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ORIGINAL ARTICLE

Influenza B Virus-associated Pneumonia in Pediatric Patients: Clinical Features, Laboratory Data, and Chest X-ray Findings

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Key Words
child;
influenza B virus;
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Background: The clinical significance of influenza B is frequently overlooked, and reports on influenza B pneumonia in children are limited. Therefore, the clinical features of associated complications have rarely been reported. The aim of this study is to evaluate the clinical characteristics in pediatric patients with influenza B virus-associated pneumonia.

Methods: From January 2009 to February 2012, 389 consecutive patients under 18 years old with influenza B virus infection were enrolled into the study. Thirty-four patients were defined as the pneumonia group by clinical symptoms and chest X-ray (CXR) findings, and 90 patients who had laboratory data and normal CXR findings were recruited to form the nonpneumonia group.

Results: The age of the patients in the pneumonia group was significantly younger (median of 5.3 vs. 6.6 years). The white blood cell count (median of 7.5 vs. 5.7 $\times$ 10^9 cells/L) and C-reactive protein level (median of 21.1 vs. 5.7 mg/L) were higher, but the hemoglobin level was lower (median of 12.6 vs. 13.2 g/dL) in the pneumonia group. The CXR findings revealed that 29.4% of patients had alveolar consolidation, 32.4% had interstitial infiltration, and 38.2% had

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ground glass opacity. Two of four patients with pleural effusion had a positive bacteria culture, and both of them died.
Conclusion: Pneumonia should be considered in pediatric patients with influenza B virus infection presenting with younger age, higher white blood cell count, lower hemoglobin, and higher C-reactive protein level. The CXR findings were varied. Patients with pleural effusion and positive bacterial culture may have more severity of clinical outcome.

1. Introduction

Influenza virus infection is a common pediatric illness, which causes endemic infection with an attack rate of 20—30% in different geographic areas annually.[1—4] The most common symptoms of influenza virus infection are often self-limited, consisting of fever, dry cough, rhinorrhea, headache, and muscle soreness. However, some influenza virus infection results in severe complications, such as pneumonia, myocarditis, and encephalitis.[4—6] These complications of influenza virus infection usually attack patients who are extremely young or old, immunocompromised, or with underlying diseases, such as asthma or neurologic comorbidity.[6—8] Among these complications, pneumonia is the most common and is well known in patients with influenza A virus infection.[6,9,10] However, the clinical characteristics of influenza B virus-associated pneumonia, especially in the pediatric population, have rarely been reported.[11] Therefore, in this study, we evaluated the demographic characteristics, clinical presentation, laboratory data, chest X-ray (CXR) findings, and outcomes in pediatric patients with influenza B virus-associated pneumonia.

2. Materials and Methods

After obtaining approval for the study from the Institutional Review Board, patients under 18 years old diagnosed with influenza B virus infection between January 2009 and February 2012 in Taichung Veterans General Hospital, a tertiary medical center in Taiwan, were consecutively enrolled. Influenza B virus infection was confirmed using the rapid antigen test for detection of influenza virus performed by nasopharyngeal swab, and/or viral throat swab culture, and/or blood sample polymerase chain reaction. Those who had CXR were eligible to be entered into the analysis, and were further divided into two groups, pneumonia and nonpneumonia groups. The enrollment process is shown in Figure 1. The pneumonia group was defined as patients with fever, clinical symptoms of respiratory tract infection, and obvious infiltrations on CXR examination.[2] The nonpneumonia group comprised patients with the abovementioned symptoms and signs, but normal CXR finding. Patients who had no blood test were excluded.

The medical charts of both investigated groups were reviewed. The demographics, including age, gender, body weight, clinical symptoms, and the durations of fever and oseltamivir use were analyzed. The initial laboratory data, including white blood cell count (WBC) with differential count, platelet count, hemoglobin (Hgb) level, C-reactive protein (CRP) level, and bacterial culture reports were collected. The films of CXR at the time of diagnosis in the pneumonia group were reevaluated by a pediatric radiologist. The findings were described based on the following four features: characteristics of abnormal opacities, distribution of abnormal opacities, unilateral or bilateral of abnormal opacities, and other extrapulmonary changes.[2] The characteristics of abnormal opacities were classified into three types: alveolar consolidation, interstitial infiltration, and ground glass opacity (Figure 2). The distribution of abnormal opacities was divided into diffuse and localized types, the latter of which was further classified into central, peripheral, upper, and lower. The interpretation of the characteristics and distribution of abnormal opacities in each individual depended on the major finding. The clinical courses including total number of days with fever and survival outcome were assessed. Clinical managements, including antimicrobial use, invasive mechanical ventilation support, and extracorporeal membrane oxygenation application, were all investigated.

All continuous data were compared by Mann—Whitney *U*-test, and the categorical data were compared by the Chi-square test within the two groups. A p value less than 0.05 was considered statistically significant.

3. Results

Among the 389 patients with influenza B virus infection, 185 patients had received CXR examination. Thirty-four patients were assigned to the pneumonia group, and 90 were assigned to the nonpneumonia group. Pneumonia was found in 18.4% (34/185) of influenza B patients who had undergone CXR imaging. The demographic characteristics and clinical features of both groups are summarized in Table 1. The median age of the pneumonia group was significantly younger than that of the nonpneumonia group: 5.3 versus 6.6 years, respectively ($p = 0.029$). The extreme percentiles of body weight distribution, that is, <3rd percentile or >97th percentile, were not different between the two groups ($p = 0.795$). At the time of visit, the durations of fever were not significantly different between the two groups. Neither oseltamivir use (5 of 28 and 9 of 80 patients, $p = 0.513$) nor doses (8.0 and 8.0 doses, $p = 0.451$) before the visit was significantly different between the pneumonia and nonpneumonia groups. The incidences of symptoms in the pneumonia and nonpneumonia groups were as follows: fever, 100% and 94.4%; cough, 97% and 94.4%; and rhinorrhea/nasal congestion, 70.6% and 81.1%,