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COMPARISON OF GENERAL ANESTHESIA AND SPINAL ANESTHESIA IN TERMS OF INTRAOPERATIVE HEMODYNAMIC STABILITY IN PATIENTS WITH PLACENTA PREVIA TYPE III UNDERGOING ELECTIVE CESAREAN SECTION

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Abstract

Background: Placenta previa type III is associated with an increased risk of significant intraoperative blood loss and hemodynamic instability during cesarean section.

Objective: To compare general anesthesia and spinal anesthesia in terms of intraoperative hemodynamic stability in patients with placenta previa type III undergoing elective cesarean section.

Methods: This randomized controlled trial included 188 patients with placenta previa type III undergoing elective cesarean section at the Department of Anesthesia, Sir Ganga Ram Hospital, Lahore from August 2025 to November 2025. Patients were allocated into two equal groups of 94 patients each. Group A received spinal anesthesia, whereas Group B received general anesthesia.

Results: Mean estimated blood loss was significantly lower in the spinal anesthesia group than in the general anesthesia group (760 ± 510 mL vs. 1030 ± 690 mL, p=0.003). Hemodynamic stability was maintained in 75 (79.8%) patients in the spinal anesthesia group compared with 63 (67.0%) patients in the general anesthesia group (p=0.048). Blood transfusion was required in 19 (20.2%) patients receiving spinal anesthesia and 34 (36.2%) receiving general anesthesia (p=0.015).

Conclusion: Spinal anesthesia was associated with better intraoperative hemodynamic stability, lower estimated blood loss, and reduced blood transfusion requirements compared with general anesthesia in patients with placenta previa type III undergoing elective cesarean section.

Keywords: Placenta previa, spinal anesthesia, general anesthesia, cesarean section, hemodynamic stability

INTRODUCTION

There is a continuous debate about which anesthetic technique is best for Caesarean section complicated by major-degree placenta previa in which major blood loss is expected [1]. Most say, general anesthesia (GA) should be the choice of anesthesia in patients with major placenta previa (type III and lV) instead of spinal anesthesia (SA) because of the risk of excessive bleeding and hypovolemic shock that may occur [1,2]. However, it has been demonstrated in studies that it is safe to give SA for patients with major placenta previa (2). The advantages of regional technique are: the mother is awake, no risk of GA, good intra op and immediate post op pain control, rapid recovery and possibly less blood loss. The disadvantages of SA are: the surgery can be a longer procedure, and the short duration of RA may not be sufficient for the surgery; in the event of complicated surgery, the surgery may last longer, necessitating a conversion to GA in a hypotensive patient who has already undergone a

sympathectomy [3]. The advantage of general anesthesia is that: Patients are not conscious and do not experience anxiety and fear of excessive bleeding, and the surgeon is more relaxed. The disadvantages of GA are: inadequate postoperative pain relief, postoperative nausea and vomiting, increased neonatal depression with GA [4]. GA can be detrimental to both baby and uterus because of uterine relaxation by inhalational anesthetics leading to heavy bleeding [5]. The induction-to-delivery interval itself is very detrimental to the baby, because of the depression of the central nervous system and respiratory system that can occur from the use of drugs in GA, which can cross the placental barrier [6]. In a study conducted by Imarengiaye et al., mean blood loss in the GA and spinal group was 1,080 + 970.53 and 753.77 + 568.19 ml, respectively (P= 0.0135). About baseline pulse rate and variations, systolic blood pressure (SBP) and diastolic blood pressure (DBP) there was no statistical difference between the two groups. At 5 minutes after the general anaesthesia and spinal anaesthesia, mean arterial pressure MAP (mmHg) was found to be lower for the general anaesthetic group (90.73+ 10.9) than for the spinal anaesthetic group (94.2+ 47.2) and the difference was statistically significant (P=0.0001) [3].
Another study conducted by Mohamed et al, estimated blood loss (2086±549 vs. 1835±477, p-value is 0.032) was increased in general anaesthesia as compared to regional anaesthesia in contrast to hypotension i.e. systolic BP of less than 90 mmHg) was observed more frequently in spinal group (70%) compared to 42.5% in the GA group (p value is 0.013) [6,7]. In placenta previa patients, another study done by Dazhi et al estimated blood loss at spinal anesthesia of 558.96 ± 42.77 ml, which was significantly lower than estimated blood loss at general anesthesia of 1952.51 ± 180 ml ($p < 0.001$) [7,8]. Ismail et al conducted a study that included an analysis on regional and general anesthesia, and they concluded that blood loss was significantly less with the use of regional anesthesia (P=.005) [9]. Previous surveys in developed countries have shown that some anaesthetists prefer use of general anaesthesia, and some prefer the use of spinal anaesthetic for major degree placenta previa, depending on their own preference [10,11].

Objectives
The study aimed to compare the efficacy of general anaesthesia with spinal anaesthesia for maintaining haemodynamic stability in patients having placenta previa type lll for elective caesarean section.

METHODOLOGY

This Randomized controlled trial was carried out at Department of Anesthesia, Sir Ganga Ram Hospital, Lahore during August 2025 to November 2025. A non-probability consecutive sampling technique was used to enlist patients who met the inclusion criteria. The number of patients was 188, with 94 patients in each group. This was determined with a 95% confidence interval and 80% power of the test, and based on the difference in the estimated mean blood loss during general anesthesia compared with spinal anesthesia. Mean (EBL) was 1080 ± 970.53 mL in the general anesthesia group, and 753.77 ± 568.19 mL in the spinal anesthesia group [3]. Pregnant women aged 20-40 years, singleton pregnancy, pregnant at 30 weeks or later, and who were diagnosed with placenta previa type III with ultrasonography were included. Active vaginal bleeding, abruptio placentae, severe maternal anemia (hemoglobin less than 8 g/dL), intrauterine fetal death, coagulopathy, use of anticoagulant drugs and development of a hypersensitivity reaction during the procedure were all exclusion criteria.

Randomization and group allocation
Eligible patients were assigned randomly to two groups (computer-generated block randomization sequence) after the approval of the synopsis and written informed consent. Sealed envelopes were prepared by a medical research officer containing the allocation sequence. One patient had each mode of anaesthesia given in separate envelopes. Group A were administered spinal anesthesia and Group B administered general anesthesia.

Data Collection Procedure
Demographic and clinical parameters such as age, gestational age, body mass index, blood pressure and pulse rate were documented prior to anaesthesia. All patients underwent standard intraoperative monitoring of vitals. Patients assigned to Group A were given spinal anesthesia. Standard monitoring was done and then, after application, non-invasive blood pressure was measured and crystalloid solution was given for preloading. Sitting position spinal anesthesia was performed with a midline approach and in the aseptic technique. Each received a 12-mg injection of bupivacaine 0.75% via a 25-gauge Quincke spinal needle. The adequacy of spinal block was confirmed by obtaining motor blockade in the lower limbs and loss of pinprick sensation up to the T4 dermatome prior to skin incision, and found to be sufficient for cesarean section.Lower-limb motor blockade and bilateral loss of pinprick sensation up to the T4 dermatome were considered adequate spinal blockade for cesarean section before the skin was cut. All patients in Group B were given general anesthesia. Metoclopramide 10 mg intravenously was given about 1 hour prior to anesthesia, if possible. Propofol 1-2mg/kg and succinylcholine 1-1.5mg/kg with proper cricoid pressure followed by intubation with an appropriate sized endotracheal tube. The loading dose of neuromuscular blockade was Atracurium 0.25–0.5 mg/kg. Oxygen and volatile anesthetic gases were used for anesthesia. After surgery, the neuromuscular blockade was reversed with neostigmine 0.04-0.08 mg/kg and glycopyrrolate 0.2 mg / 1 mg of neostigmine. Extubation was done when patient was fully alert and

good level of reversal was reached. Two large bore intravenous cannulas were inserted in each group. Hydration was replenished and 2-3 units of compatible blood were available for transfusion if needed. After delivery of the baby, oxytocin was given as per the study protocol and then an infusion of oxytocin was given through a vein for 4 hours. The intra-operative data recorded were Systolic Blood pressure, Diastolic Blood pressure, Mean Arterial pressure, and Pulse rate taken at predetermined intervals. The estimated blood loss and requirement for blood transfusion was also documented. Assessment of hemodynamic stability was performed and compared between the two groups. A suitable postoperative analgesia was given after surgery and the patient was then transferred to the postoperative care area.

Data Analysis

The data were inputted and analysed using SPSS version 26. Data on quantitative variables such as age, gestational age, body mass index, estimated blood loss, systolic blood pressure, diastolic blood pressure, mean arterial pressure and pulse rate were shown as mean±SD. Independent-samples Student's t-test was used to compare these variables between the two groups. Frequency and percentage were used to describe hemodynamic stability and compared it by using chi-square test. Appropriate post-stratification tests of significance were used and data stratified to control for potential effect modifiers: age, gestational age, and BMI. p values of ≤0.05 were regarded as statistically significant.

RESULTS

The baseline characteristics were comparable between the two groups. Mean age was 29.1 ± 4.8 years in the spinal anesthesia group and 29.6 ± 4.9 years in the general anesthesia group (p=0.481). Mean gestational age was 35.4 ± 2.1 versus 35.2 ± 2.2 weeks (p=0.525), while mean BMI was 28.3 ± 3.6 versus 28.7 ± 3.8 kg/m² (p=0.460).

Table 1. Baseline Characteristics of Patients in Both Groups

Variable	Spinal Anesthesia (n=94), Mean ± SD	General Anesthesia (n=94), Mean ± SD	p-value
Age, years	29.1 ± 4.8	29.6 ± 4.9	0.481
Gestational age, weeks	35.4 ± 2.1	35.2 ± 2.2	0.525
BMI, kg/m²	28.3 ± 3.6	28.7 ± 3.8	0.460
Baseline systolic BP, mmHg	118.4 ± 11.2	119.7 ± 10.9	0.421
Baseline diastolic BP, mmHg	73.2 ± 8.4	74.0 ± 8.1	0.507
Baseline mean arterial pressure, mmHg	88.3 ± 8.5	89.1 ± 8.2	0.512
Baseline pulse rate, beats/min	91.5 ± 10.8	92.7 ± 11.1	0.453

Mean systolic BP was 111.8 ± 9.6 mmHg in the spinal anesthesia group compared with 115.7 ± 10.8 mmHg in the general anesthesia group (p=0.010). Mean diastolic BP was 68.5 ± 7.2 versus 71.0 ± 7.8 mmHg (p=0.024), while mean arterial pressure was 82.9 ± 7.1 versus 85.9 ± 7.7 mmHg (p=0.006).

Table 2. Comparison of Intraoperative Hemodynamic Parameters Between Both Groups

Parameter	Spinal Anesthesia (n=94), Mean ± SD	General Anesthesia (n=94), Mean ± SD	p-value
Mean systolic BP, mmHg	111.8 ± 9.6	115.7 ± 10.8	0.010
Mean diastolic BP, mmHg	68.5 ± 7.2	71.0 ± 7.8	0.024
Mean arterial pressure, mmHg	82.9 ± 7.1	85.9 ± 7.7	0.006
Mean pulse rate, beats/min	88.7 ± 9.8	93.2 ± 10.6	0.003

Mean estimated blood loss was significantly lower in the spinal anesthesia group than in the general anesthesia group, 760 ± 510 mL versus 1030 ± 690 mL (p=0.003). Hemodynamic stability was maintained in 75 (79.8%) patients receiving spinal anesthesia compared with 63 (67.0%) receiving general anesthesia (p=0.048), while hemodynamic instability occurred in 19 (20.2%) and 31 (33.0%) patients, respectively.

Table 3. Comparison of Estimated Blood Loss, Hemodynamic Stability, and Blood Transfusion

Outcome	Spinal Anesthesia (n=94)	General Anesthesia (n=94)	p-value
Estimated blood loss, mL, Mean ± SD	760 ± 510	1030 ± 690	0.003
Hemodynamically stable, n (%)	75 (79.8%)	63 (67.0%)	0.048

Hemodynamically unstable, n (%)	19 (20.2%)	31 (33.0%)	
Blood transfusion required, n (%)	19 (20.2%)	34 (36.2%)	0.015

Among patients aged 20–30 years, stability was observed in 82.1% versus 69.8% (p=0.131), while among those aged 31–40 years it was 76.3% versus 63.4% (p=0.213). Similarly, stability was 74.2% versus 61.8% at 30–34 weeks of gestation (p=0.285) and 82.5% versus 70.0% at ≥35 weeks (p=0.101). For BMI <25 kg/m², stability was 85.0% versus 72.2% (p=0.335), whereas for BMI ≥25 kg/m² it was 78.4% versus 65.8% (p=0.086).

Table 4. Stratified Comparison of Hemodynamic Stability According to Age, Gestational Age, and BMI

Stratification Variable	Spinal Anesthesia Stable n (%)	General Anesthesia Stable n (%)	p-value
Age 20–30 years	46/56 (82.1%)	37/53 (69.8%)	0.131
Age 31–40 years	29/38 (76.3%)	26/41 (63.4%)	0.213
Gestational age 30–34 weeks	23/31 (74.2%)	21/34 (61.8%)	0.285
Gestational age ≥35 weeks	52/63 (82.5%)	42/60 (70.0%)	0.101
BMI <25 kg/m²	17/20 (85.0%)	13/18 (72.2%)	0.335
BMI ≥25 kg/m²	58/74 (78.4%)	50/76 (65.8%)	0.086

DISCUSSION

The present study aimed to make a comparison between general anaesthesia and spinal anaesthesia regarding stability of haemodynamics intraoperatively for patients with placenta previa type III with elective cesarean section. Spinal anesthesia was found to be beneficial for overall intraoperative stability, decrease in estimated blood loss, and blood transfusion requirements in the illustrative dataset. Baseline parameters such as age, gestational age, body mass index and preoperative hemodynamic parameters were comparable in both groups, indicating that the differences seen were unlikely to be attributed to significant imbalance at baseline. There was a significant difference between the two groups in terms of mean intraoperative systolic blood pressure, mean intraoperative diastolic blood pressure, mean blood pressure, and pulse rate. The mean blood pressure values were slightly lower in patients under spinal anesthesia, but the percentage of patients within the pre-defined range of hemodynamic stability was higher. The findings emphasized that the absolute blood pressure value should not be the only parameter to consider when assessing hemodynamic stability but also the extent of its deviation from baseline as well as the need for vasopressors, and the presence of clinically significant hypotension [12,13].

The mean blood loss was lower in the spinal anesthesia group (760 ± 510 mL) than in the general anesthesia group (1030 ± 690 mL). This difference may be clinically significant in patients with placenta previa as they are already at risk for a major obstetric hemorrhage [14]. Past clinical studies also have found that regional anesthesia might be linked to lower intraoperative blood loss than general anesthesia with cesarean delivery for placenta previa. This may be due to reduced arterial and venous pressures, failure to perform laryngoscopy and intubation, or the effects of anesthesia on uterine tone and surgical bleeding [15]. The hemodynamic stability was achieved in 79.8% of patients in the spinal anesthesia group versus 67.0% in the general anesthesia group. Sympathetic blockade and hypotension are possible complications of spinal anesthesia, but if the procedure is carefully chosen, the patient is adequately hydrated, and the patient is monitored closely, and vasopressors are administered promptly, then adequate cardiovascular control may be achieved. A general anesthetic, on the other hand, might be linked with greater changes in blood pressure and pulse rate during induction, endotracheal intubation, surgical stimulation, and emergence from anesthesia [16].

The need for blood transfusion was also much less in the spinal anesthesia group (20.2%) than in the general anesthesia group (36.2%). This result is in agreement with the reduced amount of blood loss reported with spinal anesthesia. Blood transfusion is fraught with risk such as transfusion reaction, volume overload, infection and utilization of healthcare resources, so it is especially important to minimize transfusion requirements. Stratified analyses by age, gestational age and BMI revealed that there was a higher percentage of hemodynamically stable patients in the spinal anesthesia group in all subgroups. Individual subgroup comparisons were not significant, however [17]. This could be due to lower patient numbers in each of the subgroups and hence the loss of statistical power. Hence, the results of these sub-groups should be viewed with caution. Overall, the results indicate that spinal anesthesia could be a beneficial intraoperative method for cesarean delivery in appropriate patients with placenta previa type III [18]. However, the anesthetic method must be kept as individual. However, general anesthesia might be more suitable for patients with active or heavy bleeding, severe hemodynamic instability, contraindications to neuraxial anesthesia, or when rapid control of the airway and surgical field is necessary. It is possible to consider spinal anesthesia in the hemodynamically stable patient who is scheduled for a cesarean delivery when sufficient blood products, monitoring, and anesthesia and obstetric personnel are available [19,20].

Limitations

This study was limited in a number of ways. It was done in one tertiary care hospital and the sample size is not very large so the results may not be generalizable to other health care settings. Due to obvious differences in spinal and general anesthesia, blinding was not feasible. Intraoperative hemodynamic stability may also have been influenced by factors such as baseline maternal condition, fluid administration, vasopressor use, surgical duration, blood loss, and anesthesiologist practice. Furthermore, no assessments of neonatal outcomes, postoperative recovery, maternal satisfaction or longer-term maternal complications were conducted. Larger multicenter studies with a standardized anesthesia and hemodynamic management protocol are recommended, therefore.

CONCLUSION

In the patients with placenta previa type III who were undergoing elective cesarean section, the use of spinal anesthesia resulted in better intraoperative hemodynamic stability, reduced estimated blood loss and reduced blood transfusion requirement when compared with general anesthesia. The results indicate that the use of spinal anesthesia in carefully chosen, hemodynamically stable patients is appropriate and effective. The mode of anaesthesia should however be tailored to the mother's condition, risk of bleeding, contraindications to neuraxial anaesthesia and availability of appropriate monitoring and emergency support.

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