THERAPEUTIC NARCOSIS WITH SONERYL*

By J. Stephen Horsley, M.R.C.S.,
Senior Assistant Medical Officer, Dorset County Mental Hospital.

Barbital therapy has aroused more interest than any other method of narcotic treatment. The reason is that barbital narcosis offers a new means of establishing contact with hitherto suspicious, seclusive and inaccessible patients. It is the quickest and most effective method of inducing sleep and rest in various maniacal states. Furthermore it is a potent agent in terminating the course of many acute psychoses. Barbital therapy, being empirical, and to some extent experimental, is difficult to define. It denotes more than the mere induction of continuous deep sleep. In fact, it denotes an organized scheme whereby physical and psychic rest, increased suggestibility and alteration of affect are used together to restore normality.

In the absence of precise knowledge of the mode of action of barbituric acid the choice of its derivations depends to some extent on personal preference. The opinion at Herrison based on 40 prolonged narcoses with soneryl is that the drug is less toxic and sometimes more effective than somnifaine.

Pharmacology of Soneryl.

Soneryl is n-butyl-ethyl-malonylurea, a "heavy barbiturate" comparable with nembutal, amytal and dial. It is prepared in several forms to suit the varying requirements of administration. The effects are similar. Small doses in psychotics produce anomalous emotional states, with a tendency to become either confiding or lachrymose. A full therapeutic dose produces deep narcosis lasting rather longer than that due to nembutal. Slight cyanosis is common, but there is no change in the rate or rhythm of respiration. An initial quickening of the pulse is followed by definite bradycardia. Simultaneously the blood-pressure falls by about 25 mm. of mercury. The cerebro-spinal fluid pressure falls abruptly and tends to remain subnormal throughout narcosis. Over-dosage produces great depression of all vital processes. A significant and early sign of poisoning is a soft, slow pulse of about 40. This may be followed by collapse, with subnormal temperature, dilated pupils and a dusky complexion. The most effective antidote is coramine in doses of 5 or even 10 c.c.

* Paper read at the Autumn Meeting of the South-Western Division of the Royal Medico-Psychological Association, 1936.

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

Administration and Dosage.

The arrangement of a practicable technique was preceded by a series of test doses in which various methods were applied to separate groups of 50 patients. The first method of oral medication, basing the dose on body-weight, showed partial or complete failure in 10% of cases and was abandoned. The second group received the salt, sodium soneryl, by intravenous injection, and here it was considered safer and more accurate to regulate the dose by individual response, i.e., by inducing narcosis slowly and stopping the injection as unconsciousness supervened. This method never failed to induce sleep, and in single doses had no adverse effect on the circulatory or respiratory systems. Moreover the increased restlessness which occurs on waking in 10% of cases after oral medication was not seen after intravenous injection.

The third group received soneryl sodium by intramuscular injection. The narcotic effect was apparent in 5 or 10 minutes, and its duration equalled that due to intravenous injection. Unfortunately, the solution is a local irritant, and 4 cases developed deep-seated injection abscesses. An alternative preparation of soneryl, in special solvent, has been used in 20 cases without ill-effect.

The fourth group received suppositories in doses of 5, 10 and 15 gr. These were given according to a scheme which allows for possible idiosyncrasy. This method was invariably effective and well tolerated, thereby resembling the highly satisfactory results already recorded with nembutal suppositories (1).

The conclusion is that the intravenous and rectal methods offer the greatest therapeutic efficiency. These methods will be described separately and in detail.

Part I.—Intravenous Therapy.

The immediate and profound effect of intravenous narcosis is of incomparable value in psychiatric emergencies. Objections have been raised that intravenous narcosis introduces the risk of sudden and irrevocable toxic effects, whereas the truth is that the slow injection of a dilute solution is the safest and most accurate method of estimating the correct dose. The danger of thrombosis, which has been described with somnifaine, is negligible with some of the newer barbiturates. We have not seen this complication in over 3,000 intravenous injections with amytal, nembutal and soneryl.

The value of these drugs in suicidal cut-throat is obvious, and their use in status epilepticus is well known. Their use in acute delirium is not so well defined. The difficulty here is to maintain narcosis for a period long enough to be curative. The most able exponents of somnifaine therapy will admit that in certain cases it is impossible to induce a satisfactory narcosis. Ström-Olsen (2) says that " in such instances it is advisable to cut short the

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

treatment rather than to continue injecting large quantities of the drug". The present purpose is to suggest an alternative method of treatment for those acutely delirious and toxic cases whose feverish over-activity so often ends in exhaustion and death. In treating such patients rest alone is insufficient, and it is necessary to take active measures to eliminate the toxæmia. In order to do this effectively, we turn to the surgical procedure of continuous intravenous infusion of saline.

Continuous Intravenous Narcosis.

The continuous infusion of saline by the intravenous route is established as a life-saving procedure in various surgical emergencies. An excellent account of the technique was given by Hamilton Bailey (4), who described the value of giving intravenous saline continuously for a period of 3 to 5 days. He also indicated the value of giving simultaneous intravenous medication—the appropriate drug being added to the saline, which can be infused and regulated with mathematical precision. Clearly in the treatment of the acute toxic psychoses it is equally rational to give prolonged infusions of glucose saline, adding as required minimal doses of the appropriate narcotic.

Infusion Technique.—The technique described is a modification of Bailey's (4). We assume that the general principles are known. Either a gold-plated cannula or a special needle* may be used. The advantage of the special needle is that it is quicker and easier to insert in a resistive patient.

The choice of vein is a question of convenience, and it is found equally satisfactory to use the back of the hand, the front of the forearm, or the lower extremity. The limb is kept at rest by means of a light anterior splint in the case of the hand, or a Thomas knee-splint in the case of the lower limb. In applying the splint it is necessary to take care to avoid any proximal pressure liable to obstruct the vein.

The solution.—The most useful solution is 5% glucose in normal saline, and it is recommended that 10 units of insulin be added to every 500 c.c. of glucose solution. Several methods are advocated for regulating the temperature of the fluid. This, however, is relatively unimportant, and it is far better to keep the patient warm with extra blankets and hot bottles.

Rate of flow.—The rate of flow is regulated by a thumbscrew to about 30 drops per minute. The narcotic is injected into the tubing just proximal to the needle, and this is repeated in minimal doses whenever the patient becomes restless. There is no fixed rule for determining the maximum dosage or the maximum duration of infusion. These must be decided entirely by clinical experience, together with the general condition of the patient. In our experience it has been necessary in severe cases to inject as much as

* The needle is of carbon steel gilt and is made by Down Bros., Ltd.

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

3 grm. of soneryl during the first day. This somewhat excessive dosage seems to be made safe by its extreme dilution and very slow administration in saline. The infusion may be continued in most cases with reasonable safety for 48 hours, by which time it is possible to revert to ordinary methods of treatment.

Special precautions.—Infusion narcosis necessitates the constant attention of a nurse, who for preference should have special experience of this treatment. She should be competent to measure and record the blood-pressure. It is her duty to regulate the rate of infusion, and to inject the repeated doses of soneryl whenever necessary. For her guidance she is given the following printed instructions :

1. The patient must be under constant observation.
2. Chart the pulse and respiration every 15 minutes and the temperature and blood-pressure every 4 hours.
3. Regulate rate of infusion to between 20 and 30 drops per minute.
4. Look for swelling under the eyes or in the limbs.

Important.—The nurse must report *at once* :

(i) Pallor or cyanosis.
(ii) Pulse-rate below 45 or above 90.
(iii) Any respiratory distress.

The following examples indicate the great value of this method in the treatment of very ill patients :

CASE 1 : *Married woman, aged 24. Puerperal confusional state.*—There was no personal or family history of epilepsy or psychosis. The present illness was of sudden onset on the fourth day of the puerperium. On admission there were signs of severe toxæmia, the tongue was dry and furred, with sordes on the lips. There was also pyrexia, tachycardia, albuminuria and moderately severe ketosis. The mental state was one of excited confusion, the patient persistently fighting, biting, shouting and exposing herself shamelessly. She had refused all food for several days. During the first two days ordinary methods of sedation and tube-feeding completely failed to effect any improvement, in fact she was becoming more ill. Continuous infusion of saline was then begun, together with an initial dose of 1 grm. of soneryl sodium. During the following 24 hours the infusion was continued at the rate of 30 drops per minute, together with 2 c.c. of 10% soneryl approximately every hour.

By this time her general condition showed signs of improvement and the infusion was discontinued for 2 hours, when she once more became noisy and restless. The infusion was resumed and continued uninterruptedly for a further period of 48 hours. During this time she received a further quantity of 2·8 grm. of soneryl sodium. By now almost all signs of toxæmia had disappeared. Her mouth was moist and fairly clean and the ketosis had ceased. She was allowed to wake from the narcosis, and was found to be sufficiently manageable to be nursed in the open dormitory. She was still mildly restless and confused, with delusions of identity. Four days later she had a major epileptiform convulsion, following which there was a prompt change in her mental condition. She began to realize her circumstances and to be more co-operative. The remainder of her illness was uneventful, and

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

ran a more or less typical course. The immediate benefit to her mental condition was only slight, but in the relief of her exhaustion and toxæmia it may well have been a life-saving procedure.

CASE 2: *Married woman, aged* 39. *Acute delirium.*—On admission her illness had lasted about a month. She looked ill; her tongue was thickly coated and dry. There was a moderate degree of albuminuria, and her blood-pressure was 135/90. Her mental state was one of gross confusion. She was disorientated, noisy, incoherent and violent. Visual hallucinations were of an intensity recalling delirium tremens. She saw spiders everywhere and this increased her noisy excitement. The usual treatment, including the use of hypnotics, sedative baths and nasal feeding, failed to effect any improvement. She was given a continuous infusion of glucose saline. The infusion was continued uninterruptedly for 62¼ hours; the total quantity of soneryl was 3·1 grm., most of which was given during the first day. By the third day she was coming round from the narcosis but was no longer resistive. Her mental state had changed completely to one of slight depression. When the infusion was discontinued she showed signs of returning restlessness, but after 3 days she was clear, amenable and rational. Convalescence began from this moment, and a week later she was moved to an open ward, where she stayed about 6 weeks before being discharged. She has kept well.

Continuous intravenous narcosis is drastic but effective. It is regarded solely as an emergency measure applicable to very ill patients who are failing to respond to the more usual methods. So far we have treated 10 patients by this method with encouraging results. Nine showed immediate improvement, but the tenth, who was very ill, failed to respond, and died. In concluding this preliminary account of infusion narcosis we would suggest that it offers a possible means of treating acute psychoses in the wards of a general hospital.

Part II.—Prolonged Narcosis with Soneryl Suppositories.

The general management is based on the well-known technique of the Cardiff school (3). The patient is examined, prepared, and put to bed in a quiet side-room. The usual arrangements are made for daily laboratory examination. The principal modification is the substitution of soneryl for somnifaine with consequent advantage of simplicity in administration. Many exponents of somnifaine therapy aim at producing a deep sleep from the very beginning of treatment. This method fails to allow for possible idiosyncrasy, and is not without danger. We prefer the method advocated by Meerloo (5) of using the first three days as a test period to determine the individual reaction of each patient.

The initial narcosis should be controlled by doses which do not exceed 5 gr. every 6 hours. It is often sufficient to give 5 gr. twice or thrice daily. The most important feature during the test period is the condition of the pulse, a pulse-rate below 50 being the commonest sign of intolerance.

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

After 3 days, subject to the general condition being satisfactory, it is safe to increase the dosage. The maximum single dose is 15 gr., but 10 gr. repeated two or three times a day is usually adequate for producing a fairly continuous and deep sleep. In connection with dosage, it is advisable to consider the routine administration of insulin. Glucose, being an essential ingredient of a nutritious fluid diet, is given as a matter of course. The addition of insulin is believed to raise the tolerance to soneryl and to necessitate larger doses. Therefore insulin is reserved for cases showing ketosis. Slight acetonuria occurred in about half the present series, but it was never severe, and always disappeared on giving insulin, glucose and copious fluids.

The whole problem of dosage is empirical and uncertain. To give fixed doses at regular intervals is to court disaster ; in fact, the only safe method is to regulate narcosis day by day according to the general condition of the patient. Some patients are managed easily and sleep almost continuously with the smallest doses ; others respond only to large and frequent doses. The ideal is to produce continuous deep sleep, unaccompanied by toxic effects. This is seldom achieved, and yet, in cases where sleep is by no means continuous, the results are almost as good. A study of such cases shows that although the drug does not necessarily produce sleep, it invariably produces other effects described collectively as " barbital intoxication ". In such cases the effects of narcosis may be paradoxical, consisting of acute hallucinatory excitement and motor restlessness throughout the period of intoxication, followed by sudden complete recovery a few days after abstention. As Meerloo (6) says " sudden disintoxication is an important factor and sleep constitutes no very real element ". The following case illustrates the paradoxical effect of soneryl with subsequent recovery in schizophrenia :

CASE 11 : *Single female, aged* 19. *Schizophrenia.*—There is no personal or family history of epilepsy or of previous mental disorder. The present illness began with sullen behaviour, laziness and complete indifference towards the future. She caused her family great anxiety by wandering away from home in an aimless manner, sometimes being brought back by the police. On one occasion she said she had been out " seeking death ". There was no amnesia after these flights to suggest epilepsy. On the contrary, they appeared to be typical wanderings of a schizophrene, as she failed to appreciate the alarm she caused.

She was admitted as a voluntary patient, and was aloof, autistic, and absorbed in phantasy. There was no evidence of hallucinations or delusions, but she was puerile and apathetic, and would not be employed. She was given a course of soneryl for 12 days in three phases :

Phase 1 lasted about 3 days, and was characterized by acute confusion, delirium, and persistent attempts at self-injury, chiefly by banging her head against the wall.

Phase 2 was characterized by catalepsy, dramatic posturing and vivid hallucinations of vision and hearing—she heard the voices of both her parents calling to her, and she saw the face of her mother with the wings of an angel hovering over her.

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

Phase 3 was continued with the same dose of 30 gr. daily. She became calm and restful, but did not sleep—in fact, she appeared to have developed some degree of tolerance to soneryl. Hallucinations had faded, and she was able to discuss them but with some perplexity.

Narcosis was discontinued, and on the following day she became emotional and lachrymose. The next day she had a major epileptic fit with unconsciousness, cyanosis and tongue-biting. Immediate examination failed to reveal any other abnormal neurological sign. Nevertheless there was a transient amaurosis. The accompaniments of the fit were interesting; she complained of the most intolerable burning headache, unlike any she had ever felt before. The pain was in the region of the vertex, lasting all day and accompanied by persistent cerebral vomiting. Towards the evening she was given an intravenous injection of 50 c.c. of distilled water. The headache and vomiting ceased but her temperature rose suddenly to 100°. The following morning there was slight headache, but she was otherwise clear, coherent and apparently normal. This was followed by satisfactory convalescence, willing interest in occupation and apparent complete return to normality.

Duration of Narcosis.

The optimal duration of narcosis is quite uncertain, although the general consensus of opinion is that a period of not less than 10 days is required. In the absence of definite criteria we prolong most narcoses for an arbitrary period of 14 days. Nevertheless, in cases with toxic complications and consequently abbreviated treatment, the results were equally good. The following example illustrates the relief of a melancholic attack by 5 days' narcosis:

Case 19: *Single woman, aged* 39. *Melancholia.*—The personal and family history were negative. On admission the patient was persistently depressed and agitated, reiterating her wish to be allowed to die or go at once and give herself up to the police. She was very resistive to all attention and difficult with food, ultimately needing to be tube-fed. She was given a course of treatment for 5 days, with an average dose of gr. v *b.d.* During this time she took food voluntarily and in fair quantity. In spite of other conditions being satisfactory her pulse became slow and feeble. On the third day it was 42, and by the fifth day had reached the exceptionally slow rate of 32; for this reason narcosis was stopped.

The following day the patient was much brighter, although still mildly depressed and a little retarded. Her appetite was good, and she showed interest in therapeutic occupations.

There is another side to the question of duration. Certain writers have referred to very prolonged periods extending over several weeks, or even months. Their reports of success in seemingly hopeless cases appear to justify this unusual procedure. A possible objection to very prolonged narcoses is the greater incidence of secondary effects, such as epilepsy. Some of the commoner by-effects are now considered.

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

Secondary Effects.

(1) *Cravings.*

The importance of the apparently unrelated secondary effects of barbital intoxication is that they are of value in interpreting psychopathological processes. The commonest psychic phenomenon of soneryl intoxication is a persistent and regularly occurring craving for food and drink. This craving has been observed in both circular and schizophrenic psychoses, but the most noteworthy feature is its consistent appearance in melancholia. In its regularity, simplicity and persistence, this craving in melancholia suggests a regression to the infantile level. The patient wakes at regular intervals for meals, makes insistent requests for food, and then on being fed sleeps soundly until the next meal-time. This phenomenon has appeared in seven consecutive cases of melancholia, and has been of practical value in improving the physical condition. A point of interest was that each patient had a fixed phraseology, which she repeated at every meal-time. The following are actual examples :

Case 30.—" Please give me food and drink ; please give me food and drink." •

Case 31.—" I want bread and cheese."

Case 32.—" I'm hungry ; I should like rice pudding ; please give me rice pudding."

Case 33.—" I do want some fruit ; can I just have an apple."

Case 34.—" I want a lemon drink, then I'll go to sleep."

Case 35.—" Do bring me a cup of tea and something to eat."

(2) *Catatonia.*

The relation of soneryl narcosis to catatonia is doubly interesting : on the one hand prolonged intoxication may produce a transient catatonic syndrome where it is least expected, namely in the manic-depressive states ; on the other hand true catatonic schizophrenia is relieved. It seems advantageous first to consider the more easily explained effects in schizophrenia. The effects described are not peculiar to soneryl, but have been observed also during medication with various barbiturates. The most relevant reports are those concerning sodium amytal, which was used by Bleckwenn (7) to induce spontaneous speech and lucid intervals in protracted cases of catatonic schizophrenia. Thorner (8) observed the same effect, and ascribed it to the inhibition of higher inhibitory centres. This mechanism is believed to explain the action of soneryl in those cases where it is effective in interrupting the negativism of catatonia.

Ten cases of catatonic stupor were chosen on account of their long chronicity, degradation, mutism and apparent dementia. The effect of narcosis was remarkable in that four of them not only spoke spontaneously and rationally, but showed by their conversation that apperception had been present and

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

memory preserved throughout the long period of stupor. The other six patients, who appeared to be hopelessly demented, did not improve ; nevertheless three of them who for many years had shown no sign of emotion, wept repeatedly during narcosis. The following case illustrates the probable mechanism of narcosis in catatonic stupor :

CASE 20 : *Single woman, aged 24. Catatonic schizophrenia superimposed on congenital mental deficiency.*—The history was incomplete, but there was feeble-mindedness in a sister. The patient showed signs of backwardness at school and only reached Standard 2, but she did not become certifiable until the age of nineteen. The psychosis began with dislike for work, she became sullen, depressed and excited, and threatened to hang herself. On admission to hospital she was in a state of catatonic excitement. This continued for some months, and was followed by a long period of stupor, during which she was tube-fed. During the following four years she appeared to be quite untrainable, and a continuing report at this time stated " she is oblivious to her circumstances and quite inaccessible. She does not speak or take any notice when spoken to ; she is faulty in habits, and has to be fed and looked after in every respect ". There was no apparent change for a further twelve months, when she was given a course of soneryl. During narcosis her expressionless immobility changed to one of wistfulness, with spontaneous conversation about herself. She referred to her stupor as " dreaming ", and said that she did this to get away from her work, where she had been unhappy. She said that people had laughed at her because she was not a good scholar, and that she did not want to return to her home, where she would have to work. Her explanation shows her willing escape into schizophrenia. The improvement was only temporary, and soon after treatment she relapsed into her former state of stupor.

The paradoxical phenomenon of induced catatonia is difficult to explain. It may appear early, persist throughout narcosis, and disappear suddenly on disintoxication. On the other hand, it may appear as a transient feature, alternating with complete passivity and catalepsy. The statuesque attitudes and spastic immobility of schizophrenia occur also in the induced catatonia of narcosis, but here the resemblance ends. The distinction becomes apparent in the lucid intervals after treatment when the melancholic is found to have been dominated by strong emotions, whereas the schizophrene is not. The catatonia of the melancholic is a dramatization of her affective state, that of the schizophrene being purposeless and autistic. The following case illustrates the sequence of cravings, desires, catatonia and catalepsy during the course of seventeen days' narcosis :

CASE 30 : *Married woman, aged 40. Agitated melancholia.*—It is believed that her father attempted suicide. The patient's history appears to have been normal and uneventful until February, 1936, when she became depressed, irritable and emotionally unstable. She was treated in a nursing-home for three months but did not improve, until finally and unexpectedly she jumped through a window and fell to the ground 40 ft. below. There was no evidence of serious injury, although she was very severely bruised. She was certified

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

and admitted to hospital in May. Her mental state was one of agitated depression, in which she was unable to give any clear account of herself, but would only repeat phrases to the effect that she was very wicked, but too wicked to die. At times she was intensely preoccupied, listening to hallucinatory voices which told her that she was Satan. Her expression and attitude were always those of extreme misery. She was quite unemployable, would not eat and could not sleep. The usual sedatives were of little benefit, and although her physical condition was very poor and rapidly deteriorating, it was decided as a last measure to attempt prolonged narcosis.

The first day she received two doses of 5 gr. and slept most of the time. By the second day the symptom of food-craving had appeared and her whole appearance had changed. At each meal-time she sat straight up with a mask-like face and eyes tightly closed, pinching her nostrils all the while with the finger and thumb of her right hand. She asked for food and drink, but would say nothing else; nevertheless, she ate readily and with a peculiarly slow and deliberate munching. The next phase in her narcosis was characterized by erotic desires towards the doctor and towards one of the nurses. She would not speak to anybody else, however, and within a few days the third phase appeared. This was one of catatonia. She knelt in an uncomfortable position and appeared to be praying, although at the time it was impossible to determine the nature of her thought or feeling. Phase 4 showed a complete change, with extreme docility, quiet amiable speech, but considerable apathy and the phenomenon of flexibilitas cerea. The fifth and last phase of narcosis was a return to catatonic stupor with impulsive conduct. She became somewhat difficult to manage and therefore the narcosis was discontinued.

There was little change in her mental condition until five days later, when a sudden change appeared. She began to talk in an abrupt, inhibited style, speaking of her wish to get up and return to her home. The nurses reported that she was brighter but very impulsive, making several sudden rushes towards the door. Her condition for several days was one of depressive mania, followed by gradual convalescence.

(3) *Post-narcotic Epilepsy.*

Many writers have described isolated instances of epileptiform convulsions occurring during, or more often after treatment with basal narcotics. These fits have been observed in most cases a few days after the cessation of treatment, and the inference is that they are due to sudden withdrawal of an anti-convulsant drug. Meerloo (5) describes 5 cases of epileptiform reaction in 500 somnifaine treatments, and a sixth case of a patient suffering from veronalism who later died in status epilepticus. Meerloo offers the interesting theory of a normal though latent "Krampfbereitschaft", the convulsive discharge following sudden abstention from the narcotic. Kooy (9) describes two instances of epileptic fits in a series of 130 somnifaine treatments, and he suggests the theory that "many individuals have a latent tendency to epilepsy". Ström-Olsen's (2) suggestion that the fits are causally related to hyperæmia of the brain is less easy to correlate with the fact that they occur more often after than during the treatment. A fourth and more acceptable suggestion is

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

MacNiven's (10). In his series of 40 treatments with somnifaine he observed symptoms of cerebral irritation in 3 cases. " In one of these the temperature rose to 103° on the last day of treatment. The patient developed symptoms of irritation with marked opisthotonos. This symptom lasted for three days and then subsided completely." The second case developed symptoms the day after treatment was terminated. " The patient had four epileptiform convulsions in the next twenty-four hours. Her symptoms suggested calcium deficiency, and she was treated with calcium by the mouth. Her symptoms subsided completely." The third case developed tremors of the face and limbs, which subsided following treatment with calcium gluconate.

There are indications suggesting that tetany rather than epilepsy is the correct description of post-narcotic convulsions. If this is so it is necessary to explain why the convulsions occur in most cases after cessation of narcosis. The inference is that lowered serum calcium produces a convulsive tendency, temporarily checked, but becoming apparent on sudden withdrawal of the narcotic. Further investigations are necessary to correlate the convulsive tendency with the parathyroid dysfunction suggested by Hennelly and Yates (11).

The reported incidence of post-narcotic epilepsy is about 1%, but it is possible that careful observation of patients after treatment for signs of tetany would show that this is more frequent. We have observed epileptiform convulsions in four patients during disintoxication from soneryl. In each of these cases we were able to exclude personal or family history of epilepsy :

CASE 1.—(Described above.)

CASE 11.—(Described above.)

CASE 32 : *Single woman, aged 22. Melancholia.*—The heredity is unsound ; the mother has suffered from a melancholic attack, the patient's elder sister is a chronic psychoneurotic, while the youngest sister died from pulmonary tuberculosis.

The patient was of happy disposition until the death of her sister after a long and distressing illness. The psychosis began with insomnia and loss of appetite. She became more and more depressed and agitated, thinking and speaking of nothing but her own impending death. She made several doubtful attempts at suicide and then resolutely refused all food. At this stage she was admitted to the hospital as a voluntary patient. On admission she was noisily depressed, restless and resistive to attention, refusing all food and soon needing to be artificially fed. She was given a course of soneryl narcosis for seventeen days, during the whole of which time she had the maximal amount of sleep. Her temperature remained normal throughout the treatment and her pulse was good until the thirteenth day, when it dropped to 52. The following day it had slowed down to 50. Dosage was lessened, and the treatment was continued for four days longer. All this time she had taken food freely, her craving being for rice pudding. The first day after treatment she seemed dull and slightly confused. The second morning after treatment she had a major epileptic fit, followed by a temporary lucidity in which she was calm, clear and rational in conversation, but complained

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

of an exceedingly severe headache over the vertex. It is noteworthy that this is the only time she has been known to complain of headache. Unfortunately she quickly relapsed into her former state of depression.

CASE 37: *Single man, aged 25. Schizophrenia (criminal lunatic).*—He was admitted in December, 1935, and during the following six months was persistently noisy, truculent, interfering and destructive, with outbursts of violence. Delusions of persecution that his food was poisoned, and that his body was wasting away, alternated with feelings of unreality and vague ideas of reference. He exhibited marked dissociation of mood and thought, attributing his misfortunes to the fact that his sister was casting a spell over him. Hallucination of voices made him very noisy at night, so that he always needed one and sometimes two draughts of paraldehyde. He was given a course of soneryl narcosis during which he received gr. x *b.d.*, and slept most of the time. At times he talked incoherently, but he was not noisy. His habits were clean, and he ate readily throughout the treatment. Temperature and pulse remained normal the whole time. Three days after treatment he had a severe fit, following which he complained of headache lasting about an hour. This patient did not recover, but the following improvement has been observed: (1) Clean and looks after personal needs, (2) attempts to occupy himself, (3) will converse rationally and coherently, (4) sleeps without hypnotics, (5) far more amenable and co-operative, and (6) his hallucinations are becoming less intense.

Note.—Cases 1 and 11 received insulin throughout the period of narcosis. Cases 32 and 37 did not receive insulin. Furthermore, in Case 1 there was the additional factor of calcium loss during pregnancy and the puerperium.

SUMMARY OF COMPLICATIONS.

The various toxic phenomena which are known to accompany prolonged narcosis were looked for in the present series. Some have been described already. Others, such as troublesome pyrexia and lung affections, were absent. All the complications which occurred are enumerated as follows:

Carbohydrate metabolism.—Slight disturbances were seen in 75% of treatments. The commonest was a transient acetonuria, seen in 30 cases, but it was never severe, and invariably disappeared after the administration of insulin. Slight glycosuria was common and probably due to excessive intake of glucose. It was not considered important.

Cardio-vascular.—Minor disturbances occurred in 10% of treatments. The most important complication was marked bradycardia, which in one case reached a degree suggesting complete heart-block. In two other cases narcosis was discontinued on account of pulse-rates of 42, with a systolic blood-pressure below 100. Tachycardia was not observed except in Case 10, the patient who died from circulatory failure.

Gastro-intestinal.—Three patients vomited during the early stages of narcosis, but it was not necessary to interrupt the treatment, and it sufficed to reduce the dose of soneryl and to increase the insulin. Dysphagia, which has been described by most authors, was not encountered, and in the whole series only three patients refused food.

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

Respiratory.—Nil.

Genito-urinary.—Slight disturbances occurred in 30% of cases. The commonest was a transient albuminuria, which disappeared again without trouble. Microscopical examination of deposits showed scanty red blood-cells in two cases, but there were no casts or other signs of renal damage. Three early cases were catheterized on account of retention associated with oliguria, but since then we have followed Parfitt's (12) suggestion of giving 100 oz. of nutrient fluid daily, and the complication has not recurred.

The skin.—Herpes labialis occurred in one patient during treatment. Profuse sweating occurred in one case, but there were no other skin complications.

The temperature.—Severe changes of temperature were not seen in this series. Slight pyrexia (99°) occurred during three treatments, and transient pyrexia after treatment was seen in three more cases.

Epilepsy.—Four cases are described above.

Psychic complications.—One case became hallucinated during treatment. Three melancholics became catatonic for periods during treatment.

Mortality.—The one patient with circulatory collapse after infusion would have died in any case, and it is unlikely that her condition was aggravated by narcosis.

Therapeutic Results.

The classification of results into Recovered, Relieved and Not Improved fails to differentiate that very interesting group of patients whose improvement, though marked, is only temporary. These cases in which temporary recovery is followed by relapse are most instructive. They indicate that narcosis alone is insufficient, and that where psychological readjustment is not effected there is little hope of permanent recovery. We have followed MacNiven's (10) scheme of tabulating our results in four groups :

(1) *Recovered.*—Rapid and complete restoration to health.

(2) *Relieved.*—Rapid and marked improvement, not however amounting to complete recovery. (*Note.*—Many of this group afterwards progressed to full recovery.)

(3) *Temporarily improved.*—Apparent recovery, followed within a few weeks by relapse.

(4) *Not improved.*—Self-explanatory.

Results in Schizophrenia.

Type.	Recovered.	Relieved.	Temporarily improved.	Not improved.
Catatonic stupor	0	2	4	6
Autistic	1	2	0	2
Excited	0	3	0	0
	1	7	4	8

20

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

The results in some cases of schizophrenia are encouraging in others disappointing. In view of the fact that 12 cases treated were very chronic and supposedly incurable, the percentage recovery is inevitably low. However, of the 8 earlier cases treated, 1 recovered and 7 were relieved. The quickest response to treatment was seen in the autistic cases, of which the following is typical:

CASE 38: *Single man, aged* 35.—On admission he was persistently lethargic and exhibited marked dulling of affect. He seldom spoke, but when questioned, volunteered vague hypochondriacal delusions. He would do nothing for himself, and had to be persistently encouraged before he would eat. He was in fairly good physical health, except for slight cardiac enlargement with a mitral systolic murmur conducted out to the axilla. He was given a course of soneryl for 9 days. He immediately became brighter and more alert, with a new interest in his personal appearance. He was considered to be convalescent, and was occupied in the handicraft department.

Results of Manic-Depressive Psychosis.

Type.	Recovered.	Relieved.	Temporary improvement.	Not improved.
Mania	1	5	0	2
Melancholia	1	5	4	0
Involutional melancholia	0	0	1	1
	2	10	5	3

20

The fact that our recovery-rate in this group is somewhat lower than that of other writers is counterbalanced by the considerably lower incidence of toxic complications.

The following is a typical result on a case of mania:

CASE 12: *Married woman, aged* 31.—She was admitted with a history of 6 weeks of increasing insomnia, irritability and excitement. Her condition was one of constant over-activity. She sang and shouted incoherently, would not stay in bed, and was persistently restless, interfering and threatening. She was given 3 days' light narcosis, during which she was most resistive and had to be tube-fed. Then narcosis was pushed very deep for 5 days, during which she obtained the maximum amount of sleep. Her pulse dropped to 46, but her general condition remained satisfactory. Five days after treatment she changed suddenly and became amenable, friendly and co-operative. A few days later she was moved to an open ward, where she made a good recovery.

The next case illustrates the response to treatment in agitated melancholia:

CASE 13: *Married woman, æt.* 51.—On admission she was persistently depressed and lachrymose, with much agitation and constant requests for help, though she said no one could help her, and that her misery was a punishment brought on her family. She stated that scandal and dishonour

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press

had been brought to her house (this was untrue). She was excited, restless and incoherent. She was given narcosis for a week. Following this she became mildly overactive for a few days, but did not develop a manic phase. Her recovery was rapid, complete and uneventful.

Conclusion.

Soneryl narcosis produces marked improvement and sometimes recovery in many intractable psychoses.

It may be compared with somnifaine narcosis, and even if the recovery-rate is rather lower at least the toxic complications are less common.

Narcosis induced by the method of continuous intravenous infusion, can be applied to those cases described as definitely unsuitable for somnifaine therapy, viz., the acute toxic psychoses and the exhaustions from mania and melancholia.

I am indebted to Dr. P. W. Bedford, Medical Superintendent of the Dorset Mental Hospital, for his interest and encouragement in this work. My thanks are due also to Dr. G. T. James for his notes on the male cases and for his assistance in many of the treatments.

References.—(1) Horsley, *Brit. Med. Journ.*, February, 1936, p. 283.—(2) Ström-Olsen, *Journ. Ment. Sci.*, October, 1933, lxxix, p. 653.—(3) *Idem, ibid.*, p. 638.—(4) Hamilton Bailey and Carnow, *Brit. Med. Journ.*, January, 1934, p. 11.—(5) Meerloo, *Journ. Ment. Sci.*, April, 1933, lxxix, p. 358.—(6) *Idem, ibid.*, p. 367.—(7) Bleckwenn, *Journ. Amer. Med. Assoc.*, October, 1930, p. 1168.—(8) Thorner, *Psychiat. Quart.*, July, 1935, p. 386.—(9) Kooy, *South Afr. Med. Journ.*, August, 1934, p. 567.—(10) MacNiven, *Journ. Ment. Sci.*, July, 1936, lxxxii, p. 423.—(11) Hennelly and Yates, *ibid.*, p. 415.—(12) Parfitt, *Lancet*, February, 1936, p. 425.

https://doi.org/10.1192/bjp.83.342.25 Published online by Cambridge University Press