

SEIZURE DURATION OVER ECT SESSIONS: INFLUENCE OF SPACING ECTS

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Thirty melancholic patients participated in a double blind trial comparing efficacy of modified bilateral sinewave ECT given twice or thrice weekly. Seizure was monitored on a single channel EEG tracing. All patients received ECTs in the first two weeks of the four week study period. Seizure duration estimate from EEG tracings available for 22 patients (10 patients of thrice weekly group) on all occasions of first two weeks were analysed. Seizure durations significantly reduced through the course in both the groups. Twice weekly ECTs led to significantly less decrements in the seizure duration. This differential reduction was not related to the therapeutic outcome. The improvement in depression in both groups of patients was comparable at the end of two weeks.

Electroconvulsive therapy (ECT) is an effective treatment for melancholia. To obtain therapeutic results it is recommended to ensure adequate seizures; adequacy defined as a seizure duration of at least 25 seconds on EEG (Freeman *et al.*, 1989; American Psychiatric Association, 1990). Seizure duration reduces progressively during the course of ECTs (Sackeim *et al.*, 1987). Seizure duration is inversely related to seizure threshold; longer seizure duration is correlated with lower thresholds. Increase in seizure threshold during ECT indicates elevation in tone of GABAergic transmission and is associated with the therapeutic effects of ECT in depression (Sackeim *et al.*, 1987). Considering the importance of seizure and its duration relative to therapeutic effects of ECT we studied the influence of spacing of ECTs (twice or thrice weekly) on the pattern of reduction of seizure duration.

METHODS

Patients: Patients of either sex, aged 18-65 years who met the criteria for major depressive disorder with melancholia (DSM III R) (American Psychiatric Association, 1987) formed the sample of this study. Written informed consent was obtained for admission, to receive ECTs

and undergo the randomised study of twice versus thrice ECTs weekly. Thirty consecutive consenting patients were randomised into two groups.

ECTs : Modified ECTs (Thiopentone 200-250 mg, Succinylcholine 30-40 mg and Atropine 1.3 mg) were administered thrice a week to one group (thrice weekly). While in the other group (twice weekly), the second ECT of each week comprised only of anaesthesia. Sine wave stimulus from a constant voltage generator (Gangadhar *et al.*, 1988) was administered (120-150 V for 0.6 to 0.8 secs) bilaterally. The stimulus of 120 V and 0.6 secs was set for first session. Increments in the voltage till 150 V and later in duration were made in the event of sub-convulsion. The last convulsive stimulus dose would be used for the next sessions. Motor seizure was monitored (Jain *et al.*, 1989) to ensure 20 seconds of motor seizures, failing which restimulus with increased strength was applied but never more than three stimuli in a session. The maximum seizure duration in that session was recorded. Patients were ventilated with 100% oxygen till they resumed spontaneous respiration.

EEG monitoring : Recording electrode was placed at Cz position of 10-20 system. The reference electrode was placed on the right

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mastoid and the ground electrode on the forehead. Silver/silver chloride electrodes were used. Single channel EEG was recorded with an amplifier bandwidth of 2-70 Hz. Facility was provided to electronically disconnect the EEG amplifier from the patient during passage of electrical stimulus. EEG recording would resume only after the stimulus was delivered. EEG tracing was terminated by the recording clinician not involved in the study when the record showed isoelectric line or if unequivocal absence of seizure activities lasted for at least 30 seconds. Single channel EEG traces were coded and labelled without information of any clinical details. Two independent raters, blind to each other's rating as well as to clinical details of the record estimated the seizure duration using a method described earlier (Gangadhar *et al.*, 1982). Agreement between the two raters on the seizure duration estimates with this procedure has been demonstrated (Jyothi Rao *et al.*, 1982). For the purpose of this analysis, average seizure duration of these two raters for each ECT session was considered.

Clinical assessments: Patients were assessed by a psychiatrist who was blind to the treatment schedule on the 170-item Hamilton rating scale for depression (HRSD) (Hamilton, 1960) before starting ECTs and at weekly intervals thereafter. The study design required continuation of ECT until a patient obtained a score of 7 or less on the HRSD on two consecutive weekly assessments or for a maximum period of four weeks. Hence all patients received a minimum of two weeks of treatments a period considered for this analysis. To compare the two groups two way repeat measure analysis of variance (RMANOVA) was used. The alpha was fixed at 5 per cent.

RESULTS

Thirty patients (15 in each group) completed the four week study. All were available

for the first two weeks of treatment. Five patients from the three per week group failed to develop adequate seizures (motor seizure duration 20 seconds) in one or more of sessions in the first two weeks (Fisher's exact probability test, $p = 0.027$). Such inadequate convulsions of these patients occurred in second or later sessions. None of these had an EEG seizure of greater than 25 seconds.

From the rest of 25 patients EEGs of all ECT sessions during first two weeks were available for 22 patients. 10 patients had received ECTs thrice weekly, while 12 patients twice weekly. The sample description is available in Table -1.

Table-1 : Patient characteristics

	Age (years) Mean (SD)	Male:Female
3/Week (n = 10)	40.6 (10.3)	3:7
2/Week (n = 12)	38.9 (8.6)	6:6

Significant $t = .42, p = .68$

Fisher's test, $p = .49$

The mean seizure duration of the first ECT in the two groups was comparable ($t = 0.44, d.f. = 20, N.S.$). Two way RMANOVA was used to assess the change in seizure duration from the first ECT through the last ECTs of first and second weeks between the two treatment groups. Significant reductions occurred in seizure duration in both groups over occasions ($p < 0.01$). The groups also differed in that the seizure durations became lesser in the thrice weekly group ($p < 0.01$) (Table -2). Despite this however, the mean (SD) cumulative seizure duration by the end of two weeks was significantly different [twice weekly = 164.6 seconds (35.3), thrice weekly = 212.9 seconds (38.9), $t = 3.05, d.f. = 20, p = 0.006$].

Table-2 : Seizure duration over the course (seconds), Mean (SD)

Occasion Group	1 ECT	last ECT wk I	last ECT wk II
3/Week	44.23(10.3)	31.85(7.7)	32.1(9.62)
2/Week	46.92(16.8)	38.64(9.9)	41.05(11.5)

RMANOVA

Occasion effect, $F(2,69) = 9.69, p < 0.01$

Group effect, $F(1,21) = 4.27, p < 0.01$

Interaction effect, $F(2,69) = 0.78, p < 0.05$

Significant reductions in HRSD scores occurred in both groups of patients over the two week period ($p < 0.01$) and no differences emerged between groups ($p < 0.05$) (Table-3). Median reduction in seizure duration was 8.25 seconds. Patients who had more than median reduction and those who had less than median reduction (II in each group), were comparable therapeutically and both groups had significant reductions in HRSD scores over the two weeks ($p < 0.01$) (Table-4).

Table-3 : HRSD scores, Mean (SD)

Occasion Group	1 ECT	last ECT wk I	last ECT wk II
3/Week	29.3(5.9)	10.4(9.0)	3.7(4.6)
2/Week	28.8(6.8)	12.9(9.4)	4.1(5.8)

RMANOVA

Occasion effect, $F(2,69) = 109.8, p < 0.01$

Group effect, $F(1,21) = 0.14, p < 0.05$

Interaction effect, $F(2,69) = 0.78, p < 0.05$

Table-4 : HRSD scores in patients who had more than or less than median reductions (8.25 secs) in seizure duration from 1st ECT to last ECT of 2nd week, Mean (SD)

Occasion Group	1 ECT	last ECT wk I	last ECT wk II
< median	28.7(6.3)	11.5(10.8)	3.4(2.4)
> median	29.5(6.3)	11.6(7.9)	4.4(5.6)

RMANOVA

Occasion effect, $F(2,69) = 213.8, p < 0.01$

Group effect, $F(1,21) = 0.03, p < 0.05$

Interaction effect, $F(2,69) = 0.13, p < 0.05$

DISCUSSION

We have earlier reported that ECT given twice or thrice a week produces comparable antidepressant effects in melancholics over a given time frame (Reddy *et al.*, 1990) supporting an earlier report (McAllister *et al.*, 1987). Thrice weekly ECTs in melancholics, hence, result in a third additional cost of treatment and attendant risks without significant advantage. There is evidence in clinical and preclinical research that cognitive adverse effects are more with thrice weekly ECTs (McAllister *et al.*, 1987; Rao *et al.*, 1991). This study adds to the other demerits of thrice weekly ECTs.

Significantly more number of patients receiving ECTs thrice weekly failed to have 'adequate' seizure in subsequent sessions. ECTs given thrice weekly cumulatively increased the seizure duration when 'adequate' seizures were ensured on all occasions. Therapeutic outcome between the two groups however did not differ. Seizure duration be-

came shorter through successive ECT sessions in both the groups, but less so in the twice weekly group. It is hence likely that changes in seizure threshold seen in this study was related to more frequent ECTs.

Sackeim *et al.* (1987) suggest that such increase in seizure threshold is an index of enhancement of GABAergic transmission and is associated with therapeutic effects; patients who responded poorly to ECT failed to develop increases in seizure threshold during ECT course. In this study such association was not demonstrable. When patients who had greater reductions in seizure duration (hence increases in seizure threshold) were compared with those who had lesser or no reduction, difference in therapeutic outcome over two week period was not demonstrable (Table-4). This issue of the relation between changes in seizure threshold and therapeutic effect needs further investigation.

The results suggest (a) that ECT given thrice weekly is less likely to ensure 'adequate' seizures on all occasions, (b) ECT given twice weekly also produces significant reductions in seizure duration, although this effect was more pronounced if ECTs were given thrice weekly, (c) ECT given twice weekly reduced cumulative seizure duration but without affecting the therapeutic potency, and (d) comparable therapeutic effects were achieved with a third fewer ECT.

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