

Medicine. — *On the Nature of Cardiac affection in Beriberi Patients.*
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(Communicated at the meeting of February 25, 1928).

Accurate and exhaustive clinical investigations by DR. AALSMEER, Lecturer on Internal medicine at the Surabaja Medical School for Indian Physicians (N. I. A. S.) have enabled us to find an explanation for the puzzling, most uncommon course of the perilous heart-trouble in cases of Beriberi. The body of facts now on hand proves that an increasing weakness of the cardiac contraction involving the whole heart, is the cause of a considerable disturbance of circulation. The latter will be discussed at large in the *Ned. Tijdschr. v. Geneeskunde*. In the present paper we will only emphasize some points that will help us in identifying the nature and the course of the disease itself.

These points are:

1. An increased thickness of the cardiac wall and an increase of the weight of the entire organ, considered together as a "hypertrophy". These changes appear already at the beginning of the disease on the left, as well as on the right half of the heart and are independent from the nervous degeneration occurring in Beriberi-patients.

2. The electro-cardiographic investigation shows that, in spite of the largely decreased strength of the heart, the automatic processes of the formation of stimuli, excitability, and stimulus-conduction, are completely normal.

3. The utter failure of all heart-tonics in use (digitalis, strophantus, coffein and theobromin preparations), contrasted with the complete disappearance of all cardiac phenomena after the administration of vitamin B (Katjang Idjoe etc.).

I. It is difficult to assume in one and the same heart-muscle the existence of considerable, nay, fatal weakness, and at the same time a true hypertrophy of the muscle, which is indicative of stronger activity. A hypertrophic muscle may, indeed, fail, but it cannot be expected that a muscular activity that has been enfeebled from the onset, should induce hypertrophy.

A second and in fact insuperable objection to the assumption of a hypertrophy, is the long known fact, in every respect confirmed by AALSMEER, that the administration of a vitamin-containing diet abolishes the considerable enlargement of the heart within a short time in very severe cases. It is not probable, however, that an existing hypertrophy would not leave

traces after treatment, so that the only alternative is to find other causes for the enlargement of the heart and the increase of its weight than those prominently brought forward by all earlier authors.

II. In our search for these causes this point has perhaps led us on the right track. Many years ago ENGELMANN reported, at a meeting of this Academy that the heart-muscle, just as the skeletal muscle (BIEDERMANN), swells in water and loses its contractility, whereas excitability and conductivity persist all the same. Many years later DE BOER pointed out that the swelling itself hampers the contraction of the muscle fibre mechanically, but that in this process the E. C. G. remains perfectly normal. That the same phenomenon, a weakening of the force of contraction and normal E. C. G., was found in Beriberi-patients, suggested to us the idea that here also disturbance might be caused by absorption or retention of water ("Quellung").

Potent arguments lend support to this assertion. According to TIEMANN's ¹⁾ recent inquiries all striated muscle, contrary to smooth muscle, swells in every hypotonic fluid examined by him, the cardiac muscle less than the skeletal muscle. If a similar process exists in Beriberi, such swellings may also be expected in skeletal muscle. In fact they belong to the typical aspect of Beriberi, already strongly pronounced at the calf muscle at the beginning of the disease, even where edema of the feet and symptoms of degeneration of the nerves cannot yet be demonstrated. This swelling may be identified by the pain caused by pinching the calf, which is so hard and enlarged, that in MENSE's *Lehrbuch der Tropenkrankheiten* NOCHT compares it with the well-known "pseudo-hypertrophy" of the progressive muscular atrophy in children (fig. p. 461). PEKELHARING and WINKLER already speak of a *seeming* muscular hypertrophy.

III. The next point also furnishes signal evidence for the explanation given here. It is easily understood that only such a treatment can exert a favourable influence upon the Beriberi-heart which is able to draw the absorbed water from the cardiac muscle. That digitalis cannot do this could be expected. However, it is very remarkable that no influence whatever is exerted on the heart by diuretics, neither by thyroidpreparations nor by a treatment expelling water from the tissues so potently as the mercury-preparations novasurol and salyrgan. (AALSMEER, SCHIMAZONO).

In contrast with this, vitamin B (whose absence evokes all the symptoms of Beriberi) brings on an almost marvellous improvement shortly after it is given to the patient. The literature shows conclusively that not only does the cardiac muscle resume its contractility together with, in our opinion

¹⁾ F. TIEMANN Ueber die Quellungsbedingungen des Herzmuskels unter verschiedenen Bedingungen. *Ztschr. f. d. ges. exper. Medizin.* 58, 821, 1928.

also by virtue of its smaller size and weight, but that also the skeletal muscles are benefited by this influence. The firm, thickened and painful muscles are immediately reduced to their normal size and function. In his monograph on Beriberi, published last year, DE LANGEN, when alluding to the disappearance of the edema, speaks of "the still more remarkable quick recovery of the pareses, and sometimes already paralyses, which within 24 hours were things of the past after the diet had been duly modified." According to SCHEUBE¹⁾ as early as 808 B. C. Katjang Idju was known in Japan to be "ein harntreibendes Mittel". Also in later publications this property of vitamin-treatment is often recorded. That this substance acts so differently from the ordinary diuretic treatment, favours the conception that the swelling of the striated muscles is due to a specific cause. This fact may perhaps supply an argument in answering the question whether and how far this swelling is of an infiltrative, osmotic or colloidal nature.

It would seem then that our hypothesis of the absorption of water by the heart-muscle being the causative factor, affords an explanation of the whole set of symptoms of the syndrome of Beriberi, most unique in cardiac Pathology. It seems altogether probable that other manifestations of this disease, notably the degeneration in the central and peripheral nervous system, are also due to the same cause, viz. swelling by retention of water. A good many data taken from the experimental literature seem to lend support to this view. Further investigations will have to solve this and many other problems. Likewise it may be deemed probable that analogous, or even identical processes come into play in certain other forms of insufficient action of the heart. The often incomprehensible total absence of response of the diseased heart to all our heart-stimulants, which is generally indicative of a hopeless condition of the ventricular muscle, may in some cases be explained on the same line. In this connection one is reminded of myxoedema and its treatment by the administration of thyroid, which substance, however, does not seem to act in cases of Beriberi.

There are still other reasons for giving attention to the subject under discussion. It lays a bridge between scientific clinical examination and the experimental work on problems that have recently come to the front, viz. those of the so-called "heart-hormones" and "automatins". The fact that the organism itself produces substances that can revive a heart after it has been brought experimentally to a standstill, and seem to be able to restore the automatic function, is recommended rather inconsiderably for the treatment of heart-patients. This is certainly premature, but anyhow the Beriberi heart shows that the revival of a heart, given up for lost, is not out of the bounds of probabilities. The communication made by ZWAARDEMAKER at the previous meeting of this Academy, is also of vital importance. The radiated vitamin B is the same substance that can save a

¹⁾ SCHEUBE, Die Beri-beri. Fischer 1894.

Beriberi heart. It is said to be identical to histamin, which according to inquiries published in Vienna a few days ago, is contained in various substances regarded as heart-hormones.

Meanwhile the Beriberi heart affords an instructive example for thorough investigation ; it reminds us in good time of the fact, sometimes forgotten in the hormone literature, that not every arrested heart has altogether lost its regular automatic vital function. Automatism may continue undisturbed, but in consequence of the swelling of the muscle-fibers hindrance, or other may not be able to manifest itself in a visible form. The added active substance should, therefore, in such a case not be called automatin ; what takes place in the heart is not a resuscitation from the sleep of death, but the deliverance of a fettered prisoner.

Vienna, 18 February 1928.
