CASE OF

CHRONIC HICCUP AND VOMITING:

DISCOVERY OF OXALIC ACID IN THE BLOOD.

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COMMUNICATED BY DR. WILLIAMS.

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DURING the Session 1847-8, I had the honour of bringing before the Society the results of some researches I had made on the condition of the blood in health, also in gout, rheumatism, and Bright's disease. I then demonstrated the existence of uric acid in that fluid, a substance which I believe had never before been found in it, and showed the variations in amount which it undergoes under different circumstances. I have now the pleasure of making known the existence of another acid in blood never before detected, although in many cases sought for. It is with the view of announcing this fact that I again trespass on the Society; the short time which has elapsed since the discovery, being my excuse for not having as yet determined the laws which regulate the amount of the acid found, &c.

I will very shortly relate the case of the patient in whose blood these peculiarities were first observed, as perhaps the results of the examination of this fluid may throw some light on certain symptoms exhibited during life.

A man, Joseph Robson, æt. 65, a piano-forte maker, subject in his employment to the vicissitudes of the weather, and partaking rather freely of alcoholic fluids, first came under my notice as an out-patient at University College

Hospital, in February 1849. He then complained of cough, and œdema of the face and extremities; the urine when first examined was not albuminous, but at the next visit was found to be highly charged with albumen. A small amount of blood was taken from the loins by cupping, the examination of which will be afterwards detailed. In about a fortnight from this time, his symptoms becoming more urgent, he was made an in-patient under Dr. Williams.

Condition when admitted, March 3d. Considerable œdema of face and extremities, together with ascites; constant hiccup, attended with eructation of either food or a clear watery fluid; no renal or abdominal tenderness; nor pain of any kind, but a drowsy and confused sensation; bowels very much confined; cough troublesome; dullness on percussion, and deficient breath-sound in the lower part of the left back; urine strongly albuminous, of a cherry red colour from the presence of blood.

March 8th. With the hiccup a dark-red coloured fluid has been eructated containing blood-corpuscles and (according to the clinical clerk) pus; tongue red at tip and edges, but brown-furred in the centre, tenderness was detected in the left lumbar region; the same matters were also eructated next day, but more of a coffee-ground colour. Pulse 56, respirations 28, per minute.

On the 15th the ascites had increased, the albumen in the urine diminished. On the 16th a dark-coloured fluid with a coagulum of blood was vomited; the urine was then alkaline, albuminous, dark-coloured, containing blood-corpuscles and crystals of the triple phosphate.

On the 26th the urine contained casts of tubes, urates, and crystals of uric acid; it was also albuminous.

April 5th. Ascites much increased; urine contains only a trace of albumen.

On the 10th the urine was not albuminous; sp. gr. 1015.

18th. Complains of difficulty in swallowing food.

29th. Eructation of coffee-ground matter; is sinking.

On the retirement of Dr. Williams from the duties at the hospital, he again came under my care.

May 3d. Vomiting continues, bowels constipated, thirst excessive, for allaying which much cold water is taken, but it is very soon rejected by the stomach.

4th. Takes no food; urine large in quantity, contains crystals of uric acid, but no albumen.

6th. At 10 p.m. became senseless, and died at 6 a.m., on the 7th.

Post-mortem. The only morbid appearances worthy of notice, were as follows: A few ounces of fluid in the left pleural sac. In the peritoneal cavity about 330 ounces of fluid, which was transparent, and of a greenish-yellow colour. The kidneys had a few cysts on their surface, were coarse in texture, and when minutely examined, their surfaces were found studded with innumerable white points, which appearance was found to arise from the tubes in the cortical portion being filled with a white plaster-like matter (urate of soda). This phenomenon, in a much smaller degree, is sometimes seen in the kidneys of gouty persons. The whole tract of the intestinal canal appeared healthy, as also the other organs of the body.

Examination of the blood taken from the vessels of the head.
—No coagulation took place when the fluid was allowed to stand, but the globules subsided, and the serum possessed the following characters. It was alkaline, had a sp. gravity 1013·25, at 60° Fah.

Alcoholic solution of 1000 grains examined for urea, gave of nitrate of urea = 4·25 grains.

The watery solution was then treated for the purpose of ascertaining the quantity of uric acid, but, with the greatest care, only traces could be discovered; in its place, however, a heavy whitish deposit was observed, which, by microscopic and other tests,* was found to be composed of an immense

* As the crystals were not in quantities sufficient to be collected apart from the fluid, it may be well to mention the microscopic and chemical tests employed to ascertain their nature.

Microscopic appearances. Most of the crystals had the form of the flattened octohedron, and, when made to roll in the fluid, presented the

number of crystals of oxalate of lime, most of them having the ordinary octohedral form, but some few having a spheroidal and even what has been termed dumb-bell appearance, exactly resembling those found in urinary deposits.

Method of examining blood to obtain crystals of oxalate of lime.—The serum of the blood should first be dried in a water-bath, and boiled with alcohol to remove matters soluble in that menstruum; a watery solution must then be made, which is afterwards evaporated to the consistence of a very thin syrup, and acetic acid added, so as strongly to acidulate the fluid; if any oxalic acid is present in the serum, crystals of oxalate of lime will form after the fluid has been allowed to rest for some hours. Uric acid also if present will be found to become crystallized at the same time, but forms a much heavier deposit than the oxalate of lime, and can readily be separated.

It may be observed that there is some difficulty in chemically explaining the process given above for obtaining oxalate of lime from blood, as this salt is insoluble in water, but it must be remembered that a watery solution of the serum, prepared according to the above directions, always contains a certain amount of a protein-compound, doubtless holding in solution phosphate of lime; such being the case, the following *may* perhaps be the explanation of the phenomenon.

A soluble oxalate may be contained in the watery solution of the blood without being able to decompose the lime existing in it as a phosphate, but on concentrating the fluid, and acidulating with acetic acid, the lime-salt becomes

three different forms depicted in plates of urinary deposits of oxalate of lime; some, as mentioned above, exhibiting dumb-bell-like appearances, also shown in the same plates.

Chemical reactions. The deposit was found to be unaffected by *water*, solutions of ammonia, weak potash ley, or acetic acid; but were readily dissolved by hydrochloric and nitric acids.

I may remark, that the crystals have been examined, not only by myself, but by others fully competent to judge of their nature.

separated from the protein body (which is precipitated), and is then decomposed by the oxalate with the formation and precipitation of the insoluble oxalate of lime.

Examination of the blood taken from the loins of the same patient about seven weeks before death.—Clot large and firm.

Serum, sp. gravity 1021·8 at 50° Fah.

1000 grains of serum gave, of nitrate of urea, 0·05 gr., and of uric acid, 0·025 gr.

A few octohedral crystals were discovered mixed with the crystals of uric acid, but the amount was small compared with that found in the blood after death.

Since the above observations were made I have examined other specimens of blood for the purpose of ascertaining whether octohedral crystals could be procured, and although I have never observed the crystals in quantities at all equal to those found in Robson's blood, yet I have succeeded in demonstrating their presence, several times, for example, in some cases of gout where there existed considerable inflammatory action. In such blood uric acid has always existed in considerable quantities, whereas in Robson's case in which we might have expected to find uric acid in excess, the blood exhibited scarcely a trace of this body; the oxalates appearing to have replaced the urates.

It appears to me that the discovery of oxalic acid in the blood is of considerable interest and importance; and although, at the present time, I am unwilling to draw any conclusions, the cases in which it has been found having been so few in number,—not more than five in all, yet I regard it as indicating, in the first place, that this acid in cases of oxaluria is probably formed in the blood itself, and not from any change in the urine after its excretion from the kidneys; and secondly, that a close relation exists between the uric acid and the oxalic-acid diathesis; since the oxalic acid appears either along with uric acid, or where uric acid would have been expected to be present. The latter inference is strengthened by an analysis I have recently made of the blood of the turkey, of which 610 grains of the serum gave no

indications of uric acid, and, after most careful search, no trace of octohedral crystals.

It would be interesting in cases of poisoning with oxalic acid to examine the blood by the method above alluded to, although the mere presence of this acid cannot now be looked upon as a proof that such acid has been administered.

As I am pursuing the investigation of the subject I will not at present allude to any further points, but content myself with little more than the mere announcement of the occasional presence of oxalic acid in the blood of the human subject. How far any of the symptoms exhibited by the patient, whose case is above detailed, depended on the peculiar condition found in the blood, I will not venture to say.