Teaching Video NeuroImages: Semiology and localization of ballistic movements

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Ballistic chorea (hemichorea–hemiballism) localizes to the subthalamic nucleus and its connections (video 1, figure, Aa) or the putamen (video 2, figure, Ab). Other large-amplitude hyperkinetic lesional movements can have similarly high localizing value. “Ballistic” tremor may develop months after recovering from ventrolateral thalamic strokes, in the thalamogeniculate vascular territory (video 3, figure, Ac and Ad).¹ Similarly, “ballistic dystonia,” limb dystonia with superimposed arrhythmic and jerky movements often referred to as myoclonic dystonia, may develop months after recovering from combined vascular lesions in the striatum and posterior thalamus (video 4, figure, Ae and Af).² These motor complications, delayed by hours to days (hemiballism) or weeks to months (ballistic dystonia and tremor), have relatively distinct localization value to a narrow “ballistic corridor” in the basal ganglia and thalamus (figure, B).

AUTHOR CONTRIBUTIONS

Hector Gonzalez-Usigli: drafting/revising the manuscript, study concept or design, accepts responsibility for conduct of research and final approval, acquisition of data. Alberto J. Espay: drafting/revising the manuscript, study

concept or design, analysis or interpretation of data, accepts responsibility for conduct of research and final approval, acquisition of data, study supervision.

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(Aa) Head CT in a patient with hemichorea-hemiballism due to subthalamic stroke. An area of hyperintensity restricted to the region in and around the subthalamic nucleus represents a hypertensive hemorrhagic stroke (video 1). (Ab) Axial T1-weighted brain MRI in a patient with hemichorea-hemiballism due to diabetic ketoacidosis. The area of T1 hyperintensity in the left posterior putamen was identified during an episode of severe diabetic ketoacidosis 3 weeks before the onset of right hemiballistic chorea (video 2). (Ac, Ad) Axial and coronal T2-weighted brain MRI in a patient with ballistic tremor. The area of T2 hyperintensity is restricted to the ventrolateral thalamus, corresponding to a stroke in the thalamogeniculate arterial territory (inferolateral arteries, P2) (video 3). (Ae, Af) Axial gradient echo brain MRI in a patient with ballistic dystonia. The regions of susceptibility artifact are due to hemosiderin deposition resulting from a remote hemorrhagic infarct involving the right posterior putamen, posterior thalamus, and upper midbrain, adjacent to the subthalamic nucleus (video 4). (Ba-c) Basal ganglia lesional "corridor" of ballistic movements. The ballistic movements have localizing value (shown in red) by narrowing the lesion in or around the subthalamic nucleus (a, hemiballism), ventrolateral thalamus (b, ballistic tremor), and dorsolateral putamen and posterior thalamus (c, myoclonic dystonia or "ballistic dystonia") (printed with permission: Mayfield Clinic).

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