Bilateral Bispectral Index monitoring in comparison between electroconvulsive and magnetic seizure therapy

Martin Soehle 1, Sarah Kayser 2, Richard K. Ellerkmann 1, Thomas E. Schlaepfer 2,3

Dept. of Anesthesiology and Intensive Care Medicine 1 and Dept. of Psychiatry and Psychotherapy 2, University of Bonn Medical Centre, Bonn, Germany
Depts. of Psychiatry and Mental Health, The Johns Hopkins University, Baltimore MD, USA 3

**Background**

Electroconvulsive therapy (ECT) is highly effective in treating depression. Recently, magnetic seizure therapy (MST) has been developed which seems equally effective, but without cognitive side effects.

Both ECT and MST require general anesthesia, which could be quantified using the Bispectral Index (BIS).

**Methods**

**Anesthesia**

- Bilateral BIS-recording (BIS 4.1, 10 s smoothing time, BIS VISTA™ – monitor, Covidien Inc., Boulder, USA)
- Induction with propofol (1.5 mg/kg b.w.)
- Succinylcholine (1.5 mg/kg b.w.) for muscle relaxation
- Ventilation via face mask
- Seizure induction, only after the BIS was in the desired range between 50 and 60. In case of:
  - BIS > 60: additional 10 mg propofol bolus
  - BIS < 50: waiting for the BIS to raise spontaneously above 50

**Seizure induction**

- Prevention of tongue bite by applying a robber bite block
- ECT:
  - right unilateral or bilateral stimulation
- Thymatron IV device, Somatics LLC, Lake Bluff, IL, USA
- square wave, 0.5 ms pulse width, 4-8 s stimulus duration
- MST:
  - twin coil, MagPro device (MagVenture A/S, Farum, Denmark)

All patients received 10-12 ECT or MST-treatments, of which 3 were monitored as described.

**Results**

- Both groups consisted of 10 patients
- Patients had a mean age of 55 ± 12 and 45 ± 14 years in the ECT and MST group, respectively.
- Prior to seizure induction, a comparable anesthetic depth was observed in the ECT (BIS = 52.3 ± 9.6) and the MST-group (BIS = 55.2 ± 10.3, Fig. 1).
- Postictally, MST-patients restored breathing and opened their eyes significantly earlier than ECT-patients (Table 1).

**Conclusion**

At a comparable anesthetic depth, MST is superior to ECT in terms of postictal recovery, which is correctly reflected by higher postictal BIS values.

An unilateral left BIS-monitoring is sufficient to monitor anesthetic depth in ECT or MST patients.

**Email**

martin.soehle@ukb.uni-bonn.de

---

**Aim of the study**

Comparison of ECT and MST with respect to

- recovery times
- unilateral (left-sided) BIS
- left-right side differences in BIS

**Methods**

Prospective observational trial

- Approved by the regional ethics committee and registered with ClinicalTrials.gov (Ref: NCT01318018)
- Inclusion criteria: patients suffering from treatment-resistant (uni- or bipolar) depression
- Exclusion criteria: age < 18, pregnancy, magnetic materials in the head, implanted medical devices
- Comparison between 10 successive patients receiving ECT with 10 successive patients undergoing MST

**Results**

- **Electroconvulsive (ECT)**
  - EGG: 24.6 ± 31.0, 20.5 ± 17.0 [25%; 75% percentile] (ECT vs. MST: p = 0.023)
  - motor activity: 27.5 ± 21.1, 21.1 ± 15.4 [25%; 75% percentile] (n.s.)
  - eye opening: 12.3 ± 3.0, 8.9 ± 4.1 [25%; 75% percentile] (ECT vs. MST: p = 0.004)

- **Magnetic seizure (MST)**
  - EGG: 22.8 ± 3.2, 15.4 ± 4.1 [25%; 75% percentile] (MST vs. ECT: p = 0.005)
  - motor activity: 13.1 ± 2.6, 10.0 ± 2.6 [25%; 75% percentile] (n.s.)
  - eye opening: 12.3 ± 3.0, 8.9 ± 4.1 [25%; 75% percentile] (MST vs. ECT: p = 0.004)

**Table 1.** Characteristic time intervals in comparison between the electroconvulsive (ECT) and the magnetic seizure (MST) therapy-group. Data are shown as mean ± std dev in case of normal distribution, or as median (25%, 75% percentiles) otherwise.