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Acute Obstructive Laryngotracheobronchitis due to Myxovirus Infection

By

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In the period 1961 to 1971, a myxovirus aetiology was revealed in 45% of 397 investigated cases of acute laryngotracheobronchitis. The clinical course was not specific in the different types of infection. At the same time an increase in heterologous antibodies to some types of parainfluenza myxovirus was found in 28 children. There was no correlation between the severity of the clinical signs and the incidence of heterologous antibodies.

Acute obstructive laryngotracheobronchitis (AOLTB) is a disease with a number of not completely understood factors participating in its development and of typical symptomatology including age, sex, season, climate, allergy and infection. At present, viruses, mainly those belonging to the myxovirus group, are among the most discussed aetiological factors. The problem of viral aetiology has been dealt with by a number of authors and some of them have attempted to find a correlation between the infecting agent and the clinical picture.

The present paper summarizes our clinical and laboratory observations during the past 11 years. In the period from January 1, 1961, to December 31, 1971, 1609 children were admitted to the two Prague Departments with a diagnosis of AOLTB. A complete virological examination was carried out in 937 children, i.e. in 25%. Viral aetiology was demonstrated by virus isolation and serological tests for demonstrating increases in antibody titre.

Methods

All the methods used have been described previously [6].

A viral aetiology was considered proven when isolation of the virus was accompanied by an adequate serological response, that is by an at least fourfold increase in homologous antibodies.

Results

Myxoviruses were demonstrated as the aetiological agent in 85 of the 397 investigated children. At the same time an increase in heterologous antibodies to some type of *M. parainfluenzae* was found in 28 of 85 children. A further 70 showed a significant increase in myxovirus antibodies without positive cultivation result

while in 26 cases the positive cultivation was not confirmed serologically. Thus, a viral aetiology was assumed in 181 cases, i.e. 45% of the total number of investigated children.

Clinical observations

Eighty-five children in whom myxovirus infection was confirmed both by cultivation and serologically, were investigated clinically. There were 60 boys and 25 girls; this showed the striking predominance of boys. Fig. 1 shows the age of the patients; it confirms the well-known fact that children in their first three years are the most frequently affected. Most cases occurred in autumn, winter and early spring (Fig. 2). Changes in weather were an important factor, particularly temperature changes in both directions. According to FEEYESS and LEGENT [2] the ratio is 15 : 85; only 15% of the cases occur in settled weather.

Signs

AOLTB is mostly of a sudden onset, but this may be different when the illness begins as a simple respiratory infection with very slight respiratory obstruction. For this reason even mild cases were admitted to hospital. Fig. 3 gives a classification of the cases according to signs in correlation with the aetiology and the presence of antibodies.

Complications

The most common complication was bronchopneumonia which was diagnosed radiologically in 11 cases; five of these required tracheotomy.

Other findings

Leukopenia, which made RABE [7] to assume that the disease was a viral one, has been confirmed in our cases; it was observed in 46 children, the lowest leukocyte count being 4000. In the other children the count was within normal limits. Leukocytosis was observed only once. Twenty-two children had a sedimentation rate above 20 mm/hr; in the rest, the sedimentation rate was normal. Twenty children had pyrexia of more than 38°C at the beginning of the illness, but the fever bore no correlation with the severity of the course.

Recurrence

AOLTB often recurs. Twenty-one of our cases had two or more relapses. In most cases the recurrence ran a mild course, although tracheotomy was necessary in one case during the second attack. In no case of a recurrence after tracheotomy was it necessary to perform this operation again.

Bacteriological examination

Negative bacteriological findings are among the evidence of viral aetiology. Positive findings point to superinfection, which, however, occurred later. In the first few hours we nearly always found non-pathogenic or facultatively pathogenic microorganisms in the pharyngeal or tracheal swabs of the patients.

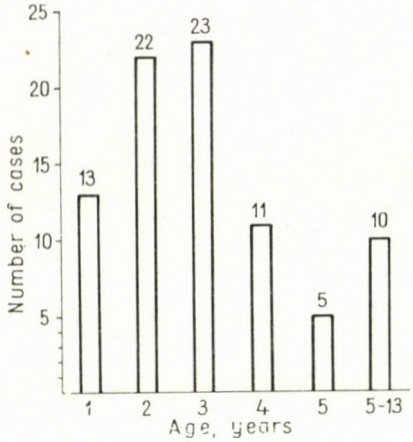

FIG. 1. The influence of age

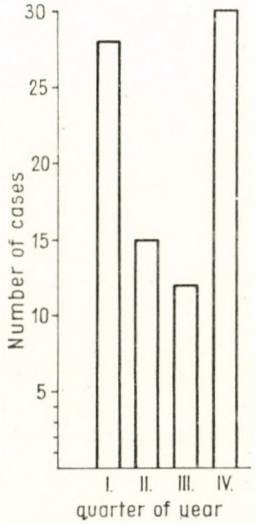

FIG. 2. The influence of season

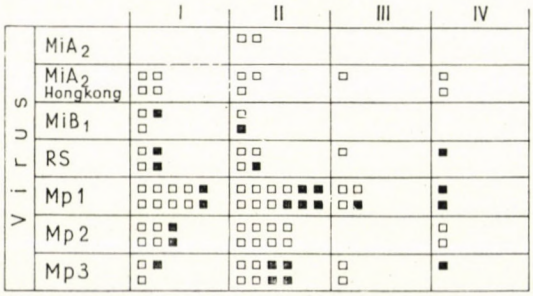

FIG. 3. Course of AOLTB due to myxovirus infection. I: Stridor, barking cough II: Stridor, barking cough, jugular retraction; III: Stridor, barking cough, sternal retraction; IV: Decompensation of respiration □ Increase in homologous antibodies. ■ Increase in homologous and heterologous antibodies

Duration of illness before admission

Signs of respiratory obstruction appeared at various times before admission. On account of the suddenness and severity of the illness, 40 children were admitted within a few hours after the onset. Twenty-seven children had been ill two days before admission and eighteen from three days to a week. In eight children of those requiring tracheotomy, the illness had started mildly 24 hours to three days before the operation, which again confirms the need for early admissionto hospital. The only exception is acu te epiglottitis which always begins acutely, but such cases were not included in the present series.

Recession of signs

Signs of respiratory obstruction and pyrexia usually receded within 48 hours except in patients requiring tracheotomy, in whom the tube could be removed in 4—5 days. The rapid improvement was due to antibiotics, conditioning of the macroclimate, and especially to corticosteroid treatment which can be regarded as specific for the condition at issue.

Discussion

When comparing the course and severity of the illness with the virological findings, it becomes evident that there is no direct relationship between the causal agent and the clinical picture. It is not possible to explain why the same type of virus sometimes causes disease of the entire respiratory system and sometimes obstructive changes, especially in the larynx. Recently, an explanation has been sought for the presence of heterologous antibodies which, according to Schumacher [8] and Chanock [1], render the organism partly immune, influencing thereby the clinical course of the illness. The presence of heterologous antibodies in infections with parainfluenza myxoviruses is considered an anamnestic reaction which is a manifestation of the previous contact of the patient with the same or different types of myxovirus of the same group. According to Chanock [1] and Wigand et al. [10], children suffer from viral infections six times a year on the average. This provides the basis for the formation of heterologous antibodies. Henle and Lief [3], Van der Veen and Sonderkamp [9] and Parrott et al. [5] demonstrated experimentally that there is a rise in heterologous antibody titre on reinfection with the myxoviruses of parainfluenza, influenza types A_1 and A_2, and epidemic parotitis. As stated above, there was an increase in heterologous antibodies in 27 patients in our series. We observed a heterologous antibody reaction not only to various types of parainfluenza myxoviruses, but also an increase in antibody titre to myxoviruses of different groups. Thus, in one case an increase in *M. influenzae* type A_2 antibody titre was observed together with the positive isolation of parainfluenza type 1, and in one child with positive cultivation of parainfluenza type 3, antibodies to RS virus were found in addition to the homologous antibodies. Besides an increase in the antibody

titre to RS virus, a significant increase in antibody titre to influenza virus type A_2 or parainfluenza virus types 1 and 3 was found in three cases. These findings must be evaluated as demonstrating mixed infections, because parainfluenza and RS virus have no cross-immunity.

Parainfluenza viruses were found in our material in 58 cases, i.e. in 69% of all myxovirus infections. This represents 15% of the total number of children investigated. This percentage is higher than the 8% reported for common respiratory infections by PARROTT et al. [5] but lower than the 30% reported by SCHUMACHER [8]. CHANOCK [1] found parainfluenza virus type 1 in 17.7% of his cases, type 2 (which is the specific virus of AOLTB) in 6%, and type 3 in 5.6%. Thus, parainfluenza virus type 1 was the most frequent in our series. The statistics of MCLEAN et al. [4] who demonstrated type 1 parainfluenza in 244 out of 390 children, are exceptional.

The positive isolation result without serological response, observed in 26 cases, can be explained as an accidental finding or by assuming that antibodies had not formed in the given time interval. This must be taken into consideration because in most virological works it is claimed that with the myxoviruses, isolation is more important than are the serological findings. Moreover, an increase in antibody titre (70 cases in our material) without confirmation by cultivation may also be regarded as a potential confirmation of the viral aetiology. In these patients antibodies to parainfluenza strains were found in most cases.

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