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ELECTROCONVULSIVE THERAPY

Report of the Task Force on Electroconvulsive Therapy
of the American Psychiatric Association

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"Granting that the question is a gross over-simplification, which of the following *best* characterizes your attitude toward the use of ECT"

	Obtained response
1. Totally opposed to its use	2%
2. Basically opposed, but O.K. as a last resort in a few selected instances	22%
3. No really strong feeling, but tend to be more opposed than favorable	8%
4. Ambivalent; undecided	1%
5. No really strong feeling, but tend to be more favorable than opposed	6%
6. Generally favorable for appropriate patients	54%
7. Decidedly favorable to its use	7%

Thus we see that 32% expressed some degree of opposition; one percent, ambivalence; and 67% some degree of favorable attitude.

Responses to more specific statements about ECT were distributed as follows (the difference to 100% reflecting response of no opinion/ambivalent/undecided):

	% Agree	% Disagree
1. There are many patients for whom ECT, either alone or in combination with other measures, is the safest, least expensive, and most effective form of treatment	72%	20%
2. Any psychiatric institution claiming to offer comprehensive care should be equipped to provide ECT	83%	12%
3. ECT should be used only when all else has failed	38%	57%
4. The introduction of antidepressants and phenothiazines has made the use of ECT obsolete	7%	87%
5. The use of ECT should be discontinued or at least should be curtailed	16%	75%

3

6. It is likely that ECT produces slight or subtle brain damage   41%   26%

7. There is a need for more explicit guidelines (perhaps from APA) for the proper use of ECT   69%   20%

8. The issuance of guidelines from any source for the use of ECT is likely to interfere with good patient care   22%   65%

9. ECT should not be administered to children 16 or under   57%   16%

Large percentages of the respondents feel that ECT is a valuable treatment technique and a majority would welcome explicit guidelines for its use.

Appropriate diagnosis/problem

Respondents were asked to rate the degree of appropriateness of ECT (assuming no physical contraindications) for 11 diagnoses/problems. Collapsing the six-point scale into "appropriate," "undecided" and "not appropriate," the following results were obtained (the difference to 100% reflecting rounding error and those who indicated opposition to the use of ECT for all patients):

	Appropriate	Undecided	Not Appropriate
Minor (non-psychotic) depression	6%	2%	88%
Major depression	86%	6%	7%
Schizophrenia (acute or chronic)	25%	15%	59%
Manic excitement	42%	13%	43%
Drug or alcohol abuse	1%	2%	94%
Personality disorders	2%	1%	93%
Sexual dysfunction	1%	1%	93%
Anorexia nervosa	11%	17%	70%
Intractable pain	8%	18%	72%
Unremitting hypochondriasis	11%	17%	70%
Toxic dementias	2%	3%	91%

In addition, 274 responde ECT as appropriate for a variet space for "Other, please spec spondents went to the effort o which they considered ECT in

The preceding table provi priateness ratings for most res accepted practices and the av ECT. On the other hand, it respondents view ECT as app little evidence of efficacy a opinion favors the use of oth dealt with in Chapter III.

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After excluding 9% of r spend at least 50% of a usu activities related to psychiat spondents were categorized whether or not they had eit ECT in the last six months, or supervision that ECT be u ~~to this definition~~ percent had personally treat months), and 11% had recon rally, these two groups were

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ELECTROCONVULSIVE THERAPY[a]
Clinical and Basic Research Issues

Editors and Conference Organizers
SIDNEY MALITZ and HAROLD A. SACKEIM

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The Cognitive Side Effects of Electroconvulsive Therapy[a]

Discussion of Part VI

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It is a well-documented fact that electroconvulsive therapy (ECT) produces cognitive impairment. This type of side effect has been a major concern of both practitioners and their patients since the treatment was first introduced in 1938. Interest in finding ways to reduce these cognitive deficits has been at the core of research efforts in more recent years, and modification of the parameters of ECT, e.g., modality, stimulus waveform, and dosage, have met with apparent success. Research into the specificities of these cognitive deficits, and how they relate to the parameters of treatment, will not only aid us in dealing with the deficits directly, but will enable us to better understand how the treatment affects a wide range of neuropsychological functions, thereby providing data on the possible mechanisms of action of ECT as well as on the neuropsychological aspects of depression.

The papers presented in this session are primarily devoted to further exploration of the ways in which the parameters of treatment relate to cognitive dysfunction. Research advances in this area have pointed to the fact that the associated side effects of ECT are not general, but specific. They are specific to the direct effects of the stimulation, to the characteristics of the behaviors being studied, and to the time at which these assessments are made.

A wide range of research interests are presented. In some cases the data support previously reported findings, while in other cases the data are representative of new areas of study. I will briefly review the major findings in the area of ECT-related cognitive functions as they are presented in this session, and show, where possible, how these deficits relate directly to the parameters of the treatment.

The first major parameter to undergo study was that of electrode placement. It was clearly observed that the memory loss often associated with bilateral placement of electrodes was markedly reduced when the electrodes were placed on one side of the head (nondominant side). This reduction in cognitive impairment, with unilateral treatment, was primarily for verbal memory, although early studies suggested that nonverbal memory was similarly affected. The differential effects of treatment modality on verbal memory are a robust finding, which has held up through many experimental trials. We see from the data presented in this session that the differences between bilateral and unilateral electrode placement for verbal materials hold for the different stimulus waveforms (Weiner's study) and for low-dosage treatment (Sackeim's study).

The differential effects of electrode placement on memory for nonverbal materials are not as clear-cut. This may be due, in part, to the difficult task of selecting stimulus materials that are sensitive to right hemisphere processing. The geometric shapes, for example, in the Sackeim *et al.* study were verbally encodable, and were, in fact, processed like verbal materials, while the nonsense shapes, which were not as easily encodable, showed treatment effects suggesting that they were being processed by the right hemisphere.

Pure nonverbal materials might be equally affected by the two treatment modalities, since the right hemisphere is being stimulated in both bilateral and unilateral electrode placements. It is interesting to note that the processing of the nonsense shapes in the Sackeim *et al.* study was sensitive to response to treatment, e.g., early in the course of treatment individuals who were later classified as responders showed greater deficit in their retrograde memory for nonsense shapes than did individuals who did not respond to the treatment. These data suggest that right hemisphere processing is differentially affected by the therapeutic aspects of the treatment. It is possible that tests of this kind could be used to predict ultimate response to treatment early in its course, and thereby restrict treatment to patients likely to respond.

Recent interest in the postictal period, i.e., the time immediately following the occurrence of the seizure, has revealed substantial differences in orientation for the two treatment modalities. Daniel and Crovitz, using a 12-item questionnaire, report marked differences between the two modes for both traditional sine-wave stimulation and for brief pulse. Greater cumulated disorientation, over the course of treatment, was observed in the bilateral groups. Similar modality differences are reported by Sackeim *et al.*, using low-dosage, titrated energy levels. Use of low-dosage treatment, however, apparently eliminates the cumulative disorientation effects for the bilateral group, while resulting in cumulative improvement in orientation times for the unilateral group. It may be that the shorter orientation times in the unilateral group at the end of the treatment course were related to the decreases in seizure durations observed in this group. Correlations between seizure duration and time to orient were found to be significant for this group.

Modifications of the stimulus waveform used to elicit the therapeutic seizure were first introduced in the 1940s. It was believed that the amount of energy needed to elicit a seizure, using a brief pulse, was substantially lower than that needed to elicit a seizure using a sine wave, and that this reduction in amount of energy might have a significant effect on cognitive impairment. Weiner and his associates report in this session that sine-wave stimulation causes greater cognitive impairment than does brief-pulse stimulation without compromising clinical benefit. Using a wide variety of carefully selected neuropsychological tests, they concluded that stimulus waveform has a more potent effect on cognitive functioning than does modality, although modality differences were also apparent in both stimulus waveform groups.

It is possible that it is not the absolute amount of energy applied to the brain that produces the cognitive impairment, but rather the amount in excess of an individual's threshold. Recent efforts (Sackeim *et al.*) have been made to develop a procedure for titrating energy levels for individuals, thereby reducing the amount of energy applied. The lower levels of energy have resulted in reduced impairment in both immediate and short-term cognitive functioning. In addition, there is no evidence for cumulative impairment over the course of the treatment, for either postictal orientation time or retrograde amnesia. While the cognitive impairment associated with the low-dosage treatment shows typical modality effects, low-dosage unilateral treatment was not found to be as effective a treatment as low-dosage bilateral treatment, despite the fact that available characteristics of the seizure obtained appeared to be equivalent.

The substantially shorter postictal orientation times for the low-dosage treatment

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group have definite advantages for the patient. Most of the patients oriented within a 45-minute period following their treatment, and were able to return to their wards and participate in ward activities by lunchtime. For outpatients, this shorter recovery time enabled them to return to their homes and to resume their domestic responsibilities by early afternoon, if they wished.

Short orientation times also make it possible to gather data on a wide variety of neuropsychological functions, closer in time to the actual seizure than is possible with the more traditional forms of treatment and their prolonged orientations. These data will be more sensitive to the treatment parameters and provide better insight into possible mechanisms of action.

At one time the confusion produced by the treatment was believed to be a mechanism of action. It was thought that patients became disoriented and "forgot" what was bothering them. Recent research, however, has offered little support for this notion. Degree of cognitive impairment, per se, has not been found to be related to response to treatment.

The specificity of the treatment on cognitive functioning was first observed when comparisons of the effects of bilateral and unilateral treatment on verbal and nonverbal memory revealed that bilateral placement had a more profound effect on verbal functioning than did unilateral placement. The fact that materials processed by the different hemispheres would be differently affected by the treatment parameters has resulted in the selection of stimuli sensitive to brain lateralization. As mentioned above, early attempts to select nonverbal stimuli were not successful since nonverbal stimuli that can be easily verbally encoded are processed by the left hemisphere. Since then researchers have explored the effects of the treatment on a wide range of neuropsychological tasks. Just reviewing the materials utilized in the studies reported in this session, we see an extensive list including memory for words, paragraphs, geometric shapes (for verbal materials), and facial recognition (affective and neutral), form reproduction and memory for nonsense shapes (for nonverbal materials).

With the use of more appropriate nonverbal materials it now appears that the differences between the bilateral and unilateral treatments, previously reported for nonverbal materials were probably more a function of the stimulus properties than of the treatment modality, and that the effects of the two treatment modalities on nonverbal tasks are about equivalent (the Weiner and Sackeim studies).

Interest in the effects of the treatment on different kinds of memory has led to comparisons of retrograde amnesia (memory loss for material learned before treatment) with anterograde amnesia (inability to learn new material). Results have indicated that following ECT, anterograde amnesia is less pronounced than retrograde amnesia. Recovery of anterograde memory (Squire's study) seems to progress at a regular pace from time of last treatment and is usually back to normal at about six months, depending, of course, on the nature of the task. Retrograde memory loss often displays a temporally limited gradient, e.g., loss of more recently acquired information and less or no loss of material more remote in time. While retrograde amnesia also returns to normal by the end of six months, many individuals report losses persisting many months after treatment, and some patients report that this gap is never filled. Memory losses are often for the events immediately surrounding the treatment experience, and these losses are often the most frequent of patient complaints.

The magnitude of the memory loss is often directly related to the time from the last treatment, and seems to be a direct response to the treatment. With time, some of the loss is dissipated. Dr. Squire reports that anterograde learning is most impaired within the 45 minutes following the treatment, and then improves with increases in time. This gradient was found for the bilateral group, but not for the unilateral group, where only minimal deficits were observed shortly after the treatment. While these findings were

clearly reported for the verbal materials (paired associate word learning), his data for the nonverbal materials (faces and nonsense shapes) suggest that the unilateral and bilateral groups were similarly affected.

There is a general claim in the literature that the learning of new materials is not as affected by ECT as the ability to retain this information, e.g., retention is more strongly affected than acquisition, particularly when a substantial delay is imposed between the acquisition and retention of the materials.

Results from the Sackeim et al. study provide additional support for this hypothesis. Using paired-word and paired-face tasks, they reported that depressed patients differed from normal controls in their ability to acquire information prior to treatment, and that the ECT produced deficits in retention for both the verbal and nonverbal stimuli, suggesting that these two neuropsychological processes are differently affected by the treatment.

Along a different dimension, Weiner and his associates report that memory loss for personal information is affected by the treatment to a greater extent than is memory for impersonal material, the latter being measured in terms of recall for famous events and famous faces. Most important is the finding that bilateral treatment produced greater impairment for personal memory than did unilateral treatment. While Weiner's data lack corroborative control, this is probably an important step in the finer differentiation of the kinds of memory losses often complained about.

Freeman's paper on patients' attitudes towards ECT lends additional support to the importance of memory losses, since close to 75% of the patients reported that memory loss was the worst side effect experienced, with 30% stating that their memories have never returned to normal. He reported that those patients who had received unilateral treatment were more likely to report that they would not want to have ECT again. At first this seems contradictory, since bilateral treatment produces greater cognitive impairment. However, it is possible that the unilateral treatment was not as effective a treatment and that the patients were disappointed in the therapeutic effects of this treatment. It would have been interesting to compare the bilateral nonresponders to the bilateral responders to see if attitude towards ECT is related to response to treatment.

The lack of a relationship between subjective reports of memory loss and objective measures reported in the Weiner et al. study suggests that the former are more a function of the mood state of the patient (in fact correlations between Hamilton Rating Scale scores and the reports of subjective memory loss were high), while the latter are more a function of the "organic" state of the patient (no correlation with depression scores). It is possible that patients' complaints of memory loss are of a specific kind, a kind not reflected in the objective scores, and a kind exacerbated by depressive symptomatology.

In summary, the papers presented at this session represent current research efforts in the study of the cognitive effects of ECT. While many of the previously reported findings have been supported, new ones have been offered and have contributed to a better understanding of the specific effects of the treatment on cognitive functioning. Hopefully, research efforts will continue in this vein and the data culled from these efforts will help to further reduce the undesirable side effects of the treatment, enabling more patients to seek and utilize ECT as an effective treatment for depression.

THE EFFECTIVENESS AND SAFETY OF ELECTROCONVULSIVE THERAPY (ECT)

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Over the past several decades, psychopharmacological treatments in psychiatry have been subjected to intensive methodological scrutiny in the continual assessment of their efficacy and safety. Although one of the most dramatic and controversial therapeutic approaches in psychiatry, electroconvulsive therapy (ECT) has not received the same concentrated, systematic attention. Through a comprehensive literature search, the present authors have attempted to provide answers relating to the efficacy and the safety of conventional ECT and some of its more prominent variations. Although specific discernible trends are reported in the text, results of the survey are too disparate for a simplistic summary statement to be made regarding efficacy in all diagnostic categories. As with most somatic treatments in psychiatry, bilateral ECT does present some apparent risk, reduced but not entirely eliminated by precautionary techniques, which must be weighed against the possible benefits to be derived in a given case. Other variations of ECT offer promise of fewer side effects but must be thoroughly evaluated as to effectiveness before they can be accepted as standard clinical practice.

Questions raised by psychiatric peer review committees and various third party interests have recently refocused attention on the effectiveness and safety of electroconvulsive therapy (ECT). The following review of the literature was therefore undertaken in response to the need for clarification of the current status of ECT as a viable psychiatric treatment modality.

Efficacy

Forty years after its introduction into psychiatry, the question of the efficacy of ECT in relation to other available psychiatric treatment approaches is still not unequivocally answered judging from present standards of scientific validity. In the early years, published reports attesting to the efficacy of ECT lacked the sophistication necessary for convincing, objective appraisal. Even if these reports had met certain evaluative requirements, the standard procedure for administering ECT at the time (*i.e.*, without anesthesia) would not have allowed the effective use of the

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double blind methodology in comparative trials. When techniques for administering ECT were later improved so that they were more adaptable for investigative purposes, interest in conducting controlled studies had all but disappeared. It is important to keep these circumstances in mind in judging the meaningfulness of the evaluative material that is available.

ACUTE SCHIZOPHRENIA

There were 10 open clinical studies (38, 40, 44, 68, 73, 78, 88, 94, 115, 120) in which the efficacy question was raised for cases of acute schizophrenia. In these studies, neither the patient nor the rater was blind to the type of treatment, and no comparison samples were employed. All but one of these studies reported over 75 per cent improvement in status, as measured by clinical evaluations of psychotic symptoms and hospital discharge rates. The lone exception (73) reported a 30 per cent improvement rate.

Open partially controlled studies were found to be more abundant in the literature. These studies can be divided into two approaches. In the first approach, the investigators used a retrospective method, comparing the improvement and dis-

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charge rates of acute schizophrenics hospitalized during pre- vs. post-ECT eras. There are 12 such studies in the literature. Ten of them (4, 5, 12, 22–24, 29, 37, 45, 49) reported a post-ECT era superiority on the criterion dimensions in question. In these studies, there was unanimity in reporting a range of 10 to 30 per cent improvement in the pre-ECT period and a range of 50 to 70 per cent improvement in the post-ECT period. Only two studies (26, 90) found no advantage to the introduction of ECT into the psychiatric armamentarium.

Another partially controlled study of the same type (91) measured effectiveness by determining length of stay in the hospital and reported an average stay of 7 months for schizophrenics treated with ECT compared to an average stay of 64 months for non-ECT patients. A further study reporting no difference in response to ECT and non-ECT methods bears particular mention. Dewett (26) found a 15 to 30 per cent improvement rate in the schizophrenics of a primitive (Bantu) tribe prior to the use of ECT and only a 10 to 20 per cent improvement after its introduction. This study, however, differed from the others in terms of its subject population (Bantu primitives vs. Western Caucasians) and number of ECTs administered (40 vs. 20). Also, although subjects were diagnosed as schizophrenics, chronicity of the illness was not elaborated.

The other approach of partially controlled studies of acute schizophrenics consisted of comparisons of ECT to various drug treatments. There were seven open comparative studies in which the major neuroleptics were compared to ECT in the treatment of acute schizophrenic conditions (8, 19, 66, 71, 75, 83, 95). The results of these studies were in general agreement that there was not much difference in the discharge rates associated with ECT and drug therapy. Findings regarding relapse rate and length of stay in the hospital were, however, inconsistent from study to study. In view of this, results are far from conclusive, and additional studies are needed to clarify the exact advantages of each treatment. In cases considered treatment resistant to phenothiazines, the sub-

sequent use of ECT becomes a relevant clinical issue. Although no systematic controlled studies have attempted to assess the success of shifting the treatment of a drug-resistant case to ECT, case studies are available reporting success with ECT referral (117).

All of the open clinical trials and partially controlled evaluations of ECT in acute schizophrenics suffer from methodological deficiencies and/or the use of heterogeneous subject populations. Obviously, acute schizophrenia is too general a diagnosis. According to improvement figures appearing in the above cited studies, the most responsive patients were catatonics and acute undifferentiated schizophrenics. The least improvement was observed with paranoid and hebephrenic schizophrenics. However, so many variables have a bearing on the improvement of any given patient that comparative figures given for ECT and non-ECT patients for different periods cannot be considered as solely reflective of one treatment modality. Only random assignment and double blind procedures could have insured measurement of the specific impact of ECT on the treatment of acute schizophrenia. Unfortunately, it was impossible to apply double blind procedures when ECT was administered without an anesthetic. It is regrettable that at this period of controversy in psychiatry, there is not one well controlled study to determine the validity of various positive and negative claims made for ECT. Three studies which attempted to utilize randomization and double blind approaches in the treatment of chronic schizophrenics and depressive populations will be discussed in later sections of this report.

CHRONIC SCHIZOPHRENIA

The majority of published articles on the effectiveness of ECT in chronic schizophrenia have dealt with chronically hospitalized, deteriorated schizophrenics. For the most part, subjects were patients who had spent at least a few years in mental hospitals, and although some displayed overt psychotic symptomatology, including loss of contact with reality, most were socially dependent and not blatantly psychotic.

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Objectives for using ECT as a treatment modality ranged from attempts at complete recovery and discharge to the assurance of manageability in the hospital. Correspondingly, efficacy was measured by either hospital discharge or reduction in the need for seclusive or restraining measures.

There were four open clinical studies (17, 102, 103, 120) utilizing chronic schizophrenics as the subject population. One (103) reported a 22 per cent and another (120) a 10 per cent discharge rate for patients administered ECT. All four studies reported a 90 per cent reduction in restraint, seclusion, and/or sedation orders.

There were six open, partially controlled studies (18, 37, 41, 49, 97, 108) of chronic schizophrenics, each having utilized comparison populations. The results of these studies differed considerably. One study (108) reported a 75 per cent improvement rate (discharge within 6 months after ECT) for chronic schizophrenics who accepted the offer of ECT vs. a 50 per cent improvement rate for those who refused ECT and were consequently treated with drugs. Employing a chronic schizophrenic group treated with routine ward milieu therapy for comparison, one small sample study (37) found that the ECT group responded more favorably. Two studies compared ECT to histamine injections. One of these (18) reported a superiority for ECT, and the other (97) found no difference in results. Two studies (41, 49) compared the effectiveness of ECT, psychotherapy, and insulin therapy in three fairly large matched groups of schizophrenics and found no differences in response rate.

Open comparison studies have thus failed to show any superiority of ECT over histamine, insulin injections, or psychotherapy. Generally, relative effectiveness in these studies was determined on the basis of hospital discharge or return to premorbid personality. However, all open clinical studies and some partially controlled studies demonstrated positive, though slight support for ECT in terms of symptomatic improvement in overall agitation and manageability.

Three controlled studies of chronic schiz-

ophrenics (14, 51, 79) attempted to establish investigative conditions approximating double blind procedures. One conducted by Miller et al. (79) compared three small (N = 10) groups of patients who were given ECT alone (i.e., without anesthesia), anesthesia alone, and anesthesia plus nonconvulsive electrical stimulation. Considering the paucity of subjects, along with the criterion measures and statistical analyses employed, it is not surprising that results indicated no difference in responses for the three groups. Had a fourth group been administered anesthesia plus ECT, thereby allowing a shock vs. nonshock comparison with increased Ns, it would have been a more acceptable study from the experimental point of view. In addition, evidence is lacking in the study regarding the effectiveness of the double blind procedures employed. In his later writings, Miller displayed a negative attitude regarding ECT although admitting doubts about his study's success at establishing ideal conditions under which unequivocal conclusions could be drawn.

The second study was that of Brill et al. (14) in which schizophrenics, most of whom were chronic, and depressives were treated with ECT (without anesthesia), ECT plus succinylcholine, ECT plus thiopental (with anesthesia), thiopental alone (anesthesia alone), and nitrous oxide alone (loss of consciousness). Curiously, careful study of this article reveals that the overall interpretation of results, i.e., that there was undifferentiated outcome, is not consistent with the data presented. Of four criterion measures examined ("clinical status," psychological battery total score, "Lorr Scale," and "Doctor's Lorr Scale"), a significant analysis of variance result in favor of ECT plus succinylcholine was found for "clinical status," a nine-point scale measuring degree of psychopathology and impairment of functioning. For this scale, it was found that the ECT plus succinylcholine group had a statistically higher mean, indicative of greater improvement, than any of the other groups except the regular ECT group. In their final interpretation of results, the authors also ignore an obviously significant differ-

ence on the "Lorr Scale" between the shock vs. nonshock groups of patients that favored the former group. Their conclusions that "The type of treatment or whether or not the patients had shock did not significantly influence the amount or percentage of improvement . . . " (14, p. 115) and the corresponding practical implication that ". . . the more traumatic components of ECT (electricity, convulsions) might be abolished without reducing therapeutic effectiveness" (14, p. 115) appear unwarranted.

The third study (51) provided partial double blind conditions in the treatment of chronic schizophrenics with short courses (four and eight sessions) of ECT and simulated ECT and the concurrent evaluation of ward controls and a "rejected" sample, i.e., promised but not administered ECT. Results of two separate analyses of behavioral scale ratings revealed nonsignificant pre- to post-treatment differences for all of the groups and no significant differential treatment effects. Again, this latter finding is not surprising since the number of ECT treatment sessions was exceptionally low for chronic, nonresponsive patients, and although 15 patients were administered the four treatment course, only eight patients (four men and four women) were subjected to the more appropriate eight treatment course.

In summary, both open clinical and double blind controlled studies lack the sophistication or conditions necessary for accurately assessing ECT's effectiveness in chronic schizophrenia. In spite of the way they were originally interpreted, the results of the study by Brill and co-workers offer the best evidence of beneficial action.

DEPRESSION

Although the effectiveness of ECT in the treatment of intensive, long term depression unresponsive to drugs is generally accepted in clinical practice, corroborative evidence in the literature is not readily available. As with studies of ECT in the treatment of schizophrenia, studies of the effectiveness of ECT in depression are characterized by a lack of homogeneity in subject population, number of treatments, severity and subtypes of illness, and measurement of response.

There were three open clinical studies (20, 33, 81) in which ECT was administered to either depressed inpatients or outpatients. All three studies reported an improvement rate of over 75 per cent.

Among open, partially controlled studies, three (30, 32, 50) examined relative outcomes during historically adjacent treatment periods, i.e., before ECT was in practice and after ECT had become a routine method of treatment. All three studies reported only a slight superiority in the improvement rate for depressed patients after the introduction of ECT. Interestingly, however, when the average lengths of hospital stay for the two periods were compared, results for the post-ECT period were found to be superior to those of the pre-ECT period, i.e., the length of stay of depressed patients in the hospital shortened considerably after the introduction of ECT. Three open comparative studies (53, 55, 113) utilized psychotherapy and milieu group therapy groups as controls in inpatient settings and reported fairly equal percentage improvement rates as measured by hospital discharges. The length of stay in the hospital for the ECT group was, however, much shorter than that for the psychotherapy group. In one of these three studies which involved manic-depressive cases (55), the death (largely suicidal) rate in the psychotherapy group was found on 1-year follow-up to be considerably higher than in the ECT group. In a similar type study involving involutional depressives (54), those same authors reported a 46 per cent recovery rate with control patients and an 80 per cent rate with shock patients, although 39 per cent of the latter subsequently experienced relapse, again revealing little treatment differential in terms of improvement rate. In another, independently conducted, comparative study with more encouraging results (65), an 89 per cent improvement rate was found with ECT, as opposed to an 11 per cent improvement rate with orally administered placebo.

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in depression. One of them (98) compared ECT with simulated ECT and reported 90 per cent improvement in the ECT group and 10 per cent improvement in the simulated ECT group. Subsequently, simulated ECT failures were treated with actual ECT, and all improved. The other was that by Brill *et al.* reported above (14). In addition to the chronic schizophrenics in this study, 14 of whom were schizo-affectives, there were 16 cases of depression, including psychotic depression, involutional depression, and reactive depression. Considering schizo-affectives among the depressed patients, the authors presented improvement rates for shock *vs.* nonshock cases from the total sample of 30 patients displaying depressive symptomatology. Although the authors claimed no differential effect, a reworking of the data by the present reviewers revealed that according to Lorr Rating Scale results, which consisted of two of the four criteria measures examined, significantly greater numbers of shock *vs.* nonshock cases were judged as improved (Fisher's exact probabilities of .029 and .037 for "Total Lorr Scale" and "Doctor's Lorr Scale," respectively).

In summary, the available controlled studies on the utilization of ECT in depression uniformly indicate an association of favorable outcome with ECT. This overall statement on the efficacy of ECT in depression, however, does not take into account the various subtypes of depression. There were no available controlled studies to substantiate any claim that ECT has any differential effect on psychotic *vs.* neurotic or unipolar *vs.* bipolar types of depression.

ECT vs. chemotherapy in depression. The question as to whether ECT should be preferred to antidepressives in the treatment of a given case of depression cannot, of course, be readily answered since predictive validity is not that precise. Regarding the general effectiveness of the two methods of treatment, however, the following information is available. According to a report by Cole (21), in which, unfortunately, no references are cited, three studies compared ECT to the antidepressant, imipramine, and found ECT superior; another three studies found essen-

tially equal improvement rates. No study reported a superiority of imipramine to ECT.

The present survey revealed 13 studies (16, 25, 47, 52, 57, 64, 69, 72, 86, 87, 89, 100, 105) in which ECT was compared to antidepressives (imipramine, amitriptyline, and/or MAO inhibitors). All of these studies were open, partially controlled trials and used different parameters to assess improvement. Most found ECT superior to its chemotherapeutic counterpart on any one of the following measures: rapidity of response, discharge rate, length of hospitalization, and degree of symptomatic improvement. A few concluded, however, that within a 1-year period, the relapse rate for the follow-up patients was the same in both treatment groups. One study (69) found antidepressives as equally effective as ECT, and another (72) found chemotherapy more effective in terms of rapidity of response and length of stay in the hospital. Results of one of the more impressive of these studies, a large scale cooperative investigation conducted by the Clinical Psychiatry Committee of the Medical Research Council (England) (89), indicated a superiority of both ECT and imipramine to placebo, whereas the monoamine oxidase inhibitor, phenelzine, was found to be no more effective than placebo. Although imipramine showed a slower action than ECT, its use reduced the number of patients for whom ECT was finally regarded as necessary.

There were three double blind studies in the literature involving the comparative effects of ECT *vs.* chemotherapy in the treatment of depression. In one (93), biweekly ECT with anesthesia plus orally administered placebo were administered to one group of depressives and biweekly anesthesia plus orally administered imipramine to another group. Results indicated that the ECT group responded with greater improvement in terms of a shorter hospital stay and earlier discharge than the imipramine group, which was, incidentally, later administered ECT. In the second study (119), depressed women were randomly assigned to one of four groups: ECT plus placebo, ECT plus imipramine,

anesthesia plus placebo, and anesthesia plus imipramine. Results indicated that ECT was superior to imipramine and that there were no differences between the ECT plus imipramine group and the ECT plus placebo group. However, when the study was repeated on 20 patients utilizing higher dosages, imipramine was reported as effective as ECT in relieving depression. The third double blind study (77) compared ECT, amitriptyline, and placebo and found ECT superior to amitriptyline on all measures, the difference being slightly below that needed for statistical significance, reportedly because of the small number of patients involved.

In a somewhat unique approach to the assessment of the comparative effectiveness of ECT and chemotherapy, Avery and Winokur (6) studied the results of the various treatments of 519 depressed patients from the standpoint of mortality over a 3-year follow-up period. Their findings indicated that ECT patients had a significantly lower mortality than patients administered "inadequate" dosages of antidepressants and patients who received neither ECT nor antidepressants. Although those patients administered "adequate" antidepressant treatment had a low mortality, statistically significant differences between these and other variously treated patients could not be documented. The results were taken as underscoring the importance of adequate treatment of depression, especially in the older man.

The above results reveal that in general terms ECT is more effective than drugs in the treatment of depression. In their appraisal of the relative merits of ECT vs. chemotherapy in the treatment of any given case, however, clinicians must still consider a myriad of potentially influential variables.

Prediction of response to ECT. In considering the efficacy of ECT in depression, some statement should be made about the prediction of response to treatment. Typically, predictive studies have involved the development of indices, or checklists, based on predispositional factors and historical and clinical features found to be highly correlated with outcome. Validated

on the same and/or subsequent populations, these indices have yielded percentage accuracy rates as high as 70 to 90 per cent in the classification of ECT responders vs. nonresponders. Abrams (1), however, after a thorough examination of the results obtained with such indices, claimed that they offered little practical advantage over simple clinical guidelines. According to Abrams, an 80 to 90 per cent ECT recovery rate could be expected if one selected only patients who were either in the depressed phase of a manic-depressive illness or who were diagnosed as displaying involutional melancholia and avoided those patients with long term hypochondriacal and anxiety features.

ECT IN OTHER PSYCHIATRIC CONDITIONS

In textbook chapters devoted to ECT and in sporadically published articles, individual observations of treatment success with ECT in the treatment of various neurotic conditions are reported (48, 60, 85). A few early clinical studies have advised the use of ECT in psychoneurotic conditions, without specifying subtypes. But, as indicated above, predictive studies have found a negative correlation between certain neurotic symptoms and improvement (1). The question of whether or not obsessive-compulsive neurosis (severe) would respond to ECT has not been clearly answered, and there have been no rational or empirical data to indicate that ECT is of any benefit in the treatment of the various personality disorders. A few reports and case studies in the literature have suggested the use of ECT in delirium tremens (to overcome the delirium state) (28, 84, 92), in narcotic drug addiction (to reduce the desire for drugs) (39), in narcotic drug withdrawal (to diminish the physical distress during withdrawal) (112), and in ulcerative colitis (for symptomatic relief) (61). More recently, the use of ECT with manic patients was found to be of benefit in terms of such outcome measured as condition at discharge, duration of hospitalization, and social recovery (76). All of these studies, however, were suggestive rather than definitive in their advocation of the use of ECT in such conditions.

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Safety

The side effects and complications of standard bilateral ECT have been a continual subject of controversy over the years. Misconceptions and confusion about the untoward reactions of ECT have arisen in the minds of the lay public and newly trained professionals as a result of this controversy. Are there dire consequences to ECT? What about the chances of death, or if not death, of permanent brain damage? Again, the literature was examined to shed light on these issues.

For ECT administered in the conventional way, *i.e.*, two or three times a week, reported death rates vary. According to Kalinowski (60), the figure is not more than 0.1 per cent in all treated cases. Friedman (35) reported 0.3 per cent in 536 treated cases. In a personal communication regarding his 11-year ECT practice, which included 55,918 treatment sessions, Andren reported two fatalities (cardiac arrest) and had only one case of fracture. Impastato (58) stated that over and under the age 60, the chances of mortality were 0.5 per cent and 0.02 per cent, respectively. Alexander (3) reported five deaths out of 5,325 patients and 70,000 treatments. Salzman (99) also provides a similar figure. If one looks at the accumulative results of these reports, all of which were published before the introduction of advanced, safer techniques, an average of approximately 0.08 per cent chance of death was associated with the use of ECT. The extent to which the reported incidents of death were directly attributable to ECT is not clear. With the general stipulation of the presence of an anesthetist during treatment, there was a subsequent reduction in the chances of death and complications. A recent survey by Beresford (10) showed that between the years 1964 and 1968, the sudden death rate with ECT was less than the 0.08 per cent figure. Supplemental experiential information on this subject is also available. One of the present authors (I. T.) administered 8,500 treatments to 870 patients within the past 4 years and experienced no sudden deaths. A practitioner in the Baltimore area, using the same

technique with three times the number of cases, personally reported that he also observed no deaths; and in another personal communication, Brody reported a 0.05 to 0.08 per cent incidence with improved methods of administering ECT.

The most commonly observed untoward action of ECT is its deleterious effect on memory and intellectual functioning. There is extensive literature on memory changes with ECT, but because of the diversity in experimental and treatment approaches utilized, a summary interpretation of the results of the studies involved is difficult to conceptualize. That there is memory loss identifiable over groups of patients is fairly well established. The extent and duration of this loss are the questions at issue.

There were 16 studies in the literature dealing with the immediate effect of ECT on memory (15, 27, 38, 56, 59, 74, 80, 101, 104, 107, 109, 111, 114, 115, 121, 122). The common conclusion of all of these studies was that after a few applications, ECT produced a variable degree of memory difficulty. Even though a few studies reported initial improvement rather than decline in the memory functioning of some patients, as measured by psychological tests, overall statistical analysis of results generally revealed a decline in memory efficiency as treatment progressed. The permanency of this decline was a matter on which there was no general agreement among the studies. The majority found no memory impairment 6 months after ECT. In three separate 5-year follow-up studies (104, 109, 115) of patients who received intensive ECT, no residual memory defects were found. On the other hand, one study (15) reported on five cases who complained of memory loss for 1 year or more, and another (59) found that ECT patients evidenced more memory impairment than controls. A more recent study (106) compared a group of schizophrenics who had an average of 58 ECTs, each, 7 years previously, to a group of controls, matched on age, sex, and severity of illness, and found no differences in verbal and performance IQ scores. There was, however, a difference in the Bender-Gestalt score, which

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was worse in the ECT group, a finding that is not surprising in view of the large number of treatments involved.

As for the occurrence of other ECT side effects, the survey of Beresford on the use of ECT during the 5-year period, 1964 to 1968, and involving thousands of cases and 49 separate psychiatric units revealed that vertebral fractures and cardiac arrhythmias were the most common complications, having occurred in 35 and 13 patients, respectively. Other diverse complications were too infrequent to be of significance.

Techniques and Procedures of ECT

There are, of course, innumerable ways of modifying the administration of a course of ECT. Besides electrode placement, most have involved independent and combined variations of the number of treatment sessions administered in a given series and the number of convulsions administered per session.

Answers to the question of the optimal number of ECTs in the treatment of different conditions vary according to the physical characteristics of the patient, diagnosis, severity and chronicity of illness, and the number of ECTs utilized previously. Unfortunately, there are no reliable biophysical or psychometric procedures for determining the adequacy of treatment in a given case. In addition to observations of a patient's reactivity and adaptability after each session, there are, nevertheless, a few general guidelines in the literature. Fink and Abrams (31) have reported that nine to 10 sessions for depression and 15 to 20 for schizophrenia would be acceptable regimens. The Massachusetts survey (34) on the practice of ECT in that state revealed that ECT practitioners usually utilized eight to 12 treatments for cases of depression and 20 to 25 treatments for schizophrenia or schizo-affective states. Both the report and survey were published in 1970. A few years previously, the Group for the Advancement of Psychiatry had advocated eight to 10 treatments for depression and 15 to 20 treatments for schizophrenia.

There were only two studies that attempted to answer the question of how many treatments were optimal for certain conditions. In one of these, Barton (9) compared two groups of patients according to their relapse rates within 3 months of respective series of nine and 12 ECTs and found no difference between the groups. In 1960, Baker et al. (7) administered 12 treatments to one group of female schizophrenics and 20 treatments to another matched group and found that the group administered 20 treatments had fewer symptoms at the end of treatment and a higher discharge rate.

Accepted practice as to the frequency of ECT in a given session has been only tentatively formulated. Since its introduction, the standard practice for ECT has been to administer one convulsive treatment every other day, three times a week. However, over the past 2 decades, there have been many variations from this practice for what appear to be clinically sound reasons. Although practitioners have utilized the standard daily ECT procedure in the treatment of acutely agitated, unmanageable patients with reported success, in order to shorten the treatment period, others have advocated an intensification of the process, specifically, the administration of four to five convulsions within 20 minutes, repeating the same procedure a week later. This type of intensive ECT was first suggested by Blachly (11), who also urged the exercising of extreme caution in its application. He called the approach "multiple monitored convulsive therapy" because it was necessary to monitor EEG and EKG, as well as vital signs, during ECT because of the risks involved.

Four papers (2, 13, 110, 118) published on multiple monitored convulsive therapy were evenly split in their conclusions regarding whether or not eight treatments administered in 2 weeks (four convulsions per weekly 20-minute session) were superior to six treatments administered in 2 weeks (one convulsion on alternate days during each week). In view of the fact that multiple convulsive therapy required special monitoring equipment and that its advantages did not appear sufficiently large to warrant the potential risks involved, it

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has not subsequently been widely adopted by practitioners.

Regressive ECT is described as a practice in which convulsive producing electrical application is repeated several times a day, 7 days of a week, until a severe personality and intellectual regression occurs. In 1957, Glueck (43) summarized previous studies of regressive ECT and reported his own results. Assessing the organic effects of regressive ECT in 50 patients variously administered 28, 30, 33, and 43 treatments, Glueck failed to find any evidence of permanent brain damage. However, since the organicity assessment techniques utilized in the study were not reported and since the study was not controlled, conclusions regarding the superiority of regressive ECT to standard ECT must be considered of doubtful validity.

Kennedy and Ancheld (62) administered four seizures daily (until vegetative regression was produced) to 25 schizophrenics who had failed to respond to therapy in the previous 4 to 5 years of hospitalization, and 14 demonstrated "significant improvement." However, there was no follow-up and no information regarding the specific characteristics of improvement. Weil (116) administered seven convulsions daily to 18 treatment-refractory schizophrenics until regression occurred and failed to find any benefits to this treatment procedure. Garrett and Mockbee (42) administered three daily ECTs to 30 chronic schizophrenics (for a total of 72 treatments in each case), and a year follow-up assessment revealed "some improvement in all patients, but not enough improvement to enable them to leave the hospital" (p. 508). Rothschild et al. (96) treated 52 chronic schizophrenics with four ECTs daily for 7 consecutive days (for a total of 28 seizures in each patient) and concluded that the procedure was not effective.

There were three recently published, partially controlled studies of regressive ECT, with no uniformity of agreement in results. Murillo and Exner (82) treated 32 process schizophrenics with regressive ECT (for an average of 26 treatments per patient and a range of six to 58 treatments) and a matched group with drugs and psy-

chotherapy, using extensive assessment techniques before and after therapy. In terms of the MMPI, IMPS, and KAS-R, there were no differences on 55 variables between the two groups. The ECT group was, however, superior to the control on 28 of the psychometric measures. Graber (46) compared two groups from a total sample of 52 chronic schizophrenics, one treated with regressive ECT and the other with conventional methods. Although he found no difference between the two groups with regard to discharge potential according to the MMPI, there were differences in favor of conventional treatment on Wittenborn Psychiatric Rating Scale measures. To a total of 37 chronic schizophrenic patients divided into two groups for experimental purposes, King (67) administered three ECTs weekly to one group and two ECTs daily to the other, keeping the total number of convulsions administered constant for the two groups. Results indicated a higher death rate and more evidence of confusion in the regressive ECT group without any significant difference between the two groups in terms of clinical improvement. The obvious discrepancy between the clinical results of the study by Murillo and those of Graber and King was possibly due to the fact that the former investigator's cases were mostly first admission process schizophrenics rather than previously, or long term, hospitalized chronic schizophrenics.

Had the results of the above studies been in favor of regressive ECT, conclusions drawn from them would have been in doubt because of the lack of utilization of double blind procedures. As it was, the early clinical and partially controlled studies that were undertaken failed to encourage the use of regressive techniques with ECT. The Massachusetts survey, mentioned previously, also placed doubts on the advantages of regressive procedures.

Another practice that bears further investigation because of its continued use is that of maintenance ECT. What is the rationale for this procedure, and is there any place for the employment of ECT prophylaxis in psychiatric practice? Maintenance ECT is defined as ECT administered once

weekly, or monthly, to patients who have previously demonstrated improvement with ECT in order to maintain this improvement. There were two published works on the effectiveness of maintenance ECT. One was uncontrolled and the other controlled. In the uncontrolled study (63), 52 schizophrenics and depressed patients who had yearly recurrent psychoses were administered monthly ECT for an unspecified period of time and all maintained their improvement without the need for hospitalization. In the controlled study, Stevenson and Geogehan (106) chose 24 schizophrenic patients who had had two or more psychotic episodes in the previous 5 years and offered them monthly maintenance therapy. Thirteen patients accepted the offer and became the experimental group; 11 patients refused and became the control group. Both groups were then followed for 5 years. The experimental group received monthly ECT for the entire period; the control group received no therapy. Results revealed that all of the control patients were admitted to mental hospitals within a 3-year period, whereas no patients in the experimental group decompensated. Within a 5-year period, only two of the experimental group patients had relapsed. Although not entirely conclusive because of obvious research deficiencies, both studies of maintenance ECT produced what might be regarded as encouraging results in view of the objective criterion measure involved.

As far as variations in electrode placement are concerned, the one of principal clinical interest has been substitution of unilateral placement for the bitemporal placement of standard ECT administration. Originally reported by Friedman and Wilcox (36) in 1942, the technique of unilateral electrode placement now in general use was first described in Lancaster *et al.* (70). In 1973, following a review of available studies on unilateral *vs.* bilateral ECT, coupled with his own clinical experience, Abrams (1) concluded that although nondominant unilateral placement had eliminated the confusion and memory loss associated with ECT, given in traditional fashion, unilateral ECT was often less potent

than bilateral ECT and could not be considered a direct substitute. In view of fewer side effects, Abrams recommended an adequate trial of unilateral ECT whenever possible and a resort to bilateral ECT if no improvement occurred. He also noted that the treatment course of unilateral ECT could be accelerated and its effects enhanced by increasing either the frequency of treatments or the number of treatments in each session. The need for further research on the effectiveness of variously administered unilateral ECT was indicated.

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