Adult respiratory distress syndrome (ARDS) due to bacteraemic pneumococcal pneumonia


ABSTRACT: We describe a patient, who had no pre-existing disease, with bacteraemic pneumococcal pneumonia and adult respiratory distress syndrome (ARDS), a rare complication. In spite of the use of antibiotics and intensive treatment the mortality rate of this kind of infection remains high. *Streptococcus pneumoniae* is the most frequently found micro-organism responsible for community-acquired pneumonia. In 25-35% of these patients pneumococcal bacteraemia is found, with a 2-3 times higher mortality rate than that for non-bacteraemic pneumococcal pneumonia.

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Case report

A 55 yr old male was admitted after having a non-productive cough for one week. His medical history revealed only some low back pain; occasionally he used some indomethacin against this. There were no signs of chronic obstructive lung disease. He smoked about 10 cigarettes a day and worked as a fireman at an electrotechnical plant. Domestic animals were cats, rabbits and some poultry.

On the day of admission he developed fever and became progressively dyspnoeic, without chills. Examination revealed a sick and somnolent patient in respiratory distress, temperature 38.2°C, blood pressure 80/50. Bronchial breath sounds and crackles were heard at the base of both lungs.

The total leucocyte count was 13.2x10^9 l⁻¹ with 21% band forms. The thrombocyte count was 834x10^9 l⁻¹, later decreasing to 72x10^9 l⁻¹. The chest radiograph showed massive infiltrates (fig. 1).

The clinical condition of the patient deteriorated quickly and mechanical ventilation was necessary, complicated by high airway peak pressure (70 cmH₂O). Adequate oxygenation was difficult in spite of the use of 20 cmH₂O positive end expiratory pressure (PEEP) and 100% oxygen, also with high frequency ventilation. At this time pulmonary capillary wedge pressure was 24–28 mmHg.

Gram-stained sputum smear contained Gram-positive diplococci. Sputum and blood cultures yielded a normal penicillin-susceptible *Streptococcus pneumoniae* (type 14). Cerebrospinal fluid culture was done because of suspected meningitis, but proved to be sterile. Serology tests for respiratory viruses, *Mycoplasma pneumoniae* and *Legionella pneumophila* were negative.

The patient was treated with cefuroxime and tobramycin, but died 6 days later of irreversible shock with renal failure. At autopsy the lungs showed diffuse necrosis, epithelial metaplasia, epithelial regeneration, hyaline membranes and oedema in bronchioli and alveoli. Many macrophages and granulocytes were seen. This is consistent with morphological changes in adult respiratory distress syndrome (ARDS) [1]. There were no signs of cardiac or renal disease or malignancy.

Diagnosis: bacteraemic pneumococcal pneumonia with adult respiratory distress syndrome (ARDS).

Discussion

*Streptococcus pneumoniae* is still the most frequently found micro-organism responsible for community-acquired pneumonia. The estimated incidence in persons...
over 18 yrs of age is 1–5 per thousand per annum [2]. In 25–35% of the patients pneumococcal bacteraemia is found [3, 4]. The mortality rate of pneumococcal pneumonia with bacteraemia is about 20–30%, which is 2–3 times higher than that for non-bacteraemic pneumococcal pneumonia [2, 3, 5–7].

Very few of these patients (the exact percentage is not known) will develop ARDS. ARDS was first described by Petty and Ashbaugh [8]. Later definitions often required a "normal" pulmonary capillary wedge pressure, to exclude cardiogenic causes of pulmonary oedema. However, the absolute values are difficult to interpret in patients who are mechanically ventilated, especially with positive end expiratory pressure (PEEP) [9]. Murray et al. [10] developed another definition using a "lung injury score". The patient in this case report had a score of 3.66 which means severe lung injury (ARDS). The combination of these definitions and the histological findings at autopsy prove that this patient had ARDS.

ARDS as a complication of pneumococcal pneumonia was described in 1983 [11]. Nine of the ten patients had a pre-existing disease and the mortality rate was high (50%).

The frequency of admissions because of bacteraemic pneumococcal pneumonia is the same as it was 40–50 yrs ago [2, 4]. At least 60% of these patients have a pre-existing disease, such as nephritis, diabetes, alcoholism, cardiac failure, chronic lung disease, sickle cell disease etc. The mortality rate of bacteraemic pneumococcal pneumonia remains high, especially in the first days, in spite of the use of antibiotics and intensive treatment [2–7, 12]. If the pneumonia is associated with shock, ARDS, chronic disease, age older than fifty years, leucopenia, asplenism or when there are more lobes involved, the mortality rate is even higher [3–7]. Alcoholism has no prognostic value unless it is complicated, for example by liver cirrhosis, [3, 5, 7].

The manner in which S. pneumoniae damages host tissue is still unknown. The pneumococcus can produce pneumolysin, a leucocytolytic substance that can kill and lyse leucocytes and thrombocytes. It may also activate the alternative complement pathway [5]. Pneumococcal cell walls and pneumococcal capsular polysaccharides can also activate this alternative pathway. Hosea et al. [13] showed in an animal model that infusion of S. pneumoniae produced a transient but dramatic increase in alveolar capillary permeability. Again, the activation of the complement system, especially C5a, would be essential for these effects.

Because of the high mortality rate, the prevention of infections by this micro-organism may be a better option, especially in high risk patients. This becomes even more important since, although still rare, penicillin-resistant pneumococci are appearing worldwide.

Vaccination with a polyvalent pneumococcal vaccine is still a point of discussion. Those who might benefit from vaccination are patients aged 55–70 yrs with diabetes or chronic heart, lung or liver disease and those aged 2–70 yrs with chronic renal disease, sickle cell disease or asplenism [14].

The incidence and fatality rate of bacteraemic pneumococcal pneumonia may possibly drop dramatically in the future, as a result of vaccination, and the associated ARDS may become even more exceptional than it is now.

References
