Original Article

The Effect of Spinal Anesthesia that is Performed in Sitting or Right Lateral Position on Post-Spinal Headache and Intraocular Pressure During Elective Cesarean Section

M Doğukan, M Bıçakçıoğlu[1], N Yilmaz[2], M Duran, Ö Uludağ, A Tutak[3], R Kaya[4], R Kiliç[5]

Deparment of Anesthesiology and Reanimation, Adiyaman University Faculty of Medicine, Adiyaman, [1]Deparment of Anesthesiology and Reanimation, Inonü University Faculty of Medicine, Malatya, [2]Deparment of Anesthesiology and Reanimation, Adiyaman Training and Research Hospital, Adiyaman, [3]Deparment of Anesthesiology and Reanimation, Adıyaman Park Hospital, Adiyaman, [4]Deparment of Anesthesiology and Reanimation, New Life Hospital, Osmaniye, [5]Deparment of Anesthesiology and Reanimation, Hatem Hospital, Gaziantep, Turkey

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Abstract

Background: Although spinal anesthesia can be applied in different patient positions, the most frequently used positions are sitting and lateral positions. It is known that different patient positions during spinal anesthesia have effects on hemodynamic parameters, postdural puncture headache, and intraocular pressure. **Aim:** The study aimed to determine the effect of spinal anesthesia performed in either sitting or right lateral position on postspinal headache and intraocular pressure during elective cesarean section. **Patients and Methods:** The study was a randomized controlled study of 104 eligible pregnant women scheduled to undergo elective cesarean section. The women were randomized into two groups. Spinal anesthesia was performed either in the sitting (Group S, n = 53) or the right lateral position (Group L, n = 51). Heart rate and blood pressure were recorded throughout the operation. The participants were informed and monitored for postspinal headaches. Intraocular pressure before and after the operation was measured with Icare PRO. The obtained data were statistically compared between the two groups. **Results:** There was no difference between the groups in terms of demographic data. Postdural puncture headache was observed in five patients in Group S and one patient in Group L (P =0.04). There was no difference between the groups in terms of intraocular pressure (P >.05). Heart rate was not significantly different between the groups; however, there was a significant difference in average blood pressure in 1, 5, 30, and 40 minutes (P <.05). The number of trials administered to patients for spinal anesthesia was significantly higher in Group L (P =0.01). **Conclusion:** Spinal anesthesia performed in the sitting position for cesarean section caused a higher postspinal headache than in the right lateral position, but the position did not affect intraocular pressure.

Keywords: *Cesarean section, intraocular pressure, postdural puncture headache, spinal anesthesia*

Introduction

Spinal anesthesia is the most common form of regional anesthesia in patients scheduled to undergo cesarean section operation because of a number of maternal and fetal advantages.[1,2] Regional anesthesia can be either performed in the sitting position or the lateral position but rarely in the prone position. Studies showed that hemodynamic

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Address for correspondence: Dr. N Yilmaz, Adiyaman Training and Research Hospital, Anesthesiology and Reanimation Clinic, 02200 - Adiyaman, Turkey. E-mail: yilmaznezir@hotmail.com

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parameters and the incidence of post-dural-puncture headache (PDPH) could be affected when performing regional anesthesia in different positions.[3]

Since the effect of spinal anesthesia induced hypotension on intraocular pressure (IOP) in pregnant women is unknown, we investigated the effect of sitting or lateral position during spinal block in pregnant women undergoing elective cesarean section, on the incidence of PDPH and intraocular pressure.

Material and Methods

The study was conducted from June 1, 2015 to December 1, 2018 in Adıyaman University Education and Research Hospital after approval of the Adıyaman University Faculty of Medicine Ethics Committee (24.12.2014/10-8).

The inclusion criteria are American Society of Anesthesiologists (ASA) II risk parturients scheduled for the elective cesarean section under spinal anesthesia aged between 18 and 40 years. The patients with body weight less than 50 kg and more than 105 kg, height less than 150 cm and more than 180 cm, multiple pregnancies, pre-eclampsia–eclampsia history, emergency surgery, bleeding diathesis, or contraindicated for spinal anesthesia were not included in the study.

Computer-generated random numbers allocated the participants into two groups. The random allocation sequence was concealed in opaque, sealed envelopes until a group was assigned. The group with spinal anesthesia performed in the sitting position was called Group S (n = 60) and spinal anesthesia performed in the right lateral position was called Group L (n = 60). Spinal anesthesia, intraocular pressure measurement, perioperative and postoperative follow-up, and data collection were performed by different researchers, thus eliminating the influence of the researchers on the results. However, eight patients whose data were not available during the postoperative period and eight patients whose spinal anesthesia failed were excluded from the study. Thus, a total of 104 patients, Group S (n = 51) and Group L (n = 53), were eventually evaluated in the study.

The patients were admitted to the preoperative unit 30 minutes before surgery for intraocular pressure measurement using the Icare Pro device and their data were recorded.

An 18 G intravenous (IV) cannula for each parturient, noninvasive blood pressure (BP), electrocardiogram (ECG), heart rate (HR), and peripheral oxygen saturation (SpO_2) were monitored. Lactated Ringer solution was infused (15 mL/kg/h) for 15 minutes followed by a maintenance dose of 6-8 mL/kg/h. The patients were given oxygen 3 L/min via nasal cannula. The patients' BP and SpO_2 values were recorded.

The pregnant women were positioned in the right lateral decubitus (Group L) or seated (group S), respectively, before the skin is disinfected. We cannulated the intrathecal space with 29 gauge Quinke-tipped guided spinal needle (Egemen spinal needle, Egemen, Turkey) at the level of the $L_{3\text{-}4}$ intervertebral space. When free cerebrospinal fluid flow was observed, 10 mg bupivacaine heavy (marcaine spinal heavy 0.5%, Astra Zeneca, Turkey) + 25 μg fentanyl (fentanyl citrate Abbot Istanbul, Turkey) was injected into the subrarachnoid space. Immediately after the procedure, the patients were placed at supine position.

Spinal anesthesia of all patients was done by the same anesthesiologist. The number of attempts for spinal block was recorded. HR and BP values were measured and recorded at preoperative period, 1st, 5th, and 10th minutes after spinal anesthesia, and subsequently at 10-minute intervals. During the surgery, when there was a decrease of more than 20% in SBP compared to the baseline value, the patients were treated with 10-mg IV bolus ephedrine, and the number of ephedrine-treated patients was recorded. When the heart rate decreased less than 50, 0.5 mg of atropine was administered. At the postoperative first hour, intraocular pressures of the patients were measured and recorded. Patients with PDPH were followed until discharge and called after 1 week.

Statistical analysis

Statistical analysis was performed by SPSS Statistics for Windows, version 17.0. After descriptive statistics values were expressed as mean ± standard deviation (SD), n, or percentage appropriately. Independent sample *t*-test was used in the analysis of quantitative independent data and Chi-squared test was used in the analysis of qualitative independent data to compare the demographic data, hemodynamic parameters, intraocular pressure, and early complications of spinal anesthesia between the two groups. If $P < .05$, it was considered as statistically significant.

Results

There were no significant differences between the groups in terms of demographic parameters ($P > .05$). The age,

Table 1: Demographic properties (age, height, and weight) of the parturients (Mean±SD)

	Group L (*n*=51)	Group S (*n*=53)	*P*
Age (years)	29.39±4.28	29.23±5.09	0.86
Height (m)	1,63±0.06	1.62±0.05	0.28
Weight (kg)	82.28±10.59	80.72±10.53	0.45

Table 2: Comparison of hemodynamic parameters in the groups (mean±SD)

Time	HR (Heart rate) (beat/min)		*P*	MAP (Mean arterial pressure) (mmHg)		*P*
	Group L (*n*=51)	Group S (*n*=53)		Group L (*n*=51)	Group S (*n*=53)	
min 0	100.04±16.72	99.13±17.25	0.78	95.49±13.91	93.66±11.73	0.47
min 1	93.64±13.51	92.61±13.44	0.69	87.59±17.27¤	81.44±14.23	0.05
min 5	95.36±15.38	92.45±20.48	0.41	77.03±13.15¤	69.79±13.66	0.00
min 10	97.01±13.09	95.64±19.03	0.67	77.83±14.51	72.92±15.87	0.10
min 20	97.45±16.62	95.88±16.67	0.63	80.29±12.72	76.63±12.62	0.14
min 30	99.43±11.59	97.96±12,67	0.53	81.96±7.92¤	78.14±11.17	0.04
min 40	99.07±12.07	98.45±14.55	.81	83.31±8.64¤	79.44±10.24	0.34

Table 3: Comparison of intraocular pressure (mean±SD)

	Group L (*n*=51)	Group S (*n*=53)	*P*
Preoperative			
Right eye	18.65±2.60	18.85±2.63	0.64
Left eye	17.94±3.07	18.22±2.81	0.63
Postoperative			
Right eye	17.38±2.45	18.23±2.89	0.10
Left eye	17.80±3.28	18.09±2.02	0.58

Table 4: Incidence of nausea, vomiting, PDPH andpatients requiring treatment with ephedrine, and number of attempts for spinal block

	Group L (*n*=51)	Group S (*n*=53)	*P*
Nausea (*n*)			
No	14	20	0.16
Yes	39	31	
Vomiting (*n*)			
No	7	11	0.26
Yes	46	40	
Ephedrine need (*n*)			
No	19	25	0.12
Yes	34	26	
Number of attempts (*n*)			
1	27	39	0.01
1	26	12	
PDPH (*n*)			
Yes	1	5	0.04
No	52	46	

PDPH=Postdural puncture headache

height, weight, and ASA distribution of the groups are shown in Table 1.

The systolic blood pressure values measured at 1st and 5th minutes and the diastolic blood pressure values at 5 minutes after spinal anesthesia were significantly different between the groups (P =0.04, P =0.01, P =.01, respectively). There was no difference in HR values between the groups (P >.05). [Table 2].

There were no significant differences in preoperative and postoperative values of IOP when the comparison was made between intergroups and intragroups (P >.05). [Table 3].

The incidence of nausea, vomiting, number of ephedrine-treated patients, number of trials for spinal anesthesia, and the incidence of PDPH were compared between the groups. There were significant differences on the number of trials for spinal anesthesia attempt (P =0.01) and the incidence of PDPH (P =0.04) but no significant differences in other parameters [Table 4].

Discussion

We found that spinal anesthesia in the lateral position caused a lower rate of PDPH in pregnant women but the IOP did not differ as per performing the spinal anesthesia either in sitting or right lateral position.

The PDPH is typically a headache that occurs bilateral, frontal, retro-orbital, occipital region extending to the nape, which is severe, throbbing, continuous, and its symptoms exacerbate in upright position. The headache may associate with nausea and vomiting.[4,5] The pain may begin after spinal anesthesia or within 72 hours.[6] The mechanism of pain is due to leakage of cerebrospinal fluid as a result of the damage that occurs in dura.[4] Although it is known that needle thickness, young age, female sex, and pregnancy are predisposing factors for puncture headaches after spinal anesthesia, there are also some publications stating that the position of patients during spinal anesthesia is a cause of puncture headaches.[5,7] Davoudi *et al*.[3] examined the effect of patient position on postdural puncture headache and showed that spinal anesthesia performed in sitting position caused higher PDPH than in lateral position. A meta-analysis showed that the lateral position is a preventive factor for PDPH.[8] Our study showed that PDPH developed after spinal anesthesia performed in the lateral position was significantly lower than in the sitting position.

Normal IOP is a statistical expression of the IOP range of the population, which is not unique to individuals. In the normal population, the IOP distribution forms a bell curve and the two ends of this bell curve are between 10 and 20 mmHg. The normal group (10-20 mmHg) ratio below the bell curve is 95%. While IOP at birth is between 6 and 8 mmHg, it increases by about 1 mmHg every two years from birth to the age of 12 years. In most Western societies, it is assumed that after the age of 40 years, it increases by about 1 mmHg every 10 years. The average IOP is around 15 mmHg. Normally the right and left IOP are similar and the difference of 4 mmHg between both eyes is observed in only 4% of normal individuals.[9,10] Intraocular pressure is affected by volatile anesthetics, intravenous anesthetics, myorelaxants, and position.[11] Şekeryapan *et al*.[10] measured IOP before spinal anesthesia and 20 minutes after spinal anesthesia in patients who underwent lower limb surgery. In their study, they found that despite a decline in IOP, this decline was not statistically significant. Hatipoglu *et al*.[12] applied spinal anesthesia to 38 patients undergoing surgery below umbilicus; IOP measurements were performed before spinal anesthesia, after spinal anesthesia, and after postoperative 24th hour, but found no difference. In our study, we also did not find any significant difference between the IOP values before spinal anesthesia and postoperative 1st hour similar to these two studies.

Hemodynamic changes such as hypotension, tachycardia, and bradycardia occur in spinal anesthesia.[13] There are conflicting results regarding the effect of spinal anesthetics on hemodynamics in patients undergoing cesarean section with spinal anesthesia. Obasuyi *et al*.[14] showed that more hypotension (systolic pressure less than 90 mmHg) was developed and heart rate was lower in pregnant women who were given spinal anesthesia in a sitting position for cesarean section. In our study, although there was no significant decrease in heart rate, we usually observed significant decreases in mean blood pressure. Shahzad *et al*.[15] found that there was no difference in hemodynamics between the sitting and lateral position for spinal anesthesia. On the contrary, Tan and Günaydın[16] demonstrated that performing combined spinal epidural block in the right lateral decubitus position would result in higher and earlier onset of sensory block level and greater number of block attempts than of the sitting position. But none of the parturients in both groups suffered from PDPH.

While there were no differences between the groups in terms of nausea, vomiting, and ephedrine requirement in our study, the numbers of attempts for spinal anesthesia were significantly higher in the lateral group. The literature showed a linear relationship between the needle tip thickness and the number of spinal block attempts. This has been linked to the reduction of the dura puncture feeling due to the thinning of the diameter of the needle.[16,17] Currently, we found that the number of attempts was significantly higher in patients with lateral position. However, the needle diameter was constant in our both groups and the difference stems from the position. Ucarli *et al*.[17] compared spinal anesthesia in sitting and lateral position with ultrasound in elective cesarean section cases and did not find any positional difference in terms of the number of trials.

Conclusion

The PDPH is more likely to develop after spinal anesthesia performed in a sitting position compared to the lateral position after elective cesarean section. However, patient position (either sitting or lateral) during spinal anesthesia has no effect on intraocular pressure.

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Conflicts of interest

There are no conflicts of interest.

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