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Tremor and Other Hyperkinetic Movements

Case Report

Fast Orthostatic Tremor in Parkinson's Disease: Case Report and Comprehensive Review of Literature

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Abstract

Background: Orthostatic tremor (OT) is a rare symmetric tremor disorder occasionally observed in association with other movement disorders.

Case report: We report the presence of a fast OT in a case of Parkinson's disease (PD), and provide a comprehensive review of the literature.

Discussion: A fast OT presenting as unsteadiness may be a presenting symptom of PD. This symptom may be nonresponsive to levodopa, and benzodiazepines should be prescribed to adequately control the OT and reduce disability.

Keywords: Orthostatic tremor, fast orthostatic tremor, Parkinson's disease, asymmetry, unsteadiness

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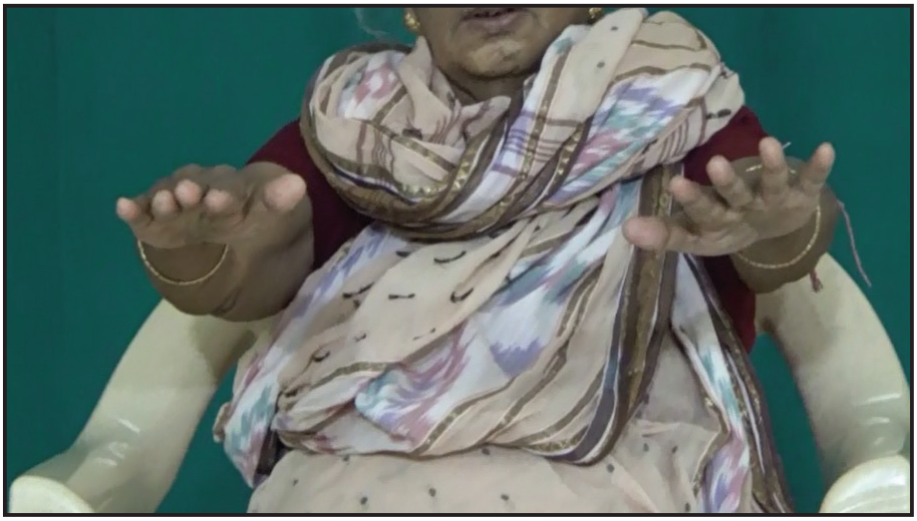
Introduction

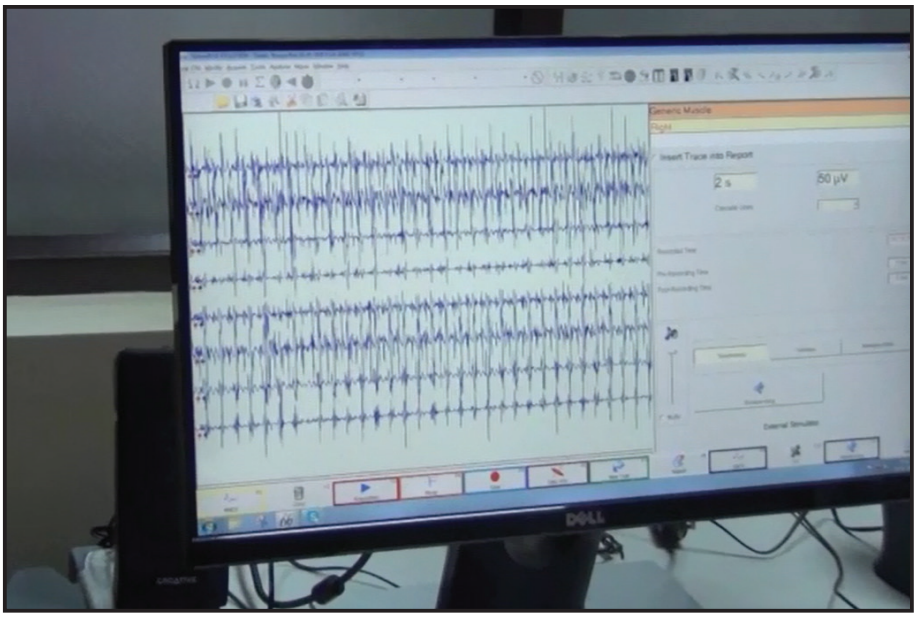
Orthostatic tremor (OT) is a rare tremor disorder characterized by a high frequency tremor of the legs which is activated on standing, absent while sitting or lying down, and improved by walking or leaning.[1] OT may be categorized based on associated neurological features. Primary (idiopathic) OT is typically observed in isolation, whereas OT plus may also occur in association with other movement disorders such as Parkinson's disease (PD).[2] OT is usually symmetrical and is subdivided into fast OT (13–18 Hz) and slow OT (<12 Hz).[3] Although slow OT is often reported in PD, there are few reports of fast OT in association with PD. This report describes a case of fast OT in a patient with PD and provides a comprehensive review of similar cases reported in the literature.

Case report

A 72-year-old lady presented to our movement disorders clinic with a 2-year history of unsteadiness on standing. She had significant instability while standing and felt the need to lean against surfaces while standing. She reported cautiousness while walking but denied any falls. There were no other complaints or any significant medical history. On examination (Video 1, Segment 1) she had mild hypomimia, a rest tremor of the right upper limb, very minimal postural tremor of the right upper limb, and asymmetrical bradykinesia (right>left) and rigidity (right>left). There was no rest or postural tremor of the lower limbs. Upon standing, she had a broad base and a significantly asymmetric tremor of the lower limbs (right>left) which subsided upon walking. She walked with a cautious gait and had reduced arm swing bilaterally. Auscultation over the gastrocnemius muscle while the patient was standing revealed a sound akin to a helicopter, that is, the "helicopter sign," which was suggestive of OT. Her Unified Parkinson's disease rating scale (UPDRS)-III, OFF state score was 21. The rest of her neurological examination was normal. MRI brain revealed periventricular ischemic changes. Surface electromyogram (EMG) recording from bilateral quadriceps, hamstrings, gastrocnemius, and tibialis anterior revealed a 15–16 Hz tremor with a burst duration of 25 ms, which was present on standing and absent while at rest and while walking (Video 1, Segment 2). There was no tremor of the legs



Segment 1: **Video demonstrating key clinical features and electrophysiological evaluation of the tremor**. A rest tremor of the right upper limb, and no rest tremor of left upper limb or either lower limb. There is a mild postural tremor of right upper limb. The patient has asymmetrical bradykinesia, with the right affected more than the left. Upon standing, the patient stands with a broad base and develops a asymmetric tremor of the lower limbs (right>left). The tremor is not evident upon walking and she walks cautiously with reduction in bilateral arm swing.



Segment 2: **Surface EMG Recording from Bilateral Quadriceps, Hamstrings, Gastrocnemius, and Tibialis Anterior while the Patient Was Standing Revealed a 15–16 Hz Tremor.** An increase in amplitude can be observed with cognitive activation.

while sitting. These features were consistent with a fast OT. We also observed a mild asymmetry in the amplitude of the EMG bursts, with increased amplitude of the tremor bursts in the right leg which corresponded with the clinical observation of asymmetry (Figure 1). Surface EMG recordings from the right wrist extensor and flexor muscles while the arm was at rest revealed a 5 Hz co-contraction tremor (Figure 2). Upon administering levodopa–carbidopa (100–25 mg), although her parkinsonian symptoms improved, that is, UPDRS-III score reduced to 10, there was no change in the OT, either clinically or on electrophysiology.

Based on the clinical findings, we arrived at a diagnosis of a fast OT in PD and prescribed a combination of levodopa–carbidopa for the parkinsonian symptoms and clonazepam for the OT. At a 3-month follow-up, the patient reported significant improvement in the OT and reduction in the parkinsonian symptoms.

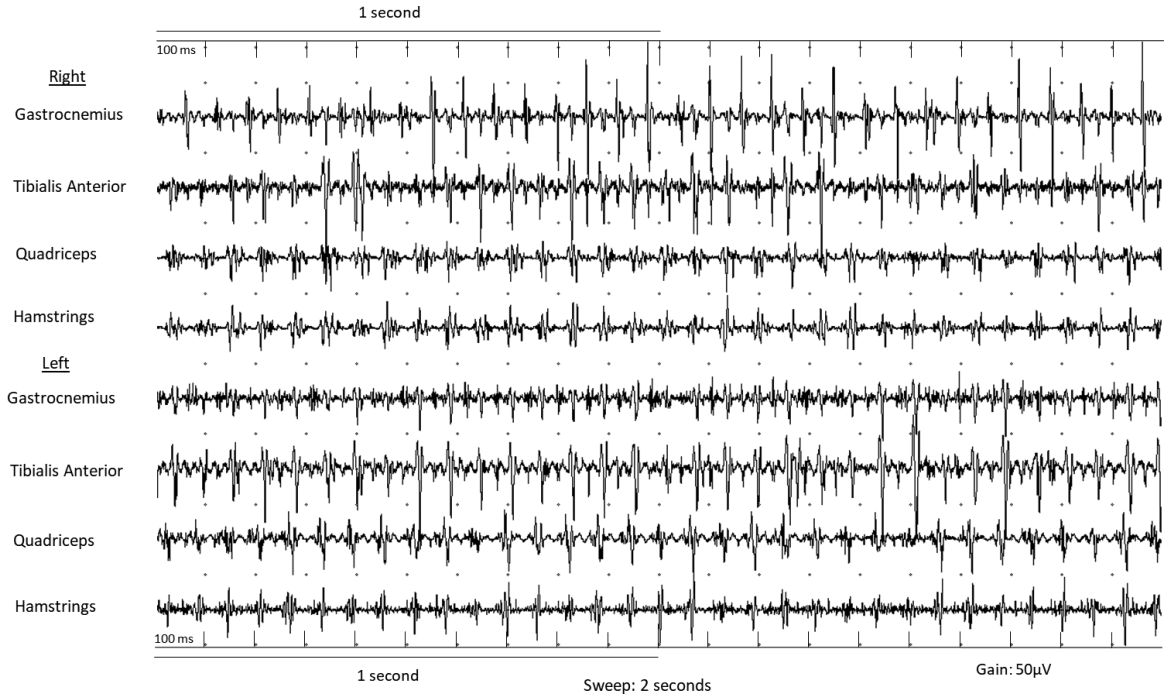


Figure 1. **Surface EMG recording from lower limbs while the patient was standing.** Recordings from Bilateral Quadriceps, Hamstrings, Gastrocnemius, and Tibialis Anterior revealed a 15–16 Hz Tremor with a Burst Duration of about 25 ms.

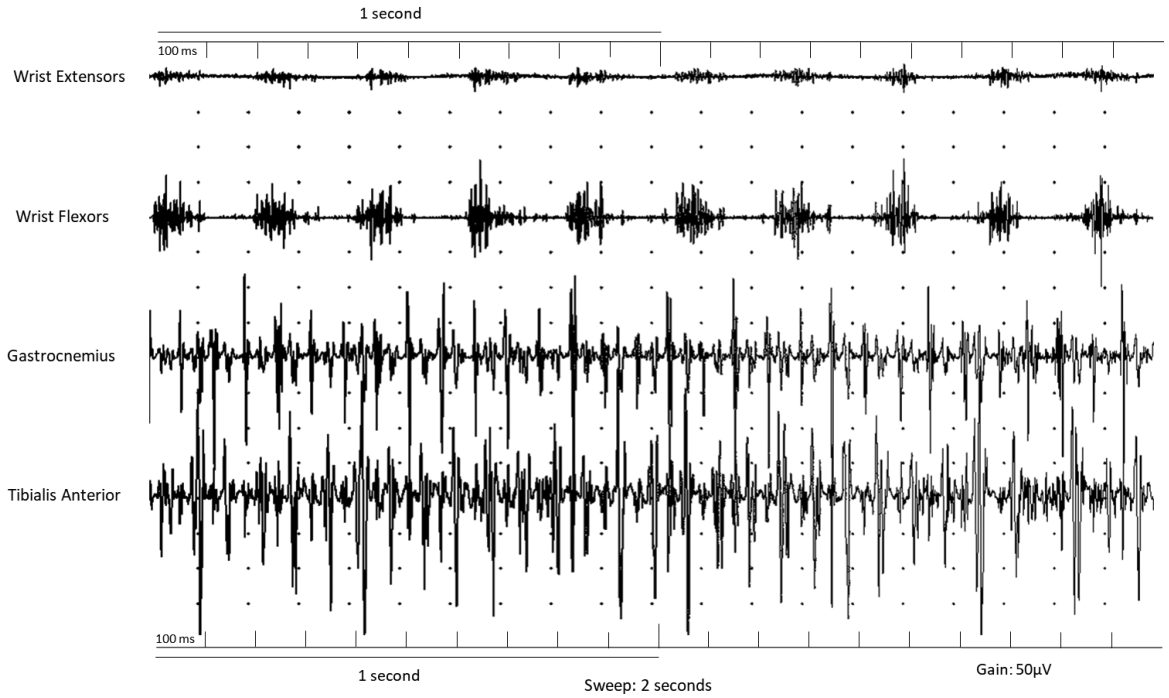


Figure 2. **Surface EMG Recording of Right Wrist Extensors and Flexors while the Arm Was at Rest Revealed a 5 Hz Tremor.** The 15–16 Hz recording obtained from the gastrocnemius and tibialis anterior establishes the presence of two different types of tremors.

Discussion

OT, although predominantly observed in isolation, may often coexist with other movement disorders, of which PD is the most prevalent. The pathogenesis of OT is uncertain, and theories including a central oscillatory network, altered cerebello–thalamo–cortical network, neurodegeneration, and a dopaminergic deficit have been suggested in the genesis of an OT.[4] Based on the concept of dopaminergic deficit in OT, it may be subtyped into type A: primary OT without evidence of dopaminergic deficit; type B: primary OT with evidence of dopaminergic deficit but without parkinsonism; and type C: OT associated with PD.[5] Slow OT, which is responsive to dopaminergic medication, is more commonly reported in PD, whereas fast OT may not respond to dopaminergic medication and is rarely reported.

To the best of our knowledge, 20 cases of EMG-proven fast OT in PD have been previously reported (Table 1).[2,6–11] The largest series was reported by Hassan et al., wherein from a large cohort of 184 patients with OT, 3.2% (six cases) were found to have a fast OT along with PD. In a vast majority of cases, the onset of OT preceded PD by several years [2,6,7,9,10] and, similar to our case, may be the presenting symptom in a case of PD.[9] In a few cases, OT may develop after the onset of PD.[2,8] Considering the proposed role of dopaminergic deficit in OT, it is plausible to expect a beneficial role of levodopa especially in cases where PD preceded the onset of OT. However, the literature review failed to provide convincing results pertaining to the response of fast OT to levodopa, with significant variability in the documented response (Table 1). No correlations were observed between the chronology of onset of symptoms, that is, OT preceding PD or vice versa, and levodopa responsiveness of the OT. Of the six cases wherein PD preceded OT, a partial-to-good response to clonazepam was reported with no clear description about the response of OT to levodopa.

OT is typically symmetric in nature, and in the present case we observed a mild asymmetry of the OT which concurred with the asymmetry of the parkinsonism. It is plausible that the observed asymmetry in OT is secondary to the asymmetric dopaminergic deficit. However, the lack of improvement of the OT after a levodopa trial confounds this concept. Furthermore, as evidenced clinically and by surface EMG, there were two definite types of tremor observed, that is, the parkinsonian 5 Hz rest tremor in the right upper limb and the 15–16 Hz OT in the right lower limb. This suggests the role of additional mechanisms for pathogenesis of fast OT in PD. The effect and role of weight-bearing on the amplitude of OT has been previously described,[12] and it is plausible that in addition to the dopaminergic deficit in the described case, a slightly imbalanced stance may have also contributed to the asymmetricity. In the report by Kang et al.,[9] one case of fast OT in association with PD was reported wherein the patient initially presented with a complaint of a unilateral leg tremor while standing. Upon evaluation the patient was found to have a 16–17 Hz tremor of only the left leg and was persisted to be unilateral at a 5-year follow-up. The patient was treated with dopamine agonists and had good response to medication. Although this case seems similar to the current report, the OT in the present study was bilateral and asymmetric which concurred with the asymmetric parkinsonism that was observed. It is uncertain from the above report if the OT was on the same side as

Table 1. Reports of Fast Orthostatic Tremor in Parkinson's Disease

Article	Number of Patients	Frequency of Tremor (Hz)	Chronology of Symptoms	Response of OT to Medication
Wills et al.[6]	1	14.5	OT preceded PD	Good response to levodopa
Apartis et al.[7]	3	14–18	1 – OT preceded PD 2 – PD preceded OT	Partial response to clonazepam
Gerschlager et al.[2]	3	13–18#	3 – OT preceded PD	2 – Good response to levodopa 1 – No response to propranolol (other details unavailable)
Leu-Semenescu et al.[8]	4	13–18	4-PD preceded OT	3 – Good response to clonazepam 1 – Details unavailable
Kang et al.[9]	1	16–17	OT preceded PD	Treated with dopamine agonists and benztropine. Good response to medication.
Mestre et al.[10]	1	13–18*	OT preceded PD	Poor response of OT to levodopa
Hassan et al.[11]	6	12.5–20**	Details unavailable	Details unavailable**
Present study, 2019	1	15–16	OT preceded PD	Poor response of OT to levodopa Good response of OT to clonazepam

OT, orthostatic tremor; PD, Parkinson's disease.
#Tremor frequency mentioned for one of three reported cases.
* Tremor frequency has not been provided for individual subjects. This is the mean frequency of all subjects in the study ($n = 26$).
** Details of individual subjects have not been provided. This is the mean frequency of all subjects in the study ($n = 184$).

the parkinsonian rest tremor. In addition, the OT in our case did not respond to levodopa.

In conclusion, a fast-orthostatic tremor presenting as unsteadiness may be observed in a case of PD. OT may either precede or occur several years post the onset of parkinsonian symptoms, and may also be a presenting symptom of PD. This symptom may often be nonresponsive to levodopa, and benzodiazepines should be prescribed to adequately control the orthostatic tremor and reduce disability.

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