

Original

Survivability for patients with dementia hospitalized by pneumonia

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Abstract

Background

The effect of Community-acquired pneumonia (CAP) and nursing- and healthcare-associated pneumonia (NHCAP) on the survival-time of patients with dementia have not be fully elucidated.

Method

The retrospective chart review was conducted with neurologically-confirmed 158 patients who hospitalized in a hospital, between 2005 and 2014. The patients were divided into three groups based on the causes of admission: CAP/NHCAP (pneumonia group; n=31), deterioration of dementia (dementia

group; n=71), and other clinical causes (other-cause group; n=56). The survival-time after hospital admission was evaluated and compared among three groups.

Results

The median durations of hospitalization was 14 months in pneumonia- and other-cause groups and 42 months in dementia group. The 90-days mortality in pneumonia group was the highest among three groups. 1-year mortality in pneumonia group was 45.2%. The most deteriorated condition on patients' walking status at the time of admission was in pneumonia group. There were the significant differences on the length of hospitalization among three groups.

Conclusions

Patients with dementia complicated with CAP/NHCAP may still survive over a year after admission if appropriate clinical managements for pneumonia can be provided even in the worse condition at the time of admission.

Key words: pneumonia; dementia; survivability; community-acquired pneumonia; nursing- and healthcare-associated pneumonia; 90-days mortality

Introduction

One hundred years ago, Sir William Osler called pneumonia as a friend of older adults ¹⁾. Therefore, the relationship between pneumonia and older adults has a long history, and, currently, it has been taking the major public health concern in globally. Especially, for older adults who have been facing dementia, pneumonia is a common cause of death ^{2), 3)}. A meta-analysis indicated that the odds of pneumonia-related death were increased more than two-fold in patients with dementia compared with those without dementia ⁴⁾. The symptoms of dementia include behavioral deterioration that may escalate into aggression, which is problematic for patients, patients’ families and caregivers. Pneumonia and worsening dementia are thus both major causes of hospital admissions in patients with dementia in the terminal. Although it has been thought that the survival-time from the admission might differ depending on whether the patient was admitted to hospital because of pneumonia, deteriorating dementia, or other clinical reasons, the survival-times on patients with dementia according to the causes of hospital admission have not been ever reported. We previously investigated the effect of hospital-acquired pneumonia (HAP) on patients with dementia and demonstrated that HAP was associated with shorter survival ⁵⁾. Under the current expansion of living arrangements for older adults, such as nursing home, care house, etc., community-acquired pneumonia (CAP) and

nursing- and healthcare-associated pneumonia (NHCAP) have been demonstrated as the leading cause of hospitalization and mortality ^{6), 7)}. We hypothesized that CAP and NHCAP may also contribute the shorter survival on patients with dementia.

The aim of the present study was to clarify the effect of pneumonia that caused hospital admission on the survival-time of patients with dementia.

Methods

Study design and patients

The retrospective chart review was conducted with 158 autopsy-confirmed patients with dementia at Fukushima Hospital, Toyohashi, Japan. Fukushima hospital is the unique hospital and research center devoted to geriatric medicine and psychogeriatrics. They have long-time experiences for providing clinical services for patients with dementia by the experts of this field of medicine. The study design and patients have been described in our previous study ⁵⁾. Briefly, the patients were all of patients who died, underwent post-mortem autopsy and neurologically confirmed dementia between 2005 and 2014 in Fukushima Hospital. Among 230 patients with autopsy-confirmed dementia, 158 patients who neuropathologically diagnosed Alzheimer’s disease (AD), dementia with Lewy bodies (DLB), and vascular dementia (VaD) were eligible for the present study (Fig. 1).

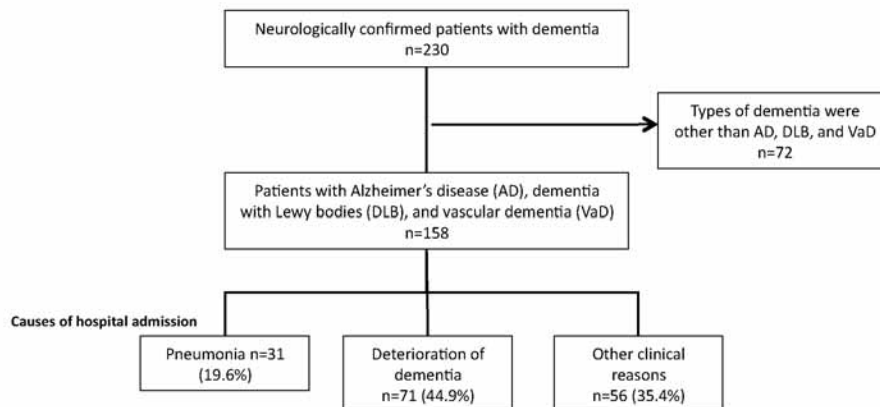


Fig. 1. Patients’ flow chart

Information on causes of hospital admission and walking status at the time of admission were additionally collected for the present study for examining the health condition of patients. The patients were divided into three groups based on the cause of hospital admission: CAP/NHCAP (pneumonia group; n=31), deterioration of dementia (dementia group; n=71), and other clinical causes (other-cause group; n=56) (Fig. 1). The other clinical causes included dehydration, nutrition supports, fractures, malignant neoplasms, and disease and symptoms other than CAP/NHCAP and deterioration of dementia. The number of months to death after hospital admission was analyzed according to the groups. The primary outcome was the survival-time from hospital admission to death. The secondary outcomes were comparisons of survival-times from hospital admission to death among three groups according to cause of hospital admission and according to walking status at the time of admission. In the present study, the hospital admission was defined as the time of hospitalization when patients discharged with death, if patients repeatedly admitted to the hospital. The development of pneumonia during the hospitalization was defined according to the diagnosis criteria of guidelines for the management of hospital-acquired pneumonia in adults by the Japanese Respiratory Society.⁸⁾ Swallowing dysfunction was clinically diagnosed by the clinicians.

Statistical analysis

Data were reported as percentages for categorical variables and as medians with interquartile ranges (IQR; 25% -75%) for continuous variables. The characteristics of subjects among three groups were compared

using the χ^2 test or Fisher's exact for categorical variables and Kruskal-Wallis tests for continuous variables. Survival curves on the number of months to length of hospitalization were analyzed by the Kaplan-Meier method and comparisons among three groups for reasons of hospital admissions and for walking conditions at the time of hospitalizations were made using the log-rank test.

Data analyses were conducted using SPSS Statistics 22.0 (IBM, Armonk, NY, USA). For all analyses, significance levels were two tailed, and a *p* value of < 0.05 was considered significant.

Ethics statement

The study was approved by the Institutional Review Board of the University of Tsukuba and the Choju Medical Institute at Fukushima Hospital. Written informed consent was obtained from the patients' relatives.

Results

General backgrounds and survival-times on patients with dementia according to causes of hospital admission

The general backgrounds and survival-time after hospital admission on patients with dementia were shown in Table 1. Among the total patients, 44.9% of patients was admitted hospital due to the deterioration of dementia. The general characteristics of patients including gender, age at death, types of dementia, and comorbidities were not significantly different among three groups, while the walking status on patients at the time of admission in dementia group was better than those in pneumonia and other-cause groups. A total of 56.6% of patients in dementia group walked into hospital at the time of admission (Table 1).

Table 1. Survival-time and backgrounds of patients with dementia according to causes of hospital admission

	Pneumonia n = 31 (19.6)	Deterioration of dementia n = 71 (44.9)	Other clinical reasons n = 56 (35.4)	P value
Gender, male- n (%)	12 (38.7)	32 (45.1)	16 (28.6)	0.067
Age at death - median (IQR)	87 (81-92)	85 (78-90)	85 (80-91)	0.262
Types of dementia				0.793
Alzheimer's disease	13 (41.9)	28 (39.4)	21 (37.5)	
Dementia with Lewy bodies	9 (29.0)	21 (29.6)	15 (26.8)	
Vascular dementia	9 (29.0)	22 (31.0)	20 (35.7)	
Conditions coming into hospital at the time of admission				< 0.001
by walk	5 (21.7)	39 (56.5)	10 (20.4)	
by wheel chair	10 (43.5)	22 (31.9)	30 (61.2)	
Bedridden	8 (34.8)	8 (11.6)	9 (18.4)	
Comorbidities				
Cerebral infarction	10 (32.3)	20 (28.2)	15 (26.8)	0.532
Hypertension	6 (19.4)	21 (29.6)	18 (32.1)	0.197
Diabetes mellitus	3 (9.7)	12 (16.9)	7 (12.5)	0.281
Heart failure	1 (3.2)	4 (5.6)	4 (7.1)	0.463
Clinical conditions				
Swallowing dysfunction	20 (64.5)	31 (43.7)	21 (37.5)	0.017
Percutaneous endoscopic gastrostomy	11 (35.5)	29 (40.8)	21 (37.5)	0.558
Develop pneumonia during hospitalization	29 (93.5)	62 (87.3)	47 (83.9)	0.152
Survival-times after hospital admission				
Duration of hospitalization-median, months (IQR)	14 (2-24)	42 (13-88)	14 (6-43)	< 0.001
30-days mortality from admission	2 (6.5)	3 (4.2)	6 (10.7)	0.395
90-days mortality from admission	8 (25.8)	6 (8.5)	9 (16.1)	0.023
1 year mortality from admission	14 (45.2)	17 (24.3)	26 (45.6)	0.022

IQR, interquartile range

Survival-times on patients with dementia after hospital admission

The median duration of hospitalization was 14 months in pneumonia- and other-cause groups and 42 months in dementia group (Table 2). Although the frequency of 90-days mortality in pneumonia group was the highest among three groups, 1-year mortality in pneumonia group was 45.2% and similar to those of other-cause group.

Length of hospitalizations were assessed by the Kaplan-Meier method and compared among

three groups on causes of hospital admission (Fig. 2a) and conditions of admission (Fig. 2b). There were the significant differences among three groups on causes of hospital admission ($p < 0.001$) and on conditions of admission ($p = 0.001$) (Fig. 2). The comparisons of only two groups between dementia and other-cause groups were not significant in length of hospitalization ($p=0.469$; Fig. 2a) and in walking status ($p=0.845$; Fig. 2b).

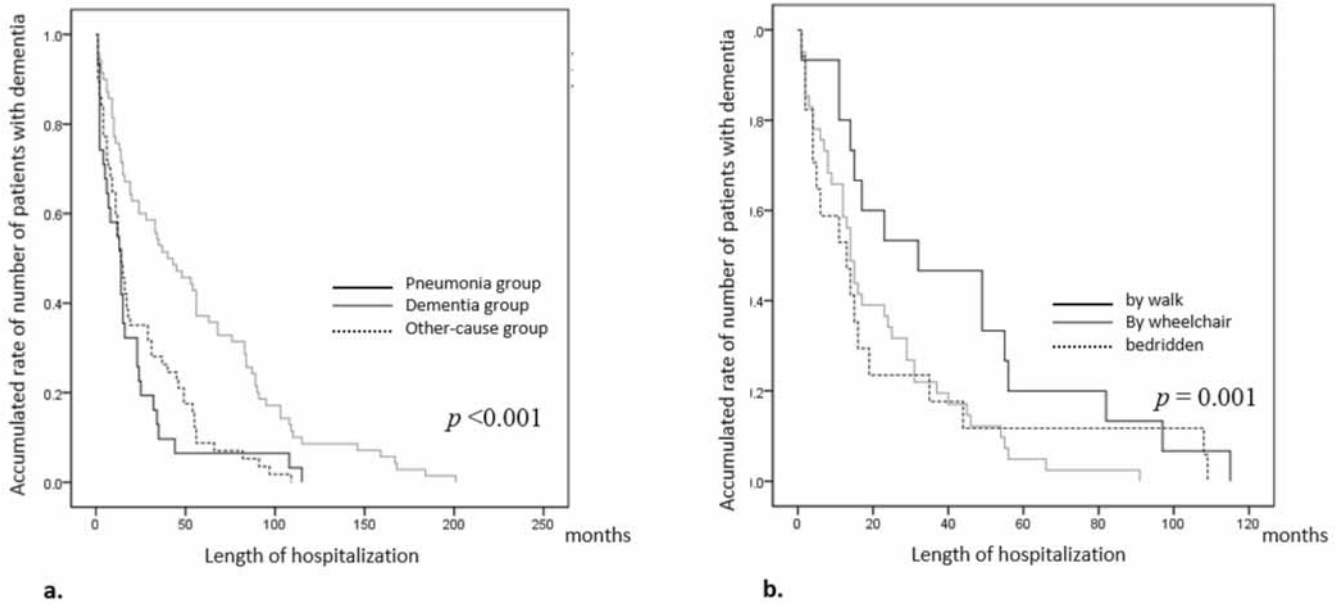


Fig. 2. Kaplan-Meier curves on length of hospitalization among patients with dementia according to the causes of admissions (a) and according to the conditions of admissions (b).

Discussions

The present study revealed that pneumonia-caused hospital admission affect patient survival. However, approximately half of patients with dementia who hospitalized due to CAP/NHCAP have a chance to survive over one year, especially for patients who overcome 90 days from the admission. These may indicate that CAP/NHCAP resulted in the apparently shorter survival of patients with dementia; however, CAP/NHCAP did not always lead directly to death in patients with dementia in the terminal stage.

Older adults are considerably more liable to suffer from pneumonia, and, currently, the third leading cause of death in Japan⁹⁾. Older adults have often suffering polyopathy, cognitive and physical disorders and decreased metabolic functions¹⁰⁾. Pneumonia in older adults is largely explained by the ageing of organ systems, in particular respiratory system, immune system, and digestive tract, and the presence of comorbidities due to age-associated diseases¹¹⁾. The previous studies indicated that the clinical diagnosis of pneumonia in older

adults is difficult and often delayed because of non-typical and paucisymptomatic presentations including frequent absence of fever, the paucity or absence of cough, changes in mental status (delirium), and poorly contributive physical examinations¹¹⁾. Under these conditions, it has been difficult for medical providers and care givers for understanding the severity of silent pneumonia. These conditions also cause difficulty for decision making on the appropriate clinical managements on pneumonia for older patients such as selection of antibiotics and other medications, laboratory examinations, nutrition supports, as well as any clinical cares that patients may feel comfortable for staying their remaining life, especially for patients with dementia in the terminal. Although drug regimens also affect to the survival for older patients¹²⁾, the effect of antibiotic treatment on the survival of older patients with end-of-life pneumonia is unclear^{11,13)}. In the present study, drug regimens, including detailed antibiotic therapy such as kind of antibiotics, dosage and duration, were not examined. However, in Fukushima hospital,

patients with dementia received antibiotics and other necessary medical care if they admitted to the hospital due to pneumonia. Although 25.8% of patients in pneumonia group died within 90 days after admission, the half of the patients in the pneumonia group survived for over a year after admission, despite the effects of other diseases, cognitive disorders and repetitive pneumonia during hospitalizations (Table 1). The results suggested that appropriate clinical management for pneumonia that caused hospital admission may have a chance to prolong the life expectancy of patients with dementia even in their terminal stage. Especially, careful managements on CAP/NHCAP soon after admission is important for patients' longer survival.

Walking status at the time of admission also contributed the survival-time on patients with dementia. More than a half of patients in the dementia group walked into hospital at the time of admission, while the majority of patients in pneumonia and other-clinical groups admitted with a wheelchair. It indicated that patients in the dementia group admitted to the hospital in better physical condition than those in pneumonia and other-clinical groups, then, they stayed in hospital longer. This may be explained by the fact that most patients in the dementia group were admitted to hospital because of behavioral psychological symptoms of dementia, including violence or violent language aimed at their families or caregivers¹⁴⁾. These conditions can be strong reasons for seeking expert medical care. In contrast, approximately 80% of patients both in pneumonia and other-cause groups came into hospital by wheelchair or bedridden (Table 1). It suggested that the home or nursing cares have been taking the crucial roles for older adults with dementia if they do not develop behavioral psychological symptoms.

The main limitation of the present study was that it was a retrospective observational study. We selected all of patients who were neurologically confirmed AD, DLB, and VaD

during the observational period in the study site; therefore, the sample size for comparing three groups according to causes of hospital admission were not adjusted. In addition, we were unable to examine the drug regimens and other therapies for treating pneumonia on patients with dementia as well as the other necessary underlying conditions and symptoms on patients. The present study was conducted in a single center specialized on geriatric medicine including dementia with the small number of patients. The further studies are required in older adults in several medical settings before the results can be generalized.

In conclusion, pneumonia-related hospital admissions affected patient survival, especially for 90 days mortality. However, patients with dementia complicated with CAP/NHCAP may still survive for over a year after admission if appropriate clinical managements for pneumonia can be provided by experts even in the worse condition at the time of admission and in the terminal stage of dementia.

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Disclosure statement

The authors declare no conflict of interests.

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