CHAPTER IV

ADVERSE EFFECTS OF ECT

Section I. MEMORY AND ECT

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Amnesia occurs for the events prior to each seizure and an impairment in the ability to commit new events to long-term memory is evident following each seizure. This impairment in learning new material diminishes gradually following each seizure and is cumulative with successive treatments.

Several general reviews of the amnesic effects of ECT are available. This review will summarize the current evidence regarding the nature and extent of memory impairment. First, the anterograde amnesic effects of bilateral ECT will be compared to the effects of right unilateral ECT. Second, retrograde effects of ECT on remote memory will be reviewed. Third, the effects of extended treatments of ECT on memory will be summarized. Fourth, recent findings involving the reinstatement procedure will be described. Results with this procedure in animal studies suggested that learned material not ordinarily affected by electroconvulsive shock (ECS) may be forgotten if a reminder of the material is presented just prior to ECS.

Anterograde amnesia: bilateral vs. right unilateral ECT

It has been demonstrated that bilateral ECT produces a greater impairment than right unilateral ECT. However, learning ability has been assessed with verbal memory tests of the type particularly sensitive to dysfunction of the left cerebral hemisphere. The possibility has therefore remained that, if memory were assessed with nonverbal tests designed specifically to detect dysfunction of the right hemisphere, the amnesic effects of right unilateral ECT might be similar to or greater than the amnesic effects of bilateral ECT. In two studies of patients receiving bilateral or unilateral ECT, impairment of nonverbal memory associated with bilateral ECT was slightly greater than the impairment associated with right unilateral ECT. In another study of patients receiving bilateral ECT, delayed reproduction of the story was assessed with verbal and nonverbal memory tests. Patients with right unilateral ECT were nearly identical in delayed recall on the verbal and nonverbal tests, but on the verbal tests, the patients with bilateral ECT were impaired.

Figure 1 indicates that patients about to begin a course of bilateral ECT were nearly identical in delayed recall 16 hours after ECT. However, the effects of right unilateral ECT were greater than the effects of bilateral ECT. The possibility is therefore raised that the amnesic effects of right unilateral ECT might be similar to or greater than the amnesic effects of bilateral ECT. It has been demonstrated that bilateral ECT produces a greater impairment of memory than right unilateral ECT.

Table 1. Delayed retention scores on verbal and nonverbal memory tests for patients receiving bilateral or right unilateral ECT.

<table>
<thead>
<tr>
<th>Test</th>
<th>Before ECT</th>
<th>After ECT</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Memory</td>
<td>8</td>
<td>4</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Nonverbal Memory</td>
<td>6</td>
<td>3</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

Figure 1. ECT and Memory Loss

Delayed retention scores on verbal and nonverbal memory tests for patients receiving bilateral or right unilateral ECT. Before ECT = 16 hours after ECT, After ECT = 16 hours after ECT.
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The findings of this study provide some evidence that memories acquired during the days prior to a course of ECT can be permanently lost. However, there is no evidence to suggest that ECT produces a permanent loss of memory for events occurring during the year prior to hospitalization, as has been reported for other psychiatric treatments. The findings of this study also provide some evidence that memories acquired during the year prior to hospitalization can be recovered after ECT. However, the results of this study do not provide conclusive evidence about the permanent effects of ECT on memory.
The clinical relevance of these findings is profound. First, this study suggests that convulsive therapy may have long-term effects on memory. In particular, bilateral electroconvulsive therapy (ECT) appears to impair memory more severely than unilateral ECT, regardless of whether the tests used to assess memory are more sensitive to left or right hemispheric dysfunction. This finding is consistent with previous reports that bilateral ECT produces a greater loss of long-term memory than unilateral ECT.

One important aspect of memory that may be affected by ECT is the ability to recall past events. In a recent study, patients were given a remote memory test before and after bilateral ECT. The test asked patients to recall television programs that were broadcast from 1957 to 1972. Patients were able to recall programs broadcast within one to two years of the treatment, but were less able to recall programs broadcast four to seven years before treatment. The deficit for remote memory was more persistent than for recent memory. Further work is needed to determine the long-term effects of ECT on remote memory.
However, Janis did include five protocols as samples of persistent amnesia for pre-ECT events. An examination of these protocols indicates that for four out of five, the lost memories belonged to the time period just prior to hospitalization. For the remaining example, the lost memory seemed to relate to events that occurred sometime during the year preceding or during the year following hospitalization. Indeed, there is some evidence to suggest that ECT procedures sometimes result in a temporary loss of memory for events occurring during the one to two years preceding ECT; indeed, there is some evidence to suggest that ECT procedures sometimes result in a temporary loss of memory for events occurring during the year preceding or during the year following hospitalization. However, Janis did include five protocols as samples of persistent amnesia for pre-ECT events. An examination of these protocols indicates that for four out of five, the lost memories belonged to the time period just prior to hospitalization. For the remaining example, the lost memory seemed to relate to events that occurred sometime during the year preceding or during the year following hospitalization. Indeed, there is some evidence to suggest that ECT procedures sometimes result in a temporary loss of memory for events occurring during the one to two years preceding ECT; indeed, there is some evidence to suggest that ECT procedures sometimes result in a temporary loss of memory for events occurring during the year preceding or during the year following hospitalization.
Memory loss in patients receiving extended ECT

Most modern studies of ECT and memory loss concern patients receiving a conventional course of eight to 12 treatments. Accordingly, such studies do not speak to possible long-term effects on memory of an extended course of ECT, e.g., more than 50 treatments. Three studies have been reported that do assess memory capacity and other cognitive functions in patients who have received an extended course of ECT 34, 35, 36. These studies are retrospective investigations of patients who have received a total of more than 50 treatments. Such patients were compared to other patients matched as closely as possible for age, sex, and psychiatric diagnosis. The results indicated that those patients who had received ECT performed worse on a variety of memory and other neuropsychological tests than the control group. However, these patients were chronic schizophrenic inpatients who had been long-term inpatients or severely ill patients who had received a cingulotomy in addition to ECT. In retrospective studies of this type, it is always difficult to know if differences between groups are attributable to ECT, or if those patients selected for extensive ECT were different from control patients before ECT in ways that affected their subsequent performance.

Reinstatement

Normal memory is not reactivated by repeated exposure to previously learned material just prior to ECT (19, 20, 21). However, several animal studies have suggested that material not ordinarily affected by convulsive stimulation may be forgotten if a reminder of previously learned material is administered just prior to ECT. To assess the reinstatement phenomenon with human subjects, patients receiving bilateral ECT learned material 18 hours before ECT or about ten minutes prior to ECT. Alternatively, they learned 18 hours before ECT and then were given a reminder a few minutes before ECT. Retention was always tested six to ten hours after ECT. Figure 3A presents results for a 32-item recognition task, and Figure 3B presents results for 18 paired associates. Patients retaining a reminder of previously learned material just prior to ECT consistently exhibited better retention than patients who learned only minutes before ECT (p < .05). Patients given a reminder of previously learned material just prior to ECT retained this material as well or better than patients who received a cingulotomy in addition to ECT. However, these patients were chronic schizophrenic inpatients who had been long-term inpatients or severely ill patients who had received a cingulotomy in addition to ECT. In retrospective studies of this type, it is always difficult to know if differences between groups are attributable to ECT, or if those patients selected for extensive ECT were different from control patients before ECT in ways that affected their subsequent performance. Accordingly, these studies cannot provide a conclusive answer to questions concerning possible permanent effects of extensive ECT.
The results of the present study provide no evidence that such a procedure would be effective in a clinical population.

Long-term effects of ECT on memory

A recent study reviewed the available literature on follow-up studies of ECT and memory and reported the results of a long-term follow-up study of patients who had received bilateral ECT, right unilateral ECT, or hospitalization without ECT six to nine months previously. Memory functions were assessed with six different tests of learning and remote memory capacity, and self-ratings of memory functions were obtained from all subjects. A group of inpatients was also tested 6–10 hours after their fifth bilateral treatment. This study can be summarized by stating that the three follow-up groups did not differ from each other on any of the memory tests. However, the group tested a few hours after the fifth bilateral treatment was consistently impaired. Figure 4 presents results for one of the memory tests. As might be expected, the inpatients performed more poorly than the other groups. Considerable forgetting occurred in all groups at one day and two weeks after learning, but there was no measurable difference between the retention scores of the three follow-up groups.

Although no objective evidence could be obtained for persistent memory impairment long after ECT, subjects who had received bilateral ECT frequently felt that their memory was not as good as it used to be. Figure 5 presents additional data on memory complaints for a larger sample of subjects who had received bilateral ECT. Of 55 persons who had received bilateral ECT (mean number of treatments = 9.9), 67% indicated that their memory was not as good as it used to be. By contrast, of 15 persons who had received right unilateral ECT (mean number of treatments = 9.4), only four (27%) felt that their memory was impaired. Subjects who had received right unilateral ECT and right unilateral groups could have occurred by chance less than one in every three. Most subjects with complaints of memory impairment long after ECT, subjects who had received bilateral ECT, felt that ECT was the cause of their memory problems. Figure 5 presents additional data on memory impairment long after ECT, subjects who had received bilateral ECT. Eleven of the 37 persons who had complaints after bilateral ECT selected from the statements the one they felt best described their circumstances. None felt that they had "severe memory problems that interfere with almost everything I do." Two felt that they had "many memory problems that interfere with almost everything I do," but these were not measured differences between the retention scores of the three follow-up groups. The results of the present study provide no evidence that such a procedure would be effective in a clinical population.
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The findings reviewed above lead to the following general conclusions about ECT and memory loss:

1. Bilateral ECT is associated with greater anterograde amnesia than right unilateral ECT, even when memory is assessed with tests known to be particularly sensitive to dysfunction of the right cerebral hemisphere.

2. Bilateral ECT also produces more extensive retrograde amnesia for remote events than right unilateral ECT.

3. Extensive ECT, e.g., more than 50 treatments, may lead to long-lasting or permanent impairment in memory capacity, but a definitive conclusion is not possible.

4. The activation of previously learned material just prior to ECT does not cause amnesia for that material.

5. New learning capacity substantially recovers by six to nine months after completion of bilateral ECT, but persisting memory complaints are common in individuals who receive bilateral treatment.

6. Memory for events that occurred prior to ECT is not retained by patients who receive bilateral ECT, unlike those who receive unilateral ECT.

Summary

The discrepancy between subjective and objective measures of memory function cannot be conclusively resolved. Three possible explanations of this discrepancy will be considered here. The possibility cannot be ruled out that failures of recall persist after ECT that are not detected by conventional memory tests. The possibility also cannot be ruled out that patients receiving bilateral ECT were different from patients receiving unilateral ECT in some way that favored the development of memory complaints. Finally, bilateral ECT might itself lead to a lingering sense of memory impairment. The maintenance of recent and remote memory initially associated with bilateral ECT might cause some individuals to be more sensitive to subsequent failures in recall, even if they occur at a normal frequency. This hypothesis, unilateral ECT itself has little effect on memory, would not be expected to lead to memory complaints. Put in its strongest form, this explanation of memory complaints supposes that bilateral ECT might lead many individuals with or without psychiatric illness to have persistent illusion of memory impairment.

References for Section I


17. Dornbush IL: Memory and induced ECT convulsions. Semin Psychiatry 4: 47-54, 1972
29. Squire LII, Slater PC, Chace PM: Memory functions six to nine months after electroconvulsive therapy. Arch Gen Psychiatry 32: 1557-1564, 1975
30. Squire LII, Chace PM, Slater PC: Memory impairment and recovery in depressed patients following a single course of electroconvulsive therapy. Neuropsychologia, in press, 1978
APPENDIX II—ALT

AMERICAN PSYCHI
TASK FORCE ON ELECTR

INSTRUCTIONS: You will help us keep the cost of processing answers according to the following rules.

Please

• Use a soft black pencil

• Erase completely any answer you wish to change

• Answer each question by writing the code number of the correct answer in the space provided.

• For some questions your answer may be a number with fewer digits than the extreme right in the space provided and fill the empty space(s) with zeros. If your age were 9 years, you would complete item 1 as 0 9.

SECTION 1

1. YOUR AGE AT LAST BIRTHDAY?

2. YOUR SEX? 1-Male 2-Female

3. NAME AND LOCATION OF MEDICAL SCHOOL FROM