A CASE OF TYPHOID COMPLICATED WITH STAPHYLOCOCCAL SEPTICAEMIA.

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THE clinical and bacteriological history of this case prove that it was one of typhoid fever, complicated at the end of the second week by a secondary generalized infection with *Staphylococcus albus* and *aureus*.

A nurse at the Liverpool City Hospital, Grafton Street, aged 29, after three months' typhoid work, was transferred to night duty in the scarlet fever wards. On October 31st, 1908—eleven days later—she complained of not feeling well, and was therefore taken off duty. Indefinite symptoms characterized the onset of the illness up to November 5th, when the probability of enteric fever arose, and this was the provisional diagnosis till November 13th. It is sufficient to state that, though the classic signs were not prominent, the weight of evidence was in favour of enteric. Pyrexia was fairly typical, there were two doubtful spots, the spleen was palpable, and Ehrlich's diazo-reaction was positive.

At 8 p.m. on November 13th—probably the fourteenth day of the disease—the patient had the first of a series of severe rigors, which recurred at intervals during the next nine days, giving an unusual clinical picture in typhoid. The rigors lasted from twenty minutes to half an hour, and were followed, as a rule, by a profuse perspiration (see Chart).

As the symptoms were associated with the development of a marked apical systolic bruit, and accentuation of the pulmonary second sound, and as on November 9th the Grünbaum-Widal reaction was negative, it was thought that the case might be one of infective endocarditis simulating typhoid at its onset.

On November 18th, therefore, a bacteriological examination of the blood was undertaken. The skin of the arm was sterilized; 10 c.cm. of blood were withdrawn from the median cephalic vein, and distributed among three flasks containing 100 c.cm. of broth and half a dozen slant agar tubes. After forty-eight hours the flasks contained staphylococci, and a Gram-negative motile bacillus with many flagella. This bacillus, after it had been subcultured for several weeks, was agglutinated markedly in half an hour with the serum of a convalescent typhoid patient in dilutions of 1 in 15, 1 in 30, and 1 in 60, but not with normal serum. The bacillus also behaved in a manner characteristic of typhoid in glucose, lactose, cane sugar and mannite broths, litmus milk, gelatine, and broth.

All the slant agar tubes, each of which contained only a few drops of blood, were covered with colonies of *Staphylococcus aureus* and *albus*, in about equal proportion, but the colonies were too numerous to count satisfactorily. No typhoid-like colonies were visible. Streptococci were absent in all the cultures.

The bacteriological diagnosis of typhoid was further confirmed by the fact that, although on November 9th the Grünbaum-

January 8th. The cardiac bruit had in the meanwhile completely disappeared.

The occurrence of intermittent pyrexia is common enough in the third and fourth week of typhoid, but one of us, who has seen over 3,000 hospital cases of this disease, cannot recall having met with such extreme and unaccountable variations in temperature, combined with repeated rigors, moreover, in the second week of the disease.

The source of the secondary infection with staphylococci could not be discovered though assiduously looked for, but it is worthy of note that the patient immediately before her illness had been nursing scarlet fever, a disease intimately associated with infective processes.

Another point of interest is the fact that the patient prior to the bacteriological diagnosis was treated with antistreptococcus serum, with apparently beneficial results, so it was deemed prudent to continue its administration, notwithstanding the absence of streptococci in the blood.

HOW MUCH FLUID DOES THE BODY REQUIRE?

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If a man living an ordinary sedentary life, not entailing visible perspiration, takes from 50 to 60 oz. of fluid per diem, then a weight of 150 lb. apparently requires about 50 oz. of fluid, this amount being passed each day through the kidneys. The question is, By how much may this quantity be reduced before physiological difficulties are encountered?

The teaching of the late Sir Andrew Clark on the importance of reducing fluid in cases of morbus cordis first arrested my attention, and I have followed his teaching in such cases with much benefit. In none have I seen urinary gravel induced by reduction of fluid in those who had not previously had gravel. Working at the circulation in high blood-pressure cases (for example, headache, epilepsy, and depression), I found that by lessening fluids I could lower blood pressure 20 or 30 mm. of mercury, this often sufficing to turn the balance.

The above quantities of fluid are more a habit than a necessity, and most people can accustom themselves to do with less than 50 oz. a day. I generally aim at 30 oz. The gain to a diseased or dilated heart is obvious; the total fluids in the body are gradually reduced by several pints, and weight falls a corresponding number of pounds.

A dilated heart resembles a distended bladder, and the latter, we know, may lose all power of expulsion. A heart thus enabled to get a more complete grasp of its contents not only saves a great expenditure of force in twenty-four hours, but valves incompetent in the dilated condition may, even though diseased, become almost completely competent. It is no uncommon thing for the transverse area of the heart to diminish 2 in. in three weeks, even if no drugs are given and no other change made.

I wrote in 1903¹ on the washing out plan, mentioning that I had seen a number of cases in which an attempt to wash out an excess of uric acid had been quite unsuccessful, because uric acid controls the passage of water out of the body, while the water does not to any important extent control the excretion of uric acid. I there mentioned some cases in which excess of fluid had dilated the heart, leading to atrophy of its muscular tissues, and leaving little but a prospect of chronic invalidism.

On a dry diet I have seen astonishing recoveries from morbus cordis. In one case almost no fluid was taken except that in fruit, and the patient passed from hopeless invalidism to the power of bicycling fifty to sixty miles in a day with ease.

The relief from reduced blood-pressure alone is no small

A, Serum reaction—(1-15); B, rigor; C, blood cultured; D, serum reaction + (1-60); E, slight rigor.

Widal reaction, tested at the Municipal Bacteriological Department, was negative, on November 18th, unknown to us, it was reported positive in dilutions up to 1 in 60.

The patient, who was treated for the septicaemia with injections of antistreptococcus serum twice daily, had the last rigor on November 21st, and was discharged cured on

matter for an organ which has to work the whole twenty-four hours, and I have always agreed with the late Sir W. H. Broadbent that we do more good by diminishing the heart's work than by driving it on with tonics.

Consider the condition of the heart, placed in a practically unyielding investment (the pericardium); every dilatation means pressure, and pressure means at least defective circulation in the cardiac veins and capillaries, to say nothing of the influence of the defective action of the left ventricle on the cardiac arterial supply. Thus every dilatation of the right side, if it increases intrapericardial pressure, must mean defective circulation in every muscle fibre of the heart. This risk is removed by lessening fluids, and in morbus cordis this also diminishes the strain on the valves, and so the tendency to recurrent endocarditis.

On the heart the effect is not only to diminish work and aid its mechanical efficiency but also to improve its nutrition enormously. The pressure in the whole arterial system is diminished, and the importance of this in advanced cases of arterial disease or impending cerebral haemorrhage needs no demonstration. The capillaries and venules are no longer over-distended and liable to rupture. The veins previously visible and prominent, especially in the lower limbs, shrink and disappear, and the very texture of the tissues becomes firmer and harder. This was well seen in the case of morbus cordis above mentioned, where fluid was taken chiefly in fruit. In place of the flabby limbs of a beer-drinking butcher this patient developed the iron-wire muscles of our nearest frugivorous relatives. The frugivora, I believe, take little fluid, and that mostly in the form of fruit.

Such changes as I describe profoundly affect the whole vascular system. Several times lately I have been called to see cases of aneurysm in which, I know not why, no attention had been paid to the quantity of fluid. One of these patients was so bad with dyspnoea that I scarcely dared to move him for examination. I found that he was taking 2½ pints of fluid a day. Four weeks later, as the result of reduced fluids, he was walking about, and only sat down for examination. The aneurysm was not cured, but life, which was threatened by the distension of high blood pressure, was at least prolonged.

In the dilated and splashing stomach commonly found with chronic collaemia there is often in addition an increase of heart area, and a capillary reflux of 7 to 8 with a blood pressure of 130 or less, and a quick, often irregular pulse, with palpitation on exertion. A capillary reflux of 7 with a strong heart should show a blood pressure of 140, and one of 8 a blood pressure of 160; thus we can measure the extent of the heart failure. These conditions are commonly seen together, and collaemia is the central factor. When the heart is already overweighted by high blood pressure it is most injurious to give excess of fluids in the false hope of washing out excess of uric acid. Excess of fluid is slowly absorbed from the stomach; while there it dilutes the digestive juices and favours fermentation; when absorbed it dilutes the digestive secretions, diminishing their power, and favouring the increase of microbic putrefaction, malnutrition, and debility. Its tendency is to dilate the stomach the muscles of which are, like those of the heart, in poor condition from defective circulation. As a result of such malnutrition and debility excess of fluid will eventually produce some oedema of the ankles, which is not infrequently accompanied by oedema of the cortical membranes, which lies at the root of brain-fag and debility, commonly called "nerves"; of bad temper, nervous excitement, hysteria, or of neurasthenia, depression, and lethargy up to the more fully-developed signs of uraemia—for example, twitching of muscles, headache and coma. Many of these conditions are often promptly relieved and may be cured by lessening fluids, strengthening the heart, and later on removing collaemia by a purin-free diet. I believe that no small part of the increase of such "nerve" troubles is due to increased consumption of fluids, especially where the increase of fluid is not accompanied by any measure to diminish the introduction of uric acid. As a rule collaemic sufferers dislike fluids. Their blood contains excess of fluid, and shows only small percentages of haemoglobin and cells, since the capillaries of all the organs of excretion (kidneys, skin, lungs) are blocked by collaemia. These patients are

easily persuaded to take less fluid, and generally have to be urged to take excess.

Albuminuria and Bright's disease are an additional indication for this treatment, for at least a part of the defective combustion, called Bright's disease, is due to cardiac weakness, and anything improving the condition of the central organ of the circulation improves the general combustion.

The treatment of collaemia with heart failure and its results is to cut down fluids but not to reduce the income of proteids—for no heart tonics will act if food is deficient; to rest the whole body as much as possible so as to lessen the work of the heart; to give heart tonics such as digitalis or nux vomica in small doses long continued, till the pulse-rate is normal and the natural ratio between capillary reflux and blood pressure re-established. I used to be puzzled by cases of neurasthenia and depression in which there were obvious indications for heart tonics, and yet the administration of such tonics made the mental condition worse. In these cases there is always high blood pressure, and to raise the pressure in the skull still more by tonics will do harm so long as there is cerebral oedema; but remove the oedema by diminishing fluids, and the tonics can then be given with benefit. The same applies to the heart—take off the work and improve its mechanical power by diminishing fluids, and the tonics will do treble the good in half the time.

What harm may be done by diminishing fluids? Uric acid gravel, or the presence of large quantities of urate in the ears, joints, and fibrous tissues, forbid diminution of fluid over a long period, for the excretion of such urate store is almost certain to give trouble in the tubules and pelvis of the kidneys if sufficient fluid is not taken. Yet when a patient is obviously dying of heart failure on the one hand, or cerebral oedema on the other, we must immediately cut down fluids and consider the excess of urates afterwards. There might be increased tendency to thrombosis, but, as the ultimate effect is a general improvement of the circulation, this does not seem important, especially if a purin-free diet is adopted.

Constipation is another possible trouble, and sufferers on an ordinary diet will not be better on diminished fluids. But what is the inconvenience of a little constipation if weighed in the balance against heart disease, or uraemia, or cerebral oedema? The use of common laxatives will counteract it while matters are critical, and later there will not be much trouble from constipation if fruit is used daily.

In serious conditions I take thirst as a guide, and I find that most patients can reduce their fluids to 30 oz. a day, and, with the help of fruit, to 25 oz., 20 oz., or less, at least for a time. If salts, salines, and diuretics are given more fluid will be called for, and then we have to decide whether most good is done by withholding drugs and water, or by giving both. As a rule, I am in favour of the former course, though drugs can be used at first, as it takes several days to reduce the fluids of the body. I order that 30 oz. be aimed at, but that fruit or extra water shall be given whenever thirst imperatively demands it.

REFERENCE.

¹ *Canada Lancet*, August, 1903.

THE OCCURRENCE OF TUBERCLE BACILLI IN THE BLOOD IN TUBERCULOSIS.

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It appears to have been little, if at all, recognized that tubercle bacilli may commonly be found in the blood of tuberculous patients.

Very recently Rosenberger¹ published a remarkable series of cases which must bring the question of blood infection in this disease into prominent notice. The cases he examined included many different forms of tuberculosis, and he was able to demonstrate the bacillus in the blood of every patient, whatever the type of the disease, and however early the disease appeared to be clinically. It is