

Clinical features of *Moraxella catarrhalis* respiratory infections

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ABSTRACT *Moraxella catarrhalis* respiratory infection was clinically studied. Subjects were 32 patients with *M. catarrhalis* respiratory infection who were treated in Kawasaki Hospital, Kawasaki Medical School from January 2006 to December 2010. The clinical features of these cases have been retrospectively reviewed. The results showed that: (1) There was not only acute exacerbation of chronic lower respiratory tract infection (in 11) and community-acquired pneumonia (in 18), but also hospital-acquired pneumonia (in 3); (2) There was frequent occurrence in elderly male patients with chronic respiratory disease or malignant tumor as an underlying disease; (3) Most patients were mild or moderate, and rarely severe; (4) Although there are many bacteria resistant to ABPC and ST, sensitivity remains against third- and fourth-generation cephem, carbapenem, and new quinolone; (5) Mixed infections with *S. pneumoniae*, or *H. influenzae* were observed; (6) Prognosis is good when the third- or fourth-generation cephem, carbapenem, or new quinolone is administered (clinical efficacy rate 100 percent, and eradication rate 100 percent).

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Key words : *Moraxella catarrhalis*, Community-acquired pneumonia, Hospital-acquired pneumonia

INTRODUCTION

Moraxella catarrhalis is important as the causative organism for acute exacerbation of chronic lower respiratory tract infection, and is also said to have high frequency as the causative organism of community-acquired pneumonia following *Streptococcus pneumoniae* and *Haemophilus influenzae*^{1,2,3,4}. This study aimed at clarifying the clinical features of *M. catarrhalis* respiratory infection.

SUBJECTS AND METHODS

Subjects

The subjects were 32 patients with *M. catarrhalis* respiratory infection who were treated at Kawasaki Hospital, Kawasaki Medical School from January 2006 to December 2010.

M. catarrhalis respiratory infection is defined as respiratory infection with sputum culture containing 10^7 /ml or more of *M. catarrhalis*.

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Methods

Type of respiratory infection, such as acute exacerbation of chronic lower respiratory tract infection, community-acquired pneumonia, and hospital-acquired pneumonia⁵⁾, severity, underlying disease, sensitivity against various types of antibacterial drugs, simultaneously detected bacteria, treatment, clinical efficacy, and bacteriological efficacy of patients were retrospectively studied.

RESULTS

Cases

Thirty-two patients with *M. catarrhalis* respiratory infection were examined. The patients included acute exacerbation of chronic lower respiratory tract infection in 11 patients, community-acquired pneumonia in 18, and hospital-acquired pneumonia in 3.

Acute exacerbation of chronic lower respiratory tract infection (Table 1)

There were 4 males and 7 females aged 53 to 89 years.

Underlying disease included chronic obstructive pulmonary disease (COPD) in 7 patients, bronchial asthma in 2, old pulmonary tuberculosis in 1, and

bronchiectasis in 1.

With regard to sensitivity against various types of antibacterial drugs, 8 (73 percent) of 11 strains were resistant to ampicillin (ABPC), 6 (55 percent) of 11 strains were resistant to ST, 2 (18 percent) of 11 strains were resistant to cefazolin (CEZ), and 1 (9 percent) of 11 strains was resistant to cefotiam (CTM), while all the strains were sensitive to cefotaxime (CTX), imipenem / cilastin (IPM/CS), minocycline (MINO), and levofloxacin (LVFX). One patient developed mixed infection with penicillin-intermittent *Streptococcus pneumoniae* (PISP).

As treatment, levofloxacin (LVFX) was administered to 5 patients, cefditoren (CDR) to 2 and cefotiam (CTM), cefepim (CFPN), and panipenem / betamipron (PAPM / BP) to 1, respectively.

Clinical efficacy was good in all patients, and all strains were eradicated.

Community-acquired pneumonia (Table 2)

There were 13 males and 5 females aged 58 to 91 years.

Underlying disease included COPD in 5 patients, bronchial asthma in 2, lung cancer in 2, diabetes

Table 1. Clinical features of patients with *Moraxella catarrhalis* infection (exacerbations of chronic lower respiratory tract infection)

Patients	Age (years)	Gender	Underlying diseases	Severity	Susceptibility <i>M. catarrhalis</i> to antibiotics								Concurrent isolated bacteria	Treatment	Clinical efficacy	Bacteriological efficacy
					ABPC	CEZ	CTM	CTX	IPM/CS	MINO	LVFX	ST				
1	53	F	COPD	-	Ⓜ	S	S	S	S	S	S	S	(-)	CDTR	Good	Eradicated
2	65	M	COPD	-	Ⓛ	S	S	S	S	S	S	S	(-)	LVFX	Good	Eradicated
3	65	F	COPD	-	Ⓛ	S	S	S	S	S	S	S	(-)	LVFX	Good	Eradicated
4	71	F	Bronchial asthma	-	S	S	S	S	S	S	S	Ⓜ	(-)	CDTR	Good	Eradicated
5	71	F	COPD	-	Ⓛ	Ⓛ	S	S	S	S	S	Ⓜ	(-)	LVFX	Good	Eradicated
6	72	M	Old tuberculosis	-	Ⓜ	S	S	S	S	S	S	S	(-)	LVFX	Good	Eradicated
7	73	F	COPD	-	S	S	S	S	S	S	S	S	(-)	PAPM/BP	Good	Eradicated
8	73	F	Bronchiectasis	-	S	S	S	S	S	S	S	Ⓛ	(-)	CFPM	Good	Eradicated
9	83	F	Bronchial asthma	-	Ⓜ	S	S	S	S	S	S	Ⓜ	(-)	CTM	Good	Eradicated
10	87	M	COPD	-	Ⓜ	S	S	S	S	S	S	Ⓜ	(-)	CPFX	Good	Eradicated
11	89	M	COPD	-	Ⓜ	Ⓜ	Ⓜ	S	S	S	S	Ⓛ	PISP	LVFX	Good	Eradicated

mellitus in 2, and chronic renal failure (undergoing dialysis), mitral regurgitation, hypertension, and old pulmonary tuberculosis in 1, respectively.

Severity was mild in 1 patient, moderate in 15 and severe in 2.

With regard to sensitivity to various types of antibacterial drugs, 14 (78 percent) of 18 strains were resistant to ABPC, 6 (33 percent) of 18 strains were resistant to ST, and 1 (6 percent) of 18 strains was resistant to CEZ, CTM, and MINO, respectively, while all the strains were sensitive to CTX, IPM/CS, and LVFX. Two patients developed mixed infection with *Haemophilus influenzae*. One patient developed mixed infection with penicillin-sensitive *S.pneumoniae* (PSSP).

As treatment, meropenem (MEPM) was administered to 5 patients, LVFX to 3, cefpirome (CPR) and CPEX to 2, subactam / ampicillin (SBT / ABPC), cefotiam (CTM), CFPM, ceftazidime (CZOP), IPM/CS, and garenoxacin (GRNX) to 1, respectively.

Clinical efficacy was good in all patients, and all strains were eradicated.

Hospital-acquired pneumonia (Table 3)

There were 2 males and 1 female aged 65 to 89 years.

Underlying disease included idiopathic interstitial pneumonias, malignant melanoma, and gastric cancer, respectively.

Table 2. Clinical features of patients with *Moraxella catarrhalis* infection (community-acquired pneumonia)

Patients	Age (years)	Gender	Underlying diseases	Severity	Susceptibility <i>M. catarrhalis</i> to antibiotics								Concurrent isolated bacteria	Treatment	Clinical efficacy	Bacteriological efficacy
					ABPC	CEZ	CTM	CTX	IPM /CS	MINO	LVFX	ST				
1	58	M	Bronchial asthma	mild	Ⓡ	S	S	S	S	S	S	S	(-)	SBT/ABPC	Good	Eradicated
2	73	M	Chronic renal failure	moderate	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	CFPM	Good	Eradicated
3	73	M	Mitral regurgitation	moderate	Ⓡ	Ⓡ	Ⓡ	S	S	Ⓡ	S	S	(-)	GRNX	Good	Eradicated
4	74	M	COPD	moderate	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	LVFX	Good	Eradicated
5	75	M	Hypertension	moderate	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	LVFX	Good	Eradicated
6	77	F	Gastric ca	moderate	S	S	S	S	S	S	S	S	(-)	MEPM	Good	Eradicated
7	77	M	COPD	severe	Ⓡ	S	S	S	S	S	S	S	PSSP	CZOP	Good	Eradicated
8	80	M	COPD	severe	Ⓡ	S	S	S	S	S	S	S	(-)	MEPM	Good	Eradicated
9	82	M	COPD	moderate	S	S	S	S	S	S	S	S	(-)	IPM/CS	Good	Eradicated
10	82	M	Lung ca	moderate	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	CPR	Good	Eradicated
11	83	F	Bronchial asthma	moderate	S	S	S	S	S	S	S	S	<i>H. influenzae</i>	MEPM	Good	Eradicated
12	83	M	Old tuberculosis	moderate	Ⓡ	S	S	S	S	S	S	S	(-)	LVFX	Good	Eradicated
13	84	M	Diabetes mellitus	moderate	Ⓡ	S	S	S	S	S	S	S	(-)	CPEX	Good	Eradicated
14	84	F	Parkinson's dis	moderate	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	CPR	Good	Eradicated
15	87	F	COPD	moderate	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	CPEX	Good	Eradicated
16	88	M	Lung ca	moderate	Ⓡ	S	S	S	S	S	S	S	<i>H. influenzae</i>	CTM	Good	Eradicated
17	90	M	Diabetes mellitus	moderate	S	S	S	S	S	S	S	S	(-)	MEPM	Good	Eradicated
18	91	F	Dermatomyositis	moderate	Ⓡ	S	S	S	S	S	S	S	(-)	MEPM	Good	Eradicated

Table 3. Clinical features of patients with *Moraxella catarrhalis* infection (hospital-acquired pneumonia)

Patients	Age (years)	Gender	Underlying diseases	Severity	Susceptibility <i>M. catarrhalis</i> to antibiotics								Concurrent isolated bacteria	Treatment	Clinical efficacy	Bacteriological efficacy
					ABPC	CEZ	CTM	CTX	IPM /CS	MINO	LVFX	ST				
1	65	M	IIPs	mild	Ⓡ	S	S	S	S	S	S	S	(-)	CAZ	Good	Eradicated
2	80	M	Malignant melanoma	mild	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	CAZ	Good	Eradicated
3	89	F	Gastric ca	mild	Ⓡ	S	S	S	S	S	S	Ⓡ	(-)	MEPM	Good	Eradicated

Severity was mild in all patients.

With regard to sensitivity to various type of antibacterial drug, 3 (100 percent) of 3 strains were resistant to ABPC, 2 (67 percent) of 3 strains were resistant to ST, while all the strains were sensitive to CEZ, CTM, CTX, IPM/CS, MINO, and LVFX.

As treatment, ceftazidime (CAZ) was administered to 2 patients, and MEPM to 1.

Clinical efficacy was good in all patients, and all strains were eradicated.

DISCUSSION

M. catarrhalis is said to hold an important position as the causative organism for acute exacerbation of chronic lower respiratory tract infection and community-acquired pneumonia. This study revealed that acute exacerbation of chronic lower respiratory tract infection occurred in 11 patients, while community-acquired pneumonia occurred in 18 patients and hospital-acquired pneumonia occurred in 3 patients, thus the number of patients with pneumonia was larger than that with acute exacerbation of chronic lower respiratory tract infection. This suggests that *M. catarrhalis* is also the causative organism of hospital-acquired pneumonia. Verducin *et al.*⁶⁾ also reported that it is not only the causative organism for respiratory infection which occurs out of hospital but also the causative organism of respiratory infection which occurs in hospital.

Acute exacerbation of chronic lower respiratory tract infection occurred in 4 males and 7 females aged 53 to 89 years, community-acquired pneumonia occurred in 13 males and 5 females aged 58 to 91 years, and hospital-acquired pneumonia occurred in 2 males and 1 female aged 65 to 89 years, showing *M. catarrhalis* respiratory infection occurred most frequently in elderly male patients. Babay⁷⁾ and Verducin *et al.*⁶⁾ also reported that elderly males develop it with the greatest frequency.

All 32 patients had underlying disease. In not only

acute exacerbation of chronic lower respiratory tract infection, but also in community-acquired pneumonia and hospital-acquired pneumonia, most are respiratory diseases such as COPD, or bronchial asthma, and malignant tumor (lung cancer, gastric cancer, and malignant melanoma) was observed in 3 patients. Verducin *et al.*⁶⁾ reported that chronic respiratory disease was observed the most frequently as the underlying disease, which is consistent with our findings. Nagatake *et al.*¹⁾ reported that with the exception of malignant tumor, cerebrovascular diseases was frequently observed. It is presumed that when cases of hospital-acquired pneumonia are observed, cerebrovascular diseases increase as the underlying disease, as was observed by Nagatake.

Therefore, it is suggested that *M. catarrhalis* respiratory infection occurs in elderly males with chronic respiratory disease or malignant tumor as the underlying disease.

With regard to severity, community-acquired pneumonia was mild in 1, moderate in 15, and severe in 2 patients, and hospital-acquired pneumonia was mild in 3 patients. This suggests that *M. catarrhalis* pneumonia occurs mildly or moderately and less frequently severely. Past studies^{6,8)} have also reported frequent mild or moderate severity, and the invasiveness was weaker than *S.pneumoniae*. However, sepsis has been reported to occur rarely in immunocompromised patients^{9,10,11)}.

With regard to sensitivity to various types of antibacterial drugs, 25 (78 percent) of 32 strains were resistant to ABPC, 14 (44 percent) of 32 strains were resistant to ST, 3 (9 percent) of 32 strains were resistant to CEZ, and 2 (6 percent) of 32 strains was resistant to CTM, and 1 (3 percent) of 32 strains were resistant to MINO. It was concluded that third- and fourth-generation cephem, carbapenem, and new quinolone should be selected for *M. catarrhalis* pneumonia or respiratory infection rather than ABPC, ST, first- and second-generation

cephem, or MINO. Several studies^{6,7,8,12,13)} have reported that many bacteria are resistant to ABPC or first-generation cephem antibiotics, and cephem of third-generation or later, carbapenem, and that new quinolone are effective in treatment, which is consistent with our findings.

Four (13 percent) of 32 patients had mixed infection, 2 were infected with *S. pneumoniae* (PSSP 1 and PISP 1) and 2 were infected with *H. influenzae*. Although the number of patients is small, attention should be paid to the fact that mixed infection with the 3 major causative organisms was found. In the literature, complications are seen not only with *S.pneumniae* or *H.influezae*^{1,8)} but also with *Mycoplasma pneumoniae*¹⁴⁾.

As treatment, new quinolone were administered to 13 patients, including LVFX to 8, CPMX to 3, and GRNX to 2. Third- and fourth-generation cephem were administered to 9 patients, including CDTR to 2, CFPM to 2, CPR to 2, CAZ to 2, and CZOP to 2, carbapenem were administered to 8 patients, including MEPM to 6, PMPM / BP to 1, and IPM / CS to 1. These choices were considered valid in terms of the guidelines^{2,4,5)} regarding respiratory infection as well as in terms of sensitivity. As a result, clinical efficacy was 100 percent and eradication rate was 100 percent. Therefore *M. catarrhalis* respiratory infection may have a good prognosis when treated appropriately.

It is concluded as follows: (1) *M. catarrhalis* respiratory infection which we have experienced included not only acute exacerbation of chronic lower respiratory tract infection and community-acquired pneumonia, but also hospital-acquired pneumonia; (2) It occurs in elderly male patients with chronic respiratory disease or malignant tumor as an underlying disease; (3) Many cases are mild or moderate, and severe cases are rare; (4) Although there are many bacteria resistant to ABPC and ST, sensitivity remains to third- and fourth-generation cephem, carbapenem, and new quinolone; (5) Mixed

infections with *S. pneumoniae*, or *H. influenzae* were observed; (6) Prognosis is good when the third- or fourth-generation cephem, carbapenem, or new quinolone are administered (clinical efficacy rate 100 percent, and eradication rate 100 percent).

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