

A protocol to augment ECT seizure duration

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The presence of a generalised seizure is necessary, although not sufficient, for effective ECT. Awareness of this has led to a widespread practice of documenting not only the occurrence but also the duration of seizures; a minimum duration of 25 seconds has been suggested (Royal College of Psychiatrists, 1989). Yet even the most recent surveys of practice have shown that on most occasions when a seizure is brief or absent the treating doctor does nothing about it (Scott *et al.*, 1989; Pippard, 1992).

Various procedures have been recommended to enhance seizure duration (American Psychiatric Association, 1990). First, the technical aspects of the ECT application should be checked. Second, the concurrent use of medication or anaesthetic agents with anticonvulsant properties should be avoided. Third, the electrical stimulus delivered can be increased, a procedure known as stimulus dosing. Fourth, the seizure threshold can be lowered by concurrent administration of epileptogenic drugs. The use of caffeine in this respect has received recent interest (Coffey *et al.*, 1987). These procedures can be, but seldom are, incorporated into a protocol to guide the treating doctor over action to take if a seizure is below a certain threshold duration.

If the process of recording seizure duration is viewed as audit, the failure to make an intervention after finding a short seizure is a classic failure to complete the audit cycle. We therefore undertook a local audit of seizure duration, firstly to examine current practice and secondly to examine the feasibility and effect of a protocol designed to enhance seizure duration.

The study

The County Hospital, Durham provides an acute general psychiatry service for a population of 160,000. ECT is carried out twice weekly using an Ectron Duopulse constant current series 3 apparatus modified by the manufacturer to increase the stimulus energy delivered. Anaesthetics are administered by consultant anaesthetists and ECT treatments by the four psychiatric trainees, three SHOs and one registrar. These trainees receive one hour of instruction in ECT on taking up post and participate in several supervised ECT sessions before being permitted to perform the treatment alone. Prior to

this study, they had been instructed about the importance of seizure duration and methods of enhancing it but use of these methods had been left to their own discretion. Seizures are routinely timed by clinical observation using a 12 inch face wall clock with full sized second hand from the start of the seizure to the end of all clinically detectable clonic activity. Restimulation was routinely performed if no seizure was observed, but not if the first seizure was merely brief. Electroencephalographic monitoring is not performed routinely. Monitoring of cardiovascular state is routinely provided by clinical observation by the anaesthetist, with an ECG machine and cardiac monitor available ready for use in the room.

Seizure durations and any procedures routinely used to prolong seizures were recorded for all ECT treatments administered during an eight week baseline period. A protocol outlining action to be taken if seizure duration fell below 25 seconds was then implemented. The protocol consisted of eight increments: the first four using increasing electrical stimulus energies from 186 to the maximum 351 mill coulombs (mC), the second four using the 351 mC level with increasing pretreatment doses of caffeine from 250 to 1000 mg given intravenously five minutes prior to the stimulus. The caffeine is supplied in solution with sodium benzoate to enhance solubility. Each course of treatment commenced with the first increment of the protocol and the next increment used only if the preceding seizure fell below the 25 second threshold. Seizure durations and the use of seizure-enhancing procedures according to this protocol were then recorded for a further eight week period. Finally, the case-notes and ECT forms for the periods both before and after introduction of the protocol were examined for record of complications or adverse effects.

Findings

Twenty-one patients received a total of 127 ECT treatments during the baseline period and 17 patients received a total of 86 treatments during the follow-up period. Therefore the mean number of ECT treatments administered to each patient decreased from 6.05 in the baseline period to 5.06 in the follow-up period.

The percentage of treatments where positive action was taken to increase seizure duration increased from 17% in the baseline period to 72% after introduction of the protocol. The percentage of treatments in which an increased electrical stimulus alone was used increased from 14% in the baseline period to 44% after introduction of the protocol. The percentage in which caffeine pretreatment was used in addition to increased electrical stimulus increased from 3% to 28%.

As a result of these interventions the percentage of seizures equal to or exceeding 25 seconds increased from 43% in the baseline period to 65% in the follow-up period ($\chi^2=9.77$ d.f. = 1 $P<0.01$). Mean seizure duration increased from 23.3 seconds (range 7–60) in the baseline period to 27.3 seconds (range 10–55) in the follow-up period ($t=3.03$ $P<0.01$).

No increase in complications or adverse effects of ECT was detected after introduction of the protocol. In the baseline period three patients reported transitory cognitive side effects. In the follow-up period two patients reported transitory headaches. In particular, no patient experienced excessively prolonged seizures or status epilepticus and no cases of tachycardia or arrhythmia or other adverse cardiovascular effects were reported by the anaesthetists.

Comment

For the purpose of this audit of practice we have accepted that adequate seizure duration is important for therapeutic efficacy of ECT. We have examined the overall affect of a protocol combining two major interventions for enhancing seizure duration, stimulus dosing and caffeine pretreatment. Each of these interventions has received considerable research interest, but an audit study of their combined effect in practice does not seem to have been done previously.

The audit cycle we have carried out shows that this combined protocol is successful in several ways. After introduction of the protocol both the percentage of seizures equal to or exceeding 25 seconds and the mean seizure duration increased significantly and, importantly, the mean number of treatments needed per patient decreased by 16%. The number of treatments per patient may be questioned because the study measured a set time period rather than a set

number of patients. However, if we assume that the reason for fewer treatments was a more rapid clinical improvement we have demonstrated a significant reduction in duration of morbidity which has both clinical and economic implications. If this can be replicated, the value of this audit of practice is amply confirmed.

This study of practice did not specifically search for subjective or objective evidence of adverse effects of stimulus dosing or of caffeine. However, no significant neurological or cardiovascular adverse effects were reported, either by patients or by staff. The protocol has now been in use in our service for two years without problem. Indeed, the only patient to suffer status epilepticus since introduction of the protocol had received an ECT application with neither increased electrical stimulus nor caffeine.

In summary, the use of a protocol combining stimulus dosing and caffeine pretreatment has been shown to be a simple and trouble-free method of enhancing seizure duration. Initial evidence suggests that use of such a protocol enhances the effectiveness of ECT, so reducing the number of treatments needed. However, the importance of regular clinical assessment of progress during a course of ECT cannot be overemphasised; intervention to increase seizure duration cannot be justified if clinical improvement is already adequate. In short, remember to treat the patient, not the seizure.

References

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A longer list of references is available from the authors.