

Thesis  
for  
The Degree of Doctor of Medicine  
of the  
University of Glasgow

The Treatment of Pleural Effusions  
by  
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Fiji Islands  
Feb. 1886.

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I hereby declare solemnly, that this "thesis" was written  
by myself, unaided, beyond the assistance received from  
the authorities cited in the opposite page

Alex. J. F. Kottow.

2.

The following is a list of Authorities consulted in preparing this thesis

D<sup>r</sup>. Baistone (Theory of Practice of Medicine)

D<sup>r</sup>. Coats (Manual of Pathology)

D<sup>r</sup>. Moxey (Paper on Pleural Effusions in the "Lancet", Feb. 1884)

D<sup>r</sup>. Guain (Dictionary of Medicine)

D<sup>r</sup>. Roberts (Practice of Medicine)

D<sup>r</sup>. Tennent - (Lectures on Pleurisy (Western Infirmary)).

The cases, with the exception of three (noted in the text) are taken (with D<sup>r</sup>. Tennent's permission) from the journals of the wards under his charge, in the Western Infirmary.

These cases were reported by myself, but as they are very long I was obliged to make a synopsis of each case except one, which I have given in detail.

# The Treatment of Pleural Effusions

I have chosen as the subject of my "Thesis" the treatment of pleural effusions, with the object of advocating early operative interference, and to do so through the criticism of a number of cases, most of which were under my own observation when House Physician in the Western Infirmary.

I do not intend to discuss the question of diagnosis, for the recognition of the existence of a pleural effusion is generally a very simple matter. The history of the case is usually so characteristic, and the physical signs so easy of appreciation, that the diagnosis of a pleural effusion is rarely overlooked.

In general practice, the position assigned to certain drugs in the treatment of the disease under examination, is a primary one, and then as it were in the order of merit, the use of the aspirator and the free incision into the pleural cavity. First-dietetics, diaphoretics &c... are all tried, and when they fail one or other of the operative methods is resorted to.

Before going on to treatment, however, it will be necessary to note some of the consequences of a pleural effusion, for in the consideration of these, and the cases bearing upon them, will be found I think sufficient arguments in favour of early operation.

Among the more important results of effusion into the pleural cavity is pressure upon the lungs and heart.

As is well known the lung upon the affected side becomes pressed upon and the circulation of blood through its tissues materially obstructed. The lung upon the sound side becomes overworked (in proportion as the

Quain's Dictionary of Medicine - Pleurisy.

2. Dr. Murray's paper on Pleural Effusions in Lancet - Feb. 1884.

4.

other is enfeebled), its air sacs become distended, the vessels ramifying in their walls are pressed upon, and the circulation is again obstructed. Again, "in several cases, the lung becomes oedematous & congested and bloody and frothy sputa may appear." The result of all this is insufficient aeration of blood, and is one of the causes of the difficulty of breathing.

Another important factor in the production of dyspnoea is the condition of the heart. It becomes displaced, and its muscular contractions are considerably impeded, both by the obstruction in the lungs in front, and the pressure of the fluid behind.

As Dr. Mosby pointed out,<sup>2</sup> "in left pleural effusions the heart is considerably displaced to the right (the apex impulse often being felt away to the right of the sternum), and there is considerable pressure on the left auricle (the left being in a much more fixed position than the right, so that pressure upon it will be less easily escaped from by yielding of the parts around) obstructing the flow of blood from the right heart to the left, and so causing engorgement of the right heart (distending it laterally and increasing the change to the right) and backward pressure on the great veins, and so congestion of the various organs, lungs, liver &c....

In pleural effusions on the right side, the heart is displaced to the left, and there is pressure on the right auricle preventing the entrance of blood into the right auricle, and so reducing the size of the heart, so that the displacement appears less than on the right side.

Hence the greater the fluid in the right side, the more will be the pressure on the right auricle, and the greater the reduction in the blood supply to the heart, and the greater the danger of cardiac anaemia, and

1. This case I received from a medical friend



death from malnutrition of the heart.

In pleural effusions on the left side, there is danger of the heart stopping in diastole on account of the engorgement.

Thus in pleural effusions there is danger of death from asphyxia or syncope, and this in otherwise healthy persons."

The following three cases illustrate, I think, some of these points.

I. J. S. aet. 70. seen first, January 7<sup>th</sup>.

Patient complains of cough, shortness of breath, and cramps in the limbs. His illness is of two months duration, due he states, to changing an indoor for an outdoor occupation.

The lung symptoms were preceded by a gnawing pain in left scapular region, catching his breath, and greatly increased by deep inspiration and coughing. This pain lasted for two weeks, and then the shortness of breath came on, and has been gradually getting worse. He now lies on his left side. Face flushed, and lips slightly livid.

Apex beat is found in region of ensiform cartilage, is heaving and diffused over the epigastrium.

Inspection of chest shows bulging of left side, with diminished movement.

Percussion over left base is abnormally dull, and from the base, half way up the chest there is increased resistance. The apex in front gives a dull tympanic note. The R. M. all over the dull area is altogether absent, while that of the right side is somewhat juvenile.

Sonosus râles are heard on right side posteriorly. Temperature normal.

Jan. 13<sup>th</sup> Patient gradually getting worse, and complains of great difficulty of breathing.

Jan. 14<sup>th</sup> Patient died this morning just as tapping was about to be performed.

Post-mortem showed large quantity of serous, but muddy fluid in the left pleural cavity.

The first point of importance to note in this case is, that the patient had been ill for two months, and as no note is made of the cardiac condition, it may be presumed there was no organic disease of the heart. But considering the patients' age, 70 years, it may be taken for granted that a slight obstruction to the heart would be serious as that organ would not be very vigorous. But the obstruction was great.

The left pleural cavity was almost full of fluid, the heart was displaced to the right, there was pressure on the left auricle, causing (as already seen) engorgement of the right heart, and backward pressure on the great veins, and so congestion of the lungs &c...

All these were present if we can judge from the symptoms and signs; there were, difficulty of breathing, lividity of the lips, heaving and diffused apex impulse in region of the ensiform cartilage, and prominent ribs at right side posteriorly.

The patient was first seen on Jan. 7<sup>th</sup>. (two months after onset of illness), and on the 13<sup>th</sup> he was found to be gradually getting worse, and complained of great difficulty of breathing. During this time he was treated by diuretics &c.. It was now suggested that the fluid should be withdrawn, but on the following day (14<sup>th</sup>) patient died "just as tapping was about to be performed."

Here then is a case of left pleurisy with all the signs of cardiac pressure becoming daily more exaggerated, and yet operative interference

Dr. Tanner's "Index of Diseases" - Pleurisy

2. "It is also generally believed, and perhaps correctly, that the discharge of a certain proportion of fluid from a distended cavity promotes the absorption of the rest" (Brissonne), page 395.

only proposed when the patient was very far through.

In Dr. Tanner's "Index of Diseases", the following directions are given for the use of the aspirator, "the thorax to be tapped, and the fluid withdrawn by aspirator whenever suffocation is threatened by amount of effusion, or from paroxysms of dyspnoea, or when remedies fail to produce absorption"

The utter fallacy of waiting till "suffocation is threatened" before using the aspirator is suggested by the termination of the case just quoted, and I hope to be able to show that the proper time to withdraw the fluid is not when "suffocation is threatened" or "remedies fail to produce absorption", but in an earlier stage of the disease to avoid the threatening of suffocation, and to aid drugs in their action.

To expect drugs alone (diuretics, diaphoretics &c.) to give relief to the symptoms in the case of a pleura distended with fluid, is to expect what they are utterly incapable of doing. But in connection with the aspirator they play a secondary part, by aiding the absorption which is believed to be promoted by the withdrawal of some of the fluid.<sup>2</sup>

The second case contrasts with the above, and as it is a somewhat unusual one, I may be permitted to give it in detail.

II.

J. B. aet. 50. Admitted November 29<sup>th</sup>.

Admitted complaining of great difficulty of breathing, cough, spit and weakness. Patient had scarlet fever 35 years ago. Three weeks ago he got a slight chill, followed by cough, and since then he has been gradually getting worse. He was admitted in a very bad state, he had to be supported in bed, his breathing was loud & rough troublesome, there was abundant frothy, hemorrhagic spit (filling three spitons in

24 hours), and the lips were very blue. Pulse 88 per minute, and "water hammer" in character. Respirations 32 per min. & laboured. Slight oedema of ankles. On auscultation of the chest - nothing could be heard but loud pulmonary rales. Apex heart - in 6<sup>th</sup> left- interspace a little to left of nipple line, left border of cardiac dullness half an inch to left of nipple. On account of the pulmonary condition the cardiac sounds could not clearly be made out, but it was evident they were not pure.

Under treatment - he improved rapidly, breathing became less laboured, cough improved, and the lung condition cleared up, and on now auscultating the heart, a loud V.S. and V.D. murmur was heard at apex, down the sternum, and over aortic area.

In the middle of December it was noted that the patient had much improved, spit much lessened & though still haemoptoic was less so than on admission, and the breathing was much more easy.

Pulmonary percussion normal. Urine contained no albumen.

January 9<sup>th</sup> On the 5<sup>th</sup> Jan: patient complained of pain over right side of chest, and a mustard blister was ordered, giving relief. Next morning he complained of pain in the axillary region, but on examination nothing could be detected. This evening however he again complained of pain, & the chest was again examined, when the following condition was noted.

Dullness exists all over right side front and back; in front, from as high as upper border of 3<sup>rd</sup> rib, down to hepatic dullness which is displaced downwards - nearly to level of umbilicus, whilst behind, dullness exists from supra epiconus fossa above, to the base of the lung. The right side of the chest measures 1 1/2 inches more than the left at-

the level of the nipple. Cardiac dullness is displaced to the left, but as the left-ventricle is dilated and hypertrophied, this fact is not clearly demonstrated. All over right-side R. M. is very feeble and at lower part of chest is almost inaudible. On right-side V. R. is greatly diminished, and V. I. is totally absent. All through the latter illness there has been no elevation of temperature, and no increase of the pulse.

Jan. 11<sup>th</sup> 65 ounces of haemorrhagic fluid withdrawn from right-side by the aspirator.

Jan. 13<sup>th</sup> 29 ounces of haemorrhagic fluid withdrawn. Patient still perspires a little. Pain in side much less, and breathing much improved.

Jan. 16<sup>th</sup> 42 ounces haemorrhagic fluid withdrawn. Cough much less, but sputum still haemorrhagic. Face not nearly so much flushed, and patient perspires very little. Breathing still a little troublesome on moving or exertion. Appetite improving.

Jan. 17<sup>th</sup> Cough much less, as also sputum, which is now viscid and containing only a little blood (and not almost purely haemorrhagic).

Jan. 19<sup>th</sup> Patient rapidly improving, cough & sputum less. Pain in chest much better, and patient can move in bed with comparative ease.

Jan. 20<sup>th</sup> Very little pain, cough much better and sputum less, mucous, frothy and tenacious, with only here and there a little blood. On examining chest there is found to be considerable movement during respiration over lower part of right-lung, but still dullness on percussion all over right-side, but R. M. is slightly stronger.

Jan. 21<sup>st</sup> 38 ounces of haemorrhagic fluid withdrawn. Sputum to-day.

free from blood.

From this time patient went on most satisfactorily, pain became less and less and finally disappeared. Breathing became much more easy, and on February 7<sup>th</sup> patient was allowed up for a little. He was then allowed to walk about the ward, and then permitted to go outside.

Feb. 29<sup>th</sup> Since last note patient has been steadily improving, and for the last fortnight has been going about in the open air, and is now up all day. He has almost no cough, and only slight mucous expectoration free from blood, and the sputum has contained no blood since Jan. 21<sup>st</sup>.

Pulse 80, Respiration 20, full and easy, and an equal amount of movement on both sides of the chest during respiration. R. M. can be heard all over right side but is slightly feeble as compared with the left. V. R. and V. F. almost the same on both sides. No pain in chest. Bowels regular.

Patient left to-day, almost well, i. e. well, except the cardiac condition.

It is the note made upon the 9<sup>th</sup> Jan: that I would first draw attention to, and it will be observed on examination, that the condition described developed at a time when the patient was recovering from a very serious illness, and was suffering from grave cardiac disease. The heart was displaced to the left, and on account of the pressure on the right auricle, the blood supply to the heart would be diminished, and the weakness of an already enfeebled heart increased.

It was at once decided to withdraw the fluid, and the patient was operated upon four times within eleven days and 174 ounces of hæmorrhagic fluid withdrawn. Before each operation the patient was placed in a semi

recumbent position, and a little brandy was given to obviate as much as possible any tendency to syncope, and on account of the cardiac condition only a small quantity of fluid was withdrawn at each operation lest the sudden removal of pressure should bring about the very condition that was sought to be avoided. From the date of the first tapping there was rapid improvement, each withdrawal of fluid being followed by marked relief to the patient, and eleven days later, when he was tapped for the last time, the sputum, which was gradually altering in character, was free from blood. This was an indication of the satisfactory progress of the case, for the continuance of the haemorrhagic sputum (which had been lessening at onset of pleurisy) was evidently due to the pressure on the right auricle causing backward pressure on the pulmonary veins; the increased function of the left lung together with the backward pressure, causing rupture of some of the smaller and already weakened vessels in the pulmonary tissue. But by the withdrawal of the fluid, and the reduction of pressure on the right auricle and right lung, the backward pressure on the great veins was reduced, and the increased tension on the left lung diminished, and the blood circulation through the pulmonary tissue rendered more easy, so that the weakened vessels were relieved and the bleeding checked.

On the 7<sup>th</sup> Feb. just one month after the onset of the pleurisy, the patient was able to leave his bed and go about the ward. And on the 29<sup>th</sup> Feb. just three months after his admission to hospital, but within two months after the onset of the pleurisy, he was dismissed well, i.e. well, except the cardiac disease.

It would be difficult to overestimate the result of this case, a result due entirely, I think it will be admitted, to early operative treatment.



Had the case been treated alone by such drugs as generally used, the termination would almost certainly have been fatal. The patient had aortic regurgitant disease, of all cardiac diseases the most liable to cause sudden death, and the large effusion in the pleural cavity must have pressed upon the thoracic organs and embarrassed the heart, increasing the danger.

In connection with this subject - the danger of cardiac failure - I have one more case to bring forward.

III. On December 31<sup>st</sup> an Indian boy aged 18 months was taken to the cane fields by his mother, and laid on a blanket, under the shade of some trees, to sleep, whilst the mother went on with her work. In a few hours the woman returned and found the child dead. On inquiry the mother stated that on Dec. 23<sup>rd</sup> the child began to be feverish and had a cough and pain in the chest. After a few days the cough ceased, but the pain in the chest & the fever continued till death. She says she did not consider the child ill enough for hospital. (I may mention that I saw the child on the 19<sup>th</sup> Dec., when it was quite well, being dismissed hospital on that day, having been treated for some slight diarrhoea).

Post-mortem appearances - Heart considerably displaced to left, and somewhat pale in colour; left side empty, but the right contained a small quantity of clotted blood. Valves normal.

Right pleura adherent all over, thickened and covered with a fibrinous exudation, and the cavity of the pleura full of pus. The right lung was completely compressed and flattened, and contained no air.

Left pleura normal, and the left lung slightly emphysematous and congested. Other organs slightly congested, otherwise normal.

1 "Practice of Medicine" (Pleminis), Dr. Brister, page 393.

It is evident from the post-mortem appearances that the child died from syncope through malnutrition of the heart. The pressure of the fluid in the pleural cavity sufficient to have completely compressed the right lung, must have exerted great pressure on the right auricle and diminished the blood supply to the heart and enfeebled it.

The left lung dilated and (as before pointed out) increased the obstruction to the thoracic circulation & diminished the aeration of the blood, augmenting the cardiac weakness, and ending in death.

All these changes occurred in a few days, showing the rapidity with which they may bring about a fatal termination.

I think it would be hard to find three more instructive cases than those I have just given, as indicating the necessity of immediately relieving the pressure upon the heart. In two of the cases, where this pressure was not relieved, though neither patient had heart disease, the result was death. The other case, by the withdrawal of the fluid in the pleural cavity and the reduction of pressure, though the patient was suffering from a grave cardiac lesion, resulted in recovery.

Another of the consequences of a pleural effusion is the occurrence of suppuration (as the case may be an empyema from the beginning)

The pus may burst into the lung, or externally through the thoracic parietes, or "may burrow in almost any direction and discharge itself at almost any surface".

The following case I saw last Summer, a few days before the patient's death. As I have lost the notes made at the time I must narrate the case from memory.

I. A. B. at about 70. He had been ill for some weeks, pain in the side, difficulty of breathing, cough and expectoration, and there were all the signs of effusion in the right pleural cavity. He was treated by the usual remedies, but without relief. After a time suppuration supervened (at least so far as can be judged by the history, though the case may have been an empyema from the first-), with all the symptoms of the formation of pus, rigors, fever &c... Not long after this the pus burst through the lung, and was expectorated in mouthfuls. At this time patient was obliged to sit up in bed for if he lay down, the pus would drain out through his mouth. He was very weak, and had great difficulty in breathing, and the least exertion was attended with considerable fatigue. The lips were very blue, and the pus expectorated was fetid. He was then seen by a Surgeon, who made two openings into the pleural cavity, one high up and the other low down, and by means of drainage tubes washed out the cavity with a weak solution of carbolic acid. The patient died however a few days after the operation.

The point of present interest in this case is, that the pus in the pleural cavity burst into the lung. Of course the operation just described has been performed in such cases with success; but is it desirable to allow cases to go on till such an operation be necessary? Because some cases have been cured by operating after the pus has burst into the lung, is an argument in favour of delaying operation till that takes place, for as we have just seen it sometimes fails. It certainly seems far better to operate early and so avoid the rupture of the lung than to

wait till such a result has occurred.

I propose to discuss this case however, more fully in conjunction with the following.

II. J. R. aet. 30. Admitted March 29<sup>th</sup>

Complaining of pain in the chest, cough and difficulty of breathing.

Present illness began 3 weeks ago from exposure to cold, & began with shivering, followed by pain in the chest and feverishness.

On examination of the chest there are found, diminution of movement all over left side during respiration, and marked bulging of the intercostal spaces, and on looking at the patient from behind, the left side seems convex, & the right slightly concave. Marked dullness on percussion all over left side front and back from apex to base, while percussion note on right side seems normal, or if anything slightly hyperresonant. Diminution of R. M. front & back above level of a line drawn round side of chest at level of nipple, below this the R. M. becomes gradually less & less distinct, and at base of left lung is wholly absent.

R. M. over right side is highly vesicular.

V. R. on left side much diminished, and V. I. is wholly absent (this is well demonstrated as the patient has a deep strong voice, and it is felt with great distinctness on right side).

Apex impulse is much displaced to the right, and when patient lies on back seems to be beating behind the sternum, but on making patient lie on right side, it is felt just at right border of sternum in 5<sup>th</sup> interspace, just 3 inches to right of its normal situation.

Right border of cardiac dullness is fully 1/2 inch to right of right border of sternum; left border cannot be defined on account of the

absolute dullness of left side. Pulse 80, regular, soft and easily compressible. Respiration 24, not markedly abdominal. Hepatic dullness normal, and not displaced. Urine diminished in quantity. The difficulty of breathing is markedly increased on any exertion.

April 1<sup>st</sup> 60 ounces of clear straw colored fluid withdrawn by aspirator. Urine increased from 12 3 to 45 3 during the 24 hours after.

April 11<sup>th</sup> 20 ounces of clear fluid withdrawn, when the canula became plugged with clear lymph.

April 18<sup>th</sup> 20 ounces of clear fluid withdrawn, when the canula again became plugged.

April 30<sup>th</sup> For the last few days (since the 22<sup>nd</sup>) there has been rise in temperature. Today patient was tapped twice, but on both occasions the tube became blocked, only a little fluid coming away (about two teaspoonfuls) which was quite clear.

May 5<sup>th</sup> Auscultation reveals friction rale in the middle line of left lateral region. R. M. quite good at left apex in front, though deficient over remaining part of lung.

May 15<sup>th</sup> Temperature still remains high, and exploratory puncture was made to-day with hypodermic needle. The syringe was quite filled with purulent fluid mixed with a few drops of blood.

May 22<sup>nd</sup> Patient transferred to Surgical ward to be treated for empyema, and kept well, at the end of July.

These two cases resemble one another in as far as in both the effusion was originally serous, and in the progress of the disease became purulent. In the one however, the purulent fluid burst into the lung, in the other, the operation for empyema was performed. On examining the

"Practice of Medicine" (Pleunig), 2<sup>a</sup> Edition, page 393.

latter case more closely it is noted that by April 18<sup>th</sup> the patient had been tapped three times and 100 ounces of clear fluid withdrawn. On the 22<sup>nd</sup> four days after last tapping there was a rise in temperature, and on the 30<sup>th</sup> the temperature was still high. Patient was again tapped, but upon the two occasions it was done the tube became blocked only a little fluid coming away which was quite clear. On the 11<sup>th</sup> May an exploratory puncture was made with the hydroemic needle & purulent fluid withdrawn.

Now when rigors, pain, elevation of temperature &c... occur in the course of a hitherto simple case, they are presumed to be indicative of suppuration! The question then comes to be, would it not be better to make a free incision into the pleural cavity with the onset of these symptoms, than to wait for the formation of pus?

Of course the speed with which suppuration occurs will vary in each case with the degree of inflammation and the health of the patient. In the above case 8 days after the rise of temperature the fluid in the chest was still clear. By operating now an efficient drainage of the fluid would be established and whenever pus formed it would have a free escape, and the chances would at least be in favour of a more speedy convalescence, than if the operation be performed as in the above case one month after the onset of the inflammatory action.

That some cases, after the onset of the symptoms above referred to, do not go on to suppuration, but that the attack passes off, is well known, but they are the exception, not the rule, and in no way affect the necessity for interference. But these symptoms in some cases may have reference to an inflammatory attack of the bronchial tubes, pulmonary tissue &c. supervening on the pleurisy, and which will tend to still further reduce the general health, and increase



1. "Every organ of the body has its proper duties to perform, & under the influence of morbid processes, these duties become increased or diminished, & in either case fundamentally modified more or less". (Functional derangements - page 85 - Bristow)

1. "Pleural effusions tend to become rapidly purulent in children & in delicate or intemperate adults." (Lectures on Pleurisy, Dr. Jenner).

the tendency for the fluid in the pleural cavity to become purulent, so that the free incision is likewise necessary.

It is obvious that a patient is in a better state of health at the onset of a pleurisy, than after the inflammation has been going on for some time, and which according to its degree, influences the nutrition and function of all parts of the system. And it must be remembered, that in certain cases the inflammation tends rapidly to the formation of pus.

Without following the physiological processes in detail it will be granted, that the longer the inflammation and suppuration go on, the greater will be the drain upon the system and the greater the constitutional debility, so that the longer we delay in aiding nature to throw off these morbid processes, the more are we increasing the deterioration of tissue generally, until at last when we do interfere, the system has become so low as not to be able as it were to take advantage of the assistance, and death results, as we have already seen; or else the assistance has come when the functional activity of the tissues is so reduced, that healthy action is long in being established, i.e. convalescence is slow. But if the assistance be given before these results take place, that is, before the system generally is influenced by the morbid processes, the tissues will be in a state of greater activity, and so respond more readily to the aid given.

In the two cases just given, one patient died, and the other had a prolonged convalescence. By the treatment- advocated (free incision with onset of symptoms presumptive of suppuration) might not a mediate result- be attained, viz. speedy convalescence.

As already pointed out- there are some cases where the inflammation tends rapidly to the formation of pus, and the following are two cases in point.

I. J. M. aet. 10. Admitted Dec. 13<sup>th</sup>. Complaining of pain in the chest; cough and difficulty of breathing. Present illness began two weeks ago, when patient got a wetting, and illness set in with shivering. Before this patient was at school but was not a strong boy.

An examination of chest there was found to be great dullness existing all over the right side behind & in front, except from the clavicle downwards for about 2 inches, where the percussion note is somewhat tympanic. There is complete absence of movement all over the right side during respiration, and there is distinct bulging of that side. Over the tympanic area of right side and about 3 inches below this & also behind to a corresponding distance downwards, there is well marked tubular breathing. Over lower part of right lung no respiratory sound is heard at all, & over this part of chest is absence of V. R. and V. E. but the latter is exaggerated over upper part of right side. All over left side the pulmonary percussion note is somewhat tympanic, and there is exaggerated vesicular breathing. The breathing is greatly labored and is distinctly abdominal.

The lower border of the liver is displaced downwards about 1 1/2 inches, but the upper border cannot be made out on account of the dullness at lower part of right side, the pulmonary & hepatic dullness blending.

Patient's face is flushed and there is great dilatation of the nostril during respiration. There is also an herpetic eruption on lower border of alae & septum nasi.

Apical beat is in 5<sup>th</sup> left intercostal space a little to left of nipple line. Cardiac sounds normal, but the heart is acting very rapidly. Cardiac dullness begins at upper border of 3<sup>rd</sup> rib, & extends somewhat unusually far to the left, slanting downwards to site of apical impulse.

Pulse 120, soft & compressible. Respiration 60. Temperature 101° on admission. There is considerable cough, and a considerable quantity of viscid, frothy, mucous expectoration but contains no trace of blood. Urine scanty. On admission to hospital an exploratory needle was used and purulent fluid withdrawn from right-side of chest.

Dec. 18<sup>th</sup>. Highest-temperature during the last-24 hours 102°, lowest 101°. Urine during last-24 hrs, 243, previous 24 hrs. 163.

Patient lies on back & left-side, he cannot lie on right-side on account of the pain. 14 ounces of greenish looking material have been withdrawn from pleura by the aspirator.

From this till the 14<sup>th</sup> of January there was slight-improvement, pain was less as also cough, and the expectoration diminished, and the respirations were fuller. Appetite also improved, but the urine remained scanty. All this time however the temperature remained high, and there was evidence of considerable quantity of fluid in right-pleural cavity, and the patient was transferred to Surgical ward.

Jan. 21<sup>st</sup>. Free incision made pretty low down in right-side, and drainage tube introduced, and dressed antiseptically.

Jan. 26<sup>th</sup>. Discharge purous & small in amount. Temperature normal.

Feb. 17<sup>th</sup>. Drainage tube removed and wound allowed to heal.

Feb. 26<sup>th</sup>. Wound full of granulations

March. 29<sup>th</sup>. Wound healed.

April 11<sup>th</sup>. Patient left well. Before leaving, I examined the chest.

R. M. was heard all over right-side, & V. R. & V. I. were both well marked. There was an equal amount of movement during respiration on both sides of the chest.

II. J. G. aet. 48. Admitted Dec. 10<sup>th</sup>.

Complaining of great pain in right side of chest, and difficulty of breathing.  
 [Patient has been given to the immoderate use of intoxicating liquors].

The pain in the chest is increased by taking a deep inspiration, or on coughing.

Attack began one week ago with a feeling of shivering on going to bed, patient having got wet through in the morning, and remaining in his wet clothes all day.

Respirations 44, considerably oppressed, & markedly abdominal, and much greater movement of the side & expansion of chest existing on left side. Indeed, below level of nipple on right side there is almost an entire absence of movement, and this becomes much more marked on palpation.

There is dullness from below lower border of 2<sup>nd</sup> rib on right side. Just below clavicle percussion note seems somewhat hyperresonant. All over left side, percussion is unusually resonant, and cardiac dullness is if anything smaller than usual. All over left side R. M. is somewhat feeble, but no side is at any part detected. On right side, from clavicle downwards the R. M. is markedly diminished and is almost wholly absent below the level of 3<sup>rd</sup> rib, where the dullness becomes so absolute. V. R. is also decidedly diminished, and V. I. all over the dull area is indeed wholly absent, but well marked on left side. All over right back dullness of an absolute kind extends as high as supra epiconus fossa, & here the percussion note is fairly clear. Over this dull area is well marked deficiency of R. M. V. I. is here, as elsewhere on right side, wholly absent. No side at any part of right side.

Decubitus, on back and towards right side, both pain and dyspnoea being experienced on attempting to lie on left side. Complaints of little cough

but the pain in right-side exists to a great degree, and is exaggerated by any movement, as exertion or coughing.

The exploratory needle was used to-day in admission & purulent fluid withdrawn from right-pleural cavity.

Dec. 20<sup>th</sup> 110 uncs of purulent looking material withdrawn by the aspirator. From this the patient improved slightly, the pain was diminished & the cough relieved, & on Jan. 6<sup>th</sup> 37 uncs of purulent fluid were again withdrawn. The temperature however remained high and the patient was transferred to the Surgical ward. He was operated on for empyema, and had a slow convalescence, being dismissed in the middle of June.

What I wish to draw attention to in these two cases is the protracted convalescence. On admission to hospital the patient had been ill for one week, and the other for two weeks. Shortly after admission the exploratory needle was used & the fluid in the pleural cavities was found to be purulent. Both patients were treated by the aspirator, and both slightly improved, but the progress of the cases was so slow that it was decided to make a free incision into the pleural cavity and allow the fluid to drain off, this was done in the one case 39 days after admission, and in the other about one month after.

Now the fluid in the pleural cavity in these cases was purulent from the beginning, so far as could be judged from the history & health of the patients (one being a delicate child, & the other an intemperate man).

At any rate it was so on admission to hospital, in one case one week, & in the other two weeks, after the onset of the inflammation. In fact in each case we were dealing with an abscess of the pleural cavity.

1. Referring to diuretics &c. Dr. Bristowe says (Practice of Medicine, page 395)  
"We believe all such agents are practically useless for the purposes indicated, & that if we are to trust in drugs at all, they should be those which by tending to improve the general health of the system, tend indirectly to promote healthy action at the seat of disease; we mean tonics, especially iron & quinine."

2. "Practice of Medicine" (Pleminis), Bristowe. page 396.

To attempt to treat such cases with the aspirator, & put the patient upon diuretics &c. is but to waste time. Not only are these drugs useless, but they do harm, for when given for any length of time, they impair digestion, and so increase the patients' weakness. What is wanted is to improve the health of the patient, by incision, with fork &c. & to make a free incision at once into the pleural cavity.

Had this treatment been adopted in the two cases I have just given, one month would have been gained in one case, & 39 days in the other, surely a very important consideration when we remember the state of health at the onset of the disease.

In examining the first case more closely it will be noted that the patient was operated upon surgically on the 21<sup>st</sup> January, and on the 26<sup>th</sup>, five days later, the discharge was serous & the temperature normal. There had been continuance of fever and the presence of fluid of a purulent nature in the pleural cavity for 39 days, and yet when a free discharge was ensured the temperature became normal, and the fluid serous within five days.

From arguments already advanced (in examining the two cases immediately preceding those at present referred to) it seems that such a result might be expected with an early operation, and so avoid the long continuance of fever and the prolonged presence of purulent fluid in the pleural cavity.

The free incision into the pleural cavity is looked upon too much as a "dernier resort", instead of being regarded as one of the best forms of treatment. In referring to empyema, Dr. Bristowe says — "the best method of treatment is, we believe, to treat the case from first to last antiseptically, allowing the pus to escape freely through a canula or drainage



take into antiseptic dressings, which should be renewed daily."

Were such treatment more frequently resorted to, the progress of such cases would be much more satisfactory.

The following are cases in which the effusions in the pleural cavities were removed, treated by the early use of the aspirator, and resulting in rapid recovery.

I. R. L. Oct. 4<sup>th</sup>. Admitted Jan. 3<sup>rd</sup>.

Illness began 3 weeks ago with great pain in left side. Patient states very firmly that he never had any feverish attack or tendency to shivering, or indeed any discomfort except the pain. He has no cough & no expectoration, but feels breathless on going up stairs. Pulse 120, somewhat soft and feeble. Respirations 28, tranquil and slightly abdominal. There is distinct lividity of both face and lips, the latter being especially well marked. Urine normal in character.

Absolute dullness exists all over left side of chest; over upper part of left side the R. M. is faint, while below it is totally absent.

On left side V. R. is greatly diminished, and V. F. cannot be made out. Percussion on right side is normal, and the R. M. is distinctly puerile. The heart is displaced to the right and the apex impulse is felt at ensiform cartilage. An measurement of the chest at level of nipple, the left, is half an inch larger than the right.

Jan. 11<sup>th</sup>. 117 ounces of clear transparent fluid withdrawn by aspirator.

Jan. 20<sup>th</sup>. Patient states that he feels quite well, and does not know what he is kept in bed for. He went on improving rapidly, and on

Feb. 15<sup>th</sup> the following condition was noted. Pulse 86, full and good. Respirations 20, full and easy, and on inspection there was

found to be an equal amount of movement of both sides of the chest during respiration. On examination of left side there is slight flatness on percussion over lower part of lung, and on auscultation, some slight diminution of R. M. over this area, as compared with the right.

V. F. is much the same on both sides, if anything, a little more distinct on left side. Cardiac dullness is out-nearly so much displaced to the right, and apex impulse is felt almost in normal position. For some time patient has been kept on semi solid food, and very little liquid given. Tongue clean. Bowels regular.

Patient left to-day, quite well.

II. A. S. et. 24. Admitted April 1<sup>st</sup>.

Complaining of pain in the right side and difficulty of breathing. Present illness began 3 weeks ago with pain in the right side. Patient had no shivering, and he states that he did not get a chill, & knows of no cause for his illness. At present he has only slight cough, and hardly any expectoration. He can lie equally well on either side, & it makes very little difference to his breathing on which side he lies. On examination of chest there is found to be marked deficiency of movement during respiration all over the right side, and this is well seen on palpation. On percussion over right side of chest in front, there is dullness of an absolute kind extending downwards from upper border of 3<sup>rd</sup> rib, and blending below with the hepatic dullness which is much displaced downwards, the lower border being about 1 inch above level of the umbilicus. There is dullness all over axillary region of right side, & behind, dullness begins a little above the inferior angle of scapula. Above this level in front & behind, the percussion note is somewhat-

hyperresonant. All over the dull area above noted, the R. M. is markedly deficient, and near the lower limit of the dullness is wholly absent. All over the clear area the R. M. is present. Percussion note on left side is normal, and the R. M. loud and present.

V. R. on right side is markedly deficient as compared with the left, and over the absolutely dull area on right side the V.F. is wholly absent. Cardiac dullness seems normal in area, but is slightly displaced to the left, the apex beat being in the 5<sup>th</sup> left interpace a little to left of nipple line.

All through this illness from the very commencement there has been no increase of temperature, patient stating emphatically that he was never feverish, and on admission temperature was 98° 6. Pulse 60, full & regular. Urine small in quantity.

April 9<sup>th</sup> 48 ounces of clear transparent fluid withdrawn by the aspirator

April 16<sup>th</sup> 20 ounces of clear fluid withdrawn

April 30<sup>th</sup> On examining chest today, the percussion note on right side is a little flat as compared with the left, but not absolutely dull.

Both sides of the chest move equally during respiration & there is no bulging of the intercostal spaces on right side. Lower border of hepatic dullness is in its normal situation. Apex beat a little to right of nipple line. On auscultation of right side the R. M. is heard with great distinctness all over, & even at the very base of the lung is only slightly fainter, if any thing, than on left side. V. R. and V. F. the same on both sides. Patient left today, well.

III. W. H. et. 13. Admitted March 17<sup>th</sup> Patient is deaf & dumb.

Since new year time he has not been well & has been troubled with cough. In account of his inability to speak, it is quite impossible to get any history of present illness.

An examination of chest there are found all the signs & symptoms of an extensive pleural effusion of the right side, viz. bulging of the intercostal spaces, dullness on percussion, diminution of movement during respiration, absence of R.M., V.R., and V.F. Heart is displaced about 1 inch. to the left, and the liver is displaced downwards. Patient has a slight cough, but no expectoration.

March 27<sup>th</sup> 4 ounces of clear fluid withdrawn by aspiration, when the canula became plugged.

March 31<sup>st</sup> 14 ounces of clear fluid withdrawn, when the canula again became plugged. From this time patient improved rapidly and on the 30<sup>th</sup> April the following note was made. Equal amount of movement exists on both sides of the chest during respiration. R.M. is heard all over right side of chest, and almost as strong as on left side. Apex heart and lower border of liver are in their normal situations. Percussion note is almost the same on both sides of the chest, but perhaps a little flat on right side.

Patient left to-day, well.

These three cases speak for themselves, and I think I am not far wrong in stating that the satisfactory results were due primarily to the early operative treatment. That they would have recovered with like rapidity by medicinal treatment alone is improbable, and the two other cases I have given where both patients died, and where medicinal treatment alone was employed, bear out this view. Another point in corroboration of this

1. "When the lung has been long compressed ..... especially if at the same time it has been covered with a thick dense layer of false membrane, the absorption or removal of the fluid is probably attended with little or no restoration of the lung." (Bristow). page 390.

is, the collapsed condition of the lung as frequently demonstrated as the result of a pleurisy on the post-mortem table (noted in case III page 12). This condition occurs in cases where the lung has been long compressed, either through the effusion not being recognised and the case left to nature, or if recognised, operative treatment delayed till drugs have failed in producing <sup>absorption</sup>. In the case of the Indian child it was found, post-mortem, that the right lung was completely compressed, and that within 9 days (page 12). It can be easily understood how, if this condition be allowed to remain, change occurs, preventing the refilling of the lung with air, or if allowing of restoration of affected lung, requiring considerable time for its recovery.

I need hardly mention that these last and the other cases I have given were put upon the various preparations of potash, squills, digitalis, convalaria majalis &c., as aids in the removal of the fluid. It must be remembered that I am not advocating early operative treatment per se, as opposed to medicinal treatment per se, but as presenting the most favourable conditions for the action of drugs, for by relieving the pressure on the thoracic organs and facilitating the circulation, there is increased absorption and excretion - in fact - aiding drugs in their action.

It will be noted that the number of times each patient was tapped varied, considerably, but in all the first operation was early. After the first operation, the number of times the aspirator may require to be used will depend upon the circumstances of the case. If after the first tapping, the urine is increasing in quantity, the breathing becoming easier, and there are other signs that the fluid in the pleural cavity is becoming absorbed, the operation will not need to be repeated. But-

if the urine remains low, breathing is still difficult, and from other signs the fluid is not undergoing absorption, it will be necessary to repeat the operation, possibly many times, until either there are evidences of absorption, or until all the fluid is withdrawn.

Unfortunately I have no cases to bring forward of pleural effusions as complications of such diseases as small pox, scarlet fever, malignant disease of lungs or pleura &c. but have the necessity for early operative treatment is urgent. For in the primary disease there are, excessive waste of tissue, impoverishment of the blood and impairment of the functions of the various organs. If now a complication occur such as a pleural effusion, the excessive waste of tissue is increased, and the blood is still further impoverished by the interference with the function of the thoracic organs, preventing its proper aeration. Again, by the pressure upon the heart, already weakened, the circulation is obstructed and the tendency to other complications increased.

In localised pleural effusions, where the fluid is confined in cavities the result of adhesions in some old inflammation, early operative treatment is also necessary.

In conclusion, I think the case I have given so far to indicate the benefit resulting from early operative interference, and the danger of delay.

In four of the cases in which the aspirator was used early, the result was all that could be desired. In two, where the treatment was very far different, both patients died. In three, the convalescence was very slow, a result due as I have endeavoured to point out, to delay in the operation already referred to. And there was one case of sudden death, from syncope. Keeping in view then that the great danger in pleural effusions is cardiac failure, paracentesis cannot be performed too early, and diuretics, cathartics

1. Quain's "Dictionary of Medicine" (Pleunis).



Sc... used to aid in the absorption of the fluid, in cases where the effusion is serous; and when in the progress of such cases symptoms occur indicative of suppuration, I think a free incision should be made at once without waiting for the formation of pus.

And those cases in which there is early formation of purulent fluid, remembering the condition of health of the patients, antiseptic treatment from the first seems to be the best, and full doses of iron and quinine administered.

"The earlier the relief, the less the damage to the lung, and the better the hope of rapid amendment". This relief can only be given by early operative interference.

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