Remarks

ON

THE INFLUENCE OF WIND ON PHTHISIS.

By W. GORDON, M.D., F.R.C.P.,

Physician to the Royal Devon and Exeter Hospital; Physician to the West of England Eye Infirmary.

THE EXISTING CHAOS OF OPINION.

THERE is a wonderful want of agreement amongst medical authorities as to the influence of wind on phthisis, and the most widely divergent views have been expressed on the subject, some maintaining that wind is injurious, others that it is non-injurious or even beneficial, others again that it may be injurious or beneficial according to circumstances. This divergence of opinion is especially unfortunate at the present time, when the curability of many cases of phthisis by open-air treatment is fully recognized, and when sites are being chosen in many parts of the country for the erection of sanatoria. A few quotations will illustrate how widely opinions differ.

Wind Injurious.

Dr. Haviland, who has made such a careful study of the distribution of phthisis mortality in the registration districts of England and Wales, goes so far as to say that "with the facts before him.....no medical man would send a consumptive case to live where he would be subject to the full force of prevailing winds."¹ Sir Hermann Weber says "My own experience has been that strong wind from any quarter.....is injurious to consumptive people, and seems to increase the mortality."²

Wind Harmless.

Dr. Theodore Williams says, "Some authorities object strongly to wind in a health station for consumptives, but I am in favour of its ventilating and purifying influence in the case of all diseases of germ origin, and protection by shelters can be successfully secured when wind is excessive."³ Dr. Symes Thompson says:

It has been asserted that wind is deleterious to phthisical patients..... A careful observation of the influence of wind on patients subjected to the full effect in windowless rooms, on balconies, and in the open air sets aside this fear. Wind is annoying, chilling, and, if accompanied by dust, is uncomfortable, and in all these respects is, of course, objectionable, but, on the other hand, it sweeps away noxious emanations and supplies fresh air as nothing else can. Some are so impressed with the evil effects of wind that they cannot face a gentle breeze without complaining of shortness of breath, who can yet climb considerable hills with ease, the difficulty being, to a large extent, imaginary. When it is realized that such is the case, and that wind is salutary, these same persons become as pleased with themselves and as manifestly benefited by exposure to a quickly-moving large body of air as they are to life in all weathers without windows.⁴

Sir J. W. Moore agrees with this: "I was delighted personally to hear Dr. Symes Thompson speak as to the innocuousness and harmlessness of wind."⁵

Wind Injurious or Harmless according to Circumstances.

Dr. Solly puts this view thus:

It is extremely difficult to generalize upon the influence of this meteorological factor [wind] on the development and progress of phthisis. Consumption is neither more or less prevalent in a place simply because it is windy, nor are consumptives as a class made better or worse by this element alone. It is beneficial or detrimental according to its temperature and humidity and the patient's condition.⁶

With such divergent views before the profession from authorities of such weight the conclusion has naturally been drawn that we have no real knowledge on the subject. Sir R. Douglas Powell has written that "the only positive climatic influence made out in relation to phthisis is that dependent upon insufficient surface drainage."⁷ Professor Osler, in his *Principles and Practice of Medicine*,⁸ does not even mention wind in connexion with the causation or with the climatic treatment of phthisis, and Dr. Kidd, in his article on phthisis in Professor Allbutt's *System of Medicine*, makes no allusion to wind in describing the sort of climate suitable to a consumptive patient.⁹

MARKED INFLUENCE OF WIND IN DEVONSHIRE.

Yet there are facts which suggest that wind is not unimportant, and the following is a brief abstract of observations which have been recently made in Devonshire.

Suggested by the Death-rates of the Rural Districts.

When the establishment of a sanatorium near Exeter was

first discussed in the autumn of 1899, I examined the phthisis death-rates of the rural sanitary districts of the county with a view to getting facts which might help in the selection of a site. I chose the "rural sanitary districts" rather than the "registration districts" because the latter included the "urban districts" which last seemed less likely to present fairly uniform conditions of life, and in Devonshire are specially apt to introduce fallacy, since many of them have long been phthisis health resorts, where imported cases are included in the death returns.

My ideas at that time were those generally held, being in accordance with the views expressed by Dr. Theodore Williams that "*the house should be protected from northerly and easterly winds and well open to the south and west.*"¹⁰ My astonishment therefore was great to find that the ideally-situated localities, well open to south and west, suffered most from phthisis. I tried to explain this distribution of the phthisis mortality by reference to general sanitation (as indicated by general mortality), to geology, and to rainfall, and failed. Nothing except exposure to west and south-west winds seemed to offer a reasonable explanation. But this explanation was so contrary to my expectation that only a searching test could have convinced me of its validity.

Proved by the Death-rates of the Parishes.

This test was as follows. I took four rural sanitary districts, two on the south coast of Devon, one on the north coast, one in mid-Devon, and examined the phthisis death-rates in the parishes of each separately. I chose parishes rather than larger units of area, because they allowed of more exact classification into "sheltered" and "exposed" as regards wind, into "pervious" and "impervious" as regards soil, and they enabled me to show more clearly, on maps of moderate size, the precise position of the dwellings. Soil and rainfall were shown to be incapable of explaining the results.

The following table gives the phthisis death-rates per 1,000 per annum in exposed, partly-sheltered, and sheltered parishes respectively, with the period of observation and the approximate ratio between the mortalities in exposed and sheltered parishes in each.

Name of District.	Years of Observation.	Parishes.			Approximate Ratio of Death-rates in Exposed and Sheltered Parishes.
		Exposed.	Partly Sheltered.	Sheltered.	
St. Thomas ...	2½	1.34	0.57	0.24	5.5 to 1
Newton Abbot ..	15	1.38	1.08	0.83	3.0 to 2
Okehampton ...	10	1.72	1.28	0.61	3.0 to 1
Barnstaple ...	10	1.10	0.75	0.44	3.0 to 1

Whilst laying little stress on the figures from St. Thomas, because the period of observation was so short, I felt justified, from a consideration of the figures from the other districts, in concluding that the degree of exposure to, or shelter from, west and south-west winds exercised a marked influence in determining a higher or lower rate of phthisis mortality in these districts. This conclusion, with the arguments supporting it, formed the subject of a paper which I had the honour of reading before the Royal Medical and Chirurgical Society in October, 1900.¹¹ In the discussion which then took place the following objections were raised.

Objections.

1. That the populations quoted were too small to found conclusions on.
2. That the periods of observation were too short.
3. That I had not sufficiently carefully excluded the influence of racial differences.
4. Or of occupations.
5. Or of differences in closeness of intermarriage.
6. Or of differences in parish sanitation.
7. That I should have confined my inquiry to female death-rates.
8. That the wind had only excited an indirect effect through the closure of windows and doors against it.

And to these another objection has since been added, namely:

9. That the wind had only exerted an indirect effect through the damp it drove into the walls.¹²

Replies to Objections.

To these objections I have replied thus:

1. If it can be shown, in a considerable number of small villages, in spite of the natural tendency of the small numbers of the populations to produce large exceptions to any law of incidence, that the law holds with no, or almost no, exceptions, then the conclusion to be drawn is, not that this absence of exception is itself a matter of chance, but that the law is so cogent that it overrides chance and compels conformity.

2. Ten years was the period chosen by Sir George Buchanan in his well-known report on phthisis and dampness of subsoil, as well as by Dr. Haviland in preparing his fine map of phthisis mortality in the registration districts of England and Wales. It seems to me a reasonable period.

3, 4, 5, 6. The medical officers of health for the four rural districts, to whose kindness I owe very much, have assured me that in their districts these objections cannot be maintained.

7. The female death-rates bring out, even more markedly than the death-rates of both sexes together, the influence of these winds. To make my inquiry into the female death-rates as conclusive as possible within the time at my disposal, I proceeded as follows:

Female Death-rates, Okehampton District.¹³

I chose a district which seemed specially suited to the purpose—namely, the rural district of Okehampton. This district is the most generally exposed in Devonshire, being open to all winds except the south, and presenting to each wind marked contrasts of shelter and exposure. Its geological formation is very simple, and its rainfall probably fairly uniform. (Rainfall, *per se*, seems to have exceedingly little effect.) Dr. Young, the Medical Officer of Health, kindly supplied me with the parish deaths from phthisis during the preceding ten years, examined and agreed with my classification of the parishes into exposed and sheltered in respect of each separate wind (namely, south-east, east, north-east, north, north-west, west, south-west), and satisfied me that neither occupations, racial differences or differences in closeness of intermarriage or in parish sanitation could account for the distribution of the phthisis mortality.

Tables were drawn up in which the parishes were classified into fully exposed, partly sheltered, and fully sheltered with respect to each separate wind, and maps were constructed to illustrate these exposures and shelters. A geological map, and a map of the distribution of the female phthisis death-rates in the parishes were also made. From these tables and maps it became obvious that geological formation could not explain the phthisis distribution, nor could shelter from and exposure to south-east, east, north-east, or north winds. The influence of north-west wind was doubtful. But the influence of west and south-west winds was unmistakable, and even startling. The following table shows the influence of west and south-west winds considered together.

Okehampton Rural District.

Name of Parish.	Female Population 1891.	Female Deaths from Phthisis in 10 Years.	Female Phthisis Death-rate per 1,000 per Annum.
I. Sheltered Parishes from both			
Inwardleigh ...	258	1	0.4
Monkokehampton ...	83	0	0.0
Chagford ...	718	7	0.9
Gidleigh ...	57	0	0.0
Throwleigh ...	149	2	1.3
Drewsteignton ...	318	3	0.8
Ashbury ...	37	0	0.0
	1,690	13	0.7
II. Exposed to both.			
Highampton ...	735	5	3.7
Beaworthy... ..	122	3	2.4
Bratton Clovelly...	255	8	3.1
Sourton ...	217	8	3.6
	729	24	3.3 nearly

This table shows:

(a) That the mortality in the parishes fully exposed to both west and south-west winds is relatively high—usually very high, whilst the mortality in the parishes fully sheltered from both is relatively low—usually very low.

(b) That the average mortality in the exposed parishes is nearly five times as great as that in the sheltered parishes.

(c) That there are no exceptions.

These figures are very remarkable, and it is difficult to imagine that mere chance can explain them. I considered that they afforded definite proof of the marked influence of these two winds.

Female Death-rates—Barnstaple District.

However, to make assurance surer, I investigated another very exposed area, namely, the Exmoor portion of Barnstaple district. This area is perhaps the second most exposed in Devonshire, being open in some part or other to all winds except the east. Its intricate hollows and winding valleys afford very complete shelter to dwellings within them, and the heights of Exmoor cut off all south-west gales from the northern towns, which are, however, fully exposed to northerly sea winds. The soil is generally fairly pervious. The rainfall, as usual, seems to have little influence *per se*, 50 in. falling in one parish (Arlington) where no deaths, male or female, have occurred within the ten years of observation. The late Dr. Harper, Medical Officer of Health for the Rural District, assured me that neither occupations, or differences in race, intermarriage, or parish sanitation could explain the phthisis distribution. This table shows the influence of west and south-west winds considered together:

Barnstaple Rural District (Exmoor Portion).

Name of Parish.	Female Population, 1891.	Female Deaths from Phthisis in 10 Years.	Female Phthisis Death-rate per 1,000 per Annum.
Sheltered Parishes.			
Westdown ...	268	1	0.3
Bittadon ...	23	0	0.0
Eastdown ...	175	0	0.0
Kentisbury ...	105	1	0.5
Arlington ...	127	0	0.0
Parracombe ...	151	1	0.6
Brendon ...	159	0	0.0
Challacombe ...	113	0	0.0
Highbray ...	109	0	0.0
Berrynarbor ...	340	0	0.0
Combemartin ...	731	2	0.2
Trentishoe ...	45	0	0.0
Martinhoe ...	84	0	0.0
Countisbury ...	125	0	0.0
Sherwell ...	179	0	0.0
	2,804	5	0.17
Exposed Parishes.			
Morthoe ...	346	3	0.8
Georham ...	390	3	0.7
Braunton ...	1,125	15	1.3
Heanton Punchardon ...	224	4	1.8
Ashford ...	87	0	0.0
Goodleigh ...	119	1	0.8
Stoke Rivers ...	96	1	1.0
Loxbore ...	100	2	2.0
Bratton Fleming...	247	4	1.6
	2,734	33	1.2

It shows:

(a) That the mortality in the parishes fully exposed to both west and south-west winds is relatively high—usually considerable—whilst the mortality in the parishes fully sheltered from both is relatively low—in the majority *nil*.

(b) That the average mortality in the parishes exposed to these winds is seven times as great as in the parishes sheltered from them.

(c) That amongst twenty-four parishes there is only one exception, and that in a very small parish—the smallest parish exposed.

Taking into account the suggestive result of the comparison of the phthisis death-rates of the rural districts of Devon, the striking results of the comparisons of the death-rates in the parishes of four separate rural districts in different parts of the county, and these startling results of the comparisons of the female phthisis death-rates in two specially-exposed areas, I can conceive of no other reasonable conclusion except that in these districts the west and south-west winds exercise a very marked influence on the phthisis death-rate amongst the populations exposed to them.

I naturally do not contend that these winds are the only influences at work. Indeed, another influence, that of soil, which is evident although subordinate, serves to explain some

peculiarities in the foregoing tables. The relatively lower death-rates, amongst females in Barnstaple district, as compared with those in Okehampton district, probably depend on the more pervious soil of the former. Again, the less marked contrasts in Newton Abbot district, between the mortalities in exposed and sheltered parishes, is probably due to the fact that many exposed parishes are on pervious soil, whilst many sheltered parishes are on impervious soil under a very heavy rainfall. Heavy rainfall on an impervious soil, where surface drainage is not rapid, must, of course, increase its dampness.

8, 9. Coming now to the last two objections, it is contended that this influence of these winds is only an indirect one, and that the direct cause of the increased mortality in exposed areas is either defective house ventilation (8) or house dampness (9). If these were correct explanations the wind *per se* would be a matter of little importance. But, though plausible, I would submit that both explanations are unsound.

8. *It is merely a matter of conjecture that doors and windows are specially closed against these winds.* There is no evidence to prove it. Cottage windows in the country districts of Devon are generally shut in all weathers and many are not capable of being opened. Doors and windows, moreover, are not all on the west or south-west side of the houses.

9. It is doubtful if a house exposed to rainy winds, on a hill-slope where wet drains easily away, is as damp as one in a valley, on a clay soil which receives the drainage of surrounding hills.

Moreover if the houses are the source of the evil—whether through defective ventilation or dampness—one would expect the male mortalities from phthisis to present as marked contrasts as the female, which they do not.

Finally, these explanations wholly fail to account for the effects of these winds on phthisis patients in dry well-ventilated dwellings.

Confirmed by the Observed Effects on Phthisis Patients.

I have watched the effects of these winds on phthisis patients in hospital and in their own houses and they seem to be uniformly injurious. A friend who has a number of phthisis patients under his care on a hill-top, in a well-built, well-ventilated house, finds that they do well in all winds except west and south-west, in which they do badly. Another friend, who practises on both sides of a long hill running north and south, tells me his phthisis patients die faster on its western slope.

Taking the observed effects of these winds on cases of phthisis, and the results of investigating the phthisis death-rates of exposed and sheltered localities into account together, it appears to me certain that, in Devonshire, west and south-west winds exercise a very marked and injurious influence on the disease.

INFLUENCE OF WIND ELSEWHERE.

But, if wind exerts so marked an influence in Devonshire, is it probable that it is of little influence elsewhere? At present there are no sufficient data for a sound conclusion, but the following considerations seem at least to point to the importance of the question.

It is not every wind in Devonshire which exercises so notable an effect. What are the characters of the winds which are so injurious?

First, they are the *prevalent winds* of the county just as they are the prevalent winds of the whole of the British archipelago. But this prevalence may be easily overstated. From the tables published by Dr. Symes Thompson in the *Climates and Baths of Great Britain*,¹⁴ it may fairly be concluded that west and south-west winds in Devon together do not account for more than one-third of the total windy days. Prevalence, however, has no doubt something to do with their influence.

Secondly, *sea winds* have been said by Dr. Haviland and others to be specially harmful. But in Okehampton district all winds except the north-east may be equally well described as "sea winds," yet only the west and south-west can be shown to exercise a pronounced effect. Again, seaside places like Beer and Paignton, sheltered from west and south-west, and fully exposed to east and south-east winds over the sea, have very low phthisis death-rates amongst their female populations; so too Ilfracombe on the north coast of Devon, completely sheltered from south-west, and fairly sheltered from west, but fully exposed to north-west, north, and north-east across the wide estuary of the Severn, has a female phthisis death-rate of only 0.6 per 1,000.

Thirdly, they are *strong winds*, and some of the greatest

authorities say any strong winds are injurious. Yet experience abroad does not altogether bear this out. The strong, dry winds of Upper Egypt, of Colorado, and of the inland plains of Australia and South Africa, although very dusty and disagreeable, seem to do little harm to phthisis patients, and are associated with populations almost free from the disease.

Lastly, they are *strong wet winds*. Can such be shown to be deleterious elsewhere? Probably the most established reputations for the cure of phthisis belong to Davos, Janja, Gorbardsdorf, Nordrach, Colorado, and the inland plains of Australia and South Africa. Of these, not one is exposed to prevalent strong wet wind. The high altitudes which have never attained a reputation for the cure of phthisis are those of the Himalayas, and they are specially visited by strong wet winds, at least at certain seasons. Lately Dr. Allen, of Natal, has drawn attention to the bad effect on phthisical patients of the wet winds of that colony,¹⁵ and Dr. Auffret has emphasized the unexpectedly high death-rate from phthisis at Brest, which he attributes to the sudden changes from the wet winds from west and south-west to the drier and colder north and north-east.¹⁶

Taking these facts into consideration, it may be reasonably believed—

1. That west and south-west winds in Devon owe their bad influence on phthisis to their being the prevalent strong wet winds of the county.

2. That strong wet winds anywhere are not unlikely to produce somewhat similar effects.

Possible Explanations.

Professor Beneke has shown, by his experiments on the cooling of flasks of water exposed to wind, that moist winds have a specially chilling effect.¹⁷ It is possible, therefore, that strong wet winds are deleterious because they are very *chilling winds*.

Sir Hermann Weber has emphasized the tendency of strong wind to induce respiratory catarrh.¹⁸ It is possible these winds excite *bronchial catarrh*.

There can, I think, be no doubt that, in Devon at least, these rainy winds, when strong, have a peculiarly *depressing* effect, inducing languor and making fatigue easily produced. Such depression may conceivably lower the resistance of the body to tuberculous invasion. Sir Patrick Manson's observations on wind and malaria are particularly interesting in this connexion.¹⁹ He writes:

Stanley says that so long as he and his companions were ascending the Congo, the wind being with them, and therefore not much felt, they did not have fever; but that on descending the stream, a strong breeze blowing in their faces and chilling them, they constantly had attacks. The physiological depression and disturbances caused by the cold wind paralyzed the self-protecting power of the body, and permitted the hitherto latent plasmodia to get the upper hand. And so it is found in the highly malarial districts of tropical Africa, that houses perched on elevated and windy situations are not so healthy as those on the lower, and therefore less exposed and more sheltered ground. This latter fact must not be interpreted as showing that wind causes or carries malaria. The wind merely acts as a cause of physiological strain, of chills; it acts just in the same way as fatigue, hunger, a wetting, disease, fear, excesses or depressing emotions, are found to do.

CONCLUSIONS.

To sum up briefly the foregoing conclusions:

1. West and south-west winds in Devonshire have a marked influence on phthisis, raising the phthisis death-rate amongst populations exposed to them, and injuring those who have already developed the disease.

2. This bad influence is probably due to the fact that west and south-west winds are the prevalent strong wet winds of the county.

3. It is reasonable to believe that strong, wet winds anywhere may produce similar effects.

4. The bad effects may be possibly explained by the chilling and depressing nature of the winds, and by their tendency to excite bronchial catarrh in those exposed to them.

REFERENCES.

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- ² *Med. Chir. Trans.*, vol. lxxxiv (1901), p. 29.
- ³ *Transactions of the British Congress on Tuberculosis* (1902), vol. iii, p. 6.
- ⁴ *Ibid.*, p. 256.
- ⁵ *Ibid.*, p. 260.
- ⁶ *A Handbook of Medical Climatology* (1897), pp. 89 and 90.
- ⁷ *Diseases of the Lungs and Pleurae*, 4th edition (1893), p. 349.
- ⁸ *The Principles and Practice of Medicine*, 4th edition (1901).
- ⁹ Allbutt's *System of Medicine*, vol. v (1898).
- ¹⁰ *Pulmonary Consumption*, 2nd edition (1887), p. 330.
- ¹¹ *Med. Chir. Trans.*, vol. lxxxiv.
- ¹² *Transactions of the British Congress on Tuberculosis* (1902), vol. iii, p. 37.
- ¹³ *Wet Winds and Phthisis*, *Transactions of the British Congress on Tuberculosis*, vol. ii, p. 524.
- ¹⁴ *Climates and Baths of Great Britain*.

1895), vol. i, pp. 77, 82, 88, 91. ¹⁵ *Transactions of the British Congress on Tuberculosis*, vol. iii, p. 39, et seq. ¹⁶ *Ibid*, p. 81, et seq. ¹⁷ Quoted by Dr. Burney Yeo, *Climate and Health Resorts*, p. 26, et seq. ¹⁸ *Med. Chir. Trans.*, vol. lxxxiv, p. 29. ¹⁹ *Tropical Diseases* (1900), p. 120.

CASE OF

PYOPERICARDITIS: PYOPNEUMO-PERICARDIUM:
PNEUMOCOCCUS PYAEMIA.

BY

W. KNOWSLEY SIBLEY, M.A., M.D., B.C., M.R.C.P.,
Senior Assistant Physician to the North-West London Hospital;

WITH NOTES ON THE OPERATIONS BY

W. ARBUTHNOT LANE, M.S., F.R.C.S.,
Surgeon to Guy's Hospital, and to the Hospital for Children, Great
Ormond Street;

AND ON THE ANAESTHETICS BY

GEORGE ROWELL, F.R.C.S.,
Senior Anaesthetist to Guy's Hospital.

In the year 1883 Samuel West, in describing a case of purulent pericarditis which had been successfully operated on, speaks of this condition as "one of the rarest of clinical rarities."⁴

Batten, in the *BRITISH MEDICAL JOURNAL* (1901), in giving an analysis of necropsies, writes of pyopericarditis, that "it is a disease seldom suspected, still more rarely diagnosed, and hardly ever treated, and yet it is one that is present in nearly 3 per cent. of the deaths in the records of the Children's Hospital."

In the *Annals of Surgery*, Philadelphia, for the year 1900, C. B. Porter published an article entitled *Suppurative Pericarditis and its Surgical Treatment, with an Analysis of Fifty-one Cases reported in Literature*.¹⁻⁵¹ But among these 51 cases are included 2 (Nos. 40 and 51) which were simple serous effusions, and both of these recovered. In this paper he makes the following observations:

"Of the total 51 cases of incision for pericarditis, 20 recovered and 31 died—a mortality for all cases of 60.5 per cent.

"Of the 14 cases in which acute pneumonia, either lobar, bronchial, or septic, was the cause of the pericarditis, only 4 recovered (Bohm,³⁰ Lilienthal,⁴¹ Porter,⁵⁰ and Bjorkmann³⁹). In 2 of these the pneumococcus was cultivated from the pus. The other two report no bacteriological examination."

Of the above 51 cases, 5 have been recorded in the *BRITISH MEDICAL JOURNAL*: West, 1883;⁴ Davidson (2 cases), 1891;^{17, 18} Bronner, 1891;¹⁹ Robinson, 1898.⁴³

The case recorded below differs in many respects from any of those previously published. That described in this *JOURNAL* in 1891 by Bronner presented the nearest resemblance clinically, though unfortunately in his case no necropsy was permitted, and so the exact state of the organs was never determined.

The case here published I saw several times in consultation, first with Dr. D. Wilson of Bushey Heath, and then with Dr. Levick of Pinner. I have to thank those gentlemen for their kind assistance with these notes.

History and State on Examination.

The patient was a healthy public school boy, aged 16, whose father had died at 33 from phthisis. His mother was living and well, but she had lost a sister at 21 after amputation of the leg for disease of the knee-joint. A brother older and a sister younger were both living and well. The patient had no previous history of serious illness. The attack commenced at school on December 7th, 1902, when he complained of a stiff neck and sore throat. He was seen by Dr. Wilson the next day, and found to have some general injection of the fauces, suggestive of a commencing tonsillitis. There was some elevation of temperature and he was kept in bed. On December 10th he was more feverish, and there was a slight dry cough, but the throat was better. During the next day or two there were some apparently superficial *râles* to be heard, at one time over the region of the right nipple, and at another in the left axillary region. The temperature on one occasion was 105° F.

On December 12th the boy presented many of the signs of a case of pneumonia of an infectious type. The pulse was 150 or more; respirations 50 to 60, very short, shallow, and catchy; slight dry cough, great restlessness; temperature about 103°. The patient appeared very ill for the physical signs, which consisted only of some large pleuritic *râles* heard just outside the left nipple region, with some impairment of percussion note over the base of the left lung. The heart sounds were indistinct, but no *bruit* was heard.

On December 13th he was obviously worse—the pleuritic *râles* over the left side were less distinct, and the dullness slightly more marked; with a very

small area of tubular breathing, and some slightly suspicious signs at the right base; cough very slight; no expectoration. He also complained of pain in the epigastric region, and there was some fullness, tenderness and great tenderness there. The heart's action was greatly excited and the sounds more indistinct—no *bruit*. There was considerable blueness over the malar regions.

He kept about the same till December 15th, when the temperature fell to normal but unaccompanied by sweating; the pulse improved, slowing to 104, but the respirations continued about 48, and there was an absence of any marked general improvement. The temperature remained normal for about twelve hours and then rose to 99.8°, falling to normal again shortly after, and again rising slightly the following evening. This condition continued for the next few days. All the pulmonary signs rapidly cleared up, but there appeared to be an increasing area of cardiac dullness, and the heart sounds became less distinct; the apex beat could not be felt.

On December 23rd, there being no great change in his condition, he was put into a fly and driven to his home, about an hour's drive, being kept all the time in the recumbent position. He then came under the care of Dr. Levick. During the next few days he appeared to improve a little in himself, but the heart's action kept rapid and feeble all the time, and he presently became gradually worse.

On December 30th he appeared very ill; the pulse was running, irregular, and very feeble. The respirations were greatly embarrassed, with marked expiratory distress. All the symptoms were greatly aggravated on placing the patient on his back for the purpose of examination, which could therefore only be done rapidly and not very satisfactorily. There was great restlessness; he was perpetually asking to be moved from side to side, being too weak to move even his hands or arms himself; the extremities were cold, and the cheeks and ears very cyanosed.

The cardiac dullness had greatly increased both upwards and outwards, the heart sounds were hardly audible, but obviously much more (probably twice) rapid than the pulse at the wrist (*pulsus paradoxus*). There was no dullness over the bases of the lungs or adventitious sounds heard. The spleen was felt below the ribs, and appeared to be displaced downwards, and slightly enlarged. There was no oedema of the legs or elsewhere.

On December 31st, during the morning, the patient had an alarming attack of heart failure, and for a time he was practically pulseless. The temperature for some hours had been subnormal, and the boy appeared to be collapsed, with the extremities blue and cold. Strychnine hypodermically was administered and he rallied a little.

First Operation.

In the afternoon an anaesthetic was administered by Mr. Rowell, and Mr. Lane inserted an exploring needle into the area of precordial dullness and found pus, a piece of rib was eventually resected, and a local empyema was evacuated. This pus was afterwards examined, and found to contain the pneumococcus in considerable numbers, and was apparently unmixing with other organisms. No tubercle bacilli were found.

Although somewhat relieved by the opening of the left pleura and free discharge of pus, still the pulse continued rapid and unsatisfactory, the respirations were just as rapid but somewhat deeper, the temperature remained elevated, and only fell to the normal for a very short time on two occasions during the next ten days, after which all the symptoms became more alarming, and the temperature rose to 103.6°. A second operation was decided upon, as the symptoms pointed to a further collection of pus.

Second Operation.

An anaesthetic was again administered by Mr. Rowell, and Mr. Lane inserted his finger into the opening in the chest wall, and now felt the pericardium bulging against it, and evidently distended with fluid. By the exercise of firm pressure the finger was forced through the wall of the pericardium and a large quantity (about 10 ounces) of pus escaped into the pleural cavity and externally. The heart was felt to occupy the back part of the dilated pericardial space, being forced away from the sternum by the fluid which distended the pericardium. The pus was identical in character with that in the empyema, no flakes were present, and the surface of the heart was smooth and not covered by lymph.

After-History.

The next day, January 11th, the temperature fell at one time to normal, and the pulse was fuller and slower than it had been for many days. After the second operation he was given a mixture containing opium and digitalis.

January 14th. Temperature each day since the last operation had dropped at some time to the normal, and the subsequent rise had each day been less marked. The appetite was bad, but otherwise the condition was satisfactory.

The opening in the thorax had enlarged, owing partly to a general bulging of this side of the chest wall, which presented a large air cavity extending from beyond the right edge of the sternum; and partly to the emaciation and consequent retraction of the intercostal spaces, with the result that there was now some 1 in. of rib exposed anteriorly. The lung was expanding satisfactorily, and as the boy lay on his back one could look into the opening in the chest wall and through the foramen, about 1 in. in diameter, into the pericardium, at the posterior part of which the heart was seen beating vigorously; the surface of the heart and pericardium was dry and of a pale mahogany colour, and there did not appear to be any fluid in the pericardium. There was a small slough attached to the edges of the pericardial opening, but beyond this the parts appeared perfectly healthy. The action of the heart was at once considerably agitated on removing the dressings and allowing more air