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### Rare Presentation of Hypoparathyroidism with features of Parkinsonism: A Case Report

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#### Abstract

**Background:** This case report presents a 54-year-old female diagnosed with Hypoparathyroidism, manifesting with symptoms of Parkinsonism. The report details the patient's clinical presentation, diagnostic journey, and management strategies. Recognizing the diverse presentations and implementing appropriate management protocols are essential for achieving timely diagnosis and effective treatment in Hypoparathyroidism cases.

**Key Words :** Hypoparathyroidism, Parkinsonism, Hypocalcemia, Hypomagnesemia

#### Introduction

Hypoparathyroidism occurs when there is destruction of the parathyroid glands (surgical, autoimmune), abnormal parathyroid gland development, altered regulation of parathyroid (PTH) hormone or impaired PTH hormone action. The manifestations of hypoparathyroidism are due to hypocalcemia and vary depending on the severity and the rate of development of hypocalcemia. Hypocalcemia presents with paresthesia, muscle twitching, spasms, tetanic contraction and seizures<sup>1</sup>. Movement disorder such as Parkinsonism is an unusual complication of Hypocalcemia. Parkinsonism is characterized by the presence of resting tremors, bradykinesia and rigidity<sup>2</sup>. This case report presents an atypical manifestation of Hypoparathyroidism, characterized by the presence of symptoms of Parkinsonism. Magnesium, a divalent cation, is one of the major intracellular electrolytes; cofactor for various intracellular enzymes, with a significant role in energy production by forming

complexes with adenosine triphosphate (ATP) molecules and also playing an important role in neuromuscular transmission and to regulate K<sup>+</sup> and Ca<sup>+</sup> channels, Mg more importantly plays role in normal PTH secretion in response to fall in plasma calcium<sup>3</sup>.

#### Case Presentation

A 54-year-old female, known to have Hypothyroidism managed with Tab. Thyronorm 88 mcg daily, Type 2 Diabetes Mellitus treated with Oral Anti diabetic Agents, and Depression under antidepressants presented to the Outpatient Department with symptoms of cramps and spasms in her hands, legs, and trunk over the past few months, which had intensified in severity over the last seven days. She had recently consulted a neurologist for her symptoms and was diagnosed with Parkinson's disease. Her hands and legs trembled with presence of rigidity in her limbs however there was no sluggishness in her movements, nor a loss of balance or grace in her step. Since then, she had been prescribed Tab. LEVODOPA (100mg) and Tab. CARBIDOPA (25mg) to be taken three times a day. Physical examination revealed evident spasms in her hands, legs, and trunk, hindering accurate blood pressure

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measurement. Despite these symptoms, she remained alert and well-oriented to time, place, and person. Trousseau sign was elicited during examination, while no other abnormalities were detected during systemic assessment.

### Diagnostic Assessment

Lab investigations were initiated, revealing a serum calcium level of 3.8 mg/dL, confirming

the diagnosis of hypocalcemia. The patient lacked symptoms of difficulty breathing due to laryngospasm/bronchospasm usually present at this low calcium levels. This finding prompted the patient's admission for comprehensive evaluation and management. Additional blood investigations were conducted, the results of which are presented in the table 1:

**Table 1: Investigation tests done in the patient**

Test	Value	Reference range
Serum Calcium	<b>3.8 mg/dl</b>	8.6 - 10.2 mg/dl
Free T3	1.58 pg/ml	1.58 - 3.91 pg/ml
Free T4	18.30 pmol/L	9.0 - 19.0 pmol/L
TSH	2.725 $\mu$ IU/ml	0.35 - 4.94 $\mu$ IU/ml
PTH	<b>13.0 pg/ml</b>	12.0 - 65.0 pg/ml
25-Hydroxy Vitamin D	55.6 nmol/L	75 - 250 nmol/L
Serum Magnesium	1.3 mg/dl	1.6 - 2.6 mg/dl
Serum Phosphorus	<b>5.9 mg/dl</b>	2.5 - 5.0 mg/dl
Vitamin B12	>2200 pg/dl	180 - 900 pg/dl
HbA1C	6.9%	<7%
Serum Na	141 mEq/L	135 - 145 mEq/L
Serum K	3.7 mEq/L	3.5 - 4.5 mEq/L
ACTH	25.8 pg/ml	<40 pg/ml
Anti- TPO	0.60 IU/ml	<5.61
Serum Cortisol	5.6 $\mu$ g/dl	3.7-19.4 $\mu$ g/dl

### Diagnosis

Following a comprehensive assessment encompassing the patient's clinical presentation, laboratory results, and diagnostic evaluations, a diagnosis of Hypoparathyroidism was established. The patient's inappropriately low normal PTH level here despite severe hypocalcaemia

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### Treatment and Management

The patient was commenced on intravenous 10% Calcium Gluconate along with Calcium and Vitamin D3 tablets. Tab. LEVODOPA and Tab. CARBIDOPA that had been prescribed for Parkinson's disease were stopped following neurology consult. Despite correcting the serum magnesium levels, there was no corresponding improvement in the serum calcium. Over the course of treatment, the patient's symptoms showed gradual improvement, accompanied by a rise in serum calcium levels to within the low normal range. Close monitoring of serum calcium levels was diligently maintained throughout the treatment period. Subsequently, the patient was discharged with instructions for regular follow-up care.

On subsequent follow ups, patient's serum calcium was maintained at low normal range with calcium carbonate tablets 3 times a day (elemental calcium 1500mg/day). She did not develop muscle rigidity or spasms after stopping anti-parkinsonism drugs. On psychiatry follow up, all her psychiatric medications could gradually be stopped. Patient appears to be doing well in each follow-up.

### Discussion

Hypoparathyroidism is a rare cause of hypocalcemia with diverse manifestations, often presenting challenges in diagnosis and management. This case underscores an atypical presentation of hypoparathyroidism with features mimicking Parkinsonism, highlighting the complexity of differentiating between these conditions.

#### 1. Magnesium Deficiency and Parathyroid Hormone (PTH):

While low magnesium levels typically stimulate the secretion of parathyroid

hormone (PTH), very low levels can induce a paradoxical block. This effect is now understood to be caused by the activation of the alpha subunit of the heterotrimeric G-protein, which mimics the activation of the calcium-sensing receptor, leading to inhibition of PTH secretion. Additionally, PTH plays a role in maintaining magnesium levels by regulating magnesium homeostasis through PTH-regulated pathways<sup>4</sup>. This underscores the need for magnesium correction when evaluating persistent hypocalcemia. However, in this patient, hypocalcemia persisted despite normalized magnesium levels, confirming primary hypoparathyroidism as the underlying cause.

#### 2. PTH and Vitamin D:

Both PTH and vitamin D are critical regulators of mineral homeostasis, particularly calcium and phosphate. Vitamin D has a stimulatory effect on raising calcium and phosphate levels, while PTH exerts a reciprocal effect on phosphate, decreasing its levels. Together, these hormones play essential roles not only in bone metabolism but also in the regulation of the endothelium, heart, and vascular structures. Deficiencies in either PTH or vitamin D have been implicated in a range of systemic diseases, underlining their importance in maintaining overall health<sup>5</sup>. Vitamin D level in our condition was within normal limits which point towards primary hypoparathyroidism.

#### 3. Depression and Hypocalcemia:

According to the DSM-IV-TR criteria, mood disorders can arise as a direct result of underlying medical conditions.

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While the full criteria for a mood disorder diagnosis may not be met in such cases, it is crucial to establish that the psychiatric symptoms are a direct physiological consequence of the medical condition, rather than merely a psychological response. Additionally, studies have shown a close correlation between hypoparathyroidism and psychiatric syndromes, with factors such as the duration of illness, female gender, and serum calcium and calcium-phosphate product influencing the relationship. However, this association does not seem to be linked to organic brain calcifications<sup>6</sup>.

#### 4. The Importance of Calcium Screening in Patients with Neuropsychiatric Symptoms:

Chronic hypocalcemia can present with psychiatric symptoms such as depression, anxiety, and even psychosis. As such, calcium screening is a vital diagnostic tool in patients presenting with neuropsychiatric symptoms. A missed diagnosis of hypocalcemia can lead to worsening symptoms, both directly through physical manifestations like tetany and indirectly through behavioral changes. Timely detection and treatment can prevent the escalation of these symptoms and improve patient outcomes<sup>6</sup>. The marked improvement in this patient's symptoms following calcium and vitamin D supplementation highlights the reversibility of hypocalcemia-induced Parkinsonism-like features and underscores the importance of early intervention.

#### 5. Overlap of Neuromuscular and Psychiatric Symptoms

Parkinsonism-like features, such as rigidity and tremors, are uncommon in hypocalcemia. These symptoms may arise from neuromuscular hyperexcitability or extrapyramidal dysfunction due to chronic calcium deficiency.<sup>7</sup> The overlap of symptoms such as muscle stiffness, depression, and reduced arm swing with Parkinson's disease can lead to misdiagnosis, as evidenced by this patient's initial treatment with Levodopa and Carbidopa. Additionally, the psychiatric manifestations, including depression, align with existing literature associating hypocalcemia with mood disorders, emphasizing the need for a multidisciplinary approach to diagnosis and management.

#### 6. Clinical implications:

Clinicians should maintain a high index of suspicion for hypocalcemia in atypical neuropsychiatric presentations, particularly in patients with a history of thyroid or metabolic disorders. A systematic evaluation, including detailed biochemical analysis, is essential for accurate diagnosis and appropriate treatment.

#### Conclusion

Hypoparathyroidism can, in rare cases, present in a way that may be mistaken for Parkinsonism. Symptoms such as muscle spasms mimicking rigidity, and arm stiffness resulting in a decreased arm swing during walking (due to postural changes), are common to both conditions. Additionally, symptoms like giddiness and depression may occur in both hypoparathyroidism and Parkinson's disease,

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further complicating the clinical picture and potentially leading to misdiagnosis and inappropriate treatment. Therefore, early and accurate diagnosis is crucial. Screening serum calcium levels in patients with neuropsychiatric symptoms can help differentiate between the two conditions, ensuring that the appropriate treatment is initiated without delay.

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