



Investigating the effects of different doses of intravenous Ondansetron on heart rate and systolic and diastolic blood pressure changes induced by spinal anesthesia in pregnant women

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Abstract

Introduction: Regional anesthesia is carried out in two modes of spinal cord (intrathecal) and epidural. Regional sensory perception is a simple method that is known as an anesthetic approach to cesarean section. One of the complications of this method is cardiovascular disease, in which vascular vasodilatation occurs and vascular defense decreases due to sympathetic control; this change can, in turn, reduce blood pressure and heart rate by reducing intravenous intake. The present study was conducted to evaluate the effects of different doses of intravenous Ondansetron on the prevention of systolic and diastolic blood pressure changes, along with arterial oxygen scavenging due to spinal anesthesia, in women under spinal anesthesia in cesarean section.

Method: The present randomized study was conducted on all pregnant women aged 15-45 years undergoing elective cesarean section at the Amiralmomenin Hospital of Zabol, southeast of Iran in 2014.

Results: 96 pregnant women under cesarean section were studied. The results of this study showed that intravenous Ondansetron had no effect on arterial oxygen saturation. The severity of nausea in group 1 was significantly higher than that of group 2 and 3. From the second minute onwards, only the third group, the group receiving high dose Ondansetron (8 mg), experienced change, towards higher and higher, in systolic blood pressure. From the sixth minute until the end of the operation, diastolic blood pressure in the third group was higher than the control group; from the second to the thirtieth minute, mean arterial blood pressure in the third group is higher than the control group.

Discussion: Administrating Ondansetron only in high doses reduced blood pressure and vascular contractility. Given the low sample size, the result could be random.

Keywords: ondansetron, heart rate, blood pressure, spinal anesthesia, pregnant women

Introduction

Regional anesthesia is carried out in two modes of spinal cord (intrathecal) and epidural. Regional sensory perception is a simple method that is known as an anesthetic approach to cesarean section [1]. One of the complications of this method is cardiovascular disease, in which vascular vasodilatation occurs and vascular defense decreases due to sympathetic control; this change can, in turn, reduce blood pressure and heart rate by reducing intravenous intake [2]. Decreased blood pressure, which can endanger the life of both the mother and the fetus, is the most common complication of regional anesthesia occurring in more than 80% of cases [3]. Various measures such as fluid therapy, medication and physical methods such as setting good position for the patient, knee bending, and maneuvering the uterus to the left has been applied to prevent hypertension [4]. The results of the present study suggest that fluid therapy does not prevent the loss of blood pressure; thus, the application of this method becomes controversial. However, the combination of fluid therapy and positioning the patient has turned out to be quite effective [5]. When supportive measures fail, we have to resort to medication.

Method

The present randomized study was conducted on all pregnant

women aged 15-45 years undergoing elective cesarean section at the Amiralmomenin Hospital of Zabol, southeast of Iran in 2014. The main exclusion criteria were patients with nerve block contra-indications (such as impaired hemodynamics, coagulation disorders, a history of elevated estrogenic responsiveness or local anesthetic, cardiovascular failure, treatment with selective reuptake inhibitors or migraine drugs) and severe pain, which is an anesthetic failure. 96 subjects participated in the present study. The heart rate and oxygen saturation rates were recorded before and after anesthesia at intervals of two minutes up to 20 minutes and 5 minutes to 35 finally, after the end of the operation, the collected data was inserted into the relevant information form. The time required to create, and return from, sensory block at each individual determined level and the time needed to reach each of the bromove stages in the motor block are also collected through the information form. Required data is collected by SPSS and analyzed using descriptive and inferential statistics. The normality of the data was checked using Kolmogorov-Smirnov test and nonparametric prototypes are used if the data Turns out not to be normal. $P < 0.05$ is considered as meaningful level.

Findings

Table 1: Mean and standard deviation of age and body mass index in three under-study groups

	Mean and SD			
	Group 1	Group 2	Group 3	
Age	29.83 (6.78)	27.43 (6.11)	29 (6.74)	0/3
BMI	29.89 (1.66)	30 (1.81)	29.77 (1.94)	0/9

Group 1: Control

Group 2: Receiving 4 mg of Ondansetron

Group 3: Receiving 8 mg of Ondansetron

Table 2: Mean and standard deviation of systolic blood pressure in groups over time

p-value3-2	p-value 3-1	p-value 2/1	Mean and SD			Systolic blood pressure mm/Hg
			Group 3	Group 2	Group 1	
0/99	0/89	0/87	121/03(12/58)	121/23(14/50)	119/43(12/54)	Arrival time
0/97	0/87	0/96	122/13(11/99)	121/33(14/44)	120/40(10/00)	After anesthesia
0/72	0/01	0/96	117/67(12/19)	114/70(14/39)	106/63(15/88)	2 minutes
0/57	0/003	0/05	113/90(13/29)	109/90(14/83)	100/70(15/61)	4 minutes
0/62	0/004	0/05	112/30(12/36)	108/93(15/11)	100/27(12/88)	6 minutes
0/83	0/004	0/02	112/40(12/70)	110/33(13/60)	100/83(12/91)	8 minutes
0/46	0/004	0/09	113/90(12/78)	109/83(12/98)	102/73(11/96)	10 minutes
0/24	0/002	0/15	114/97(12/64)	109/63(12/74)	103/50(11/17)	12 minutes
0/49	0/004	0/09	114/13(12/61)	110/27(12/39)	103/10(12/60)	14 minutes
0/42	0/01	0/25	114/70(13/38)	110/40(13/02)	104/97(1/64)	16 minutes
0/38	0/003	0/11	115/37(12/30)	111/07(12/42)	104/50(11/14)	18 minutes
0/25	0/004	0/20	116/07(12/52)	111/03(11/98)	105/60(10/69)	20 minutes
0/31	0/007	0/23	116/70(11/66)/	112/13(11/50)	107/00(11/51)	25 minutes
0/69	0/03	0/20	116/53(12/06)	114/10(11/22)	109/00(9/79)	30 minutes
0/48	0/05	0/45	117/03(11/79)	113/67(9/87)	110/13(10/83)	35 minutes
0/46	0/03	0/39	118/60(10/91)	115/23(10/29)	11/50(10/43)	After surgery
			0/001 <	0/001 <	0/001 <	p-value

Table 3: Mean and standard deviation of diastolic blood pressure in groups over time

p-value3-2	p-value 3-1	p-value 2/1	Mean and SD			Systolic blood pressure mm/Hg
			Group 3	Group 2	Group 1	
0/99	0/99	0/99	79/33-11/59	79/00-11/84	79/10-12/65	Arrival time
1	0/98	0/98	79/47-10/53	79/5012/04	78/90-11/81	After anesthesia
0/71	0/06	0/30	76/17-11/04	73/63/11/48	68/87-13/08	2 minutes
0/40	0/009	0/20	73/53-11/06	69/63-11/44	64/43-11/11	4 minutes
0/47	0/01	0/24	72/90-10/40	69/50-11/47	64/83-10/23	6 minutes
0/64	0/01	0/11	73/20-10/11	70/73-10/71	65/23-9/68	8 minutes
0/35	0/008	0/23	74/17-9/39	70/50-10/82	66/17-8/96	10 minutes
0/21	0/008	0/35	75/07-8/90	70/77-10/76	67/27-8/33	12 minutes
0/39	0/006	/15	75/57-9/14	72/30-10/08	67/70-8/26	14 minutes
0/23	0/008	0/35	76/00-9/42	71/93-9/94	68/50-7/93	16 minutes
0/19	0/003	0/25	76/80-9/12	72/50-9/54	68/53-7/93	18 minutes
0/18	0/003	0/26	77/37-8/93	73/13-9/00	69/40-8/58	20 minutes
0/29	0/004	0/19	77/70-8/44	74/27-8/79	70/30-8/09	25 minutes
0/39	0/02	0/33	77/908/3	75/10-8/35	109/00(9/79)	30 minutes
0/37	0/01	0/32	78/13-8/43	75/33-7/58	72/03-6/98	35 minutes
0/25	0/007	0/29	79/33-8/45	76/20-7/22	72/33-7/11	After surgery
			0/001 <	0/001 <	0/001 <	p-value

Table 4: Mean and standard deviation of arterial blood pressure in groups over time

p-value3-2	p-value 3-1	p-value 2/1	Mean and standard deviation of arterial blood pressure (mm/Hg)			Time
			Group 3	Group 2	Group 1	
0/99	0/98	0/99	93/24-11/50	93/04-12/42	92/68-12/20	Arrival time
0/99	0/96	0/98	93/71-10/45	93/41-12/60	92/89-11/85	After anesthesia
0/70	0/03	0/18	90/03-11/00	87/37-12/12	81/46-13/69	2 minutes
0/53	0/005	0/08	86/20-11/09	82/82-12/30	76/01-11/57	4 minutes
0/55	0/01	0/16	85/78-10/34	82/65-12/27	77/15-10/66	6 minutes
0/79	0/01	0/05	85/79-10/09	83/91-11/31	77/05-11/03	8 minutes

0/41	0/009	0/20	86/96-9/69	83/42-11/14	78/65-9/81	10 minutes
0/31	0/004	0/17	88/01-9/31	84/16-11/10	79/40-8/87	12 minutes
0/37	0/004	0/14	88/53-9/64	84/92-11/61	79/75-9/66	14 minutes
0/35	0/01	0/26	88/64-9/99	84/95-10/39	80/80-8/97	16 minutes
0/40	0/003	0/10	89/37-9/21	86/04-10/32	80/77-8/88	18 minutes
0/26	0/004	0/19	89/86-9/15	86/01-9/58	81/758/43	20 minutes
0/33	0/004	0/15	90/46-8/74	87/05-9/22	82/57-8/69	25 minutes
0/51	0/02	0/24	90/61-8/94	88/08-8/56	84/43-7/65	30 minutes
0/47	0/19	0/25	90/98-8/97	88/38-7/86	84/86-7/80	35 minutes
0/45	0/01	0/24	91/92-8/37	89/41-7/65	86/02-7/06	After surgery
			0/001 <	0/001 <	0/001 <	p-value

Table 5: Mean and standard deviation of heart rate in groups

p-value3-2	p-value 3-1	p-value 2/1	Mean and standard deviation of heart rate (mm/Hg)			Time
			Group 3	Group 2	Group 1	
0/92	0/66	0/88	84/00-8/45	85/07-11/36	86/40-10/63	Arrival time
0/99	0/99	0/99	90/43-9/16	90/03-13/27	90/20-11/58	After anesthesia
0/72	0/07	0/32	88/90-9/47	85/77-17/11	79/93-16/92	2 minutes
0/62	0/002	0/02	87/90-9/47	84/00-18/94	72/83-16/74	4 minutes
0/68	0/02	0/18	87/13-10/55	83/73-19/49	76/43-14/04	6 minutes
0/80	0/05	0/20	87/47-10/42	84/83-19/69	77/57-15/28	8 minutes
0/95	0/18	0/30	86/90-10/81	85/63-19/64	79/43-14/76	10 minutes
0/96	0/18	0/28	87/30-11/26	86/37-17/75	80/37-13/59	12 minutes
0/96	0/18	0/27	87/67-10/30	86/80-16/94	81/17-12/28	14 minutes
0/99	0/24	0/19	87/20-10/18	87/63-17/02	81/17-113/20	16 minutes
0/99	0/47	0/40	87/43-0/71	87/87-16/22	83/10-13/51	18 minutes
/97	0/61	0/74	88/20-10/64	87/43-15/27	84/77-14/08	20 minutes
0/99	0/84	0/89	87/57-10/10	87/20-15/06	85/57-14/04	25 minutes
0/98	0/62	0/73	88/83-9/45	88/20-14/99	85/67-12/47	30 minutes
1/00	0/80	0/79	89/00-9/15	89/10-14/45	86/93-12/65	35 minutes
0/95	0/72	0/88	89/67-8/91	88/73-13/08	87/20-12/82	After surgery
			0/001 <	0/001 <	0/001 <	p-value

Table 6: Mean and standard deviation of arterial oxygen saturation in groups over time

p-value3-2	p-value 3-1	p-value 2/1	Mean and standard deviation of arterial oxygen saturation (mm/Hg)			Time
			Group 3	Group 2	Group 1	
0/78	-/97	0/89	96/80-1/12	96/43-1/22	93/30-0/98	Arrival time
0/74	0/41	0/85	96/93-1/20	96/83-0/91	97/00-1/41	After anesthesia
0/52	0/96	0/38	97/17-1/31	97/10-1/12	96/73-0/78	2 minutes
0/56	0/83	0/89	97/37-1/35	97/23-1/04	97/10-0/99	4 minutes
0/94	0/49	0/68	97/17-1/31	97/27-1/11	97/53-1/13	6 minutes
0/90	0/94	0/74	97/37-1/35	97/50-0/97	97/27-1/14	8 minutes
0/95	0/97	0/87	97/33-1/26	97/43-1/25	97/27-1/17	10 minutes
0/44	0/99	0/39	97/17-1/23	97/57-1/22	97/13-1/19	12 minutes
0/51	0/84	0/22	97/23-1/10	97/57-1/0497/43-0/67	97/07-1/20	14 minutes
0/93	0/99	0/97	97/33-1/09	97/43-0/77	97/37-1/27	16 minutes
0/93	0/70	0/89	97/33-1/18	97/50-0/86	97/57-1/22	18 minutes
0/97	0/90	0/97	97/43-1/30	97/67-1/12	97/57-1/19	20 minutes
0/79	0/79	0/40	97/47-1/16	97/777-1/10	97/27-1/14	25 minutes
0/16	0/79	0/47	97/20-1/09	97/60-0/96	97/40-1/24	30 minutes
0/97	0/40	0/28	97/53-0/93	97/47-0/93	97/17-1/23	35 minutes
1/00	0/81	0/81	97/47-0/90	97/47-0/93	97/30-1/14	After surgery
			0/001 <	0/001 <	0/001 <	p-value

Discussion and conclusion

Spinal anesthesia, as a selective anesthetic technique in cesarean section, can lead to the significant and common complication of hypotension and unstable heart rate [6]. Ephedrine used to be the selective medication for preventing low blood pressure in women under cesarean section for many years; however, various complications, including increased

fetal acidity, questioned the frequent use of this medicine [7]. Given the effect of serotonin, which is administered via 5-hydroxy-tryptamine-3 receptor, some studies have used the inhibitors of this receptor, such as Ondansetron and granisetron. The present study was conducted to evaluate the effects of different doses of intravenous Ondansetron on the prevention of systolic and diastolic blood pressure changes,

along with arterial oxygen scavenging due to spinal anesthesia, in women under spinal anesthesia in cesarean section. 96 pregnant women under cesarean section were studied. The results of this study showed that intravenous Ondansetron had no effect on arterial oxygen saturation. The severity of nausea in group 1 was significantly higher than that of group 2 and 3. From the second minute onwards, only the third group, the group receiving high dose Ondansetron (8 mg), experienced change, towards higher and higher, in systolic blood pressure. From the sixth minute until the end of the operation, diastolic blood pressure in the third group was higher than the control group; from the second to the thirtieth minute, mean arterial blood pressure in the third group is higher than the control group. The heartbeat of the third group turned out to be higher than that of the control group only within time range of 2 to 6 minutes; at other times, there was no difference between the heartbeats of the two groups. Saho *et al.* (2012) ^[8] conducted a study in order to evaluate the effect of intravenous Ondansetron on hypotension due to spinal anesthesia on 26 pregnant women under elective cesarean section; it was concluded that the administration of 4 mg intravenous Ondansetron before the implementation of the block leads to a decrease in hypotension and the use of contraceptive drugs ^[8]. According to the results of the present study, administering Ondansetron only in high doses reduced blood pressure and vascular contractility. Given the low sample size, the result could be random.

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