A six-year old boy with refractory mycoplasmal pneumonia combined with recurrent pneumothorax

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abstract : A six-year old boy presented with mycoplasmal pneumonia combined with recurrent pneumothorax. The patient had been treated with azithromycin and methylprednisolone for mycoplasmal pneumonia after admission, however his condition deteriorated. We increased the dosage of methylprednisolone and changed to erythromycin from azithromycin, his condition improved progressively. He presented pneumothorax twice during recovery phase. He was put on thoracic closed drainage and was cured. Pneumothorax is rare complication of mycoplasmal pneumonia. Here we reported the case to raise awareness of this condition.

Keywords：Refractory mycoplasmal pneumonia；Recurrent pneumothorax

Abbreviation:

Refractory mycoplasmal pneumonia, RMPP

Mycoplasmal pneumonia, MPP

Mycoplasma pneumoniae, MP

Introduction: mycoplasmal pneumonia (MPP) is a common community acquired-pneumonia; the prognosis is usually good using macrolides. The incidence of refractory mycoplasmal pneumonia (RMPP) with many complications has been increasing in China and other countries due to the growing number of macrolides-resistant strains [1-2]. Pneumothorax is a rare complication of RMPP in the literature [3]. Here we report a six-year-old boy with RMPP developed pneumothorax twice during recovery. The patient had consolidation of lung with necrosis for relatively long time; his mycoplasmal

DNA load was high. All these factors contributed to the recurrent pneumothorax.

Case report

A previously healthy six-year-old boy was admitted into our department because of a 6-day history of fever and cough. Examination showed a febrile (39.2℃) boy. Vital signs included pulse 95 beats/min，respiratory rate 22 breaths/min, blood pressure 98/60mmHg（1mmHg=0.133Kpa）; He had regular breath on auscultation. Breath sounds of Left lung was deeper, right lung was coarse. Examination on heart, abdomen and nervous system found no abnormality. His white blood cells was 5.29×10^{9}/L, central granulocyte 88%, hs-CRP 25.2mg/L, PCT 0.50ng/ml，ESR 41mm/hr, IL-6 90.75pg/ml; The MP-lgM and MP-Ag was both positive. His ferritin was 318ug/L, LDH 618IU/L (≤250IU/L), D-D 4.18mg/L, FDP 11.17ug/ml. Blood culture was performed. Colloidal gold assay was performed to detect urine streptococcus pneumoniae. ELISA, to detect respiratory syncytial virus，influenza viruses, parainfluenza viruses adenovirus, *M. Pneumoniae, C. pneumoniae* was performed. Culture and molecular methods to identify pathogenic agents all got negative results. Thoracic axial computed tomography images showed both sides of the lung field was clear. Lung marking presented naturally. The bronchi were all through. No stenosis and obstruction was noted. Left lower pulmonary lobe had high-density shadow（**fig. 1a**）. A diagnosis of refractory mycoplasmal pneumonia was made. We started the patient on azithromycin, methylprednisolone(3mg/kg·d，twice a day）. On the 8th day, the boy's temperature is still high; heart rate and respiratory rate were elevated. Percutaneous oxygen saturation measured by pulse oximetry was 89%～92%. Chest Computed tomography showed higher level of inflammation, Echocardiography note suggested pericardial effusion. Fiberoptic bronchoscopy was performed and bacterial culture with bronchoalveolar lavage fluid (BLF) failed to identify any pathogenic bacteria; MP DNA load is 2.87×108 copies/ml. we increased methylprednisolone to

5mg/kg.d，twice a day. we changed to erythromycin(30mg/kg·d，twice) from azithromycin. On the 16th day, chest computed tomography showed decreased inflammation and focal necrosis (fig. 1b). The boy's clinical symptoms were alleviated. We reduced the dose of methylprednisolone. On the 22th day, the patient claimed ache in left chest and breathed with difficulty. Chest X-ray film revealed 80% pulmonary compression, indicating pneumothorax (fig. 2a). Thoracic closed drainage was performed. Pneumothorax disappeared the next day. Sputum culture showed 10^8 cfu/ml Klebsiella oxytoca, a few fungal spores and hyphae. We speculated these were opportunistic pathogen in dysbacteriosis and was not related to pneumothorax, thus did not change the therapeutic regime. On the 27th day, the boy claimed ache in left chest again, Chest X-ray film revealed 60% pulmonary compression and subcutaneous emphysema. Thoracic closed drainage was performed again, and the tube was removed on 32nd day after pneumothorax disappeared. Reexamination of sputum culture and MP DNA load were negative and normal. Medication stopped. He recovered and was discharged on 35th day.

Discussion

The number of Macrolides antibiotics-resistant strains are increasing recently, at the same time the incidence of RMPP are trending upward [4]. Clinical management of RMPP are challenging due to the long duration and many complications. Recognizing RMPP at the early stage is of great importance. Most physician will consider RMPP If fever is not resolved and lung image note become more serious after treatment with azithromycin over 1week [5]. LDH (≥417IU/L) is usually elevated in RMPP patients [6]. Clinical presentation and lab results of our patient all agreed with RMPP. RMPP is usually complicated with many complications include hydrothorax, atelectasis, hydropericardium. Pneumothorax is a rare complication and the underlying reason is unclear. The treatment alleviated the symptoms of our patient; however, pneumothorax happened twice in rehabilitative stage. We suspect

the development of focal necrosis may be the cause. Direct damage by MP and immune injury to the lung can lead to the necrosis（fig. 2b）. Rupture of alveoli adjacent to the pleura allow air breaking into thoracic cavity. Long-time compact consolidation can result in ischemia and hypoxia in lung tissue, and subsequently necrosis. High MP DNA load are associated with severity of lung tissue damage [7]. MP DNA of BLF from the patient (2.87×10^{8}copies/ml) suggested severe tissue damage. The second pneumothorax happened after cough. Elevated airway pressure can cause alveolar rupture. The recovery of tissue damage in RMPP can be slow, it is important to control pulmonary inflammation to avoid pneumothorax

RMPP is associated with overactive immune response to MP. The dosage of glucocorticoid applied to RMPP patient is inconclusive. Most physician agrees to use 1-2mg/kg·d methylprednisolone. Hormone shock therapy was also reported [8]. The patient in this case was treated with methylprednisolone 3mg/kg·d and Azithromycin since his clinical presentations fit RMPP. The effect of the treatment is minimal. His condition improved significantly after we increased methylprednisolone to 5mg/kg·d. When the patient did not respond well with standard dosage. We recommend increasing the dosage appropriately. Shock therapy can be applied in some cases if necessary.

Long-time consolidation and high MP DNA load both related to the occurrence of pneumothorax. The hormone therapy is efficient. The dose and timing of hormone therapy need to be explored in more cases. Medical team should be vigilant to avoid other microbial infection.

References

[1] Kawai Y, Miyashita N, Kubo M, Akaike H, Kato A, Nishizawa Y, et al. Nationwide surveillance of macrolide-resistant Mycoplasma pneumoniae infection in pediatric patients Antimicrob Agents Chemother.2013;57:4046–9.https://doi.org/10.1128/AAC.00663-13.

[2] Yang Liu, Xinyu Ye, Hong Zhang, Xiaogang Xu, Wanhua Li, Demei Zhu, et al. Antimicrobial Susceptibility of Mycoplasma pneumoniae Isolates and Molecular Analysis of Macrolide-Resistant Strains from Shanghai, China. Antimicrob Agents Chemother. 2009;53(5): 2160–2162.

[3] Huang L, Chen H, Peng S.Spontaneous pneumomediastinum, emphysema, and pulmonary bullae associated with refractory Mycoplasma pneumoniae pneumonia in a child.*Pediatr Pulmonol*. 2017;52(10):E77-E80.

[4] Guo DX, Hu WJ, Wei R, et al. Epidemiology and mechanism of drug resistance of Mycoplasma pneumoniae in Beijing, China: A multicenter study. *Bosn J Basic Med Sci*. 2019;19(3):288-296.

[5] Liu JR, Lu J, Dong F, et al. Low bacterial co-infection invalidates the early use of non-anti-mycoplasma pneumoniae antibiotics in pediatric refractory mycoplasma pneumoniae pneumonia patients. Front Pediatr. 2018;6:296. doi: 10.3389/fped.2018.00296

[6] Zhang Y, Zhou Y, Li S, Yang D, Wu X, Chen Z. The Clinical Characteristics and Predictors of Refractory Mycoplasma pneumoniae Pneumonia in Children. *PLoS One*. 2016;11(5):e0156465.

[7] Liu J, Zhao F, Lu J, et al. High Mycoplasma pneumoniae loads and persistent long-term Mycoplasma pneumoniae DNA in lower airway associated with severity of pediatric Mycoplasma pneumoniae pneumonia.BMC Infect Dis. 2019 Dec 10;19(1):1045.

[8] You SY, Jwa HJ, Yang EA, Kil HR, Lee JH. Effects of Methylprednisolone Pulse Therapy on Refractory Mycoplasma pneumoniae Pneumonia in Children. *Allergy Asthma Immunol Res*. 2014;6(1):22-26.

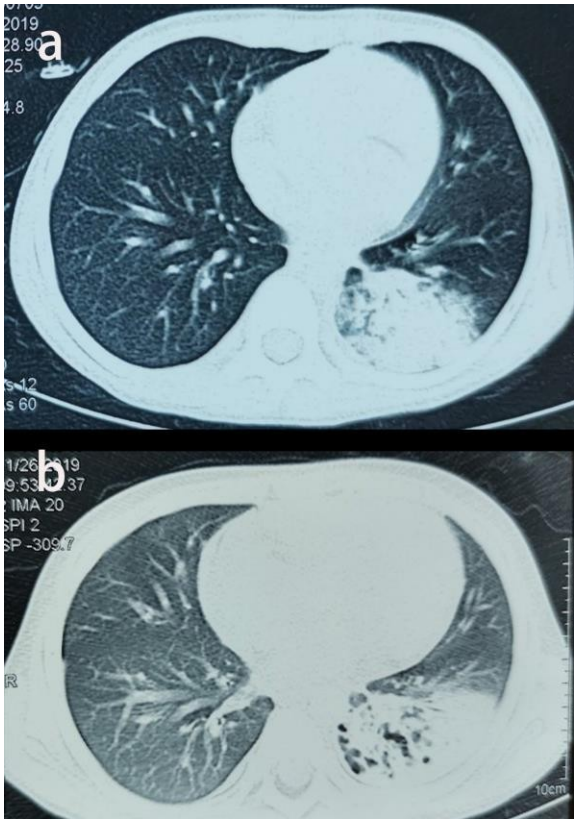

Fig. 1 Thoracic axial computed tomography (CT) images showing high-density shadow in the left lower pulmonary lobe on admission (a), and inflammation in left lower pulmonary lobe improved with necrosis on 16th day of admission, (b).

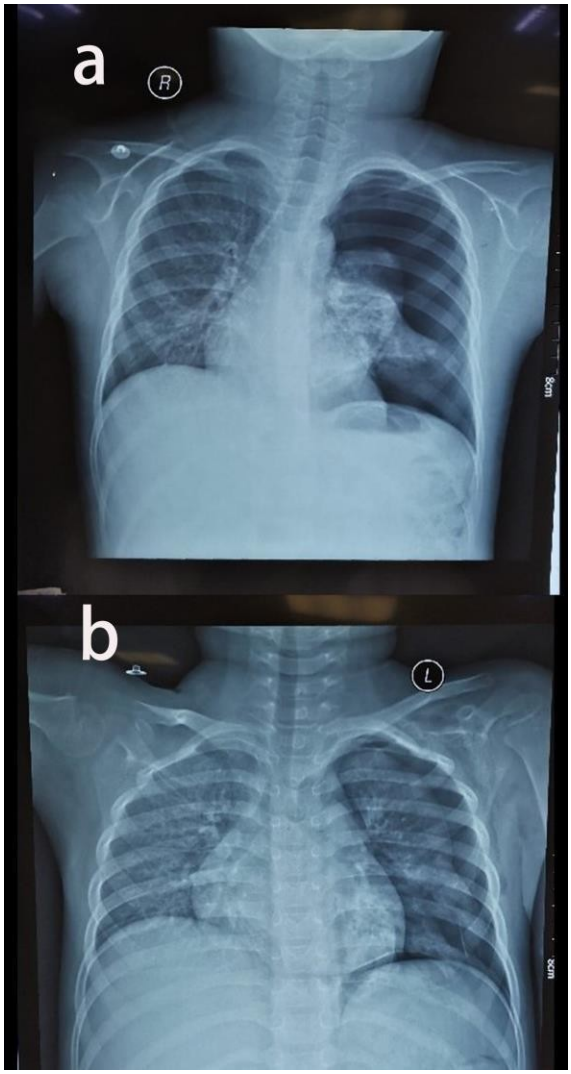

Fig. 2 Chest radiograph images showing first pneumothorax with 80% pulmonary compression (a), and Left pneumothorax with 60% pulmonary compression (b).