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Clinical experience

Anaesthesia for the preeclamptics patient?

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Abstract

Preeclampsia is a multisystem disorder of unknown exact origin in pregnancy. Three mayor signs of preeclamsia are: hypertension, oedema and proteinuria. Treatement is symptomatic,delivery contributes to cessation of symptomes, but not immidiately.

Anesthesia and analgesia for labour can be epidural, spinal or combined epidural-spinal there are safe according to new dana in literaure, but always paying attention to coagulation status. The major problem is to control hypertension but also to avoide hypotensive episodes that contribute to mothers and childs morbidity and mortality.

INTRODUCTION

Preeclampsia is a multisystem disorder in pregnancy. Preeclampsia complicates up to 8% of pregnancies in the world. Preeclampsia is a major cause of maternal mortality and morbidity, preterm birth and perinatal death *(1)*. 10%–15% of maternal deaths are directly associated with pre-eclampsia and eclampsia *(2)*. The incidence of pre-eclampsia ranges from 3% to 7% in healthy nulliparas and 1% to 3% in multiparas *(3)*.

Carefull control of the blood pressure in the parturients is necesery because high pressure is one of the first warning signals. The obstetric anaesthetist has to prevent the effects of developed organ dysfunction of the cardiorespiratory, cerebral and coagulation systems that is present in preeclampsia and eclampsia *(4)*.

Preeclampsia is a complex multi-system disorder that may sometimes proceade to eclampsia. Preeclampsia is associated with widespread endothelial dysfunction leading to placental ischaemia and multi-organ dysfunction in parturient *(5)*.

Controversies still exist with regard to its aetiology, diagnosis and treatment.

The exact aetiology of preeclampsia is unknown and probably complex. It only occurs in the presence of placental tissue and may be dependent on immunological and genetic factors *(6)*.

Preeclampsia has a complex pathophysiology, the primary cause being abnormal placentation. The abnormalities may be related to the nitric oxide pathway, which contributes substantially to the control of vascular tone. Inhibition of maternal synthesis of nitric oxide prevents embryo implantation *(7)*.

Increased uterine arterial resistance induces higher sensitivity to vasoconstriction and thus chronic placental ischemia and oxidative

stress. This chronic placental ischemia causes fetal complications, including intrauterine growth retardation and intrauterine death *(7)*.

Oxidative stress induces release into the maternal circulation substances such as free radicals, oxidized lipids, cytokines, and serum soluble vascular endothelial growth factor 1. These abnormalities are responsible for endothelial dysfunction with vascular hyperpermeability, thrombophilia, and hypertension. That compensate the decreased flow in the uterine arteries due to peripheral vasoconstriction *(7, 8)*.

During normal pregnancy placental produces equal amounts of prostacyclin and thromboxane, but in preeclamptic pregnancy produces seven times more thromboxane than prostacyclin. This is as resultat of reduced placental perfusion and release of substances causing endothelial cell injury *(8)*.

Diagnostic triad for preeclampsia is: hypertension, proteinuria and oedema. Oedema occurs in up to 80% of normotensive parturients.

Hypertension is usually developing after 20 weeks of pregnancy. Hypertension in pregnancy is defined as a systolic pressure of over 140 mmHg and /or a diastolic pressure less then 90 mmHg *(4)*.

Patients with preeclampsia are at risk of developing pulmonary oedema due to low colloid oncotic pressure and increased vascular permeability *(4)*.

Coagulation changes in preeclampsia. Early in the disease the hyper-coagulable state of normal pregnancy may be enhanced. Later, both platelet activation and consumption are increased which can lead to significant thrombocytopenia (platelet count <100,000 mm-3) in approximately 15% of women with severe preeclampsia *(1)*.

Disseminated intravascular caogulation (DIC) occurs in 7% of cases of severe preeclampsia.

The proteinuria of severe preeclampsia occurs later and reflects as ischaemic insult to the glomerulus. Patients develop oliguria, in severe preeclampsia proteinuria may exceed 500mg/day *(2, 3)*.

Abnormal liver function tests are frequently found in preeclampsia.

The neurological changes with severe preeclampsia include headaches, visual disturbances and hyperreflexia. Cerebral vasospasm has been demonstrated by intracranial Doppler in patients with preeclampsia and MRI studies demonstrated reduced blood flow. Ischaemia due to vasospasm and/or cerebral oedema may be the cause of neurological symptoms *(2, 3, 4)*.

THERAPY FOR PREECLAMTIC PATIENTS

Drug therapy in preeclampsia is based on symptomatic organ support and prevention of complications.

Termination of delivery remains the only curative treatment for preeclampsia although the disease process may not resolve immediately.

Anti hypertensive treatment is necesary to prevent maternal and fetal morbidity.

Magnesium Sulphate (MgSO4) is the anticonvulsant of choice in preventing and treating eclamptic fits. It is usually administered as a slow intravenous bolus of 4 to 6 grams and then as an infusion of 1- 2 grams per hour to keep the serum Mg in the therapeutic range. MgSO4 is a safe drug to use in the pregnant patient but the most important effect of moderately high levels is the effect on the neuromuscular junction. MgSO4 may also increase the episodes of hypotension during regional anaesthesia

TABLE 1

Anti-hypertensive drugs

Hydralazine	-direct alveolar vasodilatator -incrise uterine perfusion	**Blood pressure control onset for 10-20 min**	**5-10mg i.v. Every 20 min max . Douse 60 mg**
Nifedipine	-calciunm channel antagonist -acts as vasodilatator -acts as uterine muscle relaxant	**Blood pressure control onset for 5-10 min**	**10 mg p.os can be repeated in 30 min, than 4-6 hr.**
Labetalol	-mixed alfa/beta blocker Beta2 agonist -decreases the maternal intravilous and fetal blood flow	**BP control onset for 5-10 min**	**80 mg every 10 min Max. Dose 300mg/24 hrs.**

and will tend to blunt the response to vasoconstrictors. Treatment of overdose is supportive in the first instance and also includes intravenous calcium (e.g. Calcium gluconate 1g). Magnesium therapy is often continued for at least 24 hours post partum *(9)*.

Administration of fluid may be necessary to avoid the prerenal oliguria that is common with preeclamptic patients. Furosemide may be used to treat persistent oliguria in the presence of an adequately filled circulation.

The presence of hypoalbuminaemia, increased capillary permeability and a high hydrostatic pressure (from the hypertension) leads to the risk of pulmonary and pharyngolaryngeal oedema.

Thrombocytopenia is a common problem in severe preeclampsia but there is no absolute level of platelet count that accurately predicts the occurrence of bleeding associated with regional anaesthesia.

REGIONALNA ANESTHESIA FOR PREECLAMTIC PARTURIENS

Epidural anesthesia has been accepted as the preferred anesthetic technique for cesarean delivery in severely preeclamptic patients. Epidural analgesia may safely be extended for caesarean section. The block should be developed slowly with a weak solution of local anaesthetic and opiate and the blood pressure measured frequently for at least the first 20 minutes. Epidural analgesia is an ideal form of pain relief during labour in a preeclamptic patient. It helps to control the exaggerated hypertensive response to pain and can also improve the placental blood flow in these patients *(10)*.

A spinal analgesia is quicker and involves less potential trauma in the epidural space. Spinal anesthesia can be performed faster, has fewer complications, and is more cost-effective for uncomplicated cesarean delivery.

Spinal anesthesia for cesarean delivery in severely preeclamptic patients causes slightly more hypotension than does epidural anesthesia during the induction to delivery period. The duration of hypotension, however, was short and there was no difference in neonatal status *(10)*.

In a morbidly obese preeclamptic parturients a single dose of 9-15 mg of hyperbaric bupivacaine is considered as safe and effective dose for spinal anesthesia *(11)*.

The addition of an opioid with a lower local anesthetic dose may decrease hypotension. Ben-David et al. investigated the use of opioid in low dose spinal anesthesia and concluded that a lower local anesthetic dose combined with opioid provided adequate anesthesia and decreased the incidence of hypotension by 30% *(12)*.

Morbidly obese preeclamptic parturient often have comorbid disease states such as hypertension and diabetes. Other physiologic changes associated with obesity include increased oxygen demand and CO_2 production, decreased lung compliance, increased cardiac work load and gastric reflux *(13)*.

Hogan et al. studied the influence of body habitus on cerebrospinal fluid volume with magnetic resonance imaging studies. They concluded that patients with increased abdominal compression, as seen in obese and gravid patients, have lower cerebrospinal fluid volumes. Carpenter et al. showed that at a fixed dose of local anesthetic, there was an inverse correlation between cerebrospinal fluid volume and height sensory block. In the morbidly obese gravid patient, cerebrospinal fluid volume may perhaps be a contributing factor affecting dose requirement *(14)*.

M Reyes and P.H Pan described in a severe morbidly preeclamptic parturient that very low total dose of 5 mg hyperbaric bupivacaine was sufficient for cesarean section without the need of any supplements.

In the spinal and epidural anesthesia groups ephedrine use was similar, in the Hood and Curry study (23 and 26%) and Wallace et al. study (22 and 30%), respectively. In Visalyaputra et al. study ephedrine was administered more often in the spinal group (72%) than in the epidural group (45%).

Although the incidence of hypotension and ephedrine requirement was slightly more frequent in the spinal group than in the epidural group, we found evidence that supports the use of spinal anesthesia in severely preeclamptic patients *(16, 17)*.

Difference in mean lowest MAP (mean difference, 10 mm Hg) did not appear to be clinically significant.

The hypotension was easily treated and there was only a brief period of significant hypotension in either group.

The neonatal outcomes assessed by the Apgar score and the umbilical arterial blood gas analysis were similar in both groups.

Newborns who were born with the maximum duration times of hypotension in both groups had 5-min Apgar scores and umbilical arterial blood pH within normal ranges.

A combined spinal- epidural approach can be used with a limited dose of local anaesthetic in the subarachnoid space and the option of utilising the epidural space as necessary *(18)*.

SUMMARY

Although the incidence of hypotension and ephedrine requirement was slightly more frequent in the spinal group than in the epidural group, we found evidence that supports the use of spinal anesthesia in severely preeclamptic patients. The difference in mean lowest MAP (mean difference, 10 mm Hg) did not appear to be clinically significant. The hypotension was easily treated and there was only a brief period of significant hypotension in either group. The neonatal outcomes assessed by the Apgar score and the umbilical arterial blood gas analysis were similar in both groups.

REFERENCES

1. DULEY L 2009 The global impact of pre-eclampsia and eclampsia. *Semin Perinatol 33: 130–137*
2. CARTY D M, DELLES C, DOMINICZAK A F 2010 Preeclampsia and future maternal health. *J Hypertens 28: 1349–1355*
3. SIBAI B M, DEKKER G, KUPFERMINC M 2005 Pre-eclampsia. *Lancet 36:*
4. DULEY L, HENDERSON-SMART J, MEHER S 2006 Drugs for treatment of very high blood pressure during pregnacy. *Cochrane Database Syst Rev 3: CD001449*
5. LEVINE R J, LAM C, QIAN C, YU K F, MAYNARD S E, SACHS B P, SIBAI B M, EPSTEIN F H, ROMERO R, THADHANI R, KARUMANCHI S A 2006 Soluble endoglin and other circulating antiangiogenic factors in preeclampsia. *N Engl J Med 355: 992–1005*
6. RIBATTI D 2008 The discovery of the placental growth factor and its role in angiogenesis: a historical review. *Angiogenesis 11: 215–221*
7. FISHER S J, McMASTER M, CHESLEY'S R M 2009 Hypertensive Disorders in Pregnancy. Amsterdam, the Netherlands: *Academic Press Elsevier, 2009* The placenta in normal pregnancy and preeclampsia.
8. VERLOHREN S, HOLGER S, DECHEND R 2012 Angiogenic growth factors in the diagnosis and prediction of pre-eclampsia. *Clinical Science 122:43–52*
9. ALTMAN D, CARROLI G, DULEY L, FARRELL B, MOODLEY J, NEILSON J, SMITH D; Magpie Trial Collaboration Group 2002 Do women with preeclampsia, and their babies, benefit from magnesium sulphate? The Magpie Trial: a randomised placebo-controlled trial. *Lancet 359(9321): 1877–90*
10. VISALYAPUTRA S, RODANANT O, SOMBOONVIBOON W, TANTIVITAYATAN K, THIENTHONG S, SAENGCHOTE W 2005 Spinal Versus Epidural Anesthesia for Cesarean Delivery in Severe Preeclampsia. *Anaesth and Analg 101: 862–868*
11. LEE Y, BALKI M, PARKERS R, KARVALHO J C 2009 Dose requirement of inthratecal bupivakaine for cesarean delivery is similar in obese and normal weight woman. *Rev Bras Anesthesiol 59(6): 674–83*
12. REYES M, PAN P H 2004 Very low-dose spinal anesthesia for cesarean section in a morbidly obese preeclamptic patient and its potential implications. *Int J Obstet Anesth 13(2): 99–102*
13. KUMARI A S 2001 Pregnancy outcome in women with morbid obesity. *Int J Gynaecol Obstet 73: 101–107*
14. BEN-DAVID B, MILLER G, GAVRIEL R, GUREVITCH A 2000 Low-dose bupivacaine-fentanyl spinal anesthesia for cesarean delivery. *Reg Anesth Pain Med 25: 235–239*
15. RAINALDI M P 2009 Regional Anaesthesia in the morbidly Obese Obstetric Patient. *In:* Highlaits in Regional Anaesthesia and Pain Therapy XVIII. Rawal N, Ivani G *(ed). Kenes International: 234–237*
16. REYE S M, PAN P H 2004 Very low dose spinal anesthesia for cesarean sectio in morbidly obese preeclamptic patient and its potential implication. *Int J Obstet Anesth 13(2): 99–10*
17. GUASCH E, DOMINGUEZ A, ALSINA E, GILSANZ F 2007 Combined spinal-epidural anesthesia with very low dose hyperbaric levobupivacaine for cesarean section in a preeclamptic patient. *Int J Obstet Anesth 16(1): 91–3*
18. TYAGI A, KAKKAR A, KUMAR S, SETHI AK, SALHOTRA R 2012 ED50 of hyperbaric bupivacaine with fentanyl for cesarean delivery under combined spinal epidural in normotensive and preeclamptic patients. *Reg Anesth Pain Med 37(1): 40–4*