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Anterior Bifrontal ECT: A Clinical Trial

By RICHARD ABRAMS and MICHAEL ALAN TAYLOR

Introduction

Unilateral ECT (U/ECT) produces therapeutic generalized convulsions with less amnesia and confusion than classical bilateral ECT (B/ECT). The clinical effects of these two methods have recently been compared (Abrams *et al.*, 1972) and reviewed (Abrams, 1972), with the conclusion that U/ECT is less effective than B/ECT in the treatment of depressed patients. Generalized seizures are induced with both methods, and we considered the possibility that the therapeutic advantage for B/ECT lay in its bilateral stimulation of the brain. An opportunity to evaluate the effects of bilateral stimulation exclusive of the temporal lobes arose at the suggestion of Inglis (1970) that seizures induced with treatment electrodes placed over the front of the head should improve mood but have less effect on memory than the other techniques.

The present study is an open clinical trial of this method, which we have termed anterior bifrontal ECT (ABF/ECT).

Method

The study was undertaken on the general psychiatric wards of Metropolitan Hospital Medical Center, New York City. All depressed patients referred for ECT during a six-month period were treated with ABF/ECT, with the exceptions to be described. We originally intended a double-blind comparison with B/ECT, but the appearance of transient erythematous marks on the foreheads of patients receiving ABF/ECT rendered this unfeasible, and we settled on an open clinical trial of ABF/ECT.

Each patient was examined prior to ECT, and the following scales were completed:

1. A 15-item depression rating scale (Abrams *et al.*, 1972) modified from Hamilton (1960).
2. The Wechsler Memory Scale (Wechsler, 1945), form I or II.

The depression rating scale was repeated 4 to 6 hours after the fourth and eighth ECT. The alternate Wechsler Memory Scale was repeated 4 to 6 hours after the eighth ECT, as only two forms of this scale were available.

Treatments were given daily on weekdays. Patients were premedicated with atropine, and anaesthesia was induced with methohexital and followed by succinylcholine muscle-relaxation. A single seizure was induced at each treatment session with 2 to 3 seconds of current from the Reiter Mol-AC II machine at the 'high' setting. As the Reiter 'unilateral' electrodes did not fit the curve of the forehead, the holder was modified by drilling holes which placed the electrodes closer together than for U/ECT. An inter-electrode distance of two inches was settled on after a preliminary enquiry showed that closer placement would not yield a seizure. The skin of the forehead was cleansed with alcohol before electrode application, and rubbed with an emollient cream immediately after the seizure.* Sponge-rubber covered electrodes were used after thorough soaking in a sodium bicarbonate solution. The electrodes were applied to the forehead, straddling the midline about two inches above the nasion (Fig. 1).

In three patients seizures could not be elicited at the first or second passage of current at a duration of three seconds. The intravenous administration of 500 mg. pentylenetetrazol

* Despite this precaution the treatment often left erythematous marks on the forehead lasting as long as 24 hours, and in four patients second-degree burns occurred followed by simple peeling without scarring.

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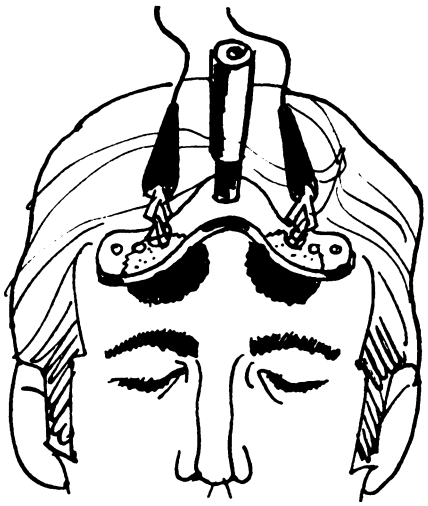


Fig. 1.—Electrode Placement for Anterior Bifrontal ECT

(Metrazol, Cardiazol) in 5 per cent solution 45 seconds before current passage effectively lowered the seizure threshold for two of these patients, and they received the remainder of their treatments in this fashion. (The third patient was dropped from the study.)

No psychotropic drugs were given during the study period. When needed to control agitation, sodium amylobarbitone (Sodium Amytal), 250–500 mg. intramuscular, was given at 4–6 hour intervals. Night-time sedation with barbiturate or non-barbiturate sedatives was permitted *ad libitum*.

Results

Twenty depressed patients were referred for ECT during the study period. Excluded were: the patient in whom a generalized seizure could not be obtained; another patient so severely ill that initial treatment with B/ECT was deemed mandatory; and a third who refused further ECT after his fourth ABF/ECT.

The final sample includes 17 depressed inpatients ranging in age from 21 to 72 years (mean, 50·6), who received at least eight ABF/ECT.

Clinical: ABF/ECT was clinically effective and significantly lowered scores on the depression rating scale after four and eight treatments (Table I). No direct comparison with U/ECT or B/ECT was done, but these results

Table I

Mean depression rating scale scores before and after ABF/ECT

(N)	Pre-ECT	Post-4 ECT	Post-8 ECT
(17)	22·2	12·1*	6·8**

($F = 25{\cdot}5$; d.f. = 2, 32; $p < 0{\cdot}01$)
* $t = 4{\cdot}8$, $p < 0{\cdot}01$.
** $t = 8{\cdot}3$, $p < 0{\cdot}01$.

may be compared with data from a previous study of U/ECT and B/ECT which used the same depression rating scale (Abrams *et al.*, 1972). Data were available for 55 patients after four treatments, and Table II shows that ABF/ECT is intermediate between B/ECT and U/ECT in reducing depression scale scores. This observation is in accord with our clinical impressions.

After patients received eight ABF/ECT we decided on clinical grounds whether to terminate ECT, to give additional ABF/ECT, or to change to B/ECT. Four patients were discharged directly, two received B/ECT, and 11 patients received 1–8 (mean, 4·4) additional ABF/ECT. Of these 11, only six were discharged (four got B/ECT, one remained in the hospital). In all, six patients received B/ECT after ABF/ECT and we frequently observed striking clinical improvement after the addition of 1–2 B/ECT.

Memory: There was little or no immediate post-ECT confusion with ABF/ECT. Patients awakened rapidly after treatment, usually within 5–10 minutes, and were alert and oriented, without the postictal clouding and confusion of B/ECT. Clinically, there was no cumulative anterograde or retrograde amnesia during a course of ABF/ECT, an observation also reported for daily administration of U/ECT (Abrams, 1967).

Ten patients completed memory testing before treatment and 4 to 6 hours after the eighth ABF/ECT (Table III). The memory scores are congruent with the clinical impressions and an overall slight improvement in test performance occurred. These scores may be compared with unpublished Wechsler Memory Scale scores obtained during a study of daily administration of U/ECT (Abrams, 1967). Data are

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TABLE II

Retrospective comparison of depression rating scale scores before and after four B/ECT, U/ECT, and ABF/ECT

	Mean age	Method	(N)	Pre-ECT	Post-ECT	% change
Abrams *et al.*	63·4	B/ECT	(25)	19·3	7·8	−59·5
		U/ECT	(30)	19·2	11·9	−38·0
Present study	50·6	ABF/ECT	(17)	22·2	12·1	−48·5

TABLE III

Mean Wechsler Memory Scales Scores before and after eight ABF/ECT

Time of examination	Raw score	Age-adjusted scores: With visual subtest	Age-adjusted scores: Without visual subtest
Pre-ECT ..	41·3	84·2	79·3
Post-8 ECT ..	44·0	86·7	81·1

TABLE IV

Retrospective comparison of mean age-adjusted Wechsler Memory Scale score (visual subtest excluded) after eight ABF/ECT or ten U/ECT

Author	(N)	Method	Pre-ECT	Post-ECT	% change
Abrams (1967) ..	(10)	U/ECT	82·0	83·5	+1·8
Present study ..	(10)	ABF/ECT	79·3	81·1	+2·3

available for 10 patients who received U/ECT and were tested with the Wechsler Memory Scale (visual subtest excluded) before treatment and within eight hours after the tenth ECT. Table IV displays these results with those of the present study after eight ABF/ECT. Comparison of these age-adjusted memory scores supports the clinical observation that the memory effects of ABF/ECT are like those of U/ECT.

DISCUSSION

Our impressions and rating scale data suggest a clinical effect for ABF/ECT which is intermediate between B/ECT and U/ECT. These findings require confirmation by direct comparison of the three methods.

We found no support for our original hypothesis that the therapeutic advantage for B/ECT over U/ECT lay solely in the bilateral stimulation of the former method. Bilateral stimulation alone, exclusive of the temporal lobes is insufficient to account for the therapeutic effect of B/ECT. Despite the generalized seizure induced by each method, and the bilateral stimulation of ABF/ECT, B/ECT appears most effective for the relief of depression.

This difference may result from bilateral *temporal lobe* stimulation with B/ECT. Evidence that B/ECT alters cerebral physiology differently from U/ECT or ABF/ECT derives from the observation that an amnestic syndrome, characteristic for patients receiving B/ECT, does not occur with U/ECT or ABF/ECT. Specific memory alterations (e.g., auditory-verbal) are reported for U/ECT, but these are rarely clinically apparent. The amnestic syndrome reflects bilateral dysfunction of the medial brain structures involved in the processes of memory consolidation (hippocampus-fornix-mammillothalamic tract); unilateral dysfunction of this system as after temporal lobectomy (and, presumably, U/ECT) is insufficient to produce such generalized memory disorders (Milner, 1966).

We believe that a fully-developed therapeutic effect of ECT depends upon bilateral stimulation of these medial brain structures subserving mood and memory systems, and that both the therapeutic effect and the memory alterations reflect this stimulation but are themselves causally unrelated.

Inglis' (1970) prediction of reduced memory-loss with ABF/ECT is supported in part, as we found no decrement in performance for the Wechsler Memory Scale subtests reflecting non-dominant (subtests I–V, and VII) or dominant (subtest VI) hemisphere memory

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functions. However, for lack of any direct comparison with U/ECT this finding remains a suggestion.

Summary

An open clinical trial of a new placement of treatment electrodes for ECT is reported in 17 hospitalized depressed patients. The method is termed anterior bifrontal ECT (ABF/ECT) and is given with electrodes placed as far forwards over the front of the head as is consistent with obtaining a generalized seizure.

Four and eight ABF/ECT effectively reduced depression as measured by post-ECT reduction in depression rating scale scores, and these effects were intermediate between those obtained in the past for B/ECT and U/ECT. Memory changes were not observed clinically or on formal testing, and significant post-ECT clouding or confusion did not occur with ABF/ECT. These memory findings were similar to those obtained in the past for unilateral ECT.

Theoretical implications of these findings are discussed.

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Richard Abrams, M.D., *Assistant Professor of Psychiatry*,
Michael Alan Taylor, M.D., *Assistant Professor of Psychiatry*,
Department of Psychiatry, New York Medical College, 5 East 102nd Street, New York, N.Y., 10029, U.S.A.

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