



CASE REPORT

Multimodal Approach to Manage Hemiballismus in a Newly Diagnosed Diabetic

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Abstract

A 67-year-old female with a complex medical history presented to the emergency department with severe right-sided hemiballismus after she was found on the floor by her son. Her initial blood glucose level was 727 mg/dL and her HbA1C level was 16.6. The patient was diagnosed with hemiballismus, a hyperkinetic movement disorder characterized by unilateral, rapid, and unpredictable high-amplitude movements. Although rare, hemiballismus can arise as the initial sign due to poor glucose control. First-line care for this condition includes glycemic management, patient education regarding lifestyle modifications, and addressing cardiovascular risk factors. Rehabilitation therapy interventions may also be employed in individuals with chorea. To the best of our knowledge, this is the first report describing the successful treatment of hemiballismus in a medically complex, newly diagnosed diabetic patient with musculoskeletal and other co-occurring sequelae through a multimodal approach involving pharmacotherapy, physical therapy, occupational therapy, and psychiatric intervention in an acute rehabilitation setting.

Keywords

Hemiballismus, Diabetes, Physiatry, Rehabilitation, Movement disorder

Background

Hemiballismus is a hyperkinetic movement disorder characterized by unilateral, rapid, and unpredictable, high-amplitude movements. Initially, the proximal limbs such as the shoulder and hip were affected. As the

disease progresses, it can involve the distal limbs, face, and trunks. Such movements are often due to an insult in the contralateral basal ganglia structures, such as the Subthalamic Nucleus, Putamen or Caudate. After stroke, nonketotic hyperglycemia is the second most commonly reported cause of acquired hemiballismus [1]. Herein, we describe a unique case of hemiballismus in a newly diagnosed diabetic patient with medical complications that was successfully treated using a multimodal approach in an acute inpatient rehabilitation setting.

Case Description

A 67-year-old female with a medical history of COPD and chronic respiratory failure on 2L of oxygen, hypertension, hypothyroidism, and chronic kidney disease presented to the emergency department with severe right-sided hemiballismus after being found on the floor by her son. She was admitted a month prior due to newly diagnosed diabetes mellitus and an altered mental status secondary to an undiagnosed UTI. Her initial blood glucose level was 727 mg/dL and her HbA1C level was 16.6. She was educated about her condition and was subsequently discharged on insulin. Unfortunately, she was noncompliant with treatment, as evidenced by her elevated blood glucose levels and worsening of her abnormal movements, which profoundly interrupted her activities of daily living (ADL), prompting her second admission to the hospital. Before re-hospitalization,

she underwent a trial of buspirone for stress and anxiety by her primary care physician. On presentation to the ED approximately three weeks after her initial admission, the uncontrollable movements of her right upper and lower extremities worsened, and she was administered IV Lorazepam and 1 mg IM Benztropine. She was discharged with a course of bztropine, advised to discontinue buspirone, and followed up with her primary care physician. She returned to the ED two weeks later because of continued right-sided flank pain and uncontrolled movements. The patient continued to take buspirone against medical advice, which exacerbated her extrapyramidal symptoms. The patient was admitted to the General Medical Department. Imaging revealed no prior stroke or acute abnormalities, and EEG results were normal. Therefore, the buspirone therapy was discontinued.

She received one dose of 1 mg IV Lorazepam and 1 mg IV Haloperidol, which were discontinued owing to a lack of efficacy. The patient was started on Risperidone and Divalproex, which reduced the chorea. The neurology team recommended discontinuation of divalproex owing to its lack of effect over time.

The patient was admitted to the Inpatient Rehabilitation Department. From a functional perspective, she required maximal assistance with transfers and ambulation because of profound hemiballismus. She was also dependent on assistance with ADL engagement, reflecting a significant reduction in functional independence when compared to her baseline status of complete independence prior to the onset of her symptoms. The interdisciplinary team developed a comprehensive physical rehabilitation program utilizing ankle weights and a weighted walker, which allowed for safer transfers and ambulation along with gait and stair training, which was enhanced by employing verbal and tactile cues.

Pharmacologically, Risperidone (3 mg) and clonazepam (0.5 mg) (morning) and 0.25 mg (evening) resulted in a significant reduction in movement frequency and intensity.

The patient demonstrated significant radicular pain with signs of sciatic nerve compression, and severe pain with ambulation. This was thought to be due to ongoing contractions of the gluteal muscles, resulting in piriformis syndrome, which affected the patient's ability to walk. This pain not only worsened her sleep quality but also limited her ability to complete intense rehabilitation therapy. This required intervention with an ultrasound-guided piriformis injection (20 mg Kenalog reconstituted with 2 CC of 1% lidocaine). Pain perception significantly improved after injection. Her hyperkinetic movements improved as her blood glucose levels were better controlled. Her hemiballismus decreased in amplitude and frequency, and her functional status progressed to contact guard/minimal assistance for

ambulation and ADLs. The patient continued to use ankle weights and a weighted walker to aid in mobility. Because the patient insisted on early discharge, family training was facilitated, and the patient was discharged against medical advice and advised to continue her therapy as an outpatient. During her rehabilitation stay, she received intensive one-on-one and group diabetic education, which was extended to her caretaker and facilitated by the RN diabetic educator. At the one-month follow-up, her blood glucose levels were well-controlled (123 mg/dL), along with a near-complete resolution of hyperkinetic movements. She was graded as modified independent (FIM 6) with ambulation using an unweighted rolling walker, and completely independent (FIM 7) with respect to engaging in ADLs. She experienced a profound improvement in her quality of life. She was able to gradually wean off clonazepam over the next month, and she had self-discontinued risperidone prior to her one-month outpatient follow-up.

Discussion

Non-ketotic hyperglycemia is the second most common cause of acute haemiballismus. Several hypotheses have been proposed regarding the etiology of hyperglycemia-induced hemiballismus. The prevailing theory is that hyperglycemia and other associated metabolic disorders lead to hyperviscosity, resulting in reduced cerebral blood flow and ischemia, affecting the basal ganglia [2]. Hyperglycemia-induced hemiballismus is associated with a hyperosmolar hyperglycemic state, which is defined as blood glucose and serum osmolarity levels greater than 600 mg/dl and 320 mOsm/kg, respectively, and negative ketones [3]. Hemiballismus due to ketotic hyperglycemia is relatively uncommon. Only 16 cases of hemiballismus have been reported to be associated with diabetic ketoacidosis.

These medications, in conjunction with aggressive management of severe hyperglycemia and a course of acute inpatient rehabilitation, yielded favorable results. Our findings suggest that a combination of glycemic control and management of hyperkinetic involuntary movements through a multimodal pharmacological and rehabilitation program of care likely led to successful resolution of our patient's symptoms. Hyperglycemia-induced hemiballismus often resolves within weeks to months once proper glycemic control is achieved; however, it can be prolonged in certain instances.

Clonazepam is a highly potent and long-acting benzodiazepine that exerts pharmacological effects by acting as a positive allosteric modulator of GABA A receptors. Clonazepam is often used for the acute management of panic disorder, epilepsy, and non-convulsive status epilepticus [4,5]. It also has many off-label indications, including restless legs syndrome, acute mania, insomnia, and tardive dyskinesia [6].

Risperidone is an atypical antipsychotic that exerts its effects through D2 5HT_{2A} blockade. It is approved for the treatment of schizophrenia, bipolar I acute manic, or mixed episodes as either monotherapy or adjunctive with lithium or valproate, and autism-associated irritability. It has also been used to treat other personality disorders, mood disorders, and movement disorders [7].

Clonazepam and Risperidone have also been shown to be useful in reducing extrapyramidal effects in previous case reports [8,9]. Recommended therapeutic interventions for people with chorea include aerobic exercise alone or in combination with resistance training, in addition to supervised gait training [10].

This case is unique because hemiballismus arose as an initial sign of newly diagnosed diabetes. At the same time, a delay in seeking medical attention, in addition to poor glucose control, may have predicted this patient's clinical presentation. In addition to treating the underlying hyperglycemia, we used pharmacological management of her movement disorder to decrease the severity of symptoms, as well as rehabilitation interventions. We have exemplified a rehabilitation approach that combines strength, aerobic, and gait training to obtain motor control to restore functional independence while engaging in activities of daily living, ultimately improving the quality of life.

Conclusion

The management of hyperglycemia-induced hemiballismus in medically complex patients is a delicate challenge in acute rehabilitation settings. Finding an appropriate balance of care to achieve movement control, in addition to managing complications and sequelae in this context, requires continuous reevaluation and revision of the treatment plan. The control of the patient's hyperglycemic state, from which hemiballismus develops, is of paramount importance. This case illustrates the potential of considering a multimodal approach to care, which should be assessed in future studies. This would in turn allow for favorable outcomes while simultaneously mitigating unwanted adverse effects often associated with standalone pharmacotherapy.

Author Contributions

Conceptualization: JG, AO, AP, KC. Data curation: AO, AP, and KC. Project administration: JG. Original draft preparation: JG, AO, AP, and KC. Writing, review, and editing: JG, AO, AP, and KC. All the authors have read and agreed to the published version of the manuscript.

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Ethical Compliance

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1975 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from the patient included in the study.

Data Access Statement

The participants of this study did not provide written consent for their data to be shared publicly; therefore, so due to the sensitive nature of the research supporting data is not available.

Conflict of Interest Declaration

The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interests in the subject matter or materials discussed in this manuscript.

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