

chitis. For this reason, it is particularly desirable that the earliest manifestations of rickets should be observed. A child whose food has been for a considerable time deficient in fat or proteids, and who is restless at night, and desires to remain uncovered, and who sweats profusely about the head, has rickets. Particularly is this true if, in addition, there is delayed dentition, and laryngismus stridulus, or some other neurosis. Bronchitis occurring in such a subject, demands treatment directed to the general malnutrition rather than to the local condition. It is often said that dentition causes bronchitis, but so far as my own observation goes, dentition seems active as a cause of bronchitis, only in infants whose nutrition is below par.

Every attack of acute bronchitis leads to some enlargement of the bronchial glands. Repeated or prolonged attacks often cause a very considerable hypertrophy of these organs, particularly in those children who are predisposed to glandular enlargements, the so-called scrofulous. Broncho-adenitis once established becomes a very potent factor in the causation of subsequent attacks of bronchitis. Bronchitis occurring several times during a winter usually means that the child is the subject of enlarged bronchial glands. There is probably no other one factor in the pathology of bronchitis more important than this of broncho-adenitis. Often these enlarged lymphatics become the seat of tuberculosis, which fortunately only rarely terminates in pulmonary phthisis. Not infrequently, however, these glands remain enlarged, and resist purely medical treatment quite strongly, and require for their complete cure a removal to the seashore. Such cases are not infrequently mistaken for pulmonary tuberculosis.

Chronic bronchitis, which is rather uncommon in the child, acts in much the same way as broncho-adenitis, as a cause for new attacks of acute bronchitis.

What is the influence of cold and dampness in the causation of bronchitis? That they have some influence can hardly be doubted, because of the relatively large number of cases of bronchitis which occur in the cold and wet seasons. But that they have the over-weening importance so commonly ascribed to them, is more than doubtful. That they do not always produce bronchitis indicates that some other factor is necessary to complete their operation, and this other factor is probably to be found in broncho-adenitis, or some form of malnutrition.

Other causes of bronchitis, such as inhaled irritants, obstructive heart lesions, Bright's disease, etc., we will not discuss.

The following conclusions are offered:

1. Bronchitis arises from a wide variety of causes.
2. The great variety of causes giving rise to this condition indicates that it is probably always secondary and never primary, and should be considered as a symptom, rather than a disease.
3. The principal causes of bronchitis in infants and children are the poisons of the acute infectious fevers, intestinal poisoning or infection, malnutrition, and broncho-adenitis.
4. The diagnosis of bronchitis should include a diagnosis of the causative factors so far as possible.
5. The treatment of bronchitis should include not only attention to the local conditions, but also the amelioration or removal of the causative factors.

THE PATHOLOGY AND SYMPTOMATOLOGY OF ACUTE BRONCHITIS AND BRONCHO-PNEUMONIA.

Read in the Section on Diseases of Children, at the Forty-fourth Annual Meeting of the American Medical Association.

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ACUTE BRONCHITIS.

Pathology.—The late Dr. Flint sums up the pathology in four lines. Although brief it covers the ground, and I can not do better than reproduce it: "Acute ordinary bronchitis is an inflammation affecting a mucous structure, leading to a secretion of mucus and the production of muco-pus in greater or less abundance. Resolution takes place in this situation without the occurrence of ulcerations. It belongs among the asymmetrical diseases."

Symptoms.—The symptoms of bronchitis differ much in degree, from a slight cough and indisposition barely noticeable, to the severe attacks denominated capillary bronchitis, from which few ever recover.

In young babies and children under five, the disease usually commences with coryza, or in common parlance, "a cold in the head." This is not invariably the rule, however, for we sometimes notice abrupt seizures similar to attacks of pneumonia or croup. In addition to the usual symptoms of coryza, such as wheezing, defluxion from the nostrils, etc., there is a dry, harsh paroxysmal cough sufficient to prevent the child from sleeping in many cases. The respiration is somewhat accelerated, and nursing babies are made very cross and fretful when attempting to nurse, from the inability to breathe readily through the nose. They are obliged to let go of the nipple from time to time, to take a breath, and then resume their meal. The amount of fever in these mild cases is slight; the temperature perhaps will not rise above 99 degrees. The pulse is more affected, and from the increased frequency of respiration and the nervousness and excitement consequent upon the disorder the pulse may run up to 120 or 130. In the more severe cases the child is plainly sick. It wants to be rocked or carried, continually cries and worries at the approach of strangers and refuses to play or be amused in any way. The fever in these cases is considerable, but must not be estimated by the rapidity of the pulse, which is usually 160, and often as high as 200 to the minute. The temperature, which alone is to be relied on in these cases as to the severity of the febrile process, usually reaches 103 degrees F., in simple uncomplicated bronchitis. A fair average would be 101 degrees to 102 degrees.

The skin is dry, hot, and burning to the touch, and the cheeks are flushed. The respiration is very rapid. The cough is dry, harsh and persistent, and after a time somewhat painful. The expectoration—which in babies is a misnomer—is scanty and consists of a little viscid mucus which is swallowed the moment it is coughed up. The tightness persists for some days unless appropriate treatment be instituted, and is a source of much annoyance and suffering. Mild attacks may terminate in a week, but when at all severe the disease is apt to last longer; that is, the principal symptom, which is the cough.

In older children we observe some deviation from the description given above. A child of six or eight is able to expectorate and to describe his feelings. There

is no expectoration at first, but after a day or two, especially if treatment has been instituted early, the cough loosens and the phlegm is raised with little effort. The child complains at first of tightness and constriction across the chest, with a scraping sensation beneath the sternum on coughing. There is also more or less laryngitis present, with pharyngitis of a mild grade in many cases. This gives rise to a sense of tickling in the throat which provokes a desire to cough almost constantly where the local irritation is pronounced.

Many cases of bronchitis in children of this age begin as laryngitis and extend down by continuity of structure. The fever is not so high with older children, nor is the respiration so rapid. After the cough has lasted several days, most children who are old enough to talk will tell us that they have pain in the stomach—the result of traction on the diaphragm from the persistent coughing.

BRONCHO-PNEUMONIA.

Pathology.—This disease is known by many names. By some writers it is termed capillary bronchitis, a most unfortunate designation. By others it is called lobular pneumonia or catarrhal pneumonia. The result has been to utterly confuse the minds of students, and many practitioners have only a vague conception of the actual pathologic condition.

Catarrhal pneumonia is not like croupous pneumonia, a distinct and independent disease clinically, but in the great majority of cases it is a secondary phenomenon, which may develop in the course of acute and chronic diseases of various kinds. It almost always follows bronchitis. The same process which produces catarrh of the bronchial mucous membrane, in its further course invades the bronchioles and the alveoli, and here leads to catarrhal pneumonia. (Strumpell.) Measles, in my opinion, has been given undue prominence as a factor in the causation of this disease. Bronchitis from whatever cause, measles, whooping-cough, or the simple variety, is the starting point in most cases.

The ball-valve theory, where a plug of viscid mucus acts as the valve, has been accepted by many writers to explain the occurrence of collapse or atelectasis. Others believe that pus is sucked into the alveoli by the labored respiration. Dr. Morrill¹ thus tersely sums up the matter: there is inflammation of the bronchial mucous membrane, which involves the walls of the smaller tubes and the surrounding connective tissue by direct extension, and the bronchioles, alveolar passages and air-cells, either by direct extension or by the migration of inflammatory material. Moreover, this material may occasion collapse of groups of vesicles, an accident in the causation of which feeble respiratory power and narrowing of the lumen of the smaller tubes materially assist.

Symptoms.—As has been already mentioned, broncho-pneumonia almost always develops secondarily in the course of other diseases. Hence it happens that its symptoms are often subordinate to other prominent symptoms of the disease. When broncho-pneumonia follows an attack of measles, it begins with the symptoms of an acute bronchitis. The inflammation advances rapidly and involves the pulmonary tissues. On the other hand, when the disease supervenes in cases of whooping-cough, its

advent is slow and insidious, and is usually accompanied by a decrease of the paroxysms. When it occurs as a distinct disease by itself, however, the length of time during which it may be preceded by acute bronchitis, without any rational or physical signs of consolidation, is extremely variable. Morrill gives the extremes as five and twenty-eight days.

The extension of the disease to the lung tissue proper, manifests itself by increase of fever, dyspnea, and a change in the character of the cough, which becomes short, painful, hacking, and as a rule much more frequent. The child is no longer able to rid its lungs of the steadily accumulating secretions. The respiration increases in frequency and the face assumes an anxious, frightened expression. It makes no attempt to talk as a rule, instinctively realizing that it has no breath to spare for that purpose. Young children do not expectorate, but during a violent coughing spell viscid and frothy mucus frequently escapes from the mouth and then is seen to differ from the typical sputa of lobar pneumonia. As fresh areas of lung become involved, paroxysms of dyspnea occur and all the symptoms increase in severity. When extensive collapse takes place, the dyspnea increases, the temperature falls, the cough ceases, and the child rapidly sinks into a comatose condition. At the same time the face becomes livid, the skin cold and clammy and death usually follows in a few hours. This disease has no regular march of invasion. Its forces scatter and attack different areas of the lungs.

The morbid process is complex, and absorption of the products of inflammation, as a rule, is so slow that it is extremely difficult to define the stage of resolution. (Morrill.) The pulse is extremely rapid from the beginning of the attack, and continues so for some time after the decline of the temperature. This is usually explained as being due to the weakness of the patient. As is well known, the pulse varies greatly in sick children, and writers differ as to what constitutes an average rate for this disease. As a rule, I think they place it too low. There are few cases of true broncho-pneumonia in young children where it will be less than 150, and more where it will be nearer 200. Morrill says that the latter number (200) has been observed more than once in cases terminating favorably. I have recently had an opportunity to corroborate the truth of this statement. The respiration also varies greatly, and what has just been said with regard to the pulse rate applies with equal or even greater force to the breathing. Excitement from any cause, however slight, will immediately affect the rate and rhythm. When the disease is fully established, the respiration becomes very rapid, often reaching 80 per minute, and I have seen it even higher. Expiration is often jerky or grunting. Sometimes the child makes a moaning sound. Morrill tells us that the breathing of young children in broncho-pneumonia is no longer abdominal; the ribs rise and fall as in adults. Osler² states that death occurs from heart paralysis, but I believe with Morrill that "death in broncho-pneumonia results more frequently from respiratory than from heart failure." The temperature varies with the other symptoms. It will average 104 degrees to 105 degrees F., during the acute stage of severe cases. It has been known to reach 107 degrees F., and yet recovery follow. A remission of three or four degrees in the morning is usually observed, but the fever is

¹ Keating's Cyclopaedia.

² Practice of Medicine.

very irregular and often the morning temperature will be higher than the evening, but this does not continue for any length of time. There is no regular ratio between the pulse, the temperature and the respiration.

According to Morrill, a favorable result in broncho-pneumonia is never immediately preceded by an abrupt decline in the temperature. This phenomenon when present means collapse, and is of the gravest import. The tongue is usually coated more or less in the early stage but is not invariably so; it sometimes looks red and raw. In the later stages, the tongue becomes dry and sore. Complete loss of appetite is the rule from the beginning of the acute symptoms. Thirst is present in most cases but sometimes is less than might be expected from the severity of the fever. On auscultation during the early stages of broncho-pneumonia, râles of all sorts and sizes may be heard, but at a later period there are persistent sub-crepitant râles in one or more spots. The course of an extensive broncho-pneumonia is usually quite protracted. Even in favorable cases the disease rarely lasts less than two or three weeks, and often much longer.

SOME PHASES OF BRONCHO-PNEUMONIA IN CHILDREN.

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In France, England and the United States of America, broncho-pneumonia is usually reported in mortality tables as catarrhal pneumonia, capillary bronchitis or congestion of the lungs, and in a study of statistics this should be borne in mind and these terms included under the designation, broncho-pneumonia, at least until greater harmony in terminology prevails. It may sometimes be mistaken for acute bronchitis or pneumonia. That these mistakes are made is evidence of two things: 1, a possible carelessness in diagnosis; and 2, some confusion as to the precise pathologic condition termed broncho-pneumonia. It is certainly confusing to read some of the definitions given of this disease. If one is to understand the obstruction of a small bronchial tube and the resulting inflammation about it to be the special condition in broncho-pneumonia, then the autopsy would usually have to determine the diagnosis. If an inflammation of the connective tissue of the walls of the minute bronchioles is the chief element in broncho-pneumonia, the diagnosis will always be difficult. If broncho-pneumonia is a disease involving inflammation of both the bronchial tubes and lung tissue, a diagnosis can almost always readily be made. It is in this sense that I use the term. A broncho-pneumonia may originate in a simple catarrhal inflammation of the mucous membrane lining the bronchial tubes; this morbid condition may extend to the deeper tissues, and eventually involve the lung tissue.

It often happens that the thickening and induration of the walls of the minute bronchial tubes close the lumen of the passages and a portion of lung is destroyed, the vessels to the part may become obstructed and degeneration result.

The catarrhal origin and the involvement of the lung tissue are more easily discerned than the obstruction of vessels or the degeneration of a small area of lung substance. If, however, there are a number of air vesicles occluded, and an appreciable area of lung substance involved, a diagnosis may easily be made.

I desire in this place to call especial attention to a class of cases which may be followed by serious results, but for which the physician is usually not consulted at the proper time. I refer to common colds. It may not infrequently happen that an acute catarrhal cold involving the nose and throat persists, and the inflammation extends into the bronchi and thence to the air vesicles and lungs, and an acute broncho-pneumonia is excited before the patient considers it necessary to call a physician. This class of cases will be met with most frequently in children, but may often be encountered among adults likewise. Such a cold frequently subsides without the interference of medication, and that common fact leads people to be careless in regard to such ailments. This undoubtedly is one of the casual factors of the high mortality of cases which come under the observation of physicians. Even those cases which do not die at once, frequently are the subject of lesions which eventuate fatally. To illustrate my statement I will refer briefly to two cases occurring in children and two in adults:

Case 1.—Robert D., 6 years old, had suffered with two or three hard colds during the fall and winter. January 30 I was called to see him. I was told that he had been sick for a week, and that I was called because his cold did not yield to the domestic remedies which had previously been sufficient. The tonsils were swollen and red, with small deposits of yellowish-white exudate. Bronchitis was marked and the inflammation had already involved the air vesicles and lung tissue. The respirations were somewhat labored. Bronchial râles were abundant. Respiratory sounds subdued and interrupted in both lungs. Percussion revealed slight dullness over left lung; right slightly, if at all modified. Pulse 125, temperature 103.5 degrees. Next day patient was slightly better and improved until the sixth of February when he was dismissed cured. The sputum was not seen in this case, but in the following it was stained with blood.

Case 2.—Zadie S., 8 years old, had spent the winter in the South with her parents. Upon returning home she contracted a severe cold. Had catarrh of the nose and throat and a cough. Medicine was secured "to break up" the cold, but she gradually grew worse until after a week it was found necessary to call a physician. When I saw her she had catarrhal sore throat and some bronchial râles with a persistent and severe cough. I was informed that for several days she had been ailing with what seemed to be only an ordinary cold. Percussion sounds normal. Auscultation revealed nothing beyond a bilateral bronchitis with a tendency to involvement of the small bronchi and in a few instances the air cells. Pulse 120, temperature 102 degrees. The symptoms increased in severity for a week, the temperature gradually rising to 104.6 degrees, and the pulse to 140. Percussion revealed small areas of dullness in the middle third of both lungs, but chiefly in the left. The respiratory sounds were modified, presenting bronchial râles, vesicular crepitation, dyspnea; some distress was complained of in the stomach. No other pain was present. The symptoms began to subside in eight days and at the end of another week she was dismissed, the lungs being clear and respiration normal. The third case was an adult.

Case 3.—Mrs. E., was in usually good health, had always been well, having never needed to consult a physician, except for sore throat from which she suffered at times. At the time of her exposure she was in a severe snow-storm and became thoroughly chilled. For several days she suffered from a severe catarrhal cold of the nose, throat and bronchial tubes. Soon however, she felt quite well and resumed her ordinary household duties. The first exposure occurred at Christmas time. Another exposure occurred in one