Original Articles

DEATH FOLLOWING ADMINISTRATION OF TETRACHLORETHYLENE

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THE value of tetrachlorethylene in the treatment of hookworm disease is well established, and it has rightly come to occupy a very prominent place in the armamentarium of the practitioner in the tropics. The popularity of this drug is due to its ease of administration, relatively low cost, low toxicity and high efficacy in eradicating the worms. A single treatment would remove more than half of all hookworms and two (occasionally three) treatments eradicate the infection altogether or bring it down to a negligible level. The drug has a pleasant smell and usually produces no untoward effect except some drowsiness. Toxic symptoms have been noted only rarely, and in spite of its widespread use, not a single case of fatal poisoning from it has been recorded. The following case is probably the first death caused by tetrachlorethylene and seems worth recording.

Case Report

A street beggar, aged 30 years, was admitted to the Carmichael Hospital for Tropical Diseases under one of us (R. N. C.) on the 25th April, 1946. His chief complaints were pain and burning sensation in the epigastrium with occasional vomiting and chronic diarrhœa—duration one year. He also had swelling of the legs for about two months.

Examination.—The patient was emaciated, weighing only 70½ pounds, and had marked œdema of the legs and feet. The heart and lungs were normal. There was slight rigidity in the right hypochondrium, the spleen and liver were not enlarged. Blood pressure was 110/55 mm. Hg.

Laboratory reports.—Blood : hæmoglobin 7.15 gm. per cent, red cells 4.15 millions, cell volume 29 per cent, mean corpuscular volume 69.8 c.μ, mean corpuscular hæmoglobin 17.2$\gamma\gamma$, mean corpuscular hæmoglobin concentration 24.6 per cent, white cells 8,000 per c.mm. with neutrophils 66 per cent, lymphocytes 31 per cent, monocytes 1 per cent and eosinophils 2 per cent. Total protein in blood (copper sulphate method)—6.1 grammes per cent (albumin 2.0 and globulin 4.1). Van den Bergh reaction —negative. Wassermann reaction—negative. Stool : no protozoa, hookworm ova 1,100 per c.c. Urine : no abnormality.

Course and treatment.—For the diarrhœa (3 to 4 loose watery motions a day) he was given sulphaguanidine, 2 grammes every four hours for seven days, along with multivitamin tablets, 2 tablets twice a day. The diarrhœa stopped, and from 4th May he was put on iron (hæmosan, 2 tablets three times a day) and magnesium trisilicate thrice daily after meals. On 9th May at 7-30 a.m. he was given 3 c.c. of tetrachlorethylene shaken in an ounce of sodium sulphate mixture (containing 4 drachms of sodium sulphate). At 10 a.m. he was found to be drowsy (a not uncommon hypnotic effect of the drug) but responded to questions. He complained of pain in the abdomen and had one big vomit of greenish colour. At about 1 p.m. the pain increased in severity, and he was rather restless, but the abdomen was soft and the pulse was fairly good. He was given atropine gr. 1/100 and somnofen 2 c.c. hypodermically as well as 50 c.c. of 25 per cent glucose solution intravenously. There was no improvement, and in the evening the pulse became feeble. Normal saline with 5 per cent glucose was given by the intravenous drip along with coramine injections every four hours. The condition however deteriorated at night, and he died the next morning.

Post-mortem report.—'Body thin and emaciated, œdema on both feet. *Rigor mortis* present.

Pleural cavity—no effusion.

Lungs—right 240 gm., normal; left 220 gm., normal.

Pericardial sac—normal amount of clear fluid.

Heart small, 200 gm., epicardium normal.

Right auricle slightly distended. Left ventricle firm and contracted, chamber almost empty. Myocardium appears atrophied. Mitral valve shows old lesion; bases of cusps fibrotic. Aortic and pulmonary valves appear normal.

Abdominal cavity—small quantity of hæmorrhagic fluid present. Parietal peritoneum appears normal. Omentum shows venous congestion specially of the free margin.

Stomach—empty except for a small amount of mucoid fluid, mucosa shows scattered punctiform hæmorrhages; pylorus feels hard, no evidence of peptic ulcers.

Duodenum pale, solitary follicles enlarged.

Jejunum—in the upper third, mucosa appears pale; deep congestion of the mucosa begins at the middle third as a well-defined inflammatory process and extends throughout the rest of the jejunum and the whole length of the ileum. Lower part of the ileum looks almost blackish owing to intense congestion—an isolated patch of deep ecchymosis is present about one inch above the ileo-cæcal valve.

Cæcum—shows perityphlitis, mucosa œdematous, no evidence of ulceration.

Appendix normal. Colon—nothing abnormal seen.

Liver—small, 850 gm., pale and soft, pattern indistinct.

Gall-bladder—adhesions with omentum, small intestine and duodenum—contents appearing purulent, a condition of septic cholecystitis.

Spleen—small, 50 gm., soft and shrunken.

Pancreas—normal.

Kidneys—right 90 gm., left 50 gm., both kidneys smaller than normal. Demarcation between cortex and medulla very indistinct, capsule strips easily.

Bladder—empty, normal.

Diagnosis—acute hæmorrhagic enteritis'.

Discussion

Compounds of carbon and halogens have been in use as anthelmintics against hookworm for the last 25 years, their efficacy depending on the chlorine content. The first one that was tried was carbon tetrachloride, but owing to its toxic action on the liver and kidneys and incidence of some fatalities it has largely been replaced by tetrachlorethylene. The latter is very insoluble in water, non-irritating and does not produce any local effect on the mucous membrane. According to Lamson, Robbins and Ward (1929) tetrachlorethylene differs from carbon tetrachloride in not being absorbed, from the intestinal tract of dogs in the absence of fat. If fat is present or if enormous doses are given to animals of different species, absorption may take place with symptoms and even death, but these symptoms are those of an overdose of a hypnotic not those of chemical changes secondary to liver damage, as in the case of carbon tetrachloride. There has been no report of deaths with this drug and this is correlated with its low rate of absorption in the absence of alcohol or fatty substances. Clinical observations, however, point to the fact that the drug is absorbed to some extent from human intestine but not in amounts sufficient to produce damage of the kidney or liver cells (Chopra, 1936). In a few cases marked symptoms of intoxication have been noted even after therapeutic doses. Kendrick (1929) reported one case in which after taking 3 c.c. of the drug the patient became unconscious with barely perceptible pulse; he was revived after two injections of strychnine and digitalin. Wright, Bozicevitch and Gordon (1937) mentioned the case of a boy of 11 years who after 1.1 c.c. of the drug became dizzy and cyanosed and lost consciousness but recovered after an injection of adrenaline solution. The child was subsequently found to have pulmonary tuberculosis. Hare and Dutta (1939) reported a girl of 18 who after taking tetrachlorethylene had severe vomiting followed by drowsiness which was relieved by application of cold to the head. And more recently Sandground (1941) described two cases of coma after administration of the drug with disappearance of most of the peripheral reflexes. Both recovered after injections of metrazol. In all these instances the effects were temporary and of a narcotic nature, but there is no case on record, so far as we know, in which tetrachlorethylene had caused a severe local action on the intestine as in the case we have described.

At the time of admission the patient was obviously in a state of chronic malnutrition of which the main clinical features were emaciation and œdema of the legs. He was a street beggar, and though 30 years old, weighed only 70½ pounds. He had suffered from a chronic abdominal pain, and this was probably due to cholecystitis which was revealed only at the autopsy. The patient had also chronic diarrhœa which responded well to sulphaguanidine, but there was no old gross pathological lesion in the intestine suggestive of a specific infective cause for the diarrhœa. It is possible that it was a 'nutritional diarrhœa'. Unfortunately the nature of changes in the intestine is not definitely known as no histological reports are as yet available. The heart, liver and spleen were all small in size. It may not be unreasonable to assume that the small intestine was involved in the process of malnutrition and was particularly vulnerable to the effects of tetrachlorethylene. Although it is not possible to arrive at a definite conclusion on the point from a single case we feel that it would be wise to withhold anthelmintics in hookworm cases with obvious evidence of malnutrition. This is comparable to the treatment of hookworm disease with severe anæmia in which no anthelmintic treatment is given until the hæmoglobin level is brought up to a safe level by iron therapy.

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STAB WOUNDS OF THE ABDOMEN

A REPORT ON 25 CASES

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THE experiences of last two great wars have taught us the principles of treatment of abdominal wounds caused by bullets or splinters. We have had some experience of the stab