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*With the author's kindest
wishes*
(3.)

ON

POISONING BY STRYCHNIA,

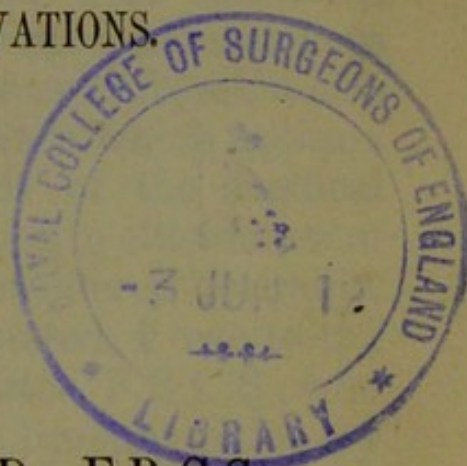
WITH

MEDICO-LEGAL OBSERVATIONS.

BY

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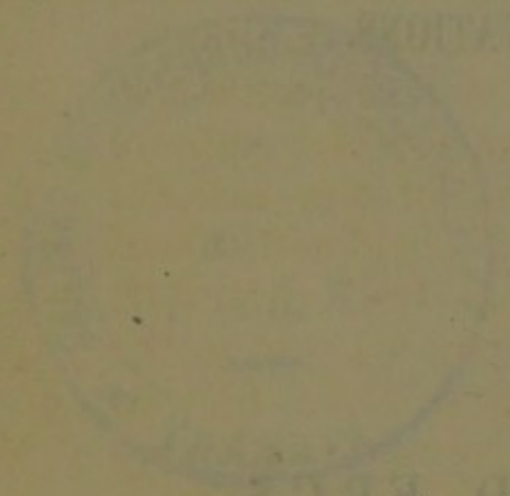
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1856.

POISONING BY STRYCHNINE

MEDICO-LEGAL QUESTIONS



(From the Dublin Medical Press.)

DUBLIN:
HARRIS AND CO. 11, GRAYSON STREET.

POISONING BY STRYCHNIA,

ETC.

THE various important considerations involved in the recent trial of the Queen *v.* Palmer, tend to invest the subject of poisoning by strychnia with additional interest. The number of already recorded instances of death from this cause in the human subject, is also comparatively small—a circumstance which appears to have added to the difficulties of the medical evidence. Any new facts, therefore, in elucidation of this branch of inquiry, may be considered desirable.

The case about to be briefly stated, I owe to the kindness of my friend Mr. G. Porter, F.R.C.S., who has, on several previous occasions, brought under my notice matters of medico-legal interest. The occurrence took place in July, 1855, and was then investigated by Mr. Porter and myself. The subject of it was a gentleman, aged 26, of muscular development, and of irregular habits, who, in a fit of despondency, swallowed *five grains** of strychnia shortly after he had partaken of a moderate dinner of meat and potatoes. The poison was purchased immediately before the catastrophe from a respectable chemist, and may, therefore, be assumed to have been at least of average purity. Shortly after he had dined, he retired to his bedroom, and in about a quarter of an hour was heard moaning by a person in a neighbouring apartment, who, on entering his room, found

* The paper which contained it was found empty in his chamber, so that there is no reason to doubt that the whole was taken.

him lying on his back in bed, his hands clenched, his forearms flexed, one leg extended, and the other in the act of being so, "as if in a convulsion," and the head drawn backwards. He died in from five to ten minutes from the first alarm. Assuming, therefore, that he took the poison immediately on retiring, the total duration of the poisoning would have been from twenty to twenty-five minutes; whilst that from the commencement of the symptoms would be uncertain—possibly, from the above data, one-half of the latter period. The inspection was made by Mr. Porter about eighteen hours after death, the weather at the time being extremely warm.

The abdomen presented some green lines, but the body was otherwise perfectly fresh. The rigor mortis was highly developed, much difficulty being experienced in flexing the limbs. The feet were extended, and the body rested chiefly on the back of the head and on the heels. The face was calm—the pupils natural—the mouth slightly open, dry brown matter adherent to its angles, and the teeth covered with a froth of the same colour.

The anterior part of the body was remarkably pale, the posterior correspondingly livid. The brain was natural.* The vessels on its surface contained but little blood, and the cephalo-spinal fluid was present in moderate quantity. The lungs were moderately congested posteriorly, and there were a few blotches of ecchymosis beneath the pleura at points corresponding to the intercostal spaces. The heart *was firmly contracted; its cavities contained a very small quantity of dark and fluid blood.* The exterior coat of the stomach (twenty-four hours after death) was somewhat putrid. The vessels of the

* In a case which fell under the notice of my friend Dr. Jameson some years since, there was considerable congestion of that organ. The subject of it was a child accidentally poisoned by strychnia.

organ viewed externally, and those of the omentum, were injected. Internally the mucous coat was removed, at the splenic end, by the digestive action of the contents, and the submucous coat exposed. The lining membrane of the body of the organ in its posterior wall was thickly mottled with dark clay-brown patches, partly diffuse and partly of ramiform vascularity, neither raised nor thickened; the colour no doubt due to the action of the gastric acids. The subjacent veins were injected with dark blood. Nearer to the pylorus was a net-work of narrow dark lines, apparently the track of some of the rugæ acted on by the contents. Here the mucous coat was softened. There was also some fine arborescence, which seemed, at one point, to have a small quantity of blood effused within it. The mucous membrane of the anterior wall of the stomach was grey, and, with the exceptions above stated, that of the organ throughout was natural. The contents (meat and potato) were of a red brown colour, exhaled a disagreeable sub-acid smell, and possessed a marked acid reaction. Nothing of note was observed in the other abdominal viscera.

As the symptoms of the deceased had been the subject of but a few moments' observation, and as the body presented nothing to account for death, I was requested to undertake an examination of the stomach and its contents, with a view to the search for poison, of the purchase of which at that time no evidence was forthcoming. The *persistently* bitter taste of the filtered contents, arising *some moments after* a drop was applied by the tip of the finger to the tongue, confirmed the suspicions which we had already entertained from collateral circumstances, that the poison, if any, was strychnia, and accordingly our researches were first directed towards that substance, which was unequivocally detected in the fluid and solid contents of the stomach, and in a

late experiment distinctly indicated by the "colour-tests" in the coats of the organ. The procedure adopted was the method of Stas, as modified by Professor Graham,* and, as far as I am aware, was on this occasion for the first time employed in the search for strychnia in the human subject. In the late experiments for the defence in the case of Cook, it appears also to have been employed in the examination of the tissues, &c., but without the modification above alluded to. Stas's method is based on the fact, that various alkaloids, when maintained in the free state and in solution, are soluble in sulphuric æther. Graham uses, as a preliminary step, the separation of the strychnia by frequent agitation with animal charcoal, which withdraws the poison from solution, but parts with it to boiling rectified spirit. The spirit being removed by distillation, the residual impure strychnia is dissolved in a little liquor potassæ, and then agitated with successive portions of æther. The æthereal extract, on evaporation, leaves the strychnia, for the most part, sufficiently pure for subsequent examination. If not, the conversion of the residuum into acetate of strychnia, and a repetition of the potass and æther, will usually suffice; or the method lately recommended by Dr. Letheby and others, of carbonizing the organic contaminations by sulphuric acid, may be resorted to, if cautiously applied.

The presence of strychnia in the case above recorded, and as eliminated from the fluid and solid contents respectively, was satisfactorily shown by the following indications:—

- a.* A marked alkaline reaction and enduringly bitter taste of the æthereal extract.
- b.* Admirably marked colour reactions with the

* Professor Graham's modification was adopted in the search for strychnia, at the time that the ingenious idea of the "beer-puff" suggested itself to certain English brewers.

bi-chromate of potass, ferrid-cyanide of potassium, and peroxide of manganese (each accompanied by sulphuric acid), and a less defined one with peroxide of lead, &c.

c. Characteristic and well-defined reactions by all the recognised fluid tests, as follow : by ammonia and carbonate of soda (fine colourless crystalline needles), sulpho-cyanide of potassium,* chloride of gold, bi-chloride of mercury, chlorine water, and tincture of galls.

The acetic extract of the finely divided tissues of stomach, when treated by the above-described method, gave the peculiar colorations with the red prussiate and the bi-chromate of potass ; and faint and rather dubious indications with the bi-chloride of mercury, and by ammonia.

When the examination of the tissues, therefore, is taken in connexion with that of the contents of the stomach, the evidence of the presence of strychnia in the former may be said to have been complete.

Having reserved some of the extract of the fluid contents for experiment upon animals, I lately applied it by Dr. Marshall Hall's interesting method. About two grains of it were introduced into the mouth of a living frog. In six minutes the animal was tetanized, and the spasms recurred during four, after which it lay apparently dead. For several minutes subsequently, twitchings of the limbs could be induced by pinching, &c. Another frog, placed in a little water, containing about as much of the extract, was unaffected, and so remained.

As respects the comparative value of the "colour-tests" and of the fluid reagents, we are probably not,

* This reagent, which is little employed, apparently, in these countries, is a very useful test for strychnia. In dilute solutions it gives, after a time, beautiful colourless prismatic tufts. Its application was discovered by Dr. Artus.—*Journ. f. Prakt. Chem. Bd. viii. p. 252.*

as yet, in a position to assign the precise value of the former ; their delicacy is unquestionable, but their distinctiveness seems to be less satisfactorily established. Some of the exceptions lately taken to them are, certainly, untenable ; further observations notwithstanding, as to the possible production of similarly developed colorations by other organic principles, appear to be required : hence, I should deem it at least safe, if not indispensable, to check their indications, as was done in the present instance, by those of the fluid reagents, which here acted most satisfactorily. With a view to this end, however, effectual steps must be taken to separate organic matter. Such I collect also to be the view of my friend Dr. Ogston, of Aberdeen—an able and experienced medical jurist. Thus, in a valuable case lately recorded by him, he relates the detection of strychnia in the blood by one of the colour-tests and by the fluid reagents conjointly. The colour-tests being all based on the principle of the action of nascent oxygen on the alkaloid, there does not appear to be any general necessity for expending much of the available extract in multiplying their indications. I have found the bi-chromate and the red prussiate of potass very satisfactory ; the peroxide of lead much less so. Dr. Letheby's very interesting and ingenious galvanic method may also be resorted to ; unless, however, as appears likely, the sulphuric acid should prove not indispensable, its practical superiority will require further elucidation.

The facts already adduced sufficiently establish, that under favourable conditions, the detection of strychnia, whether in the stomach or subsequently to its absorption, may be looked for with confidence. With the views, however, which would claim for the chemical evidence a positive result in *all* cases of strychnia poisoning, I can in no wise concur ; nor does the testimony given at the late trial on this head

appear by any means sufficient to establish a proposition so striking, and yet so little in accordance with what might, *à priori*, have been expected on physiological grounds. Thus, in the case of the experiments on the part of the defence, the dose administered was always large in proportion to the size of the animal ; and hence the only legitimate inference appears to be, that where a similar proportion obtains in the human subject, and under accompanying conditions also alike, the poison should be discovered, and accordingly it was so in the two cases above alluded to—both of them instances of suicide—where usually much more is taken than is sufficient to cause death. In charges of murder by poison, on the contrary, the investigation is not uncommonly conducted under circumstances of a very different kind ; for should the administrator possess a certain degree of skill, the dose may be so apportioned that the detection may become either difficult or impossible. A case is on record in which *half-a-grain* of sulphate of strychnia (less than that quantity of the uncombined alcaloid), caused speedy death ; and on the trial of Palmer, another was given in evidence, where the same result ensued from three-quarters of a grain. Now, it must be obvious to any who have practical experience in these matters, that under such circumstances the probability of its detection would be comparatively small, whilst regard being had to the vastly greater mass of the blood and tissues in which it would, in such case, be distributed, as contrasted with those of animals (as the dog or cat), made the subject of express experiment, the chance of its *unexceptionable* discovery in the latter quarters might be equally slight. The doctrine of partial (not entire) decomposition in the blood, adduced on behalf of the Crown, is, to a certain degree, in conformity with what is known of some other organic poisons (as,

for instance, oxalic acid, and alcohol—partially converted in the blood into aldehyde), and although it cannot neutralize the fact that much remains unchanged,* it would, notwithstanding, in the event of ulterior researches proving its correctness as regards strychnia, tend still further to explain the occurrence of negative results, where poisoning has been effected in the human subject by a minimum dose. The considerations just adduced lead me to infer, that had the proposition of subjecting Mr. Cook's body to a second chemical examination, with a view to the search for strychnia in the tissues, been acceded to, the non-discovery of the poison could not have been justly held as neutralizing the conclusive evidence as to the cause of death derived from the character and progress of the illness of the deceased. It is further also to be remarked that, those organs in which the poison might have been sought for with most chance of success (as the liver, &c.) had been already disposed of; while those that remained were such as have not, so far as I am aware, been as yet proved to be the seat of the deposition of strychnia. Experience has also satisfied me that the *distribution* of absorbed poison in the various organs is by no means absolutely uniform—a circumstance which would have added to the uncertainty of the proposed inquiry. The period at which the proposal was made, renders it also doubtful whether the conductors of the defence entertained any very strong opinion as to its validity.

As respects the detection of strychnia in the tissues of the stomach in the case here recorded, the presence of the poison in this latter quarter is not necessarily to be viewed as the result of *absorption*. I have reason to believe, that in the instance of some non-

* This does not apply merely to strychnia, but has been verified in the case of coneine, nicotine (and it has been lately asserted), of morphia.

corrosive poisons, it arises from the partial imbibition of the contents after death.* The coats of the stomach and intestines are not very commonly the seat of the deposit of poison *from the blood*. Possibly, in some cases, *during the progress of absorption*, poisons may be deposited in these structures, by the veins of the organ. It may be, therefore, desirable, even when strychnine is not discovered either in the stomachic contents or in the blood, &c., to examine the tissues of the stomach.

Much misapprehension appears to exist as to the position occupied by the chemical department of the investigation, not alone in the case of Cook, but also in questions of poisoning generally. The doctrine has been freely advanced, that no decisive evidence of poisoning is obtainable unless supported by chemical results of an affirmative nature.

Whilst disposed to admit to the fullest degree the weight justly assigned to the chemical researches, taken as *part of the whole series* of investigations in charges of poisoning, I cannot view the admission of the last-named doctrine otherwise than as alike dangerous to the public safety and unfounded in fact. The evidence derived, in some cases, from the special character and progress of the symptoms, when deliberately viewed in all their bearings, and when combined with the results of the inspection and with the previous history, is such, as, in my opinion, to be altogether conclusive. These cases, I freely admit, are, on the whole, of an exceptional character, and on the latter account require to be the more anxiously sifted. The evidences in such

* An analogous case of imbibition, apparently, is one which I have observed in certain corrosive poisons. Thus, I have discovered oxalic acid (which there is experimental evidence for believing to be decomposed in the circulation generally) in the blood of the gastro-epiploic veins, where its quantity was such as to alter the physical characters of that fluid.

instances consists mainly in the supervention and rapidly fatal termination of symptoms in themselves *strongly presumptive of a particular form of poisoning*, arising in a person usually just before in a good or average state of health, and within a moderate interval after the ingestion of some article of diet or medicine, the sensible properties of which are often unusual. With this is to be associated the fact, that the inspection reveals no cause of speedy death referable to the action of any known disease. The evidence becomes cumulative when it further appears, that the symptoms above alluded to have supervened on *more than one occasion* after the use of the just-named articles, or where *more than one person* has manifested similar effects after partaking of the same food, &c.

By an adherence to this line of investigation I was enabled, in a case of poisoning by aconite,* in which no poison was discovered, to substantiate the cause of death, as afterwards attested by the confession of the prisoner. In the late case also of Captain Kent (accidentally poisoned by aconite), it appeared to me, when consulted on the part of the Crown, that the evidence from the symptoms, history, and inspection, together with the sensible properties of the medicine, was amply sufficient to establish the mode of death.† As respects the decision of the

* "Dublin Medical Journal," vol. xix., p. 401.

† About two years since I was consulted at the instance of the Attorney-General for the State of New York, in a case (the People v. Hendrickson) in which the medical evidence in support of the charge of poisoning, rested on *the morbid appearances in the stomach, the sensible and physiological properties of a matter obtained from that organ, &c., as observed upon one of the lower animals, and on the absence, on inspection, of any discoverable cause of natural death in the body of a young woman, about four hours before in good health.* The trial was otherwise remarkable for a duration much exceeding that of Palmer: it lasted some twenty-two days! The assemblage of *symptoms and morbid appearances* in the case of Mrs. Wooller, poisoned by arsenic,

jury in the case of Palmer, evidence of the above kind was forthcoming from *all* the above sources. In the first instance, there were the symptoms of antimonial poisoning after the use of brandy, with which the prisoner maintained relations of at least a suspicious kind; secondly, the fact that two persons were subsequently seized with these same symptoms on partaking of soup, with which the prisoner was proved to have tampered; and lastly, the circumstance, that on two occasions after an administration of medicine, the deceased was seized (in each case after *almost the same interval*) with symptoms, in their nature presumptive of poisoning, and which, in the latter instance, proved fatal in about ten minutes. When to this is added the character and progress of those symptoms,* and the absence in those organs to which the symptoms pointed, of any conditions adequate to explain the fatal result, otherwise than on the hypothesis of poisoning, we have an amount of evidence in support of the latter view, which appears to me irresistible. It has been urged that the cause of death must be certain, and so the jury obviously thought it to be. In so complex a science as medicine, however, especially in its application to juridical inquiries, it would be unreasonable to expect that the conclusions of that body as to the cause of death, should be contingent on the unanimity of the medical

when considered in all their relations, was, I conceive, of itself, sufficient to create a presumption of poisoning by that substance, little, if at all, short of certainty.

* Some of the medical witnesses for the defence appeared indisposed to make allowance for minor variations in the symptoms, &c., of Cook's illness; as, for instance, the interval between the ingestion of the pills and the commencement of the symptoms. Experience, however, amply attests that such varieties are apt to occur. A most remarkable example lately presented itself in a cat poisoned by half-a-grain of strychnia. No symptom, except drowsiness, appeared for *eight hours* (!) The animal died tetanic, with violent *screaming*, in two hours more.

witnesses, who, besides differing in other respects, do not the less so, as to the amount of attention which they may have devoted to medico-legal questions. In a case, therefore, such as that now under review, the jury must be considered as having discharged only a legitimate function, in selecting from the medical opinions, *that* which alone accorded with an accumulation of circumstances almost unparalleled, even as regards a crime, in which, from its very nature, the perpetrator must be indicated by moral evidence. Their verdict, therefore, affirmed the cause of death as *constructively* certain. In fact, they appear to have accepted the view derivable from the medical evidence for the Crown, that no disease is known, which, attacking with tetanic symptoms a person previously healthy, on two occasions after the use of medicine, and yet leaving his consciousness intact, kills him in ten minutes on the latter ; whilst further, it finds him, during great part of the short interval, in nearly his usual health, and betrays on dissection none of the morbid appearances which attend on the nervous diseases most nearly parallel. Such a view should, I conceive, have sufficed to dispose of spinal arachnitis (of late, fully dealt with by Dr. Mayne), with the other and vastly less plausible speculations, such as "gritty granules" and epilepsy,* even with the train of "tetanic complications," so well nigh forgotten by the Attorney-General. The decision, therefore, with which, under the pressure of a grave responsibility, the principles of legal medicine were brought to bear on the facts of Cook's last illness, and thus to unveil an insidious

* The symptoms were not those of epilepsy, and, waiving this, it may be added, that when epilepsy proves fatal on the first or second attack (which is a very rare occurrence), it would manifest itself only as a symptom of some serious organic lesion of the brain, which should be discovered on inspection of that organ, or if sympathetic, the cause should be discernible elsewhere.

murder, appears to have been alike commendable and well-founded. It affords a wholesome contrast to the timid doubtings on matters of detail, and needless magnifying of non-essentials, which characterize the statements of those critics, who, on most important occasions, rush to the discussion of subjects which they seem not uncommonly to have for the first time considered.

The evidence to rebut the possibility of death from *tetanus* appears to have been unnecessarily elaborate on the part of the Crown. The length of the interval between the two attacks of tetanic spasm, and the total duration of that portion of the illness, should probably have sufficed to dispose of this presumption.

As respects the condition of the muscles in the interval between the spasms, in strychnia poisoning, according to an observation of my friend, Mr. Robert Adams, it is not always that of relaxation; this he noticed in a case occurring in his practice, in which twenty grains proved fatal in four hours and a quarter;* nor is consciousness always maintained, as would seem from Dr. Ogston's narrative. In reference to the morbid appearances in the human subject, the example given in this communication still further confirms the occasionally *empty and contracted state of the heart*. The theories propounded on this head on the part of the Crown upon Palmer's trial, however, do not appear more satisfactory than the view of one of the witnesses, that the proximate cause of death in strychnia poisoning is not asphyxia. In some undoubted cases

* In this instance, three-quarters of an hour elapsed previous to the manifestation of any definite indication of poisoning. The strychnia was sprinkled on ham at breakfast. In cases, therefore, in which the dose is not known, it would be obviously unsafe in medico-legal practice, to draw any inference on the latter head, solely from the length of the interval which precedes the occurrence of symptoms.

of asphyxia (as in the instance of Carlo Ferrari, who was murdered by suffocation in London), and occasionally in death from hanging, in which the general conditions of asphyxia were present, the heart has been found empty. The sub-pleural ecchymosis above described, may have been due to the violent and persistent contraction of the respiratory muscles. The emphysema noticed in Cook's left lung was, probably, due to a similar cause.

The posture of the body in Mr. Porter's case seems to indicate that the tetanic spasm at death became subsequently merged in the rigor mortis, and I have observed the same in an animal poisoned by strychnia. As there appears, however, to be variation in this respect, much of the discussions upon this matter at the late trial might probably have been omitted; nor is there obviously in the character of the rigor mortis after death, from the action of this or of any other poison, anything that can afford an available ground of distinction.

As regards the indications of vital spasm to be noted post-mortem, I have repeatedly observed partial clenching of the hands in various forms of natural death not preceded by convulsions. I believe it to arise in many cases from the preponderant influence of the flexors during the occurrence of rigor mortis. The rapid occasional supervention of the latter is poisoning by strychnia, both in man and animals, is worthy of notice. Thus, in Cook's case, it appears to have taken place in about an hour. Its extreme persistence also in the upper extremities, in that instance, during a period of fully two months, was also very remarkable, and much at variance with the usually received doctrines of physiologists on the subject.

Dublin, June 25, 1856.