Thesis

on

Acute Croupous Pneumonia

by

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On Acute Croupous Pneumonia with special reference to Treatment.

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Introductory.

In the following thesis an attempt has been made to review the present-day teaching on the treatment of pneumonia and to set down the results of three years' observation and study of this important subject. The disease will first be considered in its general aspects, its nature and etiology discussed; reference will then be made to certain points in its diagnosis and symptomatology, as well as to the factors bearing on prognosis, and finally a detailed statement given of the various methods of treatment, together with a criticism of each. So much has been already written upon the treatment of pneumonia that a complete account of the literature is well-nigh impossible. I was able, however, whilst at the University of Jena, to gather together for purposes of analysis the main writings on the subject and a perusal of these combined with my own previous and subsequent practical experience of the disease has furnished me with material for the present discourse. In summing up my results I have striven
to avoid entering into any controversy, and, even at the risk of appearing too dogmatic, have endeavoured to describe in as practical a manner as possible those methods of treatment which to my mind have been the most successful in combating a common and distressing malady.

The term "Pneumonia" or inflammation of the lung tissue may be held to include a large variety of pathological conditions. Besides the acute form to which the following pages refer we have many other subsidiary pneumonias, distinguished by different names and differing in their anatomical and clinical features from that about to be described. Thus we recognize Bronchopneumonia or lobular Pneumonia as opposed to the croupous form which is lobar in distribution, the Pneumonias associated with plague, typhoid fever, influenza and diabetes, the Syphilitic or White Pneumonia of the foetus, Pneumonia resulting from the aspiration of septic substances and the various varieties of emphysema of the lung occasionally designated by the term Chronic Pneumonia.
The variety, however, which possesses the greatest importance on account of its widespread prevalence, its high rate of mortality and its tendency like phthisis to attack the working section of the population at the most useful period of their lives, is known as Acute Lobar Pneumonia, aptly termed by the Germans, in order to distinguish it from the many and various lung infections to which reference has been made, "genuine" Pneumonia.
Etiology -

At one time chill was regarded as the main etiological factor in the production of pneumonia, until the disease was discovered to be a specific infection. Its true cause was found to be Fränkel's pneumococcus, a capsulated, lancet-shaped diplococcus existent in the lungs and sputa of affected persons and in certain cases also in the blood. This organism can be isolated from nearly every case of acute exudative pneumonia and we are justified in regarding it as the chief causal factor, though undoubted evidence is not obtainable from experiments on animals, its inoculation producing in most of them not a pneumonia, but a general septicaemia. Another organism, the pneumobacillus of Friedländer (2) has on various occasions been found associated with the disease, but its pathological significance is as yet disputed, and its importance is quite secondary to that of the diplococcus pneumonia first described by Fränkel (1) in 1883.
Reference will again be made to the bacteriology whilst speaking of the serum treatment, suffice it to say meantime that acute pneumonia must be looked upon as a general specific infection having its local lesion in the lung. There are, however, certain contributory causes which aid the action of the diplococcus pneumoniae and play an important part in the causation of the disease. These accessory causes are as important as the actual microbial infection, although it is true that a virulent infection may produce pneumonia without their aid. This is a point in which acute pneumonia differs from other infectious diseases. Very frequently exposure to cold or wet determines an attack and conditions of debility and exhaustion undoubtedly predispose to it, whilst as additional predisposing factors may be noted chronic Bright's disease and the various chronic exhausting diseases of the central nervous system.
Alcoholism not only predisposes to pneumonia but increases the gravity of the attack and makes its prognosis serious. One attack of pneumonia does not confer immunity, on the contrary second attacks occur in about 50% of cases and more than two attacks in the same person are very frequent.

Trauma has been recorded as a cause, such cases being known as "contusion pneumonia" but the condition is, as may be imagined, a somewhat rare one.

Of recent years additional factors in the etiology have been discovered, and among them may be mentioned accessory sinus suppuration. Tilley (3) regards the accessory sinuses as a source of pneumococcal infection, and in support of his views shows how frequently this condition is found post mortem. Thus, in 92% of pneumococcal infections, accessory sinus inflammation was demonstrable, 75% of these cases being acute pneumonias. All cases of pneumococcal meningitis had sinusitis.
and the condition was also found in 80% of pneumonic septicaemias. Those observations require confirmation, but are worthy of record as possibly they may come to be of considerable practical importance from a point of view of prophylaxis and treatment.

That pneumonia is contagious, and may under certain circumstances assume epidemic character has from time to time been observed. Ballard (4) recorded and extensive outbreak at Middleborough in which the disease was distinctly infectious and had an exceptional incidence on males above the age of fifteen. My own personal experience of two localised epidemics may be noted here.

In April 1906, in the Cowgate district of Edinburgh I was called to see a girl aged twelve and found her to be suffering from acute croupous pneumonia affecting the left lower lobe. The attack proved slight, crisis occurring on the sixth day. During her convalescence
her brother, a boy ten years old, was
sicked suddenly with severe pneumonia, at
first localised to right apex and later
involving the entire lung. Respirations rose
to 70 per minute and delirium was a
marked feature but recovery ultimately ensued.
At about the same time I attended, in
a street near by, a girl of thirteen
in a moderately severe attack of pneumonia,
on the second day of which her elder
sister was stricken down with the disease
which in her case proved very severe and
ended fatally in the Royal Infirmary five
days later. A few days after this I was
summoned to see a man on the same stair
who had contracted pneumonia. His crisis
occurred the seventh day and recovery was
uninterrupted. During this period I was
in attendance on two other cases of
pneumonia in the same part of the city.

My second experience of the
contagiousness of pneumonia was in
Fiskdalcly Cottage Hospital in 1907. A case
of acute pneumonia was admitted to the
male ward where the bed on either
side of him was occupied by a patient suffering from fracture. Each of the latter within a few days developed a typical attack of pneumonia. Those observations go to prove the direct contagiousness of the disease on certain occasions and from a strong point in favour of the advisability of providing in hospitals special wards for pneumonic patients, particularly at those times of year when the malady is apt to be most prevalent.
Symptoms

The symptoms of acute pneumonia are very characteristic. A short period of ill-health, with headache and feeling of malaise, may precede the illness, but in the majority of cases there is no such warning or prodromal symptoms. As a rule the disease commences suddenly with a rigor and the temperature rises rapidly to 103 or 104°F, this rise being accompanied by the usual symptoms of pyrexia.

The patient looks acutely ill, his breathing is embarrassed and hurried, his expression anxious, his face flushed and may be cyanosed. He complains of a stabbing pain in the chest or side over the affected area owing to the coexistent pleurisy, and along with this pain comes the frequent short dry cough which is accompanied a little later in the course of the disease by the characteristic sputum. This is at first slightly blood-stained but gradually assumes a rusty hue.

Its chief peculiarity is its tenacious viscosity so that the patient has often
difficulty in getting it free from the mouth. A constant feature of pneumonia is the pungent heat and dryness of the skin. Very frequently a patch of hepatic eruption appears on the lip. Dyspnoea is invariably present and the alar nasi may be seen to work with each act of respiration.

The urine is scanty, high coloured, deposits urates and is remarkable on account of the absence of chlorides, the exact significance of which fact is not yet understood.

Sleeplessness is a common and troublesome symptom. It may be due to the pain, may be caused by the dyspnoea or the distressing factor may be the frequent distressing cough.

When, as in a typical case of pneumonia, the above symptoms present themselves, the clinical picture is quite pathognomonic and scarcely requires repetition here, figuring as it does in every medical text book.
Certain points of special interest and importance may be mentioned, as they have a direct bearing upon the question of treatment.

The condition of the pulse in pneumonia is of great importance and constitutes a reliable guide, though so eminent an authority as Osler has doubted its trustworthiness. Early in the attack it becomes full and bounding and invariably diastolic. Its rate varies from 100 to 170 per minute and it is more rapid in relation to the amount of fever present than is the case with other febrile diseases.

An irregular pulse at the onset of the attack is of serious import, as also is a small and feeble pulse or one whose rate remains persistently above 120 per min.

The relation of the pulse rate to the respiration rate is a point of some practical moment in pneumonia.

Normally the pulse-respiration ratio is 4 to 1. In pneumonia, owing to the increased rapidity of respiration out of proportion to the pulse,
this ratio may be altered to 3 to 1 or 2 to 1, this increase persisting throughout the illness. The symptom is of considerable diagnostic value in cases of deep-seated pneumonia devoid of physical signs and also in cases which bear a resemblance to other infective fevers. The rapidity of respiration in pneumonia is not proportionate to the amount of lung involved. This is due rather to the effects of the toxins upon the respiratory centres.

A second point of special note in connection with the symptomatology is the frequent occurrence of abdominal symptoms; diarrhoea, vomiting and abdominal pain being in some cases the only symptoms. The cough at this stage has not yet developed or is suppressed and infrequent on account of the pain it causes, and is hence apt to pass unnoticed, whilst the pain is referred to the abdomen and not to the site of the pneumonia.
In one case under my own care acute abdominal pain and tenderness was the only prominent symptom. The temperature was 103°C and the tenderness was marked in the right iliac fossa and very suggestive of appendicitis. Observation of the rapidity of respirations led one to examine the chest, and over the lower lobe of the right lung the usual physical signs of commencing pulmonary consolidation were easily discoverable.

From the foregoing remarks may be deduced the maxim that in all acute abdominal conditions where diagnosis is doubtful, one should make it a rule to examine the chest for possible physical signs of pneumonia.

Delirium is a third symptom worthy of special mention. It is, in my experience, dependent upon one of three conditions, pneumococcal meningitis, pneumonia in an alcoholic subject, or apical pneumonia but it may occur in ordinary cases about the time of the crisis.
Meningitis is not a common complication of pneumonia, but when it occurs is apt to be fraught with very serious consequences. A very fatal form of pneumonia has been described, occurring usually in boys, closely resembling epidemic cerebrospinal meningitis, and terminating almost invariably in death within 24 to 48 hours.

Pneumonia affecting the apex of the lung is often accompanied by severe delirium. The symptoms may be those of acute mania, a condition which should be regarded as indicative of collapse and treated as such. In a case of my own in which the right apex was involved, delirium was the most marked feature, the patient calling out and gesticulating wildly.

When severe delirium occurs in basal pneumonia, previous alcoholism should be suspected. In such subjects an acutely maniacal state may be the sole indication of pneumonia, so that it is advisable in all...
cases of delirium tremens to examine the lung.

Temperature in Acute Pneumonia.

A few words may now be said upon what is probably the most characteristic feature of acute pneumonia, the crisis. After the fever has persisted for five to nine days, the temperature falls abruptly, as may best be seen by reference to the accompanying chart. Shortly before the advent of the crisis, there is an apparent increase in the severity of the symptoms.
The sudden fall of temperature is accompanied as a rule by abundant sweating, the respirations become easier and less frequent, the symptoms abate rapidly and the patient feels greatly relieved. In a number of cases the fever terminates gradually by crisis. A false crisis may occur about the fourth or fifth day, the temperature rising again and the symptoms persisting. An early crisis is a somewhat unusual occurrence, but may take place on the third or fourth day of the attack. Delayed crisis or a post critical rise of temperature are very frequently due to some undercurrent condition, such as empyema.
Physical Signs.

The physical signs may be better understood after a brief reference to the pathology of the lung condition. In the early stage the affected part is congested, the blood vessels in the walls of the alveoli dilated. The second stage, that of red hepatization, is characterized by an exudation into the alveoli, each of which will be found to contain a plug of fibrin, with cells entangled in its meshes. This may pass on to the stage of gray hepatization, invariably fatal according to some, a point of pathological interest which need not be discussed here.

Finally we recognize the stage of resolution, in which the alveolar exudate softens and is expectorated partly and partly absorbed. It must, however, be remembered that all of these stages may coexist in the same lung at different points. The right lung is more frequently affected than the left, and the lower rather than the upper lobe.
Of 160 cases mentioned by Henoch (5) the lower lobe was the part affected in 116.

The following may be regarded as the physical signs of a typical case. If seen early, inspection and palpation reveal nothing, on percussion the note may be slightly tympanitic (Skodaic) owing to relaxed lung tissue between the consolidated portion and the surface and on auscultation the breathing harsh vesicular in type with fine crepitations at the end of inspiration. Later, when the lung has become consolidated, deficiency of movement may be noted, vocal fremitus found to be increased and marked dulness elicited on percussion. Auscultation reveals breathing of a high pitched bronchial variety, there are now no crepitations, the vocal resonance is bronchophonic in nature. As the resolution stage progresses the breathing becomes broncho-vesicular and then vesicular, vocal resonance diminishes and there
come to be heard the characteristic
crepitations known as redux crepitations.
Although those physical signs are to
be noted in a fully developed case, it
by no means follows that they may be
elicited on all occasions. In some
cases, they are obtainable only with difficulty
and may indeed appear to be absent,
though the patient exhibit all the
symptoms of pneumonia.
In one case of my own the only
sign was skodac resonance over one
lower lobe, and in a few instances
I have failed to detect anything.
Such cases were probably deep seated
pneumonias which never came to the
surface. All this serves to
minimize the importance of physical
signs, which at best are of diagnostic
value only. In the great
majority of cases too, a
diagnosis may be arrived at without
examining the lungs, whilst it
is both unadvisable and useless to
repeat examinations.
The condition of the lung is no index to the progress of the disease, which may be much better judged from careful observation of the pulse and respirations. In doubtful cases however, as when the symptoms are abdominal, physical examination of the chest may be of considerable value from a diagnostic point of view.

I shall allude to the fact later on when speaking of treatment, but would meantime conclude these observations upon physical signs by stating that it is not advisable to make frequent and repeated examinations of the chest whilst dealing with a case of pneumonia.
Prognosis—

As a prelude to the question of prognosis it may be well to arrive at some conclusions as to the death rate in the disease under consideration. The mortality from acute pneumonia is a very varying quantity. Certainly the disease is to be regarded as a very fatal one, second only in importance to pulmonary tuberculosis.

Generally speaking, it may be held to average from 10 to 25 per cent, though certain writers have placed the case mortality at a higher figure than the last.

Oates (6) gives the mortality in Chicago as 20 per 10,000 of the population per annum, and it is certain that in such large industrial centres the death rate from pneumonia is much greater than in rural districts. As a matter of fact pneumonia is distinctly an urban disease, though it is difficult to account for this peculiarity.
The mortality is largely dependent upon
the age of the person affected,
and seems as a general rule to
grow with age. Thus, in patients
under six years of age it is low,
seldom exceeding 10 per cent, for
though in children the disease is
apt to be severe in type, it is
seldom fatal. As age advances,
however, mortality from pneumonia
undergoes a remarkable increase, and
in patients between sixty and seventy
years of age may range as high as
75 per cent of all cases. In the aged
it is especially fatal and has
indeed been regarded in them as
a mode of dying.

The mortality also undergoes
seasonal variations, but the high
death-rate about the months of
April and May is not altogether
due to the fact that the
disease is more frequent
during these months, but has a
significance hitherto unexplained.
Monthly Record of the Case Mortality of Pneumonia in twelve European countries. (Schwelbe)(7)

The above diagram is based upon very extensive statistical investigations. One feels indeed, however, to regard the mortality figures as rather low. The seasonal incidence of pneumonia is remarkably constant, and may in time come to be of importance in the prophylaxis.
But to return to the actual question of prognosis.

Heart failure must be considered as the chief danger in acute pneumonia, and it may be well to discuss it in the first place. It is liable to occur on the 4th to the 6th day of the disease, and, even in cases which appear to be slight, may determine a lethal ending. There have been many views as to its mode of occurrence.

Cuschmann (8) found that in a rabbit pneumococci in the circulation caused vasmotor paralysis and overfilling of the splanchnic vessels, so that the heart became secondarily weakened. He deduced that the mortality from pneumonia was dependent upon the condition of the blood vessels. Were this the case, one would suppose that in arteriosclerosis due to old age, alcoholism etc., the vasmotor paralysis would have a
good effect, yet it is in such conditions precisely that the mortality is greatest.

It is much more probable that the cardiac enfeeblement depends upon two conditions: firstly, to interference with the action of the right heart by the obstruction to circulation caused by the consolidated lung; and secondly, to direct action upon the heart substance by the pneumonia toxin.

As has been already remarked, the most important index to imminent cardiac failure is the condition of the pulse. A rapid irregular pulse, with small amplitude and low tension must always be regarded as a significant warning.

An early examination of the blood is of considerable value from a prognostic point of view. A leukocytosis of about 20,000 to 30,000 is the rule. Its absence is a bad sign, meaning that the infection is so severe.
that the tissues cannot respond to
the stimulus. Leucopenia may,
however, occur in slight cases, where
the resistance on the part of the
patient is so great that there is
no reaction. The presence
of eosinophile leucocytes is said
to be a good prognostic sign.

Many other factors must be taken
into consideration before venturing
to give a prognosis in cases
of pneumonia. The presence of
chronic Bright’s disease or of cardiac
disease naturally increases the gravity.
Obesity, advanced age or previous
alcoholic tendencies also contribute
to make the condition more serious.
Delirium must be regarded as
a bad sign, as also a haemorrhagic,
the so-called prune-juice, sputum.

The co-existence of pregnancy
depends the gravity of the case
and should abortion occur.
As a rule the greater the amount of lung substance involved the worse the prognosis, though recovery frequently follows even after a very considerable portion has become involved.

The existence of bronchitis in the opposite lung makes the prognosis much more unfavourable, but is an infrequent condition.
Treatment.

A classification of the types of a disease is often of use from a point of view of treatment. To take the case before us we may note that there are:

1. Cases of pneumonia in which a large portion of lung tissue is involved, causing as consequence respiratory difficulty.
2. Those in which the heart condition is of the greatest importance, as for instance, preexisting endocarditis.
3. A group whose predominant feature is generalized systemic infection, the toxic pneumonias.

How these various disturbances of normal bodily function may best be combated, it will be the aim of the following pages to elucidate.

In my opinion the most important facts to bear in mind are firstly, that pneumonia is an infective fever and must be treated as such, and not merely as a disease of the lung; and secondly, that
Cardiac embarrassment and failure constitutes the chief danger, for which we must watch carefully, and towards the antagonising of which our treatment must be directed. There has been so much controversy over the treatment of pneumonia that it has now become a theme on which one cannot afford to be too dogmatic. It will therefore suffice to mention the therapeutic measures which have from time to time been suggested, and to state their more apparent advantages and disadvantage in the light of one's own experience. These are those who hold that no treatment is of any avail in checking or arresting the progress of the disease or obviating its complications. This view I hold to be entirely false, for while it is true that many of the remedies advocated are of little value, it is equally certain that there are others which in skilful hands have proved of the greatest benefit.
Firstly, as to the general management of a case of acute pneumonia.

Careful nursing is of prime importance, though not, as some hold, the sole measure by which we may assist the patient's recovery. Campbell (7) and others are of opinion that one seldom cuts short the attack or saves life by adopting any measures beyond skilled nursing, and, while I cannot accept this view, I believe that too great stress cannot be laid upon good nursing arrangements for such a disease as that under consideration.

The patient should be kept at perfect rest, preferably on a single bed with a firm mattress. The bed clothing must be sufficient, but light, so as not to oppress the patient or interfere with his movements. The sickroom should be large and airy, and not too dark, as sunlight has a beneficial effect which must not be lost sight of. It is best kept at an equable temperature which
need not be so high as that required in acute bronchitis, but may range from 55 to 60°F.

An open-air treatment of pneumonia has been advised and has met with some success, though probably one might obtain results just as good in a well-ventilated room.

Daily cleansing of the mouth and gums with a weak solution of iodine is grateful to the patient and protective to those in contact with him.

Of considerable importance is the question of diet. This should be entirely fluid, and consist of milk, eggs and the various nitrogenous preparations. The patient may drink freely of cold water, though aerated waters are not to be recommended on account of their tendency to create flatulence.

Quantity is of much greater significance than quality in the dietetics of pneumonia, and it is very important that the diet should be restricted to a few ounces daily.
A full stomach embarrasses the heart and also interferes with the efficient working of the lungs, because combustible food demands oxygen for its assimilation and increases the blood pressure. Absorbed food, too, increases the production of carbon dioxide which, circulating in the blood is already giving rise to dyspnœa and aggravating the symptoms. London physicians have lately laid much stress upon this question of reduced diet. Post mortem examination of fatal cases has in many instances revealed the presence of undigested food in a dilated stomach, a condition which had certainly increased the cardiac embarrassment considerably.

Milk, eggs and strong beef tea may constitute the main part of the diet, the important fact being that they be given in sufficiently small quantity. The point is not a new one, Hippocrates having emphasised it, recommending the treatment of such acute illnesses by barley water alone.
Avoidance of physical examination of the chest must be practised in dealing with a case of pneumonia. The patient ought not to be set up in bed or turned on his side, as such an event is a frequent cause of cardiac failure. As already explained, the physical signs are no index to the progress of the disease. If for any reason the chest must be examined, this should be carried out as speedily as possible, with the patient lying on his back. For auscultatory purposes a binaural stethoscope, with the short chest-piece recommended by Dr. John Thomson, is of the greatest value.
Hydrotherapy.

It was stated by Von Jürgensen [1] that the main indication for treatment in pneumonia was the high temperature, this being the most active agent in weakening the cardiac power and increasing the liability to heart failure. He and other Continental observers recommended on these grounds treatment by a cold bath of about ten minutes duration of all cases whose temperature exceeded 104°F. It has since been proved, however, that a temperature up to 105°F has little influence on the mortality in pneumonia, and that deaths at a temperature below are nearly as frequent as above 105°F; in short, that the mortality is not dependent upon the degree of pyrexia.

Burney [2] in criticising this line of treatment, remarks that the effects of the cold bath are not so satisfactory as to warrant its general employment and recommendation, and
this may be taken as the view of most physicians in this country.
Loomis (19) of New York is also opposed to the treatment, considering that the
shock of the cold causes a nervous depression which militates against recovery
and increases the tendency towards cardiac insufficiency.

The routine use of the cold bath
in the treatment of pneumonia is, in
my own opinion, distinctly unadvisable,
and may be actually dangerous in
the aged, the alcoholic and the debilitated.
In one class of cases, acute croupous
pneumonia occurring in children, I have
found it to be of great benefit.
The child is placed in a bath of
tepid water, and cold water then
poured over his back and chest.
This causes deep inspiration, resulting
in a refilling of the collapsed portions
of lung adjacent to the consolidated
area. On all occasions in which
I have employed this measure it has
given prompt relief.
Whilst the use of the full cold bath is to be deprecated in the adult, daily cold sponging may be constantly employed. Though having no definite effect upon the course of the disease, it adds to the patient's comfort and thus indirectly assists his recovery.

Seymour Taylor [13] has published a case in which immersion of the patient in a hot bath of 106°F for a period of fifteen minutes led to a notable improvement in the symptoms. The same objections however, apply to this as to the cold bath, and those methods of treatment involve so much disturbance of the patient that they had best be avoided.
Local Applications.

Of these the icebag is probably the most universally employed as well as the most efficacious. It relieves the pain and slows the breathing, besides exercising an antipyretic action. In robust adults it may be employed with marked benefit, though in children and in debilitated subjects its use is inadvisable. If the temperature fall below 100° it should be removed, and reapplied should the temperature rise again.

Hot fomentations and poultices have been recommended, and may be of some value, but as a rule they tend in virtue of their weight to embarrass breathing and are best avoided.

Strapping the chest or the application of tight compresses, however useful in pleurisy, are distinctly contraindicated in pneumonia, where the patient requires all the chest expansion he can obtain.

Leeches, cupping and blistering may relieve pleuritic pain, but cannot affect the disease.
Alcohol—

While the routine use of alcohol in pneumonia is to be deprecated, its employment in selected cases is often of unquestionable benefit. As a general rule it should not be given in the earlier stages; but later, towards the advent of the crisis, and especially in presence of cyanosis, delirium, or a rapid irregular pulse, one may administer 4 to 6 ounces of good brandy or whisky in the 24 hours, and increase the quantity if necessary. When the fever is high, alcohol may be used on account of its effect in lowering temperature, which effect will be enhanced by the reduced diet to which reference has been made. For pneumonia in the aged, alcohol is a valuable remedy. To patients who have been habituated to its use, alcohol should be invariably given. The sudden deprivation of an accustomed stimulant in the midst of an
acute critical disease is fraught with the greatest risk, as the depression caused by its removal may be sufficient to turn the scale against recovery.

The whole question may be briefly summarized by saying that although many cases of pneumonia may be successfully treated without the use of alcohol, there are indications for its employment which must always be kept in mind and acted upon, chief among them being old age, previous alcoholic habits, and cases which in the precritical stage have developed rapid irregular pulse and delirium.
Bleeding

The practice of bloodletting, strongly advocated by Sydenham and many others, was at one time universally employed in the treatment of every case of pneumonia. Owing to its careless and promiscuous use, it fell into disfavour, and Hughes Bennett (14), writing in 1862, pronounced strongly against it. Like a number of other remedies it must be reserved for selected cases and not made a regular and routine practice. It can in no sense be regarded as curative, but there are cases in which it may be of great value as a reliever of symptoms. When dyspnoea is severe, cyanosis marked, and the right heart is overladen and dilated, the withdrawal of 5 to 8 ounces of blood from the median basilic vein at the bend of the elbow affords immediate relief, and particularly in the case of the strong
and plethoric type of patient.

Only, however, in such selected cases, can this measure be advocated, and even then must be cautiously effected, care being taken not to draw off too much, and also to stimulate if necessary.

**Saline Infusion.**

It is in toxic cases of pneumonia that this means of coping with the disease produces its best results, by diluting the toxins and assisting the antitoxic effect of the blood (20). It may be employed subcutaneously, 10 to 30 ounces or more being administered at one time.

Since the introduction of this remedy by the Italian physician Magi (15) it has been beneficial in many cases, and a modification of it, the giving of normal saline per rectum, has met with approval in America (16).

I have no personal experience of its value, but would hesitate to recommend.
a treatment which involves so much disturbance of a patient acutely ill, although prepared to admit that such a therapeutic agent might prove very beneficial in toxic pneumonias.

Drugs

It may be well for descriptive purposes to classify the drugs used in pneumonia as

1. Those which are believed to have a specific action upon the disease,
2. Those which are employed merely for the relief of symptoms.

Chief among the former class ranks quinine, which has by many been credited with a direct germicidal action.

As a rule it is given in doses of 1 to 3 grains every two hours.

Jørgensen (18) says that "above all other antipyretics it possesses the invaluable advantage of reducing the temperature without injuring the heart," and he considers it necessary to
give as much as 60 grains at a
time. It is difficult to
understand how such large doses can
be beneficial when one thinks of
the disorder of brain and stomach
they are bound to produce.

Aufrechte (17) strongly advocates the
subcutaneous injection of a 10% solution
of quinine hydrochloride and claims
for such a procedure wonderful results.

All that can be said in favour
of the quinine treatment of pneumonia
is that in small doses the drug may
be of value in the early stages of
the disease, and that it is certainly
the safest of the antipyretic remedies.

Other antipyretics have been frequently
used, but are best avoided on account
of the cardiac depression they are so
aft to produce.

Hajardin Beaumetz (18) recommends antipyrin,
levo (19) prefers phenacetin.

The general consensus of opinion,
however, is against the use of
such preparations.
Aconite in the form of the tincture has, in doses of 1 minims every three hours, produced remarkably good effects, calming the restlessness and promoting sleep. Its use should be limited to the first 24 hours of the attack, and it should be avoided in cases of children and aged persons.

Caffeine, as a 10 to 15% solution for subcutaneous injection, was recommended by Frankel (19) for all stages of the disease, but the plan has not met with much acceptance.

Veratrine is frequently prescribed in the United States on account of its powerful antipyretic properties. Its action upon the heart, however, appears to be inconstant; moreover, its use is apt to be attended by sickness and purging.

Digitalis in large doses has been extensively used by Petrescu (21) who gives 60 to 100 grains of the leaf in infusion daily and maintains that he has seen many cases aborted.
by this treatment. The method has not, however, gained much favour in this country.

Combined with belladonna in the minimal doses suggested by Hare (22), I have found digitalis to be of considerable value, but not in a sufficient number of cases to warrant my forming a definite opinion.

Diaphoretics:—The value of these in pneumonia is well known, and for many years liquor ammoniae acetatis has been regarded as remedial in all febrile conditions. By dilating the superficial capillaries it relieves the right heart, and has besides a direct effect in liquefying the alveolar exudate and facilitating its expulsion.

A free action of the skin is, moreover, very comforting to the pneumonic patient, and there can be no doubt that the administration of diaphoretics is a most commendable line of treatment.
Inhalations.—Various substances have been advised as inhalations in pneumonia. Robinson (23) eulogizes creosote for this purpose; Murray (24) regards turpentine vapours as valuable, stimulating respiration and exercising a favourable influence on the disease.

Although such vapours have proved useful in bronchitis, their influence in pneumonia is, as may well be supposed, considerably less manifest.

While speaking of inhalations it may be well to mention the question of oxygen administration. This has been found of value in cases of extreme cyanosis and dyspnoea. The inhalation should be continuous, and may be accomplished by having the tube from the cylinder inserted into the nostril or attached to a funnel suspended over the patient's face. On certain occasions it may appear to do good, but as a rule it is of doubtful benefit.
Of drugs employed for the relief of symptoms there are firstly those acting on the alimentary canal. It has already been seen how frequent are the gastric symptoms of pneumonia. To alleviate these it is a good plan to give, at the outset, several grains of calomel followed by a saline aperient; indeed, this may well be made a routine practice.

The cough rarely calls for special treatment, but if distressing and troublesome it is best relieved by giving alkali and carbonate of ammonia. Sleeplessness is frequent, and tends to militate against recovery. Its treatment depends upon the cause; pain may be relieved by 10 grains of Dover's powder, dyspnoea by blood-letting, pyrexia by cold sponging. Of hypnotic drugs the best are paraldehyde and chloral-amide.

Much more important than the above are the symptoms of cardiac failure, and a line of treatment directed
towards obviating this danger should be pursued in every case.
For the purpose nitroglycerine has been recommended, as leading to a more even distribution of blood in the arteries and veins, and so relieving the right heart.
Thyrocline has been suggested, but cannot in any sense be regarded as a cardiac tonic and should be reserved for use during convalescence.
Digitalis and strophanthus are, par excellence, the drugs for use against cardiac failure in pneumonia, and of the two the latter is more constant in its action upon the ventricles, and has no effect upon the peripheral arteries.
If the proper kind of strophanthus is given it may be used in large doses with no evil effect whatever. The tincture should be made according to the old pharmacopoeia, so as to be free from irritating resins.
In the early stage of the disease it is well to give a trial dose of 5 minims and note how the heart reacts to it. Towards the critical period 7 to 10 minims may be administered every three hours, then every hour, and finally the dose may with safety be raised to 15 minims hourly. Following this method of treatment it has been possible to tide many a patient over the crisis who would otherwise have stood a very bad chance indeed, and strophanthus must be regarded as the most valuable single drug we possess for the treatment of acute pneumonia.
Serum treatment.

An efficient antitoxic serum for pneumonia has not yet been discovered, though it is in this direction that we must look for a specific remedy.

Klemperer (35) and Washbourn (36) succeeded in immunising animals, but in case of man the same result could not be obtained.

The reason for this, explained in terms of Ehrlich's hypothesis, is that the antiserum obtained from an animal contains an insufficiency of complement, repeated and increasing injections of toxin into the animal having caused a great increase of amboceptors, but not of complement.

The human complement is unable in this case to meet the deficiency, and the serum is hence without effect.

Extensive trial has been made of the antipneumonic serum of Römer.
In a case related by Renzi, a malarial and alcoholic patient whose entire left lung was implicated reached the crisis on the third day, 20 c.c. of the serum having been injected night and morning from the first. On the whole, however, the therapeutic effects of this serum have not been sufficiently striking to warrant its universal application.
One may now briefly summarise the conclusions arrived at in the foregoing pages as follows:

1. Acute Gouponous Pneumonia is to be regarded as a general infection whose chief danger is cardiac failure.
2. There is no specific treatment and no drug which will effectually check the progress of the disease.
3. A restricted diet is of prime importance in all cases.
4. Of local applications the ice-bag is the most valuable, but its use is to be reserved for robust patients.
5. Bleeding is of great benefit when the right heart is dilated and when dyspnoea is extreme.
6. When toxic symptoms predominate, infusion of normal saline is indicated.
7. Alcohol should be used only in cases of persons addicted to it and in the aged.
8. Certain medicinal substances, such as aconite, quinine, etc. are beneficial in the early stages.
9. Active treatment should be directed towards antagonising cardiac failure, and this may best be met by giving large doses of strophanthus.

10. The serum treatment, for reasons already set forth has so far proved disappointing, but herein, in all probability, lies the remedy of the future.
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