

Comparison of 1-and 2- Minute Sitting Position Versus Immediately Lying Down of Hemodynamic Variables after Spinal Anesthesia with Hyperbaric Bupivacaine in Elective Cesarean Section

By

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Abstract:

the aim of current study: was Comparison of 1-and 2- minute sitting position versus immediately lying down on hemodynamic variables after spinal anesthesia with hyperbaric bupivacaine in elective cesarean section. **Patients and methods:** This study was performed after the approval of the Iraqi Council for Medical Specialization in anesthesia and intensive care, and after obtaining the consents from 90 pregnant women (at term) who were candidate for cesarean section with spinal anesthesia were recruited in this study. They were collected from “AL-Imamain AL-Kademain Medical City Teaching Hospital” (July 2017 - January 2018) , All patients were premedicated with 10mg IV metoclopramide and 50mg IV ranitidine , Base line blood pressure and the pulse rate were recorded initially before intervention , the Lumbar puncture was performed in the sitting position under full aseptic technique , For assessment of blood pressure and pulse rate, ten readings were taken at (3, 5, 10, 15, 20, 25, 30, 35,40and 60 min) using an automated noninvasive blood pressure. Pulse rate monitored by electrocardiogram and oximetry (SPO₂). **Results:** Current study showed higher means of pulse rate than the other two groups especially at early times after anesthesia induction. On the other hand, both group A1 and A2 showed higher mean of systolic, diastolic and mean blood pressure than group B especially 3, 5, 10 and 15 minutes after anesthesia induction, so the variation of pulse rate over the time in the three groups. Group B had higher pulse rate

than the other two groups at 3,5,10, 25 and 40 minutes with significant difference ($P < 0.05$), while variation in systolic pressure in the three group over time. During the first 15 minutes after anesthesia induction group A2 showed significantly higher systolic pressure than both A1 and B groups as well as Variations in diastolic pressure between the three groups over time is shown in table 4. Both group A1 and A2 exhibited higher diastolic pressure than group B during the first 15 minutes , also Variation of mean blood pressures over time after the induction of anesthesia ,so During the first 20 minutes after anesthesia induction, 18 women (60%) experienced hypotension compared to 11(36.67%) in group A1 and only 6 (20%) in group A2 and during the time period between 20 and 40 minutes, the three group exhibited close numbers of cases that had hypotension, Mean ephedrine requirements in direct lying, after 1 minute lying and after 2 minutes lying was 14.8 ± 4.5 mg, 13.4 ± 3.9 mg and 9.3 ± 3.8 mg respectively ,the time required to reach T6 dermatome sensory level in the three groups. Group A2 exhibited longer time period to reach this level (4.73 ± 1.69 min), Apgar score >8 in all groups. **Conclusions:** This study revealed that the patient's position is an important factor, which affects the frequency of Hypotension and the onset of sensory block , as well as Administration of spinal anesthesia for cesarean section. Based on the findings, keeping the parturient seated for 1 Or 2 minutes after spinal anesthesia, compared to immediately lying down, could decrease the frequency of hypotension.

keywords: Comparison; 1-and 2- Minute; Sitting Position; Lying Down; Hemodynamic Variables; Spinal Anesthesia; Hyperbaric Bupivacaine; Elective Cesarean Section

Introduction

A Caesarean section is a surgical procedure in which one or more incisions are made through a mother's abdomen (laparotomy) and uterus (hysterotomy) to deliver one or more babies. The first modern Caesarean section was performed by German gynecologist Ferdinand Adolf Kehrer in 1881. ^(1,2,3)

Spinal anesthesia, also called spinal analgesia (because it can be used as a Post lower limb operations analgesia), spinal block or sub-arachnoid block (SAB), is a form of regional anesthesia involving injection of a local anesthetic into the subarachnoid space, generally via a fine needle through intervertebral foramen (L4 –L5) or (L3-L4) ⁽¹⁾. Spinal anesthesia is often selected for elective or emergency cesarean section. ^(4,5)

Bupivacaine is a local anesthetic drug belonging to the amino amide group. It is commonly marketed under various trade names, including Marcaine (Astra Zeneca UK), Marcaine (Care stream Dental, Hospital Inc.), Sensor Caine (Astra Zeneca), and 'Vivacaine (Septodont). It is on the WHO Model List of Essential Medicines, the most important medication needed in a basic health system ⁽¹⁾.

Bupivacaine binds to the intracellular portion of voltage-gated sodium channels and blocks sodium influx into nerve cells, which prevents depolarization. Hence, it blocks the generation and the conduction of nerve Impulses ⁽¹⁾.

Aim of the study

Comparison of 1-and 2- minute sitting position versus immediately lying down on hemodynamic variables after spinal anesthesia with hyperbaric bupivacaine in elective cesarean section.

patients and methods:

This study was performed after the approval of the Iraqi Council for Medical Specialization in anesthesia and intensive care, and after obtaining the consents from the patients.

In a randomized clinical trial, 90 pregnant women (at term) who were candidate for cesarean section with spinal anesthesia were recruited in this study. They were collected from “AL-Imamain AL-Kademain Medical City Teaching Hospital” (July 2017 - January 2018).

The inclusion criteria were Elective C.S under spinal anesthesia; Class II of ASA and Single fetus so the exclusion criteria were Patient refusal; Cerebral vascular disease; Fetal abnormality; History of allergy to drugs used; Contraindications to spinal anesthesia; History of diabetes mellitus, cardiac and renal diseases, hypertension and Obese patient.

In this study 90 patients that were scheduled for elective cesarean section by spinal anesthesia. Patients were divided into three groups: Group A1 (30 pt) had spinal anesthesia and lied down after one minute of sitting so the Group A2 (30pt) had spinal anesthesia and lied down after two minutes of sitting and Group B (30pt) served as control which had spinal anesthesia and were lied down immediately.

Procedures

From each patient, full history was taken and weight, height and age were recorded, All patients were premedicated with 10mg IV metoclopramide and 50mg IV ranitidine , Base line blood pressure and the pulse rate were recorded initially before intervention , the Lumbar puncture was performed in the sitting position under full aseptic technique , For assessment of blood pressure and pulse rate, ten readings were taken at (3, 5, 10, 15, 20, 25, 30, 35,40and 60 min) using an automated noninvasive blood pressure. Pulse rate monitored by

electrocardiogram and oximetry (SPO₂) so , I.V. access was established and 1L of normal saline (0.9%) was administered as preload fluid , as well as A 25 gauge (Pencil point, Braun, Germany) spinal needle was introduced into the subarachnoid space at the L3-L4 lumbar level midline approach with the needle orifice cephalic, After free flow of cerebrospinal fluid out of the needle, hyperbaric bupivacaine was injected to subarachnoid space of the three Groups. The spinal needle was withdrawn and patients were positioned supine immediately in group B and after 1 minute in group A1 and after 2 minutes in A2.

All patients were placed supine with left uterine displacement. Oxygen 4-5 L/min given using a clear facemask. Onset of spinal anesthesia was confirmed by asking the patient about numbness of the legs. Surgery was started when the sensory level of the block reached T4 maternal blood pressure (BP), peripheral oxygen saturation (SPO₂). Pulse rate, nausea, vomiting and fetal Apgar score were recorded.

Statistical Analysis

Data were organized in Microsoft Office Excel software and analyzed with statistical package for social sciences (SPSS) version 20. Numerous data were expressed as mean \pm standard deviation unless otherwise specified. Repeated measures analysis of variance (ANOVA) was used to analyze pulse rate SBP, DBP and mean BP over time. Bonferr's post-hoc was used for comparison between groups. Fisher's exact chi-square test was used to analyze categorical variables. A p-value of less than 0.05 was considered significant.

Results

A total of 90 parturient women were divided randomly into three equal groups. Table 1 shows the baseline characteristics of the three groups involved in this study. Although, group A2 exhibited higher mean of age, and lower

mean of ephedrine use and gestational age, none of the listed factor showed significant difference between these groups except ephedrine use.

Table 1: Demographic and anesthetic baseline data of the study population

Variables	Direct lying (30 cases)	After 1 minute (30 cases)	After 2 minutes (30 cases)	P-value
Age, years	31.2 ± 5.3	29.9±6.1	32.1± 6.9	0.265
Weight, kg	83.4± 9.2	86.6 ± 9.5	87.3± 8.6	0.504
Height, cm	163.9 ± 18.4	158.7±17.9	161.4± 15.8	0.774
Gestational age, w	38.6 ±2.9	38.3± 4.1	38.1± 2.6	0.651

Kg: kilogram, cm: centimeter, w: week, mg: milligram

Generally, group B showed higher means of pulse rate than the other two groups especially at early times after anesthesia induction. On the other hand, both group A1 and A2 showed higher mean of systolic, diastolic and mean blood pressure than group B especially 3, 5, 10 and 15 minutes after anesthesia induction

Table2 shows the variation of pulse rate over the time in the three groups. Group B had higher pulse rate than the other two groups at 3,5,10, 25 and 40 minutes with significant difference ($P<0.05$), while there were no significant differences between group A1 and A2.

Table 2: pulse rate for the three groups over time after the induction of anesthesia

Time	Pulse rate			P-value		
	Group (B)	Group (A1)	Group (A2)	P1	P2	P3
Baseline	88.61	89.18	92.11	0.809	0.783	0.884
3 min	101.43	92.46	94.26	0.028	0.022	0.435
5 min	98.2	91.57	90.1	0.035	0.033	0.904
10 min	93.76	89.09	88.14	0.041	0.044	0.897

15 min	90.64	89.22	86.59	0.623	0.087	0.145
20 min	89.18	87.54	84.49	0.719	0.614	0.743
25 min	89.67	85.17	84.12	0.042	0.047	0.693
30 min	85.19	81.27	80.61	0.044	0.041	0.865
35 min	83.57	84.43	84.2	0.769	0.710	0.809
40 min	79.94	88.12	89.28	0.031	0.028	0.589
60 min	81.92	89.76	88.65	0.019	0.025	0.878

P1: between group B and A1; P2: between group B and A2, P3: between group A1 and A2

Table 3 illustrates the variation in systolic pressure in the three group over time. During the first 15 minutes after anesthesia induction group A2 showed significantly higher systolic pressure than both A1 and B groups with significant differences ($P < 0.05$). Although group A1 showed higher systolic pressure than group B during the same periods, statistical analysis revealed significant differences only after 3, 5 and 15 minute on induction ($P < 0.05$). Comparison between group A1 and A2 showed significantly higher systolic blood pressure in A2 after 5 and 10 minutes from induction of anesthesia.

Table 3: Systolic blood pressure for the three groups over time after the induction of anesthesia

Time	Systolic Pressure			P-value		
	Group (B)	Group (A1)	Group (A2)	P1	P2	P3
Baseline	131.28	127.25	129.42	0.534	0.511	0.702
3 min	109.73	118.19	120.12	0.029	0.008	0.654
5 min	104.32	109.65	114.34	0.032	0.021	0.042
10 min	108.65	111.29	116.76	0.048	0.030	0.045
15 min	113.59	121.39	120.17	0.009	0.019	0.829
20 min	119.16	120.13	118.69	0.376	0.439	0.432
25 min	123.29	124.46	123.08	0.734	0.834	0.771
30 min	123.37	123.9	125.94	0.922	0.730	0.684
35 min	125.7	124.18	125.12	0.883	0.876	0.854

40 min	124.36	126.32	124.91	0.645	0.874	0.545
60 min	123.65	125.43	123.97	0.342	0.904	0.756

P1: between group B and A1; P2: between group B and A2, P3: between group A1 and A2

Variations in diastolic pressure between the three groups over time is shown in table 4. Both group A1 and A2 exhibited higher diastolic pressure than group B during the first 15 minutes with significant differences ($P < 0.05$). On the other hand, at late time after anesthesia (5, 20 and 30 minutes), group A1 showed significant decrease in diastolic pressure compared with group A2.

Table 4: Diastolic blood pressure for the three groups over time after the induction of anesthesia

Time	Diastolic Pressure			P-value		
	Group (B)	Group (A1)	Group (A2)	P1	P2	P3
Baseline	75.81	74.49	76.56	0.743	0.604	0.491
3 min	62.71	68.35	70.11	0.033	0.024	0.091
5 min	60.14	69.54	72.24	0.018	0.006	0.043
10 min	62.19	68.25	69.58	0.025	0.021	0.328
15 min	61.29	65.19	70.52	0.038	0.031	0.082
20 min	68.44	65.97	70.61	0.072	0.296	0.048
25 min	71.22	67.24	71.72	0.068	0.898	0.073
30 min	69.62	69.52	73.94	0.867	0.049	0.044
35 min	70.16	72.18	72.67	0.671	0.461	0.754
40 min	72.29	72.11	74.48	0.810	0.504	0.619
60 min	72.14	72.65	73.19	0.771	0.694	0.662

P1: between group B and A1; P2: between group B and A2, P3: between group A1 and A2

Variation of mean blood pressures over time after the induction of anesthesia are shown in table 5. A comparison between group A2 and B shows that cases in group A2 had significantly higher mean blood pressure than group B all over the study time except at minute 35 and beyond. Group A1 showed somewhat similar trend compared with group B, but the significant differences appeared at minutes 3, 5, 15, 25 and 30. Furthermore, group A2 showed

significantly higher mean blood pressure than group A1 at 3, 10 and 15 minutes after anesthesia induction.

Table 5: mean blood pressure for the three groups over time after the induction of anesthesia

Time	Mean Blood Pressure			P-value		
	Group (B)	Group (A1)	Group (A2)	P1	P2	P3
Baseline	93.4	95.27	94.8	0.422	0.519	0.832
3 min	73.55	81.39	92.8	0.032	0.012	0.042
5 min	78.94	84.55	85.49	0.039	0.032	0.485
10 min	80.09	80.14	85.16	0.843	0.022	0.026
15 min	77.26	82.91	87.26	0.044	0.018	0.037
20 min	79.62	85.27	82.91	0.025	0.068	0.074
25 min	78.16	87.69	88.48	0.036	0.031	0.069
30 min	82.18	87.13	90.17	0.028	0.014	0.085
35 min	86.59	90.42	89.49	0.072	0.092	0.764
40 min	89.92	92.18	92.21	0.756	0.734	0.956
60 min	88.25	92.76	92.54	0.865	0.884	0.993

P1: between group B and A1; P2: between group B and A2, P3: between group A1 and A2

The number (and percentage) of cases experienced hypotension in the three groups are shown in table 5. During the first 20 minutes after anesthesia induction, 18 women (60%) experienced hypotension compared to 11(36.67%) in group A1 and only 6 (20%) in group A2 with highly significant difference between group A2 and B ($P < 0.001$). During the time period between 20 and 40 minutes, the three group exhibited close numbers of cases that had hypotension, and there were no significant differences. Totally, group had higher number of women (21 cases) having hypotension than group A2 (7 cases) with highly significant difference ($P < 0.001$), however, the difference between group B and A1 was non-significance ($P = 0.057$).

Table 6: Frequency of hypotension in the three groups

Hypotension	Direct lying (30 cases)	After 1 minute (30 cases)	After 2 minutes (30 cases)	P- value
Induction- 20 min	18 (60%)	11(36.67%)	6 (20%)	P1= 0.06 P2<0.001 P3=0.077
20-40 min	3 (10%)	3 (10%)	1(3.33%)	P1=1.0 P2= 0.29 P3=0.29
Total	21(70%)	14 (46.67%)	7 (23.33%)	P1=0.065 P2<0.001 P3=0.056

P1: between first and second group, P2: between first and third group, P3: between second and third group

Mean ephedrine requirements in direct lying, after 1 minute lying and after 2 minutes lying was 14.8 ± 4.5 mg, 13.4 ± 3.9 mg and 9.3 ± 3.8 mg respectively with significant differences between groups (P1= 0.192 between group B and A1; P2= 0.006 between group B and A2; and P3= 0.012 between group A1 and A2) as shown in table 6.

Table 7: ephedrine requirement in the different groups

Groups	Direct lying (30 cases)	After 1 minute (30 cases)	After 2 minutes (30 cases)	P- value
Ephedrine requirements, mg (mean \pm SD)	14.8 ± 4.5	13.4 ± 3.9	9.3 ± 3.8	P1= 0.192 P2= 0.006 P3= 0.012

P1: between first and second group, P2: between first and third group, P3: between second and third group, SD: standard deviation

Table 7 show the time required to reach T6 dermatome sensory level in the three groups. Group A2 exhibited longer time period to reach this level (4.73 ± 1.69 min) than both Group A1 (3.77 ± 2.1 min) and group B (3.25 ± 1.1 min) with significant difference from group B (P=0.026).

Table 8: the time required to reach T6 dermatome sensory level in the different groups

Groups	Direct lying (30 cases)	After 1 minute (30 cases)	After 2 minutes (30 cases)	P- value
Time required to reach T6 sensory level, min (mean±SD)	4.83±1.69	3.77±2.1	3.25±1.1	P1= 0.037 P2= 0.029 P3= 0.293

P1: between first and second group, P2: between first and third group, P3: between second and third group, SD: standard deviation

Table 9: Apgar score in 3 groups

Apgar score	1	2	3	4	5	6	7	8	9	10	Total	p
A1-1mint	0	0	0	0	0	0	0	7	23	0	30	0.00
A1-5mint	0	0	0	0	0	0	0	0	16	14	30	
A2-1mint	0	0	0	0	0	0	0	0	17	13	30	
A2-5mint	0	0	0	0	0	0	0	7	23	0	30	
B-1mint	0	0	0	0	0	0	0	0	26	4	30	
B-5mint	0	0	0	0	0	0	0	20	10	0	30	
	Poor						Accepted	Normal				

Chi-square=103.500; DF=10; P-Value=0.000
6 cells with expected counts less than 5

We found that Apgar score >8 in all groups.

Discussion

Hypotension following spinal anesthesia is very common, and a recent meta-analysis showed that the following Treatments are not completely successful in eliminating this adverse event: position changes, colloids, ephedrine, Phenylephrine, or lower legs compression ⁽⁶⁾. In a number of studies, the effect of patient positioning during or after spinal anesthesia has been studied, although Conflicting results have been reported ⁽⁷⁻¹⁰⁾. Investigators have shown better hemodynamics and reduced ephedrine requirements when the spinal anesthetic was performed in the sitting rather than in the lateral position. ^(11, 12)

In 2011, El-Hakeem *et al.*, found that sitting up for 5 minutes rather than immediately lying down resulted in decreased sensory block Height, reduced ephedrine and fluid requirements, and diminished some adverse effects such as nausea and vomiting ⁽⁷⁾

Pooran hajian *et al.*, ⁽¹³⁾ found keeping the parturient seated for 1 and 2 minutes after spinal anesthesia , compared to immediately lying down , could decrease the frequency of hypotension and ephedrine use.

Kohler *et al.*, ⁽¹⁴⁾ and Gori *et al.*, ⁽¹⁵⁾ in similar studies Found that sitting up for 3 and 2 minutes, respectively Did not influence the incidence of maternal hypotension Or the required ephedrine dose versus immediately lying down, as well as B.I Obasuyi *et al.*, found Hypotension occurred less frequently when spinal anaesthesia for caesarean using plain bupivacaine was induced with patients in the lateral compared with the sitting position. ⁽¹⁶⁾

Conclusions: This study revealed that the patient's position is an important factor, which affects the frequency of Hypotension and the onset of sensory block , as well as Administration of spinal anesthesia for cesarean section. Based on the findings, keeping the parturient seated for 1 Or 2 minutes after spinal anesthesia, compared to immediately lying down, could decrease the frequency of hypotension.

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