

A Study of Memory Changes after ECT

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ABSTRACT

Memory disturbances following ECT was studied as regards differential effects of bilateral and unilateral non-dominant ECT, and the possible relation between the number of ECT and the degree of memory changes in forty right-handed male patients, 20 to 40 years of age with no ECT given in the previous 6 months. Patients were tested for cerebral dominance and memory was assessed at various periods by Wechsler's digit span and a short story test. Data were analysed taking the differences between the pre-treatment scores. Treatment was delivered twice weekly for 4 weeks and memory was assessed after the fourth and eighth ECT. The results showed the unilateral non-dominant ECT to be associated with the least amount of memory impairment and to be in general conformity with the results of other workers.

INTRODUCTION

Following the recognition of its value ECT became the most widely used form of therapy in psychiatry prior to the introduction of drugs, and is still common at present for the sake of economy in time, finance and staff.

No method of ECT is uniformly paramount in effect or superior in relieving symptoms. One must, therefore, choose the best balance between advantages and undesired side effects. Severe memory changes would undermine the beneficial effects of the therapy and clinical improvement may mask memory changes.

Amnesia, confusion and headache are well known side effects of ECT; several efforts have been made to avoid memory impairment by

using different types of current or different electrode positions (Thenon, 1956; Freidman and Wilco 1942; Liberson, 1948).

This study is concerned with investigating the degree of memory disturbance associated with ECT. It is also aimed at identifying the possibility of the differential effect of bilateral versus unilateral non-dominant ECT in Egyptian patients. The possible relation between the number of ECT delivered and the degree of memory impairment was also studied.

EXPERIMENTAL METHOD

Subjects : The study included forty male patients in Nile Sanatorium, Maadi, Cairo.

The patients were admitted to the study only if they fulfilled the following criteria :

1. No clinical evidence of organicity.
2. Age between 20 and 40 years.
3. A clear cut diagnosis of either schizophrenia, depression or mania.
4. No ECT given during the preceding 6 months.
5. Strong right-handedness.

All patients were selected at random without emphasis on sex, marital status, education, profession or social class. All patients were already on neuroleptics and/or antidepressants for not less than one month prior to ECT.

Schizophrenics were on Trifluoperazine (15 - 30 mg/day), Chlorpromazine (75 - 300 mg/day) and Benztropine mesylate (2 - 6 mag/day).

Depressed patients were on Amitriptyline (30 - 75 mg/day) and Imipramine (75 - 150 mg/day).

Maniacal patients were on Haloperidol (9 mg/day), Thioridazine (300 mg/day) and Benztropine mesylate (2 - 6 mg/day).

Medication was continued throughout the trial period.

Diagnosis: The diagnosis was made by two psychiatrists independently and on separate occasions following the Egyptian classification published in the "Diagnostic Manual of Psychiatric Disorders" (1979).

Procedure :

- A. **Testing for Cerebral Dominance :** Since it is not enough to ask about handedness in order to determine cerebral dominance, each of the selected patients was tested for cerebral dominance using the method described by Levy & Reid (1976). These workers had demonstrated that the hand position in writing can be either inverted or non-inverted. Most people write non-inverted, this indicates that the contralateral hemisphere is dominant and such patients can be given ECT to the non-language dominant hemisphere. People with inverted hand posture manifest smaller degrees of lateral differentiation. They may have ipsilateral or mixed language dominance and should be given bilateral ECT.
- B. **Memory Testing:** Each patient was given two tests for immediate memory : the digit span from Wechsler's test and a short story test. In the latter test the patient was told a short story and asked to recite it back and scored according to the number of items correctly recalled.
- C. **Method :** Each patient underwent an assessment for memory before ECT. This pre-ECT memory is considered as a starting base line for the group related to a particular form of therapy, it is not the normal for the population. These memory tests are repeated 24 hours after each of the fourth and eighth ECT.

All patients received premedication consisting of 1 mg atropine

mixed with 0.25 gm thiopentone sodium given slowly intravenously, after the patient is asleep 25 mg of succinyl choline in a separate syringe is injected through the same needle. Immediately after injection of succinyl choline, oxygenation is begun by means of an ambu bag for 30 seconds before application of the current. After the fit is over oxygen is readministered till the patient regained spontaneous respiration. Modified grand mal seizures were elicited on all occasions in all 40 patients included in the study. Eight treatments were administered to each patient at a twice weekly rate.

- D. **Statistical Analysis:** The presence or absence of statistically significant changes in memory after 4 ECT and after 8 ECT applied either bitaterally or unilaterally to the non-dominant hemisphere, and between both groups of treatment was determined by treating the scores obtained for both memory tests by using the student's "t" test.

RESULTS

Number of Cases:

Forty patients were selected at random for the study, 20 were assigned for bilateral ECT and the other 20 patients for unilateral non-dominant ECT.

Age:

The 40 patients ranged from 20 to 40 years of age to exclude any organic effects on memory. It is assumed that people below 20 years have not reached full maturity, and those above 40 years usually have some degree of organic changes that may affect memory. 40% of patients fall in the age group of 20 - 24 years, 30% in the age group of 25 - 29 years, 20% in age group 30 - 34 years, and 10% in the age group of 35 - 39 years. More than half of the patients fall in the age group 20 - 29 years.

Marital Status :

90% of patients were single, and 10% were married.

Religion :

90% of patients were Moslems, and 10% were Christians.

Education :

One patient was illiterate, 9 patients had primary education, 22 patients had secondary education, and 8 had university education.

Profession :

The sample included 5 unemployed patients, 3 patients worked as labourers, 4 patients were semiskilled, 2 were skilled, 19 were students and 7 were professionals.

Social Class :

19 patients fell in social class II, 10 in class III, 9 in class IV, and 2 patient in class V.

The data were analysed taking the differences between the initial score and the post-treatment scores for each period separately i.e. after 4 ECT and after 8 ECT; and also taking the difference between the inter-period scores. Analysis of variance showed the following results summarized in table 1 & 2 :

TABLE I

Difference Between BIL. and UND ECT by the Short Story Test.

BILATERAL ECT			UNILATERAL NONDOMINANT ECT		
After 4 ECT	After 8 ECT	Difference between both	After 4 ECT	After 8 ECT	Difference between both
Tc = 4.8	6.87	2.9	4.0	5.3	0.06
Tt = 2.086	2.086	2.025	2.086	2.086	2.025

TABLE II

Difference Between BIL. and UND ECT by the Digit Span Test.

BILATERAL ECT			UNILATERAL NONDOMINANT ECT		
After 4 ECT	After 8 ECT	Difference between both	After 4 ECT	After 8 ECT	Difference between both
Tc = 4.64	7.0	1.68	1.36	5.6	2.57
Tt = 2.086	2.086	2.025	2.086	2.086	2.025

(A) Results obtained by the short story test :

1. There are similar and equally significant memory changes after a period of four ECT in both treatment groups.
2. After eight ECT there are significant memory changes in case of unilateral non-dominant ECT group, but the change of memory is more significant with the bilateral ECT group.
3. Analysis of the interperiod differences in memory shows insignificant change of memory with the unilateral ECT group, but with bilateral ECT group the change was significant suggesting that

the deterioration of memory continues with bilateral treatment, while with unilateral ECT the number of treatment had no effect on memory i.e. did not cause more change in memory than that already caused by four ECT.

(B) Results obtained by the digit span test :

1. There is insignificant change in memory after four ECT with unilateral treatment group, but the change was significant with bilateral group.
2. There are memory changes after eight ECT in both treatment groups and the change is significant.
3. Since there is no change after four unilateral ECT, but there is change after eight ECT, so there is naturally a difference between both periods.
4. In bilateral ECT group there is no difference between both periods pointing out to the possibility that the maximum effect on memory has already taken place after four ECT.

DISCUSSION

ECT is a useful form of therapy in many psychiatric conditions, it is still widely used in our hospitals as it is quite safe, even more so than drug therapy. However, various side effects are encountered during the treatment with electro-shocks, particularly amnesia, confusion and headache. For this reason, in order to avoid the effect of confusion on memory, memory was assessed 24 hours after the treatment time. Most of the previous work has been concerned with the study of the effects of ECT on memory in depressed patients or on heterogeneous groups. In this study at least 75% of patients were schizophrenics of various types.

All patients shared the fact of being under drug therapy prior to

admission into hospital and selection for the study. Since this work is not concerned with the therapeutic effect of ECT, it was not felt necessary to stop medical treatment for any length of time before starting the study. The comparison was between memory scores at the time of admission as a base line and that obtained after four and eight ECT with a comparative study between unilateral non-dominant ECT and bilateral ECT, hence the change of memory can be attributed to ECT rather than to the drugs which were continued all through the study. It was also thought of advantage to this type of study to continue using drug therapy to facilitate contact with the patients and to obtain scores that are meaningful and valid for analysis. It would have been of value to implement such study by examining a third group of patients treated with drugs and placebo-ECT in order to assess the net effect of drugs on memory. In conducting this work this had not been done since nowhere in the literature was it mentioned that drugs had any effect on memory and the assumption was made, although tentatively, that the change in memory was solely due to ECT. It is felt that this area deserves more attention and investigation in future studies.

Many reports indicate that unilateral ECT applied to the dominant hemisphere has more pronounced adverse effects on memory than that applied to the non-dominant hemisphere. Because of this it was decided to apply unilateral non-dominant ECT since our primary concern was to evaluate the possible difference between unilateral and bilateral ECT on memory.

Memory scores were taken by the same person since personal judgment can not be avoided in the short story test; as regards the digit span test the sequence of the digits was changed in every occasion with the individual patient to avoid the effect of familiarity and previous learning on memory.

The results show that bilateral ECT resulted in memory impairment which is much more significant than that caused by unilateral non-dominant ECT. One can also notice that the cumulative effect of bilateral

ECT is significantly more than that seen in unilateral ECT group. This is evident from the results relevant to memory changes after four and eight ECT as tested by the short story test (Table 1). There is no difference between memory rating after four and eight ECT in the unilateral group, whereas this difference is statistically significant in case of bilateral ECT.

There is an apparent false contradiction in the results presented in table 2, these results show that there is a difference between both periods in case of unilateral ECT while this difference is absent in case of bilateral ECT when the digit span test was used. This is not contradictory to our previous conclusion since in the digit span test no change in memory was found after 4 ECT, while the change of memory was significant after 4 ECT, while the change of memory was significant after 8 ECT with unilateral treatment; because of this, calculation of difference between both periods in the unilateral group was found significant, in fact this proves the mildness of memory changes after unilateral non-dominant ECT since it did not take place except after an extended number of treatments.

It must be pointed out that the results of this study as shown by the short story are in agreement with those obtained by the digit span test, only that the latter test is standardized.

Since no difference was found between bilateral, and unilateral non-dominant ECT as far as the overall therapeutic efficacy is concerned (Halliday et al, 1968; Zinkin and Birtchnell, 1968; Fleminger et al, 1970; Costello et al, 1970; Doongaji et al, 1973), and since our results show that unilateral non-dominant ECT is associated with the least amount of memory impairment it could be recommended that unilateral ECT applied to the non-dominant hemisphere is the method of choice when ECT is the treatment indicated.

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الموجز

دراسة تغيرات الذاكرة الناتجة عن جلسات الكهرباء

يشتمل هذا البحث على دراسة اضطرابات الذاكرة الناتجة عن جلسات الكهرباء دراسة مقارنة بين الوضع المتماثل لأقطاب الكهرباء والوضع الصدغي الجبهي على الفص المخي غير السائد ، كما يضم أيضا دراسة العلاقة المحتملة بين عدد الجلسات ودرجة تغير الذاكرة في ٤٠ مريضا تتراوح أعمارهم بين ٢٠ - ٤٠ سنة ممن لم يعطوا جلسات في فترة الستة أشهر السابقة للبحث ثم اختبار المرضى لتحديد الفص المخي غير السائد وكذلك اختبار الذاكرة باستخدام اختبار القصة القصيرة واختبار وكسلر . حلت النتائج بمقارنة درجات ما قبل العلاج وما بعده وقد أعطيت الجلسات بواقع جلستان أسبوعيا لمدة ٤ أسابيع وتم اختبار الذاكرة بعد الجلسة الرابعة والجلسة الثامنة . وقد أظهرت النتائج أن الوضع الصدغي الجبهي على الفص المخي غير السائد كان مصحوبا بأقل تغير في الذاكرة وهذا يتفق مع النتائج التي حصل عليها الباحثون السابقون .

ABSTRAIT

Étude du changement de la mémoire à la suite d'électrochocs.

Les troubles de la mémoire à la suite de l'électrochoc ont été étudiés par les efforts différentiels de l'électrochoc bilatéral et unilatéral non-dominant d'une part et la relation possible entre le nombre d'électrochocs et le degré de changement de la mémoire chez quarante patients mâles droitier âgés de 20 à 40 ans qui n'ont pas subi d'électrochocs durant les 6 mois précédents. Les patients ont été testés pour la dominance cérébrale et la mémoire évaluée en des périodes variées par le "Wechsler's digit span" et le test de la courte histoire. Les résultats furent analysés prenant la différence entre la cote d'avant traitement et celle d'après traitement. Le traitement était donné 2 fois par semaine durant un mois et la mémoire évaluée après le quatrième et huitième électrochocs. Les résultats montrent que l'électrochoc unilatéral non-dominant est associé au plus petit montant de changement de mémoire et est conforme généralement aux résultats d'autres chercheurs.

Electrophoresis in Psychiatry: Autoimmune Hypothesis for Schizophrenias

By M S.A. Gawad and Z. Abdel Gawad

ABSTRACT

Out of 19 Schizophrenic patients screened for their electrophoretic protein pattern, five were selected, on basis of their high protein content, for further study by immunoelectrophoresis (I E P). Anti-Total Human Serum was used for the five cases while Anti IgG, IgM, and IgA was used for the three cases that revealed increased gamma-globulins. The results of I E P indicated presence of antibodies. A short review of the studies of the mechanism involved in the formation of anti-brain antibodies and their nature was attempted.

INTRODUCTION

There are data indicating that in schizophrenia there may be a disturbance of membrane permeability. However, these ideas do not go beyond a hypothesis and have still not received convincing experimental proof.

It is well known that the changes in cell membrane permeability, or even the destruction of the membranes, are accompanied by a diffusion of the intracellular contents, especially the cell proteins, into the environment. If the human lymphoid system has never previously been in contact with a cell protein, then contact with protein in lymph nodes or in the spleen will result in corresponding antibodies to these proteins. This principle is the basis for all contemporary noninfectious immunobiology and particularly the concept of autoimmune diseases of man and animals.

Towards this end, we carried out this immunoelectrophoretic study aiming at the identification of the factor that may be responsible for the hypothesized autoimmune process.