BRONCHIOLITIS[1]

HOWARD S. TRAISMAN, M.D. and JOHN A. BIGLER, M.D.

ACUTE bronchiolitis (also referred to as capillary bronchitis) is primarily a disease of infancy and early childhood. Its occurrence is uncommon after the third year of age (1, 2, 6). The onset is sudden, with alarming symptoms, and prompt recognition and treatment is essential. During the past four years, 1949 to 1953, we have seen 92 cases of this disease. In only 5 patients were there second attacks.

Acute bronchiolitis seems to vary in its incidence. Prior to 1949 its occurrence was uncommon in our experience. Then in 1949 we saw 9 cases; in 1950, 16; in 1951, 22; and in 1952, 45.

Excellent descriptions of the pathology (3, 4, 5, 6) have been reported. There is destruction of the mucosa and submucosa of the bronchi and bronchioles. Accompanying these changes are patchy atelectasis with inflammatory alveolar and interstitial involvement. This disease belongs in the broad group of bronchopneumonias; but the process is more generalized with more emphysema and smaller areas of consolidation.

No specific causative organism or virus has been found, although H. influenza has most often been thought the cause of the infection. It has been found alone or with the streptococcus, staphylococcus, and pneumococcus. Inclusion bodies have not been reported. The age and symptoms compare favorably with the cases of pneumonitis due to the distemper virus as reported by Adams (7) recently. In distemper virus pneumonitis, there is destruction and proliferation of the pulmonary lining epithelium, a predominant mononuclear exudate and characteristic inclusion bodies. Except for the inclusion bodies the pathology is similar to that reported for bronchiolitis.

[1]From the Department of Pediatrics, Northwestern University Medical School. Received for publication, September 11, 1953.

Seasonal Incidence

The disease occurs mostly during the cold months of the year. Only 10 of our cases were seen during the warm months of June through September. There was a fairly even distribution during the remaining 8 months of the year.

Age Incidence

Bronchiolitis is definitely a disease of infancy. Of the 92 cases, 76 were under 1 year of age, 13 from 1 to 2 years and only 3 were as old as 3 years. Two infants were 1 week of age, 8 were 1 month of age, 18 were 2 months of age, 5 were 3 months of age, 13 were 4 months of age, 7 were 5 months of age and 2 were 6 months of age. From the seventh to the twelfth month, there were 22 cases.

Clinical Findings

The onset is acute with marked respiratory distress, simulating an obstructuve emphysema. Respiration is very short and rapid and some cyanosis may be present. More often than not there is a persistant cough. While the dyspnea is severe, retractions are not pronounced. Often the infant becomes comatose.

On physical examination the chest appears emphysematous and is hyperresonant to percussion. Characteristically, fine crepitant rales are heard at the end of inspiration. Squeaks and rhonchi may also be present throughout the chest. Expiration is moderately longer than inspiration. The very prolonged expiration, so characteristic of asthma, is not present nor are the characteristic high pitched squeaks. The abdomen is distended and the liver and spleen are palpable due to depression of the diaphragm from the emphysema.

There is no constant febrile pattern. Twenty-five smaller infants had no fever. In 6 the temperature was 100 to 100.9,

in 16—101 to 101.9, in 18—102 to 102.9, in 15—103 to 103.9, in 9—104 to 104.9, in 2—105 to 105.9, and in 1—108 degrees F., rectally. Fever when present usually lasts from 1 to 7 days and the period of illness from 5 to 14 days.

Laboratory Findings

In 12 instances, the white cell count was below 7,000—the lowest 4,200. In the others it varied between 7,000 and 15,000 with a few cases as high as 25,000. The differential cell count was that usually seen in infants and young children with infection. The lymphocytes predominated as often as the polymorphonuclear cells. The eosinophile count was rarely above 3 per cent.

On roentgenographic examination of the chest, there was definite pulmonary emphysema as evidenced by depression of the diaphragm which is best seen on the lateral view. There is also some elevation of the ribs. The pulmonary fields are usually clear but they may be generalized small patchy areas of parenchymal infiltration. These are never as marked and are more confined to the lower half of the lung fields than in the usual bronchopneumonia.

In those patients in whom the roentgenograms could be taken during the active phase of the disease, the findings were typical. In the milder cases and in those in whom roentgenograms could not be taken early because of the severity of the illness, the chest films were usually not so typical.

There is no characteristic pattern of organisms found upon nose and throat culture. The most common organisms cultured were the hemolytic and non-hemolytic staphylococcus, the hemolytic and non-hemolytic streptococcus, streptococcus viridans, pneumococcus and diphtheroids. H. influenzae, N. catarrhalis, B. subtilis and pseudomonas were rarely present. In about one-fourth of the cases only one of the above organisms was found while in the remainder there was a mixed flora of several organisms. The staphylococcus albus was cultured from about two-thirds of the cases.

In only a few of the cases were pharyngeal smears taken and examined for inclusion bodies in the epithelial cells; in none were inclusion bodies identified.

Treatment

The patients were usually severely ill when admitted and frequently required emergency treatment. Fifty-seven or 62 per cent needed oxygen upon admission and this was required for from 1 to 3 days. High humidity was also required. This was usually supplied by the use of a Walton humidifier connected directly to the oxygen tent or incubator. Most of the others, not requiring oxygen, were treated with high humidity either in a tent or in a high humidity room. When moisture was used the air was supersaturated. We have had little experience with wetting agents but recent reports indicate they may be of added benefit.

Adrenalin, ephedrine and the antihistamines were of no value, although tried repeatedly.

We have used all of the antibiotics and the various sulfonamides, either alone or in combination. It has been our impression that the broader coverage antibiotics, such as aureomycin and terramycin, have been of distinct therapeutic value. There is frequently little or no response to penicillin, streptomycin and the sulfonamides.

Expectorants were of no value in our group of patients. We feel that sedation is never indicated and may do harm. Aerosol penicillin and streptomycin also were of no apparent value.

Because of the respiratory difficulty, continuous cough and severe illness of most of these infants, sufficient amounts of fluid and food can not be given by mouth. Because of this, it was often necessary to give blood, plasma, 5 per cent dextrose and normal saline parenterally.

In summary, our routine of treatment has been oxygen and high humidity, aureomycin or terramycin (intravenous when necessary), fluids which can be given by mouth, and subcutaneous or intravenous fluids as necessary.

Bronchoscopy is not necessary and is contraindicated in bronchiolitis. This procedure may increase the respiratory embarrassment. Because the main path-

ology is in the bronchioles and in the alveoli, there is little secretion to aspirate. For the same reason, tracheotomy is never necessary.

Mortality

There were 5 deaths in the 92 cases observed, a mortality of 5.4 per cent. One 8-month-old infant expired 2 hours after admission with a rectal temperature of 108 F. Another infant 4 months of age, admitted with a temperature of 105 F., expired in 6 hours. Two deaths occurred in infants 1 month and 19 months of age, whose illnesses were complicated by a tetralogy of Fallot—malformation of the heart. The fifth death occurred in a 17-month-old infant who did not respond to any form of therapy during the 19 days in the hospital.

Discussion

Acute bronchiolitis must be differentiated from laryngo-tracheo-bronchitis, asthma, asthmatic bronchitis and bronchopneumonia. In laryngo-tracheo-bronchitis, there is inspiratory and expiratory stridor usually with some hoarseness. There are also suprasternal, infrasternal and intercostal retractions. None of these findings are present in acute bronchiolitis. Although emphysema is also present in asthma, in bronchiolitis there is not the characteristic prolonged expiration with squeaks and rhonchi. In bronchiolitis there is poor respiratory air exchange with only slight increase in the expiratory phase. The most characteristic and differential findings are the emphysema and the fine crepitant rales at the end of inspiration. A therapeutic test of adrenalin gives relief in asthma and often has some effect in asthmatic bronchitis while it has no effect in bronchiolitis. In bronchopneumonia the rales are more coarse, some rhonchi are also heard and there often is impaired resonance. While all of these diseases occur in infants under 1 year of age, bronchiolitis is more apt to be present in the younger infants. In this series 33 cases, or one-third, were in babies 3 months of age or younger.

Because the onset is so sudden, the condition is often critical upon hospital admission. Immediate oxygen and high humidity are necessary and we do not hesitate to use aureomycin or terramycin intravenously, with the addition of subcutaneous or parenteral fluids.

No specific organisms are found by the ordinary culture methods. Although inclusion bodies have not been found, it would seem that the infection is viral in nature. Symptomatically and pathologically it resembles canine distemper as reported in infants.

Conclusion

1. Acute bronchiolitis is a disease of infancy and early childhood.
2. It is definitely seasonal, occurring during the winter months.
3. Emphysema and fine crepitant rales at the end of inspiration are characteristic physical findings.
4. Emergency treatment consists of oxygen, high humidity and broad spectrum antibiotics.

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