MORAXELLA CATARRHALIS RESPIRATORY INFECTION IN ADULTS

N K Chin, G Kumarasinghe, T K Lim

ABSTRACT

Moraxella catarrhalis (MC) is an upper respiratory tract commensal which may also be pathogenic. In this report we examined the clinical features, microbiology and therapeutic response in 30 consecutive adult patients with pneumonia who had MC isolated in the sputum. The mean age was 66 years with an equal sex ratio. Most patients gave a history of cigarette smoking (77%) and had underlying pulmonary diseases (73%). Dyspnea and productive cough were the most common complaints (87%). Fever was a manifestation in 60% of patients. Chest X-ray features of pneumonia were noted in 78% of patients while leucocytosis (>11,000/mm³) was evident in 70%. While all isolates were susceptible to tetracycline, 70% were resistant to penicillin/ampicillin by in-vitro testing. Three patients died, two from their underlying illnesses and one from myocardial infarct. We believe that MC isolated in sputum cultures from symptomatic adults with underlying respiratory diseases should be treated as a pathogen. The short term prognosis is good.

Keywords : Moraxella catarrhalis, respiratory infection.

SINGAPORE MED J 1993; Vol 34: 409-411

INTRODUCTION

Moraxella catarrhalis (MC), a gram-negative diplococci, was first described in 1896. It was initially known as *Micrococcus* or *Neisseria catarrhalis* and was considered to be a harmless upper respiratory tract commensal[1], but subsequently gained recognition as an important pathogen. It was renamed *Branhamella catarrhalis* in the 1970s, and in 1990, *Moraxella catarrhalis*[2].

It is the third most common pathogen following *Hemophilus influenzae* and *Streptococcus pneumoniae* in causing adult lower respiratory tract infection[3], childhood sinusitis and otitis media[4,5]. Its capacity to produce beta-lactamase, first noted in 1977, may cause penicillin resistance in mixed infection by protecting other pathogens usually susceptible to beta-lactam antibiotics. Being a non-fastidious organism, it can survive in dried sputum for up to 27 days, therefore making nosocomial spread possible. The short-term mortality in some patient population may be as high as 45%[6,7].

In this report, we examined the clinical features, microbiology and therapeutic response in 30 patients with acute lower respiratory tract infections who had MC isolated in their sputa.

MATERIALS AND METHOD

Consecutive patients with sputum cultures that grew MC between March 1989 to April 1991 were traced from the microbiology laboratory, National University Hospital. Only sputum specimens with > 25 white blood cells and < 25 epithelial cells per low power field on microscopic examination were studied[8]. All sputum samples were then inoculated onto both blood and chocolate agar plates and incubated overnight at 37°C under aerobic conditions with added 5% CO_2. Pure or predominant growth of MC was considered to be significant. The features used for its identification in our laboratory are listed in Table I[9]. Antibiotic susceptibility testing was performed by the Kirby-Bauer disc diffusion technique[10].

Case-notes were then traced from the Medical Record Office, and patients with definite pneumonia were identified. The definition of pneumonia was taken to be the presence of any two of the following features: chest X-ray (CXR) infiltrates, leucocytosis (> 11,000/mm³), cough productive of purulent sputum or fever. The following patient data were collected: name, sex, age, smoking history, underlying lung condition(s), underlying systemic disease(s), presenting complaints, relevant clinical findings, CXR appearance, total white cell and differential count, sputum and blood culture results and antibiotic sensitivity, treatment given and response, and the eventual outcome.

Pneumonia was considered to be community-acquired if there were no hospital admissions in the previous 3 weeks and nosocomial if it developed after 3 or more days of hospital stay. Patients less than 12 years of age were excluded from the study.

RESULTS

During the two-year period, there were 30 adult patients with significant growth of MC from their sputa and clinical evi-

Table I - Laboratory characteristics used in the identification of *M. catarrhalis*

Colonial morphology	:	non-pigmented, opaque, smooth, does not adhere to agar
Growth on Nutrient agar	:	positive
Gram-stain	:	Gram negative diplococci
Oxidase	:	positive
Deoxyribonuclease (DNAase)	:	positive
Nitrate reduction test	:	positive
Sugar fermentation test with glucose, maltose, lactose and sucrose	:	negative

Department of Medicine
National University Hospital
Lower Kent Ridge Road
Singapore 0511

N K Chin, MBBS, M Med (Int Med)
Registrar

T K Lim, MBBS, M Med (Int Med), FAMS
Assoc. Professor

Department of Microbiology
National University Hospital

G Kumarasinghe, MBBS (Ceylon), MRC Path (UK)
Consultant Microbiologist

Correspondence to : Dr T K Lim
Pulmonary and Critical Care Medicine
University of Michigan Medical Center
3916 Traubman, Ann Arbor
Michigan
United States of America

Fig 1 - Age distribution of the 30 patients with *M. catarrhalis* pneumonia.

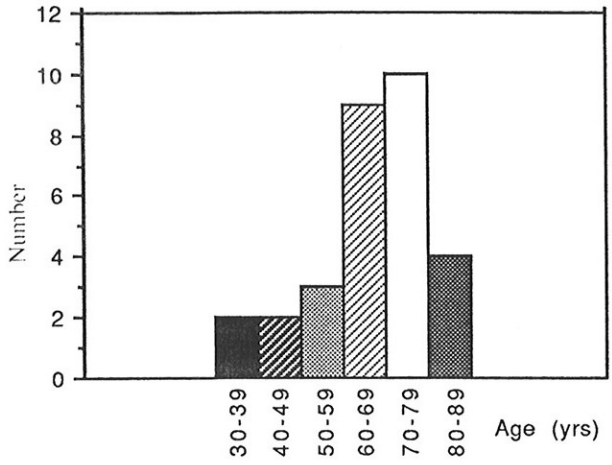
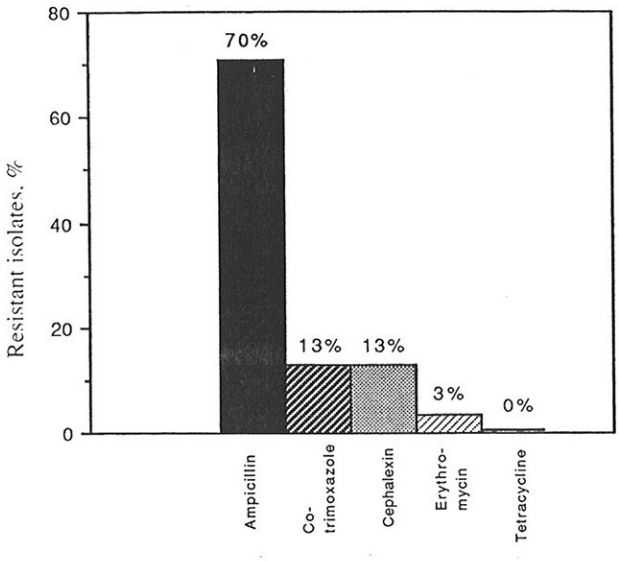


Fig 2 - In-vitro antibiotic susceptibility testing of *M. catarrhalis* isolated from 30 sputum samples.



dence of pneumonia. The sex distribution was equal. Most of them were elderly (77% were > 60 years old), with a mean age of 66 years (range 33-84 years) (Fig 1). There were 87% Chinese and 13% Malays. Most of them (77%) were current or ex-smokers.

Most of the patients (73%) had some form of underlying pulmonary diseases, consisting of chronic obstructive pulmonary disease (COPD), bronchial asthma, bronchiectasis, bronchogenic carcinoma (CA), previous pulmonary tuberculosis (PTB) and pulmonary fibrosis, in various combinations. Some of them had co-existing systemic illness as well. Of the remaining eight patients without underlying lung problems, six had either hypertension, diabetes mellitus, ischaemic heart disease, chronic renal failure, rheumatic heart disease or CA esophagus; four of them also smoked cigarettes.

The incidence of community-acquired pneumonia was 83%. The most common presenting complaint was cough productive of sputum (87%), followed by progressively increased shortness of breath. Eighteen patients were febrile on admission.

Of the 26 patients who had CXR done, 58% showed evidence of bronchopneumonia, 20% definite lobar pneumonia, 22% with features consistent with underlying COPD, PTB with fibrocalcific changes or pulmonary fibrosis. Total white cell count was raised to more than 11,000 x 10^6/L in 70% of patients (mean 13,300 x 10^6/L), with polymorph predominance. Seventeen patients who had blood cultures taken showed no bacteremia.

In-vitro antibiotic testing demonstrated that 70% of the MC isolates were resistant to the penicillin group, 13% were resistant to co-trimoxazole, 13% resistant to cephalexin, 3% to erythromycin but none to tetracycline (Fig 2). We did not test for the production of beta-lactamase.

Sixteen patients were treated with ampicillin/penicillin, of whom 9(56%) responded. The seven non-responders were subsequently given erythromycin or intravenous (i/v) cephalosporin with good results. Twelve patients responded to their first-line antibiotics : ten were given i/v ceftriaxone, one co-trimoxazole and one ciprofloxacin. Two patients did not receive any treatment, one recovered while the other died of his underlying metastatic CA pancreas. There were three deaths during the study period, all from other systemic illnesses: metastatic CA pancreas, end-stage renal failure and acute myocardial infarct.

DISCUSSION

The pathogenicity of MC was not well appreciated previously, probably due to its low virulence or confusion with other gram-negative diplococci of the *Neisseria* group. It was considered to be an upper respiratory tract commensal. However, with better characterisation of the organism (Table I) and greater awareness of its pathogenicity, more cases have been described recently. Hager et al presented the findings in 6 cases of MC pneumonia and reviewed the literature describing 429 case from 26 studies of MC bronchopulmonary infections in 1987[11]. In a large series of 42 cases of MC pneumonia described by Paul et al in 1990[6], an increase in the number of cases in the last few years was noted. There was a higher rate of malnutrition among the patients who were elderly and they and a higher mortality rate. Our data are very similar to theirs in that our patients were also elderly, frequently with underlying lung or systemic diseases. These patients had clinical evidence of pneumonia, with cough productive of purulent sputum and progressively worsening dyspnea, sometimes associated with fever. The most common presentation of MC pneumonia was hence an infective exacerbation of chronic obstructive pulmonary disease or bronchiectasis. Increased morbidity and mortality rates were related to the underlying illness and old age.

Chest X-ray changes are non-specific, which may be lobar or bronchopneumonic, sometimes reflecting changes consistent with underlying long-standing cardio-pulmonary disease. Infective infiltrates, if present, are non-cavitatory[6,7].

None of the seventeen patients who had blood cultures performed had bacteria isolated from the blood. This is probably a reflection of the mildness of MC pneumonia and contrasts with gram-negative pneumoniae which are often associated with bacteraemia[12]. This observation confirms our earlier experience with bacteraemic sepsis in which MC was not identified in 200 positive blood cultures[13]. Total white counts (TWC) are usually mildly to moderately elevated, with polymorph predominance. In this study, the mean TWC was 13,300 x 10^6/L; only two patients had a TWC of more than 21,000 x 10^6/L. One-third of the patients had normal TWC despite clinical evidence of infection.

Of the two patients without pre-existing pulmonary or systemic illness and who did not smoke, one had relatively mild symptoms and recovered without antibiotic therapy. The other patient responded to erythromycin after a failed initial course of ampicillin.

Our department also conducted a clinical study on community-acquired pneumonia over a 6-month period, and found that MC was responsible for 5.2% of the infections. The most

common respiratory pathogens were found to be *M.tuberculosis* (22%), *S. pneumoniae* and *H. influenzae*. However, no pathogen was identified in 42% of the study population[14].

Despite a 70% in-vitro resistance to the penicillin group of antibiotics, 44% of our patients actually responded clinically to ampicillin/penicillin. However, alternative drug therapy with i/v cephalosporin, oral erythromycin, co-trimoxazole and ciprofloxacin seemed to be uniformly effective. The major determinants in the choice of antibiotics were then the in-vitro antibiotic susceptibility, cost, route and frequency of drug administration and the physician's preference.

We therefore believe that MC isolated in sputum cultures from adults with underlying respiratory diseases presenting with symptoms and signs of pneumonia should be treated as a pathogen. There are no characteristic CXR features and if the organism is suspected, the preferred first-line antibiotic should be either erythromycin, co-trimoxazole, tetracycline or a cephalosporin rather than a penicillin alone in view of the high incidence of beta-lactamase production by the organism.

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