ELECTRICAL CONVULSION THERAPY IN 500 SELECTED PSYCHOTICS.

By F. F. KINO, M.D., and F. T. THORPE, L.R.C.P., D.P.M.,
West Riding Mental Hospital, Wadsley, Sheffield.

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ALTHOUGH the electrical treatment of mental disorders is still in the empirical stage, its use is well established. Certain features and principles of treatment have been elucidated in the published reports, and all are agreed that it is specific for melancholic states.

The evaluation of the scope and usefulness of E.C.T. would be enhanced by the comparative study of case material from various clinics, but much in the published reports is not strictly comparable because of the unavoidable variation in the assessment of diagnosis and the degree of recovery. In our case material collected over a period of five years we have endeavoured to present the facts with a minimum of subjectivity by limiting our observation as far as possible to measurable data. In order to reduce the variable factor of diagnosis, some 700 psychotics treated with electrically induced convulsions have been reconsidered and 500 selected for analysis after carefully excluding the overlapping types, particularly those cases presenting features of both affective and schizophrenic psychoses. The selected cases can therefore be regarded as classical examples clearly separated into the two large groups of biogenetic psychoses—schizophrenic and manic-depressive, including involutional melancholia.

Further subdivision of the depressives was made on the basis of such objective and easily comparable factors as sex, age, body build and recurrency of attack. In addition we have taken notice particularly of the therapeutic results in the reactive as compared with the endogenous types.

It is true that other factors, such as heredity, duration of illness and the prepsychotic personality may also influence the outcome, yet they have not been considered in the present study because of the difficulty in obtaining reliable and measurable data.

The 500 selected cases varied in age from 13 to 71 years, and since the bulk of them were female melancholics, it was thought advisable to make a simple, objective and easily comparable subdivision of these cases into five groups according to the following age-periods:

(1) Up to 25 years—adolescents.
(2) 26 to 40 years—adults.
(3) 41 to 50 years—involutionals.
(4) 51 to 60 years—preseniles.
(5) 61 and over—seniles.

In the assessment of the results of treatment and their arrangement into statistically acceptable grades we are inevitably faced with the effect of subjective bias in the standard of remission, especially when, as in our cases, a follow-up has not been made. We have therefore limited the range of results to three grades—recovered, improved and unimproved.

Under recovery are placed those patients discharged from hospital with a full remission of psychotic symptoms. The term improved is applied to those in whom there was a partial remission of symptoms, whether discharged or not. The unimproved constituted the failures remaining in hospital with little change in their condition.

The number of returns to hospital has also been determined without prejudice to the recoveries, since the majority of returnees were fresh attacks. On the other hand, it is felt that five years is too short an interval to permit the use of the term complete recovery. It would appear, however, that the most we can expect from E.C.T. is a shortening of the current attack, for there is little evidence that the treatment has any effect on the incidence or frequency of further attacks.

The fact that E.C.T. will often cut short or abort an acute phase of a psychosis is in itself a fundamental therapeutic contribution which at the same time improves the chances of recovery.

The shortening of the sojourn in hospital is another important point. Apart from the economic gain, it will have a favourable effect upon the whole attitude of the patient towards himself and his morbid condition.

The predominance of females in our case material is due to a deliberate selection of the more recoverable melancholic states, which are relatively more frequent in the female sex and constitute nearly 50 per cent. of the admissions. Social-environmental conditions play an important part in precipitating depressions in females, as was shown by Thorpe (1939) in a series of cases under the title of demolition melancholia. Much worse upheavals have occurred during the war period, producing reactive depressions in predisposed individuals.

Treatment.

There are few practical difficulties in the application of electrical convulsion therapy, and we have endeavoured in all cases to give the minimum stimulus producing a convulsion. Leaving the voltage unchanged at 100, the shock is given for a duration of 0·3 sec., increasing to 0·5 sec. if no convulsion is produced. It was seldom found necessary to go beyond this if a good and firm electrical contact was made between the skin and the electrodes.

Far more important is the question of the spacing and the number of applications to be made in any particular case, as each patient needs a plan of treatment depending upon the type, intensity of the mental disorder, the physical condition, age and the individual reaction to treatment.

In many melancholics improvement is evident after one or two shocks, and in these cases 10 convulsions were considered to be the minimum, given three times weekly for two weeks, then twice in the third week, followed by once weekly. In our experience treatment should not be suspended if no

improvement ensues after 4 to 6 convulsions. In exceptional cases of melancholia 60 to 70 convulsions were induced with eventual recovery with no symptoms of ill effect.

In general it was found that mania and schizophrenia required a longer and more intensive course of treatment than melancholia, the prevailing tendency being to give up too soon.

In mania it was often found necessary to reduce the spacing of treatment to once daily, yet in spite of this some cases remained in a mild hypomanic condition with a tendency to relapse as soon as a treatment was omitted. In a few cases a dramatic recovery was obtained by giving 6 to 8 treatments during the first two days, followed by a maintenance dose two to three times weekly for four weeks.

In a typical and responding case of schizophrenia recovery would ensue only after at least 25 treatments.

In these series of cases psychotherapy was not attempted, but it was noticeable that the presence of improved patients in a ward soon creates an atmosphere of optimism amongst the patients and staff, which, after all, is the basis of successful psychological approach.

Results.

Melancholia.

Table I illustrates the distribution of 300 cases of melancholia in females arranged according to their age-groups. The figures on the right of the case-numbers indicate in a downward direction the number and percentage of cases recovered, improved and unimproved.

A recovery-rate of 80 per cent. was obtained for the whole group with little variation between the age-groups with the single exception of the presenile, which gave the relatively low figure of 65 per cent. The latter, however, was balanced by the surprisingly high recovery-rate of 86 per cent. in the senile group. But if the involutionals and presenile are considered together they will include most of the agitated depressions typical of this period, and this will give a recovery-rate of 73 per cent., which, as one would expect, is slightly lower than the rest.

A general recovery-rate of 80 per cent. is very satisfactory, although it

Table I.—*Melancholia in Females.*

Age.	−25. Adolescents.	26–40. Adults.	41–50. Involutionals.	51–60. Presenile.	61–. Senile.	Total.
Number	26 { 21=81% / 5=19% / 0=	114 { 95=83% / 15=13% / 4=4%	67 { 55=82% / 9=13% / 3=5%	57 { 37=65% / 15=26% / 5= 9%	36 { 31=86% / 2=5% / 3=9%	300 { 239=80% / 46=15% / 15= 5%
Recurrent types	2 { 2 / 0 / 0	6 { 4 / 1 / 1	15 { 10 / 3 / 2	14 { 7 / 6 / 1	5 { 4 / 0 / 1	42 { 64% / 24% / 12%
Alternating types	2 { 2 / 0 / 0	4 { 2 / 0 / 2	1 { 1 / 0 / 0	4 { 3 / 1 / 0	2 { 0 / 1 / 1	13 { 62% / 15% / 23%
Pyknosomatic type	5 { 4 / 1 / 0	23 { 22 / 1 / 0	17 { 11 / 5 / 1	12 { 8 / 3 / 1	6 { 5 / 0 / 1	63 { 80% / 15% / 5%
Puerperal cases	7 { 5 / 2 / 0	22 { 22 / 0 / 0	—	—	—	29 { 93% / 7% / 0%

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must be again emphasized that the group is a selected one, and that cases with the less favourable schizoid, obsessional or paranoid features have been deliberately excluded.

The results of E.C.T. in the recurrent melancholia are shown to be less favourable than in the primary attack, although the numbers are too small to draw definite conclusions, and similar observations could be made regarding the group of alternating states. It was also of interest to find that melancholics of pyknosomatic pattern showed no advantage over the other body types.

The best results were obtained in the puerperal depressions with a recovery-rate of 93 per cent. It was found that in general, the reactive depressions were more resistant to E.C.T. than the endogenous types, although this did not prejudice the ultimate prospect of recovery. Melancholics with signs of senilitas praecox belonged as a rule to the group of failures. From a separate calculation, comparing the results in agitated and retarded types of depression, little difference could be found, although we might expect the former to be more resistant to treatment.

The number of male melancholics in our case material is comparatively small, but their psychosis was often more intense and of longer standing than in females, and most of the patients belonged to the presenile age-group. Nevertheless, out of 39 cases selected, 60 per cent. recovered, 30 per cent. improved and 10 per cent. remained unimproved.

Mania.

The number of female cases of mania was not large enough to split up into age-groups, but they were much more resistant to E.C.T. than depressions. Out of 65 cases treated, 53 per cent. recovered, 27 per cent. improved and 20 per cent. remained unimproved.

In the puerperal manias the percentage of recoveries was almost as good as that found in puerperal melancholias, but in these cases there is a danger of complications arising when sepsis is present as was found in one of our patients.

In six cases of mania in males the results were similar to that in the females.

Schizophrenia.

The number of schizophrenics treated with E.C.T. is relatively small, and only recent cases have been selected for this report. Cases of longer duration than two years have been excluded, as it is common experience that they are very refractory to treatment. Table II illustrates the results obtained in 90 patients, half of each sex, and subdivided into simple, hebephrenic-catatonic and paranoid types. The results were about the same for both sexes, and of the total 90 cases, 24 per cent. recovered, 18 per cent. improved and 58 per cent. remained unimproved. The prospect in the simple type was even less

TABLE II.—*Schizophrenia.*

Types.	Number.	Recovered.	Improved.	Unimproved.
Hebephrenics and catatonics	63	27%	14%	59%
Simple	17	12%	23%	65%
Paranoid	10	30%	30%	40%
Total	90	24%	18%	58%

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promising than in other types. It was common to obtain a symptomatic recovery in states of stupor or excitement, although a state of stupor may be changed to one of excitement after a few treatments.

Duration of Stay in Hospital.

We have calculated the duration of stay in hospital of 280 female melancholics discharged as recovered or improved after E.C.T., counted from the first day of treatment to the day of discharge. The average length of this period was found to be three months. However, this estimation, although statistically correct, could be reduced to 10 weeks for the great majority of patients if we exclude our relapsing cases, which constituted about 5 per cent. of the total, and who remained in hospital for over one year under periodical treatment.

If, in contrast, we quote Batt's (1943) calculation of 40 weeks for the average stay in hospital for nearly 200 untreated melancholics, the financial saving in our patients is almost £40 per head.

When the duration of stay in hospital is further analysed according to the age-groups, it is found that the adolescents and adults were discharged in 10 weeks, the involutionals in 11 weeks, the preseniles in 16 weeks and the seniles in 12 weeks. It is noteworthy that the seniles showed a rapid as well as a higher recovery-rate.

In the group of discharged manias the average duration of stay in hospital was 17 weeks, which is a markedly larger period when compared with melancholics, as might be anticipated from the greater resistance to treatment of the former.

Stability of Recovery.

It is generally agreed that E.C.T. does not increase the liability of relapse in the manic-depressive, provided the treatment is adequate to suppress the current attack, for it is well known that some cases will relapse quickly if too few treatments are given.

In our case material we have selected 234 female melancholics discharged during the 3-year period between January 1, 1942, to January 1, 1945, and found that of these, 32 had been readmitted by August 1, 1945. This constitutes a recurrency of 13·5 per cent., which is similar to Batt's (1943) finding of 13 per cent. in 100 depressive psychoses treated with E.C.T. Since in our cases we were not able to carry out a follow-up, we cannot say how many patients have had mild recurrent attacks not necessitating admission to hospital.

Complications.

Complications arising directly from the use of E.C.T. have never been serious enough to bring the treatment into disrepute and, provided due care is used in the assessment of the physical risks in a given patient, the procedure can be regarded as reasonably safe. The complications which may arise can be considered under the heading of pulmonary, cardiovascular, skeletal and cerebral.

We have not thought it necessary to do a routine X-ray of the chest before treatment, but a careful physical examination was always carried out, and

except in schizophrenia, there seems to be little risk of actuating a latent pulmonary tuberculosis. In our material of some 700 cases we cannot recall any instance where clinical tuberculosis occurred after E.C.T., although we cannot speak for all the discharges.

Pulmonary embolism is said to be a rare complication, and we were unfortunate enough to have one example. The patient was a puerperal mania, aged 38, admitted eleven days after parturition. There were no clinical evidences of infection, and the mental state was so acute that it was decided to try the effect of E.C.T. Over a period of eleven days a convulsion was induced on seven occasions with benefit, but six days after the last convulsion she was found to have blood-stained sputum and a mild pyrexia. A blood examination showed anaemia with a normal leucocyte count, but in culture there were found haemolytic streptococci. She died six days later, on the 36th day after childbirth, despite the administration of sulphonamide. The autopsy revealed a small infarct of the lung, pelvic venous thrombosis, and evidence of a low grade puerperal infection. In this case one cannot exclude the possibility of E.C.T. mobilizing a thrombus in the pelvic veins, although the patient had been actively maniacal all the time.

Cardiovascular complications have not occurred in our series of cases. Vertebral fractures, on the other hand, have been encountered by all investigators, although such injuries may be symptomless. We have X-rayed only those cases in which backache was complained of, and in eight cases compression fractures of the lower dorsal vertebrae were revealed, but in no case was there any noticeable after-effect. Henderson *et al.* (1943) in a series of 260 patients encountered four instances of vertebral compression fractures—an incidence very similar to ours. We have not used any physical or chemical method of restraint to prevent fractures apart from wrapping a sheet round the trunk and arms to prevent injury to the shoulders, but there is no evidence that this has been effective. Other types of fractures in our series were limited to three instances of injury to shoulder, one a dislocation, one a fracture, and in one case a fracture of the scapula. Our total fracture incidence of ten cases in about 1,000 patients treated is low compared with the figure of 3·9 per cent. given by Cook (1944) as the average from five sources. Details of the vertebral fractures are shown in Table III.

TABLE III.—*Vertebral Fractures.*

Sex.	Age.	Vertebrae.
M.	35	D 7, 8
M.	40	D 6, 7
M.	47	D 5
M.	60	D 5, 6
F.	25	D 12
F.	42	D 6, 7
F.	50	D 4
F.	59	D 6, 7

Cerebral complications, such as persistent confusion, have not been a serious problem in our cases. Transient memory disturbances have occurred, and in a few instances a Korsakoff syndrome was noticed, but we have not seen any memory defects remain.

Discussion.

Our results in melancholia are in general agreement with those of other observers, and serve to confirm the particular value of E.C.T. in depressive states.

Fitzgerald (1943), in 150 cases of both sexes, reports 78 per cent. recovery and 10 per cent. failures. Kalinowsky (1943) achieved 86·6 per cent. "recovered and much improved" in 136 cases of melancholia. In 100 females suffering from depressive psychoses Batt (1943) obtained 87 per cent. successes and 13 per cent. failures. Henderson *et al.* (1943) report 64 per cent. recovery in the involutional group and 46 per cent. in other depressions, but the rates for patients who "in some way benefited by the treatment" are 80 and 74 respectively. Mayer-Gross (1945) obtained 80 per cent. "recovery and improvement" in 49 cases of melancholia over the age of 60 years, which is lower than our figure of 91 per cent. for a similar age-group, but it is possible that our cases were of more recent origin. In a comparative study of 70 melancholics treated with E.C.T. and 68 without, Tillotson and Sulzbach (1945) report 80 per cent. improvement under shock treatment and 50 per cent. in the control group.

Our recovery-rate of 80 per cent. would by comparison appear to represent the maximum possible achievement, but since it refers to cases specially selected for purity of diagnosis the recovery-rate would no doubt be somewhere in the region of 70 per cent. in a series of consecutive cases.

Our recovery-rate of 53 per cent. for states of mania is much less than that obtained by Kalinowsky (1943), who states that his results are now "as good as those for the depressive phase" provided the patient is given adequate treatment. On the other hand, Epstein's (1943) estimation of 38 per cent. recovery in 13 cases seems too low, and is perhaps due to the smallness of his case material and more cautious treatment.

Our unfavourable results in a selected group of schizophrenics (24 per cent. recovery) agrees with Epstein's (1943) 16 per cent. recovery and Reznikoff's 27·6 per cent. remissions, but Kalinowsky and Worthing (1943) in a series of unselected cases obtained a recovery-rate almost as high as in the affective psychoses. Their figures of 67 per cent. remissions and 11 per cent. improved in cases under six months' duration and 56·8 per cent. and 20·3 per cent. for cases up to one year duration seems unduly high, and might be accounted for by a variation in the estimation of remissions. We agree with these authors that the early paranoid type often respond well, but unlike them we found the simple type of schizophrenia most refractory to treatment.

The dangers and complications of E.C.T. have not been formidable in our total series of some 1,000 cases with the single exception of a pulmonary embolism in a puerperal mania.

Deaths due to electrically induced convulsions have been very few, and Napier (1944) described five cases which he considered to be the only deaths in England and Wales, to which may be added a case of cerebral fat embolism after E.C.T. recorded by Meyer and Tear (1945). In none of these cases was pulmonary embolism a cause of death, but our case serves to emphasize this

particular danger whenever there is reason to suspect the presence of venous thrombosis in a patient, particularly in a case of puerperal psychosis. Jacobs (1943), in a special study of psychoses following childbirth, states that though a careful consideration of physical contra-indications is essential, convulsion therapy need not be delayed until the end of the physiological puerperium; however, it would seem advisable not to apply this therapy within a month of delivery.

With the latter observation we are in entire agreement, for although pulmonary embolism is ordinarily a rare occurrence during the puerperium, it is liable to occur in anaemic and infected patients as a result of some sudden movement or exertion.

Summary.

Five hundred selected cases of melancholia, mania and schizophrenia treated with electrically induced convulsions have been specially studied and the results assessed.

In a group of 300 female melancholics a recovery-rate of 80 per cent. was obtained and a further 15 per cent. improved. Patients were discharged after an average of three months' stay in hospital, but 13 per cent. of the discharges returned to hospital sooner or later over a period of three years and six months.

Mania is more resistive to E.C.T. than melancholia, and no more than 50 per cent. recovery-rate could be obtained.

Puerperal melancholia and mania showed a very high recovery-rate, but one case of pulmonary embolism is recorded as a complication of E.C.T. given in the early puerperium.

Schizophrenics were disappointing, with only 24 per cent. recovered, but this is partly compensated by the symptomatic value of the treatment for the intercurrent episodes of stupor and excitement.

Electrical convulsion therapy to be effective requires individual adaptation to a given case and should be prolonged in the more resistive psychoses.

A plan of subdivision of melancholias according to age-groups is suggested in order to facilitate comparative evaluations of the results of treatment in various clinics.

Skeletal complications occurred in 11 instances out of about 1,000 patients, and 8 of these have been compression-fracture of the dorsal vertebrae.

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