Developments in ECT Practices: An Instrumentation Perspective

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Introduction:

NIMHANS Committee was formed in collaboration with National Institute of Quality and Reliability (NIQR) in 1992, for arriving at standards in ECT practice and instrumentation. The instrumentation and software developed has been put to use in several studies.

Aim

Integrating biomedical engineering principles to enhance the standards of ECT practice.

Method

Brief-pulse, constant current ECT machine either as a stand-alone or software programmable, integrated with physiological monitoring was developed and put to use.

Results

Several research findings have partially validated the fidelity of the system:

- **Fidelity of the Stimulus:**

✓ Younger persons have lower threshold (Gangadhar et al, 1998)
✓ Later sessions have greater threshold (Gangadhar et al, 1998)
✓ Unilateral ECT associated with lower threshold (Mayur et al,1998)
✓ Longer inter-pulse interval associated with lower threshold (Kotresh et al, 2004)

- **Fidelity of Stimulus and Monitoring:**

✓ Unilateral threshold ECT has least physiological perturbation (Gangadhar et al, 2000)
✓ Younger persons have prolonged seizures (Mayur et al, 1999; Girish K et al , 1998)
✓ Later sessions have shorter durations (Girish K et al, 1998)
✓ High correlation between the motor- and EEG-durations (Mayur, et al, 1999)
✓ Post-seizure suppression predicts early antidepressant response (Gangadhar et al 1999; Jagadisha et al 2003)
✓ Seizure asymmetry with greater amplitude on the stimulated side in unilateral ECT (Gangadhar et al 2003)
✓ Changes in heart-rate predicted adequacy of seizures (Ranganath et al, 2003)
✓ Fidelity of stimulus output was tested by independent investigators and found to be accurate (Andrade et al 2003)

Further developments:

In addition to providing SPO_2 signals, the physiological monitoring can be continued using detachable, battery-operated module that can record and store the physiological signals in a pre-programmed format. The options include online or offline monitoring and manual event-markers. Sampling rate of the signals can be varied if the amplifiers have to be used for other purposes like Heart Rate Variability (HRV), or for intermittent long hours recording (such as sleep pattern analysis over a period of 24 or 48 hours).

Discussion:

The potential application of the advanced features:

While the patient is in recovery room, the anesthetist and the medical team in the ECT suite also have the option to view these signals from the multiple patients in the recovery room through network (analogous to central monitoring in cardiac ICU). One part of this development has been submitted as a joint patent application to Indian Patent Office. Clinical validation of fidelity of the stimulus and monitoring has been established and number of publications have been made.

Patients get monitored while recovering, with wi-fi technology.

Same physiological data available to the anesthetist on a monitor.

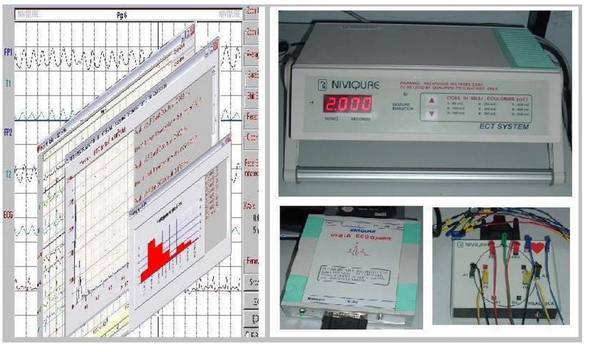
Caveat

Sensitivity is optimally designed to amplify seizure EEG signals and has not been validated for awake EEG recording in other clinical practice.

Conclusion

Newer trends in medical practice with the use of new technologies, communication systems, etc, are envisaged.

Patent link and details:
http://www.ipindia.nic.in/ipr/patent/journal_archieve/journal_2006/pat_arch_062006/official_journal_02062006.pdf
"A DIGITALLY IMPLEMENTED MULTICONFIGURABLE BIOMEDICAL ECT WITH EEG/ECG APPARATUS"
The Patent Office Journal 02/06/2006 – PAGE NO.10415



References

- Andrade C et al (Indian J Psychiatry 2003; 45: 239-243. Corrigendum, Indian J Psychiatry 2004; 46: 278.)
- Gangadhar BN et al (1998) Journal of ECT, 14: 259-265.
- Gangadhar BN et al (1999) Journal of Affective Disorders, 52: 235-238.
- Gangadhar BN et al (2000). J of ECT, 16: 177-182.
- Gangadhar et al (2003). Paper presented at the 51st Annual National Conference of Indian Psychiatric Society, Hyderabad, India
- Girish K et al (1998). Indian J. Psychiatry, 40: 327-330.
- Jagadisha et al (2003) Indian J. Psychiatry, 45; 16-20.
- Kotresh et al (2004) Journal of ECT, 20:10-2.
- Mayur PM et al (1998) Journal of ECT, 14: 94-98.
- Mayur PM et al (1999). British Journal of Psychiatry, 174: 270-273.
- Ranganath et al (2003). German J.Psychiatry, 3: 60-63