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Original article

Clinical characteristics of pneumonia in bedridden patients receiving home care: A 3-year prospective observational study

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ABSTRACT

Background: The aim of the study was to describe the epidemiology, clinical features, antimicrobial treatment, and outcomes of bedridden pneumonia patients receiving home healthcare.
Methods: A 3-year prospective observational study of poor performance status (PS) 3–4 patients receiving long-term home healthcare and hospitalized at a single center with pneumonia between October 2010 and September 2013 was conducted, and their clinical characteristics were compared with non-bedridden community-acquired pneumonia (CAP) patients.
Results: A total of 131 CAP patients with PS 3-4, and 400 CAP patients with PS 0-2 were evaluated. The PS 3–4 patients were older, and exhibited a higher frequency of underlying diseases. Aspiration was thought to be associated with pneumonia in 77.1% of the PS 3–4 patients. *Streptococcus pneumoniae* was the leading pathogen in both groups, whereas the frequency of streptococci and polymicrobial infections was higher in the PS 3-4 group. The incidence of multidrug-resistant pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA) or *Pseudomonas aeruginosa* was lower than in previous healthcare-associated pneumonia reports. The in-hospital mortality and recurrence rates were significantly higher in the PS 3-4 group than in the good PS group (17.6% vs. 6.0%, $p < 0.001$ and 15.3% vs. 7.5%, $p = 0.008$, respectively).
Conclusions: The clinical characteristics of pneumonia in poor PS patients were similar to healthcare-associated pneumonia (HCAP), except for the frequency of drug-resistant pathogens. Hence, it might be beneficial to categorize pneumonia in home residents with poor PS separately from pneumonia in CAP patients who were previously healthy or experienced mild comorbidities.

1. Introduction

The elderly population in developed countries is rapidly increasing. Consequently, pneumonia among the elderly has increased, and has become a primary cause of death in the aging population. In 2005, the joint guidelines proposed by the American Thoracic Society (ATS) and the Infectious Diseases Society of America, defined healthcare-associated pneumonia (HCAP), as pneumonia occurring in residents of nursing homes or extended-care facilities based on increases in pneumonia among the elderly [1].

However, because the number of nursing homes per capita in Japan is smaller than in Western countries, family members often care for the elderly who are candidates for nursing home placement. Consequently, the Japanese Respiratory Society proposed the term “nursing and healthcare-associated pneumonia (NHCAP)” in 2011, which was a modification of HCAP [2]. The NHCAP criteria included elderly or handicapped patients needing long-term care, including patients residing within their own home.

The aim of this study was to clarify the epidemiology, clinical features, antimicrobial treatment, and outcomes of pneumonia among home residents with poor performance status (PS).

abbreviations: ATS, the American Thoracic Society; CAP, community-acquired pneumonia; HCAP, healthcare-associated pneumonia; MRSA, methicillin-resistant *Staphylococcus aureus*; MDR, multiple drug resistance; NHCAP, nursing and healthcare-associated pneumonia; PS, performance status.

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2. Materials and methods

2.1. Study population

This study was conducted as part of prospective observational study of pneumonia beginning in October, 2010. The study was approved by the Kurashiki Central Hospital ethics committee (approval number 641) and registered with the University Hospital Medical Information Network in Japan (number UMIN000004353). The requirement for consent was waived because of the observational nature of the study.

Adult patients with pneumonia were enrolled at Kurashiki Central Hospital between October 2010 and September 2013. Pneumonia was diagnosed by new infiltrative shadows on chest X-rays, and symptoms of acute respiratory infection, including cough, fever, purulent sputum, dyspnea, and chest pain. Patients with hospital-acquired pneumonia and residents of nursing homes or extended-care facilities were excluded.

Study participants were classified as having community-acquired pneumonia (CAP) with poor PS (3–4), or CAP with good PS (0–2). The PS 3–4 patients were defined by the Eastern Cooperative Oncology Group performance status criteria [3], and included individuals capable of limited self-care, confined to a bed or chair more than 50% of waking hours, or who were completely disabled and confined to a bed or chair. Those who satisfied the criteria of HCAP were excluded from the CAP patients.

2.2. Data collection

Baseline demographic and clinical data were obtained from all patients at admission. Data included patient characteristics (age, sex, comorbid diseases, previously used antimicrobials, tube feeding, and presence of aspiration), vital signs, pneumonia severity, laboratory data, percutaneous oxygen saturation or arterial blood gases, chest roentgenograms, microbiological examinations, antimicrobials used, and clinical outcomes.

Outcome measures were 30-day survival or hospital discharge within 30 days. Initial treatment failure was defined as death during initial treatment, or a change in antimicrobial treatment due to poor response to initial therapy. Recurrence was defined as emergence of pneumonia after remission of a prior case within 90 days. The length of hospital stay and intravenous therapy, and number of hospital days until the body temperature decreased to 37.8 °C (100 °F) and remained ≤ 37.8 °C for 16 h were recorded. The pneumonia severity index system [4] and criteria outlined in the ATS CAP guidelines were used to evaluate pneumonia severity [5].

2.3. Microbiological examination

Blood cultures were performed on all patients at admission. If sputum was available, Gram staining and a quantitative culture were performed. Sputum data were evaluated when Gram staining revealed numerous leukocytes (>25 in a 100X microscopic field) but few epithelial cells. An organism exhibiting heavy growth ($\geq 10^7$ colony forming units (CFU)/mL) on a sputum culture was considered a presumptive pathogen. Moderate growth (10^5 or 10^6 CFU/mL) on the sputum culture was also considered presumptive if the Gram staining was compatible with the culture results. *Streptococcus pneumoniae* and *Legionella pneumophila* serogroup 1 were detected using the Binax NOW® rapid immunochromatographic assay (Binax Inc., Portland, ME, U.S.A.). *Mycoplasma pneumoniae* was detected by culturing sputum samples or pharyngeal swabs in pleuropneumonia-like organism medium, and/or by the protective antigen method. *Chlamydophila pneumoniae* was detected by enzyme-linked immunosorbent assay. Standard serological methods using single or paired sera were applied to determine whether there was elevation of antibodies against *M. pneumoniae* (a single increase ≥ 320 or a four–fold increase in the paired sera) and *Chlamydophila pneumoniae* (a single increase up to ≥ 3.0 as the cut-off index or a ≥1.3 cut-off index increase in the paired sera). When multiple pathogens satisfied the above criteria in one patient, the pneumonia was defined as polymicrobial. In the present study, methicillin-resistant *Staphylococcus aureus* (MRSA), *Pseudomonas aeruginosa*, and extended-spectrum beta-lactamase producing Enterobacteriaceae were considered multiple drug resistance (MDR) pathogens.

2.4. Aspiration assessment

All patients were screened for swallowing function at admission. Trained nurses monitored past history of aspiration pneumonia, choking sensation with a wet cough during meals, and the presence of massive fur on the tongue. If at least one condition was noted, the patient was deemed at risk for aspiration, and a speech-language-hearing therapist was consulted. Swallowing function was then assessed by the therapist using the water-swallowing test, repetitive saliva swallowing test, video endoscopic examination, and videofluorography, according to the Japan Study Group on Aspiration Pulmonary Disease guidelines [6].

2.5. Statistical analysis

The data were analyzed using the SPSS® software program version 18.0 (SPSS Inc., Chicago, IL, U.S.A.). The chi-square test was used to compare categorical data, and Fisher's exact test was used when there were less than 10 data points for any parameter. The Mann–Whitney *U* test was used for continuous data to compare two groups. A p value <0.05 was considered statistically significant.

3. Results

3.1. Patient characteristics

One hundred thirty-one patients with CAP with PS3-4 and 400 CAP patients with PS 0-2 were enrolled. The baseline patient characteristics are shown in Table 1. The PS 3-4 patients were older, and had a higher frequency of cerebrovascular disease, but a lower frequency of diabetes mellitus. Sixteen PS 3-4 patients (12.2%) underwent tube feeding, and PS 3-4 patients had a significantly higher tendency to experience aspiration.

Thirty-four PS 3-4 patients (26.0%) were discharged from hospitals within 90 days, and three (2.3%) underwent chronic dialysis within 30 days. Twenty-seven (20.6%) of the PS 3-4 patients and 105 (26.3%) of the PS 0-2 patients underwent antimicrobial treatment before admission.

Baseline clinical findings are shown in Table 2. The rates of orientation disturbance, low blood pressure, and multiple involved lobes were significantly higher in the PS 3-4 group. According to ATS criteria, a high mean pneumonia severity index score and an increased rate of severe pneumonia were evident in the PS 3-4 group.

3.2. Pathogen distribution

An etiological diagnosis was made in 52 PS 3-4 patients (39.7%) and 198 PS 0-2 patients (49.8%). The organisms isolated are shown in Table 3. *Streptococcus pneumoniae* was the most common pathogen in both groups. The frequency of detecting common oral cavity streptococci other than pneumococcus was higher in patients in the PS 3-4 group. In addition, *S. aureus*, including MRSA,