

A RETROSPECTIVE STUDY OF COMMUNITY-ACQUIRED PNEUMONIA IN HONG KONG WITH SPECIAL REFERENCE TO THE CHOICE OF ANTIBIOTICS

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ABSTRACT

The records of patients admitted to the Prince of Wales Hospital with a presumptive diagnosis of pneumonia over a one-year period were reviewed retrospectively. Forty-four patients fulfilled our diagnostic criteria for community-acquired pneumonia and were included in the survey. The initial choice of antibiotics was reasonably uniform: a penicillin in 75%; erythromycin in 9% and other antibiotics in 16%.

Lack of clinical improvement resulted in a change of antibiotics in 15 patients (34%). Overall 23 patients (52%) responded to a penicillin, 12 patients (27%) responded to erythromycin, and 8 patients (18%) responded to other antibiotics. This suggests that the majority of the causative organisms were sensitive to penicillin, but a significant number of patients required drugs which were effective against 'atypical' and gram negative organisms. One elderly patient, who also suffered from severe chronic airflow obstruction, died after a grand mal seizure which might have been partly related to theophylline toxicity (Mortality 2%). The investigations performed confirmed or strongly suggested the identity of the causative organism in only 9 patients (21%), and had little or no influence in therapeutic decisions. Although empirical antibiotic treatment was reasonably successful, frequent changes were required, and the lack of firm data on the aetiology indicates that a detailed prospective study is needed.

Keywords: C.A.P. Choice of antibiotics, Hong Kong.

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INTRODUCTION

Community-acquired pneumonia (C.A.P.) is a serious, potentially fatal disease and a common cause of hospital admission. A number of prospective studies in Europe and U.S.A. (1-6) helped to define the pattern of C.A.P. and provided information on which rational antibiotic therapy could be based. There has been no such study in Hong Kong, and since it is likely that there will be important geographical differences in C.A.P., the conclusions of those studies cannot be applicable locally. Thus, it is inevitable that treatment with antibiotics is empirical, at least in the initial stages. Because inadequate or inappropriate treatment may have serious consequences, the choice of antibiotics is vital. However, little is known about this important aspect. We therefore carried out a retrospective study on patients admitted to the Prince of Wales Hospital with C.A.P. over a one year period in order to determine the pattern of antibiotic use, the outcome of this treatment, the results of microbiological investigations, and what influence this had on patient management.

METHODS

A retrospective study was conducted on all patients admitted to the Prince of Wales Hospital with community-acquired pneumonia from January to December 1986. The case records were traced from computerized admis-

sion data. For the diagnosis of C.A.P., an acute lower respiratory tract infection, together with evidence of fresh pulmonary shadowing were required. These criteria conform to those of recent prospective studies of C.A.P. (3, 4). Patients who developed pneumonia after admission, patients with pulmonary tuberculosis, bronchiectasis, or pneumonia distal to bronchial obstruction (e.g. lung cancer) were excluded. Patients with co-existing chronic debilitating disease who were bed bound, and in whom there might have been a hypostatic element to the pneumonia, were also excluded. However, patients with chronic airflow obstruction were included.

RESULTS

Patient

Forty four patients were eligible for this study on the above criteria, 28 men (64%) and 16 women (36%). Ages ranged from 16-85 years (mean 51 years). There was one death (2%). Twenty eight admissions (64%) occurred between January and June, and 16 (36%) between July and December.

Investigations (Table I)

Investigations routinely performed were gram staining of sputum together with sputum culture and blood culture. Sputum culture results were available in 38 patients (86%), and results of blood culture available in 27 patients (61%).

Microbiological investigations for the causative organism were considered diagnostic in 3 patients (7%), highly suggestive in 6 patients (14%), and unhelpful in 35 patients (79%).

Investigations which were diagnostic were two positive blood cultures, both growing *Streptococcus Pneumoniae*, and one significant rise in Influenza A titres (from < 1/10 to 1/160). Investigations which were highly suggestive were the growth of *Haemophilus Influenzae* in the sputum of 3 patients, none of whom suffered from chronic

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lung disease, and elevated titres of cold agglutinins in the sera of 3 patients. Of the latter patients, 2 had a titre of > 1/128 and 1 had a titre of > 1/4096.

Results of gram staining of sputum were mainly unhelpful and did not correlate well with subsequent sputum culture results. Gram staining was negative in the sputum of those patients in whom Haemophilus Influenzae was subsequently grown. Gram positive cocci were seen in the sputum of 4 patients, and in only two of these was there subsequent growth on culture — Streptococcus Pneumoniae in one (also isolated in the blood of this patient), and Staphylococcus Aureus in the other. Gram positive cocci were seen in the sputum of a further 2 patients, but in neither of them was there confirmation of an organism on subsequent culture. Antibiotic therapy prior to hospital admission may be partly responsible for this (see below).

Table 1.

INVESTIGATIONS FOR AETIOLOGY OF PNEUMONIA

Diagnostic	3 (7%)
Streptococcus Pneumoniae grown in blood : 2 (Streptococcus pneumonia also isolated in sputum in one of these patients)	
Influenza A titres significantly raised : 1 (1/160)	
High suggestive	6 (14%)
Haemophilus Influenzae grown in sputum : 3	
Elevated levels of cold agglutinins : 3 (2 patients > 1/128; 1 patient > 1/4096)	
No help	35 (79%)

Antibiotics

Thirty three patients (75%) received either ampicillin, amoxicillin or penicillin as their first-line antibiotic. Four patients (9%) received erythromycin as initial treatment and 7 patients (16%) received other antibiotics as initial treatment. Of those who received erythromycin initially, 2 patients had received an antibiotic of the penicillin group before hospital admission. In the other 2 patients the reasons for using erythromycin were not stated. The reasons for using different antibiotics other than penicillin or erythromycin are outlined in Table 2.

The patients' response to antibiotics is shown in Table 3. Twenty-three patients (52%) responded to a penicillin and required no change of antibiotic. Four patients treated initially with erythromycin also responded completely. Eight patients (18%) failed to improve on the initial antibiotics prescribed, but responded to a change to erythromycin or doxycycline, and a further eight patients (18%) responded to alternative antibiotics. The details concerning these antibiotic changes are shown in Table 4.

Table 2.

DETAILS OF OTHER ANTIBIOTICS GIVEN AS FIRST-LINE TREATMENT

Antibiotic	Reason
1. Ampicillin + Cloxacillin + Gentamicin	Suspected septicaemia
2. Ampicillin + Gentamicin	Suspected septicaemia
3. Ampicillin + Cloxacillin	Unclear
4. Ampicillin + Erythromycin	Suspected atypical pneumonia
5. Ampicillin + Gentamicin	Unclear
6. Penicillin + Gentamicin	Unclear
7. Cefuroxime	Unclear

DISCUSSION

The numbers included in this retrospective study are small. Initially, 90 patients were identified from computer records as having a diagnosis of pneumonia. Subsequently, half of these were excluded as they did not completely fulfil our criteria for C.A.P. The Prince of Wales Hospital had only been fully operational a short time before the period of study, and this may also have contributed to the relatively small numbers. However, despite these reservations we think that these patients are reasonably representative of those with C.A.P. in Hong Kong.

Although some microbiological investigations were incomplete, (particularly viral serology), the diagnostic yield of these tests was disappointingly low, and the causative organism was seldom identified. It is likely that some patients received antibiotics before hospital admission, but a record of this was found in only 2 patients. This is a relatively common problem in Hong Kong, where patients tend to consult more than one doctor, and documentation tends to be inadequate outside hospitals (7). The widespread use of unlabelled drug containers adds to the difficulty. Nevertheless, the results of our study confirm the general impression that routine microbiological investigations are seldom helpful in guiding the treatment of C.A.P. None of the positive tests influenced management critically: either the patient responded to the initial antibiotic, or an effective change in antibiotics had been instituted before the results were available. This raises the question whether such investigations (with the possible exception of blood culture) should be performed at all in routine clinical practice.

Treatment was based on the "best guess" diagnosis, and initial therapeutic decisions were made largely in the clinical setting. The antibiotics used in this study are in broad agreement with recent recommendations (8). Twenty three patients (52%) received a penicillin as initial treatment, and responded satisfactorily without requiring a change in therapy. Four patients (9%) received erythromycin alone as a first-line antibiotic and needed no further change in treatment, and 2 of these 4 patients had elevated levels of cold agglutinins suggestive of a Mycoplasma pneumoniae infection. Seven patients (numbers 1, 4, 5, 6, 8, 10, 15, Table 4), and possibly 9 (numbers 2 and 12), eventually responded to erythromycin or doxycycline (number 10) after receiving other antibiotics during the course of their illness. From the way these patients responded to either a penicillin, erythromycin or doxycycline, it is probable that Streptococcus pneumoniae and "atypical" organisms were responsible for most of the cases of C.A.P. seen in our patients. Only 7 patients received different initial antibiotics. In 2 of them septicaemia was suspected and therefore the use of a combination of antibiotics was justifiable. The indication for using a combination of antibiotics in the other 4 patients, as well as the use of cefuroxime in one patient could not be determined from the case notes. Thus, the use of first-line antibiotics was reasonably uniform, but changes in antibiotic therapy were frequent. Some of these changes occurred very soon after initial treatment (sometimes within 24 hours of the start of treatment) before a clinical response could be expected. Therefore, it is possible that a proportion of these patients might have responded to a more prolonged course of their initial antibiotic, thereby

Table 3.
RESPONSE TO TREATMENT

A Penicillin only	23 (52%)
Erythromycin only	4 (9%)
Erythromycin or tetracycline after initial treatment failure	8 (18%)
Other antibiotics	8 (18%)
Fatal outcome	1 (2%)

Table 4.
ANTIBIOTIC CHANGES

Patient	Initial Antibiotics	Duration	First change	Duration	Reason	Second change	Duration	Reason	Microbiological Diagnosis	Outcome
1.	Ampicillin	3 days	Erythromycin	10 days	Fever not settling	—	—	—	No	Satisfactory
2.	Ampicillin	2 days	Erythromycin and Gentamicin	5 days	Unwell fever	Cefuroxime	10 days	Same	No	Satisfactory
3.	Ampicillin	1 day	Cefperazone	1 day	Unclear	Cefuroxime	6 days	Unclear	No	Satisfactory
4.	Ampicillin	10 days	Ampicillin + Gentamicin	1 day	Fever not settling	Erythromycin	9 days	Fever not settling	No	Satisfactory
5.	Ampicillin	1 day	Erythromycin	13 days	Fever not responding	—	—	—	No	Satisfactory
6.	Ampicillin	2 days	Ampicillin + Gentamicin	10 days	Fever	Erythromycin	8 days	Low grade fever	No	Satisfactory
7.	Ampicillin	2 days	Ampicillin + Gentamicin	14 days	No improvement	Cefperazone	3 days	Unclear	No	Satisfactory
8.	Ampicillin	2 days	Erythromycin	13 days	Possible atypical pneumonia	—	—	—	No	Satisfactory
9.	Amoxycillin	5 days	Cefuroxime	4 days	Not responding	—	—	—	No	Satisfactory
10.	Penicillin	1 day	Doxycycline	14 days	Fever	—	—	—	No	Satisfactory
11.	Ampicillin	1 day	Cefuroxime	3 days	Deteriorating dyspnoea	Metronidazole + Gentamicin	1 day	Grand mal Seizure Possibly related to theophylline toxicity	No	Died
12.	Ampicillin + Erythromycin	4 days	Cefperazone added	3 days	Fever not responding	Gentamicin + Metronidazole	7 days	Fever not responding	No	Satisfactory (Discharged with 14 days erythromycin)
13.	Ampicillin Cloxacillin Gentamicin	1 day	Cefuroxime	1 day	Septicaemia	Ceftazidime	6 days	Septicaemia	No	Satisfactory
14.	Ampicillin	1 day	Penicillin	8 days	Fever persists	—	—	—	No	Satisfactory
15.	Amoxycillin	4 days	Erythromycin	11 days	Fever persists	—	—	—	Cold Agglutinins 1.128	Satisfactory

obviating the need for any further change.

One patient (male, aged 71) died. He had a long history of chronic airflow obstruction and was admitted with a right lower lobe pneumonia complicated by Type I respiratory failure. Subsequently he had a grand mal convulsion, which might have been partly related to theophylline toxicity, and died.

Several prospective studies in the U.K. and U.S.A. have shown that *Streptococcus pneumoniae* is the organism most often responsible for C.A.P. (1-3). The diagnostic yield of routine investigations such as cultures of sputum and blood are often low in identifying the pneumococcus, whereas that of counter-current immunoelectrophoresis (C.I.E.) of sputum and urine is much higher (5). An earlier study which found a higher incidence of *Mycoplasma pneumoniae* infection (2) did not employ this investigation, and may therefore have given a misleading impression. More recent studies have shown that "atypical" organisms such as *Mycoplasma pneumoniae* and *Legionella pneumoniae* form the second largest group of agents causing C.A.P., and these are followed by a number of different viruses, the most common of which

include the influenza group (3-5). These studies also highlighted considerable geographical variation in the incidence of these different kinds of organism responsible for C.A.P. Our findings that most patients responded to a penicillin with a substantial proportion to erythromycin or tetracycline indicate that the general pattern of causative organisms is similar.

Nevertheless, since a precise aetiological diagnosis of C.A.P. was lacking in most of our patients, a detailed prospective study using a specialized technique such as C.I.E. is needed in Hong Kong. In its absence, the present strategy of prescribing a penicillin first, followed by appropriate changes, usually erythromycin, if there has been no clinical response seems reasonable. If there is evidence of severe infection (eg septicaemic shock) then broad spectrum cover is indicated.

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