

A Comparative Study of Spinal and General Anaesthesia on Maternal and Foetal Outcome in Cases of Elective Caesarean Section

Saraka Venugopal¹, Paritala Subbarao²

^{1,2}Assistant Professor, Department of Anaesthesiology, A.C.S.R Medical College & Hospital, Nellore, Andhra Pradesh 524003, India.

Abstract

Background: International health care community is more worried about the rates of cesarean sections throughout the world. Cesarean sections are associated with temporary benefits but are associated with short and long term risks which can extend beyond many years after delivery and affect the health of the mother, child and future pregnancies. An ideal anesthetic technique, for minimizing the surgical morbidity among mothers and neonates has yet to be described in literature. **Objectives:** Hence our objective of the study was to compare the effects of spinal and general anesthesia on maternal hemodynamic status and foetal outcome by comparing the APGAR scores of the newborn. **Materials and Methods:** A prospective cross sectional study was conducted at ACSR tertiary care hospital for a period of one year. 120 cases that fulfilled inclusion criteria were divided into two equal groups (50 each) and one group administered general anesthesia and other spinal. Maternal hemodynamic parameters were recorded and foetal outcome with regard to APGAR score at 1 and 5 minute interval was recorded. SPSS version 10 for windows was used for statistical analysis. P value <0.05 was considered significant. **Results:** In our study, statistically significant differences between the two groups were observed in relation to APGAR scores of the neonates at 1 and 5 minute intervals. APGAR score readings were higher in general anesthesia group. Significant differences were also observed in readings of HCO₃ and PCO₂ levels between the two groups and patients in general anesthesia group were more tachycardic than patients in spinal anesthesia group. **Discussion:** To conclude in our study, we observed that umbilical artery pH and APGAR scores of neonates who received general anesthesia were lower than the neonates born under regional anesthesia. Spinal anesthesia is effective than general anesthesia, foetal outcome is favorable in cases of spinal than general anesthesia. This study can be further evaluated in cases of emergency cases of cesarean section which covers all the risk factors.

Keywords: APGAR Score; General Anesthesia; Spinal Anesthesia; Cesarean Section.

Introduction

For nearly 30 years, the international health care community is more worried about the rates of cesarean sections throughout the world. However an expert panel on reproductive health has considered the ideal rate of cesarean sections to be between 10-15% at a meeting organized by WHO [1]. Since then there has been an absolute surge in the number of cesarean sections throughout the world in both developed and developing countries.

Cesarean sections are associated with temporary benefits but are associated with short and long term risks which can extend beyond many years after delivery and affect the health of the mother, child and future pregnancies [2]. With increased patient care and practices, cesarean procedures have become safe but are still associated with significant maternal and perinatal mortality and morbidity. The overall post operative morbidity rate associated with cesarean birth is 35.7% [3]. The reasons for this increase are multifactorial and less understood as there is a gross variation in the cultural and social aspects of the different regions throughout the

Corresponding Author: Paritala Subbarao, Assistant Professor, Department of Anaesthesiology, A.C.S.R Medical College & Hospital, Nellore, Andhra Pradesh 524003, India.
E-mail: sujatha2481@gmail.com

Received on 05.11.2017, Accepted on 16.11.2017

world. For many years general anesthesia was preferred type of use in cesarean sections. Moreover complications like maternal aspiration syndrome and intubation failure, which may occur during general anesthesia may contribute towards maternal mortality have been reported. In view of these, rates of cesarean section using regional anesthesia have been increasing and has become preferred technique to avoid maternal and foetal complications. Most of the reports earlier have shown, identical indexes for both general and spinal anesthesia, most of the anesthesiologists have preferred regional anesthesia under elective conditions. However, some reports point out that regional anesthesia related hypotension syndrome due to sympathetic blockade may affect neonatal outcomes by impairing utero placental perfusion. Hence, an ideal anesthetic technique, for minimizing the surgical morbidity among mothers and neonates has yet to be described in literature [4], Hence, today the choice of anaesthesia is depending upon the mothers request, obstetric reasons and experience of the anaesthetician. Most of the studies published various reports regarding the foetal outcomes with comparison to general and spinal anesthesia by reading the APGAR scores. The reports are variable and studied retrospectively and in variable cases [5].

Hence our objective of the study was to compare the effects of spinal and general anesthesia on maternal hemodynamic status and foetal outcome by comparing the APGAR scores of the newborn.

Materials & Methods

A prospective cross sectional study was conducted at A.C.S.R government medical college and hospital, a tertiary care hospital in south India by the department of Anesthesiology and department of Gynecology & obstetrics for a period of one year from January 2015 to December 2015. The study protocol was accepted by the institutional ethical committee and all the ethical committee guidelines were followed strictly.

Study Design

A total of 120 consecutive pregnant women after completion of 37 weeks and posted for elective cesarean section, without any complications and singleton pregnancy were selected for the study. Indications for cesarean delivery may be previous history of cesarean section, primary infertility, Cephalo-pelvic disproportion, Precious pregnancy

etc. All the cases were informed about the study and written informed consent was obtained. 120 cases of the study were divided equally (60 each) into two groups, Group A (General anesthesia) and Group B (Spinal anesthesia).

Inclusion Criteria

Women who completed 37 weeks of gestation and with cephalic presentation of a singleton foetus.

Exclusion Criteria

Pregnant women with any medical and Obstetric complications.

Pregnant women not consenting to participate in the study.

All the cases in both groups were evaluated preoperatively and socio demographic data was collected by interviewing, obstetric history was noted and detailed physical examination (Heart rate, systolic and Diastolic Blood pressure recordings) was done. Detailed laboratory investigations including Hb%, coagulation profile, fasting blood glucose, Prothrombin time, International normalized ratio (INR), and renal profile were done and noted for every cases in the study. Preoperative medications were administered as per protocol. All the cases were kept in 15° left lateral position till delivery to protect against supine hypotension syndrome.

Technique: On arrival in the operating room every case received ECG and non invasive blood pressure monitoring continuously, pulse oximetry and capnography for group A patients after induction. For cases of Group A general anesthesia was administered by standardized anesthesia technique by performing rapid sequence induction and intubation with Inj.propofol 2mg/kg, inj. Suxamethonium 1.5mg/kg, application of Sellick's maneuver, confirmation of endotracheal tube, inj.atracurium 0.5mg/kg and then maintenance on 0.25% -0.5% isoflurane in oxygen. Controlled mechanical ventilation with 100% oxygen, and 1.0 minimum alveolar concentration of isoflurane. End tidal carbon dioxide pressure kept at 35 mm Hg. For cases of group B, all cases were preloaded with crystalloid solution. Bupivacine 0.5%, 1.5 ml with 25µg fentanyl was given at L3-4 or L4-5 interspaces in sitting or lateral position and all patients were placed in supine position. A 15° Trendelenburg position was assumed to optimize cephalic spread of anesthetic drugs. Adequate anesthesia was defined as an upper sensory spread to a level of T4

and not requiring epidural supplementation. Emergency drugs Atropine 1mg/ml and Ephedrine hydrochloride 3mg/ml were prepared for both groups. Heart rate, systolic and diastolic blood pressure of every case was recorded at an interval of 5 min, 15 min, 30 min and 45 minutes and every 30 minutes in the recovery room till discharge.

Newborn Management

APGAR score of the neonates was assessed by the pediatrician at the end of 1 minute and 5 minutes. Umbilical artery blood gas analysis for PH, PCO₂, HCO₃ were determined and compared between both the groups. Anesthesia was labeled as effective if APGAR score was ≥ 7 and blood pH was ≥ 7.2.

Statistical Analysis

Data was presented as mean±SD. Categorical variables were assessed using chi-square test when appropriate. P value <0.05 was considered significant. The software SPSS v10 for windows 10 was used for analysis.

Results

In the present study, total 120 cases were selected for cesarean section and divided into two equal groups. Group A was administered general anesthesia and Group B spinal anesthesia as per the route of administration of anesthesia. The most common indication for cesarean section was

previous cesarean section accounting to 64% of cases with precious pregnancy (18%) the next. The mean maternal age of the participants in the Group A was 32±7.1years with range of 21-36 years and gestational age was 37±5.4 weeks. The mean maternal age of the participants in Group B was 33±5.24 years with range of 22-38 years and gestational age was 37±3.9. No statistical significance was observed with respect to maternal age and gestational age in both the groups of the study. ('P' value >0.05) [Table 1].

Table 2 summarizes the parameters of hemodynamic status of the cases in Group A and Group B. Preoperatively the heart rate, systolic and diastolic blood pressures were monitored in both the cases. The differences in the parameters were not statistically significant in both the groups preoperatively with Heart rate (p value -1.251), systolic blood pressure (p value -0.987) and diastolic blood pressure (p value -0.869). The parameters were recorded at intervals of 5, 15, 30, 45, 60 and 120 minutes postoperatively until transfer to the ward. To determine the changes in the heart rates in both groups, repeated measures ANNOVA was used. Based on the values of means and standard deviations in both the groups, it was observed that Group A patients were significantly tachycardic at all the time intervals when compared to Group B patients and were statistically significant (p value <0.05). The repeated measurement test ANNOVA was used to study the trend of changes in systolic blood pressure in both the groups. The table 2 shows that differences in the systolic blood pressure between the two groups was statistically significant and lower in group B compared to Group A at an

Table 1: Demographic data (Mean ±SD) of the study groups

Demographic Variable	Group A (General Anesthesia) (n=60)	Group B (Spinal anesthesia) (n=60)	P value
Maternal age (Years)	32 ± 7.1	33 ± 5.24	0.69
Gestational age (weeks)	37 ± 5.4	37 ± 3.9	0.78

Demographic data expressed as number, mean and standard deviation. P value ≤ 0.05 considered significant

Table 2: Maternal Vital signs of cases in the study with preoperative and post operative evaluation

	Group A (General Anesthesia) (n=60)	Group B (Spinal anesthesia) (n=60)	P value
Preoperative			
Heart rate	104 ± 12.015	101.54 ± 14.25	1.251
Systolic blood pressure	122 ± 13.54	120 ± 8.24	0.987
Diastolic blood pressure	76 ± 9.8	75.12 ± 10.35	0.869
After 5 minutes			
Heart rate	118 ± 13.15	94.34 ± 16.025	<0.05
Systolic blood pressure	127 ± 15.64	108.14 ± 11.24	<0.05
Diastolic blood pressure	80.50 ± 13.8	65.10 ± 8.125	<0.05

After 15 minutes			
Heart rate	109 ± 11.98	98.42 ± 14.125	<0.05
Systolic blood pressure	110.15 ± 11.20	116.04 ± 9.24	<0.05
Diastolic blood pressure	71.50 ± 10.815	72.12 ± 11.12	<0.05
After 30 minutes			
Heart rate	101.1 ± 10.5	89.2 ± 10.1	<0.05
Systolic blood pressure	108.05 ± 9.20	117.14 ± 4.24	<0.05
Diastolic blood pressure	74.5 ± 13.41	74.1 ± 12.12	<0.05
After 45 minutes			
Heart rate	94.12 ± 8.52	80.12 ± 8.5	<0.05
Systolic blood pressure	101.21 ± 4.65	108.11 ± 3.56	<0.05
Diastolic blood pressure	75.9 ± 10.24	76.12 ± 10.56	<0.05
1 hour postoperative			
Heart rate	84.10 ± 4.56	82.12 ± 9.5	<0.05
Systolic blood pressure	111.12 ± 6.12	104.01 ± 4.35	<0.05
Diastolic blood pressure	77 ± 6.28	77.25 ± 9.41	<0.05
2 hour postoperative			
Heart rate	78.21 ± 3.89	74.25 ± 8.5	<0.05
Systolic blood pressure	118.25 ± 4.85	108.11 ± 5.36	<0.05
Diastolic blood pressure	79 ± 5.69	78.15 ± 8.24	<0.05

Table 3: Foetal outcome: APGAR score at 1 and 5 minute interval; ABG at birth and after 5 minutes

	Group A (General Anesthesia) (n=60)	Group B (Spinal anesthesia) (n=60)	P value
APGAR score at 1 minute	8.4 ± 1.68	9.6 ± 01.9	< 0.05
APGAR score at 5 minute	9.9 ± 1.1	10.2 ± 1.1	< 0.05
<i>ABG at Birth</i>			
PH	7.26 ± 0.19	7.28 ± 0.9	0.19
PCO ₂	46.92 ± 4.98	48.21 ± 5.25	0.21
HCO ₃	21.21 ± 3.98	22.14 ± 3.12	< 0.05
<i>ABG after 5 minutes</i>			
PH	7.44 ± 0.10	7.49 ± 0.09	0.074
PCO ₂	43.28 ± 1.44	46.14 ± 2.87	0.654
HCO ₃	24.11 ± 2.50	25.11 ± 1.58	< 0.05

Data expressed as number, mean and standard deviation. P value ≤ 0.05 considered significant

interval of 5 minutes from induction of anesthesia. Repeated measures ANNOVA was used to study the trends in changes of diastolic blood pressure between both the groups. Values of the mean and standard deviations indicate that there were significant differences in both the groups at all the intervals and lower in group B than group A. (p value<0.05).

Table 3 summarizes the APGAR scores of the newborn at intervals of 1 and 5 minutes in both group A and group B. Mean APGAR score in group A at 1 minute interval was 8.4±1.68 and in group B was 9.6±01.9 and the difference was found statistically significant (p value<0.05). Mean APGAR score at 5 minute interval in group A was 9.9±1.1 and in group B was 10.2±1.1 and the difference was found statistically significant (p value<0.05). PH and PCO₂ levels were recorded in both the groups at 1 and 5 minute intervals and compared. However, there was no statistically significant difference in

both the groups at both the intervals. With regard to the levels of HCO₃, recorded at 1 and 5 minute interval, mean HCO₃ levels in group A at 1 minute interval was 21.21±3.98 and in Group B was 22.14±3.12 and the difference was found to be statistically significant (p value<0.01). The level of HCO₃ at 5 minute interval in Group A was 24.11±2.50 and in group B was 25.11±1.58 and the difference was found statistically significant (p value < 0.01).

Discussion

Cesarean section has become one of the most common and prevalent surgical procedure throughout the world. This procedure is associated with the outcome of the mother and the foetus. Hence there is an obvious need to minimize the maternal morbidity and mortality along with

favorable foetal outcome. In this regard the necessity of administering the best anesthetic procedure has gained importance. General anesthesia was the preferred anesthetic procedure in older days but with the observation of few maternal complications and adverse foetal outcomes, regional anesthesia is nowadays the preferred technique but with lot of studies reporting variable results.

In our study, the effects of general anesthesia and spinal anesthesia were compared in elective cases of cesarean section and maternal and foetal outcome was recorded and reported. In our study no cases of maternal and neonatal mortality were recorded, but findings of Haller G et al and Fenton PM et al who recorded maternal and foetal mortality in their studies [6-7]. This can be explained as the pre and perioperative patient care and follow up care was better and advanced. It was observed in our study, that there was a significant mean difference regarding mean systolic and diastolic blood pressure between the two groups respectively. This difference in blood pressure may be due to inadequate preloading of mothers who underwent spinal anesthesia and extensive sympathetic blockade. In our study, no significant difference was observed in the pH in both the groups, but a study by Seneter et al found that umbilical vein pH and arterial PO₂ were higher in cases of epidural anesthesia than general anesthesia [8]. A recent study reported no differences in umbilical artery pH values [9].

Our study also determined the effects of anesthesia on foetal outcome with APGAR scores evaluation. In our study, APGAR scores of newborn at 1 minute and 5 minute was significantly high in women who received spinal anesthesia ($9.6 \pm 0.1.9$ & 10.2 ± 1.1) in the present study as compared to general anesthesia. Similar findings with relating to APGAR score was reported by Kolatat et al and Alfredo M et al in their studies [10-11]. Findings of our study in relation to all the maternal and foetal parameters were in consistent with the findings of Manusco and colleagues who compared the general and spinal on 179 cases of elective cesarean section and found that spinal anesthesia was superior to general anesthesia in foetal outcome and maternal status [9]. Bloom SL et al in her study reported that no significant difference was observed at 1 minute APGAR scores in cases of general and spinal anesthesia but more neonates in the general anesthesia group appeared depressed and required free flow oxygen [12]. It is widely believed that regional anesthesia is safest for neonates and

mothers the reason being less exposure of neonates to depressant drugs, decrease risk of maternal pulmonary aspiration and it is easy to perform, rapid with more intensive block [13].

Some of the studies mention that umbilical artery pH was found more accurate method to assess foetal wellbeing. In the present study, average pH was high in neonates of group A (7.44 ± 0.10) than in group B (7.49 ± 0.09). In our study it was observed that fetuses born under general anesthesia had higher incidence of academia and lower APGAR scores. These findings are in comparison with findings of Sendag et al [14].

To conclude in our study, we observed that umbilical artery pH and APGAR scores of neonates who received general anesthesia were lower than the neonates born under regional anesthesia. Spinal anesthesia is effective than general anesthesia, foetal outcome is favorable in cases of spinal than general anesthesia. This study can be further evaluated in cases of emergency cases of cesarean section which covers all the risk factors.

Acknowledgements

NIL

Conflict of Interest

Nil

References

1. Ronsmans C, Graham WJ. Lancet Maternal Survival Series steering group Maternal mortality: who, when, where, and why. *Lancet*. 2006;368(9542):1189-200.
2. Liu S, Liston RM, Joseph KS, et al. Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. *CMAJ*. 2007;176(4):455-60.
3. Ngan Kee WD. Confidential enquiries into maternal deaths: 50 years of closing the loop. *Br J Anaesth*. 2005;94(4):413-6.
4. Reynolds F. General anesthesia is unacceptable for elective cesarean section. *Int J Obstet Anesth*. 2010;19(2):212-7.
5. Gori F, Pasqualucci A, Corradetti F, Milli M, Peduto VA. Maternal and neonatal outcome after cesarean section: the impact of anesthesia. *J Matern Fetal Neonatal Med*. 2007;20(1):53-7.
6. Haller G, Anaesthetist C, Clergue F. *Best Practice & Research Clinical Anaesthesiology Morbidity in*

- anaesthesia: Today and tomorrow. *BestPract. Res. Clin. Anaesthesiol* 2011;25:123-132.
7. Fenton PM, Whitty CJ, Reynolds F. Regional versus general anaesthesia for caesarean section *BMJ*. 2003 Sep 13;327(7415):587.
 8. E.B. Sener, F. Guldogus, D. Karakaya, S. Baris, S. Kocamanoglu, A. Tur. Comparison of neonatal effects of epidural and general anesthesia for cesarean section. *Gynecol Obstet Invest*, 2003;55:41-45.
 9. A. Mancuso, A. De Vivo, A. Giacobbe, V. Priola, L. Maggio Savasta, M. Guzzo, D. De Vivo, A. Mancuso. General versus spinal anaesthesia for elective caesarean sections: effects on neonatal short-term outcome. A prospective randomised study *J Matern Fetal Neonatal Med*, 2010;23:1114-1118.
 10. Koltat T, Somboonnanonda A, Lertakyamane J, Chinachot T, Tritrakaran T, Muangkasem J. Effect of general and regional anesthesia on the neonate (a prospective randomized trial). *J Med Assoc Thai* 1999 Jan;82(1):40-45.
 11. Alfred M, Antonio DV, Anammaria G, Valentina P, Lara MG, Marianna G et al. General versus spinal anesthesia for elective caesarean sections: effects on neonatal short-term outcome. A prospective randomized study. *J of Mat-Fet and Neot Med*. Posted online Jan 21, 2010.
 12. Bloom SL, Spong CY, Weiner SJ, et al. Complications of anesthesia for cesarean delivery. *Obstet Gynecol*. 2005;106(2):281-7.
 13. Krishnon L, Gunasekaran N, Bahaskaran and N. Anesthesia for cesarean section and immediate neonatal outcome. *Indian J Pediatr* 1995;62(2): 219-23.
 14. Sendag F, Terek C, Oztekin K, Sagol S, Asena U. Comparison of epidural and general anesthesia for elective caesarean delivery according to the effects of Apgar scores and acid-base status. *Aust N Z J Obstet Gynecol* 1999;39:464-7.
-