

## Monitoring the Seizure During ECT

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### Abstract

The occurrence and duration of seizures were monitored during 283 ECT sessions in 39 patients with endogeneous depression. Stimuli were delivered bitemporally, and either sinewave or brief-pulse stimuli were used. The duration of the seizure was monitored by the convulsive movements of the forearm to which a cuff had been applied, and inflated above the systolic blood pressure. The method was found to be simple and reliable.

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### Key words -

**Seizure,****Endogeneous depression,****Electroconvulsive therapy****Seizure,****Endogeneous depression,****Electro convulsive therapy**

The induction of a generalised seizure is the essential therapeutic component of electro-convulsive therapy (ECT). The recognition and measurement of the seizure parameters is important to ensure the occurrence and adequacy of the treatment [1]. This issue becomes even more important with modified ECT, during which muscle movements are masked. It has previously been noted [2] that there is a wide variation in the observation and reporting of convulsions during ECT. Recording the seizure duration may be important to establish therapeutic guidelines [3] or prognosticate side effects [4].

Various method have been used to ascertain the occurrence and duration of induced seizure. Simultaneous electroencephalographic (EEG) recording has been recommended, as it significantly reduces the number of missed seizures during ECT [5]. Recent instruments like MECTA<sup>(R)</sup> incorporate EEG recording devices in the apparatus. Simultaneous electromyogram (EMG) from the masseter or calf muscle has also been used [6]. The electrodermal (EDR) skin response provides a fairly accurate index of seizure activity [7]. The duration of ECT induced tachycardia has also been studied as a measure of seizure duration [8]. These are peripheral measures and can be produced by the direct action of the electrical current. They can only be measured using sensitive and expensive instrumentation.

The 'cuff' method provides a simple and reliable index of the occurrence of a generalized convulsion. A sphygmomanometer cuff is applied to the arm and inflated to ~ 40-50 mm Hg above the systolic BP before administration of the muscle relaxant [9]. Tonic-clonic movements can be observed and timed in this forearm quite easily and accurately. This correlates significantly with EEG seizures duration [10]. In the study we attempted to establish the reliability of

measuring seizure duration using the cuff method.

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## Methodology

The subjects included were part of a blind assessment of the clinical benefits and side effects of brief-pulse and sine-wave stimuli during ECT. They fulfilled RDC [11] criteria for major depression, and gave informed consent for their participation. Consecutive treatments in 39 subjects were studied. The subjects were randomly distributed into the two groups. (Sine wave ECT n=20 and brief pulse ECT n=19). Treatments were given three per week after an overnight fast, between 0830-0900 hrs. All stimuli were administered bitemporally. The electrode contact points were scrubbed clean with a spirit gauze and dried, electrode jelly applied and metal electrodes of 30 mm diameter attached using an elastic headband. A sphygmomanometer cuff was applied to the upper arm and inflated 60-80 mm Hg above the systolic BP before injection of succinylcholine. Anaesthesia was induced with 250 mg thiopentone, 1.2 mg atropine and 20-45 mg succinylcholine.

The stimulus was delivered using either a MECTA-D constant current model (800 M mA, bidirectional pulse stimulus of 70 Hz, 0.75 msec width, total duration of 0.75, 1.0 or 1.25 sec), or a sine-wave stimulator (designed at NIMHANS) [12] set at 140 V and 0.6 sec. The point of stimulus delivery was used at the starting point of the measurement. If a convulsion did not occur, the duration of the pulse stimulus was increased by 0.25 sec. If no convulsion occurred even after two stimuli, the session was terminated. Disappearance of the clonic movements in the cuffed forearm signalled the end of the convulsion. The duration was measured using stop-watches with an accuracy of 0.1 sec. The subjects were artificially ventilated throughout the procedure, till recovery from anaesthesia.

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## Results

A total of 283 (141 sine, 142 pulse) treatment sessions were observed. The convulsions were timed on 272 (137 sine, 135 pulse) occasions. Agreement between the two raters was 100% with respect to seizure occurrence on cuffed forearm. On 5 occasions (1 sine, 4 pulse) no convulsion was produced despite repeating the stimulus, on 6 other occasions, although a convulsion was induced, it could not be timed.

The average duration of a convulsion was  $27.48 \pm 8.06$  sec. There was a very significant correlation between the two raters ( $r=0.99$ ). In the group receiving pulse stimuli, the stimulus had to be repeated, after increasing the duration of the pulse on 30 occasions, as no convulsion was produced with the first stimulus. On 12 occasions (7 sine, 5 pulse) convulsions on the face lasted longer than on the forearm by 2-13 sec. Only on 2 occasions (both pulse), no convulsion was observed in the non-scolinated forearm.

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## Discussion

The duration of seizures induced during ECT can be easily and reliably measured by the 'cuff' method.

The duration of seizure is an important parameter during ECT. It may be altered by drugs used during anaesthesia [13]. Partial seizures have been seen to be ineffective. Short seizures are less effective than longer ones [13]. The cuff method correlates well with EEG recording of seizure activity [10]. However, single channel EEG recording during ECT has been noted to have poor inter-rater reliability [14]. Identifying the occurrence of a convulsion, and timing its onset and termination have posed problems [14]. The 'cuff' method has been shown to correlate well with EEG recording of seizure duration being shorter by approximately 10% [10]. However, other authors have found variation of 10% - 30% between the 'cuff' and EEG recording [15]. In view of this, suitable compensation could be made in assessing the seizure duration, for fulfilling the recommended seizure duration criterion of 25 sec. The reliable definition, and simplicity of procedure of the cuff method offers definite advantage over EEG recording of seizure duration.

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