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CEREBRAL SYMPTOMS

IN THE

PNEUMONIA OF CHILDREN

BY

L. EMMETT HOLT, A.M., M.D.
ATTENDING PHYSICIAN TO THE NEW YORK INFANT ASYLUM

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CEREBRAL SYMPTOMS IN THE PNEUMONIA OF CHILDREN.[1]

Two points about pneumonia are brought out very prominently in almost every text-book devoted to diseases of children. The first is that disturbances of the central nervous system are much more likely to be met with in young children than among adults; the second, that these are almost invariably associated with disease of the apex of the lung. My own experience abundantly confirms that of others regarding the first point. Since the second one, however, has been denied by an eminent authority,[2] I have gone over my own clinical records with reference to nervous symptoms, and submit the results in this paper for your consideration.

There existed for analysis one hundred and seventy-three cases, which may be briefly characterized as follows: Seventy-three were lobar pneumonia,[3] with two deaths; and one hundred, broncho-pneumonia, with a mortality of thirty-four. The sexes in broncho-pneumonia were nearly equal; while in lobar pneumonia the males predominated, forty-three to thirty. As to age, one hundred twenty-three patients were two years of age or under, and only thirteen were over five years of age.

Thirty-four cases, or twenty per cent. of the whole number, presented decided cerebral symptoms. I have

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[1] Read before the New York County Medical Society, March 26, 1888.

[2] Eustace Smith: Clinical Studies of Diseases of Children, 1887.

[3] I recognize the fact that many cases are *clinically* lobar which do not give at autopsy the lesions of croupous pneumonia.

divided these into three groups: Those attended by convulsions, of which there were fourteen; those where delirium was the principal symptom, twelve in number; and the third class, where neither convulsions nor delirium existed, but other symptoms decidedly cerebral in type—of these there were eight cases.

The convulsions of pneumonia differ in no respect from those seen in meningitis or other acute disease. In half of the cases they were a symptom of invasion, in the other half they came on toward the close of the disease. Only one case presented both early and late convulsions. In almost all instances the movements were general, and in by far the larger number they were repeated more than once. Initial convulsions were succeeded by drowsiness or semi-stupor, sometimes a light delirium or great irritability; there being nothing usually in the symptoms to indicate pulmonary disease during the first twenty-four, or even forty-eight hours.

Delirium was rarely seen for the first two or three days. It was most marked at the height of the disease—fourth to the seventh day—and, if intense, generally lasted until the crisis. It varied much in intensity—in the milder forms amounting only to incoherent rambling during sleep; in the severer forms being sometimes low and muttering, like that in typhoid, but more commonly wild and excited, like that of cerebro-spinal meningitis. In this condition some of the patients could with great difficulty be kept in bed. In addition to delirium, they had dilated or contracted pupils, involuntary passages of urine and fæces, boring of the head into the pillow, retracted abdomen, sordes on the lips and teeth, muscular twitchings, tremor of the tongue on protrusion, irregular pulse; in short, almost every symptom of cerebro-spinal meningitis.

Other patients had persistent drowsiness or semi-stupor, these occasionally alternating with periods of great irritability or excitement, sometimes terminating in convulsions, simulating very closely tubercular meningitis.

Vomiting I have not included in my analysis among the

cerebral symptoms, as it is almost a constant symptom in the invasion of pneumonia. Headache was frequent in children old enough to describe their sensations, but as the great majority of my cases were not, I have not included this symptom.

Continued irregular respiration I have not seen, although this has been mentioned by Rilliet and Barthez. Nor have I met with the decubitus *en chien de fusil* or gun-hammer position, although cases have been reported by Starr, of Philadelphia, Jenner, of Toronto, and others.

The two classes of symptoms made by the French writers, viz., eclamptic or convulsive, and the meningeal or delirious, serve very well for purposes of description, but almost every combination of the symptoms enumerated has been met with.

Diagnosis.—How are these cases to be distinguished from meningitis? is the practical question of most importance in this discussion. First, only by careful and repeated examinations of the chest. And just here I wish to say that there is no sin of omission of which the general practitioner in his care of children is more often guilty than this. It is something which is often beset with difficulties, no doubt, yet there are very few cases in which, with patience and tact, as satisfactory examination cannot be made of a child's chest as an adult's. I have made it a rule, in cases of acute illness, to make a physical examination of the chest every day until the diagnosis was clear beyond the shadow of a doubt; and I have been surprised over and over again to find in how many cases, obscure and often indefinite symptoms have been found to depend upon pneumonia. Its great frequency in early life lays upon us always the necessity of excluding it, before accepting any other explanation of a persistent high temperature in a child.

The difficulties in the case are much increased by the late appearance of positive physical signs, as in central pneumonia, although the time when they are manifest depends quite as much upon the physician's acuteness of ob-

servation as upon the state of the lungs. In my own experience I have found that the number of cases with late physical signs gradually grows smaller year by year.

Cough is usually present, but it is wanting in the first two or three days in a sufficient number of cases to make it of little value in the doubtful, obscure ones.

Activity of the alæ nasi may be seen in many other conditions, but it is rarely absent in pneumonia.

Alteration of the pulse-respiration ratio is more important than any other single symptom. Accelerated respiration, out of proportion to pulse and temperature, should always lead us to suspect the lungs, whatever other symptoms are present. Irregular respiration, especially of the Cheyne-Stokes type, is almost never seen in pneumonia.

The slow, irregular or intermittent pulse in meningitis does not occur in pneumonia. Irregularities and intermissions in a rapid pulse are quite common but are of no significance.

It is very rare for the temperature in meningitis, either tubercular or cerebro-spinal, to remain so high as we commonly find it in pneumonia. In fact, Thomas ("Gerhardt's Handbuch") asserts that a persistent high temperature almost certainly excludes meningitis. The loss of knee-jerk is the rule in meningitis (Hughlings-Jackson and Angel Money). I am not aware that it has been recorded to be absent in pneumonia and can see no reason why it should not form as valuable a symptom for differential diagnosis of meningitis from pneumonia as it is said to be from typhoid fever.

Localized paralyses are not met with in pneumonia unless there be a complicating disease of the brain.

The cerebral symptoms of pneumonia are commonly less severe and not so continuous as those of meningitis, so that the progress of the case nearly always clears up the diagnosis by the rapid subsidence of the nervous symptoms at the crisis, although we may have been in some doubt up to this time.

Between broncho-pneumonia with cerebral symptoms and pulmonary tuberculosis with a few tubercles in the

brain, I quite agree with Jürgensen that a diagnosis may be impossible.

Etiology.—Cerebral symptoms in pneumonia may depend upon complicating meningitis. This is asserted by almost all writers to be exceedingly rare. I have never seen it.

Steiner,[1] Bridge Lees,[2] and others have shown that they may arise from suppurative otitis media occurring as a complication, but this also must be rare, if we are to believe the writings upon the subject; perhaps not so uncommon, however, as the small number of recorded cases would indicate. I have met with but one instance.

Only one of the fourteen cases of convulsions was over two years of age, so that of one hundred and twenty-three cases two years of age and under, ten per cent. had convulsions. Delirium, on the contrary, was most common between the ages of four and eight years. Of the fifty cases over two years of age, thirty-three per cent. had delirium.

Temperature: Of thirty-three cases in which this was recorded there was hyperpyrexia in fourteen. In eight of these it reached 106° F., or over. Delirium and stupor were much more commonly associated with very high temperature than were convulsions.

In twelve cases the temperature was about the average for pneumonia (*i.e.*, 102° F. to 104.5° F.), and in six it was below the average.

Constitution: Fourteen children were reported in good health prior to the attack, seventeen were delicate, and one was markedly rachitic. Convulsions were more common in delicate children (nine out of fourteen cases). Of the twelve cases with delirium all but three were previously healthy.

Form of disease: Nineteen were cases of lobar pneumonia, fourteen were broncho-pneumonia, and one was not determined. Early convulsions were most often seen in the lobar form (seven of nine cases), while late convulsions in every instance but one, occurred in broncho-pneumonia.

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[1] Jahrb. für Kinderh., N. F. ii. [2] Practitioner, August, 1886.

Delirium was seen much more often in the lobar form (nine of the twelve cases).

Location of the disease: The part of the lung affected has been a subject of special investigation, as I wished to ascertain whether these records supported the idea of the intimate association of cerebral symptoms with disease at the apex.[1]

There were thirty-eight cases of pure apex-pneumonia: Right, twenty-three; left, fifteen. Of these cases seven, or eighteen per cent., had cerebral symptoms; two, delirium; three, convulsions; two, other symptoms.

There were thirty-six cases of pure base pneumonia: Right, thirteen; left, twenty-three. Of these cases four, or eleven per cent., had cerebral symptoms; two, delirium; one, convulsions; one, other symptoms.

In seventy-three cases there was extensive disease: Both apices in two; both bases in four, and in the remainder nearly the whole of one lung or large areas in both lungs were involved. Of these cases twenty, or twenty-seven per cent., had cerebral symptoms; seven, delirium; eight, convulsions; five, other symptoms. In other words, in fifty-six per cent. of the thirty-four cases with cerebral symptoms the lesion was extensive. I have studied these cases with extensive disease a little further. In twenty-one of them the lesion involved either both apices, or the apex and some other part of the lung; seven, or one-third, had cerebral symptoms. In thirty-six cases both bases, or one base and some other part, not the apex, were affected. Of these, twelve, or one-third, had cerebral symptoms; a striking agreement with the apex cases.

These figures are not large enough, it is true, to establish the proportion of cases in which cerebral symptoms are met with when the disease is situated in the various parts

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[1] This term will be used synonymously with "upper lobe" in the subsequent discussion. I have found it impossible to draw the line of distinction between them in making up my statistics, nor has it been done by most writers.

of the lung, but they are large enough to show very clearly that no such predominance of apex cases exists as we have been led to believe. So far as they show anything, it is that the extent of disease is a far more important factor in producing nervous symptoms than its location.

The great predisposing factor here is to be found in the susceptibility of the nervous system in early life, which is one of the striking peculiarities of all the acute pathological processes of infancy and childhood. Sudden impressions by the abrupt development of symptoms, as in lobar pneumonia, are more likely to disturb the nervous centres than those coming on more slowly. Very extensive disease acts in a twofold manner, both by the nervous depression which it induces, and by the interference with hæmatosis, due to a large part of the lung being crippled, so that blood deficient in oxygen and overcharged with effete products is supplied to the brain and cord.

The fact that high temperature, from any cause whatever, when maintained for any considerable time, will produce marked disturbance in the functions of the brain, is so well known that it scarcely needs to be mentioned here. When we have given the old explanation that these symptoms are due to the effect of the overheated blood upon the brain, we have said about all that is positively known upon the subject.

Prognosis.—The general mortality of the cases here analyzed was twenty-two per cent.; of the thirty-four cerebral cases ten, or thirty per cent., proved fatal. Of eight cases in which convulsions occurred at the onset of the disease only one died. The others were not specially severe. Every case of late convulsions died within twenty-four hours. One of these cases also had convulsions at the beginning of the pneumonia. Only one of the twelve cases with delirium succumbed. These cases, however, included some of the most severe ones in the series. We may conclude, then, that, excepting late convulsions, the occurrence of cerebral symptoms in pneumonia does not very much increase the danger of the disease.

It will be of interest to compare these cases with those of pneumonia in older children.

In the reports of the Pendlebury Hospital, Manchester, for the years 1881 to 1886, there are tabulated two hundred and thirty-four cases of lobar or croupous pneumonia. The hospital admits children from two to fourteen years of age. The ages of the cases of pneumonia were as follows: Under five years, 67; five to ten years, 121; ten to fourteen years, 46—total, 234. Only three cases are mentioned as proving fatal; two of these had marked delirium.

One hundred and forty-two were males, ninety-one females.

Table II., which I have constructed from these reports, shows the proportion of base and apex cases, the number in which there was extensive disease upon one side, or in which both lungs were affected, together with the number of cases with delirium and convulsions when the disease was situated in the different parts of the lung.

For convenience of comparison I have placed alongside of it, in tabular form, the one hundred and seventy-three cases which have been discussed in the earlier part of this paper (see Table I.).

In all the five cases of convulsions they occurred at the onset of the disease; only one was a severe case and none were fatal.

TABLE I.—173 *Cases of Pneumonia* (123 *under two years of age*).

Location	Apex, 38 R., 23 L., 15	Base, 36 R., 13 L., 23	Extensive disease, 73. (Both apices, 2; both bases, 4.)	Whole number, 173
Delirium	2	2	7	12
Convulsions	3	1	8	14
Other cerebral symptoms	2	1	5	8
Total with cerebral symptoms	7	4	20	34
Percentage	18	11	27	20

TABLE II.—234 *Cases in Older Children* (121 *between five and ten years of age*).

Location	Apex, 61 R., 47 L., 14	Base, 84 R., 29 L., 55	Extensive disease, 89. (Both apices, 4; both bases, 20.)	Whole number, 234
Delirium	14	13	28	55
Convulsions	..	3	2	5
Total with cerebral symptoms	14	16	30	60
Percentage	23	19	33	25

In looking at these two tables we are struck with the fact that the right apex and the left base are the parts of the lung attacked by preference, these two being involved with nearly equal frequency. The proportion of cases having cerebral symptoms is slightly larger (twenty-five per cent. to twenty) among the older children, a fact which rather surprised me.

We see, however, that with the exception of all the percentages being slightly larger in Table II., there is a striking agreement in the two series of cases. Thus, in both tables the proportion of cerebral cases in those of disease at the apex falls a little below the general proportion. The proportion among apex cases is considerably larger than among the base cases, but it is far below that among the cases with extensive disease.

We may then safely draw the following deductions:

1. Cerebral symptoms in the pneumonia of children are very common.

2. Convulsions belong almost without exception to infancy, being rarely met with after two years. Occurring at the onset, they belong essentially to lobar pneumonia; they do not indicate a bad prognosis, nor even, in most cases, a severe attack. When late convulsions come on, death within twenty-four hours may confidently be predicted.

3. Delirium comes oftenest between the ages of five and eight, usually in conjunction with extensive disease

and high temperature. These cases, although severe, with but few exceptions recover.

4. There is no such intimate association between cerebral symptoms and apex disease as has been frequently stated. Such symptoms occur in only about one-fifth of the apex cases.

5. Nervous symptoms occur much more frequently (one-third of the cases) when the disease is extensive and the temperature very high.

It was not my purpose to enter into the subject of the treatment of these symptoms in pneumonia, as I have nothing new to contribute. I wish to emphasize two points which my experience has taught me. The first is that in hyperpyrexia the cold pack is safe, and the most efficient means to reduce the temperature and thus abate the brain-symptoms dependent upon it. The second is the use of antipyrine, not so much for reducing very high temperature—for I think the cold packs are safer than very large doses, and altogether more satisfactory—but to allay restlessness, quiet delirium and cough, and promote sleep. For this purpose, doses of two or three grains are sufficient in an infant of from six to nine months, and double the dose at eighteen months or two years. The dose may be repeated every six or eight hours.

15 East Fifty-fourth Street.