

typhus. An occurrence so startling and unusual might deserve an attentive investigation. But it happened at too distant a date to admit of being now inquired into with success. Meanwhile, if on similar occasions medical men in rural districts will keep in mind what has lately happened in Peeblesshire, they will probably be able to show that the incident there is by no means unexampled.

ARTICLE II.—*Case of Suicide by Prussic Acid*, with Observations by J. G. FLEMING, M.D., Surgeon to the Royal Infirmary, Glasgow, &c.

(*Read to the Medico-Chirurgical Society of Glasgow, 12th May 1846.*)

THE great facility with which suicide or murder can be accomplished by prussic acid, has naturally led to its frequent employment for the perpetration of these crimes. Of late years, its use has become alarmingly common,—twenty-seven cases of suicide or poisoning by this liquid having taken place during 1837-38. Under these circumstances, every case which can throw any light on the symptoms or pathological appearances which follow its exhibition, deserves to be accurately examined and recorded; particularly as, from its fearfully rapid action, without leaving any external mark on the body, death from its use is more likely to be considered as the consequence of natural causes, than when produced by any other poison with which we are acquainted; besides, it is only by a careful examination of its effects on the human body that we can ever hope to arrive at a knowledge of any means for arresting its activity, or of discriminating whether it has been taken spontaneously, or administered by the hands of another.

A gentleman, aged about forty-five, of stout muscular make, called at a tavern which he was in the habit of frequenting, on the 23d of April 1846, at five o'clock P.M. He is stated to have complained of being faint, asked to be allowed to rest in another room, and to have a glass of water; he appeared agitated and breathed somewhat laboriously, but perhaps he was slightly intoxicated. He was shown into a room, and took his place in a reclining position on the end of a sofa; a tumbler, about three-fourths filled with water was placed on a table at his right side; he cannot be said to have been left alone for an hour after this, as a party were for some time drinking in the same room, and the attendants were also occasionally in it. About six o'clock, *all* the glasses were removed, with the exception of the tumbler of water which had been given to him, the door of the apartment was shut, and he was left alone, occupying a similar position on the sofa to that already mentioned, and breathing heavily as if asleep. About three quarters of an hour now elapsed before any one entered the

room, when he was found in the same position, but sitting more erect, his head leaning forward, his arms lying easily by his sides, but quite motionless. This was about a quarter to seven o'clock. I was immediately sent for, and saw him in less than five minutes. I found him stretched on his back on the sofa, and quite dead; there was not the slightest action of the heart or lungs, and, from the coldness of the face, forehead, and hands, I inferred he had been dead for half an hour. His features had a remarkably composed expression, as if he had died easily, his lips had some colour, his jaws were closed, eyelids quite shut, cornea prominent and glistening, the pupils about half dilated. I opened two veins in the right arm, to satisfy the numerous bystanders, but no blood flowed.

On examining his person, shortly after this, I found in the trousers pocket of the left side a half-ounce vial, *loosely corked*, labelled "Prussic acid," having a strong odour of that liquid, and wet as if recently emptied. I now examined carefully, but I could not detect the characteristic odour of the poison in the room, or from his mouth. A small quantity of fluid, I am satisfied it was water, had been spilled on the floor close to the sofa; neither this nor the water in the tumbler had the most distant smell or taste of prussic acid, and the landlady stated that the tumbler was nearly as full as when she handed it to him.

The body was inspected sixty hours after death; in this and in all the chemical researches for hydrocyanic acid, I was kindly assisted by Dr John Crawford, Professor of Forensic Medicine in the Andersonian University. We could not detect any odour of prussic acid from the mouth or body. Features full—expression composed and as if asleep—cheeks not even devoid of their natural ruddiness—cornea prominent, though not so much so as immediately after death—eye glistening as in life—pupils about half dilated—rigidity of limbs much as is usual at the same period after death—abdomen had a greenish tint, indicating the commencement of putrefaction. The posterior part of the head, trunk, and limbs, were of a red colour, which did not disappear on pressure. The mouth was firmly closed, and no fluid had been discharged from it. The right sleeve and side of shirt were stained with bloody serum, which had oozed freely from the veins which were opened in the arm.

Head.—On separating the scalp the veins discharged blood freely, and on removing the skull-cap, blood exuded copiously from innumerable points of the dura mater, which membrane was unusually adherent to the brain near the falx over the middle lobes. The longitudinal sinus, and the veins leading into it, were turgid with dark-coloured fluid blood, particularly at the posterior and depending part. There was a considerable amount of serous effusion in the arachnoid sac. The substance of the brain was healthy, in reference to consistence and colour, but the blood-vessels were full. Each of the lateral ventricles contained about two drachms

of serum. The choroid plexus was unusually dark and vascular. Fully a pound of blood flowed from the head during the inspection. The odour of prussic acid was not felt either from the brain or blood.

On opening the thorax and abdomen, the distinctive odour of the poison was quite perceptible, even to the peculiar acrid sensation it produces on the fauces.

Thorax.—The pericardium contained six drachms of serum, the heart appeared of natural size, but was very firm, and there was great concentric hypertrophy of the left ventricle, so much so, that its walls were in contact; in other respects, this organ was sound; all its cavities were perfectly empty; they were as clean and free of blood as if they had been washed. The aorta and larger arteries were also quite empty and flaccid; the veins were distended with blood, which was unusually dark-coloured and perfectly fluid; we could not find the smallest trace of coagulated blood in any part of the body. Extensive old pleural adhesions existed on left side and at upper part of right side; the substance of lungs was healthy; posteriorly, very much gorged with blood; their colour, when cut into, was a light rose or pink (particularly at the anterior part from which the blood had gravitated), and fluid blood flowed copiously from the cut surfaces.

Abdomen.—The stomach, with its contents, were carefully removed and put into a closed jar; it presented no unusual appearance externally; nor on its mucous surface when examined the following day. The liver was enlarged, hard and mottled, of a grey colour, and by no means loaded with blood. The gall-bladder contained a small stone, and was about half filled with a fluid having more the appearance of venous blood than of bile. The spleen was large, soft, and engorged. The kidneys highly congested. The peritoneal covering of the intestines had a reddish tint. The bladder contained about six ounces of urine.

During the inspection we tried the serum found in the ventricles of the brain, in the pericardium, and some thick fluid which escaped from the œsophagus, with the following test for hydrocyanic acid—it is commonly called the iron test. Slips of bibulous paper, wetted with a solution of potash, were immersed in the respective liquids, then dipped successively in a solution of green sulphate of iron, and diluted hydrochloric acid, but no trace of the Prussian blue colour became visible on any of them.

Some hours after the inspection four ounces of a thick pulpy fluid, which had a distinct odour of hydrocyanic acid, were taken from the cardiac extremity of the stomach, and in the clear fluid obtained from this by filtration, the test by the protosulphate of iron failed in producing the distinctive blue colour.

Ninety hours after death the remaining contents of the stomach, amounting to about fourteen fluid ounces, and consisting of half-digested animal food, bread, and apparently malt liquor, having a

faint odour of prussic acid, were put into a retort, with the addition of some sulphuric acid. The retort was placed on a sand bath, and distilled with a gentle heat for three hours, when two ounces of a clear fluid had collected in the receiver, having a distinct odour of prussic acid, masked however, by the peculiar sour smell of half-digested food.

1. On rendering a portion of the distilled liquid alkaline by potash, the addition of a solution of the protosulphate of iron produced a dirty green precipitate, which by a few drops of hydrochloric acid was changed to a deep Prussian blue colour.

2. To the fluid rendered alkaline by potash, the addition of a solution of the sulphate of copper produced a greenish precipitate which became white on adding a few drops of hydrochloric acid.

3. On a solution of the nitrate of silver being added to the distilled liquid, a copious white precipitate took place. When this was dried and heated in a very narrow reduction tube, it emitted a gas which when ignited at the end of the tube, burned with a rose-coloured flame.

The complete success of these experiments thoroughly established the presence of prussic acid in the stomach. A portion of the distilled liquid was given to Dr J. A. Easton, who has informed me that in his hands they were all equally successful. I beg to express my obligations to Dr Penney for the facilities he afforded us of conducting these experiments in his laboratory.

The following short observations are chiefly intended to point out in what respects the foregoing case accords with or differs from the symptoms and pathological appearances which have generally been observed in persons poisoned by hydrocyanic acid. An accumulation of well authenticated cases would be highly useful and interesting in a scientific point of view, and particularly valuable to the medical jurist.

It was ascertained that the unhappy man had procured half an ounce of prussic acid about fifteen minutes before he called at the tavern. There was no odour of the acid perceptible in the room or about his person within an hour after he took it, which would most likely have been the case had any of it been spilled, so we have every reason to conclude that the whole half ounce was swallowed, the bottle being empty when I found it. Next day I obtained a supply of acid from the same bottle as he had procured it, and submitted it to the method recommended by Dr Christison,¹ for ascertaining the strength of hydrocyanic acid, and the result

¹ "Fifty minims being diluted with distilled water, 390 are added of a solution containing a fortieth of nitrate of silver, and the whole is briskly agitated, upon which the cyanide of silver instantly subsides. As a small quantity of acid should still remain, forty additional minims of the solution will occasion a farther precipitate with the clear supernatant liquid, if the preparation be not too weak; but on again obtaining a clear fluid by agitation and a few seconds of rest, the subsequent addition of the nitrate of silver will no longer have any effect unless the acid be too strong."—*Dispensatory*, page 26.

was exactly what should have taken place with acid prepared according to the Edinburgh Pharmacopœia, which contains 3·3 per cent of anhydrous acid, consequently the subject of the present case in half an ounce had as nearly as possible eight grains of pure acid. With scarcely an exception the dose which is equivalent to a grain has proved fatal. The Parisian epileptics had only two-thirds of a grain each, Sarah Hart scarcely a grain. The rapidity of death does not appear to be always in proportion to the largeness of the dose, but modified by circumstances, such as idiosyncrasy, bodily strength, and the quantity of food in the stomach. There are some grounds even for thinking that beyond a certain dose the effects are not increased, that is to say, a dose far greater than a merely fatal dose does not produce more violent symptoms or speedy death than the exact poisonous dose. The medico-legal question of how long a person after a poisonous dose may have power and consciousness to perform acts of volition and motion, is of the highest importance, as from these acts principally can it be inferred whether death has been the result of suicide or murder. In the recent case of the trial of Belany for the murder of his wife, the medical opinions were strong that all volition would cease after the scream which has been considered as characteristic of poisoning by this substance. This may be quite correct where a scream does take place, but it is by no means so frequent a symptom as is commonly supposed. It does not appear to have been heard in the case of Sarah Hart; it did not occur in two cases reported by Mr Hicks, (*Med. Gaz.* 1845); nor in a case given by Mr Nunneley, (*Prov. Med. and Surg. Jour.* 1845); neither was it heard in the case I have just narrated, though several individuals were in the adjoining room.

A sufficient number of cases, however, are now on record to prove that after large doses, viz. from two drachms to four ounces of the medicinal acid of different countries, and consequently of a variety of strengths, relevant remarks may be made, and acts of volition and motion deliberately performed. I shall briefly mention three.

A gentleman at Bristol (1843), after swallowing half an ounce (Lon. Phar.) = five grains anhydrous acid, walked about sixty yards, articulated to an acquaintance several words distinctly and relevantly, and did not die for ten or twelve minutes. He gave no scream. A case is reported by Sobernheim of a young gentleman who took four ounces from two vials. He was found dead in bed, the clothes drawn up to his breast, his arms beneath the clothes, and on each side an empty two ounce vial. In Mr Nunneley's case already referred to, a gentleman after taking an ounce appears to have walked or rather ran up a stair, was quite sensible, and spoke rationally for about five minutes, and lived three quarters of an hour. The person I was called to, after drinking the poison from the vial, had the consciousness and power to recork it, and

return it to his pocket, and from the absence of the odour from his mouth, and a small quantity of water having been recently spilled on the floor at his side, it is very probable that he had time to swallow a mouthful of water from the tumbler, and replace it on the table, before he was deprived of the power of voluntary motion.

The important medico-legal bearing of these cases is evident, when I call to remembrance that so lately as 1829, a young man was tried at Leicester for the murder of Judith Buswell by prussic acid, and narrowly escaped being found guilty. She was discovered dead in bed, the bed-clothes were straight and smooth covering her breast, her arms were stretched at her side under the clothes, and an ounce vial corked, with a piece of paper round it, lying at her side. She had taken fully half an ounce. The question came to be, could she after such a quantity recork the bottle, wrap it in paper, and adjust the bed-clothes as described; or would she have perished or become insensible so soon, that those acts must have been performed by another. Four out of five medical witnesses were strongly of opinion that such acts could not have been performed by the deceased, and had the case hinged entirely on medical evidence, the prisoner would undoubtedly have been found guilty, so general was the conviction at that time of the almost instantaneous action of a large dose of this poison.

The post-mortem appearances from hydrocyanic acid are far from being distinctive; there cannot be said to be any morbid lesion which is universally found and characteristic of the cause of death, but a classification and analysis of those which are most frequently observed will afford strong evidence of this poison having been administered, and may aid us in ascertaining the physiological action of the drug.

The characteristic odour must always be attentively sought for, both externally and internally; but it has very rarely been detected in the mouth or from the surface of the body. It is stated by Taylor, that "the body commonly exhales a strong odour of prussic acid when seen soon after death;" but, with all deference, I doubt if this statement is borne out by recorded cases. Mr Champney, who saw Sarah Hart, Tawell's victim, within a few minutes of her death, reports, "I could detect no characteristic odour in the mouth." In the present case, I could not discover it within an hour after death; neither could Dr Easton, who saw the body before two hours had elapsed. Nor do I find it noted as decided in any case where the patient was examined equally early. Internally, however, if the body has not been exposed to the open air or to wet, it is generally easily detected within three or four days, if the dose has been at all considerable, which it usually is, both in suicide and murder. From most authentic reports this odour has been felt on dividing the integuments, in the brain, blood, and every organ of the body; but still it is sometimes altogether wanting. In the

well-known melancholy occurrence of the poisoning of the seven epileptics at the Bicêtre Paris, by this liquid, no odour exhaled from any part of their bodies, though the examinations (which were conducted by MM. Adelon, Marc, and Marjolin) took place twenty-four hours after death. The dose to these patients was equal to two-thirds of a grain of pure acid to each, and they lived from thirty to forty-five minutes. Taylor mentions "that the odour was not perceptible in the body of a youth who had been killed by three and a half drachms of the acid, and whose body was inspected thirty hours after death."¹

But those are certainly exceptions; for in almost every instance the characteristic odour has been detected in the chest, abdomen, or, at all events, in the stomach. In our case it was felt strong in these cavities sixty hours after death.

The placid and life-like appearance of the countenance, and, more particularly, the glistening state of the eyes as in health, have almost universally been observed after death; and though Dr Paris may go too far in considering these "a decisive evidence of poisoning by hydrocyanic acid," still they are well entitled to be ranked among the most characteristic signs. In the above case they were most remarkable, even to the colour of the lips and cheeks. The countenance had nothing of a cadaveric aspect.

Slow putrefaction and a flaccid state of the muscles have been stated to be consequences of death from this poison; but in most cases the very opposite seems to have been observed.

The extreme fluidity of the blood, with the gorged state of the veins and the emptiness of the arteries, is by far the most striking pathological appearance, and has been found in the great majority of cases. In all the seven Parisian epileptics, the great veins were filled with dark, very fluid blood, and the blood throughout the body was fluid without any trace of clots.² In a case reported by Hufeland, it was everywhere fluid, and as much as three pounds escaped from the head during the inspection. In my case, fully a pound flowed from the encephalon, and a corresponding degree of venous engorgement existed in every organ except the liver, which was indurated by previous disease. It is worthy of being noted, that, though no blood came from the veins which were opened in the arm immediately after death, it had oozed copiously from them before the time of the inspection. But this state of the blood is not invariable, for in one or two cases it has been found coagulated in the heart; and Mr George Watt of this city informs me, that in a case which occurred to him, it was thick and grumous throughout the body.

State of the Heart.—The left auricle and ventricle have almost always been found empty, and not unfrequently all the cavities. The hearts of the Paris epileptics were of a firm texture, and did

¹ Manual of Med. Juris., p. 252.

² Annales d'Hyg. Pub., vol. i. p. 510.

not contain a drop of blood. This was the exact state of that organ in the case I have narrated; and in Mr Watt's, to which I have just referred, the heart was quite empty. In Hufeland's case, in one reported by Mr Hicks,¹ in Sarah Hart's, and some others which are on record, the left cavities were empty, and the right filled with fluid blood. While in the recent instance which is given by Mr Nunneley of Leeds, "the heart was completely distended on both sides with dark fluid blood;" and "there was considerable hypertrophy without dilatation of the left ventricle."² This concentric hypertrophy of the left ventricle is not admitted by some distinguished pathologists to be a consequence of disease. Cruveilhier does not believe in it as such. He considers it to be produced by the contractility of the heart existing in full vigour at the moment of death; or, to use his own expression, "when the heart has been surprised by death in all the energy of contractility;" and I have little doubt but such was the direct cause of the hypertrophy in the present case. Cruveilhier always found this appearance in the hearts of those who had been guillotined or had died suddenly from violence; and Dr Budd supports the same view in a paper in the 21st volume of the Medico-Chirurgical Transactions.

Some difference of opinion exists among physiologists in regard to the *modus operandi* of this subtle poison; but the greater weight of authority seems to be, that it acts directly on the nervous system through whatever tissue it is applied. Dr Lonsdale³ experimented very extensively, with the object of determining whether the heart is primarily affected, and comes to the conclusion that the immediate effects are exerted on the brain and spinal cord, and that the contractility of the heart is indirectly enfeebled, apparently according to the dose, or whether the diluted or pure acid be used. If any deductions as to the mode of death can be drawn from the state in which we find the cavities of the heart, the empty state of those cavities (at least of the left) in death from hydrocyanic acid, would lead us to infer that it was the last organ in which vitality existed, and that its contractions up to the moment of death were sufficiently strong to propel all the blood from its cavities.

The pink colour of the lungs has been remarked in other cases. The coats of the stomach or œsophagus do not seem to be much affected by the presence of large doses of prussic acid.

It is entitled to notice, that (as in the case I have given) the ordinary tests have rarely been able to discover prussic acid in the fluid secretions, or even in the contents of the stomach (though the odour of it was quite distinct) till these had been submitted to distillation. The usual tests, which detect a very minute quantity of it in a state of simple dilution, fail to do so when it is combined with organic matter or the animal secretions.

¹ Med. Gaz., vol. i. N. S., p. 460.

² Prov. Med. and Surg. Journ. for 1845, p. 464.

³ Edin. Med. and Surg. Journ., vol. lxi.

The fearful rapidity of the action of prussic acid seldom admits of any remedial means being tried. When the patient has been seen alive, diffusible stimulants have been of service. Of these, the vapour of strong ammonia stands highest. Cold affusion should also be vigorously applied to the chest and upper part of the body; and of late, bleeding from the jugular vein has been recommended.

ARTICLE III.—*Contributions to Pathology and Rational Medicine.*

By JOHN HUGHES BENNETT, M.D., F.R.S.E., Lecturer on the Practice of Physic, and Pathologist to the Royal Infirmary, Edinburgh, &c.

No. 1.—INTRODUCTION.—*How should Medicine be Advanced? with a Few Words in Reply to the Suggestions of Dr Forbes.*

ALL thinking men in the profession are willing to acknowledge that medicine is an imperfect science, and that the art founded upon it is so deficient in positive rules or principles, that an opportunity is afforded for the introduction of a degree of charlatanism unknown in other pursuits. How is this state of matters to be amended? How can we give certainty and precision to that which is vague and conjectural? In other words, how is medicine to be advanced? This last question has lately excited unusual attention, and been answered in various ways. We purpose making a few observations with regard to it, as introductory to a series of articles having that object in view.

We would observe, in the first place, that, from the earliest period in the history of medicine, it has been cultivated by two distinct sects. In ancient times these were called empirics and dogmatists; the former relying on experience alone, the latter conjoining with this reason or theory. There are equally two classes of practitioners in the present day; the one styling themselves practical men, the other pathologists. It is true everybody professes to conjoin both reason and experience, but an examination of practice will show that only a few are led by the former, while the great majority are guided by the latter. The proper mode of advancing medicine is differently considered by these sects. The modern empiric or practical man thinks that, an observation of the signs and symptoms of disease having been made, we should next watch the effects of remedies, and immediately apply them for its relief or cure. In his desire to arrive at useful and certain results, he overlooks all the causes and morbid phenomena which precede or accompany the condition he is anxious to remove. Hence has arisen the class of practitioners who are trying new medicines under the idea that practice should be founded on a knowledge of therapeutics. The modern dogmatist or pathologist, however, states, that this is beginning at the wrong end, and that we must