



Hospital-based study on emergency admission of patients with Parkinson's disease



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ABSTRACT

Objective: Parkinson's disease (PD) is a progressive neurodegenerative disease. As the severity of disease worsens, patients have lower tolerance for treatments and occasionally need to be hospitalized. This study focuses on characteristics of patients with PD who were emergently admitted to our hospital and evaluates their prognosis during hospitalization.

Methods: Hospital-based study on emergency admission was conducted in a consecutive series of patients with PD between April 2009 and March 2015.

Results: A total of 164 admissions involving 136 patients with PD with available medical records were identified. Among these, 40 admissions involving 38 patients were emergency admissions. The most common cause of hospitalization was aspiration pneumonia ($n = 17$) followed by parkinsonism hyperpyrexia syndrome ($n = 6$), cerebrovascular disease ($n = 2$), dehydration ($n = 2$), and others ($n = 13$). The mean Hoehn and Yahr stage at admission and discharge were 3.5 and 4.2, respectively, with significant differences between time points ($p < 0.001$). All patients except one presented with either postural instability gait difficulty phenotype (PIGD) or mixed phenotype with PIGD and tremor. All 17 patients with aspiration pneumonia had various combinations of three components: abnormalities seen on videofluoroscopy swallowing study, cognitive impairment, and history of psychiatric symptoms.

Conclusion: Aspiration pneumonia was the most common reason for emergency admission in patients afflicted with PD for more than five years. Abnormalities seen in videofluoroscopy, PIGD and mixed phenotypes, cognitive impairment, and history of psychiatric symptoms could potentially be predictors for aspiration pneumonia in patients with PD.

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1. Introduction

Parkinson's disease (PD) is a common progressive neurodegenerative disorder. During the early stage of the illness, patients tend to tolerate pharmacologic agents well and can undergo rehabilitation, and sometimes, deep brain stimulation. However, as the severity of the disease worsens, the status of patients deteriorates and hospitalization rates increase due to motor and non-motor symptoms as well as systemic disorders. Hospitalization leads to an increase in healthcare costs [1]. The highest healthcare costs associated with PD are suggested

to be drug costs and costs related to hospital admissions [2,3]. Studies describing hospitalization in patients with PD showed that up to 99% of admissions were emergency admissions [4,5]. Common reasons for emergency admissions were infectious diseases, including aspiration pneumonia, urinary tract infection, and others. Other major reasons included falls with or without bone fracture, psychiatric symptoms, medication control, and systemic disorders [4–6]. One study estimated that approximately £200 million per year were spent on emergency admissions for patients with PD in the United Kingdom, and costs for admissions increased with patient age [6]. Few studies, however, have focused on emergency admissions for patients with PD, and no studies have provided a detailed clinical course of patients during their hospitalization.

We conducted hospital-based study in consecutive series of patients with PD who were admitted to our department on an emergency basis over the past six years and discuss the characteristics and prognosis of these patients.

Abbreviations: postural instability gait difficulty, PIGD; levodopa equivalence dose, LED; Hoehn and Yahr, H&Y.

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2. Materials and methods

2.1. Subjects

Fukuoka University Hospital is one of two university hospitals in Fukuoka City, the fifth largest city in Japan. Fukuoka University Hospital has 915 beds, 24 of which are dedicated to patients in the Department of Neurology. All clinical records of patients diagnosed with PD and discharged between 1 April, 2009, and 31 March, 2015 were reviewed. Patients were diagnosed according to the United Kingdom Parkinson's Disease Society Brain Bank Diagnostic criteria, and all of them were clinically evaluated by certified neurologists (SF, JF, YT). We excluded patients who did not satisfy the diagnostic criteria for PD. We extracted the following data: demographics, including sex, age at symptomatic disease onset, age and disease duration at admission, and places where patients lived before and after admission; reasons for admission; and Hoehn and Yahr (H&Y) stage of PD at admission and discharge. If H&Y staging was not clearly mentioned in clinical charts, we assumed the stage based on descriptions in the charts. We evaluated the patients based on clinical symptoms, laboratory data, and radiological evaluation including X-ray examination, computed tomography, and magnetic resonance imaging for diagnosis as major causes of the admission. For diagnosis of aspiration pneumonia, we confirmed any signs of dysphagia utilizing videofluoroscopy and evaluated the location of the infiltrate on chest radiograph and computed tomography. For diagnosis of parkinsonism hyperpyrexia syndrome, also called neuroleptic malignant syndrome, we utilized the diagnostic criteria [7]. We also extracted information regarding parkinsonian phenotypes, including tremor predominant phenotype, postural instability gait difficulty (PIGD) phenotype, or mixed phenotype, as well as information on cognitive function, history of psychiatric symptoms, occurrence of treatment wearing off, and results of videofluoroscopy swallowing study, if available. We calculated a levodopa equivalence dose (LED) at admission and discharge according to methods reported previously [8]. All participants were Japanese.

2.2. Statistical analysis

Statistical analysis was conducted with SPSS 22.0 (SPSS Inc., Chicago, IL, USA). Student's *t*-test was used to compare means of LED and H&Y stage between different period, admission and discharge. *P* values less than 0.05 were considered statistically significant.

2.3. Standard protocol approval

This study was approved by the Institutional Review Board of Fukuoka University Hospital.

3. Results

During the study, there were 164 admissions involving 136 patients with PD. Among these, 40 were emergency admissions involving 38 patients (15 female); these 40 admissions are the focus of our results. The mean age and disease duration at admission were 75 years and 10 years, respectively. Mean H&Y stage at admission and discharge were 3.5 and 4.2, respectively, with significant differences between time points ($p < 0.001$). The mean LED at admission and discharge was 595 mg/day and 609 mg/day, respectively, with no significant differences between time points ($p = 0.171$). Thirty-four patients (89%) had lived at home and 4 patients (11%) at nursing homes or other hospitals before admission. Twelve patients (32%) went back to their home, and 24 patients (63%) went to a nursing home or other hospitals; and 2 patients (5%) died during their stay. Detailed clinical parkinsonian phenotype was available for 33 patients. Among these, 26 patients (79%) presented with PIGD phenotype, six (18%) with mixed phenotype, and one (3%) with tremor predominant phenotype. The most common reason for emergency admission was infectious diseases ($n = 22$)

followed by parkinsonism hyperpyrexia syndrome ($n = 6$), other infectious disorders ($n = 5$), dehydration ($n = 2$), cerebrovascular diseases ($n = 2$), and others ($n = 3$). The most common infectious disease was aspiration pneumonia ($n = 17$), which was followed by urinary tract infection ($n = 2$), cellulitis ($n = 1$), spondylitis ($n = 1$), and decubitus ($n = 1$). Cerebrovascular disorders included transient ischemic attack and subdural hematoma. When we divided patients by disease duration, parkinsonism hyperpyrexia syndrome was the most common reason for admission among those with disease duration less than five years ($n = 2$). All of the six patients who admitted due to parkinsonism hyperpyrexia syndrome were elderly individuals (mean age at examination: 73 ± 4 years) with later onset PD (mean age at onset 66 ± 9 years). Considering presumable causes of parkinsonism hyperpyrexia syndrome in these patients, five had dehydration caused by appetite loss ($n = 4$) and by depression ($n = 1$). In contrast, aspiration pneumonia was the most common reason for patient admission among patients with disease duration of five years or more ($n = 17$).

We next focused on the 17 patients who were urgently admitted to our department due to aspiration pneumonia (Table 1). The mean age and disease duration at admission were 79 years and 12 years, respectively. Mean H&Y stage at admission and discharge were about 3.8 and 4.6, respectively, with significant differences between time points ($p < 0.001$). Mean LED at admission and discharge were 610 mg/day and 641 mg/day, respectively, with no significant differences between time points ($p = 0.518$). All patients presented with either PIGD or mixed phenotype. Nine of 17 patients had some cognitive impairment such as mild cognitive impairment or dementia. Ten of 17 had a history of psychiatric symptoms including medication-induced hallucinations, anxiety, or depression, though none of the patients were treated with neuroleptics at least when they admitted to our department. Additionally, all but four patients (patients 7, 11, 16, and 17) showed some abnormalities on videofluoroscopy examination such as pharyngeal residue and aspiration. We were not able to conduct videofluoroscopy for the patients (patients 7, 11, 16, and 17), as they had either severe dysphagia or severe disturbances of consciousness during their stay.

4. Discussion

In this study, we investigated characteristics of patients urgently admitted to our department and evaluated their clinical course during their stay. In line with a previous report [6], aspiration pneumonia was the most common reason for emergency admission. Falls with or without bone fractures [4] and systemic disorders, including gastrointestinal disorders and heart disease [5], have been reported to be common reasons for emergency admission among patients with PD; however, patients admitted to other departments of our hospital or to other hospitals were excluded from this study, which likely explains why fewer patients suffering from these conditions were identified. In particular, patients with disease duration of five years or more were likely to experience aspiration pneumonia, whereas those with disease duration less than five years were most likely to suffer from parkinsonism hyperpyrexia syndrome. Parkinsonism hyperpyrexia syndrome is a rare complication that occurs during the course of medication treatment for PD. The parkinsonism hyperpyrexia syndrome seen in this study was most likely induced by dehydration following psychiatric symptoms such as depression and anxiety, which often occur in patients with PD [9]. Such conditions could also induce parkinsonism hyperpyrexia syndrome even in the early stage of disease.

We evaluated the clinical course of patients using several items including discharge destination related to admission, H&Y stage at admission and discharge, and LED at admission and discharge. Most patients who had lived at their homes before admission were not able to directly go back there, although we were not able to follow them longitudinally after admission. H&Y stage of patients at discharge was significantly higher than that at admission. These results confirm that any reason for emergency admission has an impact on disability of patients with

Table 1
Demographics, clinical characteristics, and results of videofluoroscopy examination in patients with Parkinson's disease and aspiration pneumonia.

Patients	DD (years)	AAA (years)	H&Y stage		L-dopa equivalent dose (mg/day)		CI	PS	Videofluoroscopy		Residence/outcome	
			Admission	Discharge	Admission	Discharge			PR	Aspiration	Before admission	After discharge
1	4	76	3	4	450	600	–	+	+	+	Home	Hospital
2	5	84	3	5	300	300	+	+	+	–	Home	Hospital
3	7	74	4	4	780	500	+	+	+	+	Home	Hospital
4	8	63	3.5	3.5	798	1203	–	–	+	–	Home	Hospital
5	9	84	4	5	475	585	+	+	+	–	Home	Home
6	9	73	5	5	275	705	–	+	+	+	Home	Hospital
7	9	90	5	5	973	973	+	+	Not examined		Nursing home	Dead
8	10	85	4	5	450	450	+	–	+	+	Home	Hospital
9	11	79	3	3	500	500	–	+	+	+	Home	Home
10	15	76	3	5	750	900	–	–	+	+	Home	Hospital
11	15	88	4	5	600	500	+	+	Not examined		Home	Hospital
12	17	64	4	5	524	600	+	+	+	–	Home	Hospital
13	18	86	4	5	912.5	600	–	–	+	+	Hospital	Hospital
14	21	84	4	4	665	735	+	+	+	–	Hospital	Hospital
15	22	72	3	4	824	824	+	–	+	+	Home	Home
16	Not described		4	5	300	135	–	–	Not examined		Home	Hospital
17	Not described		4	5	610	641	–	–	Not examined		Home	Hospital

AAA: age at admission; CI: cognitive impairment; DD: disease duration; PR: pharyngeal residue; PS: psychiatric symptoms.

PD, which could lead to increases in healthcare costs for these patients. The dose of LED increased during hospitalization, although the change did not reach statistical significance. A recent report suggested that a reduction in LED during hospitalization was significantly associated with increased in-hospital mortality and worse discharge destination [10]. Thus, reduced LED could potentially worsen motor disability at discharge, leading to increasing costs for patients' care.

Among the patients who were urgently admitted due to aspiration pneumonia, most had cognitive impairment and/or a history of psychiatric symptoms. All patients had various combinations of three components including cognitive impairment, history of psychiatric symptoms, and dysphagia. It was reported that there were significant correlations between swallowing problems and cognitive function, anxiety, and depression [11]. Other than the signs that are apparently indicative of dysphagia, axial motor signs, cognitive dysfunction, and psychiatric symptoms could potentially be good predictors for aspiration pneumonia.

This study has a several limitations. One is the retrospective nature of the study. The second is that patients involved in this study included only those admitted to our department. Patients with other common reasons for admission, such as falls, gastrointestinal disorders, and psychiatric symptoms presumably could have been admitted to other departments or other hospitals. Third, all patients were diagnosed clinically; therefore, we potentially included patients with other neurodegenerative disorders such as Lewy body dementia [12]. Fourth, we did not include age- or sex-matched patients with PD or non-PD controls. PD generally affects elderly people, and reasons for hospitalization may potentially be related to age, as opposed to disease. Finally, we did not longitudinally follow patients after discharge, as most of them moved to nursing homes or other hospitals and are lost to follow-up.

5. Conclusions

In summary, aspiration pneumonia was the most common reason for emergency admission in patients with PD, especially for patients with disease duration of more than five years. However, any reason for admission could impact disability and quality of life. Abnormalities seen in videofluoroscopy, as well as PIGD and mixed phenotypes, cognitive impairment, and a history of psychiatric symptoms could potentially predict aspiration pneumonia in patients with PD. We have to keep looking for better ways to maintain good quality of healthcare for these patients to avoid hospitalization. We also should educate patients

so that they themselves can notice physical changes that could potentially lead to serious illness [13]. Prospective studies using a larger number of patients are warranted to confirm the results.

Conflict of interest

The authors declare no potential conflicts of interest with respect to research, authorship, or publication of this article.

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