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## THE HEART IN CONNECTION WITH THE WORK OF THE WELSH NATIONAL MEMORIAL ASSOCIATION.<sup>1</sup>

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THE head chemist of a very large industrial establishment informed me that the neglect to collect data which were available but not appreciated by the then head of the firm has been the means of throwing things back at least 15 years. The application of scientific knowledge to the production of the valuable metals, steel, copper, &c., in place of the old empirical methods, such as judging the temperature of a furnace by the eye rather than by a thermometer, is acknowledged by everybody as being essential if this country is to compete successfully with other countries. But in order to apply scientific methods it is essential to have sufficient data.

The Welsh National Memorial Association has the means of collecting most valuable data, not only in connection with lung disease but also in connection with the heart, and even if this information be not put to practical use at once, yet the time must come and come soon when it will be found of great national importance. To be more specific, I should like to quote a case that seems to emphasise the value of a combined study of heart and lungs.

A man, aged 65 was laid up with a "bad cold." His pharynx was inflamed. Two days afterwards his pulse rate was about 150 to 200 per minute, the temperature being only slightly raised. It was difficult to account for this tachycardia until the following day, when I found some dullness over the bronchial gland area. I thought the inflamed glands were irritating the heart nerves, but curative treatment was, to put it euphemistically, peculiarly limited. The temperature rose to 103-104° F. ;

<sup>1</sup> An Address delivered at the Quarterly Meeting of the Medical Staff, W.N.M.A., on June 17, 1922.

there was sweating and I diagnosed that the glands were suppurating. The tachycardia still continued, until somewhat suddenly the symptoms were considerably modified. I concluded that the suppurating gland had burst into the pleura—I operated, removed a portion of a rib and allowed a thick pus to drain. The man recovered and to-day at 75 is hale and hearty. He did not recover at once. The pulse was peculiar and the cardiogram showed *pulsus alternans*. For 18 months he had periodical anginal attacks—these and the *pulsus alternans* have now disappeared.

In this case we found three very interesting cardiological conditions—*tachycardia*, the *pulsus alternans* and the *anginal attacks*—the primary cause being an inflamed bronchial gland, the complicating cause, a disturbance of the pleura.

*Tachycardia* is a frequent symptom in cases of tuberculosis, due possibly to one or more of the following causes:—

(1) Pharyngeal inflammation irritating the ends of the nerves in connection with the nerves to the heart.

(2) Inflamed bronchial glands pressing on the cardiac nerves.

(3) Lowered blood pressure (need for data).

(4) Toxæmia: tubercular or gastro-intestinal.

(5) Disturbances of the prostate.

A collection of data with regard to this subject would be very interesting and important, and if it were possible to have the pulse *charted* in all cases of tuberculosis, such a study could not but be most informing, as was shown in an interesting article in the *Lancet* (June 3) on pulse charting and its value in connection with cases of cavities.

*Pulsus Alternans*.—This is a subject that opens up a huge field of investigation. To quote Sir James Mackenzie:—

“It would seem, then, that so far, the real cause of this irregularity has escaped detection. . . . It is invariably associated with some degree of heart exhaustion which is the outcome of extensive degeneration, so that it must be looked upon as of very grave significance. This is particularly the case where attacks of angina pectoris are present: the combination of such phenomena being invariably associated with such exhaustion of the heart muscle that a fatal issue may occur at any period.”

The case I quoted had both *pulsus alternans* and *angina*—yet 10 years afterwards at 75 he is hale and hearty. A mass of data is evidently needed to help us to a conclusion.

I am of opinion that both *pulsus alternans* and *anginal attacks* can be divided into two causal categories.

(1) Where the prognosis is good, as in this case, to a disturbance of the pressure on the outside of the pericardium and the heart.

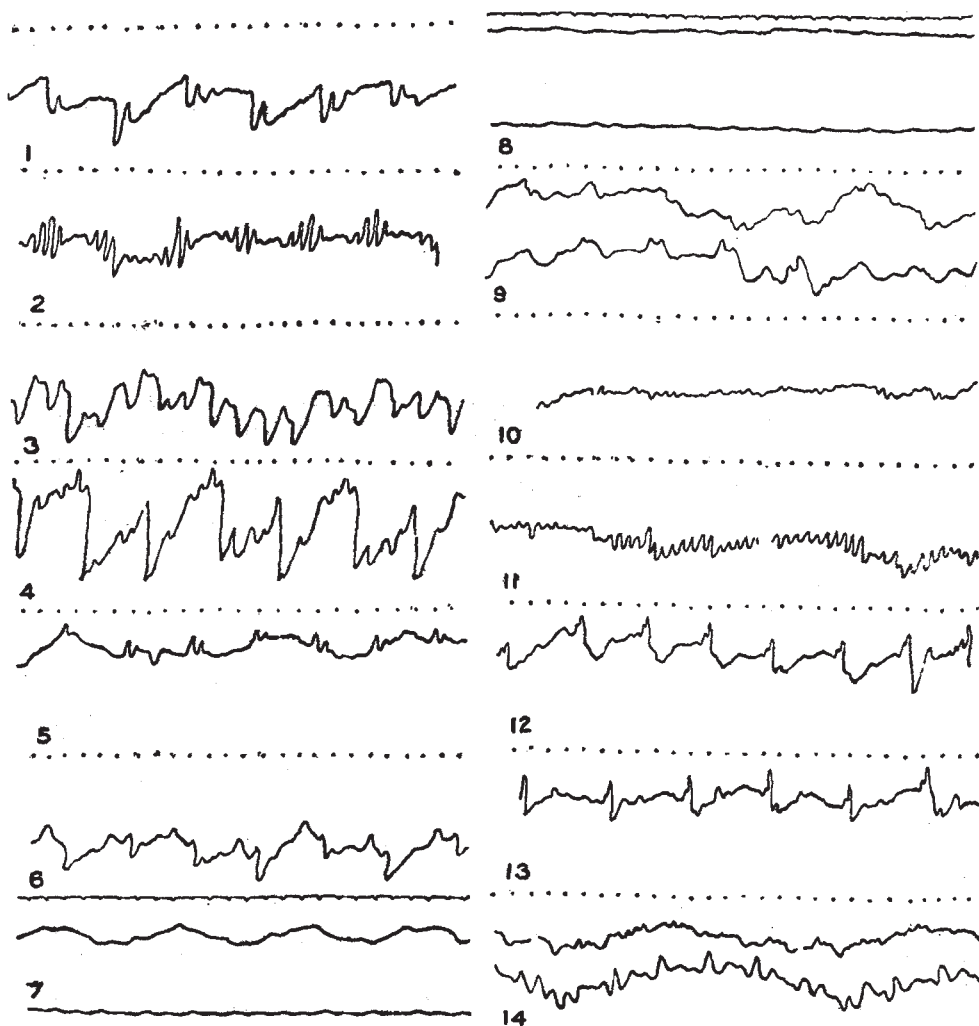
(2) Where the prognosis is bad to a disturbance of the intrapericardial pressure, associated with myocardial modifications.

In a case of acute tuberculosis of the lungs I found *pulsus alternans* present and diagnosing that the disease had spread to the pericardium I was not surprised the patient died.

Can we obtain data which might help us to establish this hypothesis or give us material to formulate a more useful theory?

I referred to the *intrapericardial pressure*—a subject which I investi-

gated in 1915. I found that in the freshly-killed lambs there was a negative pressure in the pericardial cavity to the extent of about 4 cm. of water.



1. Taken with 1-inch chest receiver from a patient sitting up.
2. Taken with 1-inch chest receiver from a patient lying down.
3. Taken with 8-inch chest receiver from a patient sitting up.
4. Taken with 8-inch chest receiver from a patient lying down.
5. Taken with 1-inch receiver from the same patient over jugular area sitting up.
6. Taken with 1-inch receiver from the same patient over jugular area lying down.
7. Heart tracing from a case of pericardial effusion.
8. Jugular tracing from a case of pericardial effusion. 7 and 8 show *pulsus alternans*.
9. Tracings from cardiac and jugular area showing occasional "ventricular" pulsation.
10. Tracing of heart before swinging arms.
11. Tracing of heart after swinging arms.
- 12 and 13 are similar, but show slowing of heart after the exercise.
14. Very wavy tracing from a patient with no physical signs, but tubercle bacilli were discovered a month later.

In healthy men accidentally killed the pressure in the pericardium was also negative to the same extent, whilst in those who died from heart failure the pressure had become atmospheric.

What is the meaning of this negative pressure? It means there is a suction action in the pericardial cavity which keeps the pericardial fluid at about an equal thickness all round the heart for the purpose of lubrication.

An organ, like the heart, which is always at work, demands movement with the least amount of friction, so that it is very important for lubricating purposes that the pericardial fluid should be of the *right quality and quantity*.

What data can be obtained on this subject?

In cardiographic work the importance of this pressure can be demonstrated in some cases of heart disease, where there is a wide difference between the cardiograms taken from a patient standing up or lying down.

I would point out also that the cardiographic result depends on the size of the receiver applied to the chest—whether it be one whose diameter is one inch, or another whose diameter is sufficient to cover the whole cardiac area.

It is important to remember that the same impulses travel up the rubber tube to produce a cardiographic record, as travel up the tube of a stethoscope, for the latter to be satisfactory must be air-tight.

To what extent, then, can a cardiogram be considered a sound record?

Again, if the size of the receiver is of importance in producing a cardiographic record, it is also of importance in stethoscopic work, and for this reason I use a stethoscope with a fair size chest-piece. With such a receiver I find that the two sounds of a healthy heart appear to be almost equal in length, especially in children.

The more diseased a heart is, the more marked is the difference in length of the two sounds—the second sound tending to disappear.

If these observations are of interest and of value, a collection of data in connection with them would be extremely useful.

There is another point I think interesting when using a large chest-piece, and that is the relation in time of the pulse to the first and second sounds. The nearer the pulse-beat is to the first sound, the more *useful* the heart. I use the word *useful* advisedly, anatomical proof not being available.

*The Worthlessness of so-called Sound Amplifying Stethoscopes.*—I would like to draw attention to the worthlessness of so-called and much advertised “sound amplifying” stethoscopes. Compatible with cleanliness, the simpler the stethoscope is the better. It is remarkable that at no medical schools of which I am aware is any advice given by a teacher as to the best way of selecting a stethoscope, with the result that the more showy the instrument is the more does it appeal to the vanity of the student. One cannot imagine a novice starting golf taking hold of any club indiscriminately and forthwith proceeding to play, yet in this important game of life on which the medical student is about to start, advice is not always given as to his choice of a “tool.”

I have the opportunity of examining large numbers of men in connection with the industries of Swansea, and my examination of their hearts makes me feel that this *pulse-heart time ratio* gives some indication of the reserve power of the heart.

Before the furnaces where a man works in a raised temperature, often at an enforced or quickened rate, his heart beats more quickly, and, in order that his heart should do so satisfactorily, it is necessary that its lubrication should be of the best.

The more quickly the heart beats the more lubrication it requires. Can we say that therefore the pericardial fluid is increased in amount, during such a period of stress?

If during that period of stress one finds that the pulse tends to approach much more nearly to the second sound, can one infer that this ratio has anything to do with the condition of the pericardial fluid?

If one finds men with hearts that are readily quickened in action by very moderate exertion, and the *pulse-heart time ratio* is modified in a similar way, ought one to draw a similar inference as to the pericardial fluid?

A very large number of men who smoke heavily (Welshmen three to five packets of cigarettes a day, or if Irishmen, twist), have this modified *pulse-heart time ratio*, whilst moderate exertion soon puts them "out of health." Has tobacco a toxic effect on the pericardial fluid?

Many men whose teeth are bad, whose gums are pyorrhœic and stomachs disturbed, have a similar ratio with an easily upset heart, and give a history of much vinegar and condimental intake. Have these condiments (salt, vinegar, sauces, lemons) a toxic effect on the pericardial fluid? The number of boys and girls examined by me under the Factory Act Regulations, at the age of 14, who have marked inflammation of the gums and who admit to a great partiality for vinegar and sour things is very interesting. It is amongst this class of child that we find rheumatic and choreic conditions together with carditic complications much more prevalent than amongst the children from homes where nourishment is supplied on more rational lines.

Are there any other conditions, say, amongst tuberculous patients which tend to have a toxic effect on the pericardium? If so, can we secure data bearing on the subject?

I would like to ask how many tuberculosis cases suffer from heart disturbance (a) as a primary affection, or (b) as a secondary affection. Data on this point with regard to the whole of the tuberculosis patients in Wales would be very valuable.

If the heart disturbance be primary, what are the causes? Heart disease is a matter of great sociological importance, and a few questions such as the following, I venture to suggest, might help towards a solution of the problem:—

(1) Meteorological conditions of district (urban and rural), aspect and situation and sanitation of house; (2) age and sex; (3) family history of rheumatism; (4) family history of T.B.; (5) father's occupation; (6) family hygiene or hygienic intelligence; (7) whether the child takes lime-bearing foods—eggs and milk, and if so, how much daily; or whether it



prefers salty acid or sour foods; (8) whether the child is well shod; and (9) what school—private, provided, non-provided.

If the heart disturbance be secondary what are the forms it takes?

- |           |   |              |
|-----------|---|--------------|
| (1) Toxic | { | Endocardial. |
|           |   | Myocardial.  |
|           |   | Pericardial. |

(2) Outside pressure.

(3) Outside dragging.

(4) Irregular shape of chest (caries, collapse of lung).

(5) Glandular or other pressure on, or irritation of nerves (cerebral or spinal).

Incidentally I might mention it is estimated that there are in Wales 40,000 people whose hearts are affected, in varying degrees, so that from a national welfare point of view it is essential to have satisfactory data.

Economically a cardiac case is a cardiac cripple in that he or she cannot compete in the labour market. Accurate knowledge with regard to say 10,000 of these cripples will help in the settlement of the problem—How to find them suitable work whereby they can be of economic advantage to the nation. Unemployed, they are a drag on the nation and a burden to themselves.

I would like to say one word in connection with pericardial effusion. Although I cannot speak with any authority I venture to say that aspiration of the fluid with subsequent subcutaneous injection of it is likely to be attended by good results. I wonder whether such a statement has any chance of making the fingers of some of the staff itch to be on to such a job?

In conclusion, I would like to solicit the co-operation of the members present in finding out the value of a point O whereby to correlate the heart's impulse beat.

O is the mid-point of a line A—B extending from the right acromion process to the left anterior superior iliac spine, and corresponds very nearly to the point of intersection by a similar line from the left acromion process to the right anterior superior iliac spine. This line A—B has an average length of *about* 24 in. in men and 22 in. in women—12 in. in babies. Any marked deviation from this length suggests some distortion.

My experience is that the normal H.I.B. is about 2 in. to the left of this point, and that if the H.I.B. be below this level the heart is abnormal. In infants the H.I.B. is 1 in. to the left.

It is a point that bears a relation to the length of the trunk rather than to a special part such as the nipple.

For X-ray photos of the chest, it would be a most valuable addition to the result were the line A—B made across the body with vaseline mixed with oxide of mercury. This line comes out on the plate and gives us a more definite idea as to the position of the heart in both the vertical and the horizontal positions. The drawing of this line would entail but very little additional work, yet might be the means of supplying us with invaluable data concerning the position of the heart in those two attitudes.

## SUMMARY.

The value of data concerning the heart.

The causes of tachycardia.

The value of pulse-charting.

The causes of *pulsus alternans* and anginal attacks. The effect of pressure inside the cardiac apparatus. The effect of pressure outside the cardiac apparatus.

The importance of intrapericardial pressure and the pulse-heart time ratio.

Can we estimate any toxic effects on the *quality* or *quantity* of the pericardial fluid?

The sociological importance of inflammation of the gums in children.

To what extent is heart disease primary or secondary in tuberculosis cases? If secondary, what form does it take?

Is the point O of any value?

X-ray photos with the line A—B marked in oxide of mercury.

## SOME OBSERVATIONS ON LOW-TENSION PNEUMOTHORAX.

By DR. GWERDER.

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THERE is an old principle, often forgotten, that fever of more than four to six months' duration rarely disappears, and that temperatures which do not fall during the first few weeks at a sanatorium, indicate a bad prognosis. It is not, of course, to be denied that there are examples to the contrary, remarkable recoveries which seemed impossible until they occurred. In earlier days I treated cases with involvement of one lung only, which had been febrile for three or four months, by artificial pneumothorax, of the original compression type. In many cases the results were good: in others, foci previously undetected by physical signs or in skiagrams, developed in the hypothetically healthy lung, or else intestinal involvement unexpectedly occurred—the result of sudden liberation of toxins by excessive compression. But according to the classical indications for inducing a pneumothorax, compression is necessary. Therefore we effected compression. For all cases of bilateral disease this treatment was inapplicable.

Provided the affected lung could be compressed, the marked loss of weight following the anorexia which occurs in cases of pneumothorax was ignored. Some patients, notably those of strong constitution, recovered completely. Others, with bilateral lesions, were not treated by this method.

Critical of this method after obtaining bad results with it, we made some careful attempts on the lines of ignoring the idea of compression, which is so universally emphasised, and we gave less gas. By the old method, 1,500 c.c. of gas were often given on the first occasion, the patient