

## Study of the Maternal and Neonatal Outcome in Caesarean Deliveries in Pregnancies Complicated by Pre-Eclampsia Conducted Under General Anaesthesia and Regional Anaesthesia

Veena Mathur, Arun Nagrath, Surekha Saxena, Manisha Maheshwari

*Department of Obstetrics and Gynaecology, S. N. Medical College, Agra, Department of Anaesthesia, S. N. Medical College, Agra*

### Summary

A total of 60 patients of preeclampsia undergoing caesarean section were divided into 3 groups of 20 each to study the maternal and foetal outcome under general, spinal and epidural anaesthesia. It was observed that total duration of surgery was significantly shorter under general anaesthesia than under spinal or epidural anaesthesia with shorter induction to skin incision and shorter skin incision to delivery interval. Mean highest systolic blood pressure increased in general anaesthesia group (13% increase) while it showed fall with the two types of regional anaesthesia. Postoperative blood pressure control and recovery did not vary in the three groups. Babies born under general anaesthesia showed more frequent transient depression than those in the other two groups which showed recovery within 10 minutes. There were with no significant differences with respect to respiratory distress in the three groups.

### Introduction

Preeclampsia is a multisystemic disorder unique to pregnant women after 20 weeks of gestation. Although maternal hypertension is diagnosed in approximately 5-10% of all pregnancies, it accounts for much higher proportion of perinatal deaths and maternal deaths.

Delivery is the ultimate cure of preeclampsia and about 20-30% of preeclamptic women may require caesarean section for delivery of the baby because of the worsening fetal or maternal status or failure of induction.

Caesarean section of the pre-eclamptic women poses problems regarding effective control of blood pressure and the resulting maternal and foetal outcomes with respect to type of anaesthetic technique used. With general anaesthesia, the pressor response to tracheal intubation is particularly marked in the pre-eclamptic patients with increase in systemic and pulmonary arterial pressure and consequent dangers of cerebral

haemorrhage and pulmonary oedema resulting in increased mortality and morbidity in both mother and child.

Spinal and epidural anaesthesia causes hypotension induced by sympathetic blockade and thus reduction in uteroplacental perfusion. Epidural anaesthesia is considered ideal for caesarean delivery of the preeclamptic women due to least disturbance in the haemodynamic status caused during operation.

The present study was conducted in the Dept. of Obstetrics and Gynaecology, S. N. Medical College, Agra with the aim to evaluate and compare the maternal and foetal effects in pre-eclamptic patients undergoing caesarean section under general, spinal and epidural anaesthesia.

### Material and Methods

A total of 60 cases of preeclampsia with systolic

Table - I  
Maternal Parameters in the Three Study Groups

| Maternal Parameters (Mean±SD)                    | Type of Anaesthesia |                  |                    | Statistical Correlation |                  |                  |
|--|---------------------|------------------|--------------------|-------------------------|------------------|------------------|
|  | Group A (General)   | Group B (Spinal) | Group C (Epidural) | GP A-B                  | GP B-C           | GP C-A           |
| Age (Years)                                      | 25.9 ± 3.7          | 24.9 ± 3.2       | 25.3 ± 3.6         | t=0.94<br>p>0.05        | t=0.41<br>p>0.05 | t=0.51<br>p>0.05 |
| Parity   | 1.00 ± 0.8          | 1.15 ± 1.1       | 1.15 ± 1.1         | t=0.48<br>p>0.05        | t=0.00<br>p>0.05 | t=0.18<br>p>0.05 |
| Weight (kg)                                      | 63.3 ± 5.8          | 62.3 ± 3.6       | 61.9 ± 3.6         | t=0.64<br>p>0.05        | t=0.30<br>p>0.05 | t=0.86<br>p>0.05 |
| B.P. at the Time of Admission (Syst. BP) (mm Hg) | 146 ± 6.8           | 149 ± 9.1        | 149 ± 8.8          | t=1.17<br>p>0.05        | t=0.03<br>p>0.05 | t=1.16<br>p>0.05 |
| (Diast. BP) (mm Hg)                              | 102 ± 6.4           | 103 ± 6.6        | 102 ± 6.9          | t=0.43<br>p>0.05        | t=0.55<br>p>0.05 | t=0.11<br>p>0.05 |

blood pressure > 140 mmHg and diastolic blood pressure > 90 mmHg along with proteinuria 1+ or more, undergoing caesarean section for various indications other than foetal distress were selected for the study.

Patients with platelets < 1,00,000/m<sup>3</sup>, eclampsia and those having medical complications were excluded from the study.

All the selected patients were randomly allocated to 3 groups of 20 patients each.

(i) **Group A:** These patients received sequence induction using pentothal (4-5 mg/kg) and succinyl choline (11.5 mg/kg) and were maintained on oxygen and nitrous oxide.

(ii) **Group - B:** After adequate hydration, these patients received premixed bupivacaine (1.5 ml of a 9.75% solution) injected into the subarachnoid space.

(iii) **Group - C:** These patients received 2% lidocaine or bupivacaine through a lumbar epidural catheter and repeated dose of 3-5ml as required.

Duration of various surgical events, input, output, highest and lowest blood pressure, peroperative blood loss, maternal side effects and neonatal outcome were observed before, during and after the operation and compared among the three groups.

#### Observations and Discussion :

Maximum number of patients were

primigravida. Majority of patients were of low parity in all groups and were in the age group for 21-30 yrs. All groups were comparable in terms of maternal age, parity, blood pressure and weight of the patients. (Table I) The most common indication for preeclamptic patients to undergo caesarean section was previous history of caesarean section in all the three groups followed by abnormal presentation, contracted pelvis, failed induction, antepartum haemorrhage, Bad obstetric history, IUGR and other.

Mean induction to skin incision interval were 2.67±0.51 min, 19.89±2.40 min, and 32.7±2.30 min, in group A, B and C respectively.

Skin incision to delivery interval among the three groups was 5.53±0.7 min (Group A) 7.18 ± 1.1 min. (Group B) and 7.84 ± 0.7 min (Group C). (Table II) It was observed that the mean induction to skin incision interval, anaesthesia induction to skin incision interval and total duration of surgery was significantly shorter under general anaesthesia group as compared to spinal and epidural anaesthesia. Wallace et al (1995) also reported significantly less duration of these surgical events under general anaesthesia.

Table - III shows mean maternal highest and lowest blood pressure, before, during and after operation in the three groups. The mean increase from preoperative levels in systolic blood pressure under general anaesthesia was 20 mmHg (13%). Under spinal 0.4

**Table II**  
**Time Intervals for Surgical Events**

| Surgical Events<br>(Mean ± SD)                | Type of Anaesthesia  |                     |                       | Statistical Correlation |                  |                  |
|---|----------------------|---------------------|-----------------------|-------------------------|------------------|------------------|
|   | Group A<br>(General) | Group B<br>(Spinal) | Group C<br>(Epidural) | GP<br>A-B               | GP<br>B-C        | GP<br>C-A        |
| Anaesthesia Induction to Skin Incision (Min.) | 2.67 ± 0.51          | 19.89 ± 2.40        | 33.70 ± 2.30          | t=31.2<br>p<0.01        | t=18.4<br>p<0.01 | t=58.4<br>p<0.01 |
| Skin Incision to Delivery (Min.)              | 5.53 ± 0.78          | 7.38 ± 1.14         | 7.84 ± 0.71           | t=5.98<br>p<0.01        | t=1.52<br>p>0.05 | t=9.72<br>p<0.01 |
| Uterine Incision to Delivery (Min.)           | 1.91 ± 0.34          | 1.81 ± 0.22         | 1.75 ± 0.20           | t=1.07<br>p>0.05        | t=0.86<br>p>0.05 | t=1.76<br>p>0.05 |
| Surgery Duration (Skin to Skin) (Min.)        | 35.75 ± 5.70         | 41.01 ± 5.48        | 42.65 ± 3.80          | t=2.96<br>p<0.01        | t=1.09<br>p>0.05 | t=4.46<br>p<0.01 |

**Table - III**  
**Maternal Blood Pressures Before During and After Caesarean Delivery**

| Maternal Blood Pressure (mm Hg) (Mean±SD) | Type of Anaesthesia      |            |                   |                         |            |                   |                           |           |                   |
|---|--------------------------|------------|-------------------|-------------------------|------------|-------------------|---------------------------|-----------|-------------------|
|   | General (Group A) (n=20) |            |                   | Spinal (Group B) (n=20) |            |                   | Epidural (Group C) (n=20) |           |                   |
|   | Pre-op                   | Per-op.    | Post-op. (24 hrs) | Pre-op.                 | Per-op.    | Post-op. (24 hrs) | Pre-op.                   | Pre-op.   | Post-op. (24 hrs) |
| Highest Systolic                          | 146 ± 5.7                | 165 ± 8.4  | 136 ± 7.9         | 149 ± 9.5               | 143 ± 9.5  | 130 ± 6.4         | 149 ± 9.8                 | 138 ± 7.6 | 129 ± 6.9         |
| Highest Diastolic                         | 104 ± 6.4                | 107 ± 20.1 | 102 ± 8.5         | 108 ± 15.4              | 102 ± 18.7 | 95 ± 15.2         | 103 ± 6.1                 | 94 ± 6.1  | 95 ± 4.4          |
| Lowest Systolic                           | 137 ± 6.4                | 117 ± 9.5  | 124 ± 5.6         | 137 ± 8.8               | 107 ± 7.4  | 122 ± 13.1        | 138 ± 8.0                 | 107 ± 7.5 | 121 ± 5.1         |
| Lowest Diastolic                          | 96 ± 6.4                 | 65 ± 7.1   | 90 ± 3.4          | 96 ± 5.4                | 64 ± 7.0   | 87 ± 2.5          | 94 ± 4                    | 62 ± 5.7  | 88 ± 2.9          |

**Table IV**  
**Intravenous Fluid Volumes and Urine Output Before, During and After Caesarean Delivery**

| Groups         | I/V Fluids    |                 |                | Urine Output    |                 |                  |
|----------------|---------------|-----------------|----------------|-----------------|-----------------|------------------|
|                | Preinduction  | Intra-operative | Post Operative | Pre-operatively | Per-operatively | Post Operatively |
| Group A (n=20) | 387.5 ± 106.8 | 1528 ± 190.1    | 2967 ± 231.4   | 55.75 ± 15.75   | 105.40 ± 18.40  | 85.52 ± 18.91    |
| Group B (n=20) | 941.0 ± 151.3 | 2055 ± 213.6    | 2955 ± 2.7     | 53.60 ± 12.40   | 167.64 ± 38.76  | 85.00 ± 13.59    |
| Group C (n=20) | 1000.5 ± 65.9 | 2110 ± 157.2    | 3025 ± 168     | 55.75 ± 10.75   | 160.21 ± 60.09  | 86.68 ± 10.03    |
| p value        |               |                 |                |                 |                 |                  |
| A Vs B         | p<0.01        | p<0.01          | p>0.05         | p>0.5           | p<0.01          | p>0.05           |
| B Vs C         | p>0.05        | p>0.05          | p>0.05         | p>0.05          | p>0.05          | p>0.05           |
| C Vs A         | p<0.01        | p<0.01          | p>0.05         | p>0.05          | p<0.01          | p>0.05           |

epidural anaesthesia, preeclamptic women had mean maximum fall of 28% in their systolic blood pressure during operation from preoperative levels which could be easily managed with I/V fluid boluses.

Connell and Downing (1987) and Hodgkinson et al. (1980) also reported increase in systolic arterial pressure of 35-45 mmHg in preeclamptic patients under general anaesthesia. Hodgkinson et al (1980) and Newsome et al (1986) also reported decreased mean arterial pressure in severe pre-eclamptic patients undergoing caesarean section under epidural block.

Wallace (1995) found no significant differences in blood pressures among the three groups of preeclamptic patients.

However post operative blood pressure control and recovery did not vary in three groups. Antihypertensive drugs were required postoperatively in five patients in group A and 2 patients each in group B and C but the difference was not significant statistically.

We observed the requirement of increased amount of intravenous fluid infusion in patients undergoing caesarean section under spinal and epidural anaesthesia as compared to general anaesthesia before operation as well as during operation to combat the intraoperative hypotension that could occur with regional anaesthesia. However, the mean volume of I/V fluids administered to these patients postoperatively in first 24 hours were not significantly different in the three groups (Table-IV).

We found that urine output increased in women

in all groups during operation. The increased output was significantly higher in Group B & C as compared to Group A, possibly due to increased I/V fluid infused in these groups before and during surgery. During post operative period, the urine output in three groups did not vary significantly. Wallace et. al. (1995) made similar observations regarding I/V fluid requirements in the three groups.

No serious side effect occurred in any preeclamptic patients in our study during operation or post operatively. Post partum haemorrhage was the most common complication under general anaesthesia while under spinal and epidural anaesthesia, 4 patients in each group observed hypotension which required treatment with rapid I/V infusion and vasopressors (Table V).

Table VI shows the foetal outcome in the three groups. There was one twin delivery in the study, that was in spinal anaesthesia group. Infants born to mothers in three groups were similar with respect to mean gestational age (38 wks), birth weight (2700-2900 gm) and mean apgar scores at 1 and 10 minutes.

Mean apgar score (A/S) of babies at 10 minutes were  $8.70 \pm 1.14$ ,  $8.55 \pm 1.0677$  and  $8.25 \pm 0.69$  in general, spinal and epidural group respectively. Though at birth, more babies born under general anaesthesia were moderately depressed (A/S < 7) at 10 minutes after birth there were only 2 infants in each group with A/S > 7.

No significant differences with respect to incidence of respiratory distress, time taken for sustained

Table - V  
Maternal Complications During And After Caesarean Section Under three Types of Anaesthesia

| Maternal Complications  | Type of Anaesthesia      |       |                         |       |                           |       |
|-------------------------|--------------------------|-------|-------------------------|-------|---------------------------|-------|
|                         | Group A (General) (n=20) |       | Group B (Spinal) (n=21) |       | Group C (Epidural) (n=20) |       |
|                         | No. of Cases             | %     | No. of cases            | %     | No. of cases              | %     |
| Severe hypertension     | 1                        | 05.00 | -                       | -     | -                         | -     |
| Hypotension             | -                        | -     | 4                       | 20.00 | 4                         | 20.00 |
| Vomitting               | 1                        | 05.00 | 2                       | 10.00 | 1                         | 05.00 |
| Aspiration              | -                        | -     | -                       | -     | -                         | -     |
| Post partum haemorrhage | 4                        | 20.00 | 1                       | 05.00 | 2                         | 10.00 |
| Post spinal headache    | -                        | -     | 2                       | 10.00 | -                         | -     |
| Pulmonary Oedema        | 1                        | 05.00 | -                       | -     | -                         | -     |
| Cerebral haemorrhage    | -                        | -     | -                       | -     | -                         | -     |
| Convulsions             | -                        | -     | -                       | -     | -                         | -     |
| Maternal Mortality      | -                        | -     | -                       | -     | -                         | -     |

Table – VI  
Foetal Parameters in the Three Groups

| Infant Parameters                          | Type of Anaesthesia            |                               |                                  | Statistical Analysis |        |        |
|--|--------------------------------|-------------------------------|----------------------------------|----------------------|--------|--------|
|  | (Group A)<br>General<br>(n=20) | (Group B)<br>Spinal<br>(n=21) | (Group C)<br>(Epidural<br>(n=20) | A Vs B               | B Vs C | C Vs A |
| Mean gestational age                       | 38.25 ± 1.63                   | 38.30 ± 1.50                  | 38.25 ± 1.37                     | p>0.05               | p<0.05 | p<0.05 |
| Birth weight                               | 2.70 ± 0.30                    | 2.02 ± 0.35                   | 2.74 ± 0.28                      | p>0.05               | p<0.05 | p<0.05 |
| Apgar Score                                | 6.55 ± 1.32                    | 6.85 ± 1.3                    | 6.70 ± 1.2                       | p>0.05               | p<0.05 | p<0.05 |
| 1 minute                                   |                                |                               |                                  |                      |        |        |
| 10 minute                                  | 8.70 ± 1.14                    | 8.55 ± 1.0                    | 8.25 ± 0.69                      | p>0.05               | p<0.05 | p<0.05 |
| - 8 at 1 minute                            | 14(75)                         | 11(52.3)                      | 12(60)                           | p<0.05               | p<0.05 | p<0.05 |
| - 8 at 10 minute                           | 2(10)                          | 2(9.5)                        | 2(10)                            | p>0.05               | p<0.05 | p<0.05 |
| Time taken<br>For sustained<br>Respiration |                                |                               |                                  |                      |        |        |
| 1 min                                      | 16(80)                         | 18(85.7)                      | 17(85)                           | p<0.05               | p<0.05 | p<0.05 |
| > 1 min                                    | 2(10)                          | 2(9.5)                        | 1(5)                             | p<0.05               | p<0.05 | p<0.05 |
| FI   | 2(10)                          | 1(4.7)                        | 2(100)                           | p>0.05               | p<0.05 | p<0.05 |
| Admission in NICU                          | 4(20)                          | 3(14.3)                       | (15.2)                           | p>.05                | p<.05  | p<.05  |

respiration and long term morbidity was observed in women under the three groups in our study.

Jouppilla et al (1979) observed better A/S in spinal and epidural anaesthesia than general anaesthesia in preeclamptic patients while Hodgkinson et al (1980) and Wallace (1995) et al observed no significant difference in A/S of infants under general, epidural and spinal anaesthesia in preeclamptic patients.

### Conclusion

From our observation it may be concluded that in preeclamptic patients caesarean section can be safely done under general as well as under regional anaesthesia. General anaesthesia results in quickest delivery of the baby as compared to either of the regional techniques and is thus ideal in situations of foetal distress. Spinal anaesthesia, previously considered unsafe in preeclamptic women can be used safely with intensive blood pressure monitoring and administration of large preinduction fluid volumes. It has advantage of quicker delivery of baby than epidural anaesthesia.

Under epidural anaesthesia, preeclamptic patients had better stability of blood pressure than under other two anaesthetic techniques. Infant condition as assessed by Apgar scores and time taken for sustained spontaneous respiration is not influenced significantly by the anaesthetic technique used. From our experience it can be concluded that maternal and foetal outcome in the caesarean delivery of pre-eclamptic women does not differ significantly with the type of anaesthesia used.

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