

The Effect of General and Spinal Anesthesia on Maternal Blood Loss in Elective Cesarean Section: a prospective Study

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Abstract:

Background: This study aims to compare between general and spinal anesthesia regarding to the amount of maternal blood loss in cesarean section.

Methods: This is a randomized controlled study conducted at Bab El Shaaria Hospital to compare maternal blood loss by general and spinal anesthesia.

Results: The results showed that the group which had a cesarean section under spinal anesthesia has a statistically significant 2nd day postoperative higher level of hemoglobin ($P < 0.001$), when compared with general anesthesia, with a mean difference of 0.660g/dL and also a statistically significant 3rd day postoperative hematocrit percentage higher with the spinal anesthesia group with a mean difference of 1.507% ($P = 0.002$).

Conclusion: The spinal anesthesia showed definite advantages over general anesthesia; being higher postoperative hemoglobin level and hematocrit value, less intraoperative blood loss, less need for blood transfusion, less postoperative pain and need for postoperative analgesia, and earlier ambulation. In addition; mothers were faster in starting breast feeding their babies

Keywords: Spinal anesthesia, General anesthesia, Cesarean section, Maternal blood loss

Introduction

Delivery by cesarean section is by far one of the most commonly performed obstetric operations all over the world ⁽¹⁾. Cesarean section refers to the procedure where a baby is delivered through an incision on the abdominal wall and uterus of the mother ^(2,3).

General anesthesia refers to the loss of ability to perceive pain associated with loss of consciousness produced by intravenous or inhalation anesthetic agents, the risks include the aspiration of stomach content, failed intubation and respiratory problem for both mother and baby ⁽⁴⁾.

Spinal anesthesia refers to the use of local anesthetic solutions to produce circumscribed area of loss of sensation. With spinal anesthesia, the drug is injected directly through a catheter that has been introduced into the subarachnoid space. Spinal anesthesia causes substantial drop in maternal blood pressure, which may affect both mother and fetus ⁽⁵⁾.

Patient and methods:

This is a randomized controlled study conducted from November 2017 till August 2018 at Bab El Shaaria Hospital to compare maternal blood loss by general and spinal anesthesia. It included 160 pregnant women.

One hundred and sixty pregnant women undergoing elective cesarean section were included in this study, randomly allocated

in two groups. The first group (G) which undergone "General anesthesia" and consists of 80 patients while the second group (S) which undergone "Spinal anesthesia" and consists of 80 patients.

All patients were subjected to the following after taking a written consent from each patient:

- Personal history:
 - Name, age, occupation, residence, socioeconomic standard and special habits of medical importance.
- Obstetric history:
 - First day of last menstrual period, estimated gestational age by date and first trimester ultrasound.
- Past medical history:
 - History of diabetes mellitus, hypertensive disorders, cardiac problems, chest diseases, renal diseases, blood diseases or bleeding tendency.
- Past surgical history:
 - Previous uterine scars and previous laparotomies.
- History of the present pregnancy:
 - Medical or surgical conditions to define high risk factors.

➤ Examination of the patients:

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- General examination:
 - Level of consciousness and orientation.
 - Vital data (blood pressure, pulse, temperature, respiratory rate).
 - Presence of petechiae or ecchymosis of the skin indicating presence of coagulation defect or blood disease.
- Abdominal examination:
 - Size of the uterus.
 - Scar of previous laparotomies.
 - Single or multiple intrauterine fetuses.
 - Lie and presentation of the fetus.
- The equation:

$$(u+v)^2 \times (\delta_1^2 + \delta_2^2) \quad (1.26+1.96)^2 \times (322^2+216^2) \quad 10.3684 \times 150340$$

$$N = \frac{(\mu_1 - \mu_2)^2}{\frac{(787-632)^2}{24025}} = \frac{155^2}{24025} = 79.84$$

Randomization and allocation:

Computer generated randomization of the two groups (spinal anesthesia and general anesthesia) between numbers from 1-160 was done, and then put into 160 envelope, one for each patient. This allowed random allocation of patients into one of the two studied groups.

Results:

Table (1): Comparison of mean hemoglobin level, mean hematocrit value before and on 2nd day postoperative, mean intraoperative blood loss in both groups using hemoglobin levels and hematocrit values

HCT	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Preoperative			
Mean±SD	34.57±3.99	35.00±3.65	>0.05 NS
Range	26.8-44	27.5-47.2	
Postoperative			
Mean±SD	28.67±3.82	30.86±3.79	<0.001**
Range	22.1-36.8	24.1-42.2	
Hb	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Preoperative			
Mean±SD	10.79±1.21	11.03±1.13	>0.05 NS
Range	8.2-14	8.6-14.2	
Postoperative			
Mean±SD	8.71±1.12	9.62±1.15	<0.001**
Range	6.4-11.6	7.5-13	
Amount of blood loss using hemoglobin levels	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Mean±SD	1167.17±318.89	867.14±313.96	<0.001**
Range	518.7-1874.8	490-1699.3	
Amount of blood loss using hematocrit values	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Mean±SD	1028.64±321.11	801.81±288.53	<0.001**
Range	595-1873.53	501.21-1624.57	

(**): Highly Significant, (N.S): Non-Significant.

Table (2): Comparison of pulse rate, systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean urinary output in both groups 12 hours postoperative

SBP	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Preoperative			
Mean±SD	114.31±8.67	116.81±9.88	>0.05 N.S
Range	100-130	100-140	
Postoperative			
Mean±SD	102.88±10.58	105.00±10.91	>0.05 N.S
Range	80-130	80-120	
Pulse	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Preoperative			
Mean±SD	84.83±5.73	86.45±6.63	>0.05 N.S.
Range	74-100	69-112	
Postoperative			
Mean±SD	93.20±7.80	91.05±7.27	>0.05 N.S
Range	76-110	72-110	
DBP	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Preoperative			
Mean±SD	74.00±7.04	74.63±7.79	>0.05 N.S
Range	60-90	60-100	
Postoperative			
Mean±SD	62.88±6.74	64.56±8.61	>0.05 N.S
Range	50-80	50-80	
Postoperative urinary output / 24 hours	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	p-value
Mean±SD	2334.38±987.39	2428.13±824.96	>0.05 N.S
Range	610-4510	650-4250	

(N.S): Non-significant.

Table (3): Comparison between both groups regarding fainting attacks after ambulation , headache attacks postoperative in the semi sitting and upright positions and the need for blood transfusion postoperative

Headache attacks	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	χ^2	p-value
No headache	70 (87.5%)	56 (70.0%)	7.320	0.007**
Headache	10 (12.5%)	24 (30.0%)		
Fainting attacks	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	χ^2	p-value
No fainting	70 (87.5%)	74 (92.5%)	1.111	0.292 N.S
Fainting	10 (12.5%)	6 (7.5%)		
Blood transfusion	Group G: (General anesthesia) (N=80)	Group S: (Spinal anesthesia) (N=80)	χ^2	p-value
Not needed	58 (72.5%)	71 (88.8%)	6.762	0.009**
Needed	22 (27.5%)	9 (11.3%)		

(**): Highly Significant.

Discussion

There was no difference in spinal compared with general anesthesia in relation to; pulse, blood pressure, urinary output, and presence of fainting attacks post-operative, this may be attributed to postoperative hemodynamic stability of the patient in both groups maintained by intravenous fluid and medications and close monitoring of the patient postoperatively.

There was less amount of blood loss with spinal anesthesia compared with general anesthesia. Mean intraoperative blood loss estimated by the acute normovolemic hemodilution technique using hemoglobin levels under spinal anesthesia was 1009.853 ml while under general anesthesia was 1162.613 ml with a difference of 152.760 ml.

There was a reduction in hemoglobin level in general anesthesia group than that of spinal anesthesia on 2nd day postoperative. Mean hemoglobin level in spinal anesthesia group was 9.412g/dL while that of general anesthesia was 8.752 g/dL with a difference of 0.660g/dL. Moreover, there was a reduction in hematocrit value in general anesthesia group than that of spinal anesthesia on 2nd day postoperative, mean hematocrit value in spinal anesthesia group was 29.695% while that of general anesthesia was 28.188% with a difference of 1.507%.

In addition, there was less amount of blood loss with spinal anesthesia compared with general anesthesia. Mean intraoperative blood loss estimated by the acute normovolemic hemodilution technique using hematocrit values under spinal anesthesia was 957.625 ml. while under general anesthesia was 1131.899 ml with a difference of 174.274 ml.

The findings in current study are similar to that reported by many investigators in the following studies:

1- Ezzatalsadat et al. conducted a study to compare between general and spinal anesthesia in cesarean section in relation to the drop of hemoglobin and hematocrit levels after the operation. They found that mean loss of hemoglobin and hematocrit in patients operated under GA were 1.6 ± 0.1 and 4.2 ± 1 respectively which was significantly reduced

after surgery. In patients operated under SA, mean loss of hemoglobin and hematocrit were 1.05 ± 0.2 and 3.2 ± 0.5 which was significantly reduced after surgery. Mean loss of hemoglobin in GA group was significantly higher than in SA group ($p=0.017$). Mean loss of hematocrit in SA group was significantly lower than in GA group ($p=0.035$)⁽⁶⁾.

2- Afolabi et al. found that women operated by cesarean section under spinal anesthesia had a significantly lower difference between pre and postoperative hematocrit (mean difference was 3.10% and 95% CI 1.73 to 4.47 (one trial, 209 women) if compared with general anesthesia. They also concluded that there was less maternal blood loss with spinal anesthesia if compared with general anesthesia (SMD -0.59 ml; 95% CI -0.83 to 0.35; two trials 279 women)⁽⁴⁾.

3- Jeong et al. concluded in their research that women underwent cesarean section under spinal anesthesia had lost blood less than those under general anesthesia ($1,160\pm 710$ ml. versus $1,230\pm 650$ ml.)⁽⁷⁾.

4- Martin et al. also concluded that mothers who underwent cesarean section under GA had significantly greater estimated blood loss than SA (787 ± 322 ml versus 632 ± 216 ml, $p<0.01$) and rate of blood transfusion (13.6% versus 2.2%, $p<0.05$)⁽⁸⁾.

5- Dyer et al. reported on maternal blood loss and noted that significantly less blood was lost when using spinal anesthesia (standardized mean difference (SMD) -0.59 milliliters, 95% CI -0.83 to -0.35, 279 women) when compared with general anesthesia⁽⁹⁾.

6- Lao et al. stated that there was no significant difference between the GA group and SA group in the preoperative hemoglobin (11.9 ± 1.4 versus 11.6 ± 1.1 g/dl) or postoperative hemoglobin (11.1 ± 1.7 versus 11.3 ± 1.2 g/dl). The GA group, however, demonstrated a significant fall in the postoperative hemoglobin ($p<0.05$). The GA group also had a higher incidence of a drop in hemoglobin of $> 10\%$ compared to the SA group (46.7% versus 20.0%, $p<0.05$)⁽¹⁰⁾.

7- Andrews et al. concluded that a greater proportion of women undergoing general

anesthesia experienced a postoperative decrease in hematocrit of 5% or more compared with patients receiving spinal anesthesia (10 of 42 versus 5 of 75, $p=0.018$)⁽¹¹⁾.

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