

## Fetomaternal Outcome in Severe Preeclamptic Women Undergoing Emergency Cesarean Section with Spinal or General Anesthesia

Tarek Mohamed Ramadan, Adel Aly Elboghady, Mohamed Anwar Mohamed Oreef

Department of Obstetrics & Gynecology, Faculty of Medicine, Al- Azhar University

Corresponding author: Mohamed A.M. Oreef, Mobile: 01010437268; Email: revo.moha11@gmail.com

### ABSTRACT

**Background:** Preeclampsia (PE) is a hypertensive disease specific to pregnancy and it complicates 5–10 % of all pregnancies and it is a major cause of maternal, fetal, and neonatal morbidity and mortality worldwide. Preeclampsia is defined as new-onset hypertension (systolic blood pressure 140 mm Hg or diastolic blood pressure 90 mm Hg) and new-onset proteinuria after 20 weeks of gestation in previously normotensive patients.

**Objective:** The aim of this work is to show the fetomaternal outcome of severe preeclampsia in women undergoing emergency cesarean section with either spinal or general anesthesia. Which better?

**Patients and Methods:** This study was conducted at El Sayed Galal and El Hussein University Hospitals. 180 pregnant women with severe preeclampsia admitted to the operating room for emergency cesarean section were included and divided into 2 groups: Group I: 150 patients underwent cesarean section under spinal anesthesia. Group II: 30 patients underwent cesarean section under general anesthesia. This study was prospective observational study. The patients fulfilled our inclusion criteria and signed a well informed consent to declare their agreement to be in this study as agreed upon by the ethical committee.

**Results:** The mean values of DBP were significantly higher in group II than in group I ( $p < 0.05$ ). The incidence of maternal complications was significantly higher in group II more than group I, especially in vomiting, high blood pressure and convulsion ( $p < 0.05$ ). There was a significant increase in neonatal weight in group I more than group II ( $p < 0.05$ ). Regarding preterm, there was a significant increase in preterm cases in group II (60%) more than group I (38%) ( $p < 0.05$ ). Regarding APGAR score at 1 and 5 min, it was found that there was a significant increase in APGAR score in group I more than group II at both 1 minute and 5 minutes ( $p < 0.05$ ). The mean values of neonatal heart rate were significantly higher in group II than in group I ( $p < 0.05$ ). The mean values of neonatal respiratory rate were significantly higher in group I than in group II ( $p < 0.05$ ). Regarding breast feeding after cesarean section (hrs.), there was a significant increase in the duration after cesarean section till the breast feeding in group II more than group I ( $p < 0.05$ ). Regarding neonatal mortality, there was a significant increase in mortality in group II (16.7%) more than group I (2.7%), ( $p < 0.05$ ).

**Conclusion:** This means that spinal anesthesia is a safer alternative to general anesthesia in severe preeclampsia with less postoperative morbidity and mortality regarding both mothers and babies. These findings agreed with many previous studies worldwide.

**Keywords:** Acute renal failure - blood pressure - cesarean section

### INTRODUCTION

Preeclampsia (PE) is a hypertensive disease specific to pregnancy .It complicates 2–8 % of all pregnancies and it is a major cause of maternal, fetal, and neonatal morbidity and mortality worldwide<sup>(1)</sup>.

Preeclampsia is defined as new-onset hypertension (systolic blood pressure 140 mm Hg or diastolic blood pressure 90 mm Hg) and new-onset proteinuria after 20 weeks of gestation in previously normotensive patients<sup>(2)</sup>.

Hypertension should be documented to be persistent over two determinations at least four hours apart, unless it is greater than or equal to 160 mm Hg systolic or greater than or equal to 110 mm Hg diastolic<sup>(3)</sup>.

Proteinuria is defined as 300 mg of protein per 24 hours or a urine protein/creatinine ratio of 0.3 mg/dL. In the absence of proteinuria, preeclampsia may also be defined as new-onset hypertension with other signs of

multisystem involvement (thrombocytopenia, liver dysfunction, renal insufficiency, pulmonary edema, cerebral or visual disturbances)<sup>(4)</sup>.

In severe preeclampsia systolic blood pressure greater than or equal to 160 mm Hg or diastolic blood pressure greater than or equal to 110mmHg on two occasions at least four hours apart while the patient is on bed rest, thrombocytopenia ( $< 100,000$  platelets/mL), impaired liver function (liver enzymes levels increased twice to normal) or persistent right upper quadrant/epigastric pain unresponsive to medication), progressive renal insufficiency (serum creatinine  $> 1.1$  mg/dL , without other renal disease), pulmonary edema, cerebral or visual disturbances<sup>(5)</sup>.

Most of preeclampsia cases occur in primigravida, there is no specific recognizable etiologic agent<sup>(6)</sup>.

For the mother, the complications can be life threatening. It includes abruptio placenta, DIC/HELLP

syndrome, pulmonary edema/aspiration, eclampsia, hepatic failure/hemorrhage, cerebral hemorrhage, perinatal morbidity, congestive heart failure, renal failure, and permanent disability. It may persist for four weeks postpartum. So, continuous close monitoring of patients with preeclampsia for a longer period of time is needed <sup>(7)</sup>.

Initial evaluation should occur in the hospital. Daily maternal and fetal monitoring, administration of antenatal steroids, and magnesium sulfate administration for seizure prophylaxis should be done during the evaluation <sup>(8)</sup>.

Severe hypertension should be treated and serial blood pressure, urine output, and serum laboratory assessment should also be done <sup>(9)</sup>.

For patients with severe features, the recommendation is termination of pregnancy if greater than or equal to 34 weeks of gestation. Expectant management is appropriate for certain patients if the patient is willing to undergo the risks of staying pregnant. Also, in abnormal fetal testing at 37 weeks of gestation or if there is persistent abnormal fetal testing or severe fetal growth restriction. Earlier delivery is considered if worsening of the maternal or fetal condition delivery is considered <sup>(10)</sup>.

The pathophysiological changes in these patients make the choice of anesthesia, confusing <sup>(11)</sup>.

Cesarean section increases the risk of cardiopulmonary morbidity associated with preeclampsia because of the altered hemodynamics in these women, this risk presents with both spinal and general anesthesia <sup>(12)</sup>.

In general anesthesia these patients are at risk of severely elevated blood pressure, increased risk of airway edema and difficult tracheal intubation <sup>(13)</sup>.

These effects make this method increases morbidity and mortality. Other associated risks are the use of magnesium sulphate in severe preeclamptic patients because it prolongs the duration of muscle relaxants making the recovery from general anesthesia in these patients is unpredictable <sup>(14)</sup>.

Spinal anesthesia is generally chosen, especially in developing countries. It could be faster with fewer complications and can be used in emergency situations because it is quick, easy as no need to insert endotracheal tube, so secure the airway <sup>(15)</sup>.

As regard the maternal and perinatal mortality outcome of cesarean sections in women with severe preeclampsia who received general anesthesia showed significantly higher proportion of birth asphyxia than those underwent spinal anesthesia <sup>(16)</sup>.

There is still a dilemma about whether spinal anesthesia or general anesthesia is better for women with severe preeclampsia <sup>(17)</sup>.

## AIM OF THE WORK

The aim of this work was to show the fetomaternal outcome of severe preeclampsia in women undergoing emergency cesarean section with either spinal or general anesthesia. Which was better?

## PATIENTS AND METHODS

This prospective observational study was done at obstetric and gynaecological department at El-Sayed Galal Hospital, Al-AZHAR University. **The study was approved by the Ethics Board of Al-Azhar University.**

180 pregnant women admitted to the operating room for emergency cesarean section were included and divided into 2 groups: Group I: 150 patients underwent cesarean section under spinal anesthesia. Group II: 30 patients underwent cesarean section under general anesthesia.

**Inclusion criteria:** Severe preeclamptic women. Systolic blood pressure greater than or equal to 160 mmHg or diastolic blood pressure greater than or equal to 110mmHg on two occasions at least four hours apart while the patient was resting on bed. Thrombocytopenia (<100,000 platelets/mL). Impaired liver function (liver enzymes levels increased twice to normal). Persistent right upper quadrant/epigastric pain unresponsive to medication. Progressive renal insufficiency (serum creatinine >1.1 mg/dL, without other renal disease). Pulmonary edema. Cerebral or visual disturbances. Gestational age  $\geq$  34 weeks.

**Exclusion criteria:** Pregnant women with cardiac disease (as these would impact on haemodynamic variables). Past history kidney or liver disease. Past history of neurological disease. Past history of psychiatry and the patient will lack the cooperation in determining the sensory level. Pregnant women who received regional anaesthesia and need to be converted to general anaesthesia (as this would confound data interpretation). Women have sensitivity to local anesthetics. Eclamptic patients and who have HELLP syndrome. Women who have chronic hypertension. Women who have diabetes. Women who have connective tissue disorder. Women who have abruptio placenta or placenta previa. Women who have coagulopathy, thrombocytopenia with platelet count less than 80,000/cm<sup>3</sup>. Women who have

sepsis. Pregnant women with gestational age <34 weeks. Informed written consent was obtained from participants before management.

All women with a diagnosis of severe preeclampsia were admitted in the hospital for emergency cesarean section. All of them were subjected to: Full history taking (personal, present, past, family and obstetric) to exclude the previous exclusion criteria in selected cases. General examination including chest, heart and abdomen. Obstetric examination including fundal level, lie presentation, fetal heart rate, liquor and fetal size. Complete blood picture and coagulation profile. Liver function tests. Renal function tests. Proteinuria assessment: Mild proteinuria: protein dipstick  $\geq 1+$  on  $\geq 2$  midstream samples 6 hours apart. Severe proteinuria: protein dipstick  $\geq 3+$  on  $\geq 2$  midstream samples 6 hours apart. Urine dipstick for grading of proteinuria was performed after admission and twice weekly thereafter. Urine output measurement was done by Foley's catheterization inserted after anesthesia procedure. Obstetric U/S for assessment of gestational age, BPP, fetal weight, concealed accidental hemorrhage, IUGR and exclusion of congenital anomalies or multifetal gestation.

## RESULTS

**Table (1):** Comparison between the two studied groups regarding indication of cesarean section.

Indication of cesarean section	Group I (Spinal anesthesia) n=150		Group II (General anesthesia) n=30		p-value
	No.	%	No.	%	
Severe preeclampsia	75	50	10	33.3	0.068
Fetal distress	26	17.3	9	30.0	0.055
Unfavorable cervix	8	5.3	1	3.3	0.324
Less fetal movement	7	4.7	3	10.0	0.123
Contracted pelvis	7	4.7	1	3.3	0.374
Post cesarean section	19	12.7	1	3.3	0.069
IUGR/ oligohydramnios	3	2.0	1	3.3	0.326
Induction failure	2	1.3	2	6.7	0.065
Premature rupture of membrane	2	1.3	1	3.3	0.218
High floating head	1	0.7	0	0.0	0.328

**Table (2):** Comparison between the two studied groups regarding blood pressure

Blood pressure	Group I (Spinal anesthesia) n=150	Group II (General anesthesia) n=30	t-test p-value
<b>SBP</b>			
Range	95-135	96-135	0.821
Mean	115.53	117.2	0.228
S.D.	11.22	12.16	N.S.
<b>DBP</b>			
Range	67-92	68-92	3.65
Mean	80.35	84.1	0.0053
S.D.	7.39	6.47	

**Table (3):** Comparison between the two studied groups regarding duration of surgery and duration of anesthesia

	Group I (Spinal anesthesia) n=150	Group II (General anesthesia) n=30	t-test p-value
<b>Duration of surgery</b>			
Range	35-80	35-80	0.982
Mean	57.86	61.0	0.1266
S.D.	13.75	14.32	N.S.
<b>Duration of anesthesia</b>			
Range	46-98	45-94	0.858
Mean	71.54	73.7	0.226
S.D.	14.01	14.82	N.S.

**Table (4):** Comparison between the two studied groups regarding maternal complications.

Maternal complications	Group I (Spinal anesthesia) n=150		Group II (General anesthesia) n=30		p-value
	No.	%	No.	%	
Nil	118	78.7	21	70.0	0.040
Headache	10	6.7	2	6.7	0.500
Vomiting	3	2.0	3	10.0	0.013
Fever and wound gaping	3	2.0	2	6.7	0.079
High blood pressure	8	5.3	5	16.7	0.014
Pain at spinal injection side	2	1.3	0	0.0	0.264
Parasthesia	3	2.0	0	0.0	0.219
Visual disturbance	6	4.0	0	0.0	0.134
Convulsion	3	2.0	3	10.0	0.013

**Table (5):** Comparison between the two studied groups regarding neonatal weight.

Neonatal Weight (gm.)	Group I (Spinal anesthesia) n=150	Group II (General anesthesia) n=30	t-test p-value
Range	1850-3200	1830-2940	12.68
Mean	2538.20	2337.3	0.0066
S.D.	411.94	338.88	

**Table (6):** Comparison between the two studied groups regarding preterm.

Preterm	Group I (Spinal anesthesia) n=150		Group II (General anesthesia) n=30		X <sup>2</sup> p-value
	No.	%	No.	%	
Yes	57	38.0	18	60.0	4.36
No	93	62.0	12	40.0	0.012

**Table (7):** Comparison between the two studied groups regarding APGAR score at 1 and 5 min.

APGAR score at 1 and 5 min	Group I (Spinal anesthesia) n=150	Group II (General anesthesia) n=30	t-test p-value
<b>Apgar score at 1 minute</b>			
Range	6-9	5-8	8.65
Mean	7.39	6.3	0.001
S.D.	1.14	1.14	
<b>Apgar score at 5 minutes</b>			
Range	7-10	6-9	7.98
Mean	8.63	7.5	0.0022
S.D.	1.08	1.14	

**Table (8):** Comparison between the two studied groups regarding neonatal hemodynamics.

Neonatal hemodynamics	Group I (Spinal anesthesia) n=150	Group II (General anesthesia) n=30	t-test p-value
<b>Heart rate/minute</b>			
Range	120-155	130-164	4.58
Mean	138.46	145.2	0.0036
S.D.	10.29	10.10	
<b>Respiratory rate/minute</b>			
Range	35-55	28-46	5.02
Mean	45.47	36.3	0.0011
S.D.	6.19	4.66	

**Table (9):** Comparison between the two studied groups regarding breast feeding after cesarean (hrs.)

Breast feeding after cesarean (hrs.)	Group I (Spinal anesthesia) n=150	Group II (General anesthesia) n=30	t-test p-value
Range	15-35	21-49	
Mean	24.69	35.4	5.11
S.D.	6.43	8.09	0.0012

**Table (10):** Comparison between the two studied groups regarding neonatal mortality and cause of mortality.

	Group I (Spinal anesthesia) n=150		Group II (General anesthesia) n=30		p-value
	No.	%	No.	%	
<b>Neonatal mortality</b>	4	2.7	5	16.7	0.0016
<b>Cause of mortality</b>					
ARF	2	1.3	2	6.7	0.03
DIC	1	0.7	2	6.7	0.005
CCF	1	0.7	1	3.5	0.012

## DISCUSSION

Hypertensive disorders complicate 5 to 10 percent of all pregnancies, and together they are one member of the deadly triad along with hemorrhage and infection that contributes greatly to maternal morbidity and mortality<sup>(18)</sup>.

Preeclampsia is best described as a pregnancy-specific syndrome that can affect virtually every organ system<sup>(18)</sup>.

Pre-eclampsia is defined as new onset of hypertension and either proteinuria or end organ dysfunction after 20 weeks of gestation in previously normotensive woman. Severe hypertension and signs/symptoms of end organ injury are considered the severe spectrum of the disease<sup>(19)</sup>.

Despite many studies on its pathogenesis, there are still many unanswered questions. It is abnormal trophoblastic invasion, immunologic mal-adaptation between fetal, maternal and paternal tissue, and also genetic factors and all have been reported as causative factors<sup>(20)</sup>.

The risk of general anesthesia (GA) is significantly increased in obstetric population. The incidence of failed intubation and aspiration are eight times higher than non-obstetrical patient. Other associated risks are systemic and pulmonary hypertension, which may be deleterious in this group of patients<sup>(21)</sup>.

Spinal anesthesia (SA) is generally chosen, especially if anesthetic resources are limited, as in developing countries. The quality of anesthesia can be superior with SA and requires less equipment and training compared to epidural anesthesia.

In the present study 150 patients were administered spinal anesthesia and 30 patients received general anesthesia for emergency cesarean section with a diagnosis of severe preeclampsia. A vast majority of patients were primigravida. All patients had significant proteinuria and an average platelet count slightly below 1,00,00/cmm. Patients in the GA group had more incidences of fetal distress and their babies were more premature in our study.

Intraoperatively, significantly higher number of patients having GA required additional preoperative and intraoperative labetalol injection. The duration of surgery and anesthesia were also comparable in the two groups.



The incidence of preterm delivery was more under GA. The babies of mothers receiving GA required advanced resuscitation in the form of supplemental oxygen and bag mask ventilation in more number of cases. A significantly higher population of babies in GA group died.

There are several reasons for preferring spinal anesthesia for cesarean sections. Babies born to mothers having spinal anesthesia may be more alert and less sedated as they have not received any general anesthetic agents through the placental circulation.

As the mother's airway is not compromised, there is a reduced risk of aspiration of gastric contents causing chemical pneumonitis. The onset of block is faster and quality of anesthesia is generally superior with spinal anesthesia and requires less equipment and training.

## CONCLUSION

This study suggests that spinal anesthesia is a safer alternative to general anesthesia in severe preeclampsia with less postoperative morbidity and mortality regarding both mothers and babies. The adequacy of safety of spinal anesthesia as an alternative to general anesthesia in severe preeclampsia, remains to be elucidated in further larger randomized trials.

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