THE ROLE OF ANESTHESIOLOGIST IN PERIPARTAL TREATMENT OF PREECLAMPSIA

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Preeclampsia is a disorder of pregnancy which occurs after 20 weeks of gestation, and it is characterized by maternal hypertension, proteinuria and often edema.
It has been described as a two stage disorder. The first stage involves the reduced placental perfusion which is responsible for the increased production of vasoactive compounds. The second stage is the response to the decreased perfusion that leads to maternal syndrome affecting both the mother and the fetus.
Intense vasospasm leads to a contracted intravascular volume by as much as 30% to 40%, depending upon the severity of the disease compared with normal pregnancy.(1)

Preeclampsia affects between 3% and 6 % of all pregnancies.(2) The life threatening maternal complications in the case of severe preeclampsia are: hypertensive encephalopathy, intracranial hemorrhage, low platelet count, disseminated intravascular coagulation and HELLP syndrom (It is characterized by hemolysis, elevated liver enzymes, and low platelet count).
HELLP syndrom affects between 0.2% –0.6% of all pregnancies. (3)
The reduced placental perfusion results in a high prevalence of intrauterine growth retardation.There is a high incidence abruption of placenta and pretermal labour. Early delivery is often required and results in fetal prematurity.
The termination of pregnancy in patients with preeclampsia is both operative and nonoperative, so the anesthesiologist should be involved in two types of care:

-in the form of pain management in labour
-in the form of perioperative and operative treatment.

Prepartal period is an optimal time for the management of hypertension, correction of intravascular volume deficits and reestablishment of adequate urine output, securing seizure prophylaxis and deciding which analgesic or anesthetic technic would be safe in an eventual surgical termination of pregnancy. Preeclampsia is divided into two groups: moderate and severe. (4).

The moderate preeclampsia is defined in a previously normotensive woman when diastolic blood pressure exceeds 90 mmHg and proteinuria is more than 0.3 g/24 hrs. Severe preeclampsia occurs if one or more of the following symptoms are present:

- Systolic blood pressure > 160mmHG,diastolic pressure >110 mmHg,MAP>105 mmHg.
- Rapidly increasing proteinuria (>5g/24 hrs)
- Oliguria of < 400 ml/24 hrs

- Evidence of cerebral irritability (hyperreflexia with clonus) and headache or scotoma (signs of cerebral edema)
- Pulmonary edema
- Platelet count <100 x 10^9/l
- elevated liver enzymes (AST,ALT) and elevated LDH

Eclampsia is also diagnosed if convulsions occur.

The treatment of preeclampsia includes:

- ♦ treatment of hypertension
- ♦ treatment of fluid disbalance and oliguria
- ♦ control of convulsions
- ♦ management of coagulation abnormalities
- ♦ the decision on the most appropriate time for the termination of pregnancy

Hypertension, one of the important symptom of preeclampsia occures due to severe vasospasm. The resultant vasospasm leads to organs ischemia which in association with severe hypertension can cause cerebral hemorrhage and pulmonary edema. The control of the hypertension includes continued monitoring and reduction of blood pressure.

The monitoring of blood pressure consists of using an automated blood pressure monitor and in the most severe cases arterial canulation is indicated and an invasive continuous monitoring of blood pressure is performed.

The successful control of hypertension involves keeping the mean arterial pressure between 1oo - 140 mmHg and insuring satisfactory placental perfusion.
Three drugs are commonly used for the acute control of hypertension in preeclampsia(2,4,5,).

Hydralazine	Direct arteriolar vasodilatator	BP control onset for 10 -20 min.	5 - 10 mg iv.every 20 min (max.6o mg)
Nifedipine	Calcium channel antagonist	BP control onset for 5 -10 min.	10 mg p.o.can be repeated in 30 min,than every4-6 hr.
Labetalol	mixed alfa/beta blocker beta 2 agonist	BP control onset for 5 -10 min.	80 mg every 10 min.(max.dose 300mg/24hr.

If more rapid control of hypertensive crises is required, nitropruside in iv. infusion is recommendable (2).

In the peripartal period large hemodynamic fluctuations occur (6,7). The hemodynamic profile of severe preeclampsia may be presented as:

- Decreased circulating plasma volume
- Mean arterial pressure (MAP) increased
- Systemic vascular resistence (SVR)increased
- Normal heart rate
- Cardiac output normal to low
- CVP (Central venous pressure) low to normal,
- PCWP (Pulmonary capillary wedge pressure) usually normal
- Left ventricular function increased or normal

In peripartal period, when a large hemodynamic fluctuations occur, the patient who is suffering from severe preeclampsia requires the monitoring of fluid volume status with CVP line. A smaller number requires pulmonary artery catheterization which helps, by allowing measurement of ventricular filling pressure and assessment of contractile and systemic vascular status, to define the etiology, monitoring and treatment of pulmonary edema. (1,5).
Fluid administration is always a concern in preeclampsia (8).
A leaky capillary with low colloid osmotic pressure due to protein loss, makes a patient with preeclampsia more susceptible to developing noncardiogenic pulmonary edema (in about 2.9% of women with preeclampsia). (1)

CVP monitoring is recommended before the induction of anesthesia when diastolic pressure is higher than 110 mmHg, and after the initiation of magnesium therapy, visual changes, signs of central nervous system irrytabilitiy, epigastric pain, oliguria.
CVP line helps also in fluid management during postpartal period because the autotransfusion due to uterine involution may produce an increase of blood volume and relative fluid overload intensified by an increased systemic vascular resistence.
The intensity of monitoring required in severe preeclampsia should be individualised and not rutinely performed.
Fluid maintaince should be restricted to 80 ml/h or 1 ml /kg/h to avoid fluid overload (1,4,5,9).
A careful assessment of urine output and a clinical condition of the parturient should be made before administering additional fluid.
Oliguria occurs more commonly due to hypovolemia and decreased renal blood flow, rather than primary renal pathology.
Oliguria is defined as a urine output of < 0.5 ml/kg/h over 4 consecutive hours.
Proteinuria indicates a glomerular involvement, probably on a vascular basis. Renal function should be checked by regular analysis of urinary electrolyte and osmolarity.
Olyguria in the presence of normal plasma urea and creatinine and high urinary osmolarity suggests an appropriate renal function. In preeclamptic patients decreases the cleraence of urate, which is accompanied by an increased uric acid in serum. The tubular damage is responsible for the decreasing clearence of urate. Resistant oliguria requires the use of fursemide and CVP or PA monitoring (9).

Prophylaxis of convulsions should start with signs of cerebral irritability such as headache, visual disturbances and hyperreflexia.
The etiology of these disturbances lies on the basis of vasospasam and hypoxia rather than cerebral edema.Convulsiones are not directly related to an elevated blood

pressure. The onset of eclamptic attack may be unexpected, it can occur before any other signs of preeclampsia.
Airway reflexes may be lost and pulmonary aspiration and hypoxia can occur rapidly.

Magnesium sulphate is established as the agent of choice in prevention of eclamptic convulsions. It is a potent cerebral vasodilatator, as well as a powerful catecholamine antagonist. The therapeutic blood level lies between 2-4 mmol/l.
The four grams loading dose is followed by continuous infusion of 1 to 3 grams through hour to maintain the therapeutic level.

Diazepam is still widely used as the agent number one to terminate convulsions and it is given in 5-10 mg increments until it becomes effective. It depresses all levels of CNS eg. limbic and reticular formation. The diazepam infusions of 10 mg/h have been used prophylactically,but may produce excessive sedation and fetal depression. Excessive sedation with diazepam carries the risk of respiratory depression and pulmonary aspiration.

Phenytoin is widely used for the prevention and control of eclamptic convulsions. The major site of action is the motor cortex where it acts by preventing the spread of seizure. Loading dose of 15 mg/kg is followed by a maintainance dose of 200 mg every 8 hours, starting 12 hours after the completion of loading dose. (8,10).

Routine antacid prophylaxis given regularly during labour will minimise the risks of pulmonary aspiration during eclamptic attack, or in situations when general anesthesia becomes necessary (9).

The most common coagulation disorder in preeclampsia is a decrease in platelet number and function. In preeclampsia the normal life span of platelets is reduced by more than 50% (4,7). Coagulopathy is found in about 5% of preeclamptic patients and in 15% of severe preeclamptic patients. An increased bleeding time has been associated with a decreased platelet count. Other clotting tests, including prothrombin time (PT), partial thromboplastin time (PTT) and fibrinogen concentration remain unchanged until the platelet count falls below 100×10^9 /l (7). When the fibrin degradation products are present in the plasma of preeclamptics patients, they provide evidence of a consuptive coagulopathy.

Thromboelastogram has been suggested as an effective method to ensure clot formation and it can determine the safety of regional anesthesia. The maximum amplitude of thromboelastinogram does not decrease until the platelet count falls below 70×10^9 /l(7).
It is generally recommended that an epidural or spinal block should be avoided if the platelet count is $<70 \times 10^9$ /l or if the bleeding time is prolonged.
Platelet transfusion is indicated either before or after delivery if the platelet count is low, or when parturients exhibit bleeding diathesis.
It is particularly important to correct thrombocytopenia before undertaking a caesarean section. Many authors agree that 6 – 10 units of platelets is necessary to all parturients with a platelet count lower than 50×10^9 /l prior to the induction of anesthesia for cesarean section. The platelet remains effective long enough to support intraoperative hemosthasis. The same applies to those with platelet count $<20 \times 10^9$ /l having vaginal delivery (2,7,11).

The decision when to deliver is made by the obstetrician in consultation with the pediatrician, and this decision often presents a balance between maternal morbidity and fetal viability.
If the gestational age is greater than 30 weeks, delivery is indicated (2).
If at all possible,the delivery may be allowed to proceed with normal labour.
If the coagulation is normal a continuous epidural analgesia is the best solution in the management of these parturients for both, the control of blood pressure and vasodilatation as well as for reducing the stress response and catecholamine release which may be induced by pain (7,11,12).
In this situation parturients require minimal fluid preloading (250-500 ml crystalloids) because is initiated low dose anesthetic with low concentracion of local anesthetics with opioids, usually a bupivacaine 0.125% with fentanyl 2 micrograms /ml.solution.
During labour, the clinical course of the parturiens and fetus should be continuously evaluated, and the physician team should be prepared to intervene with an operative delivery at any time.

ADVANTAGES OF EPIDURAL ANESTHESIA

- Epidural analgesia has been used as a therapeutic option to control blood pressure during labor in patients with progressive severe preeclampsia
- Vasoconstriction of the placental arteries is abolished and placental circulation is improved
- Intervillous blood flow is improved
- Epidural analgesia provides exellent relief of labour pain with maximum of maternal satisfaction
- Epidural analgesia is associated with a smaller hemodynamic and neuroendocrine stress response during caesarean section
- Slower onset of sympathic paralysis and small drop in blood pressure

When we must reach a decision to terminate the pregnancy surgically, we are confronted with a dilemma concernig the usage of different types of anesthesia.
Neither regional nor general anesthesia are completely safe for caesarean section in severe preeclampsia. Regional anesthesia is usually considered safer, although every case must be assessed on an individual basis.
In an urgent but not emergent cesarean section, in the situations of failure in progress or unripe cervix, the vast majority of these parturients represent candidates for an epidural block.
Emergency caesarean section in preeclampsia is most often done for fetal distress. These parturients usually have a functioning epidural catheter that has been placed earlier in labour.If an epidural catheter is not in place or does not function properly, a general or spinal anesthesia is indicated.
It has long been argued that spinal anesthesia is not suitable for preeclampsia because there is a considerable risk that hypotension may ensue. A good preoperative management (antihypertensive therapy and fluid preload) minimizes problems with

hypotension, provided there is no need for a rapid fetal delivery (abruption placenta,severe fetal bradycardia).
Preloading with 1000 ml of crystalloids in parturiens with preeclampsia before spinal anesthesia does not prevent maternal hypotension. Colloids administration are more effective than crystalloids. Preloading with colloids (50 to 100g human albumin solution) are recommended.
The usage of vasoconstrictors should be approached with caution. Some patients with preeclampsia are very sensitive to both circulating and exogenuos catecholamines. Ephedrine should be used with caution in preeclamptics who develop hypotension due to the placement of an epidural or spinal block.

ADVANTAGES OF SPINAL ANESTHESIA

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- the parturient is awake and her airway is safe
- rapid onset with complete motor and sensory block
- technically quicker and easy to perform
- small quantity of local anaesthetic, the baby is not sedated

DISADVANTAGES OF SPINAL ANESTHESIA

- hypotension and hemodynamic instability
- reduction in uteroplacental blood flow
- bradycardia
- post spinal headache
- the risk of spinal bleeding with the risk of medula compression

Regional anaesthesia is a perfect choice in cases with preeclampsia provided that all the risk factors are taken under consideration and the patients are hemodynamicaly stable.

When general anesthesia is chosen, care should be taken to reduce the pressor response to laryngoscopy. Several techniques have been described to abolish this, including preoperative beta-blockers, opioids or iv. lignocaine, but none of them is completely reliable. A bolus of magnesium sulfate may be the most effective one. Extubation may be particularly hazardous due to the aggravation of airway edema leading to acute upper airway obstruction.

ADVANTAGES OF GENERAL ANESTHESIA

are noticable in situations when:

- the patient is not fully conscious following eclampsia
- coagulopathy or low platelet count exists
- there is a severe hemorrhage which requires an operation while the patient is hypovolaemic
- life threatening fetal or maternal emergency is present

DISADVANTAGES OF GENERAL ANESTHESIA

- pulmonary aspiration
- edema of the upper airway complicates the intubation
- severe hypertensive response to laryngoscopy, intubation and extubation may lead to intracranial hemorrhage
- interaction of magnesium with anesthetics, especially with muscle relaxants
- magnesium therapy and other respiratory depressant medications may increase the susceptibility to hypoventilation and hypoxia

Seventy percent of convulsions and pulmonary complications in severe preeclampsia occur during the postoperative period.(8) For this reason, monitoring of the patients with severe preeclampsia should be continued for at least 36 - 72 hours after delivery. At the risk of eclamptic attacks, one should proceed with the magnesium sulfate therapy. As long as patients are hyperthensive, they have to be treated with antihypertensive drugs. The renal failure is usually transient, but patients with severe oliguria or anuria especialy if hemodialysis is necesarry, are treated in ICU.
During 2004, our Department of Gynecology and Obstetrics (TheUniversity Hospital in Rijeka) recorded 2827 deliveries.
Pregnancy associated with hypertension was registred in 72 cases, and there were 19 cases with severe preeclampsia.
14 (73.6%) of 19 patients with severe preeclampsia had cesarean deliveries. Regional anesthesia was administered in most of these cases (71%); in 4 cases (28.5%) we used spinal, in 6 (43%) epidural and in 4 (28.5%) general anesthesia.
5 women (26.4%) with severe preeclampsia had normal vaginal delivery, 3 with no analgesia, while two had a continuois epidural analgesia through an epidural catheter.
22 (30.6%) parturiens with pregnancy induced hyperthension underwent operative delivery. One half of those (50%) were performed with regional anesthesia and the other half (50%) with general anesthesia. Normal vaginal delivery was possible with 50 (69,4%) hypertonic parturients, while an epidural anesthesia was used with 16 (32%)parturients.
The use of regional anesthesia for operative delivery in preeclamptic parturients has increased in last years.
Spinal anesthesia is used in both mild and severe preeclamptics, as well as with elective and urgent operative deliveries.
The block can be performed either with the mother sitting up, or lying sideways. After preloading with colloid solutions (500 ml) and scin desinfection the spinal punction should be made at the level L2/3 or L3/4 in the mid-line with pencil point needle of 27G or 29G. The dosage to be given lies between 1.5 – 2.5 ml of 0.5% bupivacaine depending on the height of the parturient. The height of block is on Th6 sensory level.Our practice is to use 10 - 20 micrograms of fentanyl with 0.5% bupivacaine because sensory component of the block is denser.
Epidural anesthesia is usually used when an epidural catheter for labour analgesia is in place.
Epidural anesthesia for cesarean section is induced by using 15 - 20 ml of 0.5% bupivacaine or 2% lignocaine with 50-100micrograms of fentanyl.
When we have indications for performing **general anesthesia** than the rapid induction of anesthesia is necessary. Preoxygenation, three deep breaths of 100% oxygen, 4 mg/kg of thyopental iv. and 1.5 mg/kg succinylcholine iv. (or one

nondepolarizing relaxant) while an assistant applies cricoid pressure. When trachea is intubated and the endotracheal tube sealed by inflating the cuff, the patient's lungs are ventilated with nitrous oxyde 50% plus oxygen 50% and isoflurane 0.75% or sevorane 1%. Muscle relaxants are used as necessary. After the umbilical cord has been clamped, anesthesia has been deepened with narcotics. The inhalational agent may be discontinued. The patient is extubated awake.
Antihypertensive agents and vasodilator infusions (magnesium sulfate) must be used to control systemic arterial pressure pre-operatively and to treat pressor responses at intubation. Administration of antacids should not be ignored in the prevention of pulmonary aspiration.

Conclusion

The management of the patients with preeclampsia presents a clinical challenge. The experience of anesthesiologists in the provision of pain relief, management of cardiovascular and respiratory function, control and optimisation of fluid balance, expert preoperative preparation, seizure prophylaxis, correction of coagulopathy will have profound effects on the multi disciplinary management of these patients.

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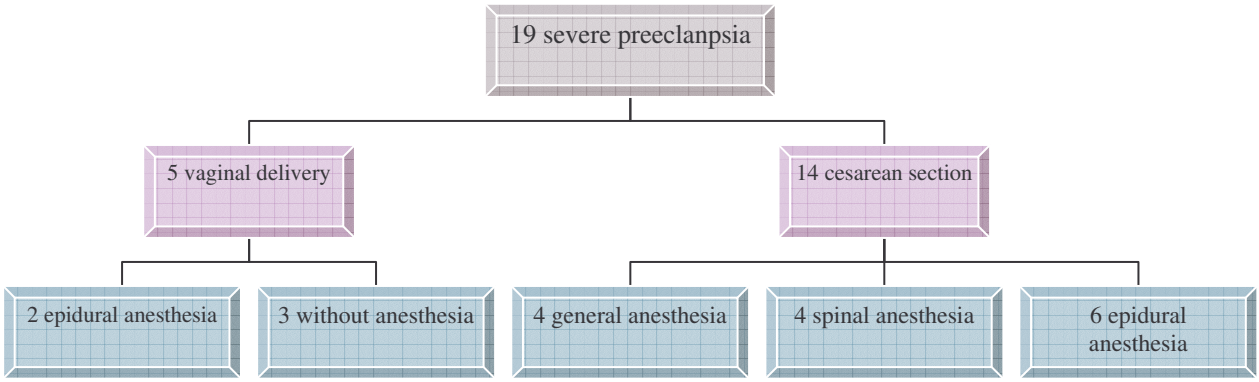
MODE OF DELIVERY IN PATIENTS SUFFERING FROM SEVERE PREECLAMPSIA



MODE OF DELIVERY IN PATIENTS SUFFERING FROM PREGNANCY INDUCED HYPERTENSION