Lung Function in Adults with Mycoplasmal Pneumonia

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We prospectively studied lung function of 17 patients (7 men and 10 women) of acute Mycoplasma pneumoniae pneumonia. Lung function tests including %VC, FEV1.0#, Peak flow, V75/HT, V25/HT, V50/V25 and MMF were measured during the acute and convalescent stage. The results showed dysfunction of peripheral airway because of reduction in V50/HT, V25/HT and MMF. It was suggested that lung function in patients with Mycoplasma pneumoniae pneumonia was impaired at the high lung volume as well as low lung volume.

Key Words: Lung function, Mycoplasma, Mycoplasma pneumoniae infection

In mycoplasma pneumoniae (M. pn.) pneumonia, it has been reported that variety of non-respiratory complications including central nervous, cardiovascular and digestive system involvements occurs1,2,3). On the other hand, in the patients of chronic obstructive lung diseases4,5,6), it is recognized as the important cause which may lead to the acute respiratory distress syndrome7,13). We had histopathologically demonstrated using hamster model that in mycoplasmal infections inflammatory change of the lung occurred not only in large airways but also in small airway8). In recent study, as a part of a project to investigate the influences of mycoplasmal infection on small airways, we have used the maximal expiratory flow-volume curve to examine the pulmonary function of patients with M. pn. pneumonia.

PATIENTS AND METHODS

We evaluated 17 patients, 16 to 55 years of age, who visited within a week of the onset of M. pn. pneumonia. Pulmonary function studies were performed by flow volume curve recorder (OST-80A, Chest Co.) during the acute stage, 4 to 6 days after treatment and after resolution of clinical findings, including %VC, FEV1.0%, Peak flow, V75/HT, V50/HT, V25/HT, the ratio of V50/HT to V25/HT and MMF (maximum midexpiratory flow). Macrolides antibiotics was used to treat all of the 17 patients.

Fig. 1 and Fig. 2 shown the results of serial %VC and FEV1.0% respectively. The results were within normal limits in 12 patients. However, these observed a definite decrease of FEV1.0% (60.9±5.70 SD) in 5 patients. Among of these patients, a patient whose FEV1.0% was 61.2 had a history and signs of chronic bronchitis, and the others were healthy adults with no history of any lung disease. In interesting case of 16 years of male, FEV1.0% at first test was markedly reduced (54.2%) reflecting an airway obstruction, but it returned to normal level after treatment.

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The change of \( \hat{V}^{75}/HT \) are tested in the same manner. The results of \( \hat{V}^{75}/HT \) are interpreted as the results of alterations in high lung volume. \( \hat{V}^{75}/HT \) during the acute stage were decreased in almost all cases and were normalized after clinical symptoms had resolved. This may suggest that mycoplasmal infections interfere considerably with high lung volume.

The results of \( \hat{V}^{50}/HT \) shown in Fig. 3 gave a similar tendency to that of \( \hat{V}^{75}/HT \). During the acute stage of mycoplasmal infections in 14 of 17 patients, \( \hat{V}^{50}/HT \) was below the normal limits (1.34±0.55 SD).

We evaluated \( \hat{V}^{25}/HT \) which change might reflect the presence of the obstructive change in the peripheral airways. Fig. 4 shows the predicted and measured values of \( \hat{V}^{25}/HT \) during the acute stage of mycoplasmal infections. In all cases on the first
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Fig. 4. Predicted and measured values of V25/HT during the acute stage of Mycoplasmal pneumonia

Measurement, the measured values of \( \dfrac{V_{25}}{HT} \) were lower than the predicted ones. The mean value of predicted \( \dfrac{V_{25}}{HT} \) was 1.32 (SD: 0.11) and that of measured ones was 0.77 (SD: 0.27). Significance of difference between the mean predicted and measured values of \( \dfrac{V_{25}}{HT} \) was tested by both t- and f-test, and the mean measured value was significantly low (\( P<0.001 \)). It is suggested that impairment of small airways occurs during the acute stage.

As shown in Fig. 5, \( \dfrac{V_{25}}{HT} \) returned to normal level in 14 cases with the treatment, but worsened in 3 cases as time went on. These 3 cases were female patients between the ages 26 and 35, with preexisting mild dyspnea. Despite the treatment they had manifested exacerbations of initial cough and sputum. Chest roentgenograms revealed reticulo-nodular shadows and pulmonary function tests provided obstructive patterns for a long period.

We investigated the relationship between the severity of pneumonia based on chest roentgenogram and the percent change of \( \dfrac{V_{25}}{HT} \) in acute stage. The percent changes of \( \dfrac{V_{25}}{HT} \) were small (15%) in unilateral pneumonias and large in bilateral ones.

The ratio of \( \dfrac{V_{50}}{HT} \) to \( \dfrac{V_{25}}{HT} \) was backed to the normal limit (1.90~2.90) of adults less than 40 years of age after the treatment.

The alteration of MMF has been recognized as a sensitive reflection of the obstructive change in small airways. Serial MMF results are presented in Fig. 6. Dotted lines indicate MMF examined twice before and after therapy. There is a tendency to worsen...
4 to 6 days after the infection and return to the normal range with treatment. This suggests impairment of small airways in mycoplasmal infections tends to worsen several days after the onset and resolve with treatment.

**DISCUSSION**

The influence of the mycoplasmal infections on lung function was investigated.

In has been well known that mycoplasmal infections impair the function of the ciliated epithelial cells and produce inflammation of airways spreads as far respiratory bronchioles. Therefore, patients with M. pn. pneumonia manifest prolonged, severe cough and impairment of lung function.

Lung function in patients with M. pn. pneumonia has already been reported by other\(^{9-12}\). Among them Blair\(^{11}\) et al. described that healthy young adult volunteers infected with M. pn. pneumonia by experiment had normal lung function. Whereas Diercks\(^9\) suggested obstructive change in patients with M. pn. pneumonia with significant fall in FEV\(_{1.0}\). In our data FEV\(_{1.0}\) during the acute stage of mycoplasma infections was actually decreased in 15 of 17 cases, especially in 6 of them the decrease in FEV\(_{1.0}\) was more severe. In many cases FEV\(_{1.0}\) was backed to normal after symptoms had resolved, but in some cases with marked decrease in FEV\(_{1.0}\) during the acute stage, it took a considerable time to return to normal. As for MEFV, both V\(_{75}/HT\) and V\(_{50}/HT\) were reduced during the acute stage and showed quick recoveries after treatment. The value of V\(_{25}/HT\) examined on the first visit was lower than predicted one in all patients.

According to follow-up studies of changes in V\(_{25}/HT\), we considered that the impairment of small airway function was common at the early stage of mycoplasmal infections. The correlation of V\(_{25}/HT\) with the extent of pneumonia was that the decrease of V\(_{25}/HT\) was more severe in cases of bilateral pneumonias than in unilateral ones.

The changes of MMF was almost same as that of V\(_{25}/HT\). The value of MMF was lowest 5 to 6 days after the onset of disease, and thereafter gradually returned to normal.

As mensioned of FEV\(_{1.0}\), V\(_{50}/HT\), V\(_{25}/HT\), MEFV, etc., lung function in patients with M. pn. pneumonia was impaired from high lung volume to low lung volume. In was also found as described by Kjellman\(^{10}\) and Berven\(^{14}\) et al that functional impairment lasted a long time even after resolution of clinical symptoms or disappearance of abnormal shadows on chest roentgenogram.

**CONCLUSION**

1) We reported the influence of Mycoplasmal pneumonia on lung function.

2) Lung function test including %VC, FEV\(_{1.0}\), Peak flow, V\(_{75}/HT\), V\(_{25}/HT\), V\(_{50}/HT\)**
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/VT25 and MMF were analyzed during the acute stage of Mycoplasmal pneumonia and after resolution of clinical symptoms respectively.

3) Of particular note was that in our studies, lung function in patients with Mycoplasmal pneumonia was impaired not only at high lung volume but also at low lung volume because of significant reduction in V50/HT, VT25/HT and MMF reflecting the interference of small airways. This could be explained by the existence of considerable impairment of small airways in mycoplasmal infection.

REFERENCES