Comparison of Characteristics of Stroke-Associated Pneumonia in Stroke Care Units in Indonesia and Japan

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Background: Pneumonia is one of the most common medical complications after stroke. Incidence and risk factor analyses of stroke-associated pneumonia (SAP) in stroke care units (SCUs) are limited. SAP incidence comparisons across countries can identify the most effective treatment to reduce this incidence. *Methods:* This was a retrospective study including consecutive patients with acute stroke in SCUs in 2 hospitals: 105 patients (mean age 78.2 ± 5.8) from the National Cerebral and Cardiovascular Center (NCVC) in Osaka, Japan (from July to August 2015), and 105 patients (mean age 60 ± 5.8) from the National Brain Centre (NBC) Hospital in Jakarta, Indonesia (from May to September 2015). We used descriptive statistics and a logistic regression model for statistical analysis. *Results:* The incidence of SAP in the SCU NBC Hospital was higher than that in the SCU NCVC (22.9% versus 12.4%, $P = .0466$). In the SCU NBC Hospital, dysphagia (odds ratio [OR] 15.20, 95% confidence interval [CI] 1.77-130.73) and severe neurological deficits on admission (OR 5.31, 95% CI 1.60-17.60) were significantly associated with SAP, whereas in the SCU NCVC, dysphagia (OR 14.42, 95% CI 2.34-88.98) and diabetes mellitus (OR 7.16, 95% CI 1.27-40.18) were the risk factors. When the patients of both hospitals were analyzed together, severe neurological deficits on admission (OR 3.36, 95% CI 1.31-8.64) and dysphagia (OR 12.62, 95% CI 3.75-42.45) were significant determinants for developing SAP. *Conclusions:* The incidence of SAP was higher in the Indonesian hospital than in the Japanese one. Our findings support other epidemiological data of a high incidence of SAP with severe neurological deficits on admission and dysphagia in an SCU setting. **Key Words:** Stroke-associated pneumonia—Indonesia—Japan—dysphagia.

Introduction

Pneumonia is the most common medical complication after stroke, with an estimated incidence of 5%-26%.[1] Compared with patients without pneumonia, those with stroke-associated pneumonia (SAP) have a higher mortality rate and a poorer long-term outcome.[2-5] Poststroke pneumonia also increases the financial burden on the medical system.[6]

Based on recent studies on stroke treatments, an increasing number of patients are now treated in specialized wards (e.g., stroke care units [SCUs] or neurological intensive care units [NICUs]). Despite their undoubted benefits for stroke patients, these treatment settings imply

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certain infectious risks that are closely associated with intensive care medicine in general. The highest incidence and mortality rate of pneumonia are observed in intensive care units, where 10%-25% of patients are so diagnosed.[7] A review of published data indicated that the incidences of SAP in NICUs and SCUs were 4.1%-56.6% and 3.9%-44%, respectively.[8]

Varying terminologies (e.g., chest infection, aspiration pneumonia, SAP, poststroke pneumonia) and diagnostic approaches are used for the spectrum of lower respiratory tract infections complicating stroke. The term "stroke-associated pneumonia" was used for the first time by Hilker et al.[7] Diagnosis of SAP remains particularly challenging for several reasons. The clinical presentation of pneumonia may be a nonspecific, impaired cough, and sputum microbiological samples have limited availability and practical value. Altered consciousness and even isolated altered mental status might be caused by stroke as well as by pneumonia. An acute-phase response with fever, leukocytosis, and elevated C-reactive protein concentration frequently occurs without infection. Fever may also be masked by antiplatelet and nonsteroidal anti-inflammatory drugs. Chest radiography may have limited utility in the early stages because the infiltrates may not yet be present.[9]

Previous studies identified several risk factors that predispose an individual to chest infection early in the course of stroke, such as older age, higher National Institutes of Health Stroke Scale (NIHSS) score, diabetes mellitus, male gender, hypertension, atrial fibrillation, congestive heart failure, chronic obstructive pulmonary disease, preexisting dependency, stroke severity, stroke subtype, and dysphagia.[10,11] However, only limited data are currently available on comparative incidences of SAP in different countries. A cross-country comparison of SAP incidences in Indonesia and Japan will enrich clinical research. The primary purposes of the present study were to determine whether the incidence of SAP is different between Indonesia and Japan, and to determine the risk factors and comorbid conditions associated with the development of SAP in both countries.

Methods

Design and Setting

We performed a retrospective, observational study using clinical data from the National Brain Centre (NBC) Hospital, Jakarta, and the National Cerebral and Cardiovascular Center (NCVC), Suita, Osaka, Japan. In the NCVC, we used data from all stroke patients that had been admitted to the SCU from July 2015 to August 2015 (n = 105). We then took the data for the same number of consecutive patients in the SCU NBC Hospital from May to September 2015 (n = 105). The data contain basic information, including gender, age, stroke subtype, comorbid conditions (hypertension and diabetes mellitus), severity of stroke (NIHSS scores on admission), dysphagia screening, radiology data, and laboratory results.

In the NCVC in Japan, SCU often refers to a ward in which advanced intensive care is provided for acute stroke patients in an unstable condition (stroke-specialized intensive care unit), excluding subarachnoid hemorrhage.[12] In the NBC Hospital (Indonesia), SCU refers to a ward for hyperacute stroke patients, including subarachnoid hemorrhage.

To be enrolled in the present study, patients must have undergone brain computed tomography or magnetic resonance imaging. Further inclusion criteria were (1) age 18 years old or above, (2) hospitalization in acute onset of ischemic stroke or intracerebral hemorrhage (ICH), and (3) admission to an SCU.

Diagnosis of SAP was made 48 hours after admission and in accordance with the Centers for Disease Control and Prevention criteria,[13] which required the presence of a new and persistent infiltrate or consolidation on at least 1 chest X-ray, or at least 2 serial X-rays in cases of underlying lung diseases, combined with one of the following clinical signs: fever, leukopenia or leukocytosis, and altered mental status in individuals who are older than 70 years (in the absence of other causes). These symptoms should be added to two of the following signs: new onset of purulent sputum or change in the characteristics of the sputum, new onset of or worsening cough, rale, and worsening of gas exchange. Stroke severity (NIHSS score) was categorized as either severe (≥21) or not severe (<21). Dysphagia was screened for using the Massey Bedside Swallowing Screen in the NBC Hospital and a dysphagia chart modified by the NCVC dysphagia team in the NCVC. Comparisons of dysphagia management in the 2 SCUs are shown in Table 1.

The study protocol was approved by the Research Ethics Board from the NCVC, Suita, Osaka. Informed patient consent was not obtained because the study was retrospective.

Analysis

We used the Stata statistical package (v. 13) (Stata Corp., College Station, TX, USA) to analyze the data. Continuous variables were described with mean and standard deviations and were analyzed with the Mann–Whitney test. The incidences of SAP according to patient age were compared in the 2 groups divided by the median age of all patients (66 years). We estimated the independent contribution of each factor to the development of SAP by logistic regression analysis. All *P* values were double sided, and the level of statistical significance was set at 5% of the confidence level.

Results

The descriptive statistics of data in the 2 hospitals, including age, gender, stroke subtype, medical history, and