

Letters to the Editor

Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS) with Myoclonus

Video 

Fragile X-associated tremor/ataxia syndrome (FXTAS) is a neurodegenerative disorder that can affect carriers of a premutation in the fragile X mental retardation 1 (FMR1) gene.¹ This gene normally contains fewer than 55 CGG triplet repeats. The full mutation (repeat number >200) is responsible for fragile X syndrome. Repeat lengths between 55 and 200 constitute a premutation which, besides being associated with FXTAS, also carries an increased risk of primary ovarian insufficiency (POI).^{2,3} Symptoms of FXTAS usually begin in the seventh decade. Major motor abnormalities are action tremor, cerebellar ataxia affecting limbs and gait, and Parkinsonism. Other possible features include cognitive decline, neuropathy, and autonomic dysfunction.⁴ The full phenotypic spectrum of FXTAS remains unclear. Although a broad range of neurological findings have been reported,⁴ myoclonus has not previously been described in association with this syndrome. We describe a man with FXTAS who, besides known features of this syndrome, also has generalized reflex myoclonus.

A 60-year-old man presented with a 2-year history of mild gait and balance difficulties. Past medical history consisted of treated hypertension and prostate cancer. Family history was notable for two sisters who experienced ovarian failure before age 35, and for the absence of mental retardation, parkinsonism, tremor, ataxia, or dementia. Examination revealed mild memory impairment (Mini Mental State Examination score 28 out of 30), and symmetric limb coordination deficits that included mild irregularity of timing and amplitude of rapid alternating hand movements, mild dysmetria on finger–nose testing, and moderate dyssynergia, evident as impaired checking response. There was mild gait ataxia, which was manifest as unsteadiness on rapid turning and inability to tandem-walk. There was mild bilateral hand action tremor on finger–nose testing and spiral drawing, and there were no parkinsonian findings. Generalized reflex myoclonus was present: tapping deep tendons in the arms or legs with a reflex hammer resulted in single jerks of the neck, trunk, abdomen, and arms. The same movements could be obtained by gentle pinprick of the palms or by scratching the palms or soles with a key (Video, Segment 1). Quantitative movement

analysis revealed jerks that caused backward head movement, forward and upward abdominal movement (indicating trunk extension and/or diaphragmatic contraction), and bilateral shoulder elevation and elbow extension, which were time-locked to the stimulus (Fig. 1A). Calculation of movement onset latencies after pinprick of the left hand showed that the hands moved first (80–100 milliseconds), followed by head (100–120 milliseconds), and abdomen/trunk (140–160 milliseconds). Note that these latencies do not inform on the point of origin of myoclonus (cortex vs. brainstem vs. spinal cord) because they do not necessarily correspond to electromyographic signal latencies, due to differences in biomechanical properties of the moving body parts. No spontaneous jerks were observed at rest or during posture or action. Neuropsychological assessment revealed dementia consistent with a frontal subcortical and cortical pattern, including poor encoding and retrieval, severely impaired visual confrontation naming, and significantly reduced psychomotor and processing speed. Brain MRI revealed marked atrophy of the cerebral hemispheres, moderate cerebellar atrophy, and bilateral increased T2 signal in the middle cerebellar peduncles (Fig. 1B,C). FMR1 gene analysis revealed CGG trinucleotide repeat length 114, that is, in the premutation range (55–200).

This report is the first description of myoclonus in association with FXTAS. The motor manifestations of FXTAS suggest involvement of cerebellar and striatonigral pathways. Therefore, generalized reflex myoclonus, which is typically of cortical or brainstem origin,⁵ was unexpected. Whether myoclonus in this patient originates from the cortex or brainstem is unclear. His cognitive deficits fit the “frontal executive” pattern that has been described in FXTAS,⁴ and include a cortical component. The reflex nature of the myoclonus (Fig. 1A) and the severity of cortical atrophy (Fig. 1B) are consistent with a cortical origin. Moreover, cerebral volume loss has been reported in FXTAS and is correlated with CGG repeat length.⁶ Thus, diffuse cortical damage is a plausible substrate for myoclonus in FXTAS. However, volume loss in the brainstem also occurs in FXTAS,^{6,7} and thus a brainstem origin for the observed myoclonus cannot be excluded.

FXTAS is a rare cause of ataxia with a reported prevalence of only 1.5% of men with ataxia.⁴ However, clinical consideration and accurate diagnosis are essential because of the associated increased risk of fragile-X mental retardation syndrome and POI in family members. Besides demonstrating a new potential clinical feature of FXTAS, this case also highlights the fact that FXTAS can present with minimal tremor, and that family history of POI can be an important clue to the diagnosis. Establishing whether generalized reflex myoclonus is indeed a consequence of the FXTAS mutation, rather than indicating coincidence or a specific susceptibility in the patient described here, will require further clinical observation of individuals with this condition.

Additional supporting information may be found in the online version of this article.

Potential conflict of interest: Nothing to report.

Published online in Wiley InterScience(www.interscience.wiley.com). DOI: 10.1002/mds.22929

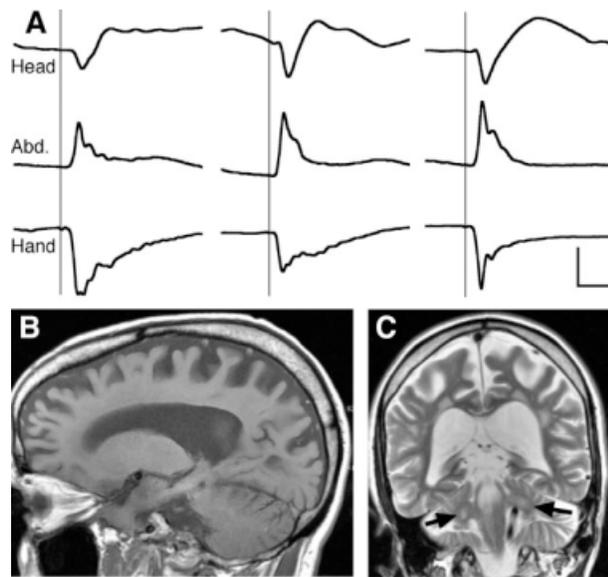


FIG. 1. A: Quantitative records of three examples of myoclonic jerks observed in the patient described in the present report. Position of head, abdomen, and left hand is plotted versus time. Traces show the response to three instances of pinprick stimulation of the hand (at times indicated by vertical lines), and illustrate generalized reflex myoclonus as time-locked jerks of the head (backward), abdomen (outward), and hand (down). Horizontal calibration bar: 0.5 seconds; vertical: 0.5 centimeters for head, 0.2 centimeters for abdomen, 1 centimeter for hand. Position was recorded at 110 Hz via an infrared motion capture camera (Proreflex MCU 500, Qualisys) with patient seated with arms flexed at the elbows. **B:** Sagittal T1-weighted magnetic resonance image illustrating cerebral atrophy out of proportion to cerebellar atrophy. **C:** Coronal T2-weighted image illustrating bilateral middle cerebellar peduncle hyperintensity (arrows).

Legends to the Video

Segment 1. Selected examination findings in patient with FXTAS with reflex myoclonus. The video demonstrates generalized reflex myoclonus, dysdiadochokinesia (with mirror movements in the other hand), mild intention tremor, dysmetria on finger step-tracking, impaired checking response, unsteadiness on turning, and impaired tandem gait.

Acknowledgments: We thank Dr. Toni Pearson for comments on this manuscript and Yaacov Rydzinski for video editing.

Author Roles: K. L. Poston: Conception, organization, and execution of research project, clinical data collection and review, writing of the first draft and review and critique of the manuscript; R. A. McGovern: Movement data collection and analysis, review and critique of the manuscript; J. S. Goldman: Clinical data collection and review, writing of the first draft and review and critique of the manuscript; E. Caccappolo: Clinical data collection and review, writing of the first draft and review and critique of the manuscript; P. Mazzoni: Conception, organization, and execution of research project, clinical data collection and review, movement data collection and analysis, writing of the first draft and review and critique of the manuscript.

Kathleen L. Poston, MD, MS
 Robert A. McGovern
 Jill S. Goldman, MS, MPhil, CGC
 Elise Caccappolo, PhD
 Pietro Mazzoni, MD, PhD*
*Division of Movement Disorders
 Department of Neurology
 College of Physicians and Surgeons
 Columbia University
 New York, New York, USA
 E-mail: pm125@columbia.edu

References

- Hagerman RJ, Leehey M, Heinrichs W, et al. Intention tremor, parkinsonism, and generalized brain atrophy in male carriers of fragile X. *Neurology* 2001;57:127–130.
- Allingham-Hawkins DJ, Babul-Hirji R, Chitayat D, et al. Fragile X premutation is a significant risk factor for premature ovarian failure: the International collaborative POF in fragile X study—preliminary data. *Am J Med Genet* 1999;83:322–325.
- Hagerman RJ, Leavitt BR, Farzin F, et al. Fragile-X-associated tremor/ataxia syndrome (FXTAS) in females with the FMR1 premutation. *Am J Hum Genet* 2004;74:1051–1056.
- Berry-Kravis E, Abrams L, Coffey SM, et al. Fragile X-associated tremor/ataxia syndrome: clinical features, genetics, and testing guidelines. *Mov Disord* 2007;22:2018–2030; quiz 2140.
- Cassim F, Houdayer E. Neurophysiology of myoclonus. *Neurophysiol Clin* 2006;36:281–291.
- Cohen S, Masyn K, Adams J, et al. Molecular and imaging correlates of the fragile X-associated tremor/ataxia syndrome. *Neurology* 2006;67:1426–1431.
- Brunberg JA, Jacquemont S, Hagerman RJ, et al. Fragile X premutation carriers: characteristic MR imaging findings of adult male patients with progressive cerebellar and cognitive dysfunction. *Am J Neuroradiol* 2002;23:1757–1766.