

INVESTIGATION OF THE CAUSE OF DEATH IN INPATIENTS WITH DEMENTIA IN AKITSU KONOIKE HOSPITAL

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Received September 23, 2020

Abstract

The mortality rate of patients with dementia is known to be higher than that of the general population. Pneumonia is one of the most common causes of death in patients with dementia, and proper intervention is important for clinical outcomes. To date, it remains unclear whether there are differences in the risk factors of pneumonia among different types of dementia. Here, we investigated the primary cause of death in patients with dementia admitted at Akitsu Konoike Hospital. Furthermore, Cox regression analyses were performed to evaluate the risk factors associated with death by pneumonia among patients with Alzheimer's dementia (AD), vascular dementia (VaD), and other conditions. We found that pneumonia was one of the most common causes of death in all of the current samples. Additionally, poor outcomes were associated with the Barthel index in AD and aging or short disease duration in VaD. These results suggest that considering the diagnostic differences in death by pneumonia is important for clinical treatment of patients with dementia.

Key Words : dementia, cause of death, pneumonia, Barthel index

Introduction

The number of people over the age of 65 years, which was 33.5 million (26.3% of the total population) in 2015, is expected to increase to 37.2 million (31.2% of the total population) in 2030¹⁾. Regarding the projected number of dementia patients as the population ages, assuming that the prevalence of dementia at each age is constant, 7.4 million people (20.8% of the population aged 65 years and older) will be diagnosed with dementia by 2030. In addition, if the prevalence of dementia increased due to an increase in the prevalence of diabetes mellitus, 8.3 million people (23.2% of the population aged 65 and older) would also be diagnosed with dementia in 2030²⁾. Patients with dementia tend to have difficulty living in their community due to cognitive and physical dysfunctions and social isolation due to death of a spouse or the development of nuclear families. This points to the risk of an increase in the number of dementia patients requiring hospitalization, including in general psychiatric hospitals. Moreover, progression of cognitive dysfunction or physiological complications prolongs the duration of hospitalization, contributing to an increase in the number of patients with dementia incapable of living in their community.

Accumulating evidence of life expectancy for dementia patients has suggested that the range of life

expectancy ranges from approximately 3 to 12 years^{3,4,5,6}. As regards the direct causes of death in patients with dementia, previous studies revealed that pneumonia could be the direct cause of death among inpatients with dementia^{7,8,9}. Therefore, proper intervention for pneumonia is of critical importance for the treatment of dementia patients in clinical settings. For example, physical complications, age-related deterioration of physical functioning, deterioration of swallowing function due to antipsychotic medication, and physical restraints are risk factors for pneumonia^{10,11,12}. However, it is important to clarify which factors specifically affect pneumonia and life expectancy in patients with dementia for their appropriate treatment interventions and improvement of the prognosis. Furthermore, the risk factors of death by pneumonia will differ among individual clinical diagnoses of dementia due to the diversity of background, clinical symptoms, and the degree of progression of dementia.

Akitsu Konoike Hospital has a total of 544 beds (423 and 121 beds for the psychiatric ward and medical ward, respectively), where many dementia patients with various physical complications are admitted. In some cases, dementia patients admitted to the internal medicine ward are transferred to the psychiatric ward because of behavioral and psychological symptoms that make it difficult for patients to continue their treatment in the internal medicine ward. In this study, we investigated the cause of deaths and disease-specific factors related to death by pneumonia among patients with dementia admitted to the Department of Psychiatry at Akitsu Konoike Hospital. To the best of our knowledge, the present study is the first to investigate the cause of death and the risk factors for patients with dementia depending on the diagnostic differences of dementia.

Subjects and Methods

Based on the currently available medical records, we retrospectively examined 125 patients with dementia who died during their hospitalization in our psychiatric ward between January 2017 and December 2019. The validity of the assessment was confirmed by at least two specialists certified by the Japanese Psychogeriatric Society. Dementias were classified into three types: Alzheimer's dementia (AD), vascular dementia (VaD), and others, which included alcoholic dementia, frontotemporal lobar degeneration, progressive supranuclear palsy, and unspecified dementia.

In this study, the risk factors for death by pneumonia in patients with dementia were assessed as follows: duration of illness after diagnosis of dementia, age at admission, ability to perform activities of daily living at the time of hospitalization, use of physical restraints during hospitalization, and use of antipsychotic medication. The Barthel index was used to assess the ability to perform activities of daily living. The severity of dementia was assessed using the Clinical Dementia Rating Scale (CDR) at the time of admission. Group comparisons of age at admission, age at death, duration of post-diagnostic morbidity, and Barthel index were examined by the Kruskal–Wallis test followed by post hoc Bonferroni correction. Group comparisons of sex, CDR, existence of physical restraint, and antipsychotic medication were performed using Pearson's chi-squared test. To investigate the relationship between death by pneumonia and each risk factor, Cox regression analyses were performed for all patients with dementia and each dementia diagnosis group (AD, VaD, and others), with survival duration after hospitalization as a survival variable and death from pneumonia as a status variable. Statistical analyses were performed using IBM SPSS Statistics version 26 (IBM Inc., Armonk, NY, USA), and the significance level was set at $p < 0.05$ in each analysis. Because this was a retrospective observational study based on medical records, informed consent was obtained from the subjects by means of opt-out consent. Patient information was kept confidential and anonymous, and those

who indicated their nonparticipation in the study were excluded. This study was approved by the Research Protocol Review Committee of Akitsu Konoike Hospital and was in accordance with the Declaration of Helsinki.

Results

Table 1 shows the demographic characteristics of the participants. Of the 125 subjects, 68 (54.4%) were diagnosed with AD, 23 (18.4%) with VaD, and 34 (27.2%) with others. Patients with VaD showed a significantly higher proportion of males ($p < 0.05$) and a significantly longer survival period ($p < 0.05$) than those with AD and others (Table 1 and Figure 1). Additionally, patients with others showed a significantly longer survival period than those with AD. Among the three groups, there were no significant differences in the duration of disease after diagnosis, age at admission, Barthel index, existence of physical restraint, and antipsychotic medication.

Table 2 shows the direct causes of death for all patients with dementia and each diagnostic group. The distribution of the direct cause of death did not differ among the groups ($\chi^2 = 10.8$, $p = 0.21$). Pneumonia was the most common direct cause of death in all diagnostic groups, and there was no significant difference in the number of deaths from pneumonia among the groups ($p = 0.17$). Table 3 shows the risk factors of death

Table 1. Demographic characteristics of the current participants.

	AD (n=68)	VaD (n=23)	Others (n=34)	χ^2	p
Sex, male (%)	43 (63.2)	21 (91.3)	22 (64.7)	6.8	0.036 †
CDR, number (%)				4.2	0.07
1	0 (0)	0 (0)	2 (5.9)		
2	8 (11.8)	6 (26.1)	7 (20.6)		
3	60 (88.2)	17 (73.9)	25 (73.5)		
Age on admission, mean (SD)	84.6 (5.0)	79.3 (10.8)	83.0 (7.0)	4	0.14
Age at death, mean (SD)	85.0 (4.9)	80.4 (10.1)	83.5 (6.8)	3.1	0.36
Post-diagnosis sickness period (year), mean (SD)	4.5 (8.3)	3.2 (3.6)	3.6 (7.8)	3.1	0.078
Survival period after hospitalization (day), mean (SD)	133.5 (116.3)	361.6 (378.8)	175.4 (474.9)	18	0.001 †
Barthel index, mean (SD)	35.1 (33.0)	36.3 (31.7)	26.5 (28.0)	1.9	0.38
Physical restraint, additive (%)	15 (22.1)	4 (17.4)	8 (23.5)	0.32	0.85
Antipsychotic medication, additive (%)	19 (27.9)	6 (26.1)	6 (17.6)	1.3	0.52

CDR; Clinical Dementia Rating Scale

† ; $p < 0.05$

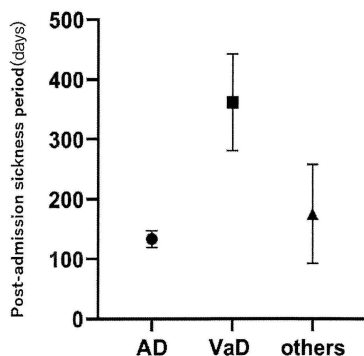


Fig. 1. Survival period after hospitalization (day) Patients with VaD show a significantly longer survival period than those with AD and others

Table 2. Breakdown of the number of people by direct cause of death

	All cases	AD	VaD	Others
Pneumonia	60 (48.0)	31 (45.6)	15 (65.2)	14 (41.2)
Cerebrovascular disease	3 (2.4)	3 (4.4)	0 (0.0)	0 (0.0)
Malignant neoplasm	8 (6.4)	4 (5.9)	2 (8.7)	2 (5.9)
Extrinsic death	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Senility	19 (15.2)	14 (20.6)	1 (4.3)	4 (11.8)
Others	35 (28.0)	16 (23.5)	5 (21.7)	14 (41.2)

Number (%)

by pneumonia among all patients with dementia and each diagnostic group. We found that age at admission was significantly associated with death from pneumonia in all dementia patients (HR=1.06, p=0.008). In patients with AD, the Barthel index at admission was significantly associated with death by pneumonia (HR=0.98, p=0.016). On the other hand, a significant relationship between the age at admission (HR=1.11, p=0.007) and duration of illness (HR= 0.52, p=0.006) and death by pneumonia was shown in patients with VaD. In the others group, there was no significant association between mortality from pneumonia and each risk factor.

Table 3. COX regression analysis of risk factors for death by pneumonia.

	All cases			AD			VaD			Others		
	B	p	HR	B	p	HR	B	p	HR	B	p	HR
Age on admission	0.053	0.008 [†]	1.06	0.004	0.91	1	0.11	0.007 [†]	1.11	0.11	0.097	1.11
Antipsychotic medication	-0.45	0.13	0.64	0.36	0.38	1.43	-0.81	0.37	0.44	1.38	0.077	3.99
Post-diagnosis sickness period	-0.042	0.46	0.96	0.089	0.17	1.09	-0.66	0.006 [†]	0.52	-0.18	0.27	0.84
Physical restraint	-0.089	0.78	0.92	0.12	0.8	1.13	-0.99	0.3	0.37	0.81	0.34	2.24
Barthel Index	-0.009	0.055	0.99	-0.018	0.016 [†]	0.98	0.012	0.35	1.01	-0.007	0.54	0.99

[†] ; p<0.05

AD; alzheimer's dementia, VaD; vascular dementia, HR; hazard ratio.

Discussion

Pneumonia is a critical cause of death in patients with dementia. Consistent with previous studies, we found that pneumonia is the most common cause of death among patients with AD, VaD, and others. The importance of the management of pneumonia in patients with dementia has been reaffirmed by the fact that pneumonia was the fifth leading cause of death in Japan (6.9%) in the Vital Statistics of the Ministry of Health, Labour and Welfare in 2018¹³⁾. In the present study, the survival period after hospitalization for AD was significantly shorter than that for VaD and others. Patients with AD without physical problems were considered to be discharged to their homes and institutions relatively smoothly because treatment and environmental adjustments proceeded. On the other hand, patients with VaD often had worse physical complications that persisted after the acute treatment of behavioral and psychological symptoms and physical complications, consequently prolonging hospitalization. Death in hospital due to complications during prolonged hospitalization without a smooth discharge to home or the facility were thought to be associated with longer post-hospitalization survival.

In the AD group, lower Barthel index at the time of admission was significantly associated with death by pneumonia, and there was a significant trend in the overall dementia population, although the difference failed to reach significance. AD patients with preserved daily living ability are likely to receive instructions from their caregivers and maintain control of their hygiene, such as bathing and brushing their teeth. Progressive cognitive and physical dysfunction can hinder adequate care from caregivers, resulting in increased risk of pneumonia in AD patients. Therefore, precise evaluation of cognitive and physical function on admission and early intervention of rehabilitation and care planning for AD patients can sustain activities of daily living, subsequently improving the prognosis.

Our findings showed that aging and a shorter duration of disease after diagnosis can cause death by pneumonia in patients with VaD who are often associated with physical complications such as hypertension, arrhythmia, dyslipidemia, and diabetes mellitus. Patients with these complications who have a long duration of disease may have an environment that allows them to maintain oral cleanliness or whose physical complications are controlled so that they do not become fatal. This suggests that routine control of physical complications in VaD patients may prevent the development of pneumonia from becoming fatal.

There was no significant difference in the others group. This was most likely due to a mixture of a wide variety of diseases, including dementia with Lewy bodies, alcoholic dementia, frontotemporal lobar degeneration, progressive supranuclear palsy, and unspecified dementia.

Antipsychotics and physical restraints were not significant risk factors for pneumonia in each group. However, the administration of antipsychotics has been reported to increase cardiovascular risk and worsen long-term prognoses¹⁴. We cannot exclude the possibility that antipsychotics may have been a cause of death other than pneumonia. Therefore, it is obvious that, when taking care of people with dementia, the use of antipsychotics should be kept to the minimum necessary and physical restraints should be avoided as much as possible.

The present study has some potential limitations. First, this study had an insufficient sample size (125 patients) for the 3-year observation period, and the possibility of bias in the observation population cannot be denied. It is necessary to conduct a detailed study of each type of dementia by building up a sufficient number of cases. Second, only patients who died during hospitalization were examined in the study, and those who survived and were discharged from the hospital who were not included in the study may have also biased the results of this study. Finally, because we did not consider the types of antipsychotics and the chlorpromazine equivalent, the possibility that the administration of antipsychotics and the duration of physical restraints may have a direct effect on the cause of death from pneumonia cannot be excluded. In general, it is necessary to conduct a prospective study on all hospitalized dementia patients and to validate the results of this study.

In conclusion, our findings suggest that risk factors for death by pneumonia differ among types of dementia. Consideration of disease-specific risk factors and proper intervention may prevent complications of pneumonia, contributing to better prognosis in patients with dementia.

Acknowledgments

We wish to thank the participants for their valuable involvement with the study.

Disclosure Statement

The authors have no conflicts of interest to declare.

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