Essential Tremor in Children

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Abstract

Objective: To characterize the clinical and therapeutic aspects of essential tremor (ET) in children.

Background: ET, an autosomal dominant disorder, has been studied extensively in adults, but little is known regarding its occurrence, clinical characteristics, treatment and prognosis in a pediatric population. Often stigmatized as a disorder of the elderly, ET may be misdiagnosed in children. Previous series of childhood ET were limited by a small sample size.

Design/Methods: Data on clinical information, including gender, age at onset, family history, associated disorders, and response to treatment, was collected on consecutive patients diagnosed with childhood-onset ET at the Movement Disorders Clinic at Baylor College of Medicine.

Results: Of the 30 ET patients, 22 (73.3%, $p = 0.02$) were male. The mean age at onset was 9.1 ± 5.3 years and the mean age at evaluation was 14.4 ± 3.8 years. Family history of tremor was present in 76.7% of the patients. Seventeen (56.7%) had some neurological comorbidity, such as dystonia, present in 10 (30%). Only 10 (30%) of the patients were treated with a specific anti-tremor medication; all 5 treated with propranolol improved.

Conclusion: Concomitant movement disorders, such as dystonia, are common in patients with childhood-onset ET, thus supporting the notion that ET is a heterogeneous disorder. Treatment strategies used in adult patients with ET seem to be also effective in children with ET although controlled therapeutic trials in this population of ET patients are lacking.

Introduction

Essential tremor (ET) has been studied extensively in adults, but little is known regarding its occurrence, clinical features, treatment and prognosis in a pediatric population. Hornabrook and Nagurney[1] reported that 4.6% of cases of ET had their onset during childhood. As it is often stigmatized as a disorder of the elderly, ET may be misdiagnosed in children. Furthermore, the study of childhood-onset ET may provide new insights into the genetics of this common disorder. ET is believed to be inherited as an autosomal dominant disorder, although no gene mutation have yet been identified.[2-4] Previous reports focusing on ET in children have included a relatively small number of cases ranging from 5 to 19.[5-7]

The primary purpose of this study is to draw attention to ET as not merely an adult or "senile" condition, but as an important and potentially troublesome or even disabling pediatric movement disorder. Using a relatively large sample of childhood-onset ET, the findings will provide new insights into the clinical presentation, treatment and pathogenesis of this common movement disorder.

Methods

All patients diagnosed with ET starting prior to age 18 years were queried from the database at the Movement Disorders Clinic at Baylor College of Medicine. This yielded 33 candidates, but three patients were excluded because of a psychogenic component in one and insufficient information in two. ET was defined as bilateral postural tremor with or without kinetic tremor involving hands or forearms, which was visible and persistent.[2] Some patients have "pure" ET without any associated disorders, while other may have co-existent dystonia and possibly other movement disorders.

We analyzed various features of the childhood onset ET including age at onset of tremor, the anatomic location of tremor, and nature of tremor (postural, kinetic, task-specific, or rest). Postural tremors were assessed while the arms were held outstretched in front of the body or in a "wing-beating" position, horizontal with shoulders abducted and elbows flexed. Kinetic tremor was elicited by the finger-to-nose and heel-to-shin maneuvers. Task-specific tremors were evaluated during the particular activity, such as writing, that precipitated the tremor. Rest tremor was assessed when the affected limb was in a resting position, supported against gravity. Family history was also obtained from the patients and the parents and whenever possible the family members were examined. If information was not available in the chart, patients or their parents were contacted by phone.

Table 1. Demographic and Clinical Features of Childhood-Onset Essential Tremor

Variable	Male (%)	Female (%)	*p*
Children	22 (73.3)	8 (26.7)	0.02
Age at Onset	9.9 ± 4.8	7.4 ± 6.4	0.28
Age at Evaluation	14.7 ± 3.4	13.6 ± 5.1	0.51
(+) Family Hx, 1°	15 (68.2)	2 (25.0)	0.05
(+) Family Hx, >1°	13 (81.3)	4 (66.7)	0.59

1° = First degree relatives
>1° = Second degree or more distantly related relatives

Key References

1. Hornabrook RW, Nagurney JT. Essential tremor in Papua New Guinea. Brain 1976;99:659-672.
2. Jankovic J. Essential tremor: A heterogenous disorder. Mov Disord 2002;17:638-644.
3. Lou JS, Jankovic J. Essential tremor: clinical correlates in 350 patients. Neurology 1991;41: 234-238.
4. Bain PG, Findley LJ, Thompson PD, et al. A study of hereditary essential tremor. Brain 1994;117: 805-824.
5. Uddin MK, Rodnitzky RL. Tremor in children. Semin Pediatr Neurol 2003;10:26-34.
6. Paulson GW. Benign essential tremor in childhood. Clin Ped 1976;15:67-70.
7. Louis ED, Dure LS, Pullman S. Essential tremor in childhood: a series of nineteen cases. Mov Disord 2001;16:921-923.
8. Hubble JP, Busenbark KL, Pahwa R, Lyons K, Koller WC. Clinical expression of essential tremor: Effects of gender and age. Mov Disord 1997;12:969-972.
9. Higgins JJ, Loveless JM, Jankovic J, Patel P. Evidence that a gene for essential tremor maps to chromosome 2p in four families. Mov Disord 1998;13:972-977.
10. Vanasse M, Bedard P, Andermann F. Shuddering attacks in children: An early clinical manifestation of essential tremor. Neurology 1976;26:1027-1030.
11. Kanazawa O. Shuddering attacks-report of four children. Pediatr Neurol 2000;23:421-424.

Results

Of the 30 ET patients, 22 (73.3%, $p = 0.02$) were male. [Tables 1] The mean age at onset was 9.1 ± 5.3 years and the mean age at evaluation was 14.4 ± 3.8 years. Seventeen of 30 (56.7%) patients reported a first-degree relative with tremor, another 17 of 22 (77.3%) reported a relative beyond the first degree as having tremor. Overall, 23 patients (76.7%) reported at least one relative with tremor. There were no significant differences between males and females with respect to anatomical distribution or the nature of tremor. [Tables 2] Thirteen of the 30 (43.3%) cases were diagnosed as pure ET without any other neurological disorder; the reminder had a variety of comorbidities. Besides dystonia, present in 10 (30.0%) of patients, Tourette syndrome, manifested by motor and phonic tics, attention deficit disorder and obsessive-compulsive disorder, was a frequent comorbidity, present in 8 (26.6%) of patients. The frequent occurrence of Tourette syndrome among our patients with childhood-onset, however, may be an artifact since these boys were initially referred for evaluation of Tourette syndrome and the ET was coincidentally diagnosed based on our examination and history.

The amplitude of ET may be influenced by many intended and unintended factors. Fourteen of the 30 patients noted that stress or anxiety increased their tremor. All eight patients responding to questions about physical activity also noted that this increased their tremor. With respect to caffeine intake, three males and one female noted that caffeine exacerbated their tremor; two patients, 1 male and 1 female, noted that alcohol intake transiently relieved their tremor.

Only 10 of the 30 patients were treated with specific anti-tremor medication. All five patients treated with propranolol noted marked improvement in their tremor. One patient placed on primidone also noted improvement with this drug.

Table 2. Anatomical Distribution and Type of Tremor

	Male		Female	
Tremor Characteristics	N	%	N	%
Anatomical Distribution				
Hand	22	100.0	7	100.0
Arm	13	59.1	2	28.6
Leg	6	27.3	2	28.6
Head	5	22.7	0	0.0
Trunk	4	18.2	1	14.3
Voice	4	18.2	1	14.3
Nature of Tremor				
Postural	27	95.5	6	85.7
Kinetic	20	63.6	6	85.7
Task	19	63.6	5	71.4
Rest	2	9.1	0	0.0

None of the differences between sexes were statistically significant by chi square analysis.

Discussion

In a previous study of 350 patients with ET evaluated in our clinic, we found a bimodal distribution of the age at onset of ET with peaks in the 2nd and 6th decades,[3] a finding also confirmed by Bain et al.[4] Both studies found no difference in clinical features between the young- vs late-onset groups. The findings from the present report of 30 patients with childhood-onset ET provide further evidence that childhood-onset ET is clinically and phenomenologically similar to the more common adult-onset ET.

Majority of our ET patients were boys ($p = 0.02$), similar to the report of Louis et al.,[7] the second largest study of childhood-onset ET (N = 19). Louis et al.[7] found no major difference between childhood and adult tremor except for male preponderance and paucity of head tremor in the childhood-onset ET. We also found that head tremor was relatively uncommon in our population, noted only in 5 of 30 (16.6%) patients, all males. This is in contrast to adult head tremor which is predominantly present in female ET patients; found in 60% of women with ET.[8] All our patients had hand tremor and 51.7% also exhibited arm tremor; 24/29 (82.6%) had a task-related tremor, for example while playing baseball or with toys. Tremor in the head, voice, legs, and trunk was present in far fewer patients than was upper extremity tremor.

Our finding that 76.7% of all patients had a family history of tremor must be inter-preted cautiously because this information was based largely on questioning the patients and their parents rather than on actual examination of all relatives. Our findings, however, are consistent with those of Louis et al.,[7] who found family history of tremor in 68.2% of their patients. The high familial occurrence provides support for the genetic basis of ET. Although the gene for this disorder has been elusive, a gene marker on on chromosome 2p22-p25 has been identified.[9]

The most common associated neurological disorder in our series was dystonia. This correlates with what is seen in adult ET cases, in which the frequency of ET patients with associated dystonia has been reported as high as 47%.[3] As noted before the high occurrence of Tourette's syndrome in our series is probably an artifact, as the children with coexistent ET and Tourette's syndrome were initially referred for evaluation of the latter disorder.

Although none of the children's parents recalled tremor during infancy, in some children with ET the onset of tremor may be preceded by so-called "shuddering attacks".[10,11] Vanasse et al.[10] identified 6 young children presenting with a history of shuddering attacks, who upon examination exhibited postural tremor and a positive family history of tremor. These attacks are described as episodes of "shivering" in which the child remains conscious, with the head, elbows, and knees flexed.[10,11] EEG monitor-ing and evaluation of shuddering attack patients reveals no abnormal findings, thus setting this disorder apart from epilepsy.[11] These studies suggest that shuddering attacks, occurring as early as in infancy, herald the onset of ET later in life.

Of those patients receiving treatment purely for tremor, propranolol was the most commonly prescribed drug at initial consultation. The positive response to propranolol noted by five of our patients is consistent with the known efficacy of this beta blocker in adult tremor.

Since all cases were referred to our specialty clinic, they may not be representative of general pediatric ET population. Patients who may be experiencing tremor, but do not seek medical attention or are not diagnosed and, therefore, not referred to a specialty clinic are not represented, with consequent selection bias toward more severe or complicated cases. The observation of ET in patients originally referred for evaluation and treatment of Tourette syndrome, however, underscores the lack of diagnostic acumen with respect to ET in children among primary care physicians, particularly pediatricians. Our study draws attention to ET as a pediatric movement disorder.