



## Case Presentation

# Management of Severe Hemiballismus: Treatment Challenges in the Acute Inpatient Rehabilitation Setting: A Case Presentation

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**Abstract**

We report a case of a patient with profound right-sided hemiballismus resulting from an acute unilateral left thalamic lesion. The hemiballismus was significant and persistent, resulting in profound functional disability. We discuss the use of low-dose haloperidol in conjunction with acute rehabilitation in the treatment of hemiballismus, resulting in decreased amplitude and frequency of adventitious movements and leading to substantial functional gains in our patient. To our knowledge, this is the first extensive report of successful rehabilitation of a patient with functionally disabling hemiballismus.

**Level of Evidence:** To be determined.

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**Introduction**

Hemiballismus is a rare movement disorder, which may have significant functional implications for those affected by the condition. It is characterized by uncontrollable, large-amplitude, nonrhythmic movements of one or both limbs on one side of the body. Historically, it has been associated with lesions to the contralateral subthalamic nucleus (STN); however, more recent data suggest additional associations with lesions in the thalamus, cortex, and various nuclei of the basal ganglia. We present the case of a patient with profound right-sided hemiballismus from a small, acute, unilateral, left thalamic, hemorrhagic stroke resulting in substantial functional decline. We discuss the successful rehabilitation of the patient through the use of low-dose haloperidol and acute inpatient rehabilitation (AIR). To our knowledge, this is the first reported case of the use of haloperidol and acute inpatient rehabilitation resulting in short-term measurable functional gains.

**Case Presentation**

A 56-year-old man presented to the emergency department with acute onset of involuntary, large-amplitude, nonrhythmic, right-sided movements with

leg greater than arm involvement. The patient's prior medical history was notable for a remote right thalamic hemorrhage 12 years previously, with only mild residual left hemiparesis and without an associated movement disorder. He was treated at that time with an external ventricular drain and subsequent ventriculoperitoneal shunting. Physical examination findings on admission were notable for a mild left-sided hemiparesis, diffuse hyperreflexia, and continued prominent right-sided hemiballismus as previously described. A subsequent computed tomogram of the brain revealed a small, isolated, acute, intraparenchymal hemorrhage in the left thalamus with mild surrounding vasogenic edema (Figure 1) and a VP shunt placed a decade ago after a right thalamic hemorrhage. The patient's hemiballismus persisted into his AIR admission, where his hemiballismus, now only in the leg, was so profound that he required a pelvic restraint to prevent him from throwing himself out of his wheelchair. The patient experienced an atraumatic fall on AIR day 1 due to his uncontrollable movements and impulsivity, requiring 1:1 observation at that time. That day, therapists noted bruising and rough skin on the posterior aspect of his right calf due to "extreme involuntary movements." This subsequently developed into an open abrasion that was cruciform in appearance, measuring approximately  $1.5 \times 0.5$  cm,



**Figure 1.** Noncontrast computed tomogram of the brain demonstrates a small acute hemorrhage in the left thalamus (solid white arrow), with mild surrounding edema and mild mass effect on the left aspect of the third ventricle. A ventriculoperitoneal shunt catheter (dashed white arrow) is partially seen in the right posterior temporal scalp soft tissues, placed 12 years previously for a remote right thalamic hemorrhage.

reported by nursing staff on AIR day 14; it was due to repeatedly hitting his right calf against the side of the bed and required padding of the bed and nursing wound care. The patient was started on clonazepam 0.25 mg twice daily on AIR day 5. This only partially ameliorated the patient's agitation and made him somewhat more manageable under 1:1 observation, but did not have any effect on the hemiballismus. The patient did not make any rehabilitation gains. He was started on haloperidol (0.5 mg/day) on AIR day 14, with rapid improvement in agitation and significant decrease in the amplitude and force of the ballistic movements as well as subsequent dramatic functional improvement. As a controlled substance, the clonazepam fell off the medication order system on AIR day 18, with no decrement in agitation or significant upward trajectory of rehabilitation gains. The right calf abrasion was completely healed by AIR day 26, and a dressing was no longer required.

On admission to AIR, the patient had demonstrated significant functional impairment resulting from his hemiballismus, which substantially improved with treatment, resulting in profound gains in functional outcomes. He initially required moderate to maximal assistance from occupational therapy for activities of daily living and maximal assistance from physical therapy for ambulating 40 feet with 3-person assist with

a rolling walker. He also demonstrated decreased overall functional mobility and decreased attention and concentration. On AIR 1 he was trialed with a weighted vest, ankle weights, and a weighted rolling walker to resist adventitious movements and to aid in ambulation; however, these attempts were unsuccessful, and he continued to require maximal assist to ambulate 40 feet with 3 persons for safety. Two days after starting haloperidol, the patient ambulated 50 feet and 40 feet with moderate assistance (the walking distance the second time was limited by impulsivity). Dramatic gains continued, and by AIR day 30 the patient was ambulating 125 feet with close supervision to minimum assistance, and remarkably without an assistive device. The patient was at a supervision level for bed mobility and transfers. At the time of discharge from acute rehabilitation (AIR day 48), the patient was at a supervision level for all activities of daily living and close supervision for ambulation with a single point cane for ambulating 300 feet. The cane was used as a precaution and an aid against untoward events in community ambulation. Hemiballistic movements of the right leg persisted, but both the amplitude and frequency were significantly decreased. Improvement in concentration and attention were also noted after initiation of haloperidol. There were no adverse motor or other side effects of haloperidol. This functional status without any further side effects was maintained at outpatient follow-up.

## Discussion

Hemiballismus is a rare hyperkinetic condition infrequently seen in the acute inpatient rehabilitation setting. It can be caused by a wide variety of conditions, although stroke is by far the most common cause. However, the incidence of poststroke hemiballismus is exceedingly rare, reported in 0.54% cases of stroke in a large series of 5009 patients [1]. Nonketotic hyperglycemia is the second most common etiology, with more rare associations attributed to complications of human immunodeficiency virus infection, encephalitis, vasculitis, multiple sclerosis, and neoplasms [2].

Although classically thought to predominantly result from lesions of the subthalamic nucleus STN, case series have suggested that in fact lesions of the STN are the cause of a minority of cases of hemiballismus, with lesions in the caudate, putamen, cortex, and thalamus more frequently seen [1,3,4]. In cases of hemiballismus attributed to lesions in the thalamus or STN, 3 theories predominate. The classical model of basal ganglia circuitry suggests that STN injury causes decreased excitation of the globus pallidus interna (GPi). Decreased excitation of the GPi causes decreased inhibition of the thalamus. With decreased inhibition of the thalamus, there is corresponding increased excitation of the cortex, brainstem, and spinal cord, resulting in

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