Antimicrobial therapy in community-acquired pneumonia among emergency patients in a university hospital in Japan

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Abstract As antimicrobial therapy for pneumonia has not been well established in Japan, this study was designed to obtain a more definitive standard for antimicrobial treatment of this condition. Two hundred and thirty-one emergency patients admitted to Kyorin University Hospital between January 1998 and December 2000 were retrospectively analyzed in respect to their age, underlying disease, causative organism, and primary treatment with antimicrobial agent. Furthermore, the severity and prognosis were analyzed for those patients who had not responded to initial treatment with antimicrobial agents. The majority of the patients were elderly (over 65 years old; mean overall age 66.7 ± 15.2 years) and had severe pneumonia; underlying diseases were recognized at a high rate in patients with severe pneumonia ($P < 0.05$) and in those classified as elderly ($P < 0.0001$). The most common underlying conditions in elderly patients were respiratory, cardiovascular ($P < 0.01$), and cerebrovascular ($P < 0.05$) diseases. The most common causative organisms were Haemophilus influenzae, Staphylococcus aureus, Streptococcus pneumoniae, and Mycoplasma pneumoniae. In patients with severe pneumonia, S. aureus, Klebsiella pneumoniae, and Pseudomonas aeruginosa were identified as the most common causative organisms. Complications associated with antimicrobial treatment were observed in those patients with K. pneumoniae isolates who also had severe pneumonia and were frequently treated with penicillin. Furthermore, increased mortality rates were observed in patients not responding well to the initial treatment with antimicrobial agents. Thus, the selection of appropriate initial antimicrobial agents is an important factor affecting the prognosis of patients with community-acquired pneumonia.

Patients and methods

Patients

Two hundred and thirty-one emergency patients 15 years of age and over with pneumonia, admitted to Kyorin University Hospital between January 1998 and December 2000, were the subjects of this study. The diagnosis of pneumonia was determined by the following five criteria: (1) Gram’s stain test of sputum on admission, (2) quantitative culture of sputum, (3) body temperature ≥37°C, (4) a new infiltration shadow on the chest X-ray, and (5) CRP ≥1.0mg/dl. Physi...
Determination of causative organisms

The presence of bacteria was considered to be the definitive causative factor when neutrophils were observed by Gram’s stain test and the concentration of bacteria (determined in the culture on admission day) reached $10^5$ cfu/ml in sputum cultures.

Blood culture was excluded from the determination of causative organisms because it was performed for only a few patients.

*Mycoplasma pneumoniae* and *Chlamydia pneumoniae* were determined to be causative organisms (1) when serum antibody to *Mycoplasma pneumoniae* increased $>$280-fold as determined by complement-fixation reaction in a single serum sample, and more than four times in paired sera; and (2) for *Chlamydia pneumoniae*, when increases in IgG $>$ 1.35-fold (cut-off index) and IgA $>$ 1.00-fold (cut-off index) in paired sera were observed by microimmunofluorescence (Hitazaym; Hitachi Medical corp.; Tokyo, Japan).

Classification of the severity

Severity was classified according to the guidelines$^1$ of the Japanese Respiratory Society as follows:

1. Mild pneumonia
   A. Three or more of the following clinical findings
      1. Extent of consolidation in the lung $\leq 1/3$
      2. Temperature $\leq 37.5°C$
      3. Pulse rate $< 100$/min
      4. Respiratory rate $< 20$/min
      5. Dehydration (−)
   B. Two or more of the following laboratory findings
      1. WBC $< 10,000$/µl
      2. CRP $< 10$ mg/dl
      3. PaO₂ $> 70$ Torr

2. Severe pneumonia
   A. Three or more of the following clinical findings
      1. Extent of consolidation in the lung $\geq 1/3$
      2. Temperature $\geq 38.6°C$
      3. Pulse rate $\geq 130$/min
   B. Two or more of the following laboratory findings
      1. WBC $\geq 20,000$/µl
      2. CRP $\geq 20$ mg/dl
      3. PaO₂ $\leq 60$ Torr or spO₂ $\leq 90$

3. Moderate pneumonia
   Cases intermediate between mild and severe pneumonia
   Cases with cyanosis, disturbance of consciousness, or shock were included in the severe pneumonia cohort. We disregarded the condition in the guidelines that determined severity to be one stage worse in patients over 65 years old.

Statistical analysis

All values obtained are expressed as means ± SD, and comparisons between two groups were made using the $\chi^2$ test; a $P$ value $< 0.05$ was taken to indicate statistical significance.

Results

The demographic background and severity of patients analyzed are presented in Table 1. The severity of the symptoms correlated with the age of the patients. Comparison between patients over and under 65 years old showed a predominance of severe cases in the former group ($P < 0.05$). Forty-six of 60 patients (76.7%) with severe pneumonia were over 65 years old, and 14 of 60 patients (23.3%) were less than 65 years old ($P < 0.05$).

Underlying diseases

Cardiovascular disease and chronic respiratory disease were the most common underlying diseases, followed by diabetes mellitus, cerebrovascular disease, and malignant disease. There was no significant difference in manifestation of severity of pneumonia in patients with cardiovascular disease or respiratory disease. Mild pneumonia was not seen among patients suffering from malignant disease. The mild-grade pneumonia was observed mostly in those (33.3% of patients) without any underlying diseases, whereas severe pneumonia was seen in only a few patients (6.6%) without any underlying diseases. The difference