Unusual progression of a *Legionella pneumophila* infection in a young child

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**Abstract.** A 2 1/2-year-old boy showed an unusual course of a *Legionella pneumophila* infection with severe dyspnea, long-term loss of conscience (5 days) and permanent persistence of pulmonary obstruction.

**Key words:** *Legionella pneumophila* infection in a child - Permanence of severe pulmonary obstruction

**Introduction**

Legionnaires’ disease is an acute bacterial infection which has been frequently reported in adults, but only occasionally in children [1, 5, 10, 13, 14, 15, 16, 17, 19]. Fatal cases have been described in infants with chromosomal disorders and severe immunodeficiency [6, 7, 17]. Only mild respiratory tract infections are common in this age group [1, 15, 17]. This case report deals with an unusually severe course of Legionnaires’ disease in a young boy.

**Case report**

The patient was a 2 1/2-year-old boy, whose growth and development had been normal until one week prior to admission, when he fell sick with fever (40°C), cough, diarrhea and somnolence. On admission he presented with somnolence, severe respiratory distress, intercostal retractions and tachypnea, acrocyanosis, distended abdomen and a temperature of 38°C.

Initial chest X-ray showed bilateral lung infiltrates (Fig. 1) [8]. Cultures of blood and cerebrospinal fluid, tuberculin reaction and urinalysis gave negative results. EEG indicated nonspecific changes, CAT scan revealed no pathological findings.

One day later, the patient’s respiratory condition and state of consciousness deteriorated dramatically, necessitating mechanical respiration for 10 days. Antibiotic treatment was started using amoxicillin, flucloxacinil, gentamycin and azlocillin. Five days later, erythromycin was added to the regimen. Within the 2 following days, the patient’s condition improved and he regained consciousness. His pulmonary status, however, remained severely impaired. Following extubation, bronchial obstruction, dyspnea, and cyanosis persisted. Intensive therapy with β₂-sympathomimetics, theophylline and glucocorticosteroids was initiated, with little success.

Physico-chemical intoxication was carefully ruled out. Serological tests for *Legionella pneumophila* (serogroups 1-4) were studied by indirect immunofluorescence (IFA), as described by McDade et al. [15] and Wilkinson [21, 22]. Results were evaluated using the criteria of the Center for Disease Control [5], i.e.: A four-fold rise or fall in titer concentrations, or a single titer ≥ 1:256. Cross-reactive antibodies were excluded by blocking with an immunosorbent prepared from an *Escherichia coli* 013:492:H4 strain [20, 21].

Serological tests were also performed on the sera of the father, mother and younger brother to detect associated cases of Legionnaires’ disease in the fam-

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Fig. 1. Chest X-ray film demonstrates bilateral lung infiltrates
ily. The results of all serological studies are summarized in Table 1.

Both the initial and the second investigation of the patient’s serum showed significant titers of 1:1024 against all four serogroups. The titers were still somewhat elevated 3 weeks later, whereas they were found to be within normal limits during 3- and 6-month control studies. The blocking test performed with the initial serum detected no cross-reactivity. The first test of the mother’s serum (4 weeks after the initial investigation of the patient’s serum) showed elevated titers against all four serogroups, which returned to normal limits after 10 weeks. The father’s and brother’s sera had negative values.

Clinical course

The child was hospitalized for a total of 3 months. Severe bronchial obstruction persisted; therapeutic efforts resulted in only slight improvement. During two more febrile episodes (6 and 10 weeks, respectively after the onset of clinical symptoms) bronchial obstruction deteriorated again. At these times, adenovirus and parainfluenzavirus infections, respectively were detected by serological studies. Tracheo-bronchoscopy showed only mild inflammatory changes, as commonly observed postintubation, and thus, broncho-pulmonary symptoms remained unexplained. Bacteriological and mycological investigations of bronchial mucus showed only nonpathogenic flora. Owing to the permanently impaired respiratory situation, a bronchography was not performed. The level of sweat sodium was within normal limits. Studies of immunoglobulins, complement, NBT-test, T- and B-Lymphocyte count and lymphocyte activation by stimulants gave normal results. No evidence of atopic disease in the family history and in tests for IgE and RAST was detected.

Follow-up treatment was with disodium chromoglycate and ketotifen in addition to the continued inpatient therapeutic regimen. Thus, only moderate improvement could be achieved. Dyspnea at rest and cyanosis on exertion increased promptly whenever the dosage of prednisolone was reduced below 0.35 mg/kg body weight per day. Radiological follow-up has shown no evidence of fibrotic pulmonary disease. Determination of bronchial airway resistance, performed by using a forced oscillation technique, confirmed severe bronchial obstruction to be the predominant pathogenetic feature. Now, 1 year after the onset of symptoms, there is still no convincing improvement of clinical symptoms. The child is still dependent on steroids.

Discussion

Since the discovery of L. pneumophila in 1977 in connection with an outbreak of severe pneumonia of unknown etiology in Philadelphia many reports have dealt with epidemic and sporadic cases of Legionnaires’ disease [2, 5, 7, 10, 11, 13, 15, 17]. Various clinical characteristics, such as subacute onset of high fever, malaise, unproductive cough, myalgia, gastrointestinal and cerebral symptoms have been described. Risk factors seem to be age, male sex, severe underlying illness [18], immunosuppression and cigarette smoking.

Andersen et al. [1] suggest that infection with L. pneumophila in the early years of life may lead to subclinical disease with nonspecific febrile illness like Pontiac Fever [12] or only to seroconversion. They point out, that cross-reactions against other gram-negative bacteria in the IFA may play a more important role in children than in adults infected by L. pneumophila [3].

The present case was not at all typical of Legionellosis. Unconsciousness and dyspnea have hitherto not been described in connection with this disease, suggesting primarily other possible causes of severe respiratory distress [9]. The clinical syndrome seemed to be compatible with aspiration pneumonia which may occasionally be caused by anaerobic bacteria of the bacteroid type cross-reacting with L. pneumophila in IFA [3]. This possibility was excluded by performing a blocking test, as reported by Wilkinson [21].

Most unusual, however, was the clinical course and the persistence of bronchial obstruction [4]. Rosenberg [17] reported the case of a 31-year-old patient who developed temporary bronchospasms during a 3-day period in connection with a L. pneumophila infection. This responded, however, quite well to treatment with aminophylline and isethionate HCl (Bronkosol).

Our 3-year-old patient still suffers from severe bronchial obstruction with only slight and temporary improvement during therapy. The onset of clinical symptoms is clearly related to the acute L. pneumophila infection, suggesting that this infection directly affected the airway epithelium. We have to consider, of course, that two subsequent viral infections (adenovirus and parainfluenzavirus infections, respectively) may have enhanced the underlying bronchial damage.

Contrary to the previous publications available to this date, it appears conceivable that not only children with chromosomal disorders or immune deficiencies can develop severe clinical symptoms, but apparently healthy children as well.

In conclusion, this paper describes the clinical course of a L. pneumophila infection in a young boy. He presented with severe pneumonia and respiratory distress, a 5-day period of unconsciousness and subsequently developed chronic severe, not completely reversible bronchial obstruction. Only slight improvement has been achieved by bronchodilator therapy and corticosteroids.

References


Table 1. Indirect immune fluorescence studies of Legionella pneumophila antibodies: Serological groups 1-4 (Titers indicated are reciprocal values)

<table>
<thead>
<tr>
<th>Date of blood sample</th>
<th>Patient</th>
<th>Mother</th>
<th>Father</th>
<th>Brother</th>
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<td>1024</td>
<td>128</td>
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<td>1024</td>
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<td>27. 10.</td>
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<td>2. 8.</td>
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