



# A Distinct Scenario of a Patient with Parkinson's Disease and Comorbid Normal Pressure Hydrocephalus

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## Abstract

### Keywords

- ▶ Parkinson's disease
- ▶ normal pressure hydrocephalus
- ▶ neurodegeneration
- ▶ pathophysiology
- ▶ treatment
- ▶ shunt

In literature, patients with coexistence of normal pressure hydrocephalus (NPH) and Parkinson's disease (PD) have been rarely reported. Herein, I illustrate the evaluation processes of a remarkable patient with PD and comorbid NPH from my experience, which I think may provide crucial perspectives regarding the management problems of these patients. Besides, the patient had also developed bipolar disorder in the follow-up course and extrapyramidal side effects related to antipsychotic medications, which further complicated the treatment process. I think that results of future reports of larger case series including the long-term follow-up of this group of patients with coexisting NPH and PD would provide substantial perspectives regarding the contributory effects of these two pathophysiologies, as well as management, of NPH in these specific patients with neurodegenerative pathology.

## Introduction

Normal pressure hydrocephalus (NPH) can be defined as a neurological condition clinically characterized by the triad of gait dysfunction, cognitive abnormalities, and urinary disorders. Remarkably, although NPH is known as a common cause of lower body Parkinsonism, other Parkinsonian symptomatology may frequently exist in NPH.<sup>1</sup> Besides, a neurodegenerative disease may exist simultaneously with NPH, including Alzheimer's disease, dementia with Lewy's bodies, and progressive supranuclear palsy.<sup>2</sup> However, patients with coexistence of NPH and Parkinson's disease (PD) have been rarely reported.<sup>3,4</sup> Herein, I have illustrate the evaluation processes of a rare patient with PD and comorbid NPH from my experience which I think may provide crucial perspectives regarding the management problems of these patients. Remarkably, the patient also developed bipolar disorder in the follow-up course and extrapyramidal side effects related to antipsychotic medications which further complicated the treatment process.

## Case Report

A 63-year-old male patient applied to the neurology polyclinic visit for PD. Upon history taking, it was learned that

PD was diagnosed 6 years ago when he had presented with a 1-year history of a rest tremor of the right hand, right-sided bradykinesia, and gait impairment. Treatments of dopamine agonists and rasagiline were initiated. He had not applied to regular controls and he had been taking only levodopa/benserazide 100/25 mg 2 × 1 and quetiapine 1 × 50 mg for symptoms of insomnia, aggression, and irritability. At admission to our clinic, moderate right-sided slow, rhythmic, rest tremor was recognized. Other Parkinsonian signs including moderate rigidity, bradykinesia, bradyphrenia, and Myerson's sign were present. Furthermore, history questioning revealed that the patient had been suffering from hyposmia, constipation for many years. The patient had significant gait disturbances and balance problems. Particularly, he had difficulty in initiating forward walking and turnings. Wearing off episodes were apparent, and the clinical benefit of levodopa lasted for two and a half hours. The treatment was changed as levodopa/carbidopa/entacapone 4 × 100/25/200 mg and controlled-release levodopa/benserazide 100/25 mg was added for the morning off symptoms. Significant improvements in his motor symptoms and tremor severity were achieved. However, the patient suffered prominently from balance disturbance and gait difficulty



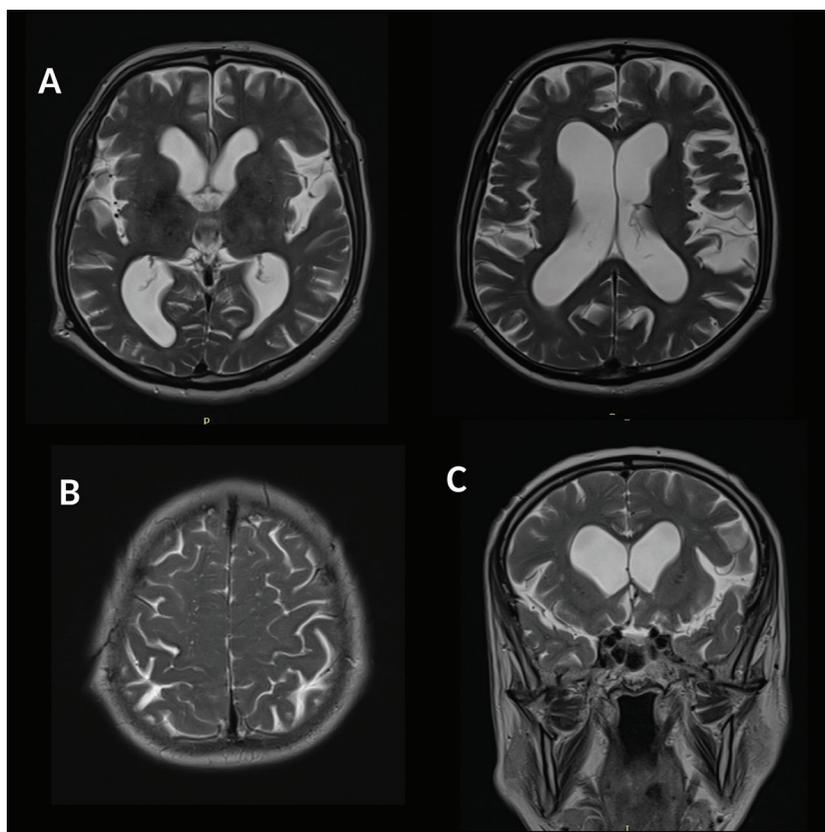
over the last 1-year period which did not benefit from treatment changes for PD. He had also been suffering from mild memory problems and perceptual disturbances over this period. Standardized minimal test (SMMT) score was evaluated as 26 points. Besides, urinary incontinence symptoms were present. Cranial MRI showed ventricular enlargement disproportionate to cerebral atrophy, tight high-convexity and narrow callosal angle which were compatible with NPH (►Fig. 1). Preliminary diagnosis of comorbid NPH was made and, after obtaining informed consent, tap test was performed which provided a considerable, transient recovery in the patient's balance disturbance and gait (particularly more obvious during turnings). Taken together, the patient was diagnosed as PD and comorbid NPH. He was informed about NPH and its contributory role in his clinic. Shunt surgery was suggested; however, he refused surgery at that time and accepted to attend on regular polyclinic follow-up visits.

However, 2 months after discharge, he was reattended to our center due to newly onset psychiatric symptoms of aggression, irritability, grandiosity, and delusional jealousy which had begun over the last 3 weeks interval and progressed. After the psychiatric assessment, a manic episode was diagnosed. History interrogation also revealed suspicion of a previous, short-term mania episode 3 years ago. Therefore, bipolar disorder (type 1) was diagnosed. Following hospitalization, levodopa treatment had to be tapered off and stopped in a few days interval. In addition, high-dosage anti-psychotic medication of quetiapine and aripiprazole were

required to initiate for control of the symptoms. The mood stabilizers of lithium and valproic acid could not be tolerated due to metabolic side effects occurring in the acute period. By consensus between departments, the patient was discharged on quetiapine 300 mg and aripiprazole 20 mg without levodopa therapy. Although, Parkinsonism symptoms of bradykinesia, resting tremor and gait difficulty were obvious at discharge; he was able to mobilize without a support and perform activities of daily living at home. Treatment for PD was planned to be started in the follow-up visits. Nonetheless, 1 month after discharge, the patient's neurological complaints had significantly increased such that he could not mobilize without unilateral support and could not perform most of his activities of daily living (►Video 1). Remarkably, he had admitted to our polyclinic with a demand for surgery of NPH. Nevertheless, neurological examination revealed markedly deterioration of the Parkinsonism signs including bradykinesia, rigidity, and tremor. Furthermore, freezing

#### Video 1

Neurological examination at second hospitalization of the patient, showing severe parkinsonian findings including severe, resting tremor of the right hand, bradykinesia, and facial masking. Freezing of gait can be observed during initiation of gait. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0039-3402622>.



**Fig. 1** Cranial MRI, showing enlarged ventricles and disproportionately enlarged subarachnoid space hydrocephalus (A), tight high convexity (B), and narrow callosal angle (C). MRI, magnetic resonance imaging.

episodes were obvious during the initiation of gait and turnings which significantly disturbed mobilization. On the other hand, he did not experience a deterioration in the mental state (the patients scored 26 points on repeated SMMT that was the same with SMMT performed three months ago), as well as urinary symptoms. Of note, all the laboratory investigations including complete blood count, biochemical tests, TSH (thyroid stimulating hormone), B12, folic acid, sedimentation, C-reactive protein (CRP) were within normal limits. Therefore, the deterioration in his neurological status during the interval period was associated with extrapyramidal side effects of antipsychotic medications and related deterioration in the PD. Hence, the patient was informed in this regard. After psychiatry consultation, low dosage levodopa/benserazide was initiated ( $3 \times 25/6,125$  mg) and antipsychotic medications were planned to be tapered off gradually. Two months later, at the final evaluation on quetiapine 150 mg and levodopa/benserazide  $3 \times 100/25$  mg, no psychiatric symptoms were reoccurred and a marked improvement in his neurological symptoms was achieved (**– Video 2 and 3**).

## Discussion

Herein, we present a rare patient at whom the clinical management was strictly hard which required multimodal evaluation. I think that the clinical follow-up of this patient may give substantial thoughts to be kept in mind in clinical practice. Remarkably, at first hospitalization, shunt surgery was suggested for the management of the forefront symptoms of balance problems and cognitive symptoms that had started over the last 1-year period. However, at second hospitalization, the forefront symptomatology was associated with deterioration of Parkinsonism which was related to antipsychotic side effects, not the worsening of NPH pathophysiology. Therefore, we did not suggest surgery for NPH at that term and preferred to focus on the management of the PD therapy and extrapyramidal side effects of antipsychotics, which we considered to be responsible prominently from the symptomatology. In my opinion, proper discrimination of symptoms and related

pathophysiology in these rare concurrences of PD and NPH is critical for the selection of appropriate treatment modality, as well as improved clinical responses. At this point, the presence of a possible deterioration in the frontal type cognitive symptoms and urinary symptoms may substantially aid in this regard (suggesting deterioration of the NPH pathophysiology). Remarkably, distinguishing the motor symptoms and related pathophysiology may constitute a strictly challenging issue, as both of them present with lower body Parkinsonism. In a crucial study, postural control was found to be worse in all directions in the patients with NPH according to PD.<sup>5</sup> It (postural instability) was also emphasized to be closely related to NPH pathophysiology other than PD.<sup>4,5</sup> At this point, I think that postural instability, which was also not deteriorated at the second hospitalization of our patient, may be a key finding for this handicap. I also think that for a proper evaluation of the contributory effect of NPH in the symptomatology of these patients, having an opinion about the treatment modalities of PD (is it sufficient?, treatment-related side effects?) is critical, which was not included in a crucial previous report by Lee et al.<sup>3</sup> On the other hand, a limitation of this report may be that a dopamine transporter (DAT) scan was not performed to support the diagnosis of PD. However, we think that the clinical presentation (asymmetrical pill-rolling tremor, upper extremity extrapyramidal signs, etc.) and the history of the prodromal symptoms were pretty sufficient for the diagnosis.

Another interesting issue to be discussed may be the term “neurodegenerative NPH,” which was proposed by in a recent crucial review by Espay et al.<sup>2</sup> They emphasized the previous reports revealing the considerably higher rates of Alzheimer's dementia and other neurodegenerative pathologies in patients with NPH according to the normal population. They also reported the devastating results of their long-term institutional experience in which postshunt benefits in patients with initial diagnosis of idiopathic NPH persist in only 32% of patients at 36 months, and with known revised diagnosis in over 25% (Alzheimer's disease, dementia with Lewy bodies, and progressive supranuclear palsy). In conclusion of their report, they postulated that previously reported NPH cases with “dual” pathology likely represent ventriculomegalic presentations of selected neurodegenerative disorders. They also remarked that benefits from shunting may be short lived in these patient group, with a consequently unfavorable risk–benefit ratio. In the previous two case reports of PD with comorbid NPH,<sup>3,4</sup> shunt surgery was also performed which had provided improvements in the patients' neurological status. However, long-term follow-up data of these patients were not included which may be the major limitations of these reports avoiding to suggest ambitious conclusions. I think that results of reports of larger case series including the long-term follow-up of these patients group with coexisting NPH and PD would provide substantial perspectives regarding the contributory effects of these two pathophysiologicals, as well as management, of NPH in these specific patients with neurodegenerative pathology.

### Video 2

(A) Neurological examination, performed 2 months after discharge, showing significant improvement in parkinsonian signs. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0039-3402622>.

### Video 3

Neurological examination, performed 2 months after discharge. Postural control is not significantly disturbed. Online content including video sequences viewable at: <https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0039-3402622>.

## Conclusion

Herein, I have illustrated the evaluation processes of a remarkable patient with PD and comorbid NPH from my experience. Via the presentation of this rare patient, I draw attention to the importance of detailed evaluation of NPH patients with comorbid neurodegenerative diseases. In addition, in the light of the literature data, I also rediscuss some crucial debates regarding the pathophysiology of NPH with neurodegenerative disease; the problem of their definition and treatment approaches. I think that results of future reports of larger case series including the long-term follow-up of this group of patients with coexisting NPH and PD would provide substantial perspectives regarding the contributory effects of these two pathophysiologies as well as management of NPH in these specific patients with neurodegenerative pathology.

### Author's Contributions

H.O. contributed to the concept and design, acquisition of patients and/or data, analysis and interpretation of data, and preparation of the manuscript.

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### Conflict of Interest

None declared.

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