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Comparison of clinical characteristics between healthcare-associated pneumonia and community-acquired pneumonia in patients admitted to secondary hospitals

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ABSTRACT

Background: Since healthcare-associated pneumonia (HCAP) is heterogeneous, clinical characteristics and outcomes are different from region to region. There can also be differences between HCAP patients hospitalized in secondary or tertiary hospitals. This study aimed to evaluate the clinical characteristics of HCAP patients admitted into secondary community hospitals.

Methods: This was a retrospective study conducted in patients with HCAP or community-acquired pneumonia (CAP) hospitalized in two secondary hospitals between March 2009 and January 2011.

Results: Of a total of 303 patients, 96 (31.7%) had HCAP. 42 patients (43.7%) resided in a nursing home or long-term care facility, 36 (37.5%) were hospitalized in an acute care hospital for ≥ 2 days within 90 days, ten received outpatient intravenous therapy, and eight attended a hospital clinic or dialysis center. HCAP patients were older. The rates of patients with CURB-65 scores of 3 or more (22.9% vs. 9.1%; $p = 0.001$) and PSI class IV or more (82.2% vs. 34.7%; $p < 0.001$) were higher in the HCAP group. Drug-resistant pathogens were more frequently detected in the HCAP group (23.9% vs. 0.4%; $p < 0.001$). However, *Streptococcus pneumoniae* was the most common pathogen in both groups. The rates of antibiotic change, use of inappropriate antibiotics, and failure of initial antibiotic therapy in the HCAP group were significantly higher. Although the overall survival rate of the HCAP group was significantly lower (82.3% vs. 96.8%; $p < 0.001$), multivariate analyses failed to show that HCAP itself was a prognostic factor for mortality ($p = 0.826$). Only PSI class IV or more was associated with increased mortality ($p = 0.005$).

Conclusions: HCAP should be distinguished from CAP because of the different clinical features. However, the current definition of HCAP does not appear to be a prognostic for death. In addition, the use of broad-spectrum antibiotics for HCAP should be reassessed because *S. pneumoniae* was most frequently identified even in HCAP patients.

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Introduction

Pneumonia was traditionally classified as either community-acquired pneumonia (CAP) or hospital-acquired pneumonia (HAP), but in 2005 the American Thoracic Society (ATS) and the Infectious Diseases Society of America (IDSA) introduced the concept of healthcare-associated pneumonia (HCAP).[1]

ATS/IDSA guidelines state that patients with HCAP should receive broad-spectrum empirical antimicrobial therapy directed at multidrug-resistant (MDR) pathogens associated with healthcare settings.[1] This treatment strategy from the ATS/IDSA guidelines is based on the epidemiology and clinical outcomes of HCAP.[2,3] That is, MDR bacteria such as methicillin-resistant *Staphylococcus aureus* (MRSA) or *Pseudomonas aeruginosa* are isolated more frequently in patients with HCAP and the mortality rates associated with HCAP are significantly higher than for CAP in some reports.[2,4,5] Therefore, treatment strategies based on this distinction between HCAP and CAP are thought to be very important as guides to the treatment of patients with pneumonia.

However, this concept has been controversial. The British Thoracic Society (BTS) guidelines state that there is no difference in the distribution of causative pathogens between patients with HCAP and elderly patients with CAP, although its definitions of HCAP are somewhat different.[6] A recent prospective UK cohort study demonstrated that the increased mortality in HCAP according to the 2005 ATS/IDSA definitions was primarily related to underlying patient-related factors rather than the presence of antibiotic-resistant pathogens.[7] This study did not establish a clear indication to change current prescribing practices in a UK cohort. A study from Europe has shown that the microbiological and mortality data of patients with nursing home-acquired pneumonia (the largest subgroup of HCAP) are more similar to the data of those with CAP.[8] The reason for these varying results among studies may be that HCAP itself is heterogeneous and the regions or countries where studies were performed had different compositions of HCAP subgroups and different healthcare systems.

In Korea, there are limited data and no guidelines focusing on HCAP.[9,10] Given that all of the studies were conducted in tertiary referral hospitals with over 1,000 beds and included relatively small numbers of patients residing in nursing homes or long-term care facilities (less than 10%), the results are likely to be biased towards more severe pneumonia or specific subgroups. Therefore, it is necessary to collect and evaluate data regarding patients with HCAP admitted to secondary community hospitals. This study aimed to clarify the differences in the clinical characteristics of patients with HCAP and CAP hospitalized in secondary hospitals. Also, the clinical utility of HCAP as a prognostic factor was investigated.

Material and methods

Study design

This study was performed at the Kyung Hee University Hospital at Gangdong (a 600-bed hospital in Seoul, South Korea) and at the Jeju National University Hospital (a 540-bed hospital in Jeju, South Korea). These hospitals are classified as secondary community hospitals according to the Korean healthcare system.

Patients diagnosed with CAP (CAP group) or HCAP (HCAP group) who were hospitalized in these hospitals between March, 2009 and January, 2011 were evaluated. Clinical characteristics, comorbidities, severity, identified pathogens, antibiotic therapy and clinical outcomes were compared between the two groups. The severity of pneumonia in each group was determined using the CURB-65 (confusion, urea nitrogen, respiratory rate, blood pressure, age $\geq$ 65 years) score and the PSI (Pnemonia Severity Index). The study protocol was approved by the Ethical Review Committee of the two institutions. Informed consent was waived because of the retrospective nature of the study.

Categorization of pneumonia

Pneumonia was defined as the presence of a new infiltrate on the chest radiography plus at least one of the following: fever (temperature $\geq 38.0^{\circ}$ C) or hypothermia (temperature $< 35.0^{\circ}$ C); new-onset cough with or without sputum production; pleuritic chest pain; dyspnea; or altered breath sounds on auscultation.[11] Multi-lobar involvement was defined as the presence of pneumonic infiltrates in two or more lobes on chest radiograph or computed tomography.

According to the 2005 ATS/IDSA guidelines,[1] the risk factors for HCAP include hospitalization for two days or more in the preceding 90 days, residence in a nursing home or extended care facility, home wound care, chronic dialysis within 30 days, and family member with MDR pathogens. In accordance with the guidelines, the HCAP group of this study included patients with any of the following: 1) residence in a nursing home or long-term care facility; 2) recent history of hospitalization in an acute care hospital for $\geq$ 2 days in the past 90 days; 3) recent outpatient intravenous therapy (such as antibiotic therapy or chemotherapy) or wound care within the past 30 days; 4) attendance at a hospital clinic or dialysis center in the last 30 days.[1] CAP was defined as a diagnosis of pneumonia in patients who did not meet any of the criteria for HCAP.

Microbiology

Microorganisms in samples obtained from sputum, tracheal aspirate, bronchial alveolar lavage fluid, or blood were investigated. Sputum was defined as adequate when > 25 neutrophils and < 10 squamous epithelial cells seen under low-power field. For *Mycoplasma pneumoniae* or *Chlamydia pneumoniae*, serum samples were evaluated. Serum samples in which particle agglutination antibody titers were > 320, or that were proven to have a four-fold or greater increase of antibody titers in paired sera, were regarded as positive. BinaxNOW® (Binax Inc. – Maine, USA) was routinely used to detect urinary antigens for *Streptococcus pneumoniae*. Seeplex® RV7 detection (Seegene, Inc. – Seoul, Korea) for respiratory viruses including influenza A/B virus, parainfluenzavirus, adenovirus, rhinovirus, metapneumovirus, respiratory syncytial virus and BinaxNOW® Legionella Urinary Antigen Test (Binax, Inc. – Maine, USA) for *Legionella pneumophila* serogroup 1 were performed according to the clinical judgment of the attending physicians. The antibiotic sensitivity of all isolates was