No. 2 subject, R. C. L. Aged 27, non-smoker.

Nitrogen–oxygen	Helium–oxygen
5 min. 23 sec.	9 min. 30 sec.
4 min. 40 sec.	9 min. 10 sec.
4 min. 10 sec.	10 min. 21 sec.
4 min. 36 sec.	8 min. 54 sec.
3 min. 58 sec.	8 min. 20 sec.
Average 4 min. 33 sec.	Average 9 min. 15 sec.

Probably the slightly better times obtained by subject No. 2 are accounted for by difference in age and smoking habits. His fifth experiment, which was easily his worst, was done shortly after exercise. The results are on the whole very consistent.

Conclusion

An artificial atmosphere of helium and oxygen is theoretically and practically about twice as easy to breathe as ordinary air, and the mixture should be of great value in cases of respiratory obstruction or in cases in which it is essential to economize muscular effort. When obstruction is present its value is immediately apparent and can be measured by simple timing experiments. Even if there is no obstruction, in which case it has no visible effect, it might still be of value in reducing the amount of work done by the patient and in preventing post-operative collapse of the lung because of its low solubility.

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CARDIAZOL THERAPY IN STUPOR

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The treatment of schizophrenia by cardiazol has been practised on the Continent to an increasing extent in recent years, and the view is current that a favourable response is often met with in cases of stupor. In the present series eighteen cases of stupor were treated, and in their selection no special criteria were employed. Each case, however, was carefully examined to exclude organic disease. The stupor, although it varied in depth, was the outstanding clinical feature in each case.

Technique of Injection

The technique employed was that recommended by Meduna. A 10 per cent. solution of cardiazol buffered to *p*H 8 with 0.1 per cent. disodium hydrogen phosphate to prevent decomposition on sterilization was injected intravenously, beginning with 0.5 gramme in the case of men and as a rule 0.4 gramme in the case of women. Three injections were given weekly, and the dose was increased by 0.1 gramme whenever it was found that a larger amount was required to produce a convulsion. It was never necessary to employ a higher dosage than 1 gramme. It was decided to produce in each case thirty convulsions unless some complication supervened. It is well known that thrombosis is one of the difficulties to be contended with, and therefore if only one or two veins be available (and this is not uncommon in women) treatment may have to be abandoned at an early stage. With a view to preventing this occurrence the solution of cardiazol employed was buffered, and in addition all traces of the drug were removed from the needle by rinsing in normal saline before insertion into the vein. Further, after the injection had been given any extravasation of blood into the tissues was prevented by firm pressure by means of a swab at the site of puncture, and this was maintained throughout the convulsion. As soon as the latter was over, a dry dressing was firmly applied. No attempt was made to thread the needle up the vein, as this appeared likely to increase the possibility of thrombosis.

Results

The total number of patients treated was eighteen, of whom eleven were males and seven females. In eleven cases thirty convulsions were produced, and this was held to constitute a full course of treatment. In the remaining seven cases, for one reason or another (see below) it was found necessary to discontinue treatment after the production of from three to nineteen convulsions. In the table below are set out particulars of the cases. It will be noted that Cases 1 to 11 received the full course of treatment, while in Cases 12 to 18 treatment was incomplete for the reasons assigned.

Table giving Particulars of Eighteen Cases of Stupor Treated by Cardiazol.

Case	Sex	Age	Duration of Illness	Duration of Stupor	Type of Stupor	Dose in grammes	No. of Convulsions	Result	Remarks
			Years	Years					
1	M.	40	3	1 4/12	Non-resistive	0.5-0.7	30	Complete remission	
2	M.	28	1 3/12	1	Resistive	0.5-1	30	,,	
3	F.	23	1 3/12	9/12	,,	0.4-0.7	30	,,	
4	M.	23	4/12	3/12	Non-resistive	0.5-0.8	30	Partial remission	
5	F.	23	5	6/12	Resistive	0.4-1	30	,,	
6	F.	22	6	2 3/12	,,	0.3-0.8	30	,,	
7	F.	47	10	10	Non-resistive	0.3-0.8	30	,,	
8	M.	44	4	3/12	,,	0.5-0.8	30	No change	
9	M.	28	5	3	,,	0.5-1	30	,,	
10	M.	30	3	3	,,	0.5-1	30	,,	
11	M.	32	7	2	Resistive	0.4-0.7	30	,,	
12	M.	36	1 9/12	1 3/12	,,	0.5-1	19	Partial remission	Marked hostility
13	F.	47	13	4	,,	0.5-0.7	7	,,	Treatment being continued
14	F.	31	3 4/12	3	,,	0.5-0.6	4	,,	Thrombosis of veins
15	M.	28	2	2	Non-resistive	0.5-0.7	9	No change	Activation of pulmonary tuberculosis
16	M.	27	3 9/12	3	,,	0.5-0.8	8	,,	Thrombosis of veins
17	F.	30	3	4/12	Resistive	0.4-0.6	4	,,	,,
18	M.	35	10/12	10/12	Non-resistive	0.5-0.6	3	,,	Numerous after-convulsions

Reference to the table will show that of the eleven cases which received a full course of treatment three made a complete recovery, four showed some improvement, and the remaining four did not benefit. As is to be

expected, and as others have stated, there is a definite correlation between the duration of the mental disorder and response to treatment, those cases with the shorter duration improving to a greater extent than those in which symptoms have been present for a longer time. In the three cases which recovered the average duration of illness was under two years; in those in which only a partial remission or a complete failure to respond was obtained the average duration of symptoms was over five years.

It is noteworthy that, of the cases which recovered, Case 1 was considered to be one of depressive stupor, whereas Cases 2 and 3 were undoubtedly examples of schizophrenic stupor. In all three the stupor was profound, and in Cases 2 and 3 it came on abruptly. It seems that it is in these cases, where a deep stupor has appeared suddenly and has not been preceded by a phase involving schizophrenic deterioration, that the best results may be anticipated. The fact that in Case 1 there was a relatively long duration of illness before the onset of stupor does not contradict this suggestion, since in that instance the illness was considered to be essentially depressive in type and therefore no deterioration was to be expected.

In order to discover whether such deterioration is present in any given case of stupor before treatment is begun, a colleague, Dr. W. P. Berrington, has suggested the employment of sodium amytal. This drug in many cases causes the patient to emerge from his stupor for a short time, during which it is possible by questioning and observation to detect the presence of any deterioration. It is also possible that sodium amytal may be useful in another way, since it seems likely that unless it produces the above effect treatment with cardiazol will not lead to good results.

In those cases where stupor was deepest a few injections only were necessary to produce dramatic results, particularly in relation to mutism and refusal of food. As an example of this Cases 13 and 14 can be quoted. In the former the patient had been stuporous for four years and mute and refusing food for two years. Three injections were enough to make the patient sit up, converse, and feed herself. In Case 14 the patient had been stuporous, mute, and refusing food for three years. Again three injections led to the patient sitting up, speaking, and feeding herself.

Complications Observed

1. THROMBOSIS

In spite of the precautions (see above under heading of technique) which were taken thrombosis of the veins did occur in a number of cases, and in three of these to such an extent that it was impossible to continue treatment. In these cases the number of injections given was very small —namely, four, four, and eight respectively. It is noteworthy, however, that in some of them it was possible to give as many as fifteen injections into the same vein without any apparent thrombosis occurring, and this would appear to suggest that a personal factor is involved. Occasionally, after thrombosis had occurred in a vein, if an interval were allowed to elapse it was found that the vein could again be used successfully.

2. DISLOCATIONS

(*a*) *Forward Dislocation of the Jaw.*—This occurred in two patients, and took place at the beginning of the fit when the muscles of the jaw, along with others, were in tonic spasm. The reduction of the deformity was easily carried out immediately after the fit had ceased, during the stage of relaxation. It was found possible to avoid a recurrence of the dislocation in subsequent seizures by instructing the nurse to prevent the lower jaw opening too wide by pressing upwards with one hand placed under the chin while exerting counter-pressure with the other on the vertex. This pressure may be discontinued as soon as the tonic spasm is over, and the gag or tampon is then quickly placed between the teeth.

(*b*) *Subcoracoid Dislocation of the Shoulder.*—This happened twice during the tonic stage of the fit in a patient who gave no history of any previous dislocation at this joint. Reduction presented no difficulty.

3. ATYPICAL FITS

(*a*) *Delayed Fits.*—In the majority of cases the convulsion occurs about fifteen seconds after the injection of cardiazol into the vein. In a few cases it is found that this interval is constantly exceeded, and a period as long as two or three minutes may elapse. So far as could be ascertained, in those cases all the cardiazol went into the vein. In one case it was known that the greater part of the cardiazol went into the surrounding tissues, and in this instance a seizure occurred, but not until fifteen to twenty minutes had elapsed. The longer interval is presumably accounted for by the slower absorption, which prevented the cardiazol from quickly reaching the concentration in the blood necessary for the production of the seizure.

(*b*) *Weak Seizure followed by a Strong.*—In one case on almost every occasion the injection of cardiazol was followed by a slight fit, and then, after an interval of up to a minute, the major convulsion occurred.

(*c*) *Strong Seizure followed by a Weak.*—In two cases immediately after the patient had had a strong seizure and was in a state of relaxation a second much weaker fit followed.

(*d*) *After-convulsions:*

(i) Convulsive Twitchings.—In one case where the veins were partially thrombosed an injection of 0.7 gramme into an arm was followed by a ballooning of the vein, and as no fit occurred a similar injection was given into the other arm, with the same result. Finally, a patent vein was chosen, and when another 0.7 gramme was injected a strong fit occurred; but throughout the next twenty-four hours this patient continued to have generalized convulsive twitchings accompanied by periodic vomiting. The cardiazol which was injected into the first two partially thrombosed veins was possibly absorbed so slowly that the concentration in the blood failed to reach that necessary to produce a major convulsion, but was sufficient to give rise to generalized twitchings.

(ii) Numerous Severe Seizures.—Case 18 (see table) is of great interest. Following the first injection of 0.5 gramme of cardiazol a strong seizure occurred and was followed after an interval of three minutes by another not quite so strong. Three days later a second injection of the same amount produced no reaction. On the third occasion 0.5 gramme again produced no reaction, so the dose was immediately repeated, with the result that a strong seizure occurred, followed almost at once by three more strong seizures. Later in the day the temperature rose to 101° and the patient appeared ill. On the next occasion, since 0.5 gramme had previously failed to produce a fit, 0.6 gramme was given without result. As before, this was immediately repeated, and was followed by the occurrence of seven fits at intervals during the next twenty-four hours. It was decided, in view of this, to discontinue further treatment.

4. ACTIVATION OF PULMONARY TUBERCULOSIS

Case 15, in which there were no clinical symptoms or signs of a pulmonary lesion before treatment was begun, showed after the ninth injection an evening rise of temperature, with clinical evidence of a right apical lesion, which has subsequently progressed rapidly. It is possible in this case that had a skiagram of the chest been taken before treatment the presence of a quiescent focus would have been discovered, contra-indicating treatment. Such an occurrence suggests the advisability of screening the chest in every case before treatment is undertaken.

The results of treatment described above must not be considered to be final, as relapse may yet occur in some of the cases. Indeed, in one (Case 5) which had received a full course of injections and had had thirty convulsions resulting in a partial remission there are already signs of relapse, and this in spite of a further short course of injections.

Conclusions

From the results it would appear advisable to treat every case of stupor, whether of long or short duration, with cardiazol. Complete recovery or improvement may be expected in those cases in which the illness has lasted a relatively short time and in which the stupor has been almost the earliest symptom. Even when underlying deterioration is masked by stupor the latter will disappear with cardiazol therapy, but the former will become evident. Apart altogether from the question of remission, refusal of food and consequent tube-feeding in cases of stupor should be almost completely eliminated by cardiazol therapy.

We would like to thank Dr. N. Roberts, medical superintendent of West Park Hospital, for permission to publish the details of the cases.

Clinical Memoranda

Suicide after Treatment as Voluntary Patients

During the last fifteen months four women between the ages of 30 and 38, who had been married for from eleven to eighteen years, have entered this hospital as voluntary patients, left in a month, and committed suicide within a few days of leaving—three by coal gas and one by drowning. Their cases bear such strong resemblances to each other as to necessitate being recorded as a group.

DESCRIPTION OF CASES

In three cases there was no suspicion of mental illness in the family; in the other the mother and one brother (out of five siblings) had each been in a mental hospital for a period. There was nothing of interest in their early histories except a tendency to obsessional traits. All had carried out the duties of a housewife with conscientiousness for many years. They were all non-smokers, and only one took a little stout occasionally as a tonic. They were or had been regular church-goers, and all had strong religious feelings. One had no children, two had one each, and the other had four.

In two cases the illness was the first attack. Of the others one had had mild symptoms six years before, and one had experienced, during the last fifteen years, six attacks of apathy and depression lasting a few weeks. Menstruation in each case lasted five to six days, and was regular and rather full. Their symptoms were generally worse during these periods. Their sexual appetites had been stronger than those of most women, but in three cases certainly there had developed either a marked apathy towards or a strong distaste for the husband, who had proved too dull or unimaginative or uninterested to hold their affections. Along with this the children of the marriage became a great trial.

When the patients were first seen at an out-patient clinic the acute symptoms had in each case remained unchanged for at least two months, but the total period of development of the illness had generally been much longer. All the four failed to respond to weekly out-patient psychotherapy, and were admitted to mental hospital as voluntary patients.

They appeared quiet and depressed, with a tremendous apathy which so impaired their energy, concentration, and initiative that their household duties had become intolerable. But on examination they quickly became emotional, and spoke freely of their difficulties and of the utter hopelessness of their future. The general intellectual level was good and the ordinary faculties well preserved. Insight was complete, and they were entirely without delusions or hallucinations. There was no retardation. They were friendly, helpful, and co-operative, and could laugh and be amused. Insomnia was prominent. Self-pity was exaggerated, and two of them said they had toyed with the idea of suicide, but this was not considered to be a great danger at that time.

Three of them complained of chronic bronchitis. Signs of autonomic instability (flush, pallor, coldness and numbness of extremities, dilated or variable pupils, sweating, frequency, and urgency without apparent physical cause) were rather more noticeable than usual, and the tendon reflexes were exaggerated. But otherwise physical examination and laboratory investigation revealed no abnormalities.

One patient was treated by prolonged narcosis, the others by rest in bed, mild sedatives, and simple encouragement and interest. They all appeared to improve a little, but they were anxious to leave, and discharged themselves. Within a few days of leaving (in two cases within twenty-four hours) they had committed suicide.

We regard these patients as women of the obsessional type, with very rigid ideas of right and wrong. It seems that dissatisfaction was followed by antipathy towards the husband, complicated in one instance by a violent attraction to another man. Inflexible moral standards, learnt in childhood, retained their full force, and the patients were unable to deal with the conflict aroused.

DISCUSSION

This group of cases is described as a contribution to the study of the prognosis in depressive states. The difficulties of treatment in such cases and the danger of failure are apparent; but there is a further complication of the problem.

Such cases represent only one group of many different kinds of non-certifiable mental illness which are coming in increasing numbers to psychiatric out-patient clinics. The last resort in treatment for them can only be the mental hospitals, where the facilities are often grossly inadequate; overcrowding is almost the rule, and proper segregation of patients is sometimes impossible. If this is a serious difficulty in the treatment of psychoses, it may be tragic when the voluntary decision to seek help in a mental hospital is made with such mental stress and effort as can only be compensated for by complete cure, and is accompanied by apprehension which proves to be justified.

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