ELECTRO-CONVULSION THERAPY IN 301 PATIENTS IN A GENERAL HOSPITAL*

WITH SPECIAL REFERENCE TO SELECTION OF CASES
AND RESPONSE TO TREATMENT

BY

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In this country psychiatric patients have rarely been treated in general hospitals under exactly the same conditions as other medical or surgical cases. Some indication of the possibilities of this branch of psychiatry has been given already (Sands, 1943), and the results bear comparison with any in general medical wards (James, 1945). One of the chief methods of physical treatment employed—convulsion therapy—has been the subject of numerous reports during the last nine years. Most of these have been from the mental hospital point of view—concerned mainly with the results, risks, and technical modifications appropriate to the more severe states of psychotic depression. The majority of depressions in general hospital psychiatric wards are of a different pattern (see later), requiring an altered plan of treatment. Before treatment they need special attention to differential diagnosis for the elimination of all those conditions whose superficial resemblance enables them to be covered by the term “depression.” Excepting a few—e.g., Stockings, 1944; Frank, 1945—most publications discuss the effects of convulsion therapy with little regard for the wide range of conditions involved. Since only a section of the total range of depressive states can be specifically treated by convulsion therapy, errors are not infrequent, with aggravation of illness and waste of effort. The issue is further confused by the profuse descriptive terminology linked with varieties of depression. Labels such as melancholia, reactive or endogenous depression, psychotic, psychoneurotic, agitated, involutional, psychopathic, anxiety depression, etc., are some of those encountered.

Concerning the question of diagnosis, textbooks necessarily stress the characteristic qualities of each reaction type, and unwittingly one comes to expect the illness in “pure culture” as it were—e.g., either schizophrenic or depressed. In actuality, the patient usually presents no full-fledged symptom-complex running true to a particular reaction type. Like the human society of which he is an individual member he shows but one phase in the evolution of a process, even if a pathological one. In the early stages of the process several abnormal personality trends may be apparent, and in different situations and times differing impressions will be gained of what may ultimately prove to be the main diagnosis. Later, as the evolution of the illness proceeds, condensation of the clinical picture tends to occur, narrowing down to one rather obvious reaction type. Perusal of the early records of a chronic case will often demonstrate this process of diagnostic “purification,” the complicated and uncertain diagnosis of recent illness moving, sometimes regressing, towards the single pathological type. In all cases incapable of early recovery this process is going on in greater or lesser degree. It is essential to recognize it in order to understand many of the clinical effects of convulsion therapy in those early cases of a few weeks' or months' duration which are the special concern of this paper.

Depression in a mental hospital patient is generally characterized by radical personality change and considerable inaccessibility. The diagnostic field is covered, to a large extent, by manic-depressive, recurrent, and involutional types, depressed G.P.I.s, pre-senile and arteriosclerotic psychoses, and occasionally early schizophrenias. By contrast, the subjects of depression seen in the general hospital or out-patient department in an earlier or milder phase of the same pathological process retain more of their original personality and are more accessible; questions of certification infrequently arise, and socially all are treated on the same footing as medical or surgical patients. Table I shows the different trend in

diagnosis of the general hospital depressive states. Less than 25% can be diagnosed as “manic-depressive, involutional, or recurrent.” The majority either are simple, endogenous, or reactive states or are associated with neurotic or psychopathic complications. A few are pre-schizophrenic. Generally their personalities remain well preserved and questions of certification hardly arise. The response of these patients to convulsion therapy, while often as satisfactory as in the more advanced psychotic depression, soon showed the need for special care and some reorientation in diagnosis and case selection. In 1934 Lewis, writing on the less advanced forms of depressive illness at the Maudsley Hospital, said, “Pure syndromes and reaction types are less and less often found as more careful examination of the patient and his illness is made.” One of the consequences of such difficulties is that many of the cases admitted to military mental hospitals as depressive psychoses are often not psychotic but acute reactive neurotic disturbances (Stockings, 1944). Conversely, in a neurosis centre it is not uncommon to find cases admitted as neurotic proving to be less severe forms of psychotic depression, even allowing for those termed neurotic for administrative reasons. A similar situation prevails with civilians.

However, such apparent contradictions and multiple patterns of reaction are natural enough, remembering the possibilities of pathological and non-pathological variations in the personality; but from the therapeutic aspect it is imperative to decide which is the dominant pattern or personality deviation responsible for the maintenance of the patient's illness and which are of secondary significance. The mere intensity of symptoms is no reliable guide. In deciding, we need, more than ever, all relevant knowledge of the personality prior to breakdown, and of the transition from normal to pathological responses. The practical importance of all this is seen when a few convulsions clarify the uncertain diagnosis rather too drastically. Instead of the usual remission there may be further depression, confusion, anxious or hysterical symptoms, incontinence, or no demonstrable effect at all—not because the method is useless, but through the psychiatrist failing to perceive the mental pathology of his patient. The truth is that in this direction treatment has outstripped diagnosis and is likely to be more accurate than the clinician in doubtful cases.

Owing to the frequent finding of neurosis and depression in the same patient and the intractable nature of the chronic neurotic, attempts have been made to treat the neuroses with electric convulsion therapy (E.C.T.). The literature on the subject is conflicting, and most of the results are by way of an appendix to larger series of figures for the psychoses. Moriarty and Weil (1943) quote 14 authors for 130 cases of all forms of neurosis, of whom 28% were classified recovered, 61% improved, and 11% not improved. They concluded that these results were encouraging, and stated that 10 out of 20 of their own cases remitted with the additional assistance of psychotherapy. They were of the opinion that the better appetite, sleep, and affective gain wrought by E.C.T. paved the way for subsequent psychotherapy. In 1945 the same authors quoted 42 unclassified neurotics treated by E.C.T. and psychotherapy; of these 38% remitted, 55% improved, and 7% were unchanged. Pacella and Barrera (1943) thought that metrazol made neurotic patients worse, especially the obsessional compulsive group, and emphasized the need for psychotherapy in patients given E.C.T. Osgood (1944) draws attention to the difference in opinion about the value of E.C.T. in neuroses, while Bennett (1943) reported on 11 E.C.T.-treated cases, all showing some improvement. Kalinowsky *et al.* (1944) believe that the usefulness of this treatment in psychoneurotic conditions is not yet established. Smith *et al.* (1943) regard the treatment as of doubtful value. Frank (1945) found the post-convulsive automatism of psychoneurotics and psychopaths to be dramatic, to be covered by amnesia, and to be an expression of subconscious memory material. He observed that this “catharsis” did not seem to help. The outstanding impressions from these reports are the poverty of the results compared with those usual in psychotic depression, and the stress laid on the use of psychotherapy in the few favourable reports—a contrast to the perfunctory allusions to psychotherapy in discussing E.C.T. in psychotic depression.

* Patients were accommodated in one ward, sometimes two, of the general hospital block, separate from the military neurosis unit.

From the many varieties of mental disorder encountered at a neurosis centre I have selected 301 cases treated by myself or my colleague Dr. Shorvon with convulsion therapy, composed of neuroses (80), minor psychotic depression (134), and some having elements of both (87).

TABLE I.—Incidence

	%	No.
Minor psychotic depression:		
Simple endogenous	30.8	68
Reactive	7.2	16
Recurrent	8.1	18
Manic-depressive	5.0	11
Involutional	9.6	21
Depression with neurosis:		
Anxiety	9.6	21
Hysteria	13.1	29
Obsessional	9.0	20
Depression with depersonalization	3.1	7
Depression with psychopathic personality	4.5	10
Total depressions		221
Neuroses:		
Anxiety	35.0	28
Hysteria	37.5	30
Obsessional	27.5	22
Total (all cases)		301

The chief features of this sample of patients are: (a) They are representative of the largest section of psychiatric practice. For every major psychosis there are many of the above minor types. (b) Neurotic symptoms occurred to a greater or lesser degree in half the total number. (c) Genuine manic-depressive types were uncommon, but short-term emotional instability was relatively frequent. (d) Depression was often associated with psychosomatic, depersonalization, or psychopathic symptoms. Though listed as a leading feature of only 7 patients, depersonalization was a complication to some degree in at least 21 others. (e) The response to E.C.T. tends to be more variable than in the severer psychotic states seen in mental hospitals owing to the association of other reaction types with depression. The main clinical groups react to convulsions in an individual way that is often of assistance in diagnosis—more so than earlier reports led one to expect.

Primary Neurotic States

1. *Obsessional Neurosis*.—Since the use of convulsion therapy the treatment and prognosis of this group depend more than ever on deciding whether the depressive aspect of such patients represents the primary factor in a psychotic depression or a secondary one in a severe obsessional neurosis. A full psychiatric examination will settle the matter in many instances, but psychiatrists will be familiar with the intermediate type in which the relative proportion of obsessional neurosis and depression cannot be definitely assessed. The mere intensity of such obsessional or depressive symptomatology as the patient displays is no reliable guide, for patients tend to insist on the primary nature of the obsession (Lewis, 1934). Their misleading insistence has led to unjustifiable claims for the successful treatment of obsessional neurosis by E.C.T. The following example from a case in this series originally diagnosed as obsessional neurosis illustrates the difficulty. The patient presented strong obsessional symptoms of 16 years' duration. Her father and one brother had obsessional personalities. Her condition was such that four experienced psychiatrists considered her suitable for leucotomy and unlikely to respond to E.C.T. None the less, she improved so much on a course of convulsions that after receiving six she was discharged and shortly returned to work. It may be objected that a more carefully taken history would have elicited a point in the illness where depression set in, but it could not be found even where a predisposition to do so existed. She partly relapsed after a year. Table II shows the results of treatment in two groups of neurotic and psychotic patients, both having strong obsessional compulsive thoughts.

The disparity in results is obvious. Only 3 obsessional neurotics showed much improvement, compared with 17 out of 20 cases of obsessional depression recovered or much improved. Besides depression, four of the obsessional neurosis cases were complicated by anxiety and two by schizophrenic

features. The follow-up finding that 5 out of 13 cases of obsessional neurosis could be considered recovered after twelve months is in agreement with those who believe that this form of neurosis has a less gloomy prognosis than is often thought to be the case. The effect of convulsion therapy on obsessional

TABLE II

	Obsessional Neurosis						Depression with Obsession					
	R	MI	I	NC	CR	Total	R	MI	I	NC	CR	Total
At discharge ..	0	3	10	9	0	22	11	6	2	1	0	20
After 6 months ..	4	2	6	1	0	13	6	3	1	0	2	12
After 12 months ..	5	3	3	1	1	13	4	4	0	0	0	8

R = Recovered. MI = Much improved. I = Improved. NC = No change. CR = Complete relapse.

neurosis was usually negligible. After 6 to 8 convulsions amnesia may lead to a temporary "sham" recovery. Sometimes a symptomatic improvement occurred for 12 to 24 hours after a fit. This temporary breaking up of the obsessional pattern occasionally paved the way for progress in psychotherapy—the combined treatment resulting in a better adaptation. Apart from early complaint of memory defect, the obsessional neurotic was singularly free from the mental complications seen in other types, to be discussed shortly.

TABLE III

	Anxiety Neurosis						Depression with Anxiety					
	R	MI	I	NC	CR	Total	R	MI	I	NC	CR	Total
At discharge ..	1	5	11	11	0	28	10	6	4	1	0	21
After 6 months ..	2	8	4	5	2	21	7	3	4	3	2	19
After 12 months ..	2	3	5	3	5	18	10	3	2	1	1	17

2. *Anxiety Neurosis*.—Of the 28 cases of anxiety neurosis listed in Table III 19 were associated with varying degrees of depression, 7 with obsessional symptoms, 6 with hysteria, and 3 with depersonalization. The distinguishing features of their reaction to E.C.T. are: (a) more apprehension before treatment than any other group, treatment often becoming a focal point in their phobias; (b) exaggeration of somatic symptoms appears for a few hours or days. Aches and pains of a vague psychogenic quality occur in various parts of the body, and there is much unattached fear. These developments indicate that treatment should be stopped if the patient has not already refused to continue. There is every likelihood of doing more harm than good in attempting to treat anxiety states with E.C.T., and the contrasted results of Table III are obvious enough.

TABLE IV

	Hysterical Neuroses						Depression with Hysteria					
	R	MI	I	NC	CR	Total	R	MI	I	NC	CR	Total
At discharge ..	2	3	15	10	0	30	8	13	5	3	0	29
After 6 months ..	3	2	6	8	2	21	3	6	10	2	2	23
After 12 months ..	3	2	6	9	0	20	5	8	4	2	5	24

3. *Hysterias*.—In the 30 patients of this group conversion symptoms were sometimes present, but were not of a fully developed or fixed type. The majority showed some superficial depression, and the prognosis in general was poor. There were two forms of reaction to E.C.T.—a dramatic but transient improvement, and, more often, a flare-up of psychological and physical symptoms. Any new physical discomfort provoked by the treatment tends to be incorporated into the hysterical pattern. For example, slight nausea will tie them to a bowl for an hour or more in expectation of vomiting if allowed to do so, though in all other patients the liability to vomiting is rare in E.C.T. Similarly, old-standing hysterical pains such as backache become greatly exaggerated. It is true to say that such improvement as occurred in these hysterical neurotics was due to other treatment or could be ascribed to wrong diagnosis.

So far as primarily neurotic illness is concerned one can only conclude that convulsion treatment is best avoided. Neurotic patients complain of memory defect much earlier

and more insistently than do psychotics. In anxious or hysterical conditions the patient may be made temporarily worse. The effects of E.C.T. are not comparable with those of psychotherapy in neurosis, where Curran (1937) has reported definite improvement in from 60 to 70% of patients. Where a complexity of psychotic and neurotic traits defies ordinary means of diagnosis it may sometimes be justifiable to employ a few well-spaced convulsions to give further information for the purpose of taking a more definite line in treatment.

Depression with Neurotic Complications

In this section the same personality deviations are considered—i.e., depression, hysteria, anxiety, and obsession states—but their relative importance in the aetiology is reversed. In these patients the principal reaction type is mild or moderately severe psychotic depression, while neurotic symptoms are of secondary aetiological importance. The latter were definitely present in one-third of the 221 cases. To a degree which depends on their development in the previous personality, these neurotic symptoms modify prognosis and treatment in their own characteristic way. When they are the outcome of comparatively minor neurotic traits in an otherwise well-adjusted personality they disappear as the depression is benefited by treatment. Alternatively, the more closely neurotic qualities in the previous mental make-up approach the status of chronic symptoms the less satisfactory will be the final effect of E.C.T. on an intercurrent psychotic depression.

Accurate information about the previous personality of a patient suffering from depression and neurotic symptoms will enable one to forecast the extent of recovery after treatment. If the previous personality has been well adjusted, having no more than mild neurotic trends, then the depression and neurotic symptoms, however florid, are likely to respond to treatment. But if the personality has been definitely handicapped for a long time by neurotic features, then, though the depression may remit, the neurotic symptoms will subside only to persist at their former level in the personality. Although an infinite variation prevails in the ratio of psychotic to neurotic activity, we must endeavour to decide which is the dominant pathological deviation. Failure in this respect may leave the illness not merely unchanged but worse after E.C.T., as already noted.

Obsessional symptoms are the only neurotic complication having any favourable effect on the outcome of a psychotic type of depression. The immediate results are as satisfactory as in uncomplicated depression; patients were not prone to the mental complications seen in other neuroses, and the relapse rate was the lowest for any of the larger clinical groups. These last two factors are no doubt a corollary to the rigidity usually imposed on the personality by obsessional qualities, and recall the influence of the obsessional mechanism in preserving the personality of the schizophrenic patient (Stengel, 1945). Subjects with depression complicated by neurosis complain of memory defect earlier and more often than purely psychotic types. Obsessional depressive patients notice this forgetfulness more than any other group treated by E.C.T.

Where recent anxiety symptoms complicate depression they do not materially affect the result. Such patients are more apprehensive of E.C.T. and may need premedication. Sodium amytal 3 to 6 gr. (0.2 to 0.4 g.) half an hour before treatment, or 3 ml. of 10% sodium amytal intravenously immediately beforehand, will not prevent the fit, though a small voltage increase is sometimes required. This modification is also useful for temporary post-convulsion restlessness or excitement.

The presence of hysterical symptoms in a case of depression means a more unstable constitution. In 29 patients of this type 9 had partly or completely relapsed in six months, and 12 in a year. Immediate results compared unfavourably with other depressive states with or without neurosis, so that this was the only group in which recovered cases were exceeded by any less satisfactory category. Even so, the contrast with the primary hysterics in results is very striking. This contrast is most obvious in Tables II and III, and one is tempted to infer that where a case considered to be primarily neurotic has shown considerable gain with E.C.T. the diagnosis is probably wrong.

The depressions with secondary neurotic symptoms, having a combined "recovered-much improved" rate of 76.5%, compared well with 77% for all other depressions shown in Table V.

TABLE V.—Depressions (Endogenous, Reactive, Involutional, Recurrent, Manic-depressive, and Psychopathic)

	R	MI	I	NC	CR	Total
On discharge ..	59 (54%)	25 (23%)	20 (18%)	5 (5%)	0 (0%)	109
After 6 months ..	41 (45%)	20 (22%)	20 (22%)	1 (1%)	9 (10%)	91
After 12 months ..	44 (60%)	12 (16%)	9 (12%)	4 (6%)	4 (6%)	73

The results in these mild or moderately severe psychotic cases differ little from other published reports. Their condition, on discharge, of 77% recovered and much improved, 18% improved, and 5% unchanged, is in keeping with the 47 statistical reports collected by Ziskind *et al.* (1945), in which 2,777 cases were divided into 69% recovered and much improved, 18% improved, and 13% unchanged. One patient committed suicide three months after discharge.

Relapses

Since relapse is sometimes considered to be frequent, its incidence was fully examined, and is shown in Table VI.

TABLE VI.—Relapses (6 months to 4 years)

	No. of Patients	Partial Relapse	Complete Relapse	Total Relapsed
Depression:				
Endogenous ..	68	7 (10.3%)	8 (11.7%)	15 (22%)
Reactive ..	16	0 (0%)	4 (25%)	4 (25%)
Recurrent ..	18	9 (50%)	3 (16.6%)	12 (66%)
Involutional ..	21	2 (9.5%)	4 (19%)	6 (28.5%)
Manic-depressive ..	11	1 (9%)	1 (9%)	2 (18%)
Psychopathic personality ..	10	0 (0%)	0 (0%)	0 (0%)
Anxiety ..	21	4 (19%)	3 (14.3%)	7 (33.3%)
Hysteria ..	29	7 (24.1%)	5 (17.2%)	12 (41.3%)
Obsession ..	20	2 (10%)	1 (5%)	3 (15%)
Depersonalization ..	7	1 (14.3%)	2 (28.5%)	3 (42.8%)
Total ..	221	33 (14.9%)	31 (14%)	64 (28.9%)

Of all relapses, half occurred within the first 6 months, approximately a quarter more within a year, and the remaining quarter within four years. If out-patient observation is maintained for six weeks after discharge many incipient relapses can be curtailed by further treatment. The 25% relapse rate for reactive depression is misleading if one does not allow for the fact that the personal problems of all the patients represented in the percentage could not be appreciably alleviated, and demanded an exceptionally high degree of adjustment. The unfavourable effect of neurotic features on the incidence of relapse has been noted elsewhere, obsessional depressions excepted. The high relapse rate of the recurrent group offers no hope of convulsion treatment limiting their constitutional liability to subsequent attacks. The ease with which these recurrent cases become depressed is usually paralleled by their rapid response to a few fits. Remembering that all these patients were subject to frequent bombing and other wartime stresses, the general relapse rate is probably not excessive. In the largest single group of endogenous depression only one out of every eleven relapsed completely.

Indifferent Results

To assist in case selection 52 depressed patients discharged "improved" or with "no change" were examined for factors which might have contributed to these unsatisfactory results.

(1) *Treatment was insufficient* in 14 cases on account of physical handicaps, refusal to complete the course, or the presence of strong delusional symptoms in the depression. In the latter cases, as Fitzgerald (1943) has pointed out, longer courses of fits are necessary than in simple depressions. Of the 5 cases of depression which made no improvement at all (see Table V) 4 had insufficient treatment owing to premature discharge. Of the 20 patients listed as "improved" 5 failed to complete their treatment, while no such failures were seen in the "recovered" and "much improved" categories.

(2) In 20 depressed patients *severe chronic neurotic symptoms* with hypochondriasis and depersonalization prevented full recovery. Such symptoms persisted even though depression was improved.

(3) *Psychopathic personalities* adversely affected progress in at least 5 cases.

(4) In 4 cases an early depression proved to be a temporary mask for *schizophrenia*.

(5) In 7 cases *persisting reactive stresses* remained undisclosed until several fits had been given. Such patients would improve for 12 to 24 hours, then relapse. This type of response should always suggest further search for reactive factors, such as homosexuality, marital infidelity, etc.

(6) *Over-treatment*.—In one of my cases two fits were enough to translate depression into mania. In a general hospital psychiatric ward such a complication is an impossible problem which may result in transfer to an observation ward, unless the attack is mild enough to be well controlled by a course of continuous sleep. The first sign of such a change is failure to sleep, so that in cyclothymic patients it is well worth while maintaining a sleep chart each night to give the first warning of the manic swing.

In the whole series other factors prejudicial to full recovery were:

(7) *Subshock*.—In 66 depressed cases which had one or more subshocks in their course the recovery rate on discharge was 21% less than that for the whole series. Although it is generally considered advisable to use the minimum current which will induce a fit, it is probably better to give 10 to 15 volts in excess of the minimum rather than strive for a margin so narrow that there is substantial liability to subshock.

(8) *Age*.—In 220 depressed cases there was no significant variation for age until after 60, when the expectation of recovery or considerable improvement with E.C.T. is half the corresponding rate for early or middle life.

TABLE VII.—Results According to Age Groups

Age (years):	Under 20	21-30	31-40	41-50	51-60	61-70
A. Recovered and much improved	10	47	42	35	21	4
B. Improved and no change	3	19	15	12	9	3
Ratio of A to B	3.3	2.5	2.8	2.9	2.3	1.3

Depersonalization

This fascinating symptom, of which so little is really known, was prominent in 20 cases, and occurred in a lesser degree in many others. So long as it occurs in an essentially depressive setting, it will clear as the depression responds to E.C.T., and in this respect depersonalization behaves like any of the classical forms of neurosis. Where severe it has an unfortunate habit of clouding the depression. The patients tend to make it their chief complaint, and the real diagnosis is obscured. The combined "recovered" and "much improved" percentage for depressed depersonalization cases is not significantly less than the corresponding figures for endogenous depression.

There remain a few points on which, as a result of further experience, it is possible to write more conclusively.

The Correct Number of Fits

There can be no absolute rule about this, since the number has to be adapted according to the type of illness and its severity in each patient. Because individual requirements may vary from 2 to 15 fits at the rate of one, two, or three a week, it is inappropriate to think in terms of set courses after the practice of injections of arsenobenzol for syphilis. As a rule, schizophrenic cases require from 10 to 15 fits at the rate of three per week, dropping to two after the first two weeks. For most depressions a frequency of two fits a week is sufficient. When delusional symptoms are prominent (cf. Fitzgerald, 1943) a total of 8 to 12 fits is usually needed, while in depressions not so complicated the number may range from 2 to 8. The latter figure is suitable for some chronic obsessional states. In many cases it is better to give fits more frequently at first and space them out later, according to progress. The above numbers are based on the practice of giving one or two further fits after remission of symptoms has occurred, in order to minimize possibilities of relapse. In general, the more often fits are given per week the greater the incidence of confusional states, of forgetfulness, and of delta activity in the E.E.G. pattern. The number cannot be properly regulated and the above complications minimized without personal interviews after every one or two fits, because

individual needs cannot be foreseen more than one or two treatments ahead. The patient should be interviewed on a day when no treatment is given, otherwise apprehension before and mild confusion after the fit render co-operation doubtful.

Fractures; Pregnancy; Late Fits

The symptomless character of most of the compression spinal fractures occurring after E.C.T., the absence of subsequent disability after over 10 years, and the finding of similar fractures in 10% of epileptics (Cook and Sands, 1941) have allayed much of the anxiety felt in the matter. Since it was obviously desirable to minimize the chances of these fractures, the effect of extension over a rolled blanket placed under the mid-thoracic spine while counter-pressure is exerted on shoulders and hips, as recommended by Furst (1940), was tried on 100 female patients. Fracture boards were placed under the mattress. The incidence of fractures was reduced to 4%, compared with the 14.7% noted in 1941 (Cook and Sands), when no restraint was used in a group of 143 cases, half male and half female. With the spine fully extended, only minor degrees of compression were found in the few patients so damaged. All patients were radiographed before and after treatment. In some reports pain in the back has been the criterion for the use of x rays and the basis for subsequent figures of fracture incidence. This is misleading, since the pain is sometimes of purely muscular origin and many spinal fractures of the simple compression variety due to fits are not accompanied by pain. Local tenderness over the site of fracture, with or without pain referred round the lower chest towards the epigastrium, aggravated by deep breathing and coughing, is the most trustworthy clinical sign. In the present series of 301 patients an impacted fracture of the humeral neck was the only other form of bony complication.

One patient was discovered to be three months pregnant during a course of 5 convulsive shocks. Another was not known to be pregnant until her course of 8 convulsions had been concluded. Both pregnancies subsequently terminated in full-time healthy children.

No late fits suggestive of induction of an epileptic habit are known to have occurred in this group, in spite of a fairly comprehensive follow-up, nor was there any evidence of a lowered threshold for the induction of fits in the later stages of a course. The E.E.G. abnormalities in a group of 58 patients examined by Dr. Denis Hill did not include the characteristic wave and spike of petit mal.

Commentary

One of the most interesting points about convulsion therapy is the consistency of its effects amongst the commoner mental illnesses, with the resulting illumination of diagnosis in doubtful cases. First, as between neurotic and psychotic states; although symptoms of both may often be found together in early cases, if convulsion therapy is given it differentiates between them and emphasizes the gulf between their appropriate treatment. While the psychotic depression cases, with their withdrawal from reality and diminished awareness of the environment, thrive on the massive psychological and physical stimulus of the fit, the neurotics, with a pathological awareness of self and unstable and exaggerated emotional responses to environmental change, are aggravated by such trauma. The results here and in other papers support this view. In the psychotic group itself (organic cases excluded) the efficiency of the treatment shows considerable variation, depending largely on whether affective or thought disorders predominate. Though results in the former are generally good, the latter do not show the same immediate specific response. Those conditions regarded as primarily disorders of thought—namely, the schizophrenias, paraphrenias, and paranoias—have their own mode of reaction. There is usually no detectable response until 4 to 6 fits have been given; then some symptomatic improvement occurs coincident with forgetfulness of recent events, with mild confusion, and with dysrhythmia in the E.E.G. If the treatment is continued further, as advocated by some authorities, then after 10 to 15 fits appears the plateau type of over-politeness and emotional shallowness described by Frank (1945). In fact, a temporary sham

improvement is maintained so long as some degree of disintegration of pattern of thought can be effected by the fits. Individual cases have often done well, particularly where a lively affective reaction accompanies schizophrenic thinking. Even so, as Sargant and Slater (1944) have pointed out, relief of the mood disorder may occur, leaving a pathological thought content uninfluenced. It is hardly surprising, therefore, that figures for large series of such patients are not to be compared with results in depressions, and in the long run are not better than those in controls. By contrast, in psychotic depression the patient may have recovered, or be well on the way to doing so, before discoverable abnormality of memory or E.E.G. can be found. Old people often respond well to E.C.T., although about the age of 60 or later it is not uncommonly found that, after dispersal of depression, senile changes remain in the form of narrowness and poverty of ideation, tendency to perseveration, and the use of a very limited range of words. In mania the effect is less dramatic, yet E.C.T. appears to exert a form of sedation on the manic symptoms, often most useful at the height of the illness. Neuroses, depressions with neurotic features, and reactive depressions have all been described as possessing characteristic reactions to convulsion therapy. It is certain that the careful observation of these reactions under in-patient conditions can give much useful information about the underlying psychopathology, duration of treatment, and prognosis—the very part of the treatment requiring a specialist's attention.

TABLE VIII.—Case Selection for E.C.T.

Favourable	Doubtful	Contraindicated
Psychotic depression with retardation, agitation, delusions, and neurotic or psychopathic complications	Schizophrenia	Anxiety neurosis
Depressed phase of manic-depressive psychoses	Paraphrenia	Hysteria
Recurrent depression	Paranoia	Neurasthenia
Involuntional depression	Obsessional neurosis	Organic psychoses with syphilis or with arteriosclerosis
Reactive depression where reactive stress has faded	Idiopathic epilepsy	Pre-senile dementia
	Post-encephalitic	Post-traumatic syndromes
	Parkinsonism	Huntington's chorea
	with depression	

Regarding the whole problem of mode of action, it is difficult to escape the conclusion that a varying degree of personality disintegration and regression is required, sufficient to disorganize the recently acquired habits of feeling and thinking. The personality then employs long-established reflexes and patterns of behaviour to readjust at a slightly lower level, but not necessarily to stay there. Concerning the far more drastic procedure of leucotomy, Golla (1943) recalled the work of Sherrington and Graham Brown demonstrating the remarkable recuperative powers of even the severely damaged nervous system. Similarly, in the few weeks immediately following convulsion therapy this inherent recovery process is paralleled by a gradual disappearance of forgetfulness and of such dysrhythmia as was engendered in the E.E.G. Such a process could hardly be expected to flourish in the presence of a pre-existing organic cerebral pathology; and in fact, if a case of depression secondary to arteriosclerosis, syphilis, or pre-senile dementia is inadvertently given E.C.T. the usual recuperation is impeded or absent. In such cases not only may a permanent state of regression be inflicted but the organic deterioration may be accelerated. Incontinence of urine sometimes gives an early warning of this error.

The propriety of using psychotherapy with E.C.T. in depression has often been discussed (Moriarty and Weil, 1943; Osgood, 1944). It depends on the type of depression and how far it has progressed. Moderate psychotic depressions, such as can be treated under general hospital conditions or as voluntary cases, are frequently blended with neurotic complications. If treated by E.C.T. the psychotic depression clears and the relief may enable the neurotic element to make a spontaneous adjustment. If it does not, then psychotherapy is indicated, being often assisted by the previous dispersal of the depressive element of the illness. Selinski (1943) and Kalinowsky *et al.* (1944) have commented on the better accessibility to psychotherapy given to some patients by E.C.T. In this respect, severe certified depressions are no problem, since, obviously, strict psychotherapeutic techniques cannot be applied to an inaccessible patient, while in depression secondary to a

primary neurotic disorder E.C.T. is certainly to be avoided in favour of psychotherapy. These methods are complementary, and inadequate treatment is inevitable if all therapeutic effort is canalized in one or other direction for every case.

A final point should be made about the relation of E.C.T. and other physical treatment to terminology. There is a tendency to associate the term "psychotic" too exclusively with mental hospital types. It is sometimes overlooked that there are at least as many cases of psychotic-type depression outside such hospitals whose treatment is equally urgent—and more so, since they are usually without proper observation and exposed to suicidal risks. In some a well-integrated personality can survive the stress of a mild psychotic depression, while in others the relatively sound integration may conceal severe symptoms even from those in closest contact, so that the final tragedy surprises all concerned. These patients respond well to E.C.T., and give results comparable to any in general medicine; none the less, these findings should deter the inexperienced but enthusiastic therapist from "pressing the button" without a satisfactory preliminary investigation of those appearing to be depressed, otherwise definite harm may be done to the patient. Repeated careful psychiatric examination before, during, and after treatment is the most important aspect of convulsion therapy—more so than the careful management of the actual fits.

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TECHNIQUE FOR THE USE OF *d*-TUBOCURARINE CHLORIDE WITH BALANCED ANAESTHESIA

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The novelty of curare has passed, and the site of action, physiology, and pharmacology of the drug have been the subjects of many recent publications (see Gray and Halton, 1946). It is thought that a description of the methods employed in the administration of *d*-tubocurarine chloride (B. W. & Co.) in some 1,500 cases might be opportune. For the sake of brevity in the ensuing discussion *d*-tubocurarine chloride (B. W. & Co.) will be referred to as curarine.

Apparatus

Solutions of curarine and the quick-acting intravenous barbiturates are non-miscible. It is necessary here to correct a misunderstanding that may have arisen through a previous statement that curarine dissolves in excess pentothal solution. This is perfectly correct when applied to the pure crystalline powder. However, the solution now supplied by the makers