ELECTROCONVULSIVE THERAPY:
Is Further Investigation Necessary?*

C. G. COSTELLO, Ph.D.[1]

Introduction

Recent reports in the lay literature and in professional house publications have brought into question once more the validity of electroconvulsive therapy (ECT, EST) as a treatment and have highlighted the iatrogenic effects.

J. Easton Jones (10), a general practitioner working in a mental hospital in England, described how patients in that hospital were given ECT for two years with a machine that, unknown to anyone, did not work.

Roueche, in the 1974 issue of the *New Yorker* (14) presented data on the amnesic effects of ECT. He described how a woman in her early fifties became depressed after the work of an orthodontist produced results that were ". . . both mechanically and cosmetically 'disastrous'." After eight ECTs for the resulting depression, she had no recollection of any part of her hospital stay of nine weeks; on her return home she could not remember what she usually had for breakfast and did not know the meaning of terms such as Blue Cross and Watergate; the contents of books read after her treatment disappeared rapidly from memory; terms associated with her work as an economist and analyst such as 'over-the-counter', 'mutual funds' and 'odd-lot dealers' had no meaning for her. Because she could not recover her professional past she obtained a disability retirement pension but continued to work without pay as a low level clerk. Four months after her treatment she said she continued to feel "As empty as Eve."

The editors of the September-October, 1974 issue of the American Psychological Association weekly newspaper *Monitor* presented in call-out block letters a statement made by Karl Pribram during an interview conducted for the *Monitor*: "I'd much rather have a small lobotomy than a series of electroconvulsive shocks." Asked if he had ". . . some pretty solid ideas about what electroconvulsive shock does," he answered, "No — I just know what the brain looks like after a series of shocks — and it's not very pleasant to look at." However, he went on to say, "Not that it [ECT] can't be effective as a treatment if carefully used."

Rumours and myths may develop around any medical treatment. Furlong (7) took *Playboy* magazine to task over a report in the January, 1970 issue in which ECT was described as "absurdly archaic" and a treatment which ". . . should have been abolished with the strait jacket. . . ."

On the other hand, there is an absence of well-established data. The woman whose memory loss was described in the *New Yorker* article, becoming curious about the whole idea of ECT, tracked down a list of references supplied by the National Institute of Mental Health. She was disappointed,

*Revised manuscript received December 1975.

[1] Professor, Department of Psychology, University of Calgary, Calgary, Alberta.

noting that "The result was nothing. The authorities all seemed to be parroting each other."

An extensive review of the literature (2) indicated that all the studies attempting to evaluate the therapeutic efficacy of ECT were at fault methodologically. The two major faults were: the absence of a placebo-ECT group of patients; and the failure to incorporate double-blind conditions.

An Attempt at a Placebo-Controlled Study

In 1970, I embarked on an investigation into the therapeutic efficacy of ECT, trying to satisfy the methodological requirements not satisfied in previous studies. I have now had to abandon the study because my request for patients conflicted with the clinical commitments and ethics of the attending physicians, all of whom had faith in the efficacy of ECT for some of their patients. Although the study aborted, I made a number of observations which suggest that this treatment is definitely in need of further investigation.

After five years only ten patients were in the study. The one lucky break I had was that random assignment had resulted in five ECT patients and five placebo-ECT patients.

Basically the procedure was as follows: once it had been decided by the attending psychiatrist that ECT was indicated, and if the patient was suffering from endogenous depression, he was assigned at random to either the ECT group or to a placebo-ECT group. The patients in the placebo group went through exactly the same procedure as those in the ECT group except that instead of shock being applied to the head, a non-phasic pulse current of 20ma was applied to each leg for a period of two minutes — this was called peripheral shock. The patient did not know which group he had been assigned to and the doctors and nurses who administered the treatment were employed especially for the study and had no contact with the patient outside the treatment room. The regular ward staff, including the patient's own doctor, were not informed of the treatment administered. All patients received six treatments — ECT or peripheral shock.

On the day of the last treatment the patient's own doctor and two or three ward nurses were asked to judge which kind of treatment had been administered. In only one of the ten patients was there complete agreement. In that case the wrong decision was made. A peripheral shock patient was judged to have had ECT.

As previously noted, it had been hoped to restrict the study to those patients suffering from endogenous depression since, according to current psychiatric textbooks, it is this diagnostic group for which this treatment is particularly effective, but it quickly became apparent that ECT was being prescribed for a heterogeneous group of patients, and that if criteria were not relaxed the study would take an inordinate time. My curiosity having been whetted by this heterogeneity, I decided to examine the records of patients admitted to the psychiatric unit in which the ECT study was plodding its weary way. The records of two hundred and eighty-six patients admitted to the unit for a ten-month period before the commencement of the study were examined — the details and findings have been reported in this Journal (3). None of the following variables were significantly related to the prescribing of ECT: diagnosis, attending physician, sex, age, marital status, religion, education, method of admission and occupation, and it was therefore obvious that some other uninvestigated variable must be related, or that the prescriptions took place at random. Jones (10) in his *World Medicine* article noted that in his hospital " . . . the indications seemed a bit vague, ranging from temporal lobe epilepsy, chronic schizophrenia to depression and poking the medical superintendent in the eye."

The dependent measures used here had been decided upon because all the patients were likely to be depressed. Consequently, they were all self-report measures of depression apart from one of salivary output. The diagnoses given the ten patients in the study indicated that these measures are of little relevance. In the ECT group there was one

acute psychotic reaction, two paranoid schizophrenics and two undifferentiated schizophrenics. In the peripheral shock group there was one involutional depressive reaction, one undifferentiated schizophrenic reaction and three paranoid schizophrenics. For what it is worth, non-parametric statistical tests indicated no significant differences between the two groups on the measures of depression, either before or after treatment.

In view of the heterogeneity of diagnoses in the ten patients included in the study it may be argued that the clinicians were probably referring atypical cases. But some data collected during the first year-and-a-half of the study suggest that this is not so.

All the 904 patients examined in the Department of Psychiatry of the Foothills Hospital, Calgary from October 2, 1970 to July 12, 1972 were administered the Pilowksy Questionnaire (LPD) (12) designed to classify patients into three classes — endogenously depressed, reactively depressed and non-depressed. In Table I the number of patients in each of these three classes is presented, as are the numbers of patients in each class who received ECT. A Chi square test indicated no significant relationship between the classification and the admininstration of ECT.

Previous Placebo-Controlled Double-Blind Studies

It may be argued that double-blind placebo-controlled studies of ECT have already been conducted and that they have demonstrated it to be therapeutically effective.

There have been attempts at controlled studies of ECT but no firm conclusions can be drawn in favour of its therapeutic efficacy. One study of this nature was conducted by Ulett, Smith and Gleser (16), comprising 84 patients with diagnoses of schizophrenic, involutional psychotic, psychotic-depressive, neurotic-depressive, and manic-depressive (depressed) reactions, were divided into four groups matched for diagnosis, sex, age, education, and incidence of previous attacks. These four groups were assigned respectively, to convulsive photoshock, subconvulsive photoschock, electroshock, and control treatments. The control was actually a placebo-ECT group, since all the patients were sedated by means of intravenous secobarbital sodium to a light stage of sleep prior to treatment, and the handling of them in all the groups was kept as uniform as possible. They were all given up to 12 to 15 treatments three times a week. Response was evaluated by means of a psychiatric rating on a 5-point rating scale and on the Malamud Psychiatric Rating Scale. These ratings were made three days after the last treatment by one of the psychiatrists who was not informed of the treatments the patient received. Follow-up studies were made after three and six months on those who had received no further treatments. Our concern here is with the comparison between the ECT and the placebo group. The assessments after three days suggested that the therapeutic response of the ECT group was superior to that of the placebo-shock group, and the same general trend was evident three months and six months

TABLE I
RELATIONSHIP BETWEEN CLASSIFICATION OF 904 PATIENTS INTO ENDOGENOUS DEPRESSION, REACTIVE DEPRESSION AND NON-DEPRESSED AND THE ADMINISTRATION OF ECT.

	Reactive Depression	Endogenous Depression	Non-Depressed
ECT Administered	31	45	87
ECT Not Administered	159	225	357

after the cessation of therapy. But the authors did not conduct any statistical tests on their data. Chi square tests carried out by the present authors on the data obtained at the three post-treatment points failed to reveal any significant differences.

Sainz (15) divided his 20 patients diagnosed as manic-depressives (depressed) or involutional depressives into two groups of 10 " . . . by selecting each alternate admission." One group received ECT and the other was given 'mock' electroshock with intravenous sodium pentothal only. The patients of the 'mock' group were unaware that they had not received ECT. Nine of the ten on ECT recovered, and one was moderately improved. Nine out of the ten 'mock' ECT patients did not recover and when they were then given the full course of ECT seven subsequently showed full remission. Unfortunately, it would seem from the report that assessments were made by Sainz himself in full knowledge of the group to which the patient belonged.

Brills and his colleagues (1) investigated the role played by the various components of treatment with electric shock in producing recovery. They assigned 97 male patients to one of five treatment groups: ECT with succinylcholine chloride; orthodox ECT; ECT under thiopental sodium eliminating the motor convulsion; thiopental sodium alone; and nitrous oxide alone. The last two treatments induced unconsciousness without shock, although electrodes were applied. Roughly two-thirds of the patients were diagnosed as schizophrenic reaction, while the remainder were diagnosed as schizoaffective reaction, psychotic depression, involutional depression, reactive depression, and manic-depressive psychosis. Assessments were made a month before and a month after treatment by ratings of psychiatric status on a 9-point scale, by the Lorr Psychiatric Rating Scale applied by both psychiatrists and nurses, and by ratings of psychological status derived from a psychological test battery. A global rating was also made combining scores derived from these three methods. The ratings were made without knowledge of group membership.

No statistically significant differences were found in the therapeutic effectiveness of the variations of ECT and simulated ECT, nor were there any reliable differences between the combined shock group and the combined nonshock group. The fact that the groups were not precisely equal in the actual proportions of schizophrenics and depressives necessitated further analyses. No significant differences in improvement were found for the treatment groups when the depressives were considered separately.

Wilson and his colleagues (17) reported the results of an investigation carried out in two phases — 24 patients were randomly assigned to four groups: all in the electroshock-imipramine group received both electroshock and imipramine. The electroshock was administered following intravenous thiopental sodium and succinylcholine chloride, and there were two treatments per week for a total of six treatments. Two in this group were lost to the study so that the final data were obtained on only 22; the electroshock placebo-drug group; the anesthesia-imipramine group; the anesthesia-placebo-drug group.

The patients in the third and fourth groups received intravenous thiopental twice weekly for a total of six treatments but were not given succinylcholine chloride or an electroshock. Response to treatment was assessed by the change from pretreatment to protreatment in psychiatric ratings based on the Hamilton Scale and by the change in MMPI Depression scores. The assessment interviews on which the Hamilton Scale scores were based were done by three raters at the same interview, one of whom was aware of the treatment received by each patient. The agreement between the raters was extremely good. The comparison of particular interest is that between the ECT placebo-drug group and the anesthesia placebo-drug group. The improvement in the ECT drug-placebo group was significantly greater than the improvement in the anesthesia-drug-placebo group. There is the problem that one of the interviewers knew to which group the patient belonged and thus the double-blind condition was not completely met. Otherwise the study pro-

vides some support for the effectiveness of ECT.

Another such study is that by MacDonald *et al.* (11) — thirty depressed patients were assigned at random to three groups, ten received amitriptyline and twelve ECT. Four of the control groups received a placebo drug and four simulated ECT. In the simulated ECT condition, unconsciousness was induced rapidly by the injection of thiopental sodium (pentothal) but was not followed by ECT. Globing improvement ratings, a Depression Rating Scale, a Word Observation Inventory, and the MMPI were used in evaluating the response one month after treatment. Amitriptyline and ECT were both demonstrated to be more effective than the control procedures. It is unfortunate that the control procedures — placebo drug and simulated ECT — were combined for the statistical comparisons with the treatment procedures. The important question is do the patient expectancies (those in anticipation of ECT and those elicited by the preparatory procedures) account for any part of the therapeutic responses to ECT? The placebo components of ECT may very well differ from those of placebo drugs. In the MacDonald *et al.* study the relatively poor response of the control patients may be due to a lack of response or worsening of patients administered the placebo drugs.

Are Placebo-Controlled Double-Blind Studies Appropriate?

The appropriateness of these investigations of therapy has been questioned (4, 6, 8, 9, 13). The main argument is that the effectiveness of a therapy is dependent upon the trust a patient has in his therapist and on the confidence the therapist has in his therapy. Since these factors are removed in placebo-contolled double-blind studies, it is not possible to adequately test the effectiveness of a therapy.

Where there is almost complete certainty that a therapy does not have iatrogenic effects it may not be necessary to separate the contribution to effectiveness of the therapy itself and that of the expectancies surrounding the therapy, but to adopt such an attitude would be to retreat from the position of medicine as a scientifically based practice back to a dependence on clinical authority. In any case, because ECT produces impairment of memory, the question of the independent effects of the treatment and the expectancies surrounding it cannot be readily dismissed.

On the other hand, experience suggests that the successful completion of a double-blind placebo-controlled study of ECT may not be possible, but it might be worthwhile considering the possibility of alternative research designs.

Alternative Research Designs

One alternative is to drop the placebo group and do a double-blind investigation of some parameters of ECT. A well-known double-blind study of this nature was conducted by Cronholm and Ottosson (5), in which the therapeutic effectiveness of three treatments were compared: grand mal seizures evoked by a stimulus considerably above threshold; grand mal seizures evoked by a stimulus only moderately above threshold; and grand mal seizures such as those evoked by a stimulus only moderately above threshold but in which the seizure discharge was reduced by lidocaine, an anticonvulsive drug. It was demonstrated that the depression-relieving effect of ECT was bound to seizure activity and not (or only slightly) to the other effects of electrical stimulation.

This study here has provided the most impressive evidence in support of the hypothesis that the effectiveness of ECT is mediated through its physical properties and not through the expectancies surrounding it, but two caveats should be mentioned — the study was composed of only patients suffering from endogenous depression, and the findings may not be applicable to other types of patients. Secondly, no attempt has been made to replicate these important findings.

However, such a design, with the removal of a placebo condition, may be acceptable to some clinicians but not to all because of the presence of the double-blind requirement. Therefore, considerable diffi-

culty is likely to be encountered when completing such studies. Double-blind comparisons of bilateral *versus* unilateral ECT are studies of the kind being discussed. A study of unilateral ECT conducted here was slow and difficult. Discussion with other investigators reveals that this is a common experience and some are abandoning ECT research altogether.

The only circumstance under which a non-blind study of the parameters of ECT could be conducted would be where the clinicans involved considered the various forms of the treatment being investigated to be equally effective. But a researcher is not likely to find himself in such a position and furthermore it would not be easy to objectively and reliably determine the degree of faith of the clinicians in the different forms of the treatment.

Another possibility would be to manipulate the patient's expectancies. For instance, patients may be told that the therapy would be effective after a certain number of treatments, and it could then be determined whether the point of major shift in condition coincided with the point at which the patient expects the treatment to be effective. But this design is not free of the ethical problems of concern to clinicians, and it is unlikely that any adequate study of the effectiveness of ECT can be done without some ethical problems being involved. On the other hand in order to answer the original question, further investigation of ECT is necessary. Indeed it may be queried how ethical it is to use a therapy on any but an experimental basis when so many questions about it still remain unanswered.

Summary

Recent reports in the lay literature and professional house publications both have brought into question the validity of electroconvulsive shock as a therapy, and highlighted the iatrogenic effects of the treatment. The failure to complete a study of the therapeutic effectiveness of ECT is reported. The study incorporated two conditions thought to be essential for an adequate evaluation of the treatment: a placebo-ECT group; and double-blind procedures. The failure of the study revealed the difficulty of conducting to completion an adequately controlled investigation of a treatment already accepted by clinicians. Other placebo-controlled double-blind studies are reviewed, and alternative study designs are discussed.

Acknowledgements

Despite the fact that the study reported in a section of this paper is an incomplete one, so many people were involved that a full list of acknowledgements would take up more space than the paper itself. But I must single out some people: the Alberta Government for their research grant; the Medical Ethics Committee of The Foothills Hospital, Calgary for their approval of the study; Dr. K. I. Pearce for its medical supervision; Sheran Christensen for its overall coordination; the many psychiatrists who tried to quiet their clinical ethics in favour of research ethics; the many nurses under the coordination of Ms. Anne MacDonald. To them and those not mentioned I wish to express my gratitude.

References

1. Brills, N. Q., Crumpton, E., Eiduson, S., Crayson, H. M., Hillman, L. J., Richards, R. A.: Relative effectiveness of various components of electroconvulsive therapy. *Arch. Neurol. Psychiatry, 81*, 627–635, 1959.
2. Costello, C. G., Belton, G. P.: Depression: Treatment. In: *Symptoms of Psychopathology*, Ed. C. G. Costello, New York, Wiley, 201–215, 1970.
3. Costello, C. G., Christensen, S. J., Bobey, M., Hall, M. K.: The relationship of illness and non-illness variables to the administration of ECT. *Can. Psychiatr. Assoc. J., 17*: 325–326, 1972.
4. Cromie, B. W.: The feet of clay of the double-blind trial. *Lancet, 2*: 944–997, 1963.
5. Cronholm, B., Ottosson, Jan-Otto: Experimental studies of the therapeutic action of electronconvulsive therapy in endogenous depression. In: Jan-Otto Ottosson (Ed.), Experimental studies of the mode of action of electroconvulsive therapy. *Acta Psychiatr. Neurol. Scand., Supplement 145, Vol. 35*, 69–101, 1960.
6. Feinstein, A. R.: The need for humanized science in evaluating medication. *Lancet, 2*: 421–423, 1972.

7. Furlong, F. W.: The mythology of electroconvulsive therapy. *Compr. Psychiat., 13*: 235–239, 1972.
8. Hoffer, A.: A theoretical examination of double-blind design. *Can. Med. Assoc. J., 97*: 123–127, 1967.
9. Hoffer, A., Osmond, H.: Double-blind clinical trials. *J. Neuropsychiatry 2*: 221-227, 1960.
10. Jones, J. E.: Non-ECT. *World Medicine, 9*: 24, 1974.
11. MacDonald, I. M., Perkins, M., Marjerrison, G., Podilsky, M.: A controlled comparison of amitriptyline and electroconvulsive therapy in the treatment of depression. *Am. J. Psychiatry 122*: 1427–1431, 1966.
12. Pilowsky, I., Boulton, D. M.: Development of a questionnaire-based decision rule for classifying depressed patients. *Br. J. Psychiatry 116*: 647–650, 1970.
13. Plutchick, R., Platman, S. R., Fieve, R. R.: Three alternatives to the double-blind. *Arch. Gen. Psychiatry 20*: 428–432, 1969.
14. Roueche, B.: Annals of medicine: As empty as Eve. *New Yorker*, 84–100, 1974.
15. Sainz, A.: Clarification of the action of successful treatment in the depressions. *Dis. Nerv. Syst., (Suppl.), 20*: 53–57, 1959.
16. Ulett, G. A., Smith, K., Gleser, G. C.: Evaluation of convulsive and subconvulsive shock therapies utilizing a control group. *Am. J. Psychiatry, 112*: 795–802, 1956.
17. Wilson. I. C., Vernon, J. T., Guin, T., Sandfifer, M. G., Jr.: A controlled study of treatments of depression. *J. Neuropsychiatry, 4*: 331–337, 1963.

Résumé

On trouve dans la documentation non specialisée et dans certaines publications professionnelles des opinions qui remettent en question la valeur thérapeutique du choc électroconvulsif et soulignent les effets iatrogéniques de ce traitement. On y mentionne également l'absence d'une étude complète de l'efficacité thérapeutique du traitement EC. Au cours d'une expérience on a réuni les deux conditions considérées comme essentielles à une évaluation adéquate du traitement: le groupe EC de placebo et l'essai thérapeutique à double insu. L'échec de cette expérience a fait ressortir la difficulté de mener à bien une recherche suffisament contrôlé d'un traitement déjà accepté par les cliniciens. Le texte présente plusieurs vérifications du contrôle placebo et de l'essai thérapeutique à double insu, et commente des expériences nouvelles.

We shall have to learn to refrain from doing things merely because we know how to do them.

Lancet 2: 801, 1965

Sir Theodore Fox
1899-