

## Original Articles.

## THE FREQUENCY, PROGNOSIS AND TREATMENT OF LOBAR PNEUMONIA IN INFANTS AND CHILDREN.\*

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LOBAR pneumonia in infants and children, as compared to adults, differs in a general way in its location, in that double pneumonia is rarer in children than in adults, being half as frequent. Pneumonia of the upper lobes is more frequent in children. The affection of more than one lobe is not so common in children as in adults, being half as frequent; that is, roughly speaking, 40% of adult cases show an affection of more than one lobe, whereas only 20% in children show this involvement. The right lung, according to Jürgenson and Von Ziemssen, is more frequently affected in children than in adults. In the statistics of Von Ziemssen the proportion was 126 in the right to 108 in the left lobe. I will show in another place that these statistics correspond quite accurately with my own personal cases.

The occurrence of so-called central pneumonia of a lobar nature, if we accept the statements of textbooks, would seem to be more frequent among children than adults. I cannot say, however, that, in a general way, this has been my experience. The diagnosis of central pneumonia in children, I find, is very common in practice; its substantiation is very difficult. In some epidemics central pneumonia is more common than in others. The mode of infection, in these cases, seems to determine the location of the pneumonia. Without the physical signs one should hesitate to make a diagnosis of central pneumonia.

The pneumonia of infancy and childhood as compared to that of the adult presents certain differences in its course which should impress the physician. In certain epidemics meningeal symptoms seem to predominate, especially in those cases in which the apices of either lung are involved. In other epidemics pneumonia with meningeal symptoms is not so frequent.

In children pneumonia is more apt to be followed by purulent pleurisy, especially below the age of four years, than by pleurisy with effusion, as in the adult.

**Frequency.** — With this introduction as to the location of pneumonia and its complications in infancy and childhood, as compared to the adult, we will take up some statistical data which will enlighten us as to the frequency of pneumonia at the different ages of infancy and childhood.

During my fifteen years of service in dispensary practice I saw 839 cases of pneumonia of all kinds and types. Of these cases 582, or 69%, occurred before the end of the first two years of life. The greatest frequency was, therefore, between the first and second years. This corresponds quite accurately with the statistics of Jürgenson who, in 312 cases of pneumonia in children, showed

that 157, or 50%, occurred in the first three years of life.

As to sex, there is not, in children, that preponderance of the male sex that we find in adults, for of the 839 cases mentioned 436 occurred in male and 403 in female children, thus showing about an equal distribution of morbidity.

As compared to adults, the involvement of the various parts of either lung — speaking now essentially of lobar pneumonia — is slightly different in infants and children. Of 217 of my own personal cases of lobar pneumonia I found the following involvement of either lung:

Right lung: Upper lobe, 74 cases; middle lobe, 8 cases; lower lobe, 41 cases. Left lung: Upper lobe, 35 cases; lower lobe, 58 cases.

It will thus be seen that the right lung is mostly affected, and that the upper lobe of the right lung rather than the lower lobe of the left lung is mostly involved. This may be due to some difference in the material, which is hospital material, and mostly younger children. In Jürgensen's statistics — I quote Jürgensen because his are the most carefully worked out statistics we have on fibrinous pneumonia — the right side was involved in 49% of cases, the left side in 43%, and 7½% of cases showed involvement of both lungs. In my own cases I have not included those in which both lungs were involved, because in most of them, no autopsy being obtained, the children having recovered, they were of such an age and the course of the disease was such that it was impossible to decide whether we had true fibrinous or bronchopneumonia to deal with. In this one respect, possibly, the statistics leave something to be desired. In only two of my hospital cases could I say positively that both lungs were involved.

As to the age of incidence, my youngest case was three months old. Jürgensen's youngest observed case was four months. In the statistics of purely lobar pneumonia, as in pneumonia of all kinds, more than 50% were below two years of age. Of 82 cases observed between the years 1901 and 1904, inclusive, 48 were below five years of age.

**Prognosis.** — The prognosis of lobar pneumonia in infants and children will vary as to the age, severity and kind of infection, as to the amount of lung involved, and the presence or absence of complications. Generally speaking, the prognosis as to age is best below ten years. In mixed statistics given by Jürgensen of cases of lobar pneumonia, the mortality was as follows: Up to ten years, 4.8%; ten to twenty, no mortality; twenty to thirty, 6½%; between sixty and seventy 25.8%, which was the largest. In my own experience most of the deaths, in 82 cases of the past four years, were below the age of two and one-half years. Only one death in eight occurred after the fifth year. In other words, the younger the child, the greater danger. This corresponds quite accurately with the experience of Jürgensen, Von Ziemssen and Leichtenstern abroad, and American observers such as Holt and others. Therefore, any statement as to the mortality of lobar pneumonia in infants and children should

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be accompanied by a statistical statement of the age, for if we deduct the fatal cases of my 82, which were 8, we would have, above two and one-half years of age, a mortality of only one in 75 cases, whereas the actual mortality of my cases was 9.7%.

The season of the year also influences mortality. In the winter months, when the epidemic is at its height, the mortality is greatest, and in the spring and summer months it is lowest. This is due, possibly, to the great virulence of the infection.

Complications, also, influence the prognosis. In infants and children a complicating pericarditis is fatal. This is especially so in younger infants and children. At an advanced age, however, above five years, pericarditis of a pneumococcus type, if recognized in time, may be led to a favorable issue by operative interference. I have seen one such case. On the other hand, the diagnosis of pericarditis in younger children and infants is very difficult during life, perhaps in most cases impossible. It is invariably fatal. Other complications, such as otitis, pleurisy, empyema, do not materially influence the prognosis in infants and children if recognized early and treated on sound principles.

As to the prediction of the prognosis, a study of the blood has been heralded in past years as a key to the outcome of the affection. My own experience of 90 cases of fibrinous and bronchopneumonia examined with reference to leucocytes, and also with reference to leucocytosis as a key to prognosis, showed that even in the fatal cases of both forms of pneumonia in infants and children there was marked leucocytosis. The increase of leucocytes in the fibrinous form of pneumonia is especially marked at the time of crisis. In bronchopneumonic forms leucocytosis was marked at about the time of the drop of temperature. From the observations of Billings and Ewing it must be concluded that in the adult leucocytosis is a favorable sign in lobar pneumonia. It bears, however, as Heiman believes, a certain ratio, in children at least, to the amount of lung involved. In children, also, leucocytosis is more marked, that is, there is a greater number of leucocytes to the cubic millimeter of blood, than in the adult. The absence of leucocytosis is certainly a grave prognostic sign in children, but its presence, even to a high degree, does not preclude a fatal issue to the disease.

*Treatment.* — Lobar pneumonia, being an acute infectious disease, absolutely self-limited in its course, uninfluenced by any mode of specific treatment that we know of, it should be the duty of the physician to manage a case of lobar pneumonia in an infant or child very much on the same principles as he would manage a case of any other infectious disease, such as typhoid fever, with a certain allowance for the duration of the disease and the severity of the infection.

In lobar pneumonia, the temperature, though continuously high for days, does not exert those changes which the continuous temperature

for weeks does in typhoid fever. On the other hand, the strain on the heart in lobar pneumonia for the period of infection of one week is greater than it is for the corresponding time of such a disease as typhoid fever. We refer rather to the physical strain. In typhoid fever the effect of the continuous temperature and toxemia on the heart muscle is of the slow, progressive type, whereas, in pneumonia the effect is sharper and crowded into a shorter space of time than in the disease of longer duration, and, therefore, we have fewer changes in the myocardium as such, but more strain on the vitality of the muscle tissue, due to toxemia, high temperature, and the obstruction of the circulation in the lung. In other words, in pneumonia there is really more heart strain. In typhoid fever we have more of the slow, toxic myocarditis. The physician must be guided by the requirements of each individual case. In a younger child, on account of the high mortality and the lack of resistance to infection which we have seen, especially below two and one-half years of age, lobar pneumonia will require more active management on the part of the physician and the nurse, than when it occurs in a child above six years of age, for, as we have seen, in older children the disease is better borne than in younger children. What seems to overwhelm younger infants and children is the violence of the infection and the strain on the heart, accompanied by the temperature. The continuously high temperature of a week is less well borne by the child below three years of age than by one above it, and for that reason requires more active, judicious treatment. In an older child a temperature of 104°, to my mind, is a normal temperature of pneumonia, and would be apt to cause very little disquietude, whereas a similar temperature in a young infant or child, persisting for any length of time, would need much more active treatment because it does much greater damage to the organism. The heart needs more support to conquer the infection in the younger infant and child than in the older subject. In children in general the heart is much more fit to withstand the infection of lobar pneumonia than in the adult, for they have no constitutional or acquired taints, such as alcoholism or syphilis, to stand in the way of recovery.

The temperature in lobar pneumonia, as stated, requires treatment according to the amount of mischief it is doing. Some infants and children will bear remarkably well a temperature which other infants of the same age will not. Hydrotherapy is our sheet-anchor in the treatment of the temperature. It is only in exceptional emergencies that we resort to other measures. In applying hydrotherapy to infants and children, it must not be forgotten that the severer methods, such as the cold bath, or the Brandt bath, are second in importance to the milder measures of sponging, or the application of cold compresses wrung out of water at a temperature of 75° to 80° F. In the management of my hospital cases I have found that infants and children, as a rule, bear the cold bath very badly. They become blue,

and the reaction is delayed, as we call it, and it is very difficult in some children, particularly bottle-fed infants, to rouse them out of the depression which is caused by the application of the cold bath. I therefore prefer sponging in these cases, and apply a certain index. If an infant or child does not react from a cold sponge I apply a lukewarm sponge. In some infants and children it is impossible even to sponge, and in such cases I apply compresses, wrung out, of water at 75° to 80° F., from the neck to the umbilicus.

The heart should always be supported if necessary. Some children, especially those above five years of age, seem to bear the disease so well that very little, if any, cardiac support is called for. In children below this age some require active cardiac support, and this is met as the case demands. Alcohol and digitalis are the principal remedies, in my estimation, in supporting the heart in lobar pneumonia in infants and children. A reliable tincture of digitalis is the most convenient preparation to use. Alcohol in the form of whisky is a most valuable preparation, and much better than brandy. It should not be given in excessive doses, as it is apt to upset the stomach and, therefore, interfere with nutrition. If cyanosis is present, showing a certain amount of strain on the right ventricle and insufficiency of the left, nitroglycerin is a most useful remedy, at least in my hands, given in doses of 1-100 to 1-150 of a grain every few hours. In young children and infants a smaller dose is called for. Strychnia is a very popular drug, I find, among practitioners in the treatment of pneumonia of all kinds. Its use in infants and children is most prevalent, and some physicians advise the use of this drug to its physiological effect. I have seen cases of pneumonia treated with strychnia to such an extent that it was necessary to suspend the drug and to treat the physiological effects of the strychnia rather than the pneumonia; in other words, the child exhibited the effects of poisoning with strychnia and was suffering more from this than from the pneumonia. I would, therefore, beg that this drug be used with greater caution in the treatment of pneumonia, more especially as, from a scientific standpoint, we do not, as yet, know the exact mode of its action in this disease. In all probability it supports the respiration by a so-called stimulation of respiration. If such is the case I advise its moderate use in the treatment of this disease. It should not be used in those cases, examples of which I have repeatedly seen, of nervous children who, without its use, showed tremors and unrest due to toxemia and high temperature.

Thus far I have not spoken of the nutrition of the patient. This, I may say, is by far the most important element in the management of pneumonia in infants and children. It can be readily appreciated how important this is in young infants and children who depend almost entirely upon one form of food to resist the inroads of the disease. A child with pneu-

monia should be fed with a light assimilable diet, given at regular intervals. It should be carefully nursed and the condition of the tongue watched. If the tongue is dry, small quantities of water, a teaspoonful at a time, should be given at intervals of half an hour or so throughout the day, if it can be done without disturbing the patient to any excessive degree.

In managing a case of pneumonia the hourly stimulation, so much in vogue in certain quarters, is to be deprecated, as is also the disturbance of the patient for the sake of nutrition at short intervals. We should try to give the medicines and the food at about the same time so as not to disturb the patient too much. If we can make the intervals of medication and nourishment every three hours we are serving our patient the best, for rest is as important to a case of pneumonia as medication, and in some cases more so.

I have not seen much good result from the administration of oxygen, but I try to keep the sick room at an equable temperature, — 67° to 68° F., — well ventilated, so as not to be uncomfortable for the patient or attendants. I think that excessive cold is no more conducive to recovery than excessive warmth. Patients with pneumonia should have quiet and isolation as far as is possible.

The physician, in the treatment of lobar pneumonia in infants and children, should not forget that one of his principal functions is to watch for complications. If, during the course of the disease, the patient runs a very high temperature, 105° F. or above, for any length of time, the ears should be examined. If at the end of a certain period of time, the seventh, eighth, or ninth day, the temperature does not drop, we should examine the chest very carefully for effusion, and if such is found and does not disappear after a few days, a needle should be introduced to investigate its nature. If there is no effusion in the chest there is no explanation in the lung for the continuance of the temperature, the heart should be examined, and we should never lose sight of the possibility of ear complications.

There are some things which I would like to particularize about in the treatment of pneumonia in infants and children, especial in pneumonia of the lobar type. These children suffer from pain, due either to the cough or to the presence, as we all know, of pleuritic complications. We should try to control an excessive amount of coughing, and also to relieve the pain. I rarely make use of the stronger preparations of opium, such as morphine, even in older children. I content myself with codein for the relief of the cough and pain in older children, and in younger children with the camphorated tincture of opium, or the wine of opium.

In younger children tympanites is a baffling symptom. We should not hesitate to give a good calomel purge for the relief of this symptom. Tympanites will sometimes cause great distress and embarrass the heart to an excessive degree. In such cases of great tympanites 5 gr. of calomel

is not an excessive dose for a young child. In cases of ordinary tympanitic distention  $\frac{1}{2}$  gr. of calomel repeated after a two-hour interval suffices.

In the course of pneumonia there are attacks of collapse in which the patient becomes blue, the extremities cold, the heart weak, and the pulse rate high. Such cases are best treated by the application of warmth, both to the extremities and to the heart, and the internal administration of camphor and nitroglycerin.

In closing this paper on the frequency, prognosis and management of lobar pneumonia in infants and children I would say that its skillful management can help the patient to overcome the infection, and that its mismanagement may turn the scale against the sufferer.

### ACETONURIA IN NON-DIABETIC SURGICAL CASES.

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In the *Annals of Surgery*, vol. xxxvi, Brewer reported a fatal case of appendicitis with acetonuria. The death in this case was ascribed to some condition of auto-intoxication of which the acetonuria was an accompanying sign. The impression received from this case is that the gravity of the prognosis was decidedly increased by this condition with its accompanying acetonuria.

Brackett, Stone and Low,<sup>1</sup> in the summary of a paper on aciduria (acetonuria) associated with death after anesthesia conclude "that the appearance of acetone in the urine in quantity sufficient to give the ordinary clinical reaction, is to be regarded as an indication of serious and possibly dangerous disturbance of the metabolism."

Having had attention drawn by these papers to this condition it was natural to examine the urine for acetone and diacetic acid of any patients whose convalescence deviated from the normal course. The next step was to determine as a routine the presence or absence of acetone and diacetic acid in the urine of patients entering the hospital. This was undertaken to discover if possible the importance of the condition of acid auto-intoxication, or whatever it may be, which is accompanied clinically by the presence of acetone in the urine, as a contra-indication to operation or as an element in the prognosis.

The conclusions implied or definitely stated by Brewer, Brackett, Stone and Low in their papers do not seem to be in accord with those found by this further study. From this it appears that the condition is naturally divided according to its severity into three grades, and illustrative cases are given below which occurred from March 6 to Sept. 21, 1904, in one of the three surgical services of the Boston City Hospital. No attempt has been made to report all the cases.

During the summer of 1904, the urine of 110 patients was at entrance examined for acetone and diacetic acid. In addition 35 patients

were examined for acetone alone, and 5 for diacetic acid alone. Among these 9 were found where acetone was present, in 4 of which it was associated with diacetic acid. In addition to these a number of other cases with positive tests was found which were, however, excluded from this series because of a possibility that the urine might have been collected after etherization, as ether had been given immediately on entrance. These cases included accidents, fractures and emergencies where the urine that was examined might have been collected after the operation. In these cases, therefore, it could not be denied that the acetone present was not due to the anesthesia as it has been shown that a distinct amount of acetone may be found in the urine after narcosis. A brief résumé of the cases follows in which acetone alone or with diacetic acid was found by routine examination.

**CASE I. Tubercular adenitis of the neck.** — June 3, 1904, Helen D., sixteen years. For nine years, a swelling on both sides of the neck below the angle of the jaw. June 6. Dissection of neck and removal of glands. June 21. Discharged. Left side of neck healed. Small sinus on right. Urine examination, June 4, day after entrance: albumin and sugar absent, acetone present, diacetic acid absent.

**CASE II. Cerebral concussion.** — June 6, 1904. Herbert F., seven years. While playing yesterday was run into by another boy. Fell, striking ground with head. No head symptoms. To-day complained of severe abdominal pain. Because of this pain, some drowsiness and incoherence, brought to hospital. Examination showed the condition to be principally mental. Drowsy and unable to think clearly. Vomited once or twice after entrance. Discharged on June 8. Urine examination June 7, day after entrance: no albumin or sugar, slight amount acetone present, diacetic acid absent.

**CASE III. Appendix abscess.** — June 7, 1904. Sarah E. B., fifty years. For two and one-half years, twenty-four years ago, passed considerable pus in urine. Peritonitis after childbirth ten years ago. Stone removed from bladder at that time. Had malaria during period when twenty-six to thirty-four years old. Feeling mean for six weeks. Gave up work three days ago. Considerable pain in right side of abdomen for past week, worse when lying down. Examination: Some spasm and tenderness between ribs and ilium on right and in region of gall bladder. Dullness and especial tenderness over a mass felt just below the costal margin. June 17. Abscess cavity running from perinephritic space downward, outward, and forward to appendix; region drained. Aug. 4. Discharged to Convalescent Home with a sinus. Urine on June 8, day after entrance, contained both acetone and diacetic acid but no albumin or sugar.

**CASE IV. Chronic appendicitis and inguinal hernia.** June 10, 1904. William L. B., twenty-six years. History of several attacks of abdominal pain. This morning general abdominal discomfort and cramps. Pain increased and became localized over the appendix region. Several movements of the bowels. Has slight inguinal hernia. June 18. Interval operation for appendicitis and Bassini operation on the hernia. July 11. Discharged. Urine, June 11, day after entrance; no albumin, sugar or diacetic acid; acetone present.

**CASE V. Cerebral concussion.** — June 15, 1904. James J. M., ten years. Last night fell from wagon to ground, striking head and abdomen. Came to hospital

<sup>1</sup> BOSTON MEDICAL AND SURGICAL JOURNAL, July 7, 1904.