The Hypodermic Injection of Morphia in Insanity. By JOHN M. DIARMID, M.B., C.M., Assistant Physician, Perth District Asylum.

In 1843 the subcutaneous injection of morphia was introduced into this country by Dr. Alex. Wood, of Edinburgh, as a means of treating nervous disease. He found it remarkably efficacious in relieving neuralgia, but believed its action to be almost, if not entirely, local. His results as to the relief of pain have received almost universal confirmation; but subsequent experiments have shown that the drug acts on the nerve-centres, and thus indirectly soothes the pain of an irritated nerve, and not by causing direct anæsthesia of the seat of pain. To Dr. C. Hunter is due the credit of having first demonstrated that local injection is not necessary for the relief of local pain. He employed the hypodermic injection of morphia very successfully in controlling the spasms of chorea, in subduing the excitement and overcoming the sleeplessness of Delirium Tremens and Acute Mania, and in alleviating the restless wakefulness of traumatic inflammation. (His experiments were published in the "Med. Times and Gazette," for 1859.) Two years later, in 1861, Dr. W. C. McIntosh, now Superintendent of the Perth District Asylum, then Assistant Physician of Murray's Royal Asylum, Perth, employed morphia, subcutaneously, in almost all forms of insanity, and found it, to use his own words, "a sedative to the furious, a calmative to the depressed and despairing." His observations were published in the "Journal of Mental Science" for 1861; and although this mode of using morphia rapidly became known, employed, and esteemed in many asylums, and by many alienists, the results, so far as I am aware, were published only as isolated notes till Dr. J. B. Ward's paper appeared in the "West Riding Asylum Medical Reports" for 1871.

By most alienists, opium—or its alkaloid, morphia—is regarded as distinctly the most reliable of hypnotics and sedatives in one or more forms of mental disease. Cullen, Ferriar, Van Sweeten, Valsalva, Morgagni, Guislain, Odlir, Esquirol, Brandreth, Pliny Earle, Pritchard, Halloran, Seymour, Shute, and hosts of other physicians have given it as a hypnotic and sedative in mania, and as a tonic and calmative in melancholia; and all concur in giving it the place of honour. Dr. Bucknill calls it "the right hand of

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the physician in the treatment of insanity"—"a true balm to the wounded spirit, a sedative in mania, a restorative in melancholia." The same eminent writer calls the "skilful and discriminating use of opium the sheet-anchor of the alienist physician." Schroeder Van der Kolk bears similar testimony in favour of opium and morphia, as sedatives in melancholia and mania.

The concurrent opinions of those men—many of them most eminent alienists, and all of them quite competent to judge of the value of a remedy—thus establish the usefulness of opium too securely to be overthrown by a few isolated attacks. But there remains the objection that, given by the mouth, opium and its alkaloids are exceedingly apt to cause "nausea, dryness of the mouth, loss of appetite," and constipation. The experience of Drs. Bucknill, Hunter, McIntosh, and Ward has been that, by administering morphia subcutaneously, there is very little tendency to loss of appetite or constipation.

Constipation is produced in either of two ways, viz., by paralysis of the nerves which govern the peristaltic action of the intestinal canal, so that its lumen becomes dilated and blocked up by masses of fœces; or by suppression or diminution of the secretion of the digestive and mucous glands of the stomach and intestine. Now morphia has, as is well-known, a local anæsthetic action,* and by contact with the gastric and intestinal glands, may, and probably does, act on them so as to check the production of their lubricant and softening secretions, and thus cause constipation.

The condition of the tongue and mouth is always diagnostic of the state of the stomach; and when we have a parched mouth and a furred tongue, as after stomachic doses of opium and morphia, we may reasonably infer that the stomach is in the condition which, considering its functions, is analogous. It is very probable that a furred tongue is nothing but the result of a morbid secretion from the glossal mucous glands, due to reflex irritation from, or in sympathy with, the gastric tubules or intestinal mucous coat.† By the subcutaneous injection of morphia, we avoid any possibility of local interference with the gastric functions; and that there is great probability of the

* E.G. Its value (as suppositories), in relieving irritability and pain of the rectum, and in checking "emotional" diarrhœa.

† It (the hypodermic method) has the advantage of disturbing the stomach and parching or furring the tongue much less than when morphia is given by the mouth.—Bucknill and Tuke, p. 727.

topical action of this drug being the cause of its producing constipation, is indicated by its influence in controlling diarrhœa, which can likewise be checked by direct astringents, such as logwood and catechu.

The difference between the action of morphia taken by the mouth, and introduced into the system by the cellular tissue, in tending to produce constipation, cannot be due to difference of effect on the nerve-centres; for, in whatever manner the drug gets into the blood, its effects must be uniform. We may reasonably conclude, then, that the loss of appetite and constipation, apt to occur from the stomachic use of morphia, are, to a great extent, due to local action. Nor is this advantage confined to the hypodermic administration of morphia alone; for experiments (Dr. Lente) with quinine in intermittent fever have proved that, when given subcutaneously, it does not interfere so materially with digestion, nor so readily cause vomiting, as when administered by the mouth; and Dr. John Duncan, of Edinburgh, has found that the secondary effects of mercury seem to disappear more quickly when introduced by the cellular tissue.* Dr. Lente also found that where the use of quinine by the stomach was precluded by constant vomiting it acted well subcutaneously. He notes that it caused much less cerebral disturbance, and acted more rapidly, by hypodermic injection. Dr. C. Hunter also found in some cases where morphia, given in the ordinary way, caused vomiting, that no such result followed the hypodermic injection of a similar dose.

In some cases of melancholia, where I found morphia very useful as a sedative, there was a condition of great gastric and intestinal irritability, as shown by alternating constipation, diarrhœa, and vomiting; but the risk of local aggravation of the state of the digestive organs was avoided, and the beneficial effects were obtained by subcutaneous administrations.

Again, when morphia is given by the stomach, it runs considerable risk of being altered, and having its virtues impaired, by the gastric secretions, or the constituents of food; it may not be wholly, or not at all, absorbed, or its absorption may be delayed, and thus its influence may be diminished or lost. The efficacy of morphia given by the mouth thus depends on the condition of the stomach; but, when employed subcutaneously, its action is independent of any such probable source of deterioration.

Even if it has escaped the action of the gastric juice, and has

* "British Medical Journal," vol. ii., p. 795, 1874; "Medical Times and Gazette," vol. i., p. 573, 1874.

passed into the blood (as all such crystalloid solutions are supposed to do), it has to go the round of the portal circulation and to pass through the liver cells. And even if the hepatic structures have no effect on it, it may have a prejudicial action on them, just as alcohol and other substances have; while opium is well known to check the secretion of bile, an action which may not be desirable at a time when its other properties are useful.

We can accurately observe the amount of morphia introduced into the system subcutaneously and with exactitude estimate the results, for, once in the cellular tissue, it must be absorbed; whereas we can never tell the exact amount which is absorbed in the alimentary canal, because we cannot detect how much may pass away with the fœces.

We can, also, give a definite dose subcutaneously to a patient who refuses to swallow medicine, and to whom it can be given by the mouth only after a struggle (in which part is often spilt); and the same objection applies to its administration in food artificially introduced into the stomach, with the further one of its interfering with the digestive process, it may be, where there is great need for aiding digestion, as in melancholics. At any hour of the day, to the patient most averse to take remedies, morphia can be be given subcutaneously with ease at the most suitable time, and almost without a struggle.

And, as is well-known to experimenters, many substances produce their effect much more rapidly when given subcutaneously than when given by the mouth; and speedy action is frequently most desirable in insane paroxysms. Substances which act as nervines or through the nervous system act more rapidly when employed subcutaneously, *e.g.*, apomorphia. Tartar emetic, which seems to act as a direct irritant to the stomach, on the other hand, acts much more speedily when given by the mouth.

It is held by many, if not all, physiologists that pain necessarily implies coexisting impairment of nutrition, pain being an indication of irritation, and irritation depressing vitality. It cannot be denied that much impairment of the nutrition of the nerve-centres exists in melancholia, nor that the morbid fears of the melancholic are as much a symptom of irritation and depression of the brain as neuralgia often is of a similar condition of a sensory nerve. It is undeniably established that of all remedies the hypodermic injection of morphia is pre-eminent in soothing neuralgia. Indeed, Anstie says, "the supreme utility of the hypodermic method is due to the

certainty with which, in moderate doses, it will cut short the pain." It is probably on account of its rapidity of action that morphia is so useful an anodyne when administered hypodermically in neuralgia. Hence, as the influence of any agent on the brain—pressure, for example—is in proportion to its rapidity of action, rather than to its force, a smaller dose of morphia hypodermically has a greater effect than a larger dose by the stomach, but the influence of which is spread over a longer period. This potency makes the hypodermic method most valuable, but at the same time increases the danger attached to the use of opiates in any form. Hence more caution is required with the hypodermic than the stomachic use of morphia. All powerful remedies have, however, an element of risk in their use, and the value of a soporific or sedative is in inverse ratio to its perfect safety.

It would thus follow that the hypodermic injection of morphia should have analogous usefulness from the certainty with which it could alleviate brain-pain or melancholic depression. The argument is strengthened by the fact that many attacks of neuralgia are centric in reality, although the pain is referred to some peripheral nerve.

I gave morphia hypodermically in eight persons suffering from melancholia—two males and six females. In no one case did the treatment fail in having a beneficial effect. It was the most certain hypnotic, the best and most prolonged sedative, and almost invariably had a good influence on the appetite, partly through the recuperative aid of sound sleep, and partly by soothing the constant, gnawing misery which took away the desire for food, and (in some cases) the ability to sit still sufficiently long for a proper meal to be taken. Nor did I find it tend to cause constipation; for where the motions were regular before the hypodermic treatment, they remained so during its continuance, and after it was stopped. In one case I injected morphia upwards of 40 times—frequently daily on 4, 5, and, at one time, on 9 consecutive days. On each of these 40 days, the bowels were moved, and the appetite was unimpaired. Generally the intelligence of such patients is sufficiently acute to enable them to judge which sedative affords them most ease. Two of the eight (the men) distinctly preferred the subcutaneous administration of morphia to any draught, whether cannabis indica, chloral, or an equivalent dose of Liq. Morphiæ Mur. One always asked for a "strong dose," and the other said he got "twice as much sleep" with the hypodermic treatment as with-

out it; and both were constantly begging for it, until one did not require it, by recovery, and until it was discontinued in the other, lest the opium habit should be acquired. Neither of the two men required a dose of medicine for constipation; and in the case of the man who recovered, a night of sound sleep was always succeeded by increased cheerfulness and an improved appetite next morning. All the six women, but one, frequently refused to swallow medicine; and it was found much easier to use the hypodermic than the stomachic mode of administration. I must, however, add that of the directly tonic properties of morphia, apart from the restorative effects of sound sleep and calm of mind, I have never been able to detect any distinct trace.

In acute mania, this method of treatment was found most useful. Many writers agree in praising the efficacy of opium, given by the mouth, in subduing the excitement and removing the sleeplessness of the maniacal. When given by the cellular tissue, morphia has all these virtues of opium, and is "more rapid, pure," and powerful in its action. Dr. Hunter found that $\frac{3}{4}$ gr. of morphia given by the mouth, to a patient suffering from acute mania, had no effect until the lapse of an hour; the same dose, administered subcutaneously, caused sleep in five minutes. In the same patient the dose by the mouth secured only an hour's sleep; that by the cellular tissue was followed by a sleep of 12 hours' duration. In another similar case, $\frac{3}{4}$ gr. morphia, subcutaneously, was succeeded in an hour by sleep of $6\frac{1}{2}$ hours' duration; administered in the ordinary way, it was succeeded by furious excitement. Many more similar instances might be adduced from his experiments. In my own experience, I have found $\frac{1}{2}$ and $\frac{2}{3}$ gr. of morphia followed by sound sleep in a quarter of an hour, or twenty minutes, after injection during the uncontrollable excitement of general paralysis.

Rapidity of effect is always most desirable in any sedative or hypnotic given in maniacal paroxysms. The advantages thereby gained are, that the exhausting cerebral action is speedily checked, that the restorative processes are more quickly brought into play, that nurses and attendants are saved trouble, and (it may be) danger, and that the chances are lessened of patients being excited by seeing or hearing another in a paroxysm.

I tried the method in eight patients labouring under acute mania. Of these, six have recovered, one is convalescent, but is not yet discharged; and one has passed into a chronic, and therefore doubtful, condition. In all, morphia was given subcutaneously for excitement and restlessness. The hypnotic

effects in all but one were most satisfactory, and the subsequent sedative influence in all was most beneficial. The exception to the soporific action was a female suffering from puerperal mania, who seemed to have an idiosyncracy to morphia, as it caused vomiting, but very little sleep. In another female, who had slept very little for two weeks previous to admission, and was very little in bed on the night after, the result was most encouraging. She was very excited, excessively restless, refused to take food, and constantly denuded herself. $\frac{1}{3}$ gr. of morphia injected at bedtime, on the second night after admission, caused sound sleep. She slept well for the succeeding five nights; and on a recurrence of the excitement and sleepless condition, $\frac{2}{3}$ gr. proved effectual as a calmative and soporific, its sedative results extending over next day. A few days afterwards she began to work, and was convalescent in two weeks from her coming under treatment. The influence of the hypodermic treatment in controlling the excitement of acute mania was even more strikingly exhibited in the behaviour of a young man who had shown homicidal tendencies before admission. On the night after admission, he was very restless and excited; and during the succeeding day was greatly excited, danced on the chairs and tables, and denuded himself. At 7.30 p.m. he had $\frac{2}{3}$ gr. of morphia injected; shortly afterward he became quiet, and was sound asleep at 9 p.m. He has slept well every night since (a period of rather more than two months), was quiet and composed next day; began to work in three days, and five days after was employed cleaning windows. He has continued in well-doing, and is to be discharged ere long. In these two cases morphia had an alterative as well as hypnotic and sedative action on the brain. The alterative action may have been indirect, due to the recuperative effect of sound and prolonged sleep, or may have been directly tonic. Dr. McIntosh's paper records similar instances in which this alterative influence of morphia was manifested.

As might be expected from the utility of the treatment in acute mania, it is strikingly efficacious in mitigating, and sometimes even seems to cut short, a paroxysm of excitement, whether it appears as recurrent mania, or occurs in the course of chronic mania or dementia. Three patients suffering from recurrent mania, five labouring under chronic mania, and three dements, had attacks of restlessness, with loss of sleep and great excitement, treated with morphia subcutaneously. The total number of injections was 111; the doses varied from $\frac{1}{4}$ to $\frac{2}{3}$ of a grain of morphia; and the successful injections were

92. The narcotic was either given in the morning as a sedative, or in the evening as a sedative and hypnotic. Frequently, when the sedative action of a morning dose was not well marked during the day, the hypnotic effects were satisfactory at night; and often, when an evening dose failed in causing sound sleep, its quieting influence was noticeable next day. Another marked characteristic of the hypodermic treatment was the invariable improvement of appetite which followed a successful dose in a case of chronic mania, and in one of dementia. Both patients, when excited, refused food, except in small quantities, and at considerable intervals. $\frac{1}{4}$ gr. of morphia, subcutaneously, generally sufficed to give sound sleep, temporary or continued improvement of conduct and appetite. Elaterium in $\frac{1}{6}$ gr. doses was given to both on various occasions, but never succeeded so well as the morphia. The dement had a most fœtid breath when excited, but it became perfectly sweet after a few doses of the sedative. In the homicidal paroxysms, the value of the hypodermic method has often been proved. Dr. McIntosh once injected 1 gr. of morphia into the cellular tissue of a most "dangerous" and "furious" maniac, who "had just torn a canvas dress to fragments, and was meditating further mischief." In an "hour he calmed," and was set to work a few hours after. The same patient frequently tore his blankets to pieces; was in the habit of beating himself, tearing his face, throwing stones; and without any provocation used to attack patients and attendants with hands, feet, and teeth. He was, perhaps, the most troublesome patient ever at Murthly. During his paroxysms of excitement, which occurred at irregular intervals—from a week to a month—he suffered from obstinate constipation, for which doses of $\frac{1}{3}$ gr. of elaterium and 2 ♏ of ol. croton were given frequently. The depressing and derivative action of the purgatives had not such a beneficial influence on his conduct as $\frac{1}{4}$ gr. to 1 gr. of morphia. Indeed, a powerful narcotic was the only safeguard for his fellows.

Many patients, during a period of excitement, refuse medicine, and decline a meal, rather than take food which they suspect to be drugged. Sedatives can be given, where this occurs, with the greatest ease by the subcutaneous method. The dement referred to can never be persuaded to take medicine by the mouth; and as he rarely takes anything but milk during an attack, it has frequently been found impossible to give him sedatives, such as cannabis Indica, in the ordinary manner. He makes little or no resistance to subcutaneous injection.

The beneficial results of the hypodermic treatment have been more marked where the destructive attempts and homicidal assaults have been of the nature of sudden impulse; less successful where those efforts were the manifestations of a sullen, obstinate, and savage disposition. Where the impulse was simply destructive, morphia was more satisfactory as a sedative than in curbing homicidal tendencies.

The moral influence which this method has on the conduct of some patients is remarkable. For example, A. R., chronic mania, with paroxysms of excitement, and destructiveness. This is a man of a most fiery disposition, who, during the six months preceding last Christmas, had nine maniacal outbursts. While suffering from these recurrences, he used to threaten the medical officers, and frequently assaulted the attendants. He would take no medicine, broke his bedstead, the door of his room; and was in the habit of denuding himself and tearing his clothes to pieces. He had delusions as to his being a wild animal (*e.g.*, a bull, an otter, a stag, etc.), possessed of unusual strength; and, acting on this idea, defied everyone. On the 23rd of last December, after he had been unusually violent and destructive, $\frac{1}{3}$ gr. of morphia was subcutaneously injected. This was in the afternoon, and he remained quiet for the rest of the day, after the operation. Next day he piteously begged not to be injected; and, instead of blustering and bullying, cringed, and almost cried. From that day to the present time (a period of seven months) he has never once denuded himself, never once threatened a medical officer or attendant, never once committed an assault or torn his clothing; and although he has had several attacks of excitement, he has been obedient as a child. The sight of the injection syringe, or of another patient undergoing injection, stops any tendency to bluster; and yet his delusions are as vivid as ever.

The restraining influence which the knowledge that medicine can be adminstered to them, whether they are willing or not, exercises over many of the insane is very potent; while the defiant and triumphant attitude of mind which such patients frequently assume after an ineffectual attempt to give drugs by the mouth, is most subversive of the quiet and order of an asylum.

In a case of general paralysis in which laudanum by the mouth increased the restlessness, from which, together with sleeplessness, the patient was suffering, Dr. McIntosh found $\frac{2}{3}$gr. of morphia, subcutaneously, followed in a hour and a half's time by sleep of ten hours' duration. Dr. Ward also secured

several nights' rest to a patient suffering similarly, by $\frac{1}{3}$gr. each evening, after hyoscyamus, digitalis, and chloral had lost all efficacy.

In three cases of general paralysis which have come under my observation I administered morphia subcutaneously 84 times with most successful results.

The first is a chronic case, the patient being at present able to walk about vigorously after three years' duration of the malady. After three days of great excitement, with restless nights, he had $\frac{2}{3}$ gr. injected on two successive evenings. The hypnotic effects were manifested in an hour's time with sedative action lasting 24 hours after. During the three days of excitement he refused food, and was constipated. After each dose of morphia, he took food well next day, and his bowels were moved.

The next case was of a more acute nature, lasting only about a year. He was under observation for 174 days, and an exact record was kept of the diurnal phenomena. This patient exhibited all the restlessness and sleeplessness characteristic of general paralysis. He had morphia administered to him subcutaneously, in doses of $\frac{1}{6}$ to $\frac{5}{6}$ gr, 70 times; bromide of potash, in 40gr. doses, was given twice; 30grs. of chloral once. Tincture of cannabis Indica in ʒi doses four times; and 30 ♏ of chlorodyne once. The cannabis failed as a hypnotic and sedative every time given; the bromide failed once as a sedative, and the chlorodyne and chloral had no effect. Warm baths were followed by sound sleep, seven out of eleven times, exhibited alone. With cannabis (♏ 60) a bath was unsuccessful. With morphia warm baths were successful five out of six times. Of the 70 hypodermic injections, 55 were followed by strongly marked hypnotic and sedative action. Of the 55, 48 were unsupplemented by baths or cannabis; two were successful ($\frac{2}{3}$ gr.), aided by tincture of cannabis Indica (♏xx. and ♏xxx). Once an injection of $\frac{2}{3}$gr. was unsuccessful, although supplemented by ♏xxv. tincture of cannabis indica. The addition of $\frac{1}{7}$gr. to the $\frac{2}{3}$gr dose caused sound sleep when injected next evening. Of the 174 nights, if we subtract the last six of his life, when he was too feeble to be restless, as he was dying from cerebral exhaustion and pneumonia, and if, likewise, we subtract 89 on which he had some form of hypnotic or sedative, there remain 79 nights on which he had no drug nor other stimulant to sleep. Of these 79 nights, 33 were spent in wandering about his dormitory (except when held in bed), and disarranging his bedclothes. Of the 70 nights on which he had morphia subcutaneously, 15 only were spent in unrest.

Frequently, however, when the drug failed to give sleep at night, its action was only delayed, and almost invariably he slept by snatches on the day following. Such was rarely the case when he had no sedative on the preceding evening. At one time he was watched for 14 successive nights without hypnotics, and on seven of these he never closed an eye. When he did not sleep his dormitory was invariably wet and filthy; when he did sleep it was seldom in either condition, and, still more rarely, when he slept under the influence of a soporific.*

So great was the improvement in cleanliness at night in this patient by the hypodermic treatment, that we were prompted to extend it to some patients of incorrigibly filthy habits. We tried it in four chronic dements, one male and three females. It was completely successful in one young woman, whose habits during the summer and autumn, and until the very cold weather in December, had been cleanly. After she was found wet on four or five successive mornings $\frac{2}{9}$ gr. of morphia were injected one evening; her bed was found dry the two succeeding mornings. Of the next 16 nights she was dry four. During the next 40 days she had morphia six times, and was dry on the night after each injection. Of the remaining 34 nights she was dry twice on nights, each second to that of an injection. Unfortunately, vomiting almost always occurred after each administration, although the dose was diminished to $\frac{1}{6}$th of a grain. Tonics (iron, quinine, and strychnia†) were given without any reformation of her habits. As the weather became warm, in last April and May, she began to improve in cleanliness, and, by the beginning of June, a complete amendment had occurred. The next case—a female—was described by the head attendant as the filthiest patient in the house. On the first four nights on which morphia was administered, she was simply wet. Whenever not injected she was wet and dirty. Of the four subsequent injections, two were successful. The third patient had been dry only one night for two years. She was twice injected (gr. $\frac{1}{6}$), and was dry once. In these three cases the degraded condition was simply due to habit, as the bodily organs and functions were healthy. No improvement had followed night nursing. In the male, as was afterwards

* The third case is a male suffering from frequent violent paroxysms which are easily controlled by doses of $\frac{2}{3}$ gr. of morphia subcutaneously.

† Dr. Kelp found, in a young woman suffering from melancholia, and in an imbecile, that incontinence of urine (lasting from childhood) was cured in the one, and checked in the other, by subcutaneous injections of $\frac{1}{16}$ to $\frac{1}{6}$ gr. of strychnia. Strychnia given internally had no effect.—"Brit. Med. Jour.," vol. i, p. 278, 1875.

discovered, the condition is due to weakness of the bladder, and, of course, the hypodermic treatment had no effect, as neither dietetic nor medicinal regimen hitherto has had.

As is well known, the closure of the apertures of the rectum and bladder by the sphincters is purely involuntary; but the opening of these is more or less voluntary in the normal condition. Hence, when the ideo-motor centres are under the influence of morphia, the sphincters voluntarily remain closed, and prevent either micturition or defœcation. In the younger female referred to, I am convinced the wet habits were purely voluntary, and were due to a reluctance to expose herself naked to the cold wintry air; but when narcotised she was prevented, by involuntary action, from wetting her bed.

Dr. Ward found that during eighteen months an epileptic, who was injected nightly, never had a fit. This patient was subject to violent paroxysms of excitement, headache, and constipation. In two cases which came under my observation, morphia was given subcutaneously to soothe the irritability and calm the excitement which succeeded a prolonged series of severe fits. The sedative and hypnotic effects were well marked, but no great influence on the recurrence of the attacks could be detected. Indeed, a fit once occurred two hours after the administration of the morphia, and when its action was well pronounced. It is very probable that in Dr. Ward's case the fits were caused by reflex irritation, which the morphia soothed. The headaches would indicate this view.

In a case of puerperal mania Dr. Ward noticed that the action of morphia, instead of becoming apparent in from a quarter-of-an-hour to an hour's time, was deferred for eight or twelve hours. Some of the cases observed at Murthly exhibited this peculiarity. It was noticed in a case of puerperal mania, one of chronic melancholia, and in one of general paralysis. At one time the writer was inclined to attribute the delayed action to faulty absorption from a fatty and thickened condition of the capillaries (such a condition being found in general paralysis), because a crystalloid solution, like that of morphia, would take much longer to pass through a fatty than a colloid septum, such as a normal capillary wall. It is true that the melancholic referred to has dilated capillaries and a diseased heart, yet the delayed action does not always happen; and the patient suffering from puerperal mania is young and healthy, so that the hypothesis is not very tenable. A careful consideration of the instances, however, show a preponderance of evidence that the delay is due to a nervous cause, to some condition of

the brain.* Probably the hypnotic effects of the drug are possible only after the cerebral condition causing excitement has been modified by its sedative properties. In the case of puerperal mania there was often rapid action on the excito-motor centres (as shown by contracted pupils and vomiting), while the effects on the ideo-motor centres came only after a considerable interval.

When morphia is long in being followed by sleep, various adjuncts may be advantageously employed in some cases. For rapid and safe action, a warm bath is pre-eminent. In melancholia, acute mania, and general paralysis, warm baths are often most efficacious calmatives and soporifics; being stimulants to the skin, lungs, kidneys, and bladder, and dynamic tonics to the nervous system. Sometimes however, nay frequently, they are ineffectual in themselves, and not seldom do they increase the excitement of maniacs and general paralytics, more especially after a continuance. When combined with the subcutaneous use of morphia, they invariably act like a charm, even when the dose is insufficient in itself. In melancholia this combination is very successful and very speedy in bringing about a calm condition of mind, quickly followed by sound sleep. Tincture of cannabis Indica in small doses (ɱxx. to xxx.) is a useful supplement to an insufficient or delayed dose of morphia. Chloral, likewise, acts well with morphia, but has the grave disadvantage of depressing the heart's action, just as the latter narcotic frequently does. Cannabis Indica, on the other hand, raises the pulse, while acting as a soporific and sedative, and this counteracts the most objectionable, while aiding the desirable properties, of morphia.† When any patient has an idosyncracy to vomit after the injection of morphia, or suffers from a weak heart, a safe plan is to give a small dose subcutaneously, and then to administer a small dose of cannabis.

In a continuance of the hypodermic treatment, just as when opiates are given by the mouth, it is necessary steadily to increase the dose, as the nervous system becomes habituated. From observing the doses which proved sufficient and then watching how long each remained so, I am inclined to estimate the rate of habituation to be between $\frac{1}{30}$ and $\frac{1}{60}$ gr. of

* The trophic centres may also be in an anæsthetic condition during the paroxysms of excitement of general paralysis and acute mania, and the depression of melancholia; and the absorptive processes may thus, for a time, be in abeyance or retarded.

† Tea and coffee aid the action of cannabis and are antagonistic to that of morphia on the heart.

morphia daily, that is, in the generality of individuals. The loss of tolerance or habituation (during intermissions of the opiate) in the cases observed seemed to be at the same rate as the acquiring. Hence it is always necessary to increase the dose gradually during a continuance of the drug, and to diminish it to a very considerable extent (to avoid narcotism) when recommencing it, even after a lapse of only a few days.

It is alleged by some as a grave objection to the hypodermic administration of morphia in insanity, that it causes constipation. After a close observation of the effects of 289* injections in 37 persons, comprising three general paralytics, eight melancholics, three cases of recurrent mania, eight of acute mania, five of chronic mania, three of dementia, three of epilepsy, treated for excitement or loss of sleep, and four dements treated for filthy habits, it may not be presumptuous in me to deny the assertion that morphia, employed subcutaneously, induces constipation. While, from the little experience I have had, I am unable to confirm Dr. Bucknill's statement that in some cases of melancholia opium "not only does not tend to constipate the bowels, but that it regulates and promotes their evacuation," I can affirm that in no one patient, where the bowels were regularly moved previous to injection, was this condition interfered with by the hypodermic treatment. Indeed, in two cases, one of melancholia, and one of general paralysis, smart diarrhœa occurred during the time they were under the subcutaneous administration of morphia, and did not seem the least influenced by it. Strange as it may seem, severe purging may even be caused by morphia introduced into the body by the cellular tissues. In the experiments on the antagonism of drugs, carried on under Professor Bennett's directions, it was observed, after one of the dogs had 1 gr. of meconate of morphia injected subcutaneously, that "restlessness, nausea, vomiting, diuresis and diarrhœa followed." A somewhat similar series of phenomena came under my observation. A stout, hirsute female, of 30 years of age, weighing about 9½ stones, suffering from chronic dementia, with paroxysms of excitement, had, for violence, at 11.30 a.m., one day, about ⅔ gr. of morphia injected. At 12.30 p.m. she had nausea and slight vomiting, which were checked by strong coffee. She, however, became quiet, instead of being

* The paper is based on a record of 413 injections, of which 124 were performed by Drs. McIntosh, Cruickshanks, and Gunn. To the last-named gentleman I am much indebted for a careful description of 118 injections. All the 37 patients who were under treatment came under my own observation.

excited, like the dog. At 6 p.m., immediately after taking supper, she vomited violently, and half-an-hour later suffered from profuse purging. Such coincidences are curious.*

Vomiting is the most unpleasant sequence of administering morphia by this method. If vomiting occurs, it generally takes place within the first two hours after injection; but, at times, it may be delayed for six or seven hours, and then may happen immediately after food is taken. From a consideration of the comparative frequency, it would appear that general paralytics are least liable to suffer from vomiting, 84 injections in this class of patients never once causing it.† Melancholics rank next in rarity of vomiting, five instances having occurred in 122 injections. One female, who once vomited after a subcutaneous injection of $\frac{1}{4}$ gr., frequently vomited independently of morphia, being of a very bilious habit, and subject to alternating constipation and diarrhœa. Three vomitings happened in a man who had frequently borne $\frac{1}{2}$ gr. with impunity, but was upset by $\frac{1}{4}$ gr. after an interval of time during which the treatment was discontinued. The remaining occurrence was caused by $\frac{1}{6}$ gr. in a tall, stout woman, weighing nearly 12 stone. In acute mania seven vomitings occurred in 72 injections; and, if we exclude five, which were evidently due to idiosyncracy, there were only two instances, each of which was due to rather a strong dose.

In recurrent mania there were three vomitings in 45 injections; in chronic mania, six in 42 injections; in dementia, 14 in 43 injections; and in epilepsy, two in five injections.‡ In a total of 413 injections there were 37 instances of vomiting. Those patients were taken at random, without any selection, except that they required a hypnotic for restless nights, or a calmative for excitement or disturbances. Hence, the number of vomitings which occurred may be taken as the maximum

* The violent purging may have been due to hypersecretion from the intestines, caused by irritation of the nerve-centres of secretion, followed by paralysis of the intestinal walls. Certainly it was not caused (in the lunatic's case) by dietetic conditions, for during a period of 12 months (two before, and ten after the occurrence) with an unvaried dietary, she never once has had a loose stool.

† In a patient (G. P.) at present under treatment, there was great impairment of deglutition, with constant regurgitation of food after each meal, on admission. After the injection of morphia his power of swallowing was much improved, and he did not regurgitate. The same improvement occurred after sound sleep by other means (cannabis Indica and bromide of potash combined), and was due to the recuperation of the reflex nerve-arcs of the œsophagus and stomach by cerebral rest.

‡ The vomitings in epilepsy occurred in a young man who is subject to almost daily regurgitation of food, and to occasional attacks of hæmatemesis.

which may happen with ordinary attention to the doses given.

Vomiting most commonly occurred when the drug was administered in the morning,* about an hour after breakfast; and a dose which had no unpleasant effect when given an hour after supper, frequently caused vomiting in an hour-and-half or two hours when injected at 9 a.m. This difference of effect is, no doubt, due to the diurnal changes in the state of the nervous system, and also to the varying conditions of the stomach in the forenoon and evening. The stomach must be more active, and, therefore, more irritable in the early part of the day, when the patient is walking about, than at night when the body is at rest in bed.

Any disordered condition of the stomach, more especially any hypersecretion, invariably caused vomiting with morphia. All in whom vomiting occurred, except two suffering from acute mania, one from recurrent mania, and one from chronic mania, who had irregular appetities, were gross eaters. An exception must also be made in the case of a melancholic female, already referred to, whose appetite was very capricious. More than once, when vomiting occurred after a dose which usually had no such action, it was discovered that the patient had got hold of a quantity of scraps of broken meat.

Vomiting occurred six times out of 222 injections in males; 31 times in 191 injections in females. Of the four men who vomited, three were gross feeders—one being in the habit of taking all kinds of odds and ends from the refuse barrels; another ate grass, leaves, coals, etc.; while the third was seen by the writer taking a plateful of soup, a slice of bread, and two platefuls of gooseberry tart (he had $\frac{1}{4}$gr. injected four hours before), and in three-quarters of an hour was found regurgitating his dinner, but without nausea or depression.

In experiments on the lower animals, it has been found that the action of morphia is in proportion to the weight of the animal. Such is not the case in the insane; for a dement of 12st. weight will vomit after a dose which has no such effect on an acute maniac or acute melancholic of 8 or 9st. It would seem that the tendency to vomit is in proportion to the deterioration of cerebral tissue—for the more the loss of intelligence,

* Of the 37 vomitings, 23 occurred in the morning. Of the 23, 22 occurred in patients who were injected in the morning or evening, as required. Of the 14 which happened in the evening, 13 were in patients who were injected only in the evening, and, therefore, their behaviour under morning administration is unknown.

generally, the more apt is this unpleasant symptom to occur. In only one case who has been discharged recovered was there vomiting; and that was once in a young woman of 18, weighing 8st., after a two-thirds grain dose in the morning. The same dose was borne well next day, when given in the evening; and on the second evening after, $\frac{5}{6}$ gr. had no depressing influence. Of the 37 persons experimented with, ten have recovered, or are convalescent; six of these have been discharged recovered. In all, the ten have been injected eighty-six times, and have vomited on seven occasions. Five vomitings occurred in rather an idiosyncratic case, who had twenty-two injections. In the remaining sixty-four injections, there were only two vomitings in nine cured or convalescent patients. Excluding the eighty-four injections of general paralysis, we have 243 injections of incurable or doubtful chronic maniacs, melancholics, dements, and recurrent maniacs. Of these, 30 caused vomiting. The total ratio of vomitings to injections in curable cases of acute mania and melancholia was about 1 to 12; in incurable cases, it was (including dements and epileptics) 1 to 8; excluding dements and epileptics, it was about 1 to 11; in ordinary curable cases, it was 1 to 32.

The more acute and curable a case, the less tendency to vomit. In recent cases where vomiting occurred, it was manifested (except once) as the disease began to merge into the chronic state. Thus one man who tolerated $\frac{1}{2}$ gr. of morphia on admission in acute mania, vomited after $\frac{1}{4}$ gr. nine months later; and a melancholic, who was not affected unpleasantly by $\frac{1}{3}$ gr. (as a first dose) in the first month of his malady, was much depressed and vomited after $\frac{1}{4}$ gr. six months later.

Vomiting does not hold any definite relation to excitement; for not unfrequently does it occur in the most excited individuals, and sometimes has no material influence in subduing this condition. Indeed, the condition of the nervous system which causes vomiting occasionally seems to counteract the sedative properties of morphia; nor does vomiting necessarily indicate general depression of the system, for the pulse and countenance remained unchanged during its occurrence in some idiosyncratic cases. We may, then, conclude that where there is no organic brain disease, as in acute curable cases, there is very little irritation of the pneumogastric centres by the narcotic; or that the depressing influence is too slight to induce vomiting. In dements (not congenital), and in chronic maniacs where the disease has been of long standing, and, consequently, where there must be considerable cerebral degenera-

tion, morphia seems to act with peculiar power on the vagus.* The anæsthetic condition of the nerve-centres in general paralysis prevents vomiting, even although the brain may be largely diseased. Conversely, it might almost be laid down as a principle that freedom from vomiting after a moderate dose of morphia is one of the most hopeful symptoms in the cases of patients suffering from acute mania.

Dr. Hunter attributed vomiting to a peculiar constitution—to a highly nervous diathesis, especially in females. My experience has been that temperament has very little to do with it; and that excitable females are not more liable to vomit than the saturnine, and are, perhaps, less so, as being less given to gross eating.

Of the means employed to check vomiting, strong coffee was found the most useful. Its effects are, however, but transient; for although vomiting was always stopped immediately after coffee was given, it sometimes recurred some hours afterwards.

Some observers recommend the combining of atropia with morphia for subcutaneous injection, and aver that thereby all the sedative without any of the depressing effects of the latter drug result. Indeed, it has been stated with a fair show of proof that atropia is an antidote in opium poisoning.† By Dr. McIntosh's advice I combined both drugs for injection in some cases who vomited after morphia. Two cases of melancholia—one of which had vomited after $\frac{1}{4}$ gr., and the other after $\frac{1}{6}$ gr.—were injected with $\frac{1}{4}$ gr. and $\frac{2}{3}$ gr. of morphia combined with $\frac{1}{60}$ gr. of atropia. Vomiting occurred after this administration in neither case. The atropia and morphia together were given in the evening, whilst the doses of the opiate which caused vomiting were given in the morning. According to the researches of the Committee of the British Medical Association on the Antagonism of Drugs, the sulphate of atropia seems to counteract the action of morphia within a "limited area;" but this circumscribed power may be sufficient to check the disagreeable effects of medicinal doses.

An examination of the diet-rolls of the asylum shows that the kind of food which a patient takes while being treated hypodermically has no appreciable influence in inducing or pre-

* One of the males who vomited when morphia was administered six months ago is dying at present, apparently from brain disease.

† Assistant-Surgeon G. C. Ray describes two cases of opium poisoning—one a lad of 14, who had swallowed about 40 grs.; the other, a child of $2\frac{1}{2}$ years, who had taken 10 grs., in which, after the ordinary remedies failed, injections of $\frac{1}{6}$ gr. sulphate of atropia seemed to counteract the coma, and to have been the means of recovery.—"Indian Med. Gaz.," July 1st, 1875.

venting vomiting. Those on tea and bread vomited just as frequently and as readily as those taking porridge and milk.

Even although morphia does cause vomiting, it is not to be condemned; but only on that account to be given with every possible precaution to prevent such a contingency. Castor oil frequently leads to vomiting, and elaterium ($\frac{1}{2}$ gr.) acts as an emetic far more frequently and more severely than morphia; but the use of either in insanity is not, for this cause, to be decried.

When vomiting is caused, no interference with the appetite, as a rule, follows; and often when a disturbed digestion causes irritability of temper, a good clearing out is frequently most beneficial to the stomach, and disposes to mental equanimity. In some cases of paroxysmal destructiveness where vomiting was an almost constant sequence of the hypodermic treatment, elaterium, or blue pill, was found to act most satisfactorily in leading to improvement of conduct.

In many patients vomiting was succeeded in an hour or two by great increase of appetite, as might perhaps be expected.

To prevent vomiting—which although, in my experience, not hurtful, is certainly disagreeable—I would recommend that morphia should always, where possible, be given at bedtime. If necessity requires—as in an outrageous patient—its administration during waking hours, the period immediately after or before a meal should be avoided.

Drs. McIntosh and Ward each had a case in which dangerous narcotic depression was produced by $\frac{2}{3}$ and $\frac{1}{6}$ gr. of morphia in a woman and man respectively. The woman had heart disease ("systolic bellows' sound"), the man was 74 years of age. Both recovered by stimulating treatment. Disagreeable but not dangerous narcotism occurred in three of the cases which came under treatment during my experiments. One—a female labouring under chronic mania, with paroxysmal excitement—had $\frac{5}{12}$ gr. of morphia injected at 9.20 a.m. About 11 a.m. she "became sick and vomited; her face was blanched, her pulse very small, and her hands cold and slightly moist." Strong coffee was given, and she speedily rallied.

The second case is a melancholic male, who frequently had $\frac{4}{9}$ gr., and several times $\frac{5}{9}$, without any depression. A month later, after an interval without morphia, less than $\frac{1}{3}$ gr., given at 9.30 a.m., caused narcotic depression about 11.20 a.m. The face was pallid and bedewed with sweat, the lips cyanotic, the pulse small, but there was no vomiting. Three ounces of sherry were given, and at 1 p.m. he took his dinner as usual.

The third was a female, subject to recurrent attacks of maniacal excitement. In August, 1874, she frequently had ½ to ⅔ gr. of morphia subcutaneously during a paroxysm, and ⅔ gr. were never known to have a depressing influence. On the 18th of November of the same year, she had ⅔ gr. injected at 9.20 a.m. for obstreperous conduct. At 11.40 a.m. she was found with contracted pupils, livid lips, pallid face, and almost unperceptible pulse. She had three ounces of sherry; and by 2 p.m. was able to take a walk of a mile.

What I would wish to direct attention to is that all three suffered from attacks of syncope, during which they were as much depressed as by the morphia. One has an enlarged heart, with mitral disease; one died of heart disease (syncope), and the third has a weak heart. Those cases show how unsuitable individuals suffering from cardiac disease are for hypodermic injections on account of the depressing effect of morphia on the heart, and because a death from syncope might be attributed to the drug. It would thus appear that the use of morphia hypodermically for alleviating the severe pain caused by aortic aneurism (*vide* "British Medical Journal," p. 745) is rather hazardous. The relief afforded by ⅛ gr. in this disease, and for such a length of time as eighteen hours, shows the high value of the subcutaneous use of morphia in relieving pain.

In the insane, I would most decidedly advise that morphia should not be employed hypodermically in persons labouring under heart disease, or exhibiting any symptom which indicates serious brain disease, general paralytics excepted.

In melancholic females, I have found it best to begin with ⅙ gr. of the acetate of morphia (equivalent to about 14 minims of the liq. morph. acet. B.P.), not oftener than once in every 24 hours, and have never found it necessary to increase the dose beyond ¼ gr. In melancholic males, the dose generally begun with is ⅛ gr. once a day, and all the sedative advantages of the remedy are usually gained without going beyond ¼ or ⅓ gr. In acute mania ¼ to ⅓ gr. may be given for a first dose, and in robust individuals ½ gr. may be administered with safety. In recurrent mania ⅓ to ¼ gr. is all that is necessary to secure quiet and sleep. In the paroxysms of chronic mania ⅛ to ¼ gr. has the requisite calmative influence. General paralytics require and bear the largest doses; and in one case I had gradually to increase the daily amount given to ⅝th of a grain; while Dr. McIntosh has given 1⅛ gr. in a similar case.

It must be remembered that it is very rarely necessary to give the morphia hypodermically oftener than three or four

times consecutively, and only once did I require to give it on more than nine successive evenings. In one melancholic I have given an injection on nine consecutive days, and in a general paralytic on fourteen days running. Those are very exceptionable cases. In melancholics, one injection every twenty-four, thirty-six, or even forty-eight hours frequently secures sleep at night, and rest of mind during the day.

From a comparison of the results obtained with the various sedatives and soporifics employed, it would appear that $\frac{1}{9}$ to $\frac{1}{6}$ grain of morphia given subcutaneously is a more potent hypnotic, and has a more prolonged calmative influence than ♏xxx of tincture of cannabis Indica administered by the mouth. $\frac{1}{4}$ of a gr. of morphia gave 8 to 10 hours' sleep in some cases where 20 grs. of chloral, or 45 grs. of bromide of potash failed to give more than 2 or 3.* In a melancholic female a draught containing 40 ♏ of tr. of cannabis Indica and 30 grs. of bromide of potash procured sound sleep; but was invariably followed next morning by headache, a tendency to stupor, and numbness, and weakness in the inferior extremities. Morphia (^{1} gr.) subcutaneously had equally marked hypnotic and sedative effects, but had no such disagreeable sequelæ. To the same patient $\frac{1}{16}$ tr. was administered thrice, with much greater calmative and soporific action than the combination of cannabis and bromide had. In a case of acute mania, where doses of 40 ♏ of gr. can. Ind. had no appreciable action, $\frac{1}{3}$ gr. of morphia secured sound sleep and quiet behaviour. The addition of 15 grs. of bromide of potash to a similar dose of cannabis, insured a sedative influence for some hours. In another case of acute mania, in which 45 minims and 60 minims given on two successive nights, had no apparent power whatsoever to calm excitement, $\frac{1}{3}$ gr. of morphia, administered subcutaneously at 11·30 a.m., was followed by a day of quiet, with sound sleep at night. On a previous admission, after ʒi doses of tincture of cannabis Indica had failed in alleviating her restless condition, $\frac{1}{2}$ gr. of morphia (subcutaneously) gave sound sleep, with quietness on the subsequent day. In general paralysis, ʒi. doses of cannabis had no effect whatever; while $\frac{1}{3}$ to $\frac{2}{3}$ grs. of morphia almost invariably secured sound sleep. In one individual, after potash bromide 30 grs., and tr. can. Ind. 40♏ combined failed in checking an attack of furious excitement in $2\frac{1}{2}$ hours after administration, $\frac{5}{6}$ gr. of morphia calmed the excitement and sent the patient to sleep in less than half-an-

* Of the 17 unsuccessful injections in acute mania, 4 were insufficient from a faulty syringe, which allowed part of the intended dose to escape.

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hour. A similar attack of excitement was overcome, and the patient sent to sleep in about 20 minutes by ⅔ gr. of morphia.

According to Dr. Hunter's experience, one-half the stomachic dose in males, and one-third in females, suffice subcutaneously. Dr. Bucknill states that he has found ½ gr. subcutaneously act more powerfully than double the quantity by the stomach.* My own experience of the effects of comparative stomachic and hypodermic doses is, that the latter are far more potent.

Morphia in doses of $\frac{1}{9}$ to $\frac{5}{9}$ gr., was given, subcutaneously, 122 times in melancholia (2 males and 6 females), and was successful as a hypnotic (5 to 10 hours' sleep) and sedative 109 times. In recurrent mania (2 females and 1 male) morphia was injected to subdue excitement and aid sleep 45 times, in doses of $\frac{1}{3}$ to $\frac{2}{3}$ gr., and secured the desired end 36 times. In acute mania (2 males and 6 females) the opiate was administered in ¼, ½, and ⅔ gr. doses 72 times—successfully 55 times; chronic mania, 42 (2 males and 3 females)—failures 9; dementia 24—failure 1. In the paroxysms of chronic mania and dementia, calmative and hypnotic action resulted 56 times in 66 injections of ¼ to ½ gr., the latter quantity being rarely required. In the excitement of epileptic mania, 4 of 5 injections (gr. $\frac{1}{6}$ to ¼) were efficacious. In general paralysis, 69 of 84 administrations of ¼ to $\frac{5}{6}$ gr. doses were successful soporifics and calmatives.

In the same cases, chloral was given 15 times (by the mouth) in 20 to 30 doses, and failed 4 times as a hypnotic. It was given 7 times in acute mania, and failed once; thrice in recurrent mania, and was successful twice; twice in general paralysis, once without effect; and thrice with success in melancholia.

Tr. of cannabis Indica (mxx. to mlx.) failed 9 in 24 times in melancholia; 4 in 7 (mxl. to mlx.) in recurrent mania; 2 in 4 (mxl. to l.) in chronic mania; and 13 in 30 times (mxxx. to lx.) in acute mania. It was of none effect in 40 to 60 minim doses 4 in 5 times in general paralysis. In all, the failures were 32 in 70 administrations.

To the same persons, bromide of potash was given 15 times, and was successful 9 times. It was given once in puerperal mania (60 grs.), and had a soothing effect; 7 times in melancholia (15 to 55 grs.) and failed 5 times; twice as a successful sedative (40 and 50 grs.) in recurrent mania; thrice ineffectually (30 to 45 grs) in chronic mania; twice in general paralysis (40 grs.) with one failure.

* Psychological Medicine, p. 727.

Of all the narcotics used for comparison with morphia, hyoscyamus was the most unsatisfactory, as it failed 14 in 15 times, administered twice daily in ♏xv. doses of the tincture to a melancholic female in whom $\frac{1}{6}$ to $\frac{1}{8}$ gr. morphia (subcutaneously), once daily, acted like a charm. In acute mania, hyoscyamus seemed to act better, securing sleep thrice, in 30 to 50 minim doses. But although it acted as a hypnotic, it was followed on each occasion by most furious excitement when the patient awakened.

Of all the hypnotics and sedatives employed, morphia, hypodermically administered, was found the most certain and speedy, being successful 329 times in 394 injections, the proportion of failures being about 16 per cent.* Chloral comes next as by far the most potent soporific, the failures being 26 per cent. Although an invaluable hypnotic, chloral has the great disadvantage of exercising no sedative action. It was, however, found to procure sleep without fail in a case of puerperal mania where morphia seemed to have no sleep-compelling action, this being the only instance of such results.† Tr. of cannabis Indica was a much better sedative than chloral, but exhibited very little soporific tendency in ordinary doses. Where there was excitement (except of the mildest) it seemed to have little or no calmative influence whatever. It acted best in melancholia, and showed itself to (in moderate doses) be a safe and pleasant sedative. Bromide of potash is too unreliable a sedative to be used, with much benefit, in insanity.‡ Occasionally it seemed to do well in excitement connected with menstruation, but the trials were too few to warrant any precise conclusions.

The smallest proportion of failures with the hypodermic treatment was in dementia (1 in 24); but this can be accounted for by morphia being given for the most part to subdue excitement, to secure which end much smaller doses are required than to cause sleep.§ Besides, morphia acts very powerfully on the weak brains of dements. If we are to estimate a mode of

* The majority of the failures were due to the rapid habituation of the system to the doses employed.

† I have more than once observed furious excitement succeed sleep secured by chloral, and recently have observed a great diminution follow its use.

‡ Dr. Clouston's favourite combination, Tr. of can. Ind. (♏40), and bromide of potash (30 to 40 grs.) was given 11 times successfully—twice it failed. It is no doubt a very certain form of sedative, but unfortunately causes so much stupor, confusion of ideas, and such paresis of the motor nerve centres (after sleep is over) that it is a very dubious remedy in frequent doses.

§ It is not usual for dements, even when excited, to suffer much from loss of sleep.

treatment by its success in aiding the restoration of the brain to a healthy condition, then the hypodermic method was most valuable in acute mania. As a sedative, its benefits were, perhaps, felt most in melancholia. Its calmative properties were strikingly exhibited in alleviating the paroxysms of chronic mania and dementia, and in checking the attacks of recurrent mania. In general paralysis it was the "*dernier resort,*" the indispensable hypnotic, "the sheet anchor of the physician."

The injection of morphia has sometimes led to the formation of small abscesses. My experiments were made with a solution of acetate of morphia in distilled water, acidulated with a few drops of glacial acetic acid, and having any excess of acid neutralized by liq. potas. The strength of the solution was 1 gr. to every 12 minims. The site of puncture was over either deltoid, from convenience of access, and as being free from veins. I never had more than a few drops of blood issue, and that on very rare occasions; nor did an abscess ever form in consequence of the operation.

The conclusions which seem to me to have evolved themselves from those experiments and observations are the following:—

1. Of all single drugs, opium, or its alkaloid morphia, is the most potent and reliable hypnotic and sedative in the treatment of insanity.
2. Morphia, administered subcutaneously, is more rapid in its action and more powerful in its effects than when given by the mouth.
3. By hypodermic injection, not only irregularity in action dependent on gastric conditions, but digestive disorders incident to the stomachic exhibition of morphia are avoided.
4. The subcutaneous is the easiest method of giving opiates when a patient refuses to take medicine, and always the most exact.
5. Of various adjuncts to opiates, warm baths are the most useful.
6. Attacks of acute and recurrent mania, and paroxysms of excitement in chronic mania and dementia, may be cut short in the outset, or beneficially controlled, by morphia subcutaneously administered.
7. In such cases (*i.e.*, acute mania, &c.), the tongue becomes clearer, and the appetite, as a rule, improved by this treatment.
8. Morphia so administered has no marked tendency to cause constipation; and even in melancholia by allieviating the

misery, and thus lessening the waste of nervous force, it predisposes to improvement in appetite and digestion.

9. Vomiting, the only unpleasant symptom apt to occur with the hypodermic treatment, is generally due to over-eating or digestive disorders existing previous to injection, and may, by care as to the time of administration, be avoided; and when it happens, is frequently beneficial rather than otherwise.

It must, however, be borne in mind, that many of the phenomena referred to are still *sub judice*, and that the opinions enunciated may require considerable modification as the result of further inquiries.

On the Past and Present Provision for the Insane in the United States. By Daniel Hack Tuke, F.R.C.P.

As the Hospitals for the Insane in the United States of America have recently been prominently brought before the medical profession in England, it may not be uninteresting to the readers of this Journal to have a slight historical sketch of what may be called the past asylum movement in the States. I am not aware that this has been given before in any journal or work published in Great Britian. The peculiar difficulties of a new country, peopled by different races, and the constantly disturbing influence of immigration, ought to be borne in mind in this narrative. These difficulties are too frequently overlooked. In a letter I received from Miss Dix two years ago, she writes—"We have an amazing burden in all our charitable institutions of every class of disabled foreigners of all ages and in all stages of feeble or quite broken down conditions of health."

As in England, so, no doubt, in America, frightful abuses have existed—more than that, much remains to be done. The insane have been subjected to the same barbarous neglect and treatment as with us. Puritanism, in the first instance, was only too likely to treat some forms of madness as instances of witchcraft, and their subjects would be punished or put to death accordingly. Other cases would be simply referred to the cruel action of Satan upon the mind, and proper medical treatment would be the last thing thought of. A good illustration of the belief in such diabolical influence in mental depression occurs in Cotton Mather's "Life of William Thompson." "Satan," he says, "who had been often in an extraordinary manner irritated by the evangelic labours

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