

CASE REPORT

The use of magnesium sulfate in severely preeclamptic patients for emergency cesarean section

Tülin Akarsu Ayazođlu*, Murat Unal**

**Chief Assistant*

SB.Kartal Kosuyolu High Specialization Education and Training Hospital Ýstanbul (Turkey)

***SB Education and Training Hospital Samsun (Turkey)*

Email: murat.unal@yaboo.com

Correspondance: Tülin Akarsu Ayazođlu, SB. Kartal Kosuyolu Yüksek Ýhtisas Eđitim ve Arařtırma Hastanesi Kartal /Ýstanbul (Turkey); Email: akarsu.dr@gmail.com

ABSTRACT

The anaesthetic management in the peripartum period of a pre-eclamptic patient is important. The anesthesiologist must perform a detailed preanesthetic assessment, including a history and physical examination. The morbidity and mortality rates are higher in severe preeclampsia. Magnesium sulfate has been successfully used in obstetrics for inhibiting premature labor and in the treatment of eclampsia-related seizures. Magnesium inhibits the release of acetylcholine in the neuromuscular junction and behaves like a neuromuscular relaxant, potentiating the effects of non-depolarizing neuromuscular blockers. We report two cases of pregnancy with severe preeclampsia, managed with magnesium sulfate, who underwent emergency caesarian section.

Key Words: Preeclampsia; Magnesium sulfate

Citation: Ayazođlu TA, Unal M. The use of magnesium sulfate in severely preeclamptic patients for emergency cesarean section. *Anaesth Pain & Intensive Care*;15(3):178-181.

INTRODUCTION

Pre-eclampsia is a multifactorial and multiorgan related disease process that occurs in up to 58% of pregnancies after 20 weeks of gestation and generally includes the combination of maternal hypertension and proteinuria. Pre-eclampsia and eclampsia account for 1015% of maternal deaths¹. Pre-eclampsia was the third leading cause of maternal mortality in the USA, accounting for 54 out of 540 maternal deaths in 2004, behind only embolism and hemorrhage². It can also lead to significant fetal morbidity and mortality, including an increased incidence of placental abruption, fetal growth restriction, and preterm delivery. The American Society of Anesthesiologists (ASA) recommends regional anesthesia in pre-eclamptic patients without coagulopathy even in an emergent procedure³. General anesthesia may increase the risk of complications, such as

cerebral hemorrhage due to blood pressure changes associated with rapid sequence induction of anesthesia⁴. The use of magnesium sulfate is important for the anesthetic management of preeclampsia because it inhibits the release of acetylcholine in the neuromuscular junction and behaves as a neuromuscular relaxant, potentiating the effects of non-depolarizing neuromuscular blockers (NMB). Sugammadex (bridion) is the first selective relaxant binding agent which was originally designed to reverse the steroidal NMB - rocuronium that is used after surgery in order to reverse the effects of muscle relaxants. The aim of presenting this case report is to raise awareness regarding the management of severe pre-eclampsia cases.

CASE 1

A 27 yrs old, 72 kg, primigravida with twin gestation in 33rd gestational week, was admitted to our hospital with severe preeclampsia for peripartum care, which finally

required a cesarean section. On physical examination her blood pressure was found to be 210/110 mmHg, heart rate (HR) was 125 beats/min and with albumin 3+ in urine.

Laboratory investigations; AST: 310 U/L, ALT: 270 U/L, GGT: 65 U/L, LDH: 710 U/L, Alkaline phosphatase: 518 U/L, glucose: 105 g/dl, total protein: 5.7 g/dl, albumin: 2.6 g/dl, total bilirubin: 2.20 mg/dL, direct bilirubin: 1.13 mg/dl, urea 27 mg/dl and creatinine: 0.85mg/L. Haematological and coagulation profile was as follows; Hemoglobin (Hb): 12.6 g/dl, hematocrit: 36%, WBC count: 8700, platelet count: 79300 mm⁻³, bleeding time (reference range 1-3 min): 4.5 min, clotting time: 8 min, prothrombin time (PT): 19 sec, INR: 2, and activated partial thromboplastin time (aPTT) 41.2 sec.

As a result of the obstetric evaluation emergency caesarean section was planned. Full loading dose of MgSO₄ 4g was given IV to be followed by 2g/hr infusion. Six units of fresh frozen plasma and 8 units of platelets were ordered to be kept as reserve. The blood pressure was controlled by intravenous hydralazine infusion at a rate of 5-10 mg/hr. Before operation 3 units of FFP's were transfused. Due to lack of signs of excessive bleeding platelet transfusion was not required. In the operating room 15 ml/kg infusion of a balanced electrolyte solution was started.

General anaesthesia was planned with invasive arterial pressure, ECG, oxygen saturation and urine output monitoring. In the operating room her BP was 160/105 mmHg and heart rate 110/min. After preoxygenation, rapid sequence induction with cricoid pressure was achieved using thiopentone sodium 350 mg, rocuronium 35 mg to achieve muscle relaxation and a 7.5 mm endotracheal tube was used for intubation. Controlled mechanical ventilation was instituted and anaesthesia was maintained with sevoflurane and 100% oxygen. After the delivery of live babies, inj. fentanyl 100 µg was administered and FiO₂ was decreased to 0.5. Hemodynamic parameters remained within a n acceptable limit of systolic blood pressure 135-165 mmHg, diastolic blood pressure 80-95mmHg and heart rate between 90-102 beats/min. There was no hemostasis problem during the operation which lasted fifty minutes and the platelet infusion was not given.

At the end of the operation neostigmine 1.5 mg and 0.5 mg of atropine sulfate was used for decurarisation, but adequate spontaneous breathing did not return even after 30 minutes. Assisted ventilation was continued and atropine and neostigmine administration was repeated. The patient's blood gases and electrolytes were within normal limits. BIS value of 85-90 was found. Nerve stimulation with Stimuplex[®] nerve stimulator (Organon Technica, Belgium) was used to assess NMB reversal. Response to supramaximal stimuli of four (TOF) was evaluated every five minutes, but the response remained 0%. Sugammadex was given in a dose of 2 mg/kg. The 90% recovery time on TOF was 1.10 minutes with sugammadex and no recurrence of NMB was observed during the postoperative period. Serum MgSO₄ level was measured at 6.3 mg/dL (therapeutic level 5-9 mg/dL). After the patient was able to open eyes on verbal commands, ETT was removed and the patient shifted to the PACU for further management.

CASE 2

A twenty five years old woman was followed up by obstetrics and gynecology clinics because of the onset of premature uterine contractions on the 31st gestational week. Her laboratory work up depicted AST: 41 U/L, ALT: 29 U/L and platelet count at 103000 mm⁻³. She was hypertensive and had proteinuria. Magnesium sulphate was started by the obstetrician in the recommended dosage, but the uterine contractions failed to respond to this therapy. An emergency cesarian section was planned and we opted to administer an epidural anesthesia for this procedure. The section was performed without any adverse event. On 20th hour postoperatively, her blood pressure elevated and vaginal bleeding ensued. Laboratory investigations were repeated and moderate anemia, low platelet count with impaired liver functions were detected. Platelet count decreased to 48100/mm³. She was admitted to the ICU. Elevated blood pressure was treated with 0.5-2 µg/kg/min nitroglycerine infusion; 2 units of RCC, 8 units of platelets and 15 ml/kg of FFP were transfused. When platelet count elevated over 100,000 and PT, aPTT and INR returned to within normal limits, the epidural catheter was removed on 2nd day. Recovery of the liver function tests was noted by the 4th day. She was transferred to the Obstetric ward on 5th postop day and was discharged on 8th day.

DISCUSSION

Severe pre-eclampsia has been characterized by one or more of the following criteria: sustained systolic BP=160 mmHg or diastolic BP=110 mmHg while resting, proteinuria, sudden oliguria, central nervous system disturbances, pulmonary edema or cyanosis, epigastric or right upper quadrant pain, liver dysfunction, thrombocytopenia, and fetal growth restriction⁵⁻⁷. The anesthetic management is important for patients with pre-eclampsia in the peripartum period. The anesthesiologist must perform a detailed preanesthetic assessment, including a history and physical examination with careful attention to the airway examination due to the increased risk of pharyngolaryngeal edema^{8,9} and the patient's cardiopulmonary, fluid, and coagulation status. Fasting should be considered in very active high-risk patients to decrease the risk of aspiration should cesarean section become necessary. Laboratory values including urine protein, platelet counts, liver enzymes, and a coagulation profile should be obtained. Magnesium sulfate has been used in obstetrics since 1925 for prevention of seizures in eclampsia^{10,11}. With the use of magnesium the risk of seizures decreases by 52% when compared to diazepam, and 67% when compared to phenytoin¹².

The use of magnesium sulfate, is important for the anesthetic management of preeclampsia with the advantage of decreasing peripheral vascular resistance without changing uterine blood flow¹¹ and has some analgesic properties that are enhanced by volatile anesthetics. It also has many potentially deleterious effects, especially at toxic levels such as augmentation of neuromuscular blockade, respiratory depression and cardiovascular collaps^{13,14}.

Sugammadex is the first of a new class of selective muscle relaxant binding drugs, developed for the rapid and complete reversal of neuromuscular blockade induced by rocuronium and vecuronium.

Regional anesthesia is associated with a decrease in maternal mortality but GA is still necessary in some cases. Indications for GA include suspected placental abruption, coagulopathy, platelet count less than 80,000/μL in the pre-eclamptic patient, severe pulmonary edema, eclampsia, and severe fetal distress¹⁵⁻¹⁷.

For the first patient general anaesthesia was planned because of coagulation disorder and abnormal platelet count. Rocuronium was instituted for rapid sequence induction. At the end of surgery, when the patient's compromised respiratory functions were noted, we suspected a cerebral incident. However, BIS level was found 85-90 scores so that cerebral event was excluded.

Secondly, we suspected MgSO₄ to had depressed the activity of the neuromuscular junction. Sugammadex was given, which rapidly reversed MgSO₄rocuronium induced neuromuscular block. At that time the blood magnesium level was found to be 6.3 mg/dL. The patient was conscious, cooperative and her motor functions were perfectly normal when sent to the PACU. American Society of Anesthesiologists (ASA) recommend that regional anesthesia be used in pre-eclamptic patients without coagulopathy in order to decrease the need for general anesthesia should an emergent procedure become necessary^{3,6}. Because of the hemodynamic consequences of laryngoscopy and tracheal intubation, we chose regional epidural technique for our second patient. Anesthesia and surgery were uneventful in this patient, but her general condition deteriorated on 20th postoperative hour. She was followed up by close monitoring, infusion of blood and blood products, controlling blood pressure with vasodilators and the epidural catheter was removed at an appropriate time in the ICU. The patient was discharged without any problem on 8th postop day from the hospital.

It is concluded that the parturient with severe pre-eclampsia syndrome can be managed with MgSO₂, but its augmentation effect on NMB must be kept in mind; intra-operative course may be uneventful but these patients warrant to be managed closely during the post-operative period in an ICU with complete monitoring for up to their discharge.

REFERENCES

1. Duley L. The global impact of pre-eclampsia and eclampsia. *Semin Perinatol* 2009;33(3):130137.
2. Miniño AM, Heron MP, Murphy SL, et al. Deaths: Final Data for 2004. *National Vital Statistics Reports*. Available at: http://www.cdc.gov/nchs/data/nvsr/nvsr55/nvsr55_19.pdf. Accessed on Nov 4, 2007.
3. Practice guidelines for obstetric anesthesia: An updated report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia. Available at: <http://www.asahq.org/publicationsAndServices/OBguide.pdf>. Accessed on Jul 08, 2010.
4. Gogarten W. Preeclampsia and anaesthesia. *Curr Opin Anaesthesiol* 2009;22(3):347351.
5. Sibai BM, Caritis S, Hauth J. What we have learned about preeclampsia. *Semin Perinatol*. 2003;27(3):239246.
6. American College of Obstetricians and

- Gynecologists (ACOG) Practice bulletin: Diagnosis and management of preeclampsia and eclampsia. *Obstet Gynecol.* 2002;99(1):159167.
7. Lindheimer MD, Taler SJ, Cunningham FG. Hypertension in pregnancy. *J Am Soc Hypertens.* 2008;2(6):484494.
 8. Heller PJ, Scheider EP, Marx GF. Pharyngolaryngeal edema as a presenting symptom in preeclampsia. *Obstet Gynecol.* 1983;62(4):523525.
 9. Goldszmidt E. Principles and practices of obstetric airway management. *Anesthesiol Clin.* 2008;26:109125.
 10. Gonçalves MM. Doença hipertensiva específica da gravidez. In: Ratton JLA. *Medicina intensiva.* São Paulo: Atheneu, 1997;66-76.
 11. Cardoso RL, Correa CM. Pacientes obstétricos em UTI. In: Nácul FE. *Medicina intensiva abordagem prática.* Rio de Janeiro: Revinter, 2004;542-548.
 12. The Eclampsia Trial Collaborative Group. Which anticonvulsant for women with eclampsia? Evidence from the collaborative eclampsia trial. *Lancet* 1995;345:1455-1463.
 13. Alday Muñoz E, Una Orejón R, Redondo Calvo FJ et al. Magnesio en anestesia y reanimación. *Rev Esp. Anesthesiol Reanim* 2005;52:222-234.
 14. Sibai BM. Magnesium sulfate prophylaxis in preeclampsia: Lessons learned from recent trials. *Am J Obstet Gynecol.* 2004;190(6):15201526.
 15. Haddad B, Deis S, Goffinet F, et al. Maternal and perinatal outcomes during expectant management of 239 severe preeclamptic women between 24 and 33 weeks' gestation. *Am J Obstet Gynecol.* 2004;190(6):15901595.
 16. Endler GC, Mariona FG, Sokol RJ, Stevenson LB. Anesthesia related maternal mortality in Michigan, 1972-1984. *Am J Obstet Gynecol* 1988;159:18793.
 17. Hawkins JL, Koonin LM, Palmer SK, Gibbs CP. Anesthesia related deaths during obstetric delivery in the United States, 1979-1990. *Anesthesiology* 1997;86:27784.



TRAINING IN ASSESSING RESEARCH

Critical Appraisal Skills Programme

www.casp-uk.net

Organizes workshops and other resources to help individuals to develop the skills to find and make sense of research evidence.

US Cochrane Center

Understanding Evidence-based Healthcare: A Foundation for Action

<http://us.cochrane.org/understanding-evidence-based-healthcarefoundation-action>

A web course designed to help individuals understand the fundamentals of evidence-based healthcare concepts and skills.