

When fully established the disease is grossly disabling. Earlier recognition should lead to the more frequent use of surgery in appropriate cases.

ADDENDUM.—Since writing this account another patient has had operative treatment—a successful pneumonectomy. He was one of the three extensive left-sided cases.

My thanks are due to the Cumberland County Council for permission to undertake this work. I am indebted to Dr. R. Hambridge, chest physician to West Cumberland, for drawing my attention to these cases, advising me on this paper, and putting me in touch with the patients and their clinical and x-ray records.

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AN EPIDEMIC OF ACUTE BRONCHIOLITIS IN INFANCY

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During October, November, and December, 1953, 164 children under the age of 2 years were admitted to the Children's Hospital in Sunderland suffering from acute bronchiolitis. This number represents over 30% of all admissions under the age of 12 years for this period; many other cases were taken into the Hospital for Infectious Diseases and have not been included in this paper. The objects of this report are to record briefly the explosive nature of the outbreak, the clinical picture of the illness, the mortality, and one possible system of treatment.

Clinical Description

In most of the cases an adult in the family developed a cold. A few days later the infant began to show signs of upper respiratory infection with nasal obstruction and cough; there was little systemic upset at first, but after two to four days there was a sudden increase in the severity of the illness with the appearance of persistent distressing cough, wheezing, cyanosis, frothing at the mouth, and sometimes collapse. Often the baby was seen by his family doctor in the morning, when his symptoms and signs caused no particular alarm, and yet was admitted, acutely ill, on the same evening. The younger infants suffered the most severe illness and the highest mortality.

The clinical picture of the babies during the course of this illness showed certain constant features, although the severity of these features varied from case to case. It was thus possible to recognize the disease quite easily after the first few cases had been seen.

The baby was often restless and had a constant cough; this was hard and irritating, and would sometimes be so persistent that it was almost paroxysmal. The baby had a wheeze, and on watching the chest wall there could be seen retraction of the lower ribs on respiration. Some cyanosis was present, and often a fine froth was present on the lips.

Clinical examination usually showed a tachycardia—the faster the heart the more ill the baby. Rhonchi were present over both lungs and fine crepitations could be heard, usually at the lung bases but sometimes over the whole chest. A

prominent feature was often the very poor air entry at the lung bases, and unless the baby was crying, or in some other way taking deep breaths, the crepitations could be missed. In a few cases the spleen tip could be palpated. In the most severe cases, especially those that died, the liver would be noted to be enlarged and signs of heart failure would be superadded to the clinical picture.

This clinical picture of the acute stages was often maintained for three or four days, and then usually quite suddenly the patient seemed much better, but some bronchospasm would remain for several more days, and in certain babies this persisted for several weeks, although they were otherwise well. In the acute stages the baby was loath to take fluids and took a long time over small amounts. As the infant improved, the feeding returned to normal, and this in itself was of importance in assessing recovery.

Investigations

Radiographs of all the infants were taken and white blood cell counts were carried out. The Public Health Laboratory Service examined blood sera from a small number of cases during the acute and convalescent stages, but no rise in the titre of antibodies to the viruses of the two types of influenza, streptococcus MG, or psittacosis was found. No cold agglutinins were present, and examination of specimens which were frozen immediately after removal from the upper respiratory tract was unproductive. Radiographs constantly showed increased translucency at the lung bases and there were small areas of segmental collapse in 20% of cases, more commonly in the older babies. The total white blood cell count was in the region of 14,000 per c.mm. and there was no constant pattern in the differential count.

Mortality

The mortality was 6%, all 10 deaths being in infants under 1 year of age (see Table). Complications included diarrhoea in 10%, otitis media in 2%, and convulsions in

Age Group	Total	No. Requiring O ₂	Mortality
0-6 months	108	68 (60%)	8 (7%)
6 months-1 year	34	17 (51%)	2 (6%)
1-2 years	22	9 (42%)	0

1%. Relapse after apparent recovery occurred in 2.5%. The deaths seemed to be due to right-sided heart failure, and the necropsies which were carried out on four of the cases showed terminal bronchiolitis with areas of emphysema, collapse, and oedematous infiltration of a proportion of the alveoli; the heart was dilated and there was generalized venous congestion.

Treatment

Treatment was arbitrary, and to some extent standardized. Oxygen was the most important single factor, and 60% of cases were sufficiently cyanosed or distressed to warrant immediate nursing in "oxyginaire" tent or Queen Charlotte box. Although the disease appeared to be of virus origin, antibiotics were given to all cases to prevent superimposed bacterial infection. A combination of intramuscular penicillin in doses of 25,000 to 100,000 units six-hourly, to produce an immediate effect, and chlortetracycline 25 to 100 mg. six-hourly, by virtue of its broader spectrum, was used. Oxygen was rarely needed for more than four days, and the antibiotics could be stopped within the week in almost every case. Because the pressure on hospital accommodation was so great and the rate of relapse so low, some babies were returned home after four or five days, and these were given an additional prophylactic course of sulphadimidine after discharge. In the earliest stages, feeds of glucose-saline were given, and milk was introduced as soon as the infant showed signs of improvement. Cases were seldom in hospital for more than 14 days, most of them having to be discharged after a week to make room for others.

Follow-up

About half of these infants have been seen at varying intervals in the two years following their illnesses, and no severe pulmonary complications have been noted, although a higher proportion of them seem liable to recurrent wheezy bronchitis than do the general population at this age in the district. Plain radiographs have shown no evidence of permanent lung damage.

Discussion

This disease has been described adequately from both clinical and pathological points of view in a manner much more scientific and exact than that which we have attempted here, but rarely in literature readily available to the general practitioner, who is the person most likely to see the illness in its sporadic form and in its early stages. The feature which made the deepest impression on the hospital staff during this outbreak was the rapidity of advance of the infection in a few hours from what had appeared to be a common cold to what was obviously a critical illness. Equally remarkable was the speed of recovery once the crisis had passed, the low rate of relapse, and the absence of serious sequelae. No attempt has been made to find out if minor degrees of bronchiectasis are common, but we have formed the impression that this is improbable in view of the absence of moist sounds in the lungs of those babies whom we have followed up.

The treatment employed may stimulate criticism on the ground that penicillin and chlortetracycline should not be given together, but the recovery of many desperately ill infants in the earlier stages of the epidemic made us reluctant to change this combination of antibiotics. Oxygen gave much more relief than humidification of the atmosphere with steam, although both together might have been even more effective. Drugs such as adrenaline, ephedrine, and aminophylline produced no obvious beneficial effect. Small doses of chloral hydrate and "nepenhe" were of considerable value. No attempt was made to alter the viscosity of the bronchial secretions.

The absence of significant pyogenic organisms from culture of the sputum coughed up into the back of the throat, combined with the appearance of the lungs at necropsy, suggests that the infecting organism was a virus. It also seems significant that there was an epidemic of upper respiratory infection amongst the adult population at the time.

Despite the early discharge home of many of the incompletely recovered cases, it eventually became necessary to open an unused ward in another hospital to deal with the flow of admissions.

Similar cases have been seen each year in this area over the past six years since adequate records have been kept, and it is interesting to note that this disease, although present each winter in this area, assumed epidemic proportions in 1951, in 1953, and again in 1955. The results of the 1955 epidemic will be published at a later date.

It is interesting to speculate on the nature of this illness. A distinct impression has been obtained that it is far more common than the limited reports in the literature would suggest. We would like to advance a tentative theory that acute bronchiolitis is not distinguishable from bronchopneumonia in young babies, and that it may, in fact, be the form in which bronchopneumonia attacks them. The epidemic incidence may parallel the epidemic incidence of upper respiratory infections in the older members of the community.

Excluding staphylococcal pneumonia, it must be rare indeed that any other form of bronchopneumonia occurs in young babies. If the above theory is acceptable, it would suggest that acute bronchiolitis is synonymous with bronchopneumonia in the young infant.

The great importance of this illness in the young baby is that it starts as a common cold and advances so rapidly that the general practitioner may not appreciate its severity when he first sees the baby, especially as the rise of temperature may be small.

Oxygen and chemotherapeutic agents appear to be life-saving, and we feel it unlikely that without their help the average case would survive until the initial virus infection burned itself out.

Summary

An epidemic of acute bronchiolitis in infants living in an industrial area in the North of England is described.

The rapid onset and severity of the illness, and the lack of long-term complications, are discussed.

The importance of oxygen and chemotherapy is stressed.

A possible theory of aetiology is put forward.

We wish to thank the resident doctors and nursing staff of the Sunderland Children's Hospital for their excellent care of these ill babies. We wish also to thank the Radiological and Pathological Departments, including the Public Health Laboratories, for their help.

Medical Memoranda

A Danger from Flexometallic Endotracheal Tubes

A middle-aged obese woman was recently anaesthetized for a neurosurgical operation. As premedication she had pentobarbitone sodium, 3 gr. (0.2 g.), and atropine 1/100 gr. (0.65 mg.). Anaesthesia was induced with thiopentone, 0.3 g., and gallamine triethiodide, 60 mg. The cords were sprayed with less than 1 ml. of 10% cocaine and a No. 9 "latex" armoured tube was passed. The patient was positioned on the table on her left side and anaesthesia was maintained with nitrous oxide (5 litres/minute), oxygen (2 litres/minute), and trichlorethylene (less than 0.5%). The operation, which was one for cranioplasty, proceeded uneventfully until the skull was being closed, some two hours from the beginning of the anaesthesia. About this time the patient gave signs of obstruction. The chest began to heave and the movements of the reservoir bag were reduced. On listening at the end of the corrugated breathing-tube, sounds similar to those produced by obstruction were heard, although the air passages sounded quite dry. No cause for the obstruction could be found outside the tube, and so a gum-elastic catheter was passed down the tube with suction. After this had been introduced about 6 to 8 in. (15 to 20 cm.) down the tube, obstruction became complete and the situation was remedied only by the removal of the endotracheal tube. Fortunately the operation was practically completed by this time and it was not necessary to introduce another tube. The patient was returned to the ward at the end of the operation and made an uneventful recovery.

Examination of the endotracheal tube showed a large blister, practically 1½ in. (3.8 cm.) long, which had formed on the inside of the tube about 2 in. (5 cm.) from the proximal end. Over this blister, on the outside, the colour of the tube appeared to be lighter than elsewhere, and closer examination revealed a number of patches of similar lightness. Other tubes were examined, some of which had never been used, and these too were seen to have some light patches.

Two days later the tube which had been used for the operation was taken to be photographed, and it was surprising to find that the blister had almost disappeared.