Broncho—Pneumonia in Children.

George H. Dupont.

1898.
"Broncho-pneumonia"
"in Children."

Introduction.

It is a striking fact, although one which may frequently be noticed, that the diseases which are met with most often in daily practice are those which receive the least attention in current medical literature and especially in the medical journals; whereas rare and extraordinary, or less understood complaints, are the subject of frequent discussion at the societies, and of any number of papers and larger works.

Among the diseases most frequently met with, at any rate in the winter months of the year and among the working classes of the population, Broncho-pneumonia in children is probably as frequently the cause of grave anxiety, and of a fatal issue as any other disease.
and the study of it therefore, cannot fail to be of interest and instruction, both in regard to its nature, its progress, and the methods adopted for aiding the patient towards recovery.

As it is in children that one most frequently meets with the disease, this thesis will be confined entirely to a consideration of the illness as it affects those who are still in their childhood, including in this the periods of Infancy and Childhood.

Definition of Infancy & Childhood.

Infancy, from the derivation of the word, strictly speaking should imply the period during which a child is unable to speak, but as a rule the term is used to designate that portion of life between birth and before the eruption of the milk-teeth; but some writers extend the term to the end of the first year of life. It is impossible to draw any hard-
fast line, but perhaps the limit is best placed at the 7th or 8th month. The term Childhood is applied to the period commencing with the first dentition, and ending with the commencement of the second, at about the sixth or seventh year of life.

General difficulties.

The investigation of disease as it occurs in early life is no doubt beset with many difficulties, but a good deal of success or failure depends on the way in which the investigation is approached and the temperament of the observer. The principal difficulty arises not so much from the absence of intelligent speech on the part of the little patient, as from the difficulty we experience in referring the various symptoms to their true origin. Children are not merely men & women on a small scale, there are marked differences both anatomical & physiological, which
when deranged invest the common-
est forms of illness with uncommon
features which may be a source of
considerable obscurity & confusion.

Definition of Terms, and outline of the
Chief Varieties.
Included under the term Pneumonia
are all forms of inflammation of
the substance of the lung: two
principal varieties however, stand
out, namely the Lobar, and the
Broncho-pneumonia.
The Lobar form may be seen at any
period of childhood, but is com-
paratively rare in infancy: its
course when affecting a child is
characterized by practically the same
features as when it attacks an adult,
namely its sudden onset, its
steadily high temperature, resolution
by Crisis, and in addition it
stands in the great majority of cases
As a favourable termination.
The Statistics of the Pendlebury Hospital
For sick children, at Manchester, for the years 1878-93, show that, out of some 708 cases of lobar pneumonia treated there, 30 proved fatal, a mortality of about 5%: the highest death-rate being in children under 2 years of age, and Dr. Ashby, in his article on "Croupous Pneumonia," (Diseases of Children, Ashby & Wright, 1876, page 225) mentions that these figures closely correspond with those given by Bow Dusch, who in 331 cases in children under 10 yrs. of age, had a mortality of 4.8 per cent.

The Catarhal, lobular or Broncho-pneumonia on the other hand presents many features of difference; it is the common form of inflammation of the lung met with in infancy, and is frequently seen in early childhood. It differs from the croupous form in its Pathology, in its being generally a secondary disease, in its symptoms, and in its marked tendency to a fatal ending.
The Calamhal form as it affects children will be considered under the following heads, and in this order.

I Pathology.

II Aetiology.

III Symptoms, Physical signs and Course.

IV Complications and Sequelae.

V Diagnosis.

VI Prognosis.

VII Treatment.

VIII References.
Before proceeding to describe the pathology, it will be as well to consider somewhat in detail the differences in structure and physiology between the chest and lungs of the infant and those of the adult.

As regards the outward appearance of the thorax, the chest is deeper in proportion than in the adult, that is to say, the antero-posterior diameter more nearly approaches the transverse, and the angle which the cartilages make with the sternum is wider; this being probably due to the fact that the abdominal viscera occupy a relatively larger space and press the diaphragm upwards.

As regards the more minute structure of the lung itself, it is of an embryonic type, the infant's lung representing an intermediate condition of growth which illustrates the gradual change from the foetal
to the adult condition.
These conditions have been very
carefully studied by Bertin, whose
observations on the subject are
quoted by Morgan Rotch in his
work on Pediatrics.
"In speaking of the lung in in-
fantile life, he says, that if we ex-
amine the lung of a 5 months fetus,
it is found that the bronchi consti-
tute the entire respiratory tract thus far
developed, and at the terminal end
of the bronchi are bud-like dilatations,
( the rudimentary air-spaces )

Generally speaking, the lung of the
infant differs from that of the
adult in the following respects:
Proportionately the extent of the bronchial
tubes is greater than that of the air-
spaces. The connective tissue stroma
is likewise in greater abundance,
and tends to cellular proliferation;
the alveoli are small, their epithelium
proliferates abundantly and the ab-
sorbenets accomplish their work slowly,
the blood-vessels playing a more important rôle.

These facts may well be borne in mind in connection with the bronchial lesion which forms so important a part of Broncho-pneumonia.

As regards the differences met with in the physical examination of a child's chest; In Percussion, too much stress must not be placed on a little impaired resonance unless the result of Auscultation confirms the result. An important difference is found between the right & the left lung; the liver being relatively large, posteriorly the 11th rib on the right side marks the lower border of the liver, while it descends as low as the 12th on the left side, but we can recognise the cause of the modified note by remarking that the breath sounds at this point already weak are perfectly audible. Further, a
"cracked pot" note is easily elicited in an infant or account of the yielding nature of the chest wall, entirely apart from the presence of a cavity or any lung lesion.

Dr. Ernest Burtle recommends "broad percussion", by percussing with 3 fingers or 3 fingers applied to the chest wall, and states that by this method scattered nodules of subdiaphragmatic pneumonia may sometimes be detected even in an early stage; one must however state that the method is frequently not of any value where the usual method of using one finger has failed, and among these authorities Dr. Ashley distinctly recommends the use of one finger.

On Auscultation, as is well known the breath sounds are coarser and harsher than in older persons, this being especially marked towards the apices, and expiration is often prolonged, without being an indication
If any inward state, we must also recollect that inward sounds are very plainly conveyed from the affected to the healthy side of the chest and may give rise to confusion.

Vocal resonance or sounds is usually of little value in young children, but when a child is crying even violently we may hear results which are of some use. It is especially important to examine the whole chest thoroughly as a patch of broncho-pneumonia may be situated anywhere, and if sounds of it are audible post-laterally, it seldom or never gives any indication of its presence on auscultating the front of the chest or vice versa.

Pathology.

In the lungs of a child dying from broncho-pneumonia there is always a certain amount of
Collapse, mostly patchy in its distribution, and which usually affects the margins of the lung, and according to Enlace Smith it is in these patches of collapse that broncho-pneumonia generally originates, a view however that is evidently not shared by numerous other observers. The collapse is followed by congestion of the small vessels owing to the impingement created by imperfect aeration of the blood, and to the absence of expansion and contraction of the air vessels, whose movements in health materially advance the pulmonary circulation. At any rate, if these collapsed portions do not become pneumatic they certainly become oedematous by the above process, and thus an section of an affected lung we have collapse, oedema, and reddish-grey nodules of consolidated pneumatic tissue varying in size from that of a small pea to a nut.
but as the process advances, the
modules which are at first isolated
become united and form con-
siderable tracts of consolidation, and,
at the same time the consolidated parts
become firmer, drier and of a
yellowish-grey colour.
The pleural surface may show
minute haemorrhages, or be a little
roughened by the presence of lymph.
As Broncho-pneumonia is almost
always secondary we see the usual
signs of Bronchitis, the bronchi ex-
uding a thick puriform fluid on
section, and the same material
may be found in the air vesicles.
In addition, a certain amount of
dilatation of the vesicles is almost
invariably present in the neighbor-
hood of the collapsed portions, and
this Emphysema may be produced
quite acutely in 3 or 4 days, and
contribute very materially to a
fatal result.
There is moreover, an appreciable
degree of cylindrical dilatation of all the minute bronchi, due
perhaps in some cases to accumulated secretion, but probably
more often to diminution of the respiratory surface causing in-
dcreased rush of air to the parts which remain in use.

Microscopically the alveoli are found to be crowded with cells,
in great part derived from the proliferated epithelial lining of the
vesicles; mixed with these are leucocytes and mucoid material,
probably the secretion from the in-
flamed bronchi which has been
drawn into the alveoli, and
when this puriform fluid is very
plentiful in the alveoli, there may
be but few cellular elements
present.

In a case which terminates favour-
ably resolution takes place, a pro-
cess of fatty degeneration ensues,
the consolidated material becomes
softened, and is removed more or less rapidly chiefly by absorption; expectation in a child under 6 years of course being unusual. In a very severe case, a lobe may be solid, and on the surface beneath the pleura there are a number of yellow spots the size of a millet-seed or larger, which when pricked exude a drop of thick pus; these may be scattered throughout the lung and are minute abscesses surrounding the terminal bronchioles, and formed by the softening of the pneumonic lobules.

II. Pathology.

Age. Although broncho-pneumonia as a secondary disease, may occur at any age, it is nevertheless most common in childhood, and especially under 2 or 3 years of age as a primary disease — and the writer is convinced that it is much more frequently a primary disease.
than is usually supposed — it occurs with much greater fre-
quency in childhood.

Surroundings. The social position
of the child has undoubtedly a very
important influence in the pro-
duction of the disease, from bad
feeding & Insanitary Surroundings;
but of still greater importance is
the fact that people of the poorer
classes will often neglect a
bronchial catarrh, and looking
upon Measles & Whooping Cough
as ineradicable maladies, do not
seek Medical advice unless some
more severe symptoms have
supervened, and these are fre-
quently the signs of the onset of a
Pneumonia; so that in practice,
among the Working Classes, or the
Out-Patient department of a Hospital
one frequently meets with the disease,
and seldom sees a simple bronchial
catarrh or slight bronchitis: As an
illustration of this, the writer saw
some 15 cases of broncho-pneumonia in practice among the working classes during 18 months, whereas on changing to another more prosperous district not a single case was seen in an infant during a similar period of time, although bronchial catarrhs were frequently under treatment. This latter point is closely associated with Preceding disease as a cause, which in 9 cases out of 10 in secondary broncho-pneumonia is Bronchitis which by extension sets up lobular inflammation. Measles and Whooping-cough also number broncho-pneumonia as their most frequent sequelae, as doubt through a preceding Bronchitis. It may ensue as before stated in a patch of collapse, or at any rate it is very likely to occur who would have a tendency to collapse of the lung as in a scrophulous child; and Rickets has a marked tendency the complicated
By Broncho-pneumonia, the softness of the ribs encouraging the collapse.

In Scarlet or Enteric Fevers, pneumonia may intervene caused by the specific micro-organisms of the disease, or by the septic organisms present.

In Acute Summer Diarrhoea, pneumonia is very apt to occur, and the immediate cause of death in a chronic intestinal enteritis is often an attack of Broncho-pneumonia.

It may also occur by extension from some deposit in the lung, chiefly from those of a tubercular nature.

The precise relation of Bacteria as causative agents in the production of Broncho-pneumonia is not yet clearly made out; the organisms present have been studied more recently by Neumann (Jahrbuch für Kinderheilkunde Band XXX p. 233) and Deimler (ibid. p. 277) Stiehly & Nordrupp.

The term most commonly found appears like the Ränkel Weichselbaum Pneumococcus, whilst Friedlander's
Bacillus Pneumoniae appears much less frequently.

In the Septic Pneumoniae, as in Scarlet Fever, Measles and Diphtheria one meets with various Micrococci, the Staphylococcus (both Aureus & Albus) and the Streptococcus Pyogenes.

In doubt a sudden depression of temperature, usually spoken of as a chill, has an influence in producing the disease by lowering general vitality, but it seems to be a decided reaction at present against ascribing any illness to a chill, and indeed it is difficult to indicate its exact importance as an aetiological factor.

III Symptoms, Physical Signs and Course.

The disease varies in its mode of onset according as it is secondary say to an attack of Bronchitis, or whether it occurs primarily.

In the former case the child has been
ill for some days perhaps with the ordinary signs of a bronchial catarh, namely somewhat increased frequency of respiration but no dyspnoea, a troublesome cough and perhaps a slight rise of temperature say & 99.5° at night; these symptoms being accompanied by Rhonchi of varying pitch which may be only heard in places, and with inspiration.

Then perhaps the child becomes worse, the frequency of respiration increases to 30 or 40 per minute, there is some difficulty of breathing, the cough becomes more troublesome, and the Rhonchi on auscultation are heard all over the chest accompanied by moist sounds of the medium variety especially at the bases, & the temp. rises to 100° or 101. Such would indicate Bronchitis involving the capillary tubules, and the precise time & onset of a Broncho-Pneumonia would be.
Somewhat difficult to determine. We should find however in many cases the temperature suddenly rising say to 103° or 104° with corresponding increase in the pulse rate to 140 per minute or faster; the child becomes more restless and the cough more hacking, and the temperature assuming the Remittent type.

Case. This is seen well in a case of the writers, M. A. a little girl of 5 months, who had been under care for 2 months with whooping cough which apparently had been cured as the cough had disappeared. She had seemed out of sorts for a few days and when seen on June 26, 1895, the temperature was 100° with rapid breathing and the child signs of bronchitis. She continued much the same until July 1st when she seemed much worse, more rapid breathing and temperature nearly 103°. Medium crepitations over both lungs, but at the left base.
a patch about 1/2 inches in diameter where the respirations had a loud clicking character.

If the Pneumonia is extensive the child is somewhat anxious in its look, and takes no interest in anything but its breathing, in fact its case with which a child in this state can be examined, without its resisting, is very marked and almost characteristic.

In a fully developed attack on inspection we notice the various accessory muscles are brought into play, and there is recession of the Epigastrium and Intercostal spaces, and

June 1895.

Records of Temperature, Pulse, Respiration and Stool.

<table>
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<tr>
<th>Date of Month</th>
<th>Day of Disease</th>
<th>Temperatures</th>
<th>Pulse</th>
<th>Respiration</th>
<th>Stools</th>
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<td>78</td>
<td>12</td>
<td>6</td>
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<td>6</td>
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<td>92</td>
<td>16</td>
<td>6</td>
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Records of Temperature, Pulse, Respiration and Stool.

In the case of Maryallet 5 Mos.

Day of Month: 26 27 28 29 30 1 2 3 4 5 6 7 8 9

Day of Disease: 3 4 5 6 7 8 9

Temperature: 98.7 98.9 99.0 99.1

Pulse: 78 82 88 92

Respiration: 12 12 16 16

Stools: 6 6 6 6
often in a severe case some cyanosis.

There may or may not be a loss of resonance on percussion in places, according to the extent of the pulmonary tissue involved, but a considerable amount of bronchopneumonia may exist without any definitely impaired resonance. There may be hyperresonance especially anteriorly from the presence of pneumothorax.

On auscultation, numerous rhonchi are heard, it may be all over the chest, and numerous medium crepitations, but at the site of the patches the crepitations have a sharp clicking or consonant character, from their being conducted to the stethoscope through consolidated tissue.

The respiratory murmur is generally weak at first, and is often masked by the bronchitic sounds present, but over the patch "blowing" or bronchial breathing may usually be heard.

With this condition in the chest
there is usually some intestinal up-
set, it may be diarrhea & vomiting
may be produced by the cough.
Nervous symptoms are not seen
as a rule in the course of the ill-
ness, but may be present in a late
stage of a severe case.
The temperature, if left to itself, con-
tinues to swing irregularly for a
week or more, and then the evening
temperature begins to fall, the swing
is less marked, and it gradually
assumes the normal position, the
breathing becomes easier, the child
becomes brighter and may begin to
play a little with its toys; the phys-
ical signs however do not alter so
rapidly and the chest may take 2
or even 3 weeks to clear up.

Chart III

Records of Temperature, Pulse, Respiration and Stools, from
in the case of Pneumonia

<table>
<thead>
<tr>
<th>Day of Month</th>
<th>Day of Disease</th>
<th>Temperature</th>
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<td>98.5</td>
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<td>99.4</td>
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<td>16</td>
<td>17</td>
<td>99.5</td>
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The swinging temperature being well seen in the preceding & this chart, the form of a fatal case & this, violet C., ending in recovery.

1896. February. Chart III

Records of Temperature, Pulse, Respiration and Stools, from

In the case of

<table>
<thead>
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<th>Day of Month</th>
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<th>10</th>
<th>11</th>
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<th>15</th>
<th>16</th>
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<td>Day of Disease</td>
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<td>Stools</td>
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If the case assume a more unfavorable aspect the temperature becomes more rapid, 60 or 70 per min. the pulse quicker & weaker, the child often becoming a curious earthy colour, then cyanosed and finally comatose, or as may be somewhat frequently seen, convulsions ensue; the temperature may fall towards close or else run up to a considerable height & death follows.

This termination is illustrated by
Another case of ours.

A male infant, 6 months of age, was seen on January 7th, 1895, having been ill for some days. The child obviously had whooping cough, and now had signs of capillary bronchitis with a temperature of 103°. The bronchitis increased the next day, and on the 9th Jan., the little patient was evidently much worse, all the symptoms exaggerated, and it might then were 2 slight convulsions. The temp. was 104° on Jan. 10th. There were marked signs of broncho-pneumonia in each lung, on the following day the temp. fell to 103°, but on the morning of the 12th Jan., there was a further convolution, the temperature ran up to 104°. By the child died at 9.30 a.m. on the 12th Jan. After the detection of the broncho-pneumonia, and on the 6th day after the child was first seen; chart IV illustrates a somewhat similar, albeit more prolonged case.

Altho. the above represents the various features of a well marked severe attack, it is only right to say that a great many cases one meets with do not present...
all these characters.

In one variety which one has met with several times, in fact almost as frequently as one has found broncho-pneumonia secondarily, one has noticed that the onset has been sudden, the temperature rising rapidly, and the onset accompanied by vomiting, or it may be a convulsion, alike. This has not been so frequently seen in the cases one has personally observed: the physical signs point to a considerable portion of the lung being involved, and it is only by the subsequent course and an attack that one can distinguish it from the Croupous variety, the temperature coming down by lysis and not in the sudden way one would expect from a true Croupous Pneumonia. On the other hand one sees cases which have all the symptoms and signs of a commencing Broncho-pneumonia, which will terminate much more rapidly than the typical
cases in which the temperature becomes normal in a week or a little more.

Sir R. Douglas Powell draws a marked distinction between the disease in a confluent form and that which occurs in the disseminated form. Both as regards the symptoms and the physical signs, but practically the two conditions appear precisely alike, differing in degree rather than in kind, and the distinction therefore seems of no great importance; suffice it to say, however, that an attack beginning somewhat suddenly and involving a considerable patch of lung is more likely to terminate favourably than one which commences more gradually and is evidently disseminated. Some cases, instead of resolving may degenerate into the chronic form producing fibroid pneumonia, or in more acute cases it pulmonary abscess or other conditions which will be dealt with when considering
IV. Complications and Sequelea.

There may be (a) Causal, chief among which may be mentioned Bronchitis, which so often is the precursor of Broncho-pneumonia. Measles also, and Whooping cough, but perhaps in these illnesses the Catarhal Pneumonia may be looked upon as a complication of the diseases themselves. An attack may sometimes commence with a Stridulous Coryza, and in the rare cases in which the Spasmodic disease proves fatal, death is usually due to the presence of the Pneumonia. Diphtheria will also come under the same category, and the pneumonia with this disease is often haemorrhagic, (Dr. Ashley). Small patches of dark red extravasated blood being seen on section of the Pneumonia lung; and General Tuberculosis
in many and perhaps in most instances becomes complicated with this form of pulmonary inflammation, as regards the (b) Concomitant complications, as already mentioned, gastric and intestinal cataracts frequently complicate the process of this pneumonia; indeed, in children, a cataract of some mucous tract is almost invariably accompanied by a similar affection of another.

Rickets, of course, when it complicates pneumonia is a preexisting disease, but may only become important by increasing the tendency to pulmonary collapse, and in such children resolution is apt to be less complete even if they survive the acute stage. Pulmonary Collapse, also, a very frequent concomitant of pneumonia of the Catarhal type (and as mentioned when considering the bronchial anatomy a certain amount is usually seen) is especially of importance when it exists in considerable amount, and
may materially increase the tendency to a fatal result by blocking off a still greater portion of the aerating surface. As mentioned also a certain amount of Emphysema is almost invariably seen. In addition to dilatation of the air vessels we get a certain amount of Dilatation of the bronchi, but this does not seem to persist after resolution of the Pneumonic portions. In cases which do not resolve rapidly, such as those following Whooping cough, we may get evidence of this condition continuing to exist for some time.

A little Dry Pleurisy may exist, if a patch is near the surface, and sometimes in an unhealthy subject, or in a case following some severe disease there may be Effusion purulent in character; indeed in a case in which the temperature does not come down in the ordinary way we usually begin to suspect this complication, as is well shown
in the following case under the writer's care, of George R., a little boy aged 21 mos.
On April 5, 1876, he was playing about as usual but came in and refused his tea; he was seen on the following evening when his temp. was 102.5. He had a cough but no physical evidence of pneumonia; he was worse on the following day, and when seen on the 7th his temp. was 104.2; the child lived in rather unsanitary surroundings, was fairly well nourished, had a frequent cough, but no vomiting, and a patch of Broncho-pneumonia at his left base, his respirations being 56 per minute. He was given a febrile mixture and some Phenacetin powder of 5 grs. at intervals, but with effect of only reducing the temperature temporarily, these symptoms continued alike to a somewhat less extent.
On 16th it was noted, the temperature is lower, but child is very weak and of a very unhealthy colour, from this date airs of fluid appeared at the left base and increased until on the 19th the left side
was full from aftertaste; the child became weaker and breathing more laboured; Empyema being suspected an aspirator was used and 20 ounces of yellow pus were easily withdrawn. The temperature however rose rose again, and although incision and drainage were tried on the 15th June the child sank and died on the 17th.

Chart IV

Records of Temperature, Pulse, Respiration and Stools, from 10 to Day of May, 176

In the case of George R. Aged 81. Occupation

| Day of Month | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 1 | 2 | 17 |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Day of Disease | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |

Pulse

| Day of Disease | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |

Respirations

| Day of Disease | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |

Stools

| Day of Disease | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |

(c) Sequela. (3) Delayed Resolution.

The pulmonary condition nearly always takes 2 to 3 weeks to clear up after an attack of at all a severe nature, but in some cases it may be observed that moist expectorations & some cough
will remain for even 2 or 3 months, and
even then clear up. Some apparently no
trace behind; this is of course of con-
siderable importance as regards the
prognosis, the writer well remembers
giving an unfavourable prognosis
in the case of a little boy aged 5 yrs
whose chest had not cleared up in
3 months, and being surprised to
see, after a change of air & admis-
sion of Cod oil &c, the child looking
quite well & with nothing abnormal
be heard in the chest.
Instead of clearing up thus, the con-
dition may become one of
(2) Chronic Broncho-Pneumonia,
eventually leading to fibroid Infla-
ration of the lung. There is a
special tendency for the confluent
form to develop into this condition
if it does not clear up in the usual
way, & it is also especially liable
to occur after Measles or Whooping Cough
in an unhealthy child: 
the base or often the Apex of a Lung
remains more or less dull, the breath sounds are bronchial in character, one hears crepitations of the Druil variety, the temperature rises up every night with accompanying sweats and delirium. Such a state of affairs may go on for weeks, and of course the risk is that general tuberculosis of the lung or of the membranes will follow, and most cases of chronic broncho-pneumonia terminate either in recovery or in tuberculosis, such cases indeed being popularly spoken of as "chronic consumption," resembling closely on this disease especially in the winter when all the above symptoms are exaggerated; but they tend to improve considerably in the summer.

Although post mortem we find dilated bronchi, excessive development of fibrous tissue and emphysema, mucus is absent.

In their later stages, such cases present retraction of the chest, with bronchial breathing, consonant rales.
and a cough occurring in paroxysms almost indistinguishable from pertussis, in children over 6 years of age one may see expectation of quantities of foetid sputum, in fact the most are those of contraction of the pulmonary substance with bronchitis.

Such a child is thin, delicate, acacemic, has clubbed fingers and the right side of the heart tends to dilate, and such children are very liable to repeated attacks of pneumonia.

Apart from leaving any marked disease behind, bronchopneumonia especially when it has existed in the disseminated form is very liable to leave behind it a certain amount of pulmonary delicacy.

In other cases the disease leads to suppurative destruction of the lung, and the abscesses produced are usually of small size, involve the
Terminations of the Bronchi and assume a dendritic form.

The more chronic forms are liable to lead to tuberculous affection and (6) Caseation of the Bronchial glands, in fact these glands are almost universally caseous in those dying of pulmonic tubercles or chronic cavitary pneumonia" (Ashby & Wright). They are unlikely to give rise to any symptoms per se, and are too deeply situated to cause percussion dulness from mere tuberculous enlargement: the most reliable auscultatory sign of their presence is interference with the entrance of air into one lung from pressure on its bronchi, but this may readily be marked; in occasional cases the glands may enter into the trachea being coughed up or causing asphyxia; they have been known to open into the esophagus, or to point in one of the intercostal spaces close to the sternum.
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close to the Sternum.
Lastly, and closely associated with chronic pneumonia is secretion of the bronchial glands. The disease may lead on to true Pulmonary tuberculosis, when the appearances found on post-mortem examination are essentially similar to those found in the adult; in older subjects the diagnosis of early tubercula is difficult enough, but in the child where there is no expectation to be examined for Bacilli, and when the patient can give no information as regards the symptoms or history, the difficulty is still greater, and the young the subject the more likely are the symptoms to be wanting in distinctive character. Frequently, washing, a slight cough and a family history of tuberculosis are all that one can get, and the diagnosis, except in cases with well marked signs must be provisional; but in a case where washing and hectic follow a bronchopneumonia
There is a strong suspicion of tuberculosis even tho' the child may have appeared comparatively well between the acute attack and the hectic condition. Even in advanced cases with dulness, the evidence of cavity formation is usually wanting, and as mentioned before, the presence of a cracked-pot sound in front, owing to the yielding character of the chest, will in a young child is of no diagnostic importance. After the age of 6 years the symptoms & physical signs resemble practically those found in the adult & the detection of the condition is relatively more easy. The tubercular condition may progress acutely, or be more of the nature of a fibroid phthisis, in which one finds dulness, intense bronchial breathing, resonating rales, and eventually retraction of the side. A child with such a condition may improve considerably in health, may live for years;
but in most cases the disease is progressive and the opposite side becomes involved.

**Diagnosis.**

In the very early stages, the diagnosis of bronchopneumonia may be difficult or impossible, the only signs to be heard in the chest being those of the antecedent bronchitis.

There rise of temperature also, although suspicious is not distinctive, as a rule in bronchitis the temperature is not high; 100° – 101° perhaps, but if this should rise to 103° or 104° the probability is increased. If with this rise the cough assumes a more hacking character and the expectorations are of the sharp, clicking variety, then even without dulness the diagnosis of bronchopneumonia is justified; indeed, in many cases may be seen in which little or no dulness can be elicited even on broad percussion, and yet the expectorations...
have the clicking character. The temperature is suddenly elevated and the rapidity of respiration increased.

Another difficulty is to distinguish the catarhal from the lobar form. The onset is as a rule less sudden, albeit a marked number of the cases of the catarhal form commence with very slight preceding bronchial catarrh. The age of the patient is important; if the attack is in an infant the disease is almost certainly catarhal; if that infant is a delicate one, it is almost certainly so.

Marked dyspnnea, and not mere increased frequency of respiration is suggestive of catarhal rather than "eroupous pneumonia.

When the lung is more extensively involved, a patch of bronchopneumonia even if confluent may be distinguished from the lobar form by attention to the expectorations: over a patch of lobar pneumonia there is, as a rule, an entire absence of
Crepitations, the only sound heard being that of the tubular breathing, but in the Celsian form in addition to the tubular breathing, the crepitations are sharper over the patch not merely round its edge.

An attack of Bronchopneumonia may be complicated by tubercle which gives rise to the attack of inflammation, the detection of the Tuberculosis under these circumstances may be impossible, or its presence may be guessed at if there is a history of some ill health and evacuation before the acute illness; the family history too may help us, and the appearance of Meningitic symptoms during an attack which has been unduly prolonged will tend to confirm the suspicion; always remembering however that convulsions in the late stage of Pneumonia are probably due to toxemia, but convulsions during the earlier course of the illness are very suspicious of Tuberculosis, excepting
the initial convolution which may occasionally usher in an attack, although by no means often seen in the enteric form.

VI. Prognosis.

There can be no doubt about the fact that the prognosis in Bronchopneumonia in a child is always serious and the prospect of recovery doubtful. Age is an important factor, the large majority of fatal cases occurring during the first years of life, and in newborn infants the illness almost invariably results in a fatal termination. The prognosis is also influenced by the disease in the course of which the attack of Bronchopneumonia occurs; one can say that it is undoubtedly most grave when the attack comes on during the spasmodic stage of Whooping Cough or the younger the child the more fatal the disease. In our own cases we find that 4 have occurred during pertussis and all have proved fatal, all 4 being
fatal issue.
Cases which are going to prove fatal, as a rule do so within 4 or 5 days, and after that time has elapsed our opinion may be more favourable; on the other hand, a prolonged case such as one lasting for weeks with elevated temperatures is more unfavorable in proportion to the length of time the temperature remains elevated, death usually resulting from exhaustion after the disease is thus protracted.
Very high or very low temperatures indicate danger; when a case goes above 106° it is usually fatal, although 105° is by no means so. When the secretion of the blood is affected to a serious degree the danger increases, therefore blueness of the nails or lips, lividity of the face and suppression of the cough with increasing somnolence & apathy are all grave signs, and as mentioned earlier, convulsions occurring late, as a rule indicate approaching dissolution.
Another danger is that of a Relapse; in a case which seems to be pursuing a favourable course, one may suddenly see increased rapidity of breathing and further rise of temperature. Such cases are more serious, and a single relapse in a weakly child is often sufficient to bring about a fatal issue, albeit we have seen 2 distinct relapses in a boy aged 6 years, and the case after going on for some 5 or 6 weeks terminated favourably.

In other instances one may see several complications existing simultaneously, as in a case of a little boy aged 1 yr. 7 mos., who was under our care recently; this child was almost convalescent from Whooping Cough, then he developed Bronchitis and subsequently Broncho-pneumonia, on the 5th day of which the rash of Measles appeared, & death followed 2 days later.

A less remote danger is the possibility of the disease becoming chronic and Tuberculosis being engrafted upon it.
VII. Treatment.

Treatment of the disease, for practical purposes must be divided into
(1) Preventive treatment, and
(2) When the attack has supervened.

1) Preventive Treatment.

As was mentioned when discussing the
etiology of the disease, the poorer classes
but seldom seek medical advice during
the stage of Bronchial Cough, and in
consequence one does not often get the
opportunity among them of treating the
illness in this stage. Doubtless
however many attacks of Broncho-
Pneumonia, might be warded off by
 timely treatment of this condition, by
confining the child to its cot, or at
any rate to one room kept at a
Temperature of 62° F., and by
administering some simple mixture
such as one containing Brimis, Citric
and Apl. Rhetbus Rhizos.

When however we leave the stage of
Bronchitis, these measures must be
increased; the child must be strictly confined to bed, the room kept at 63°-65° F, and often measures adopted, such as ponticking &c, which will be described in detail when dealing with the developed attack of pneumonia.

One must however emphasize the fact that an Emetic administered & repeated if required is absolutely necessary to remove the mucus from the trachea of an infant or young child, or Broncho-pneumonia is extremely likely to supervene. For this purpose the Vin. Spiritac of the Pharmacopoeia is usually recommended, but is often absolutely useless in producing emesis, & one has given it in tea-spoonful doses, repeated 5 or 6 times or more at intervals of 5 minutes without any vomiting being excited, and it is especially in the severe cases where the reflexes are dulled, that one meets with this difficulty, that is, in
precisely those cases where its action is most to be desired. It is much better, and more certain to use the Powdered Ipecacuanha, which may be given in 5 grains doses to a child under 2 yrs. of age, in Syrup of Strange peel, and repeated in a few minutes if it fail to act, which is seldom. The act of vomiting after Ipecacuanha is generally attended by considerable diminution of the wheeze, and increased freedom of Respiration, the tension of the vessels seems to be diminished with consequent relief to the congested mucous membrane. If the attack however is not wards off and we get the stage of:

2) Bronchopneumonia, the treatment is somewhat different.

The indications now are as follow:

a) To reduce the temperature;

b) To relieve congestion in deeper parts;

c) To support the strength of the patient;

a). To accomplish the first of these
true indications, the writer can without hesitation place the first place to Phenacetin. He has found this drug of especial use in many of the febrile conditions with which children are affected, but the result of its employment in some cases of Catarrhal Pneumonia has been little short of wonderful, and of all the points to which it is desired to draw attention in this thesis, the use of Phenacetin is the chief.

The writer now uses it in practically every case of Bronchopneumonia which comes under his care. For a child up to 2 years of age, if the case is seen near the onset, it may be given in 3 grain doses, every 3 hours; and this must be continued for 2 or 3 days by which time the temperature will usually be normal; indeed, at one time such good results had accrued from its use, but if the temperature did not come down in 2 or 3 days the writer was inclined to think that some complication
was keeping it elevated; this opinion however required the modified somewhat, as he has seen 2 cases in which Phenacetin did not have any permanent effect in keeping the temperature down, although it was not apparent at any time that there was any further complication to keep up the febrile condition.

Still, even in the cases in which the temperature is not kept down by the drug, the beneficial influence is still seen in the brighter appearance of the child and considerable relief to the symptoms generally.

As almost all of the writers more recent cases have been treated in this way, the charts do not indicate the usual swinging of the temperature, but its progress is seen in chart V on the next page, the case being one of a little girl of 4 yrs., with a little Bronchitis & a patch of Bronchopleuronia at the right base. The immediate effect of the Phenacetin is shown.
The effect is also seen in

Chart VI

April 1897.

Records of Temperature, Pulse, Respiration and Stools, from 4.
In the case of Harry B. Broncho-pneumonia. Aged 46.

It is necessary however to emphasise the fact that the administration must be regularly continued at first, as if it
left off after a close or two, the temperature will almost certainly rise again, 
the other symptoms recur or increase.
as seen in the following case; a little girl 1yr. 6mos. old, began suddenly on Oct 20, 1896 with short 
ness of breathing, feverishness, vomiting, 
where seen head pulse 160 Recps. 70 
& a patch of Cerebral Pneumonia at right 
base. He was given the usual 3800 of 
Phenacetin at once, & 3 more in the 
up, when she was much better. 
Recps. normal, only one more powder 
given during the day, & the following 
morning the Recps. were up to 703, recps. 
60, pulse 120. Phenacetin given every 4 
hrs. for next 24 hours & the Recps. 
again fell & did not rise again.

The marked effect of Phenacetin is 
also seen in the case of Dr. an infant 9y weeks, taken ill the 
day before seen & got rapidly worse, 
when seen respiration rapid, ir- 
regular & gasping, deathly tint of face.
Temp. 103. Pulse almost uncountable. Every week, well marked Broncho-pneumonia at left base, & suspension at right base. Given Phenacolin & 70 every 3hrs, & few drops of brandy & 1/2 mss of Dr. Staphanthei. Next morning temp. almost normal & child lively. Still ill but brighter; the treatment was not employed at all regularly during this day & at night temp. rose again to 103°, with more regular administration however it again fell & child active. slept was considerably better, treatment continued over 4 hrs & child improved greatly no further rise of temperature. 2 days later the note is "when seen today child is recovering rapidly & chest clearing up," that is 7 days from the onset. Subsequent progress was eventful. This was the youngest case the writer has had; but for III, he has given 8 children of 5 & 6 months old, and never in any case has he seen any
ill effect arise from its use; although many cases of curious in-tolerance of the drug have at times been reported, rashes, sudden dyspnoea & other bad symptoms being described: such cases, however, must surely be rare considering the frequency with which the drug is prescribed by Medical men or taken by the patient without Medical advice.

In its beneficial effect on the Brucella pneumonia of children, it differs markedly however from its effect on pneumonia in adults, where in the writer's experience Phenacetin & antipyrin are useless and even harmful.

Lepid Bacillus may also be used to reduce the fever, settle the writer has seldom or never had to resort to it; for such treatment the child should be in a bath at 70° & may remain there for 10-15 minutes at a time.
but the pyrexia quickly returns, wrapping the child in a cold pack has also been suggested. Bathing with a sponge wrung out in tepid water the writer has found useful & soothing.

b). To relieve congestion.
The room in which the child is being treated must be kept up to 65° if possible, & the air kept moist by means of a steam kettle; and a tent rigged over the child's cot is of great use in these cases.
Poultices are of undoubted value & the method of using them should be as follows: Make a good large poultice consisting of 4 or 5 tablespoonsfuls of linseed & one of mustard, and apply this to the back for 4 or 5 hours, when it should be removed & the back covered with a sheet of warm cotton wadding; then a similar poultice should be applied to the front of the chest, & so on. Such applications may be repeated 3 or 4 times as there is considerable tolerance of
counterirritation even in a young child: If the skin had too reddened, simple lanced poultices should be used; care being always taken not to put a poultice on without previously placing it against the cheek to test its heat, and also not to make them too heavy, as to put a heavy application of any kind on a chest in which the lungs are blocked by mucus, or the lung in a state of collapse is simply to cause death through suffocation.

In a very severe case Dr. Eustace Strode recommends dry cupping, and judging from its value in adults it ought to be useful.

Oxygen may be used in a bad case with a tendency to cyanosis, and although the writer has not employed it in children, a very successful case of its use is reported by Dr. J. P. Philips in the British Medical Journal May 11, 1895, in which a child's life was undoubtedly saved by its use.
The administration, apparently requires to be frequently repeated and continued at intervals, it may be for some days.

C) To support the strength.

The diet should consist entirely of fluid food; milk diluted with water to 1/4 its strength should form the principal nourishment, or if a tendency to diarrhoea, saccharated solution of lime should be used instead of barley water. A cup of beef tea may be allowed once daily, and a little egg beaten up in milk.

In infants at the breast, in addition to the breast feeding a little white wine or weak tea may be given, especially if the child has too much dyspepsia to suck well.

Stimulants are of undoubted value, although not necessary in every case, and as a firm believer in their value one can scarcely go so far as to agree with Dr. Eustace-Smith
who says "Stimulants should be given
Early & no attempt to lessen the
Temperature should be made with-
out at the same time administering
Brandy."
In severe cases Brandy should be
given frequently. To an Infant or very
Young child, 10 drops every hour
is a very good plan & is of value,
always remembering however the
narcotic influence of Alcohol, and
watching the effect carefully.
Then of course there is the inevitable
contrary opinion & a writer in the
"Archives of Pediatrics" May 1895,
"disapproves of the quantities of alcohol
so frequently given"; he continues,
"alcohol fed children will digest less
perfectly in pneumonia than those
to whom it is not given." This
objection, however, seems rather a
theoretical one, & one is sure that
one can point to a case or two where
brandy as above suggested, at any
rate seemed to help to save life.
Except in the earlier stages, expectorant drugs are rather of secondary importance; Aconite, as often recommended, the writer considers useless and dangerous, should certainly not be given without alcohol, in which case it is difficult to see its use.

Specacunshka is useful especially when combined with carbonate of Potash, or a simple saline may be used if the case is mild.

If the pulse is very fast and weakening, Digitalis must be employed, with a little Peruna.

In the stage when the temperature has subsided, liniments may be rubbed into the chest, a good one being equal parts of the tincture of Capsicum and Soap liniment, or better still the tincture of Pot. Sod E. Napone.

A useful tonic during convalescence is the Syr. Fr. Phosph. To.

If the cough remains a little
Oxymel Bellad may be used with it, the two forming a mixture which children take readily.

Cod liver oil, or malt oil should be administered.

If circumstances permit, when out the child may with advantage be moved to the sea side.

Cod liver oil should must especially be used in the more chronic cases, in which also the chest should be painted with 1/3 of iodine, and in such cases, residence in a warm place if available will be of advantage.

Complications such as dyspnoea or whooping cough, of course necessitate the methods of treatment usual for these complaints, and their treatment is not materially affected by the concurrent or antecedent pneumonia.
VIII. References.

In preparing the above, reference has among others been made to the following works:

Ashley & Wright. "The Diseases of children" 1896
Entrace Smith. "Disease in Children" 1884.
Samuel West. "Diseases of Children"
"British Medical Journal"
Nov. 9, 1895.
May 11, 1895.