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Seizure threshold rise during electroconvulsive therapy in schizophrenic patients ☆

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Abstract

A rise in seizure threshold during a course of electroconvulsive therapy (ECT) has been demonstrated in patients with depression and mania, but no information has been available as to whether the same result occurs in schizophrenia. Ninety-three patients with schizophrenia underwent estimation of the seizure threshold by the dose-titration method, at the first and second, seventh, fourteenth, and twentieth treatments over an index ECT course. The 3-week stabilization period was used as a response criterion. Eighty-six patients (92%) showed a rise in threshold. The magnitude of increment was $269 \pm 244\%$. The rise in seizure threshold could be predicted by the number of treatments, initial seizure threshold and EEG seizure duration, and these factors explained 42% of the variance.

Keywords: Electroconvulsive therapy; Schizophrenia; Rise in seizure threshold; Predictive factors for threshold increase; Dose-titration method; Three-week stabilization period

1. Introduction

A substantial number of studies suggest that electroconvulsive therapy (ECT) possesses anticonvulsant properties. In animals, electroconvulsive shock has powerful anticonvulsant effects in blocking the development or aborting the expression of amygdala-kindled seizures (Post et al., 1986). In humans, an ECT-induced generalized seizure is immediately followed by a relative refractory period during which the threshold may be so elevated that restimulation often fails to elicit a seizure. It is also known that there is usually a progressive increase in seizure threshold

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over the treatment course (Sackeim et al., 1987a,b; Coffey et al., 1995a,b). Moreover, ECT has previously been used to treat seizure disorders and their associated behavioral problems (Kalinowsky and Kennedy, 1943; Caplan, 1946; Taylor, 1946; Sackeim et al., 1983).

Prior ECT studies in depressed patients report 30–100% increases in seizure threshold over a treatment course, in which the threshold values were reported only at the sixth or eighth session (Malitz et al., 1986; Sackeim et al., 1987a,b, 1991, 1993; Coffey et al., 1995b; Shapira et al., 1996). A similar finding has been reported in manic patients (Mukherjee, 1989). The present study was conducted in patients with schizophrenia, and seizure threshold was quantified over a longer ECT course to evaluate changes in threshold and their relationship to the therapeutic outcome and clinical variables.

2. Methods

2.1. Subjects

Ninety-three patients with DSM-IV schizophrenia (American Psychiatric Association, 1994) and with acute psychotic exacerbations received ECT at the participating hospitals. The study was IRB approved. After a detailed explanation, each subject and/or guardian gave written informed consent for ECT and for study participation. Patients were excluded if they received ECT or depot neuroleptics within 6 months, had psychotic disorders due to a general medical condition, neurological illness, alcohol or other substance abuse, serious medical illness, or were taking medicines that inhibit seizures, e.g. anticonvulsants, benzodiazepines, beta-blockers. All patients had normal results for complete blood count, serum electrolytes and electrocardiography.

All patients were free of medicines beginning 5 days prior to the first ECT. Flupenthixol was prescribed on a fixed dosage schedule: 12 mg/day ($\geq$ 800 mg CPZ equivalents) during the first week, 18 mg/day ($\geq$ 1200 mg CPZ equivalents) for the 8th to 10th days, and 24 mg/day ($\geq$ 1600 mg CPZ equivalents) thereafter, depending on tolerability. Benzhexol (4–10 mg/day) was used to control extrapyramidal symptoms with the dosage titrated on a clinical basis. No other medications were prescribed.

2.2. ECT technique

ECT was administered three times per week. The ECT devices were MECTA SR1 and Thymatron DGx. Each patient was treated with the same device throughout his/her treatment course. After atropine 0.4 mg intravenously, anesthesia was given with a minimal dosage of thiopental (2–4 mg/kg) and succinylcholine (0.5–1 mg/kg). Patients were oxygenated from the onset of apnea until post-ictal spontaneous respiration. Bitemporal bilateral electrode placement was used in all patients throughout the treatment course. The tourniquet method and two channels of pre-frontal electroencephalogram (EEG) were used to assess seizure duration.

2.3. Determination of initial seizure threshold

Seizure threshold was estimated by our titration schedule (Table 1) at the first two treatment sessions. This schedule incorporated the Thymatron factory default settings. The MECTA has no default or standard settings specified by its manufacturer; its settings were chosen to match the method of the Thymatron. In diminishing priority order, we then matched current, pulse width and frequency. Uniform increments of stimulus dose contribute to the systematic and impartial measurement of seizure threshold. This dose method is the only one we know with reasonably uniform increments for the MECTA SR1; Thymatron dose settings have uniform increments.

We defined an adequate seizure as a bilateral tonic–clonic seizure lasting for at least 30 s, along with EEG evidence of a seizure. At the first treatment session, the first level of stimulus intensity (10% of maximum charge) was administered. If this failed to elicit an adequate seizure, the stimulus charge was increased in increments of 10% as listed in Table 1. A maximum of four stimulations per session was allowed, with an interval of at least 40 s between each. Additional