

EFFECTS OF ELECTRO CONVULSIVE THERAPY ON COGNITIVE FUNCTIONS IN PATIENTS OF DEPRESSIVE EPISODE

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ABSTRACT

Objectives: The objective of the study was to determine the effect of Electro Convulsive Therapy (ECT) on cognitive functions in patients of depressive episode.

Design and Setting: It was an observational analytical study conducted in Departments of Psychiatry Military Hospital Rawalpindi and the Naval Hospital (PNS Shifa) Karachi.

Methodology: Fifty-five patients with depressive episode who were to undergo ECT treatment were included. They were administered translated versions of Mini Mental State Examination (MMSE) 24 hours before first ECT and 3 hours after first, second, fourth and sixth ECT and one month after the last ECT. Pre ECT cognitive functions were compared with those after subsequent ECTs. Data was compiled and analyzed by using Statistical Package for Social Sciences (SPSS) version 10.0 calculating mean values and p-value for determining the significance of difference which was set at 0.05.

Results: Mean age of the subjects was 29 years. Thirty-nine (71%) were males, 16 (29%) were females; 24 (44%) were taking tricyclic antidepressants as compared to 31 (56%) who were on other antidepressants. ECT had a significant effect on registration and recall of memory in the depressed patients who underwent six ECTs given by bilateral electrode placement and this persisted one-month after the last ECT. There was no significant effect of ECT on orientation, attention and concentration component of cognitive functions one month after last ECT. Language functions including comprehension and articulation remained unaffected.

Conclusion: This study finds no persistent cognitive impairment after 30 days in patients treated with ECT, except for a decline in registration and recall aspects of short term memory.

Keywords: Electro convulsive therapy, depression, cognitive functions.

INTRODUCTION

Electro convulsive therapy (ECT) is one of the most effective but least understood treatments in Psychiatry. The technique and the associated anesthesiological interventions have been highly refined, so that ECT is now considered a safe and effective treatment of patients with major depressive disorder, manic episode, schizophrenia, and other

serious mental disorders [1-4]. Many clinicians and researchers believe that ECT is grossly underused as a treatment. The major reason is hypothesized to be misconceptions and biases about ECT at least partly fueled by widespread misinformation and negative propaganda in the media of its ill effects on brain [5]. Many inaccurate reports have appeared in both professional and lay literature about alleged permanent brain damage resulting from ECT. Although these reports have largely been disproved, the fear of ECT-induced brain damage continues [6,7].

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Common side effects associated with ECT are headache, confusion, and delirium during and just after the recovery phase of anaesthesia. Cognitive impairment is a common problem associated with ECT. Marked confusion may occur in 10% of the patients within 30 minutes of the seizure [8]. Delirium is usually most pronounced after first few treatments and in patients who receive bilateral ECT or who have coexisting neurological disorders. The delirium characteristically clears within days or few weeks at the longest. The greatest concern about ECT is the association between ECT and memory impairment. About 75% of all patients given ECT say that the memory impairment is the worst adverse effect [9]. The immediate effects of ECT include loss of memory for events shortly before the treatment and impaired retention of information acquired soon after the treatment. Some individuals also experience loss of more remote personal memories. These effects depend on both electrode placement and electrical design; electrode placement appears to be the more important factor [10-12]. However, two months after treatment there is no difference between treatment regimens. Many patients fear that there is going to be lasting memory change and some complain about it after ECT. However Sackheim has found either no difference in memory or some improvement in memory some weeks after ECT [11]. Moreover depressive disorders substantially impair cognitive function and many patients report their memory as subjectively much improved after ECT. In addition, several studies have found no significant difference in memory tests between ECT-treated patients and controls that had not received ECT [13,14]. Freeman et al. in 1980 examined a group of self-selected patients who were convinced that their memories had been impaired by ECT. Some impairment was indeed found and there was no evidence of faking. However much of this impairment could be accounted for by continuing depressive disorder, drugs and alcohol use [9]. The degree of cognitive

impairment during treatment and the time it takes to return to baseline are related in part to the amount of electrical stimulation used during treatment. In spite of the memory impairment, which usually resolves, there is no evidence of brain damage caused by ECT [7].

The concerns about the negative impact of ECT on cognitive functions are also regularly raised by community in Pakistan as well as patients and their families. However there is no data available on the subject. The present work is therefore designed to study the effect of ECT on cognitive functions in patients suffering from depressive disorder in a section of Pakistan's population.

PATIENTS AND METHODS

This prospective study was carried out in patients admitted to Departments of Psychiatry Military Hospital Rawalpindi and Naval Hospital (PNS Shifa) Karachi. Fifty-five depressed patients undergoing ECT treatment who fulfilled the diagnostic criteria of depressive disorder with no other comorbid psychiatric or neurological disorder were included in the study. Exclusion criteria included patients more than 40 years, mute patient or those with language problems / communication difficulties.

After selection they were explained the nature, purpose and the procedure of the project. They were then asked if they were interested to be included or otherwise. All the relevant data such as demographic and clinical features were obtained from their medical history sheets and from their relatives. Patients were administered Mini Mental State Examination (MMSE) by the author 24 hours before first ECT and hours after first, second, fourth, sixth ECT and one month after last ECT.

Mini Mental State Examination (MMSE) was introduced by Folstein et al in 1975. It is a standard tool for cognitive assessment in the clinical setting as it facilitates the detection of mental status changes [15].

Bilateral ECT under general anaesthesia using 1-2 minutes ventilation with pure oxygen and followed by induction Thiopental sodium 3-5 mg/Kg body weight and Suxamethonium 40-60 mg for muscle relaxation was administered.

Pre ECT cognitive functions were compared with the cognitive functions after 1st, 2nd, 4th, 6th ECT and one month after last ECT. Scores on Mini Mental State were divided into five major groups of Orientation, Registration, Attention and Concentration, Recall and Language. Data was compiled and analyzed by using Statistical Package for Social Sciences (SPSS) version 10.0. Since every individual was followed over a period of time, our data resembled matched subsets. Means and standard deviations were compared for Pre-ECT and after sessions of ECT using repeated measure analysis techniques. F statistics along with corresponding p-value were calculated to determine significance values of results (all P-value <0.05 were considered significant).

RESULTS

The mean age of the studied group was 29 ± 5.96 years. Thirty-nine (71%) out of the 55 study subjects were males and remaining 16 (29%) were females. Thirty-six (65%) were married, 18 (33%) were unmarried with 1 (2%) widow. Fourteen (25%) had past history of depressive episode; however no one had received ECT during past. Forty-one (75%) had no past history of psychiatric illness, 24 (44%) were taking tricyclic antidepressants as compared to 31 (56%) who were on other antidepressant medications. Only 5 (9%) had positive family history of psychiatric illness and remaining 50 (91%) had no family history of psychiatric illness.

Scores on MMSE were divided into five major groups as described earlier i.e. orientation, registration, attention & concentration, recall and language. Means and standard deviations of all scores were independently calculated. Since every individual was followed over a period of

time, the data resembled matched subsets type. Means and standard deviations were compared for pre-ECT and after sessions of ECT using repeated measure analysis techniques. F statistics along with corresponding p-value was calculated to determine significance values of results (all P-value <0.05 were considered significant).

Orientation:

Orientation in time, place and person was tested as per MMSE scale. Scores of orientation were taken on a scale from zero to ten. Mean and standard deviation of all scores were calculated independently (table-1) gives the mean \pm SD of all the scores of orientation for all six stages of study. Mean + SD were compared for each stage using repeated measure analysis techniques. F statistics of orientation was 3.078 with the P value of 0.085, which means there was no statistically significant change in mean scores of orientation before ECT and one month after 6th ECT. This means ECT has got no effects on orientation of the patients of depressive episode one month after last ECT compared with their pre ECT status.

Registration:

Registration of memory was tested on MMSE scale and scores were recorded on a zero to three scale. Means and standard deviation of all scores (table-2). Mean and SD were compared for each time of recording the scores by using repeated measure analysis techniques. F statistics was 6.383 and P value was 0.014, which means a statistically significant change in mean scores of registration before ECT and one month after 6th ECT occurred.

Attention and Concentration:

Attention and concentration of the patients were tested according to the procedure given in MMSE and scores were recorded from zero to five. Mean scores and standard deviation of all scores were calculated independently (table-3) gives mean scores and standard deviation before first ECT, after first, second, fourth, sixth and one

month after last ECT. Each individual was followed over a period of time; hence the data obtained resembled the matched subsets type. Mean and standard deviation were compared for each reading using repeated measure analysis techniques. F statistics was 3.056 and P value was 0.086, which means no statistically significant change in mean scores of attention and concentration before ECT and one month after 6th ECT.

Recall:

Recall of memory was tested on MMSE scale from zero to three. Mean and standard deviation of all scores were calculated independently. (Table-4) gives the mean and SD of all the scores of recall for all six stages of study. Mean and SD were compared for each stage using repeated measure analysis techniques. F statistics of recall was 5.611 with the P value of 0.021, which means statistically significant decline in mean scores of recall before ECT and one month after 6th ECT occurred.

Language:

Language and other functions were tested as per MMSE and scores were taken on a scale from zero to nine. Means of all scores were calculated independently. There was no change in the mean scores of different recording over time so further analysis was not carried out. There was no effect of ECT on language (comprehension and articulation) functions. Both written and spoken parts of language were unaffected.

DISCUSSION

The main aim of this study was to assess the effects of ECT on cognitive functions of patients of depressive episode. Patients were selected from indoor settings of military hospitals. They included those suffering from severe depressive episode according to ICD-10 criteria and undergoing ECT as acute treatment.

The major findings of our study are that ECT has got significant effect on registration and recall parts of memory in the depressed

Table-1: Orientation Scores (n=55).

Orientation Score	Mean \pm SD
OR1	9.6182 \pm .7326
OR2	8.2000 \pm 1.5800
OR3	8.1091 \pm 1.5477
OR4	8.0182 \pm 1.5213
OR5	8.2727 \pm 1.6828
OR6	9.8727 \pm .4327

Table-2: Registration Scores (n=55).

Registration Score	Mean \pm SD
Reg 1	2.8909 \pm .3146
Reg 2	2.4727 \pm .6626
Reg 3	2.4727 \pm .6626
Reg 4	2.4727 \pm .6626
Reg 5	2.5273 \pm .6626
Reg 6	2.6000 \pm .6626

Table-3: Attention Scores (n=55).

	Mean \pm SD
Attention 1	4.4182 \pm 1.0834
Attention 2	3.4909 \pm 1.1999
Attention 3	3.4545 \pm 1.1677
Attention 4	3.4000 \pm 1.1483
Attention 5	3.8000 \pm 1.2080
Attention 6	4.6364 \pm .7785

Table-4: Recall Scores (n=55).

	Mean \pm SD
Recall 1	2.7455 \pm .5517
Recall 2	1.7455 \pm 1.0579
Recall 3	1.7091 \pm 1.0483
Recall 4	1.6364 \pm 1.0429
Recall 5	1.7818 \pm 1.1335
Recall 6	2.2545 \pm 1.0753

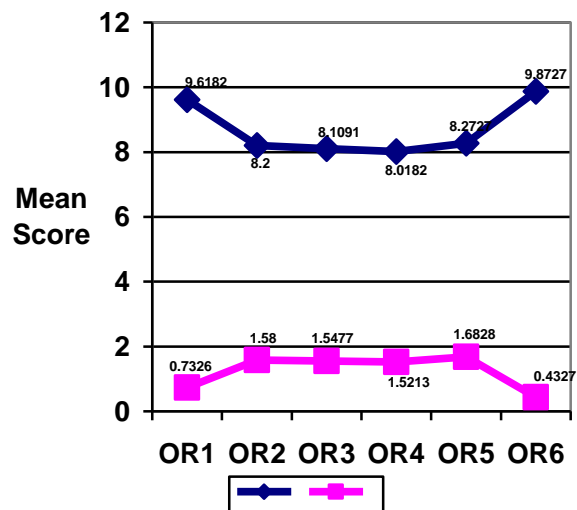


Fig1:Orientation Scores (Mean + SD)

patients who have gone through six ECTs. This effect lasts even after one month of the last ECT received by the patients.

Williams et al compared 15 depressed patients, 17 in remission from depression, 20 normal control subjects and 15 in remission as a result of ECT [17]. Although this study showed impairment of memory functions two weeks after ECT, at six months no problems were reported. These findings are comparable with our results as there was a significant effect on the registration of new memories as well as recall of memories after one month of last ECT in our study. We followed the patients to one month in comparison to William et al, who observed the effects even after six months.

Schweitzer et al studied the effects of ECT on memory and cognition in 32 patients with moderate to severe depression. They found that 32% patients had memory impairment after six sessions of ECT but the memory deficit was significantly improved by the one-month follow-up examination [18]. This is in line with our study.

Freeman et al compared 26 patients who complained of permanent unwanted effects against two control groups. Subjects were given a battery of 19 cognitive tests. The significant differences among the complainers were mostly attributed to depression and medication, not to the ECT treatments. However, some impaired cognitive functioning was seen as a result of ECT [9].

Frith and Reid found out that ECT treatments actually led to improvement in memory and other cognitive functions by eliminating the underlying depression [19-21]. Our study does not identify the individuals who have impaired cognitive functions prior to ECT because of their primary illness i.e. depression. However detailed assessment is required to assess their cognitive functions separately and analyze the effect of ECT in this group of patients.

There is no significant effect of ECT on orientation, attention and concentration

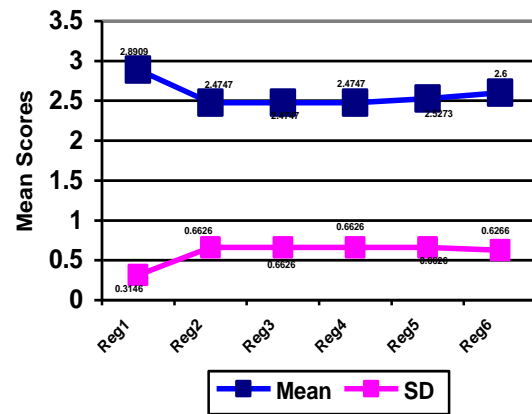


Fig 2:Registration Scores (Mean+SD)

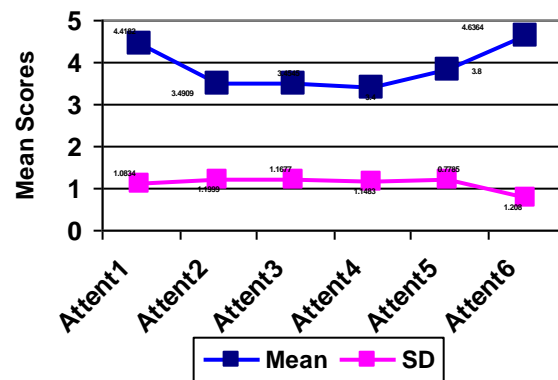


Fig 3:Attention Scores (Mean+SD)

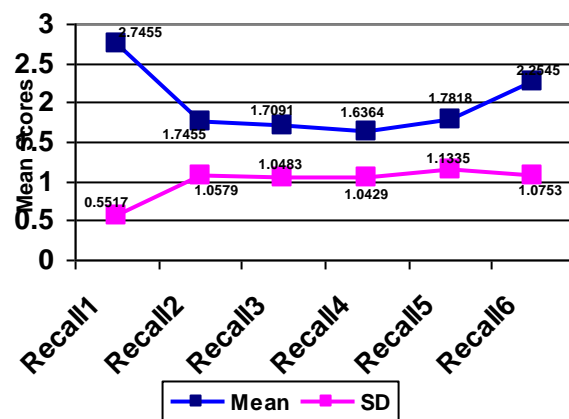


Fig 4:Recall Scores (Mean+SD)

component of cognitive functions. Language and other functions were not altered with ECT throughout the study period. The trend of scores on all four components of cognitive functions i.e. orientation, attention & concentration, registration and recall of memory showed an improvement after the last ECT till final reading one month after last

ECT. Overall these findings are consistent with previous researches on effects of ECT on cognitive functions of the patients. Ghaziuddin et al studied cognitive impairments among adolescents treated with ECT. They found significant impairment of concentration and attention and memory functions especially recall. However there was no evidence of long-term damage to concentration, attention and memory, which is consistent with our results [22].

Limitations of Study:

The small sample size and absence of controls were the main limitations of the study. Moreover these patients were mainly Armed Forces personnel and their families so they do not represent the general population of the country. The use of tricyclics in the studied population is a confounding factor as these drugs can cause cognitive changes as well. The cognitive functions were assessed by using MMSE while a battery of tests of cognitive functions are available. Ideally assessment should have continued up to six months of the last ECT while our study stopped the assessment of cognitive functions at 30 days.

CONCLUSION

The only cognitive effects identified in the study are disturbances of registration and recall in short term memory that appear after 1st ECT and lasts to the 6th ECT. All other cognitive functions remain unaffected. The common concern about the negative impact of ECT on cognitive functions has not been substantiated in our study population. Further studies need to be undertaken after addressing the limitations of the study, to substantiate a case against ECT as a cause of cognitive decline in depressed patients.

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