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Electroconvulsive therapy in severe depression: Effect on cognition

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Abstract

Introduction: Depression is the leading global cause of disability and approximately, 350 million people suffer from depression worldwide. Despite the availability of numerous psychopharmacological treatments, evidence indicates that only 60–70% of persons who tolerate antidepressants will respond to first-line drug therapy for major depressive disorder. Resistance to the antidepressant medication is the main indication for ECT. However, the use of ECT remains controversial due to concerns about temporary cognitive impairment in persons with depression who receive acute ECT. The present study was planned to evaluate the effectiveness of ECT in severe depression and its effect on cognition.

Materials & Methods: A total of 30 consecutive patients diagnosed with Severe Depressive Episode as per International Classification of Diseases (ICD-10) Diagnostic Criteria for Research and satisfying the eligibility criteria were taken in the study after informed consent. ECT was administered as per prevailing guidelines by means of a medical model BPE – 2000 giving bidirectional square wave pulse at a frequency of 20-90Hz. Baseline evaluation by Hamilton Rating Scale for Depression and Mini-Mental State Exam (MMSE) for cognition was done one day prior to ECT treatment. Post-treatment evaluation was carried out at the end of ECT treatment and at one month after ECT treatment.

Results: The mean age of the study subjects was 38.53 years with 66.7% females and 33.3% males. Significant improvement was seen in depressive symptoms after ECT treatment ($p<0.05$). Mean Hamilton score at baseline, immediately after ECT and at 1 month follow up were 40.03, 14.32 and 14.89 respectively ($p<0.01$ and p-0.19). Study participants already had memory difficulties prior to treatment with 63.3% and 10% having mild and moderate impairment respectively which did not change drastically post-treatment (p-0.48). At 1 month follow-up, participants reported a slight increase in memory problems (53.3% mild and 30% moderate impairment), but the difference was not significant (p-0.25). Mean MMSE scores at baseline, immediately after ECT and after 1 month were 22.27, 21.23 and 19.56 respectively (p-0.69; p-0.056)

Conclusion: The observation made in present study strongly suggest the benefits of ECT in reducing and providing sustained relief from the acute symptoms of depression while sparing cognition in most cases. The study findings may assist health care providers and potential patients to take a more informed decisions about their care.

Keywords: electroconvulsive therapy, hamilton rating scale, mini mental state examination, severe depression

Introduction

Depression is the leading global cause of disability and approximately, 350 million people suffer from depression worldwide [1]. About 13% of men and 21% of women will be affected in their lifetime and, according to WHO, Major Depression will be the world's second most debilitating disease by 2020 [1]. India has about 16.6 million cases of Major Depression per year and 10.3 million cases at any time [2].

Despite the availability of numerous psychopharmacological treatments, evidence indicates that only 60–70% of persons who tolerate antidepressants will respond to first-line drug therapy for major depressive disorder (MDD) [3]. Furthermore, at least one-third of persons with MDD who receive drug therapy will become treatment resistant [4]. Patients who do not have their symptoms fully remitted show higher recurrence risk, anxiety disorders, chronic medical illnesses, have worse psychosocial functioning, worse quality of life (QOL) and higher number of symptoms during follow-up [5-7].

Electroconvulsive therapy (ECT) is a procedure which consists of the induction of convulsive crises by means of applying an electric current through the brain for therapeutic purposes. Resistance to the antidepressant medication is the main indication for ECT [8-11]. Besides, ECT provides a faster response as compared to medication, which is necessary in severe situations that need emergency intervention, such as catatonia and suicide risk [12]. The American Psychiatric Association has already included these situations as indication of ECT as the first choice [13]. The efficacy of ECT to treat depressive symptoms has been established by means of innumerable studies developed during the last decades [14]. According to Prudic, ECT is the most effective biological treatment currently available for depression, and no other treatment up to now has shown to be superior to ECT in the treatment of major depression in controlled studies [15].

However, the use of ECT remains controversial due to concerns about temporary cognitive impairment in persons

with depression who receive acute ECT [16]. The UK ECT Group also found that differences in ECT treatment modalities (eg, electrode placement, pulse shape, treatment frequency and treatment dosage) had a differential impact on the incidence and duration of cognitive impairment in persons with depression [17]. Semkovska and McLoughlin [18] examined the issue of cognitive impairment post-ECT in a recent meta-analysis. After pooling results by cognitive test, these authors found that cognitive impairment was limited to a post-treatment period of 3 days. Although Semkovska and McLoughlin [18] did assess risk of bias, these results are not reported in the manuscript nor did they report the grading of the strength of evidence.

The present study was thus planned to evaluate the effectiveness of ECT in severe depression and its effect on cognitive impairment, as not much work has been done in this regard in India.

Materials and Methods

A Prospective Interventional study was conducted in patients with Severe Depression receiving Electroconvulsive Therapy during Oct' 2015 to Sept' 16. A total of 30 consecutive patients diagnosed with Severe Depressive Episode as per International Classification of Diseases (ICD-10) Diagnostic Criteria for Research and satisfying the eligibility criteria were taken in the study after informed consent [19].

Inclusion Criteria

1) All patients above 18 years of age.
2) All OPD and IPD patients diagnosed with Severe Depressive Episode (as per ICD-10) receiving Electroconvulsive Therapy.
3) All patients willing to participate in the study by means of Informed consent.
4) All patients giving Informed consent to undergo Electroconvulsive Therapy prior to every treatment.

Exclusion Criteria

1) All patients who had received Electroconvulsive Therapy within past one year.
2) All individuals with Neurological deficits, serious medical illnesses and Mental Retardation.
3) All individuals with other Psychiatric and Neurological disorders like Dementia, Mania, Psychosis, and Substance use disorders.

Methodology

A written Informed Consent after explaining the procedure in detail was taken before each ECT treatment. Baseline evaluation was done one day prior to ECT treatment while Post-treatment evaluation was carried out at the end of ECT treatment and at one month after ECT treatment. All the observations were recorded on a specially designed proforma and validated by two experienced psychiatrists independently.

Depression assessment

The Hamilton Rating Scale for Depression (HAM-D) [20] was used to assess depressive symptomatology in all participants at pre-treatment, post-treatment, and follow-up testing sessions. This study utilized the 21-item interview which rates the severity of symptoms observed in depression such as low mood, insomnia, agitation, anxiety and weight loss. The questionnaire is one of the most commonly used scales for rating depression in medical research. The investigator rates the patient by interviewing them and observing the patient's symptoms. Each question has from three to five possible responses that increase in severity. The total score represents a sum of the values for the questions. Scores ranging 0-7 were normal, from 8 to 13 indicate mild depression symptomatology, 14 to 18 indicate moderate depression, 19 to 22 indicate severe depression and scores above 22 are interpreted as indicating very severe depression.

Cognition Assessment

The Mini-Mental State Exam (MMSE; Folstein, Folstein, & McHugh, 1975) [21] was used to assess cognition. This is a brief 30-point questionnaire that is used to screen for cognitive impairment in many clinical settings. The MMSE includes simple questions and items assessing several areas, including time and place orientation, immediate auditory memory, motor functioning, and visual perception. Any score greater than or equal to 25 points (out of 30) is considered normal (intact), and scores below 25 points may indicate severe (≤16), moderate (17-20), or mild (21-24) cognitive impairment.

Electroconvulsive Therapy

ECT was administered as per prevailing guidelines by means of a medical model BPE – 2000 giving bidirectional square wave pulse at a frequency of 20-90Hz [22]. Seizure threshold was determined by the half age method of Petride and Fink [23].

Statistical Analysis

All the collected data was entered in Microsoft Excel Sheet 2007.The data was then transferred and analyzed using SPSS ver. 17. Qualitative data was represented in the form of frequency and percentage and analyzed by chi-square test while quantitative data was represented using mean +/- S.D and analyzed using Wilcoxon Sign Rank Test. A p-value of <0.05 was taken as level of significance.

Results

The mean age of the study subjects was 38.53 years with 66.7% females and 33.3% males. Most of the subjects had between 2-4 episodes during their course of illness. Other psychiatric morbidities were seen in 40% of the cases (Table 1). Immediately post-treatment 6 participants had HAM-D scores in the range indicating no depression (score < 8), 17 had scores in the mild to moderate depressed range (scores 8-18), 7 demonstrated severe/ very severe depression (>/=19). These data indicate that the majority of the participants responded to ECT treatment. At 1-month follow-up, 4 patients fell in the range indicating no depressive symptoms, 24 in the mild to moderate range and 2 in the severe/ very severe range. Mean Hamilton score was 40.03, 14.32 and 14.89, before ECT, immediately after ECT and at 1 month follow up respectively (p<0.01 and p-0.19) (Table 2 and 3). Study participants already had memory difficulties prior to treatment with 63.3% and 10% having mild and moderate impairment respectively which did not change drastically post-treatment (p-0.48). At 1 month follow-up, participants reported a slight increase in memory problems (53.3% mild and 30% moderate impairment), but the difference was not significant (p-0.25). Mean MMSE scores at baseline, immediately after ECT and after 1 month were 22.27, 21.23 and 19.56 respectively (p-0.69; p-0.056) (Table 4 & 5).

Table 1: Distribution of patients according Baseline Characteristics

Baseline Characteristics (n-30)		
Variables	**N**	**%**
Age group (yrs)		
</= 30	2	6.7%
31-40	16	53.3%
41-50	11	36.7%
> 50	1	3.3%
Sex		
Female	20	66.7%
Male	10	33.3%
Family History of Psychiatric Illness		
No	7	23.3%
Yes	23	76.7%
Course of Present Illness		
Gradual	22	73.3%
Sudden	8	26.7%
Medical Co-morbidity		
No	19	63.3%
Yes	11	36.7%
No. of Episodes		
1	4	13.3%
2-4	25	83.3%
>4	1	3.3%
Psychiatric Co-morbidity		
No	18	60.0%
Yes	12	40.0%
Substance Abuse		
No	22	73.3%
Yes	8	26.7%

Table 2: Distribution of subjects as per severity of depression

Hamilton Score	Baseline		Immediate After ECT		1 month F/u	
	N	%	N	%	N	%
No Depression	0	0.0%	6	20.0%	4	13.3%
Mild	0	0.0%	17	56.7%	19	63.3%
Moderate	0	0.0%	6	20.0%	5	16.7%
Severe	30	100.0%	1	3.3%	2	6.7%
Total	30	100.0%	30	100.0%	30	100.0%
p- value	< 0.01				0.71	

Table 3: Distribution of subjects based on mean change in Hamilton score

Hamilton Scale	Mean	SD	p- value
Baseline	40.03	8.76	<0.01
Immediately after ECT	14.32	9.62	
1 month After ECT	14.89	9.54	0.19

Table 4: Distribution of subjects as per impairment in Cognition

MMSE	Baseline		Immediate After ECT		1 month F/u	
	N	%	N	%	N	%
No Cognitive Impairement	7	23.3%	4	13.3%	4	13.3%
Mild	19	63.3%	18	60.0%	16	53.3%
Moderate	3	10.0%	7	23.3%	9	30.0%
Severe	1	3.3%	1	3.3%	1	3.3%
Total	30	100.0%	30	100.0%	30	100.0%
p- value	0.48				0.94	

Table 5: Distribution of subjects based on mean change in MMSE Scores

MMSE	Mean	SD	p- value
Baseline	22.27	3.34	0.69
Immediately after ECT	21.23	4.06	
1 month After ECT	19.56	3.56	0.056

Discussion

Among the most vexing predicaments for many clinicians is providing dispassionate guidance regarding electroconvulsive therapy (ECT) to a patient and family members of a severely impaired, suicidal, medication-resistant patient, who has benefited marginally from psychotherapy. The American Psychiatric Association (2001) regards it as a very effective option when other treatments fail [1]. Present hospital based prospective observational study was conducted to evaluate changes in depressive symptoms and their sustenance in patients with severe depression.

In present study, all the 30 subjects had severe/very severe depression before ECT therapy. Immediately post-treatment 6 participants had HAM-D scores in the range indicating no depression, 17 had scores in the mild to moderate depressed range, 7 demonstrated severe/ very severe depression. Our findings indicate that the majority of the participants responded to ECT treatment. At 1-month follow-up, 4 patients fell in the range indicating no depressive symptoms, 24 in the mild to moderate range and 2 in the severe/ very severe range. Mean Hamilton score was 40.03, 14.32 and 14.89, before ECT, immediately after ECT and at 1 month follow up respectively ($p<0.01$ and p-0.19). These findings shows that ECT provided sustained relief from symptoms of depression.

In results of the study by Saccoman *et al*. [24] indicate that ECT is an effective treatment of severe depression. Their study showed that 88% of the participants responded immediately after completion of a standard series of bifrontal ECT. Our success rate is also comparable to the 70 to 90% response rate for all types of ECT reported by the American Psychiatric Association's (2010) practice guidelines regarding treatment for depression [25], and higher than remission rates of 55% and 64% found in multisite research consortium projects [26,27].

Like other investigations, the current study also found that few participants experienced a return of depressive symptoms 1 month after treatment cessation and that on average participants demonstrated an increasing trend in depression symptomatology from post-treatment to follow-up. Specifically, 6.5% of the participants who were classified as 'no depression' as per Hamilton scale were later classified as 'mild depression' after the cessation of treatment. Saccoman *et al*. [24] found the relapse rate of 13.5% in their study. Relapse rate in our study is very low as compared to some other studies of ECT (such as Prudic *et al*. [15], who reported a 64% 24-week relapse rate in their 2004 publication and Grunhaus *et al*. [28], who reported a 28.5% 3-month relapse rate in their 2001 study).

Very low relapse rates at follow-up in our study may be due to the lack of a longer follow-up period. This is considered a limitation of this study. The present data are restricted to only 1month follow-up which is much shorter than the follow-up

periods of 24 weeks from Prudic *et al*. [15] and 3 months in Grunhaus *et al*. [28] This provides reason to be cautious in making strong conclusions about ECT relapse rates. It is plausible that given the trend in the current sample of rising symptomatology longer follow-up periods may have resulted in a higher relapse rate. But still, ECT can be considered an effective course of action for severe, medication-resistant, depressive conditions.

Regarding effect of ECT on cognition, our results showed that most of the study participants already had memory difficulties prior to treatment with 63.3% and 13.3% having mild and severe impairment respectively which did not change drastically post-treatment At 1 month follow-up, few cases reported a slight increase in memory problems (53.3% mild and 33.3% severe impairment). The difference was however non –significant ($p>0.05$). Mean MMSE scores at baseline, immediately after ECT and after 1 month were 22.27, 21.23 and 19.56 respectively (p-0.69; p-0.056).

Results of the study by Saccoman *et al*. [24] also demonstrated no significant changes in MMSE scores between pre-treatment, post-treatment, and follow-up assessments. Similar results were also observed by studies of Eschweiler *et al*. [29], Heikman *et al*. [30], Kellner *et al*. [26], and Schulze *et al*. [31].

Conclusion

These results help clarify to a great extent what patients can expect to experience following a treatment with ECT. In weighing the benefits versus the risks, these data strongly suggest the benefits are substantial in reducing the acute symptoms of depression while sparing cognition in most cases. The study findings will help patients to understand what the risks are concerning cognitive side effects of ECT and may assist health care providers and potential patients to take a more informed decisions about their care. Providing this knowledge upfront may serve to greatly reduce an individual's anxiety and fear prior to ECT treatment. Subsequently these results may help reduce the stigma of ECT, making it more likely to be utilized as a treatment option for severe depression.

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