor vs. postural tremor	Number (%) ET cases	Number (%) ET cases
–2.00	Postural>kinetic	0 (0.0%)	16 (4.3%)
–1.50 to –1.99	Postural>kinetic	0 (0.0%)	
–1.00 to –1.49	Postural>kinetic	0 (0.0%)	
–0.50 to –0.99	Postural>kinetic	2 (0.5%)	
–0.01 to –0.49	Postural>kinetic	14 (3.8%)	
0	Postural=kinetic	4 (1.1%)	4 (1.1%)
0.01 to 0.49	Kinetic>postural	85 (23.0%)	349 (94.6%) ^A
0.50 to 0.99	Kinetic>postural	143 (38.8%)	
1.00 to 1.49	Kinetic>postural	93 (25.2%)	
1.50 to 1.99	Kinetic>postural	25 (6.8%)	
2.00	Kinetic>postural	3 (0.8%)	

^A When stratified into ET cases with more right than left sided kinetic tremor, this value was 94.0%, and more left than right sided kinetic tremor, this value was 96.0%.