Article *NIMHANS Journal*

Does ECT Stimulus Waveform Influence Rate of Recovery in Endogenous Depression?

Volume: 06 Issue: 02 July 1988 Page: 121-126

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Reprint requests

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Abstract

In a double-blind, prospective study, we compared the rate of recovery of endogenous depression to sinusoidal wave (SW) and brief-pulse (BP) electroconvulsive therapy (ECT) in an attempt to identify treatment variables that hasten recovery - an important clinical consideration. Twenty nine endogenous depressives, randomized into SW and BP ECT groups, were treated with alternate-day, bilateral, modified SW or BP ECT. At the conclusion of the study, we found that while the percentage of ECT responders was significantly greater with SW than with BP ECT, the rate of recovery was similar in the 2 groups; the findings are briefly discussed.

Key words -

Electroconvulsive therapy,
Sinusoidal wave ECT,
Brief-pulse ECT,
Endogeneous depression,
Recovery rate
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Brief-pulse ECT,
Endogenous depression,
Recovery rate

While it is generally agreed that the average number of treatments required for optimal therapeutic response of

endogenous depression to electroconvulsive therapy (ECT) is 6 to 8 [1], certain patients may require just 2 or 3 while others may need as many as 10 to 12 treatments [2]. There seems to be a tacit agreement in.literature that this variability is largely a function of patient characteristics - an assumption supported by reports that some depressed patients are unusually sensitive to ECT [3], [4], [5]. Attempts have been made to identify such patient characteristics [6], [7]; however, since patient characteristics are not subject to manipulation in therapy, the issue that merits the clinician's attention is whether treatment factors can be identified to hasten the recovery process - an important clinical consideration as it seeks to reduce the suicide risk, improve the quality of life etc., earlier in treatment. The stimulus waveform is a major ECT variable that has not been adequately studied in this regard.

While the general consensus seems to be that sinusoidal wave (SW) and brief-pulse (BP) ECT are equal in therapeutic efficacy [8], comparisons have in general focused on the percentage of depressed patients responding to these two therapeutic modalities. With regard to the rate of recovery, it has been opined that the sine waveform could possibly show better results in shorter time [9]. Two prospective studies [10], [11] showed that depressed patients respond faster to SW than to (low-energy) BP ECT; the latter study ascribed its findings to the greater quantum of electrical energy delivered by SW ECT as compared with low-energy BP ECT. Unfortunately, the conclusions drawn from these studies are somewhat limited as both were conducted on a heterogenous population of depressed patients.

Early studies, briefly reviewed by Robin [10], have not yielded definitive results; such studies have additionally suffered from various methodological shortcomings. To our knowledge, no recent studies have addressed this important issue. We therefore conducted a double-blind, prospective study to compare the rates of recovery with SW and BP ECT in a (homogenous) cohort of endogenously depressed patients.

Material and Methods

The sample comprised all endogenously depressed patients (RDC) identified over a 3 month period in 2 adult psychiatry units at NIMHANS. Informed consent for participation in the study was obtained in writing. Subjects were randomized into modified SW or BP ECT groups; no concurrent medication was administered.

SW ECT was administered using an ECT machine designed and assembled at NIMHANS. This constant-voltage SW generator delivers SW stimuli ranging in voltage from 90-190 V (in 10 V steps) and in duration from 0 - 9.9 sec. (in 0.1 sec steps). Visual displays permit the recording of the voltage and amperage of the stimulus delivered during the ECT. The following were the SW stimulus settings employed during the study: 50 Hz, 140 volts, unmodified, alternating current SW.

BP ECT was administered using the MECTA constant-current BP generator. The following were the BP stimulus settings employed during the study: 70 Hz, 800 mamps, 0.75 msec. width, biphasic rectangular pulses.

As suggested in a recent study [12] the electricity delivered to the brain was computed in millicoulombs rather than in joules (as is conventional) as the latter method is exposed to the confounding influence of inter-electrode resistance which is well known to vary widely between subjects, and, in the same subjects, across time [13], [14].

Modified, bilateral treatments were administered on alternate mornings, thrice a week. During each ECT, voltage and current parameters were noted; in the event that the patient failed to convulse, the stimulus was repeated with an increase in stimulus duration. Seizure duration was visually measured by the cuff method [15] by 2 observers using stopwatches; the mean observed score was recorded.

Severity of depression was rated on the 17-item Hamilton Rating Scale for Depression (HRSD) and on a global scale [16]. Both were administered by a blind rater before commencing the ECT course and,

again, roughly 30 hours after each ECT. The time was selected to ensure that ECT-related side effects did not influence the somatically loaded HRSD, and that diurnal variations in depression did not interfere with ratings of severity.

Treatment was stopped when further amelioration of depression was unlikely. This was operationalized as follows: no further reduction in HRSD scores after 3 consecutive ECTs with a minimum of 6 ECTs OR occurrence of total/near-total absence of depressive features on the HRSD (HRSD score <=4), whichever obtained earlier.

"Response to ECT" was defined as >= 75% reduction in initial HRSD scores by the end of the ECT course. While many definitions of response are available in literature, we considered this definition to most appropriately distinguish patients who show satisfactory clinical improvement from those who do not, in an Indian population.

Results

Thirty two endogenously depressed patients entered the study; of these, 4 developed a transient mania, suggested to be a side effect of ECT [17], [18]. Two of these patients were dropped from the study as their manic reaction developed in mid-depression; data from the remaining 2 patients were retained as the manic reaction coincided with the lifting of depression. A further patient was dropped from the study due to withdrawal of consent (due to pressure from relatives) despite adequate initial response. These 3 patients did not differ from the rest of the group on sociodemographic, clinical or treatment variables.

Of the remaining 29 patients, 14 were in the SW group and 15, in the BP group. The sample characteristics are described in Table 1. As is evident, the 2 groups were comparable on all variables but age. The groups were also comparable on indices suggested to predict good outcome with ECT [19], [20], [21]; the results of these data have already been reported [22] and will not be presented again here.

Table 1 - Sample characteristics

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At the end of the study, HRSD and global scores in each patient after each ECT were found to be highly correlated (r=0.90 to 0.99); hence, only HRSD scores were considered for further analysis. The correlation of measured motor seizure duration between the 2 observers was also high (r=0.99).

At the study endpoint, the treatment variables for the SW and BP ECT groups were computed; the results are presented in Table 2. The 2 groups were comparable on all treatment parameters save that of current delivery - a variable on which SW and BP ECT are already known to intrinsically differ [23]. While we have presented only the cumulated data of current delivery and seizure duration experience, we also computed the means of these parameters for each patient: no significant between-group differences were obtained.

Table 2 - Treatment variables at the study endpoint in the SW and BP ECT groups

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Thirteen (92.9%) SW and 9 (60%) BP patients were deemed to have satisfactorily responded to ECT; the difference is significant (Fisher's exact probability test; p=O.049). An analysis of covariance revealed that the correlation of percentage recovery with age was - 0.09 (N.S.), indicating that recovery was independent of the effect of age.

The rate of recovery to SW and BP ECT was computed by 2 methods. In the first method, the number of treatments received was compared between the SW and BP groups at the points of 25%, 50%, 75% and maximum (in excess of 75%) recovery in patients who reached or crossed these respective recovery points (Table 3). In the second method, as followed by Robin and de Tissera [11], the mean HRSD scores were compared between the SW and BP groups after sequential ECTs (Table 4). Finally, since the mean HRSD score was greater in the SW group than in the BP group before onset of treatment, and since it was lesser after ECT 2 (Table 4), the reduction in HRSD scores after ECT 2 was compared between the 2 groups; no significant difference. was obtained.

Table 3 - Number of ECTs required to produce a given degree of recovery in all patients reaching/crossing the respective recovery point

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Table 4 - Mean HRSD scores after sequential ECTs

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Discussion

Although the SW and BP groups were comparable on all treatment variables excepting current delivery (Table 2), significantly more patients responded to SW than to BP ECT; an analysis of covariance revealed that this finding was independent of the effect of age - the only variable on which the 2 groups differed (Table 1). This important finding has already been discussed in terms of hypothetical therapeutic window / response threshold of current requirement [24].

From Table 3, it is apparent that a comparable number of ECTs was required to produce a given degree of recovery in the 2 groups and from Table 4, it is clear that sequential ECTs produced parallel reductions in mean HRSD scores between the 2 groups. These findings suggest that the rate of recovery of endogenous depression treated with ECT is independent of stimulus waveform. By the same token, since SW ECT is intrinsically characterized by greater current delivery than BP ECT, it would appear that while the quantum of current delivered may have relevance to the percentage of patients responding [24], it does not influence the rate of response - a finding which directly contradicts the observations of Robin [10] and Robin and de Tissera [11]. No reasons are obvious to explain these discrepant findings.

A point meriting consideration is that the SW and BP responder groups differed significantly in age - could this difference account for the slight edge SW seemed to have over BP ECT? While literature is scant on the subject of the influence of age on rate of recovery of endogenous depression to ECT, it has been suggested that older patients may have a less favourable dose-response ratio (in terms of

number of treatments required to produce a given degree of affective improvement) than younger patients [6]; therefore, our conclusions (below) must remain tentative.

We conclude that stimulus waveform (and hence quantum of current delivered) may not influence the rate of recovery of endogenous depression treated with ECT.

Acknowledgements

We gratefully acknowledge Drs. Shekhar Seshadri and Sanjeev Jain, lecturers in Psychiatry, who administered the ECTs to the patients in the study. We also acknowledge Mr. S. Rao, Computer programmer, Department of Biostatistics, for assistance in the analysis of data.

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