

the patient pass safely through it, when once it is established.

I would outline the treatment under the following heads: (1) Prophylaxis. (2) General management of the disease. (3) Diet and feeding. (4) Special treatment: (a) by drugs; (b) by serum therapy. (5) Symptomatic treatment: (a) to relieve pain; (b) to lower the temperature and moderate the nervous symptoms; (c) to stimulate the heart, in order to prevent cardiac failure or to overcome it if present; (d) to stimulate respiration.

Prophylactic treatment is very important. Care must be taken to see that children are sufficiently clothed yet not overclothed; that they are much out of doors, and that while indoors they are in well-ventilated rooms, with a temperature not over 68° or 70° F. during the day and a few degrees lower at night. Children ill with any diseases, particularly those that are most likely to be complicated by bronchopneumonia, should be turned often in bed, now on one side, then on the other, now on the back and then on the abdomen. Bronchitis in an infant should be most carefully treated, as such cases, especially if neglected, are very prone to develop bronchopneumonia. In all cases the mouth should be carefully washed at least once daily, preferably with some alkaline antiseptic solution; and antiseptic nasal sprays are advisable as preventive measures.

General Treatment.—Infants are better for being much held in the nurse's arms; older patients are to be put to bed at once and the bowels moved by calomel, in doses of one-tenth of a grain every half-hour or every hour for ten doses, or until the desired effect is obtained. The sick-room should be large, light, and well-aired; there should be a steady renewal of the supply of fresh air, and—if it is deemed advisable—additional moisture should be imparted to it. A change of rooms several times in the twenty-four hours is the best arrangement, provided all of the windows of the one which the patient leaves be opened wide so that it may be in the best condition upon his return. An open fireplace is an excellent ventilator. When the patient's temperature is high the temperature of the room may be at from 65° to 68° F.; when the patient's temperature is normal, the room temperature should be 70° F. The chest had better be protected by an oiled-silk jacket throughout the attack, and the skin of the chest may advantageously be kept red by some light application of mustard. Thick hot poultices should not be used.

It is well to establish a more or less strict isolation, and to disinfect the patient's rooms and their contents before they are used by another person. Especially should this be done in secondary cases.

Great care should be exercised in the management of the diet, as the turning of the tide one way or the other often depends upon it. Plenty of cool water, not iced, should be at hand, and the patient should be encouraged to drink it.

Special Treatment.—Drugs can often be given to advantage by inhalation. The child should be placed under a tent and some kind of a vaporizer employed. A variety of drugs may be added to the water or it may be used by itself. The addition of creosote gives particularly good results. Turpentine, compound tincture of benzoin, and terebene may also do good service when exhibited in this way. The inhalations should be given for from eight to fifteen minutes at a time, every two to six hours. The cough is often greatly relieved by such inhalations. The administration of drugs which, it is believed, can make the blood a less favorable medium for bacterial life, is not to be considered in the case of infants and young children.

For accomplishing this purpose we must look to the better preparation and use of serum therapy, which is now only in its incipency.

Symptomatic Treatment.—Pain severe enough to demand the administration of some form of opium is unusual. When such a condition does exist, small doses of Dover's powder are quite efficient. Ordinary temperatures, say those under 104° F. rectal, do not in them-

selves call for special treatment. However, it may be advisable to apply cold, when this degree of temperature is reached, in order to control the nervous symptoms, such as sleeplessness, restlessness, or delirium. In some cases Holt gives for this purpose one grain of phenacetin every two hours to an infant of six months.

The cold is best applied by cool or tepid sponging, or by packs. The spongings are to be frequently repeated until the symptoms for which they are given are controlled. Both cardiac and respiratory stimulants may be needed. Of the first class we will mention alcohol in the form of brandy or whiskey, strychnine, nitroglycerin, and caffeine. None of these is to be administered as a routine treatment. As a matter of fact, however, very many, indeed nearly all, patients with secondary bronchopneumonia need cardiac stimulation, the chief indication for such being a weak, rapid, irregular pulse. The physician should determine how much alcohol it is desirable to give in the twenty-four hours and have it administered in small divided doses, well diluted with at least from six to eight times its bulk of water. A child one year old may need only half an ounce of brandy during the day, or he may need as much as two ounces. The dose, whatever it is, should be reduced as soon as possible, and the alcohol should not be continued for too long a time. Nitroglycerin may be used to help the heart over a particularly hard strain. To a child of the age mentioned above, gr. $\frac{1}{100}$ – $\frac{1}{50}$ can be given every hour for several doses, say five or six. Strychnine is not to be given so frequently as alcohol or nitroglycerin. To a child of the age mentioned gr. $\frac{1}{100}$ to gr. $\frac{1}{50}$ of strychnine may be given every three or four hours. It is often best to use two of these drugs, giving them alternately. The effect of caffeine is less certain and the drug is not so much used as the others for its effects upon the heart; as a respiratory stimulant it is better.

The seat of the disease being in the lungs, it is very natural that respiratory stimulants should be called for. Strychnine helps here just as it does in cases of cardiac failure, and in addition to it we can use atropine, caffeine, and oxygen, all of which may be necessary in cases of respiratory failure. We should not wait until the patient is *in extremis* before giving oxygen; when administered it should be considerably diluted with air.

After an attack of bronchopneumonia general tonics are indicated, and it is especially advisable for the patient to have a change of air, preferably to a warm, dry climate, where he should remain for several weeks.

Prognosis.—This must always be guarded, for bronchopneumonia is a dangerous disease. The mortality of all cases, considered together, is between sixty and seventy per cent.

The mortality of primary cases varies greatly, viz., from ten to fifty per cent., depending upon the previous condition of the patient, upon the virulence of the infection, and upon whether the child is an inmate of an institution or not. In private practice the maximum mortality is about thirty per cent.

In secondary institutional cases the mortality of infants under one year of age is appalling. In certain diseases it reaches and stays at one hundred per cent. for months at a time.

The prognosis depends upon the child's age, surroundings, and previous condition, and upon the nature of the infection. Rachitic children developing bronchopneumonia are almost sure to succumb. Bronchopneumonia is most fatal when associated with pertussis, next with measles, and then with diphtheria. This order, however, is a matter about which statistics differ.

Holt says the shortest cases are the most fatal; that the only termination under ninety-six hours is a fatal one, and he says further that, in cases of over two weeks' duration, the prognosis grows worse with each day of continued temperature.

Patients having a low temperature, little or not at all above 100° F., are usually in a condition of low vitality, and consequently about seventy-five per cent. of them die. The mortality of cases in which the temperature

reaches 106° F. or over is about eighty-five per cent. The most favorable prognosis is in cases with a fairly even temperature curve, one that does not run to either extreme, and does not vary much one way or the other from 103° or 104° F., during the period of activity of the infection.

A steeple chart with great rises and correspondingly great drops of temperature, simulating a pus temperature, usually indicates a mixed or a streptococcus infection, and the prognosis is worse than in the cases with a more even curve.

A convulsion or two at the onset of bronchopneumonia does not affect the prognosis unfavorably, but when convulsions come later in the course of the disease they do affect it, and that decidedly for the worse.

Bronchopneumonia may terminate in resolution, suppuration, gangrene, chronic bronchopneumonia, or death.

Henry E. Hale.

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PNEUMONIA, CHRONIC.—(Synonyms: Interstitial Cirrhosis of the Lungs, Chronic Interstitial Pneumonia, Pulmonary Fibrosis, Fibroid Phthisis.)

Chronic pneumonia is not an independent morbid entity, but occurs as a sequel of one or more previous or coexisting pathological conditions of the lungs or pleura. It is a chronic productive inflammation which may occur wherever connective tissue is found. It is encountered in two chief forms, circumscribed and diffuse. The circumscribed form is associated with tuberculosis, gummata, tumors, infarctions, hemorrhages, abscesses, and every morbid growth, and really is the attempt of the part to wall off the pathological condition.

The diffuse variety is secondary to incompletely resolved lobar pneumonia or to acute or subacute bronchopneumonia and chronic bronchitis, spreading mostly from the bronchial walls. It may also be a result of pleurisy, and is then called by Charcot pleurogenous.

Interstitial pneumonia may invade the lung in great bands, which develop in the normal septa. A potent cause of interstitial pneumonia is the inhalation, for a considerable length of time, of dust, as necessitated by certain occupations; for example, coal-mining, stone-cutting, and some kinds of work in iron. Zenker calls this form pneumonokoniosis.

In general arteriosclerosis inflammation of the connective tissue of the arterial walls extends to that of the lung itself and results in a diffuse interstitial pneumonia.

Chronic pneumonia is, as a rule, unilateral, but in pneumonokoniosis it is always bilateral. The circumscribed variety is, as a matter of course, distributed according to the distribution of the lesions with which it is associated. When these lesions are close to the pleura this membrane becomes involved, its two layers being thickened and adherent. The zones of new connective tissue about the original lesion contain blood-vessels at first, but later these become more or less obliterated, although there is not the same tendency to death of tissue as is found in tuberculous lesions. About these zones there is usually present a certain amount of emphysema.

In well-marked cases of the diffuse variety more or less of the pleura is adherent and greatly thickened, and the affected lung is smaller than normal and cannot be separated from the chest wall without tearing. The lung

feels firm and leathery. The heart may be drawn to the affected side, and its right half may be hypertrophied.

On section the pleura is seen to be tough, fibrous, and of a grayish color. There is often a creaking sound as the lung is cut. The cut surface is firm, shiny, and of a dull red or bluish color or marbled. Much pigment is often present throughout the lung tissue and in the bronchial nodes. The walls of the small bronchi are increased in thickness and in many places dilated. Some of the dilations are large and often contain varying amounts of pus. The microscope shows the new tissue to be connective tissue of the small-celled variety; most of the cells are round, but some are fusiform. There are at first blood-vessels in this new tissue, but they tend to disappear later; there is, however, as before mentioned, but little tendency to tissue necrosis. The walls of the atria, air sacs, and air cells are infiltrated with the new connective-tissue cells, and the air cells may contain organized exudate.

In the unilateral cases the unaffected lung is enlarged because of the compensatory emphysema present.

SYMPTOMS.—In looking for the symptoms of chronic pneumonia we first get a history of one or more of the diseases which it follows, especially chronic bronchitis or protracted bronchopneumonia. In the early stages the patient may feel fairly well, complaining only of cough with sero- or muco-purulent expectoration. The cough is worse in the morning, and is paroxysmal when there is an accumulation of secretion in the lower lobes. As the process advances there is dyspnea on exertion. Lying on the unaffected side may cause dyspnea, as it restricts the action of the functioning lung; consequently patients with unilateral chronic pneumonia lie on the affected side. With the onset of ulceration a new order of symptoms is noted, all of them being worse during the winter season. The sputum changes its character and becomes a thin muco-purulent fluid, of a gray or black color and is often fetid. On standing it separates into layers; the lowest contains solid particles and is yellowish in color; the next above is a greenish fluid; and the top layer is thin and frothy and contains mucus and fat. Cavities are formed, allowing of accumulations of pus, and these in some instances are emptied by change of position. Fever, of a hectic type, and night sweats may be looked for early, and small, frequent hæmoptyses are common occurrences. With the conditions present giving such symptoms, it is no wonder that the patient's general condition becomes rapidly worse. The whole aspect of the case is that of chronic pulmonary tuberculosis, excepting that no tubercle bacilli can be found.

There is no elevation of temperature except during exacerbations of the bronchitis and after ulceration has begun, as noted above. Pain is by no means a constant symptom. It is present only when the pleura is involved, and then the diminution of respiratory movement on that side usually keeps it from being very severe.

For months we may be able to discover only the physical signs of previous or coexisting disease. Gradually there develop signs due to diminution of aërating surface, thickening of pleura, contraction of the new tissue giving lessened or absent respiratory movement, deformity of the chest, spinal curvature, and displacement of the heart. The cardiac pulsations are sometimes abnormally visible. The dilations of the bronchi, with or without contained fluid, also give rise to special symptoms. In unilateral cases the unaffected side is increased in size, has increased respiratory movements, and shows the signs of compensatory emphysema.

TREATMENT.—In the management of these cases prophylaxis is of the utmost importance. All patients with persistent bronchitis, or with protracted or unresolved pneumonias, and those who have had several attacks of bronchopneumonia, should receive the very best tonic treatment with respiratory exercises; and above all, they should find the climate in which they do best and should, if possible, live there. When the trouble is due to the occupation, this must be abandoned. No treatment directly affects chronic pneumonia when once it is estab-

lished. The therapeutic endeavor is then to control the cough, overcome the fetor of the sputum, and keep up the general tone of the individual. The patients must avoid exposure to cold and wet. They must spend their winters, at least, in the South, and are better for living the year around in a dry, warm, equable climate. Moderate daily outdoor exercise and the best of food are very important.

DIAGNOSIS.—In aiming at a diagnosis of chronic pneumonia, we have to consider the possibility of pleurisy, cancer of the lung, pneumothorax, and pulmonary tuberculosis.

PROGNOSIS.—The outlook for the future comfort and happiness of these patients depends largely upon their dispositions and their ability to get to a suitable climate. No hope of cure can be held out to them. The disease, however, is seldom in itself a cause of death. Some intercurrent malady usually terminates the scene.

Henry E. Hale.

PNEUMONIA, LOBAR.—(Synonyms: Croupous Pneumonia, Fibrinous Pneumonia, Pneumonitis, Lung Fever.) The lung differs from all other structures in having two separate circulations—the nutrient, supplied from the left side of the heart through the bronchial arteries, and the functional, supplied from the right side of the heart through the pulmonary artery. This double circulation underlies all the phenomena of pneumonia, and must be recognized in any definition of the disease, as without it the disease itself could not exist.

DEFINITION.—Lobar pneumonia is an acute disease in which a specific parasite invades the air cells of one or more pulmonary lobes, where it grows in a fibrinous medium exuded from the functional capillaries, and generates a toxin that infects the system at large.

The local process causes consolidation of the affected area by filling the air cells with the effused material, which material is afterward removed, leaving the structure of the lung intact. The general infection is marked by fever, which in a typical case begins with a chill, and after a duration of from four to nine days ends abruptly by crisis.

In most cases a local dry pleurisy is excited, the phenomena of which are added to those of the pneumonia proper.

Death may take place from the virulence of the infection, from loss of respiratory surface, from exhaustion of the right heart, from consecutive asthenia, or from a combination of two or more of these causes.

SYMPTOMS AND CLINICAL COURSE.—The attack may be preceded by prodromes, such as malaise, headache, anorexia, pain in the limbs and back, etc.² But, as a rule, the first complaint of the patient is of pain in the chest, usually in the mammary region. This is sudden in its onset and often very severe, and by restricting the movements of the ribs renders the respiration superficial and rapid. In most cases a chill follows, or, it may be, precedes the pain. The chill varies from a mere creeping sensation to a heavy and prolonged rigor, as severe as in a case of intermittent fever. With the chill there is a rise of temperature. The thermometer shows from 3° to 4° F. of fever during the first twelve hours, rapidly rising until the temperature reaches from 103° to 105° F. or even more. Then there is a period during which the temperature is maintained with slight variations until from the fifth to the eighth day, when a crisis occurs and the temperature becomes normal, or often subnormal. Cough is an early symptom, but it is repressed as much as possible to avoid the severe pain which it causes. The expectoration is apt to be frothy at first and mixed with florid blood; later it becomes viscid and very tenacious, so that it is spat out with difficulty and adheres like thick mucus to the vessel containing it. Its color at this stage varies in different cases. It may be a light yellow, a pale green, or a chocolate-brown, or a mixture of these colors. It is often likened to prune juice. Sputa of this kind may be considered pathognomonic. As resolution progresses the expectoration becomes less

colored, less sticky in consistence, and more catarrhal or purulent in its character, and the quantity gradually diminishes until it ceases altogether.

The respirations are early increased in frequency, and this quite out of proportion to the pulse rate and temperature. In nearly every severe case the respirations will go up to 40 or 50 or more to the minute, and they not infrequently reach 60 or more when the consolidation is extensive, or pulmonary edema takes place. This disproportionate frequency of respiration is very significant. The pulse is full and strong in the early stages, running from 90 to 100 when the temperature is 103° to 104° F., and becoming weaker and more frequent as the disease advances. When the respiration is greatly embarrassed the pulse is apt to be small and creeping.

The skin is hot and dry at first, later there is a tendency to perspiration, which may be profuse. The face is pale, with often a dusky red patch on each cheek. The lips are inclined to a bluish hue in proportion to the degree of pulmonary implication. They are often the seat of an herpetic eruption.

After the first forty-eight hours the chlorides in the urine are greatly diminished, or entirely absent. In severe cases a moderate degree of albuminuria is common during the height of the disease.

The physical signs begin to be appreciable, as a rule, within from twelve to twenty-four hours after the initial chill. Usually the first to be noticed is a fine crepitan rale, heard only with inspiration, though in some cases this is preceded by a diminished clearness of the respiratory murmur. Dulness on percussion succeeds, increasing in intensity as the consolidation becomes more complete. Ultimately the respiratory murmur is wholly replaced by a peculiar whiffing sound heard most distinctly toward the close of expiration, the so-called tubular breathing. If the pleura is involved there may be a rubbing or creaking sound in addition. There are increased vocal resonance and vocal fremitus. At the crisis, while the temperature falls and the pulse and respiration become less frequent, there is no immediate change in the physical signs, showing that the condition of the affected area remains the same.

In a large proportion of cases of pneumonia there is decided leucocytosis, the white cells numbering 20,000, 30,000, 40,000 or more to the cubic millimetre.

Variations from the above course are common. The pain may be entirely absent, or it may be felt at a point outside the chest, as for instance in the abdomen. The chill is absent in about one-third of all cases. The subsequent severity of the attack seems to be in some degree proportioned to that of the chill, but this rule has many exceptions, especially in advanced age. The temperature begins to rise from the moment of the attack, and increases with slight fluctuations until the maximum is reached. In cases that pass the crisis the highest point is usually a few hours before the decided fall takes place. When death takes place before the crisis, the highest point often immediately precedes dissolution, when it may reach 107°, 108°, or even 109° F.

When defervescence occurs by crisis, which is usually from the fifth to the eighth day, the temperature falls within a few hours almost or quite to normal. This is apt to occur during the night, and it often happens that the patient is left at the evening visit with no sign of an approaching decline of temperature, yet the next morning is found in an almost afebrile condition.

Within a day or two after the crisis the temperature very often becomes subnormal.

In a considerable proportion of cases instead of crisis there is a gradual fall of temperature until the normal line is reached. This defervescence by lysis may be complete at any time between the third and the fifteenth or twentieth day.

Delirium.—As the pyrexia increases, delirium is pretty frequently observed. Occurring early, and in persons having a tendency to cerebral disturbance in the presence of fever, it may have but little significance, but in other cases it is due directly to the infection, and it then points

to a condition of considerable gravity. Old persons are especially liable to a quiet delirium resembling that of typhoid fever.

Sleeplessness is not at all uncommon, and should always suggest an inquiry into the habits of the patient.

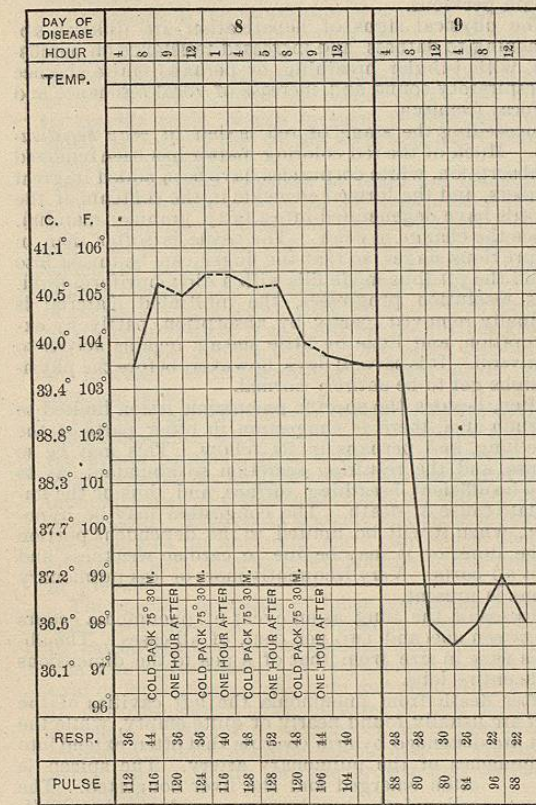


Fig. 3829.—Defervescence by Crisis.

for while it is not confined to those with alcoholic antecedents, it is much more frequent in such persons, and in the absence of delirium the key to the problem might be overlooked. In non-alcoholics the condition seems to be one of cerebral irritation at first, and later, perhaps, of cerebral exhaustion.

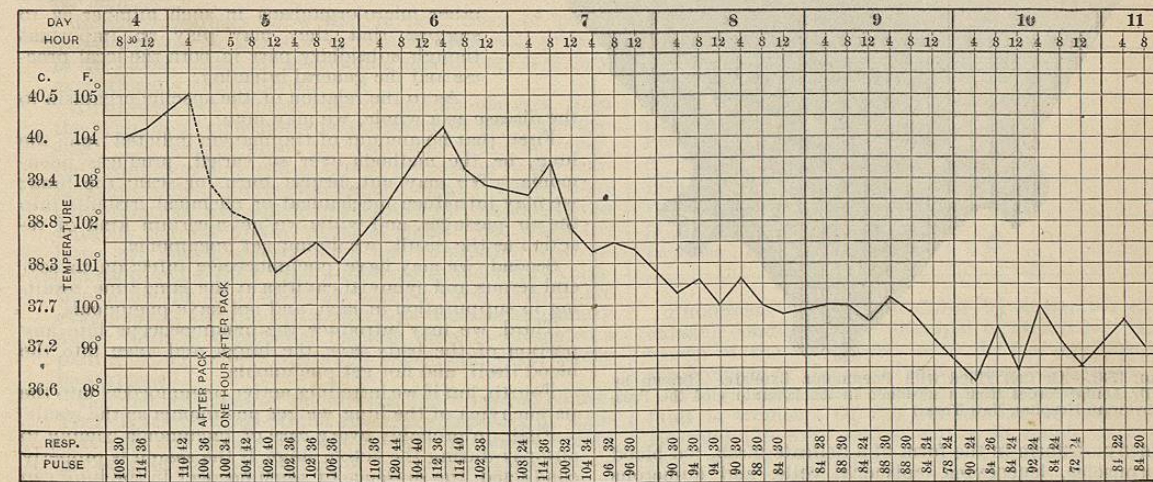


Fig. 3830.—Defervescence by Lysis.

In children often, and very rarely in adults, convulsions take the place of the initial chill.

Causes of Death.—Death may occur in a variety of ways. The patient may be overwhelmed by the intense virulence of the infection, death occurring within from thirty-six to forty-eight hours after the chill. Apparently all the vital functions are overpowered by the toxæmia. There is extreme muscular and nervous prostration, the heart's action becomes rapid and feeble, digestion is suspended, the kidneys act imperfectly, delirium and coma supervene, and death occurs from acute asthenia.

In other cases death is caused by exhaustion of the right heart. The muscle, already enfeebled by the action of the poison, tires out from overwork, dilatation and over-distention follow, and finally, failure to contract.

Still another cause of death is loss of respiratory surface. This is rarely the result of simple pneumonic consolidation, but there are added to this, congestion and edema of other portions of the lung. The lung fills up more and more, and death by asphyxia takes place.

Not infrequently death comes from exhaustion of the vital powers after a protracted struggle which the system is no longer able to endure. This is common in feeble and aged persons, and occurs usually after the febrile period.

Lastly, death may be caused by one or more of the complications of the disease.

In addition to the foregoing, sudden death may occur at any stage of the disease in a manner which, with our present knowledge, cannot be accounted for, and for which there is no anatomical explanation.

PATHOLOGY.—Autopsical Findings.—These correspond to a process extending from simple hyperæmia through extreme engorgement, fibrinous and cellular exudation into the air cells, complete consolidation, fatty degeneration of the exudate, and removal of the latter by absorption and expectoration. All of these stages may be represented at the same time in different portions of the lung.

The earliest lesion is simple congestion. When the chest is opened a portion of the lung may be found in this condition. It is not so fully collapsed as the surrounding normal lung, and to the touch it is slightly more resistant. On section the surfaces are bright red, and exude a bloody frothy serum. The physical sign corresponding to this condition is a slight localized feebleness of respiration, with more or less abundant moist râles. A few hours later the hyperæmia has passed into an extreme degree of vascular engorgement. The diseased part shrinks but little when the chest is opened. The pleural surface is of a deep red color, veiled by more or less of fibrinous exudate, which peels off readily in flakes. The resistance to touch is markedly increased,