PROLONGED NARCOSIS WITH PARALDEHYDE AND DIAL.

By M. B. Brody, M.B., Ch.B., D.P.M.,
Senior Resident Physician, Runwell Hospital, Essex.

(Received February 21, 1940.)

In the course of routine clinical work with excited patients I found that a dose of 3 drm. of paraldehyde with 3 gr. of dial (2 tablets) often produced a long and sound sleep where other powerful narcotics were relatively ineffective. It therefore seemed worth while to try the combination for prolonged narcosis. At the outset it was attractive in that it was cheap, was given by mouth, and that both drugs had a good reputation for efficiency and safety. Paraldehyde has also the special advantage of not being a cardiac depressant (Edmonds and Gunn, 1936; Sollman, 1937). Both drugs have been used before for prolonged narcosis, but not in this combination, and usually in much higher doses. [For references, see reviews of Palmer (1937) and Gillespie (1939).]

Technique.

The paraldehyde is prepared as a suspension in the strength of 1½ drm. of paraldehyde and 1 minim of liquor atropinae to the ounce. Dial is given in 1½ gr. tablets which may be crushed into the draught. The normal dose is 1 oz. of the paraldehyde mixture and one tablet of dial. The draught is further diluted with water for each dose. Even so, it is very unpleasant, and many patients like to suck a slice of lemon with it.

The preparation and nursing of the patient, daily urine testing, recording of temperature, pulse, respiration and amount of sleep are carried out as with somnifaine narcosis. The first dose of the day is given about ¾ hour after breakfast, and nearly always needs to be repeated in the evening. Many patients sleep quite satisfactorily on these two daily doses, but others need a further dose during either the afternoon or the night. This extra dose should be of the paraldehyde mixture only, without dial, so that dial is not given more than twice in 24 hours. Sometimes the dosage has to be increased after a few days. If so, double doses of paraldehyde mixture and 2 tablets of dial are given as required. Not more than 3 double doses of paraldehyde mixture (= 9 drm. of paraldehyde) and 4 tablets of dial (= 6 gr. of dial) should be given in 24 hours, though this dosage may be maintained for several days. In order to keep the technique as simple and uniform as possible, the rule should be—not more than 2 doses of paraldehyde and dial together, plus one extra dose of paraldehyde alone during 24 hours, whether in single or double strength. Experience taught that increasing the dosage beyond this level or doubling the dose of one without the other, or giving smaller doses more often, complicates the technique without improving the result.

https://doi.org/10.1192/bjp.86.362.526 Published online by Cambridge University Press

The normal hospital diet is given, but avoiding anything that might be difficult to swallow, such as bread crusts or roast meat. Mince, stews, mashed vegetables, eggs, soft bread and butter with jam are all safe. Also, the patient has two to three pints of egg and milk daily, and liberal glucose and lemon drinks. Solid food is taken as long as the patient can feed himself without difficulty in swallowing. If he cannot feed himself or there is the slightest dysphagia he is given fluids only.

Diet and medicine are given when the patient wakes up, not at fixed times. Very often, having eaten, the patient will fall asleep again. In any case the medicine should not be given until ¾ hour after the meal, since giving it earlier increases the liability to vomit.

Insulin is not given so long as the patient can take solid food, which he generally can for the full course of treatment. If he is reduced to fluids only, 10 units of insulin, which may be increased if necessary, and a glucose drink are given with each dose of medicine.

Narcotic Effect.

Ninety patients were treated. The average time out of 24 hours spent fully asleep, drowsy and awake was $17{\cdot}2 \pm 1{\cdot}9$ hours, $2{\cdot}0 \pm 1{\cdot}5$ hours and $4{\cdot}8 \pm 2{\cdot}3$ hours respectively. The amount of sleep is particularly satisfactory, as 52 out of the 90 treatments were given to some of the most difficult patients in the hospital. A few patients were treated with paraldehyde alone, dial alone, and a mixture of paraldehyde 3 drm., pot. brom. 30 gr., and tr. opii 30 minims. The narcotic effect was not as good as with paraldehyde and dial, the highest average daily sleep being 14½ hours, and similar complications occurred.

Mortality.

Two of the 90 patients treated died. The first was a maniacal woman of 54. She had improved after a previous course of treatment, but a few weeks later developed a large carbuncle on a dangerous area of the scalp and became much worse mentally. She interfered with the dressings constantly. I regarded the consequent danger of the infection spreading as so urgent that I decided to repeat the narcosis in the hope of stopping her interference with the dressings and of improving her mental condition. She died suddenly on the fourth day. At the post-mortem there was lobular collapse of the lung such as is found after anaesthetic death from respiratory paralysis. No doubt the sepsis had made an otherwise safe dose dangerous, the mechanism possibly being a double upset of carbohydrate metabolism. The second patient was a hypomaniacal man of 70. His narcosis was stormy. After the treatment he was much quieter, in fact a little depressed. About 14 days later he became very over-active, restless and noisy. He had to be hand-fed. He died of broncho-pneumonia a month after the last day of treatment. One cannot exclude the presumption that had he not been weakened by the treatment he would not have got his fatal broncho-pneumonia at that time, so that the narcosis must be held at least indirectly responsible for his death. I have described these

https://doi.org/10.1192/bjp.86.362.526 Published online by Cambridge University Press

patients in detail not for the sake of special pleading, but because the circumstances of sepsis and old age are exceptional; and I believe, in the light of experience, that similar deaths will not happen again.

Complications.

The complications are similar to those of other techniques. From the start there is a small fall in blood pressure, but on the whole, cardiovascular anxieties are rare. Nearly all the patients had a steady and regular pulse throughout. One patient only had a mild cardiac collapse on the fourth day, but recovered within an hour or two and finished the course without incident. Dysphagia and ataxia also were uncommon. *Vomiting* was the most troublesome complication. At first, liquor atropinae was not included in the paraldehyde mixture, and 15 out of 21 patients vomited. Out of 69 patients who had paraldehyde with liquor atropinae 21 vomited—a striking proportional improvement. Most of the vomiting was in the first three days (see Table I), which suggests that the cause is not intoxication, but the gastric insult of the mixture —quite understandable by those who have taken paraldehyde. Twenty-two patients were *restless*, particularly in the first half of the second week. Thirty-six patients had *pyrexia* scattered evenly over the fortnight. It rarely exceeded 100°, and, as with somnifaine, the temperature usually returned to normal if the next dose was omitted. Eleven patients had *albuminuria*. Four patients had to be *catheterized*. One patient, who had been a regular epileptic in the past, had a single *epileptic fit* two days after the end of treatment. One patient had a *Saturday night palsy* which made a full recovery. Many of the patients who had these complications had them once only.

TABLE I.—*Distribution of Complications according to Day of Occurrence.*

Complication.	Day exhibited.														Total occurrences.	Number of patients.
	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.		
Vomiting*	7	10	5	1	2	3	1	1	0	3	1	2	1	0	37	21
Pyrexia	3	7	7	7	7	5	6	8	7	5	4	4	6	2	78	36
Restlessness	0	0	0	5	4	4	3	9	9	8	9	6	7	5	69	22
Albuminuria	0	1	3	2	3	3	3	3	5	4	3	4	4	3	41	11

* Excludes 15 out of 21 patients treated before liq. atropinae was introduced into the paraldehyde mixture.

Ketonuria and Glycosuria.

Only five patients had *ketonuria*. In three cases the patients were so restless that for several days they had not been able to take solid food, and had had fluids only. In two of these insulin was not given, and the ketonuria

https://doi.org/10.1192/bjp.86.362.526 Published online by Cambridge University Press

ceased when the narcosis ended, and they began to take solid food again. It is not possible to decide whether the end of narcosis itself or the resumption of solid food caused it to disappear. The third patient first showed ketonuria on the 6th day. Thereafter he had 10 units of insulin with glucose with each dose of the mixture, but ketonuria appeared on the 9th, 10th, 15th, 16th and 17th days. He was restless and on fluids only throughout. A fourth patient had ketonuria on the 9th, 10th and 11th days, when acute otitis media was discovered and the treatment was stopped. The fifth patient had a trace of ketones in the urine on the 9th day. It disappeared without insulin and the treatment was successfully continued. She was menstruating at the time.

Six patients had *glycosuria*. One of them had glycosuria and ketonuria together on the 6th and 15th days. Two patients had a "faint trace" only on two occasions each, and the others no more than "a trace" once each. Except in the first patient there were no special associations with the glycosuria and it disappeared without special treatment.

These findings throw a little light on the problem of ketonuria during prolonged narcosis. Most patients had no insulin, and a good full diet was evidently enough to prevent the appearance of ketonuria. But though starvation may predispose to ketosis I cannot agree with Menzies (1937) that it is the sole cause of it. The appearance of glycosuria, remembering that the production of alimentary glycosuria is normally almost impossible, must be due to some upset of carbohydrate metabolism. Certainly, starvation cannot explain it. Many patients with acute peptic ulcer symptoms have no more to eat than patients on somnifaine narcosis with the Ström-Olsen technique, but have no ketonuria. Finally, since ketonuria appears at the same time as restlessness, confusion, pyrexia and other toxic signs, it is surely logical to assume that it is itself a toxic sign.

Weight.

Twenty-five patients gained weight, 42 lost weight, and 13 showed no change. The average change in weight was a loss of $1{\cdot}7 \pm 3{\cdot}4$ lb. The significance, if any, of weight change in prolonged narcosis has not yet been settled. Many authors ignore it, or mention it very vaguely. Some claim an increase in weight. On the other hand, Monnier, quoted by Gillespie (1939), reported a loss of 4–5 kg. with cloettal. "He regarded it as of therapeutic value in that it is a sign that metabolic processes are altered." Out of the 51 patients with attacks of less than two years' duration, those who benefited lost on the average $1{\cdot}05 \pm 2{\cdot}8$ lb., whereas those who had no improvement or only temporary improvement lost on the average $2{\cdot}1 \pm 3{\cdot}4$ lb.—just double. Statistically, however, the difference is less than twice the standard error of the difference. The subject is perhaps worth further investigation.

https://doi.org/10.1192/bjp.86.362.526 Published online by Cambridge University Press

TABLE II.—*Results in 51 Patients in whom the Acute Phase was under two years' duration.*

Diagnosis.	Number treated.	No change.	Temporary improvement.	Lasting improvement.	Recovered.
Mania	26	13 (50%)	2 (8%)	3 (11%)	8 (31%)
Depression	19	7 (37%)	1 (5%)	3 (16%)	8 (42%)
Schizophrenia	6	5 (83%)	1 (17%)	0	0

RESULTS.

As many of the patients were chronic refractory cases, I have only included in the table of results cases in whom the acute phase was of under two years' duration—the type to whom narcosis is usually given. The criteria for assessing the results were similar to Palmer's (1937). The results closely resemble those obtained with somnifaine and other drugs. A male maniacal patient continued maniacal during the treatment, but two days after it ended suddenly became acutely depressed, and has remained so for the last 18 months. A second course of treatment made no change.

DISCUSSION.

I believe the treatment to be reasonably safe if used with normal caution. Most patients caused no anxiety. Only three treatments had to be stopped because of signs caused by the narcosis, two because of feeble pulse, and the other because of restlessness. The special virtues of the technique are simplicity and cheapness. The cost of the maximum daily dose of paraldehyde and dial is less than one-third of the cost of 4 c.c. of somnifaine. The difference for a hospital doing 50 treatments a year amounts to several pounds. The biggest disadvantage is the unpleasant taste. The memory of it is always vague, and most patients make little opposition to the medicine after the first two or three doses. But it must be admitted, the unpleasantness of it makes the treatment psychologically unsuitable for some patients. Its best use, perhaps, is for the treatment of acute phases in chronic manic-depressive patients and other types with acute manic excitement. Such patients are not distressed by the unpleasant taste; and simplicity of technique has additional virtue when the treatment is to be conducted in chronic or refractory wards.

SUMMARY.

The technique for prolonged narcosis with paraldehyde and dial is described. Used with the caution afforded to other techniques it is reasonably safe, but not foolproof. The complications and results are similar to those with somnifaine. The advantages are simplicity and cheapness. A disadvantage is the

https://doi.org/10.1192/bjp.86.362.526 Published online by Cambridge University Press

unpleasant taste, which makes it psychologically unsuitable for some patients. It is most useful for treating periodic acute phases of excitement or depression in chronic patients.

It is a pleasure to thank Dr. R. Ström-Olsen, Physician Superintendent, for permission to use the clinical material of the hospital, and for much helpful advice.

REFERENCES.

EDMONDS, C. W., and GUNN, J. A. (1936), *Cushny's Textbook of Pharmacology and Therapeutics*. London. p. 363.
GILLESPIE, R. D. (1939), *Journ. Neur. and Psych.*, **2**, 39.
MENZIES, D. (1937), *Lancet*, **233**, 559.
PALMER, H. A. (1937), *Journ. Ment. Sci.*, **83**, 636.
SOLLMAN, T. (1937), *A Manual of Pharmacology*. Philadelphia. p. 731.

https://doi.org/10.1192/bjp.86.362.526 Published online by Cambridge University Press