rendering them innocuous, for double the quantity of strychnine, veratrine, quinine, and morphine is required to kill an animal, if injected into the portal vein, as would be sufficient if injected into the jugular vein, while no less than three times the quantity of curara is requisite. The liver exerts a similar power over peptones and ptomaines, as well as over compounds of ammonia with weak acids, such as ammonium acetate; but chloride of ammonium is unaffected, the protective power being apparently associated with the presence of glycogen. Conversely, these bodies may be expected to exert an action upon glycogen, perhaps rendering it less easily decomposed. We can readily understand on this supposition how the addition of a single egg or a piece of cheese to a meal of bread-and-butter will increase its staying power, so that a person will be able, with this slight addition, to go on for four or five hours, instead of wanting another meal at the end of two. It would also explain the action of morphine in cases of diabetes. As Claude Bernard found that reflex dilatation of the hepatic artery would increase the transformation of sugar in the liver and induce diabetes, one was inclined to attribute the beneficial action of morphine or codeine to their sedative action on the nerve centres, preventing any irritation which might exist from affecting the hepatic vessels. But Mitchell Bruce has clearly shown that this is not the case, and that we must look to a direct action of morphine upon the liver itself for an explanation of its utility in diabetes.

There are a number of drugs which will produce temporary glycosuria. Many of these are supposed to act by dilating the hepatic artery; for example, amyl nitrite, curara, ortho-nitro-propionic acid, and methyl delphinine, chloroform, chloral hydrate, alcohol, and hydrocyanic acid. It is not improbable, however, that some of these at least may cause sugar to appear by lessening the normal processes of oxidation, by which it ought to be converted into carbonic acid. For carbonic oxide is a most powerful agent in producing glycosuria, and amyl nitrite, alcohol, and chloroform all tend to lessen oxidation. The most remarkable substance in producing glycosuria seems, however, to be phlorizin. This substance, which is obtained from the root bark of apple trees, appears to have the power of preventing the organism from oxidising or otherwise utilising sugar. When dogs are kept without food for several days, but receive phlorizin all the time, the whole of the glycogen disappears both from the liver and the muscles; but if they are still kept without food quantities of sugar appear in the urine, which can only be produced, so far as one can see, from the breaking up of the albuminous tissues of the body. In birds phlorizin causes glycosuria, even after the liver has been extirpated. Arsenic, antimony, and phosphorus all cause the glycogen to disappear from the liver, but they produce at the same time fatty degeneration; whereas phlorizin appears simply to cause a general shrinking of the liver. The secretion of bile, though itself a subsidiary function of the liver, may be taken as a gauge of its activity. Bile pigments are derived from the blood, as may be seen by injecting hæmoglobin or such substances as will dissolve corpuscles, and noting the increase of bile-colouring matter and its presence in the urine. Toluylene-diamine likewise breaks up the corpuscles and produces hæmoglobinuria, and in some cases jaundice, due to the blocking of the bile ducts by the inspissated secretion. The effect of similar poisons may be the cause of so-called hæmatogenous jaundice, and the similarity of some of the products of digestion to snake poison, which is an albumen and itself causes jaundice, supports this view. Similar poisons also occur in jequirity seed, and in the blood of hag-fishes, lampreys, and eels. Epidemic jaundice may result from poisons absorbed from the intestine. In one case, at least, jaundice of this sort came on after eating ham which appeared to be tainted; and in another case, from the same cause, which proved fatal, there was found a condition of red atrophy of the liver.

The biliary function appears to be modified in a remarkable way by many substances of the aromatic series which greatly increase the bile. Ammonia and its compounds have a very important action on the glycogenic function, and it is a very remarkable thing that a great many ptomaines belong to the class of compound ammonias or amines, and the striking action of toluylene-diamine indicated the necessity for ascertaining the effect produced by bodies of the aromatic series free from nitrogen, as compared with those combined with ammonia. Dr. Collins found that both toluylene-diamine and toluene greatly increased the flow of bile, and they have been since prescribed with good success.

Most of the vegetable hepatic stimulants—iridin, euonymin, and aloes—belong to the aromatic series, and it is probably among this class that new bodies which will act upon the liver will be found. The changes in hepatic cells during digestion and after the administration of drugs have been studied by Ellenberger, Baum, and Neumann, and many members of the aromatic series have been found to increase their activity, pilocarpine and atropine, however, having a contrary effect, whilst toluylene produces congestion of the liver with shrinking of the cells. The whole subject of hepatic stimulants must be studied anew, by referring it to the latest development of pharmacology, "the pharmacology of the cell." An attempt has here, however, been made to give a brief outline of it, whilst keeping in view the practical object of these lectures—the prevention, control, and cure of disease.

REMARKS ON

THE TREATMENT OF SEVERE CHOREA BY PROLONGED SLEEP, AND ESPECIALLY BY CHLORAL HYDRATE IN REPEATED DOSES.

By W. T. GAIRDNER, M.D., LL.D.,

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IN ORDINARY TO HER MAJESTY THE QUEEN IN SCOTLAND.

THE extremely interesting and practically important communication of Dr. H. Charlton Bastian on Chorea treated by Prolonged Sleep in THE LANCET of July 13th has led me to set down (necessarily in a brief and hasty fashion) certain remarks and observations which, besides having perhaps some separate interest of their own, may be advantageously perused alongside of his. Although I am by habit and constitution careless about questions of priority, I may state that Professor Liebreich, in the third edition of his monograph on Chloral Hydrate, has quoted a case of mine published in August, 1870, which I have reason to think may thereby, in some quarters at least, have given the first decided impulse to the employment of that drug in severe cases of chorea; and my own carefully watched and by no means indiscriminate use of chloral since that time induces me to think that I may be able now to add, were it only a little, to the current information upon the subject, and even to the facts and conclusions of Dr. Bastian's article aforesaid. The case in question was recorded in the *Glasgow Medical Journal*¹ as an isolated and probably unique observation; and, not having been largely commented on or followed up by others at this time, it might easily have been lost sight of altogether in the crowd and press of therapeutical printed matter, had it not been for the deliberate, and on the whole satisfactory, references of such authorities as Liebreich, von Ziemssen, and more recently Hilton Fagge and Gowers, in treating of the subject. The observation of Bouchut, specially referred to by Dr. Bastian, was published in 1873,² and is no doubt fully entitled to the position assigned to it in giving the first suggestion to his own employment of the remedy. Still, the main facts of my case in 1870 are so curious, and so little capable of being reproduced in the way of a practical experiment in therapeutics, that it will scarcely be regarded as superfluous now to give a brief account of them here.

The patient was a girl of eight years of age, healthy otherwise, who had been twice admitted to treatment in the Glasgow Royal Infirmary—viz., in April, 1869, and in January, 1870. On the first occasion the disease was successfully treated, as usual, by arsenic, and did not greatly differ from an average case of the chorea of adolescents, except in the cure being rather protracted (three months). On the second occasion, although the disease was not, as to its type or its degree, greatly more severe, it had proved

¹ Case of Chorea treated by Chloral; Accidental Overdose; Disappearance of the Chorea. (*Glasgow Medical Journal*, new series, vol. ii., 1869-70, p. 550.)

² *Bulletin Générale de Thérapie*, Feb., 1873; referred to by von Ziemssen, along with several other scattered observations, nearly contemporaneous with, or perhaps preceding, my own, by Frerichs, Caruthers, Briess, J. Russell, and others, to which I have no time at present to refer. (See article on Chorea in von Ziemssen's *Cyclopædia*, English translation, vol. xiv., p. 467.)

much more refractory to remedies such as arsenic, zinc, and Calabar bean, which had been successively and very fully employed without any satisfactory result. At this time chloral hydrate was comparatively a new drug; and although habitually shy of employing new powerful or intoxicating remedies, and especially new narcotics, it occurred to me, just as it did to Bouchut, and later to Dr. Bastian, that by means of a drug which was reputed to be an almost pure hypnotic (and, within limits, a safe one), we might perhaps indefinitely control or keep in abeyance the inconvenient spasms which had resisted these other remedies, at least until a new and better habit was formed. The treatment was accordingly begun with five grains three times a day, steadily persevered in, and gradually increased until the dose reached fifteen grains, also given thrice daily. At this time I was desirous of still further increasing the dose to twenty grains; for although it is stated that there was a marked improvement, there seemed to be no reason against, and much to say for, the persevering use of the remedy in as high a dose as was considered safe. But, by a mistake at this time, fully explained in the journal, but with which I had nothing to do, a dose of sixty grains was accidentally given at once to this girl of eight years, instead of the twenty grains prescribed. This was about 9 A.M. on Feb. 26th (seven weeks after admission). About an hour later, symptoms of poisoning set in, which, without ever perhaps arriving at the point of extreme danger, may be said to have lasted in a severe form more or less up to 2 P.M., when a gradual recovery began to take place. Without going into the details as given in the *Glasgow Medical Journal*, it may be said that more than twenty-four hours later the patient was still unduly drowsy, and was not awakened by the introduction of the thermometer into the rectum, all the spasms having absolutely disappeared. What was still more curious was that this freedom from spasm continued even after she became fully awake, and after every trace of the action of the drug had disappeared. On April 22nd (nearly two months after the overdose) we were able to record that "since the accidental overdose described above the girl has had no return of the chorea even in the slightest degree, and is to-day sent to the Convalescent Home."

Now, although there are probably few physicians less disposed than I am to make much of a single case therapeutically, or more distrustful of the errors arising from confounding the *post* with the *propter*, I readily confess that the facts of this single case, considered as an unprepared experiment, struck deep into my convictions, and have had an influence on my treatment of chorea ever since. Not that chloral hydrate has ever been adopted as a routine treatment in this disease; very far from it. In the great majority of cases of infantile or of adolescent choreic spasm, it has always appeared, and still appears to me injudicious and inexpedient to have recourse to narcotics in any shape or form. I wish to emphasise this point, because I have very little doubt that a little more harping upon this case, or obtrusion of recommendations founded on it directly, might have led to a good deal of what I should regard as at least very questionable practice, and perhaps to exaggerated claims on behalf of the remedy. My practice hitherto has been, chloral notwithstanding, in the average of cases of chorea very much what it was before, and in this respect also on the lines recommended by Dr. Bastian. I can say, with him, that "in all ordinary cases of chorea I never think of having recourse to it" (chloral), and this because such cases yield readily to arsenical and other essentially tonic treatment, and will often get well, though perhaps more slowly, without any active remedies at all. Time in such cases, as respects these young subjects, is almost of no consequence; the danger of the disease is practically *nil*. The patient can be treated, if necessary, at home; or, if in hospital, are much better employed there in following good regimen and in getting good food than in contracting a habit of indulgence in narcotics. But there are unquestionably a few cases in which the tonic regimen and tonic treatment fail, and others in which their action, though ultimately successful, is so slow as to be unsatisfactory; besides a very few in which the disease *per se* is alarming and apparently dangerous from exhaustion, present or proximate, so as fully to justify (not to say excuse) a much more active treatment. In all these three classes of cases I have habitually employed chloral, and since 1870 chloral *almost alone*. These, of course,

have been almost among the worst cases in my experience; and practically these have included *all* the very bad cases. And, therefore, it is surely not without importance that I declare, as I am now able to declare, that I believe in no single instance has chloral hydrate, with the comparatively modest and limited expectations I formed of its value, wholly and absolutely disappointed expectation. It has not often *cured*, it is true, directly and at once, as in the case just narrated, but it has always had an important influence in controlling choreic spasm, and has rarely failed in placing the patient *in the way of cure* when followed up by hygienic and other remedies or by lapse of time, which in many such cases is *the* remedy. And I can recall several cases of chorea in children so bad that I could not but regard them as having an element of present danger, which have yielded at once as a first step in the treatment to chloral hydrate, under which mainly the cure has been completed. Taking it all round, my experience of this remedy in chorea, while not without qualifications, is certainly not in accordance with the following expression of Dr. Sydney Ringer (*sub voce*): "Chloral *sometimes* restrains the voluntary movements of chorea, *but sometimes it is powerless*." It would be much more correct to say that chloral can almost always be depended on to control the movements of genuine chorea for the time during which its physiological action is fully maintained, but that it is sometimes inadequate to a permanent cure.

The causes of this inadequacy it would be interesting to investigate had I before me fully the means of doing so. It must be admitted that some cases of choreiform spasms in adults are so inveterate as to defeat every kind of treatment, as in the case of an elderly man from Paisley, whom I have had more than once under my care, and in whom the very obstinacy of the disease, with some peculiarities in its characters which I do not now stop to describe, suggest a doubt as to its nature and pathological associations. Chloral hydrate is probably little, if at all, useful in those strictly localised spasms, or grimaces of habit, often of a lifetime duration, which sometimes pass under the name of "St. Vitus's dance," and for which in the meantime we have no other name. It has not been at all useful, or at least not permanently useful, in those cases of post-hemiplegic spasm or of Hammond's "athetosis," in which I have tried it; notably in one of which an account was sent to THE LANCET³ in June, 1877, but in which the result of this treatment was not given there. I do not expect to witness, nor have I witnessed, any favourable results either in paralysis agitans or in disseminated sclerosis. In other forms of muscular agitation and tremor I have no experience to offer.

On the whole, my experience of chloral hydrate entitles me to affirm this much, and no more:—1. That it sometimes succeeds in chorea absolutely, where other remedies fail. 2. That it can be depended on, as a rule, in very severe cases, to initiate a treatment which may be afterwards successfully carried out otherwise. 3. That in such cases it has an almost absolute power of suspending or controlling spasm during the persistence of its deep hypnotic action, and is therefore invaluable as a palliative (care being taken, of course, to avoid poisoning, either acute or chronic). 4. That this or other limitations will interfere with the curative action of the remedy in some very inveterate cases; the failure of chloral hydrate in these cases, however, being common to it, with all other remedies. In this respect, also, my experience appears to concur with that of Dr. Bastian, who thus writes of the eight or nine cases he has treated with this remedy during twelve years: "Some of the cases have been notably improved; other very chronic cases, however, have not derived much permanent benefit. In none of the cases has any evil resulted from the treatment." On the other hand, I have some doubts whether I have given the remedy as much scope as Dr. Bastian—following herein Bouchut—has shown forth in his late article in THE LANCET. Certainly, I do not remember having ever induced a sleep prolonged over a fortnight, or three weeks, with the exception of waking intervals of about half an hour for the purpose of administering nourishment. The mere fact that this has been done, and done successfully and without any manifest disadvantage or danger, by so good an observer, will encourage me to pursue yet further, in all probability, the treatment indicated above; having regard, however, to the doubts expressed by Dr. Bastian himself in this case

³ Vol. i. 1877, p. 830.

as to the expediency, at least, of the third week of artificial sleep thus induced.⁴

A case at present under observation in the Western Infirmary is one to which these remarks may possibly apply, although from the peculiarities of the spasm and the very long period of its persistence it will be at once recognised as belonging to the most inveterate order of cases of choreic spasm, if not indeed (as it is within my experience) unique in some respects. I give the facts here with the utmost possible brevity, and shall be very glad to be assisted by references either to similar cases or to any other mode of treatment likely to be of permanent service.

Christopher McI—, aged seventeen, a fairly healthy, though perhaps rather delicately organised lad, who, with the exception of an attack of so-called "gastric fever" in 1888, cannot be ascertained to have ever suffered from any acute or chronic illness but the present, was adopted at a very early age by a stepmother, his own mother having died during his earliest infancy (a fact concealed from himself). There is every reason to suppose that he has been well cared for; but no information can be had as to the cause of his mother's death, or as to any neurotic antecedents in the family. From an indefinite age before his adoption, at two years and a half, it was observed that his arms "worked" a good deal, and, although he had learned to walk, his gait was unsteady and peculiar, and, according to description, with more or less of festination and a disposition to fall forward and to walk on his toes. The arms, however, have all along been, much more than the lower extremities, the seat of the "workings." When about six or seven years of age, the boy was brought to Dr. Gairdner and Dr. Coats, but neither of these can remember the case at this time, and there are no notes of it. Since then he has been a good deal under the care of Dr. Paterson (Partick), who has employed most of the ordinary remedies for chorea, with only temporary and very slight effect, corroborating in every detail the statements of the stepmother. He is fairly intelligent, and is said to have got on well at school, though having difficulties as regards writing owing to the spasms, which never entirely ceased when he was awake, but were absent during sleep. The disease appeared to get worse shortly after the attack of "gastric fever" above mentioned. He became more unsteady in his gait, and for the first time was confined to the house by the fear of being "run over" if he was allowed to go about. In the course of November and December last he became almost completely helpless, staggering so much, even in crossing the floor, that it was useless to think of letting him leave the house, even when attended. At the same time the spasms continued, more severe than ever, in the arms and upper part of the body. How severe they had become may be judged of from what was witnessed soon after his admission to the Western Infirmary, Glasgow, on May 18th, 1889, when the impression at first given to the eye by his posture and expression when in bed was that of a severe case of tetanus, with marked opisthotonos affecting the upper part of the back and neck, so that the head was projected backwards as far as it could well go, the whole body being at the same time rolled and tumbled about in every direction, and the arms in a state of extreme pronation. Although the tetanoid character of the spasms was maintained even to the point of more or less risus sardonius, and the opisthotonic attitude was maintained even during sleep, there was no pain, and the tonic spasm was never such as could not be momentarily overcome, the other movements being altogether those of chorea, and ceasing during sleep. He was at this time wholly unable to walk, and could scarcely speak so as to be understood, although

the tongue when protruded was less affected by the jerking movements than could have been expected. As already stated, the use of chloral hydrate in this case has greatly modified the spasms, and has always controlled them when the patient has been kept directly and fully under its influence; but it has not been maintained so continuously, nor for so long periods, as in Dr. Bastian's cases, partly from fear of inducing ultimately poisonous effects. I shall now be encouraged to persevere in the hope of obtaining further relief, and perhaps even a permanent cure of this hitherto indomitable disorder.

I am able to add to these notes a brief sketch of yet one more case, which is thus far important that it seems to afford a certain amount of encouragement to the palliative use of hypnotics even in cases in which Dr. Bastian seems disposed to disallow them: "In the most acute and severe cases of chorea, in which the temperature is raised, and the movements are violent and continuous, with or without delirium or maniacal symptoms, I have never yet tried this mode of treatment, and should not recommend its adoption." Notwithstanding the fatal issue, I am disposed to think that the details of treatment in the following case justify some modification of the language of this last statement.

In the terrible, but happily rather rare, form of pure chorea which sometimes occurs in adults associated with high temperatures, and tending to rapidly fatal exhaustion, I have had only one opportunity of testing the controlling influence of chloral hydrate. This was in the case of a woman (Mrs. D—) aged thirty-two, admitted into the Western Infirmary, Glasgow, on Nov. 3rd, 1874. The summary of the case made at the time (which I quote for the sake of brevity, though all the details are most interesting) shows that the patient was probably three months pregnant, had a history of rheumatic fever eight months previously to admission, and was of a nervous and excitable temperament from childhood, which made it rather difficult to exempt her from a suspicion of acute mania in connexion with the chorea. She had had, however, no other serious illnesses till adverse family circumstances brought on fits of despondency, which ended in distinctly insane manifestations, these latter apparently arising side by side with the choreic disturbance, which at the time of admission had lasted for three weeks. A brother also had had epileptic attacks, ascribed to fright, and concurring with a nervous temperament from boyhood. The patient's temperature after admission was from 103° 8' to 104° 6' (rectum⁵); her pulse always 120 or upwards, and when moribund estimated as 190 or upwards. There was no distinct valvular murmur, and the urine was non-albuminous. The picture of the disease during the three days she was under observation embraces all the most exaggerated incidents of the worst forms of the choreic spasm, bilateral and extending throughout the voluntary muscular system. I will only now remark on the treatment and its results. Two drachms of the syrup of chloral hydrate were ordered to be repeated every hour till some kind of effect was observed, the case being of course carefully watched. After the fifth dose (corresponding with a hundred grains in all) she slept for about two hours and a half, and during this time had no spasms of any kind, her sleep being natural to appearance and perfectly undisturbed. Liquid food was very carefully administered in considerable quantities, notwithstanding the difficulties arising from the spasms affecting both the articulation and the deglutition. "Except when under the influence of chloral the patient was a perfect picture of unrest in almost every muscle of her body, turning over and over, tossing her arms and legs about quite incoherently, protruding and retracting the tongue in an equally sudden and grotesque manner, rolling her head upon the pillows, and twisting her spine in every possible direction, snapping her teeth and lips in such a way as to make it surprising that she did not bite her tongue, rolling her eyes, and in every way as regards the general expression counterfeiting the most violent form of acute mania, but still, to a critical and informed observation, conveying the impression that the muscular system was more in fault than the volition." On Nov. 5th it is recorded that "the effects of the chloral hydrate in subduing the spasm having been abundantly proved (although it was difficult in this way to keep up a sufficiently continuous stupor without doses so large as to involve risk)," Dr. Gairdner acted on a suggestion of

⁴ For the guidance of others who may be led to make trial of this treatment in very obstinate cases, it may be as well here to place before the reader the recorded limits assigned to the treatment by the French and the English observers respectively. "Bouchut's patient of fourteen years and a half, with chorea and dementia, took forty-five grains a day for twenty-seven days, making in all over two ounces and a half, spent almost the whole time in sleep, and suffered no visible bad results from the chloral. Improvement took place on the fifth day of the use of the chloral, and the cure was complete on the twenty-eighth day" (Ziemssen, *ut supra*). On the other hand, Dr. Bastian writes of his recent case in THE LANCET (p. 57, first column): "Perhaps, however, it would have been safer had she not been kept this extra week (the third) under the influence of the chloral, even though it might have involved another two weeks' sleep after an interval." The reasons for this hesitation appear sufficiently in the text; but there is no statement as to the maximum daily dose of the remedy; only that "the sleeping draught (of twenty grains of chloral hydrate, and ten grains of bromide of potassium, to be repeated on waking) was to be used as seldom as possible."

⁵ There was a doubt as to the accuracy of observations taken in the axilla (on one occasion 102° 4') on account of the displacement caused by the spasm.

Dr. Cowan, then Professor of Materia Medica, and determined to make a trial of the inhalation of chloroform and ether as a mixed vapour, this being carried out on Nov. 4th, at 9 P.M. "It was soon demonstrated that the occurrence of anæsthesia completely controlled the spasms, which were kept in abeyance just so long as the patient was completely insensible, and began again, though feebly, the moment there was the least indication of the anæsthetic effect passing off. It was, however, found that the pulse and the breathing remained without serious disturbance from the anæsthetic vapours (the pulse, however, throughout not counting less than 120); the breathing during anæsthesia being comparatively calm, and not at all stertorous. It was therefore resolved to maintain the anæsthesia for a more lengthened period, and this was easily done by relays of attendants, the vapour being administered at intervals of from a quarter to half an hour, and being regulated in the main by the evidences of returning restlessness, on which an additional dose was administered just sufficient to maintain quietude. For about twenty-two hours anæsthesia was thus maintained, being only relaxed so far as to allow of food being given, which in the liquid form was easily swallowed. She passed urine in bed spontaneously, but no fæces. The temperature in the rectum, while deeply anæsthetised on the morning of Nov. 5th, was 103.3°." Dr. Andrew Denholm (now of Chorlton-cum-Hardy, Manchester), who at this time was the resident assistant, and who had the charge of all these arrangements, and carried them out most faithfully for many anxious hours, records that at 7 P.M. on Nov. 5th the anæsthesia was intermitted, and the spasms returned, though not so violently. It became evident to him that the patient was dying. Pulse 192; breathing very rapid; temperature (in axilla) 103.2°. An injection was given towards midnight, which brought away some soft faecal matter. After this there were scarcely any spasms (no anæsthetic being given), but the patient sank gradually, and died at 4.15 A.M. on Nov. 6th.

The extracts given above will probably suffice to convey an idea of the exact impressions left on our minds at the time; but no words can adequately express the vivid convictions arising from the use of artificial anæsthesia in this case, both as to its almost unlimited power of controlling the spasm, and as to its want of power, amounting to absolute failure, in reaching the root of the whole morbid condition—viz., that which was responsible for the fever, the accelerated respiration, and the asthenia increasing and terminating fatally even when the spasms were kept completely in abeyance. It may, of course, occur to someone to say that the remedies were in part responsible for this; to which my answer must simply be, that all this was most carefully considered at the time, and that my experience (though small) of similar cases scattered over many years warrants the statement that chorea of this particular type, and with these febrile concomitants, is a most formidable disease, however treated, and ends fatally just as this case ended, the only difference being that the spasms are not controlled, but continue until they end in the weakness of the moribund state. The association with pregnancy, moreover, probably adds very greatly to the dangers of such chorea in the female adult. I have distinctly in my mind a somewhat similar case in the Edinburgh Royal Infirmary, about thirty-five years ago, where the patient, after making a fairly good convalescence from Asiatic cholera, was seized with severe febrile chorea, and died. In the present case (Mrs. D—) a post-mortem examination could not be obtained. In that case (the Edinburgh one) the aortic valves were found minutely fringed with recent warty vegetations, which we associated with rheumatic symptoms distinctly occurring with or preceding the chorea. I do not now remember that any other lesions were definitely made out either in the brain or elsewhere, but the embolic pathology of chorea was probably not strongly present to our minds at that time.

Glasgow.

THE ROYAL WEDDING.—The following members of the medical profession received special invitations to be present at the ceremony of the marriage of H.R.H. the Princess Louise of Wales with the Duke of Fife:—Sir William Jenner, Bart.; Sir James Paget, Bart.; Sir Prescott Hewett, Bart.; Sir William Gull, Bart.; Sir Henry Acland, K.C.B.; Sir Oscar Clayton, C.M.G.; Dr. Laking, Dr. Quain, Dr. Reid, Mr. A. Profeit, and Dr. Evans.

ON THE TREATMENT OF CHRONIC URÆMIA BY MORPHINE.¹

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HOSPITAL, ETC.

WE are often compelled to witness the sufferings of patients in the last stages of Bright's disease of the kidneys. The disorder proceeds from a variety of causes, some of which are probably not remediable. Nothing is more distressing than to witness agony we are powerless to relieve, and any suggestion of treatment for the alleviation of the grievous suffering of such cases will be sure to receive careful consideration and discussion, even if it runs counter to current teaching. For the notes of the two cases I am about to relate, which form the basis on which this paper is founded, I am indebted to Dr. Galloway, my house physician at the time when they were in the hospital. To the same gentleman I am also indebted for carrying out with great care and judgment the treatment I suggested.

CASE 1.—E. W—, aged thirty-eight, was admitted into the London Hospital under my care on June 9th, 1888. The patient had had five children. During the last two pregnancies she had complained of swelling in the legs, which disappeared after the birth of the fourth child, but which had gradually increased since the birth of the last, seven months previously to admission. There was no history obtained of any previous attack of acute nephritis or of blood in the urine. On admission there was great oedema of the lower extremities, ascites, and breathlessness. The heart was hypertrophied, and there was no murmur. There was well-marked albuminuric neuro-retinitis. At this period she passed about fifty-five ounces of urine daily of a specific gravity varying from 1012 to 1018, and containing from one-half to two-thirds of albumen as measured by the ordinary precipitation test. The deposit on standing contained numerous granular casts. The treatment adopted was rest in bed, a non-nitrogenous diet, and the promotion of the functions of the bowels and skin. She was much troubled by headache, the frequent attacks of which were relieved by antipyrin. Under this plan of treatment she greatly improved, and about the end of July was allowed to sit up. On July 30th she exerted herself more than usual, it being visiting day. In the evening she had a severe attack of dyspnoea. It came on rapidly, and she had to sit up in bed gasping for breath. The respirations increased up to 50 in the minute, and were extremely shallow and laboured. The heart's action was weak and very rapid—150 to 200 per minute; she was much cyanosed, and covered from head to foot with a cold sweat. She was in great terror of dying, and was in a condition of mental excitement. Nitrite of amyl, alcohol, ammonia, and ether were all used, with no effect. At length, after watching and treating the patient for an hour and a half, the attack showing no sign of abating; one-sixth of a grain of hydrochlorate of morphine was injected hypodermically. In a few minutes the dyspnoea became less urgent, the patient easier, and the heart's action slower and stronger. In twenty minutes the patient was able to lie down, and by the morning was in her usual condition. During the following week she had two slight attacks of dyspnoea, which were kept in check by ten minims of liquor morphinæ hydrochloratis by the mouth. During the month of August, during which appropriate treatment for the kidney disease was pushed, she improved greatly, and was better than at any other period of her residence in the hospital. On Sept. 1st two severe attacks of dyspnoea occurred. Two doses of fifteen grains of chloral hydrate in half an ounce of diluted brandy were given at 5 and 10 P.M. The first dose relieved the attack considerably; the second had little effect. At 1.30 A.M. one-sixth of a grain of hydrochlorate of morphine was injected, and the attack passed off in a few minutes. After the first dose of chloral, 240 ounces of serum were withdrawn from the abdominal cavity, but, as seen from the above, this did not relieve the dyspnoea. During these attacks of dyspnoea the patient sweated profusely; she sweated freely at other times when perfectly easy. The patient next remained comparatively well till Sept. 30th, when she again began to suffer from urgent paroxysms of

¹ Read at the Medical Society of London, April 8th, 1889.