Differential Memory Complaints After Bilateral and Unilateral ECT

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A structured interview was used to elicit 35 depressed patients' reports of memory function after a full course of either bilateral or unilateral ECT. The interviewer and patients were blind to the type of electrode placement. Although the two groups of subjects did not differ in severity of depression or amount of ECT, significantly more patients receiving bilateral ECT reported general difficulty remembering things, difficulty describing events before hospitalization, and difficulty remembering daily events.

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Increasing attention has been given to memory loss and confusion as a side effect of ECT. Despite the large body of literature on this topic, only a few investigators have included patients' own assessments of their memories after this treatment. In polling the majority of ECT patients at one hospital in a given year, Freeman and Kendell (1) found that 50% of the sample rated memory loss as the worst side effect of the treatment. (See also Freeman and associates' study [2].) In addition, Squire and associates (3) obtained patients' self-ratings of a list of typical memory functions before bilateral ECT and 1 week and 6 months afterward; their patients rated some but not all of the memory functions as worse after ECT.

Exaggerated complaints about one's memory might be expected from all patients, given the publicity this side effect of ECT has received. However, in Small's follow-up (2–5 years) study of subjective memory complaints associated with ECT (4), only 8% of the patients treated with nondominant unilateral ECT had memory complaints, compared with 46% of the patients who had received bilateral ECT. This result was subsequently replicated by Squire and Chace (5). The APA task force on ECT has also reported that bilateral electrode placement is more often associated with memory loss than is nondominant unilateral placement (6). This fact would be well-known by an interviewer in a psychiatric setting, and even patients themselves might be informed about this potential difference due to electrode placement. A dummy electrode on the dominant side of the head for nondominant unilateral ECT would be a necessary condition in a double-blind study. Caution is therefore needed in interpreting the results of prior studies which do not contain a statement that both the interviewer and the patients were blind to electrode placement.

Severe depression has been shown to impair performance on short-term memory tests (7, 8) and, especially in the elderly, has been associated with complaints of poor memory (9). Physicians may be referring patients with more severe depression for bilateral ECT, introducing a systematic bias into studies comparing the effects of bilateral versus unilateral treatment. In Small's study (4), although depressive symptoms were systematically matched, there were more schizophrenic patients in the bilateral group: They comprised 77% of that group, compared with 33% of the unilateral group. Thus, patient and interviewer blindness and random assignment to electrode placement are essential in ensuring that differences between bilateral and unilateral treatments are due to neither differences in expectation nor severity of illness.

It is also conceivable that bilateral and unilateral electrode placements exert their differential effects on memory through varying amounts of treatment. Since seizures are frequently missed by the patient (10), the number of sessions is not an adequate measure of amount of treatment received. Careful monitoring by EEG of the number of seizure seconds in each session can help separate the effects of electrode placement on memory from those of treatment dosage. The failure to properly measure and report this variable has seriously flawed previous studies comparing bilateral and unilateral treatment.

In the present study we recorded patients' assessments of their memories after a complete series of ECT; patients and interviewer were blind to electrode placement. The extent of depression was formally rated by a psychiatrist blind to electrode placement,

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and the amount of seizure activity during treatment was monitored by EEG. The purpose of the study was to determine the nature of memory complaints, if any, after a course of ECT in depressed patients and to determine if memory complaints were related to site of electrode placement.

METHOD

Subjects were 35 inpatients (24 women and 11 men) at a private psychiatric hospital (the Carrier Foundation) who had been diagnosed as having major affective disorder (34 patients) or schizoaffective disorder (one patient) according to *DSM-III* criteria. This study was initiated during an ongoing larger study that assessed the effect of dexamethasone on ECT-induced memory loss (11, 12); these patients were the last 35 from the larger study. Once patients were referred for ECT and had signed informed consent forms to participate in the research study, they were randomly assigned to one of four groups with regard to both electrode placement and drug/placebo conditions. There was a restriction in the larger study that the four groups be equal in size. There were no statistical differences between drug and placebo groups for the data that will be presented in this paper. Thus, for clarity we combined drug and placebo patients in the bilateral and unilateral groups. By chance, 21 of the 35 patients had been assigned to bilateral and 14 to nondominant unilateral ECT. The ratio of women to men was similar in both groups.

ECT was administered three times weekly with bipolar brief pulse stimuli with a constant current of 800 mA. Dominance was determined according to a shortened version of the Harris Tests of Lateral Dominance (13), and all unilateral treatments were delivered to the nondominant side of the head. Three leads, one attached to a dummy electrode, were used for both types of treatment to ensure patient blindness to assigned group. All seizures were monitored with simultaneous EEG recordings. If a single stimulus resulted in less than 25 seconds of seizure activity—the treatment length recommended by the APA task force (6)—the stimulus was repeated at higher settings so that seizure seconds for the session totaled at least 25.

As reported elsewhere (11, 12), cognitive tests, self-rating scales, and psychiatrist evaluations of depression and psychopathology were completed according to a fixed schedule throughout the treatment series.

Within approximately a week of confirmation that a patient had received the last ECT in a series, he or she was interviewed by an experimenter (J.R.) who was also blind to the type of electrode placement. The interview questions were designed to appear as a general evaluation of the ECT so as not to particularly elicit compliance in reporting of memory difficulties. For example, improvements in memory and mood were also discussed.

After this interview the patient's attending physician, who was not blind to electrode placement, was questioned about the patient's progress in treatment and memory function. The attending physician's evaluation was obtained in this way for 32 of the 35 patients who had been interviewed.

RESULTS

Patients given bilateral and unilateral ECT did not differ with regard to age (mean age for sample=53.1 years; range, 22–78), IQ (mean [±SD] Kent [14] IQ=20.82±5.48), or time elapsed between the last treatment and the interview (mean [±SD]=5.5±4.2 days).

By the end of the treatment all patients showed a significant improvement on the Hamilton Rating Scale for Depression (15), which was completed by a psychiatrist blind to electrode placement (mean[±SD] pretreatment score for the sample=22.1±7.7, mean posttreatment score=6.8±7.4; $t=7.5$, $df=31$, $p<.001$). The mean pretreatment Hamilton scores for the bilateral and unilateral groups were not significantly different (bilateral group=22.8±5.3, unilateral group =19.7±10.1; $t=1.17$, $df=33$, n.s.), nor were the mean posttreatment scores (bilateral group=7.7±8.3, unilateral group=5.0±5.7; $t=1.03$, $df=32$, n.s.). The change between mean pretreatment and posttreatment Hamilton scores for the bilateral (15.2±11.7) and unilateral (15.2±12.2) groups was identical.

The mean number of treatment sessions for the bilateral and unilateral patients (8.9±3.4 and 7.9±1.6) was not significantly different ($t=1.05$, $df=33$, n.s.). Total mean seizure time for the bilateral and unilateral patients (324.4±128.5 and 263.5±69.4 seconds) did not differ statistically ($t=1.62$, $df=33$, n.s.).

Patients' responses to the interview questions are shown in table 1. Probabilities were obtained with a two-tailed Fisher exact test. Percents are based only on the number of patients who answered a particular question.

Although slightly more bilateral than unilateral patients felt that the treatments had helped them, this difference did not reach statistical significance ($p=.10$). However, differences between the two groups in complaints of poor memory were apparent. Significantly more bilateral than unilateral patients described general difficulty remembering things, difficulty describing events before hospitalization, and difficulty remembering daily events. Although the number of days elapsed between the last cognitive testing session and the actual interview was equivalent in both groups ($t=.90$, $df=30$, n.s.), significantly more bilateral than unilateral patients were unable to remember these sessions, which took place several times during the ECT series. This determination was made by unobtrusively asking the patients about the sessions. Despite the fact that bilateral patients had more specific memory complaints, the two groups did not differ signifi-

TABLE 1. Frequency of Memory Complaints in 35 Depressed Patients After Bilateral or Unilateral ECT

Effect of Treatment	Bilateral (N=21)			Unilateral (N=14)			Significance[b]
	Available Sample[a]	N	%	Available Sample[a]	N	%	
Helped	17	17	100	14	10	71	n.s.
Improved remembering	21	5	24	14	3	21	n.s.
Difficulty remembering	21	13	62	14	0		p=.002
Difficulty describing events before admission	21	13	62	14	2	14	p=.02
Difficulty remembering daily events	20	7	35	13	0		p=.05
Memory worse since admission	16	4	25	14	0		n.s.
No memory for testing sessions	21	12	57	14	1	7	p=.01

[a]The number of patients on which the percent is based. Missing data represent responses of "I don't know" or indirect responses that were not codable.
[b]Two-tailed Fisher exact test.

cantly in the number of patients rating their memories as worse since admission or in the number reporting some memory improvement.

To determine whether there were more complaints per individual in the bilateral group, we took a tally of memory complaints from the responses to the last five interview questions in table 1. Eight bilateral and 14 unilateral patients had 0–1 complaint about memory, and 13 bilateral but no unilateral patients had two to five complaints (p=.002, Fisher exact test). The largest number of complaints per patient in the unilateral group was only one, whereas over half of the bilateral patients had two or more complaints (p=.002). All bilateral patients had at least one complaint.

Each patient's physician was contacted and asked briefly about the patient's progress and memory. A pattern similar to that seen in the patient reports emerged. The doctors agreed with their patients' evaluations of treatment effectiveness in 93% of the cases. More bilateral than unilateral patients complained to their physicians of memory problems, although this difference did not reach statistical significance (p=.10). Only 41% of the 22 patients who had both interviews and who had reported impaired memory to the interviewer made similar complaints to their physicians. In the physicians' opinions, memory problems and confusion were more widespread in the bilateral group (p=.05).

DISCUSSION

The overall results of the present study are similar to the findings of Small (4) and are directly comparable to the results obtained from Freeman and Kendell's survey (1) of 166 ECT patients (both bilateral and unilateral). Seventy-eight percent of Freeman and Kendell's patients and 87% of ours felt that the treatments helped. Forty-one percent of Freeman and Kendell's patients spontaneously reported difficulties with memory, and an additional 23% reported difficulties when questioned about specific memory problems. Of the patients in the present study, 35% reported memory complaints in response to a general question, and an additional 18% mentioned specific problems as the interview progressed. Thus, 64% of the patients in the Freeman and Kendell study and 53% of those in the present study had some memory complaint.

Our data also corroborate the finding by Squire and associates (16) that many of their patients who received bilateral ECT maintained an amnesia for events surrounding their admission to the hospital. Of the bilateral ECT patients in the present study, 62% complained of difficulty describing events that occurred just before hospitalization, whereas only 14% of the unilateral patients did so (p=.02).

As we mentioned earlier, when the subjects were questioned unobtrusively, many more bilateral than unilateral patients had no recall of cognitive test sessions that took place at several times during the ECT series. This finding supports similar observations in a smaller sample by Daniel and associates (17). When questioned directly after the sixth ECT treatment, none of their bilateral but 78% of their unilateral patients claimed to remember being read a short story before that treatment. In a second study, a more objective determination was made 24 hours after the fifth ECT treatment. Significantly more bilateral than unilateral patients had no memory for a test session that took place one-half hour before the fifth ECT treatment (18).

In the present study there were more memory complaints after ECT by depressed patients who had received bilateral than by those who had received unilateral (randomly assigned) electrode placement. This supports previous findings that bilateral ECT is associated with more deficits in memory performance than is unilateral ECT. Most of the bilateral patients in this study had more than one type of memory complaint, whereas very few unilateral patients had even one such complaint. The most common complaint was of a failure to remember events that occurred just before admission. Physicians typically corroborated the patients' reports of poor memory, although the problems were often understated by the patients to their physicians.

Levels of depression before and after treatment were equivalent in the bilateral and unilateral groups, as were the number and length of ECT treatments. Furthermore, the strict blindness to electrode placement of both the interviewer and the patients prevented expectations of greater memory loss with bilateral treatment

from contributing to the larger number of complaints in this group. Since the difference in memory complaints was not likely to be due to any of these variables (depression, treatment dose, expectations), it was more likely to be based on a real difference in the effects of bilateral versus unilateral electrode placement on memory.

We have documented elsewhere (11) that the bilateral patients were more cognitively impaired than the unilateral patients after five ECT treatments. Since, for most of our sample, additional ECT was interposed between the cognitive tests given in the larger study and the structured interview evaluating memory, the two measures cannot be directly compared for each patient. Even so, some specificity existed in correlations between interview items and test performance (e.g., complaints of poor daily memory significantly correlated with a decline in test performance of short-term memory). However, the two sets of measures did not overlap completely. This may be due to the time difference in their collection (L.R. Squire, personal communication).

On the other hand, lack of overlap between self-report and objective measures of memory, even when obtained closer together in time, is quite common and can result from two opposite situations: poor test performance by patients who do not complain and good test performance by those who have memory complaints. The former may result from denial or a disturbance so severe that the patient cannot remember memory failures which occur. The latter may reflect the insensitivity of some performance tests to specific memory disturbances that affect the patient's functioning. Even if there is no objectively identifiable basis for complaints, the *subjective perception* of having a poor memory can distress the patient. Complaints based on this perception can provide useful clinical information, since they can be a sign of problems such as persistent depression (9). Until further research clarifies the relationship between subjective and performance-based measures, both should be used to assess memory during and after ECT treatment.

REFERENCES

1. Freeman CPL, Kendell RE: Patients' experience of and attitudes to ECT, in Electroconvulsive Therapy: An Appraisal. Edited by Palmer RL. New York, Oxford University Press, 1981
2. Freeman CPL, Weeks D, Kendell RE: Patients who complain about ECT. Ibid
3. Squire LR, Wetzel CD, Slater PC: Memory complaint after electroconvulsive therapy: assessment with a new self-rating instrument. Biol Psychiatry 14:791–801, 1979
4. Small IF: Inhalant convulsive therapy, in Psychobiology of Convulsive Therapy. Edited by Fink M, Kety S, McGaugh J, et al. Washington, DC, VH Winston & Sons, 1974
5. Squire LR, Chace PM: Memory functions six to nine months after electroconvulsive therapy. Arch Gen Psychiatry 32:1557–1564, 1975
6. American Psychiatric Association: Task Force Report 14: Electroconvulsive Therapy. Washington, DC, APA, 1978
7. Breslow R, Kocsis J, Belkin B: Contribution of the depressive perspective to memory function in depression. Am J Psychiatry 138:227–230, 1981
8. Sternberg ED, Jarvik ME: Memory functions in depression. Arch Gen Psychiatry 33:219–224, 1976
9. Kahn RL, Zarit SH, Hilbert NM, et al: Memory complaint and impairment in the aged. Arch Gen Psychiatry 32:1569–1573, 1975
10. Fink M, Johnson L: Monitoring the duration of electroconvulsive therapy seizures. Arch Gen Psychiatry 39:1189–1191, 1982
11. Horne RL, Pettinati HM, Menken M, et al: Dexamethasone in ECT: efficacy for depression and post-ECT amnesia, Biol Psychiatry 19:13–27, 1984
12. Pettinati HM: Battery to assess post-ECT amnesia, in Syllabus and Scientific Proceedings of the 134th Annual Meeting of the American Psychiatric Association. Washington, DC, APA, 1981
13. Harris AJ: Harris Tests of Lateral Dominance, 3rd ed. New York, Psychological Corp, 1974
14. Kent GH: Oral Test for Use in Emergency Clinics. Mental Measurement Monograph Serial 9, 1932
15. Hamilton M: A rating scale for depression. J Neurol Neurosurg Psychiatry 23:56–62, 1960
16. Squire LR, Slater PC, Miller PL: Retrograde amnesia and bilateral electroconvulsive therapy. Arch Gen Psychiatry 38:89–95, 1981
17. Daniel WF, Crovitz HF, Weiner RD, et al: The effects of ECT modifications on autobiographical and verbal memory. Biol Psychiatry 17:919–924, 1982
18. Daniel WF, Weiner RD, Crovitz HF: Autobiographical amnesia with ECT: an analysis of the roles of stimulus wave form, electrode placement, stimulus energy, and seizure length. Biol Psychiatry 18:121–126, 1983