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Original Article

Safety of subarachnoid block for elective cesarean delivery in women with major degree placenta previa

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Abstract

Background: Placenta previa is a serious complication of pregnancy, often causing antepartum hemorrhage with significant fetomaternal morbidity and mortality. The ideal anesthetic technique for cesarean section is controversial because of associated complications. The study aimed at ascertaining the safety of subarachnoid block among women with major degree placenta delivered by elective cesarean section.

Materials and Methods: This was a prospective analysis of 11 parturients of the American Society of Anesthesiologists Class I/II with major degree placenta previa billed for elective cesarean section, who desired and consented for spinal anesthesia over a 32-month period. Spinal anesthesia was induced with 10 mg heavy bupivacaine plus 0.5 mg morphine sulfate after a 2-L infusion of normal saline. The surgeon incised the uterus only after 10 IU of intravenous oxytocin was given.

Data collected included pre- and post-operative packed cell volume (PCV), mean arterial pressure (MAP), pulse rate, peripheral oxygen saturation, estimated blood loss (EBL), and Apgar scores. The data were analyzed using SPSS version 21 for Windows® with statistical significance set at $P < 0.05$.

Results: The mean preoperative PCV was 33.6 ± 3.5% and pulse rate was 99.3 ± 8.5/min while MAP was 97.9 ± 9.9 mmHg. Mean EBL was 918.2 ± 499.6 ml. Apgar scores at 1 and 5 min were 8.8 ± 1.2 and 10.00, respectively. There was no statistical significance between pre- and post-operative parameters: Pulse rate 95.71 ± 14.07/min ($P = 0.96$), MAP 95.7 ± 12.13 ($P = 0.70$), and PCV 30.3 ± 3.9 ($P = 0.32$). Ten parturients (90.9%) had spinal hypotension. There was no maternal or fetal death.

Conclusion: Subarachnoid block is safe in women undergoing cesarean delivery for major degree placenta previa, but anticipation for hypotension is important.

Key words: Cesarean section, placenta previa, spinal anesthesia

Introduction

Placenta previa is a common complication of pregnancy, with incidence as high as 1 in 200 pregnancies.[1] The incidence rises with increase in cesarean delivery rate. In this condition, placenta implants in the lower uterine segment between the fetus and the cervical os. For ease of management, the obstetricians classify placenta previa into Types I, II, III, and IV. In Type I, the lower edge of the placenta does not reach the internal os. In Type II, it reaches but does not cover the os. Type III covers the os asymmetrically while in Type IV, the os is covered symmetrically. Type I and II are considered minor degree while Type III and IV are major degree.[1]

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Placenta previa is often associated with antepartum hemorrhages with significant fetomaternal morbidity and mortality.[2] Most cases are delivered by cesarean sections.[3,4] Because of the likelihood of excessive hemorrhage, hypotension, and difficulty associated with the control of blood pressure (BP) following the sympathectomy that accompanies neuraxial blockade, general anesthesia is traditionally recommended by some practitioners for delivery in this group of parturients.[5] However, the best choice of anesthesia for this condition has largely remained controversial.[6] Anesthetic management is dictated by the likelihood of major hemorrhage, maternal preference, as well as the obstetric/anesthetic experience level.[7] With the increasing awareness of the availability and safety of regional anesthesia services over general anesthesia, many parturients are expressing preference for spinal anesthesia in spite of the diagnosis of major degree placenta previa.

The aim of this study was to investigate changes in maternal vital signs, packed cell volume (PCV), as well as maternal and fetal outcomes, in parturients with major degree placenta previa who were delivered by cesarean section under subarachnoid block.

Materials and Methods

This was a prospective, case by case analysis of parturients of the American Society of Anesthesiologists Class I and II with major degree placenta previa, who underwent elective cesarean section under spinal anesthesia at the Federal Medical Centre, Makurdi, between January 2013 and August 2015. Parturients recruited into the study were those who opted for spinal anesthesia after due information as choices available to them were explained by an anesthetist different from the researcher. After informed consent, they were recruited into the study. Those with abruptio placentae, active antepartum hemorrhage, or emergency cesarean section for placenta previa, multiple pregnancies, or any comorbidity were excluded from the study. Approval for the study was obtained from the hospital ethics committee.

All recruited parturients were reviewed the night before surgery and the following data collected: Age, weight, height, parity, and gestational age. Relevant investigations were performed including PCV and ultrasound diagnosis of the placenta previa. Two to four units of blood were cross-matched for each parturient. All the parturients received tablet ranitidine 150 mg the night before surgery. They were fasted overnight or at least 6 h after their last meal.

On arrival at the operating theater, a comprehensive patient monitor (Mindray MEC1000, Shenzhen Mindray Bio-Medical Electronic Co. Ltd., Shenzhen, China) was used to take their baseline vital signs, namely, pulse, NIBP (including mean-arterial pressure [MAP]), and peripheral oxygen saturation (SpO_2). Two 16G intravenous cannulas were inserted into two major veins on each arm of the patients. A urinary catheter was passed into the bladder. The bladder was emptied and the catheter retained, attached to a urine bag. An anesthetic machine was made ready with oxygen, endotracheal tubes, laryngoscope, and drugs for possible conversion to general anesthesia, if needed.

Two liters of normal saline was infused intravenously over 30 min into the patients. They were then placed in the sitting position. Routine cleaning and draping of the back were carried out. Lumbar puncture was carried out at the L3/L4 spinal interspace using a 25G Quincke type spinal needle. On confirmation of flow of cerebrospinal fluid, 10 mg of heavy 0.5% bupivacaine (Marcaine®, AstraZeneca, Levent-Istanbul, Turkey) premixed with 0.5 mg morphine sulfate (Vermor-10®, Verve Health Care Ltd., India) was injected intrathecally. The parturients were returned to the modified supine position. Surgery was allowed to commence on achievement of at least T6 dermatomal blockade.

Spinal hypotension was accepted as a 20–30% reduction in baseline BP and was treated with increased crystalloid infusion and/or intravenous boluses of ephedrine hydrochloride 5 mg (STEROP-Belgium). Bradycardia was accepted as a pulse rate <60 beats/min and was treated with injection of 0.6 mg of atropine. A 20% or greater of total blood volume loss, along with evidence of cardiac decompensation, namely, hypotension, tachycardia, and pallor, was accepted as trigger for transfusion.

The surgeon was requested to notify the anesthetist of the time when the lower segment of the uterus was exposed and ready to be incised. He waited to allow intravenous injection of 10 IU of oxytocin diluted to 10 ml slowly. Thereafter, the lower segment was incised and the head of the fetus delivered within 1 min. Attention was paid closely at the pulse rate and BP of the parturients as the automated noninvasive BP monitor was set to read at 3 min interval till BP normalized; therefore, it was adjusted to 10 min interval. A 500 ml of normal saline with 40 IU oxytocin was then set up to run over 1 h throughout the surgery. The neonate delivered was handed over to the midwife and the pediatrician for cleaning and resuscitation, respectively. The Apgar scores were assessed by the pediatrician and documented in the folders of the parturients. The pediatrician and the midwife were unaware of the study.

At the end of surgery, the vital signs of the parturients were documented, namely, MAP, pulse rate, SpO_2. Total fluid and blood given and urine output were also

documented. The estimated blood loss (EBL) was done by an anesthetist, oblivious of the study. This was done by visual estimation of soaked surgical drapes, abdominal packs, and gauze counts in addition to blood in the suction bottle. Maternal outcome was considered good if mother was alive and bad if dead. Fetal outcome was considered good if the fetus was alive and bad if the fetus died. Fetal morbidity was rated with the Apgar scores. Apgar scores at 5 min <7 and ≥7 were considered as poor and good, respectively.

The parturients were followed up in the ward to do the postoperative PCV 24 h later and to take count of any postoperative transfusion. The duration of hospital stay was also documented. Any complication noted was documented and treated.

Data Analysis

The data collected were entered and analyzed using SPSS version 21 for Windows® (SPSS Inc., Chicago, IL, USA) and were presented as percentages, mean ± standard deviation. One-way ANOVA was used to compare the means of maternal pre- and post-operative clinical parameters at 95% confidence interval. $P < 0.05$ was considered statistically significant.

Results

Eleven parturients participated in the study. The mean age of the parturients was 29.72 ± 3.47 years, with a range of 23–33 years. Seven (63.6%) of them were aged between 30 and 33 years. The mean height was 164.3 ± 4.0 cm and the mean weight was 72.8 ± 12.5 kg, giving a mean body mass index (BMI) of 25.9 ± 4.0 kg/m^2. Ten (90.9%) of them were multiparous while one (9.1%) was nullipara, with a mean parity of 1.9 ± 1.3. The mean gestational age at delivery was 261.1 ± 10.8 days (37.3 ± 1.5 weeks).

The mean preoperative mean-arterial blood pressure (MAP) was 97.9 ± 9.9 mmHg while the mean preoperative pulse rate was 99.3 ± 8.5/min. The mean preoperative PCV was 33.6 ± 3.5%, with the lowest PCV being 28% and the highest 38%. One (9.1%) of the parturients had two previous cesarean sections while another had a coexisting uterine fibroid. The mean preoperative peripheral oxygen saturation (SpO_2) was 98.7 ± 0.5%.

The mean EBL was 918.2 ± 499.6 ml, with a range of 400–1800 ml. Four (36.4%) parturients had EBL of 1000 ml and above. One (9.1%) had blood transfusion intraoperatively. The mean amount of fluid (crystalloids) given intraoperatively was 3536.4 ± 827.4 ml. The mean Apgar score at 1 min was 8.8 ± 1.2 while at 10 min was 10.00.

Postoperatively, the mean urine output was 339.1 ± 249.0 ml. The mean pulse rate was 95.7 ± 14.1/min; the mean MAP was 95.7 ± 12.1 and mean PCV was 30.3 ± 3.9. The mean SpO_2 was 99.0 ± 0%. In one-way ANOVA analysis, there was no statistically significant difference between mean pre- and post-operative pulse rate ($P = 0.96$), MAP ($P = 0.70$), and PCV ($P = 0.32$) [Table 1]. Ten of the women (90.9%) had spinal hypotension. Ephedrine was used in 3 (27.3%) of the parturients with the average dosage of 9.0 mg. The mean duration of hospital stay was 4.6 ± 0.5 days. Five of them (45.5%) had mild itching mostly around the face and nostrils that did not require treatment. There was no maternal or fetal morbidity and mortality.

Discussion

The ideal anesthesia for parturients with placenta previa undergoing cesarean delivery has remained controversial.[6] Due to concerns about bleeding and possible poor response to hypovolemia when pharmacological sympathectomy induced by regional anesthesia occurs, many anesthetists tend to prefer general to regional anesthesia for this condition. Adigun and Eyelade[5] in a retrospective study in Ibadan, Nigeria, had found that anesthetists tended to use spinal anesthesia for Type I and II placenta previa (minor degree) and general anesthesia for Type III and IV (major degree). Imarengiaye *et al.*[8] in an earlier study in Benin, Nigeria, had found that 35.8% of their parturients had spinal anesthesia for cesarean section, especially those without antepartum hemorrhage. However, the study did not state whether the placenta previa was major or minor degree.

Our study was on parturients with major degree placenta previa not actively bleeding and the women were hemodynamically stable. Concerns about consent were addressed by the fact that the subjects of the study were those who voluntarily opted for spinal anesthesia after detailed explanation of choices available. This therefore accounted for the long duration of the study and consequently too, the fewer number of subjects studied. Imarengiaye had observed two main concerns of the anesthetist faced with the task of managing a parturient with placenta previa under regional anesthesia. These are

Table 1: One-way analysis of variance comparison of pre- and post-operative means of parameters

Parameter	Mean preoperative	Mean postoperative	*P*
MAP (mmHg)	97.9±9.9	95.7±12.1	0.695
PR (beats/min)	99.3±8.5	95.7±14.1	0.959
PCV (%)	33.6±3.5	30.3±3.9	0.321
SpO_2 (%)	98.7±0.5	99.0±0.0	Nil

CI=95%. MAP - mean-arterial pressure, PR - Pulse rate, PCV - Packed cell volume, SpO_2 - Peripheral oxygen saturation, CI - Confidence interval

that the impaired cardiovascular reflexes during extensive block worsen in significant intraoperative bleeding and second, many anesthetists find it challenging managing significant hemorrhage in an awake patient who is likely to be worried.

However, we found that spinal anesthesia is relatively safe in women undergoing cesarean delivery for major degree placenta previa as depicted by lack of significant statistical difference between pre- and post-operative maternal vital signs, PCV, as well as favorable maternal and fetal outcomes. Similar safety among women with placenta previa was noted by Parekh *et al.*[9] and McShane *et al.*[10] Both studies found no maternal morbidity and mortality in women with placenta previa delivered by cesarean section under spinal anesthesia. Safety of subarachnoid block in this study may be attributable to intravenous injection of oxytocin before uterine incision, thereby reducing blood loss, adequate preloading of the patients with crystalloid, and prompt treatment of any detectable hypotension with further fluids and using the vasopressor ephedrine. These concerns about regional anesthesia have also been addressed by prophylactic use of intravenous fluids and vasopressors elsewhere.[8]

Opponents of the use of regional anesthesia in women with placenta previa for cesarean section are of the opinion that resultant sympathetic blockade makes control of arterial BP difficult when hemorrhage occurs. Our study did not observe such difficulty as the women who developed spinal hypotension responded well to the management such that there was no significant difference in their pre- and post-operative MAP ($P = 0.70$). This study suggests that management of such is not a problem when treated appropriately with sympathomimetic drugs such as ephedrine with no untoward outcome. Despite the concerns, use of regional anesthesia among women with placenta previa is still safe, especially when there is no abnormally invasive placentation, continuous bleeding, and hypovolemia.[11,12]

Hence, the safety of spinal anesthesia noted in our study may also be because all our patients had elective cesarean delivery and therefore, were not actively bleeding and so hemodynamically stable before the procedure. Other researchers also attributed safety of regional anesthesia in women with placenta previa to the level of preoperative PCV of ≥24% before the procedure.[5,13] This optimal level of PCV was noted among our patients as virtually all of them had PCV of ≥28% before the subarachnoid blockade.

Further, in our study, there was no statistical difference between the mean pre- and post-operative PCV even though 90.9% of our subjects had no blood transfusion. This was also noted by Parekh *et al.*[9] This reiterates the fact that general anesthesia leads to lower postoperative hemoglobin as result of increased EBL but regional anesthesia is associated with reduction in blood loss.[9,14,15] The reduced blood loss is thought to be due to impaired sympathetic tone and arterial BP associated with regional anesthesia,[9] a cardiovascular change that opponents of regional anesthesia are ironically concerned about.

The mean age of the parturients in our study was 29.72 ± 3.47 years. This tends to agree with the age of 30.5 ± 5.2 years as Imarengiaye *et al.*[8] and 31.62 ± 4.8 years as Adigun and Eyelade[5] reported. Placenta previa is associated with increasing maternal age.[16,17] The finding in our study agrees with these studies.

Over 90% of the parturients were multiparous which agrees with Imarengiaye, who found 71.6% and Adigun, who found 80%. Bonner *et al.*[6] had found that multiparity and previous cesarean sections are risk factors for abnormal placentation. We found a 9.1% incidence of the previous C-section in this study.

The mean BMI of 25.91 ± 4.03 kg/m^2 in our study population was within normal limits. The parturients in this study were not vulnerable to many complications associated with maternal obesity. Shaikh[16] in Pakistan found that patients with BMI >30 had a frequency of placenta previa of 10.3% compared to 4.8% in those with <20.

The mean gestational age was 37.23 ± 1.51 weeks. This is in agreement with Imarengiaye and Adigun, who found 36.8 ± 2.8 and 36.13 ± 3.0 weeks, respectively, in their reviews. Most of the parturients were at term as at the time of intervention. Obstetricians usually target 36 weeks of gestation for elective section of placenta previa patients who are not bleeding. At this age, the fetus is usually mature for extrauterine life. However, where bleeding occurs but not torrentially, the target is usually to get the pregnancy to 24–34 weeks of gestation. Corticosteroids and tocolytics are usually prescribed to aid fetal lung maturity and prevent premature contractions, respectively.[18]

The mean EBL was 918.18 ± 499.63 ml, with a range of 400–1800 ml. The transfusion rate in our study was 9.1%. In a retrospective study of 146 cases of placenta previa for cesarean section in Australia, Campbell found a mean EBL of 1072 ml. Those who had general anesthesia lost more than those who had spinal anesthesia.[19] Imarengiaye *et al.*[8] reported an EBL of 653.7 ml and a transfusion rate of 22.2%. These two studies were retrospective and covered both minor and major degrees of previa. Our study was on major degree placenta previa and used spinal

anesthesia only. Antepartum hemorrhage, often associated with major degree placenta previa, and preeclampsia were identified by Faponle and Makinde as predictable indications for major blood loss and blood transfusion.[20]

The SpO_2 in the study did not change in any significant way during the study, indicating a negligible effect of regional anesthesia on the oxygen saturation of the parturients.

Conclusion

The study suggests that subarachnoid block has a place and is safe in women diagnosed with major degree placenta previa with stable hemodynamic status undergoing cesarean delivery, especially with the use of intravenous oxytocin before uterine incision, adequate prophylactic use of crystalloids, and appropriate use of vasopressors to maintain circulatory blood volume. Meticulous monitoring for possible intraoperative hypotension is essential for the overall outcome of the patients.

Limitations

The limitation of this study is the small sample size despite the 32-month duration of the study. However, it will stimulate further comprehensive studies by researchers in this area regarding the safety of spinal anesthesia in hemodynamically stable patients with major degree placenta previa billed for elective cesarean delivery.

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Conflicts of interest

There are no conflicts of interest.

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