Anaesthetic Management in Electroconvulsive Therapy During Early Pregnancy

Ülkü Özgül, Mehmet Ali Erdoğan, Mukadder Şanlı, Feray Erdil, Zekine Begeç, Mahmut Durmuş

Department of Anaesthesiology and Reanimation, İnönü University Faculty of Medicine, Malatya, Turkey

The management of major psychiatric conditions during pregnancy is exceptionally difficult. Pharmacoresistant, life-threatening and severe symptoms such as catatonia and suicidal behavior affect the health and safety of both mother and child. In such cases, electroconvulsive therapy (ECT) may be considered as an alternative to pharmacologic treatment. In this report, we aimed to present anaesthetic management of a patient, who was 13 weeks pregnant and needed ECT due to major depression.

Key Words: Anaesthesia, electroconvulsive therapy, propofol

Introduction

The treatment of severe psychiatric disorders such as schizophrenia and bipolar disorder is extremely difficult during pregnancy. All drug treatments carry a potential risk especially in the early period of pregnancy. Pharmacological treatment of life threatening psychiatric symptoms such as catatonia, suicide attempt and severe psychosis may cause teratogenic morphological and behavioural effects on the foetus, and negative adverse effects such as withdrawal syndrome in the mother. Risk further increases in the presence of concomitant obesity, hypertension and diabetes. Electroconvulsive therapy (ECT) is an alternative treatment method in such cases (1, 2).

Electroconvulsive therapy is a procedure in which generalized seizures are induced by passing electric currents from the brain tissue. ECT is recommended as the main treatment in bipolar disorder and major depressive disorder (MDD) in the first three months of pregnancy as well as after delivery, by the “American Psychiatric Association” (APA); ECT is considered as a high-efficacy and low-risk treatment in such cases (3). Advances in anaesthesia techniques in the recent years, have increased the efficacy and safety of ECT. As the procedure takes a short time, the anaesthetics used during pregnancy should have a short duration of action, provide rapid recovery and should not have a harmful effect on the mother and the foetus.

In this case report, we aimed to present the anaesthetic management of a 13 weeks pregnant woman who underwent ECT because of MDD.

Case Presentation

A 32 years old patient, who was 13 weeks pregnant, had been diagnosed as having depression 5 years ago; she was scheduled for ECT by the Psychiatry clinic as her complaints increased in the last 2 months and she had suicidal ideation not responsive to drug treatment. In order to prevent aspiration risk, an IV H₂-receptor antagonist (Nevofam-I® 20 mg ampule, Mustafa Nevzat Drug Industry Limited Company, İstanbul, Turkey) was administered to the patient 30 minutes before anaesthesia, and written informed consent was obtained from her relatives. ECG, pulse oximetry and non-invasive blood pressure monitoring was initiated in the operating room and intravenous isotonic saline infusion was started. Electroencephalography (EEG) and electromyography (EMG) electrodes were attached. As peripheral venous access cannot be obtained in the upper extremities, a blood pressure measurement cuff was placed around the upper arm for isolated arm technique. After three minutes of preoxygenation, anaesthesia was induced using 1 mL kg⁻¹ propofol, and unresponsiveness to verbal stimuli and the absence of eyelash reflex was considered as unconsciousness. After loss of consciousness was achieved, the cuff on the isolated arm was inflated till the radial artery pulse disappeared and 1 mL kg⁻¹ succinylcholine was used for muscle

relaxation. In order to maintain the end-tidal CO₂ level at 35-45 mmHg, 100% oxygen was delivered via a face mask. Using Thymatron System 4 bipolar ECT device (Somatics INC. Lake Bluff, IL, USA) electric stimulus was delivered via bifrontotemporal electrodes. Systolic, diastolic and mean arterial blood pressures, heart rate (HR) and oxygen saturation of the patient were recorded before and after anaesthesia induction, immediately after the seizure, and at 1, 3 and 10 minutes of seizure (Table 1). In the monitoring of seizure activities, both the time of EEG and EMG recordings, and the motor seizure duration recorded at the extremity (that cuff was placed) were measured by the chronometer. Time to spontaneous breathing, eye opening and orientation, were evaluated. ECT, producing adequate seizure duration was administered three times a week in ten sessions, and all sessions were applied with the same anaesthesia technique, by the same anaesthetist. During the treatments haemodynamic changes did not exceed 20% of the baseline value and oxygen saturation did not fall below 95%. The mean duration of EMG and EEG seizure activity were 20 and 25 seconds (sec), respectively, time to spontaneous breathing was 96 seconds, time to eye opening was 227 seconds, and time to orientation was 297 seconds. The patient was closely monitored during ECT sessions and she was transferred to the ward after full recovery. The condition of the foetus was evaluated after each session by the department of obstetrics. After clinical recovery, the patient was discharged from the hospital.

Discussion

Lifetime risk of major depressive disorder is 10-25% in women and it makes a peak in childbearing ages (25-44 years of age). Currently, it is estimated that 9% of pregnant women experience an MDD attack (4, 5). Untreated depression has negative effects such as preterm birth, low birth weight, preeclampsia, high amounts of alcohol and drug use, and weakening of the bond between the mother and the baby. Suicidal ideation and other psychotic symptoms have been reported to be increased in such cases (6). It was found out that our patient, who was diagnosed as having depression five years ago, had suicidal thoughts after her attack during preg-

nancy. ECT was planned to be administered to the patient as suicidal ideation could not be treated by medication that was initiated at the Psychiatry Clinic.

Electroconvulsive therapy is an effective treatment method used in pregnant patients. A study evaluating 339 pregnant women who underwent ECT between 1941 and 2007, reported that 25 fetuses or neonates developed complications and only one of them was associated with ECT; therefore, it has been suggested that ECT can be used safely in such cases. The most common complication of ECT during pregnancy is foetal bradycardia. Transient reductions in heart rate are caused by hypoxia. In order to avoid hypoxia, the mother should be preoxygenated and hypotension should be avoided in order to preserve uteroplacental blood flow (1). Additionally, typical cardiovascular response to electric stimuli during ECT is a parasympathetic response that continues for 10-15 seconds, followed by a significant sympathetic response (7). Anaesthesia was induced after adequate preoxygenation in our patient. Reduction of oxygen saturation or hypotension did not develop during and after ECT. No negative adverse effects on the foetus were determined in the evaluations made by the Department of Gynaecology and Obstetrics after ECT sessions.

Although the mechanism of action of electroconvulsive therapy is not completely known, it is mainly based on inducing a grand mal epilepsy seizure in the brain by external electrical stimuli. A successful ECT depends on the production of adequate seizures. However, the relation between the efficacy of ECT and seizure duration is debatable. It has been reported that ECT is not successful in conditions where the duration of seizure is <15 sec or >120 sec (8). Besides the publications stating that mean motor seizure duration of 20-30 seconds provides sufficient clinical efficacy, the more common opinion is that this duration should be at least 25 seconds (9, 10). The anaesthetic agents used during ECT may increase seizure threshold and accordingly may shorten the duration of the seizure (11). In our case, the mean duration of EMG and EEG seizure activity were 20 and 25 seconds, respectively.

Table 1. Haemodynamic variables of the patient

	HR	SAP	DAP	MAP	SpO ₂
T0	67	112	67	84	99
T1	77	99	60	75	99
T2	79	134	80	100	100
T3	78	133	74	100	99
T4	75	126	73	95	99
T5	86	113	70	84	99

HR: Heart rate (beats/min), SAP: Systolic arterial pressure (mmHg), DAP: Diastolic arterial pressure (mmHg), MAP: Mean arterial pressure (mmHg), SpO₂: Saturation (%), T0: baseline, T1: Post-induction, T2: immediately after the seizure, T3: 1 minute after the seizure, T4: 3 minutes after the seizure, T5: 10 minutes after the seizure

The ideal anaesthetic agent that will be used in electroconvulsive therapy should have a rapid onset of action, should have no effects on haemodynamic responses, should not shorten the seizure duration and its effects should diminish rapidly. Anaesthetic agents used in ECT during pregnancy may carry potential embryonic risks. As the organs of the foetus develop between 3 and 8 weeks of pregnancy, the first three months are considered as the most susceptible period to teratogens. However, none of the agents used for premedication or induction is included in pregnancy category A drugs. Different anaesthetic agents like methohexital, sevoflurane and propofol are used in anaesthesia induction for ECT in pregnant women (4, 7). Methohexital is not available in our country. Sevoflurane may be recommended, especially in the last three

months of pregnancy, as it decreases uterine contractions associated with ECT (7). Propofol is different from other anaesthetic agents in that it provides rapid induction and recovery, prevents nausea and vomiting and suppresses hemodynamic responses. Additionally, its low molecular weight and low solubility in fat provides rapid elimination from fetal circulation. Therefore, propofol is the ideal agent recommended for ECT in pregnant women (1, 2). Propofol, used in our case, suppressed the hemodynamic responses to ECT, and the patient responded to verbal stimuli in 292 seconds.

Neuromuscular blocking agents are used to decrease motor activity during electroconvulsive therapy. Succinylcholine is the mostly preferred depolarizing neuromuscular blocking agent due to its short duration of action. Furthermore, as succinylcholine is highly ionized and water soluble, it has a very low placental transfer. It is used at 0.75-1.5 mL kg⁻¹ doses for ECT (7). We also used 1 mg kg⁻¹ succinylcholine for our patient. Time to spontaneous breathing was 96 seconds after ECT.

It has been suggested that risk of gastric content aspiration increase after the second three months in pregnant women who underwent electroconvulsive therapy. It has been reported that administration of sodium citrate 15-20 minutes before ECT or alternatively increasing the gastric pH by H₂-receptor antagonists decrease the aspiration risk (12). We gave an H₂ receptor antagonist before the intervention to prevent the risk of aspiration in our patient.

Conclusion

ECT is the first line treatment of major depression in pregnancy, and clinically important for the mother and the baby. We suggest that anaesthesia management during ECT can be provided safely by using propofol and succinylcholine in the early stage of pregnancy.

Informed Consent: Written informed consent was obtained from patients who participated in this case.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - Ü.Ö.; Design - Ü.Ö., F.E.; Supervision - Z.B., M.D.; Materials - M.Ş.; Data Collection and/

or Processing - Ü.Ö., F.E., M.Ş.; Analysis and/or Interpretation - Ü.Ö., F.E., M.A.E.; Literature Review - Ü.Ö., M.A.E.; Writer - Ü.Ö., M.A.E.; Critical Review - Z.B., M.D.; Other - M.Ş.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this case has received no financial support.

References

1. Anderson EL, Reti IM. ECT in pregnancy: a review of the literature from 1941 to 2007. *Psychosom Med* 2009; 71: 235-42. [\[CrossRef\]](#)
2. Lovas A, Almos PZ, Peto Z, Must A, Horváth S. Anesthesia for electroconvulsive therapy in early pregnancy. *J ECT* 2011; 27: 328-30. [\[CrossRef\]](#)
3. American Psychiatric Association. Committee on Electroconvulsive Therapy. Use of Electroconvulsive Therapy in Special Population. The practice of Electroconvulsive Therapy, Recommendation for Treatment, Training, and Privileging: A Task Force Report of the American Psychiatric Association. 2nd ed. Washington, DC: American Psychiatric Association; 2001: 46-51.
4. Wisner KL, Gelenberg AJ, Leonard H, Zarín D, Frank E. Pharmacologic treatment of depression during pregnancy. *JAMA* 1999; 282: 1264-9. [\[CrossRef\]](#)
5. O'Hara MW, Neunaber DJ, Zekoski EM. Prospective study of postpartum depression: prevalence, course, and predictive factors. *J Abnorm Psychol* 1984; 93: 158-71. [\[CrossRef\]](#)
6. Kurki T, Hiilesmaa V, Raitasalo R, Mattila H, Ylikorkala O. Depression and anxiety in early pregnancy and risk for preeclampsia. *Obstet Gynecol* 2000; 95: 487-90. [\[CrossRef\]](#)
7. Ding Z, White PF. Anesthesia for electroconvulsive therapy. *Anesth Analg* 2002; 94: 1351-64. [\[CrossRef\]](#)
8. Sackeim HA, Devanand DP, Prudic J. Stimulus intensity, seizure threshold, and seizure duration: impact on the efficacy and safety of electroconvulsive therapy. *Psychiatr Clin North Am* 1991; 14: 803-43.
9. Andersen FA, Arslan D, Holst-Larsen H. Effects of combined methohexitone-remifentanyl anaesthesia in electroconvulsive therapy. *Acta Anaesthesiol Scand* 2001; 45: 830-3. [\[CrossRef\]](#)
10. Fink M. What is an adequate treatment in convulsive therapy? *Acta Psychiatr Scand* 1991; 84: 424-7. [\[CrossRef\]](#)
11. Başgöl E, Çeliker V. Anaesthesia in Electroconvulsive Therapy. *Turkish Journal of Psychiatry* 2004; 15: 225-35.
12. Folk JW, Kellner CH, Beale MD, Conroy JM, Duc TA. Anesthesia for electroconvulsive therapy: a review. *J ECT* 2000; 16: 157-70. [\[CrossRef\]](#)