

AIM OF THE WORK

The aim of this work was to study the effects of ondansetron for reduction of spinal analgesia induced hypotension in laparoscopic cholecystectomy.

PATIENTS

The present study was carried out in Alexandria Main University Hospital on 40 adult patients of both sexes, with American Society of Anesthesiologists classification (ASA) I and II physical health status and scheduled for laparoscopic cholecystectomy. All patients signed an informed consent to take part in this double blinded study and were randomly categorized into 2 equal groups (20 each) using closed envelope method after approval of the Local Ethical Committee.

All patients were informed about spinal anesthesia in details. They also were informed about possibility of conversion to general anaesthesia.

Exclusion criteria:

1. Patients with contraindications to spinal anaesthesia.⁽²¹⁹⁾
 - Patient refusal.
 - Low fixed cardiac output states.
 - Infection at or near site of injection.
 - Neurological deficit.
2. History of hypersensitivity to ondansetron or local anaesthetic agents.
3. Patient receiving selective serotonin reuptake inhibitors or migraine medications.⁽²²⁰⁾
4. Conversion to general anaesthesia.

Patients were divided randomly into two groups:

Group I: patients received intravenous ondansetron 4 mg diluted in 10 mL of normal saline over 1 min and 5 min before spinal anaesthesia.

Group II: patients received intravenous normal saline 10 mL over 1 min and 5 min before spinal anaesthesia.

METHODS

Pre-operative assessment:

Patients included in this study were assessed thoroughly by:

- Detailed medical and surgical history taking.
- Complete clinical examination.
- Laboratory investigations: all investigations needed according to the case.

A peripheral 18-gauge i.v. cannula was inserted. All patients received Ringer's solution 10 mL/kg given over 30 min as a preload. They were divided into two groups as mentioned before.

Standard monitoring was established using a multichannel monitor Drager infinity vista xl, Germany. After injection of the studied solution by five minutes, patients were placed in the sitting position and skin was prepared with betadine 10%. At the puncture site, 2 ml of 2% lidocaine were injected subcutaneously. The puncture was performed at L₂₋₃ interspace using a 25 gauge Quinke spinal needle and injection of 3ml of 0.5% hyperbaric bupivacaine plus 0.5 ml fentanyl (25µg).

After injection, the patient was in the supine position till the level of sensory block reached T4. When the sensory block reached T4 dermatome and Bromage score 3⁽⁵⁰⁾ (patient can not flex ankles, knees or hips) surgery was allowed to start.

Sedation was given in the form of 4 – 6 mg nalbuphine. Oxygen by face mask was given at 6 L/min throughout the procedure.

Intraoperative fluid infusion was calculated and given according to body weight.

Surgery was started by small incision at the umbilicus through which abdominal cavity was entered. The surgeon inflated the abdominal cavity by low pressure pneumoperitoneum (10 mmHg) with carbon dioxide to create a working space. The camera was placed through the umbilical port and the abdominal cavity was inspected. Additional ports were opened inferior to the ribs at the epigastric, midclavicular, and anterior axillary positions through which surgery was done.

MEASUREMENTS

The following parameters were measured for each patient:

1- Demographic data :

- Age (years).
- Sex (male / female).
- Weight (kg).
- Duration of the operation (minutes)

2- Haemodynamic measurements:

- Heart rate (beats per minute) using lead II.
- Blood pressure: mean arterial blood pressure was measured in mmHg.
- Arterial oxygen saturation (S_pO₂): using pulse oximeter.

These parameters were measured before and immediately after intrathecal injection and then at 5, 10, 15 minutes, and then every 15 minutes till the end of the procedure, then hourly for six hours postoperatively.

3- End tidal capnography

It was measured by capnomask before intrathecal injection, immediately after injection and then every 15 minutes till the end of the procedure.

4- Nausea and vomiting score:

Nausea and vomiting was assessed every 15 minutes till the end of the procedure and then hourly for six hours postoperatively.⁽²²¹⁾

Complain	score
No nausea or vomiting	0
Nausea alone	1
Vomiting or retching once	2
Vomiting or retching twice or more	3

5- Sedation score:

Sedation was estimated using Ramsey sedation scale⁽²²²⁾ every 15 minutes till the end of the procedure and then hourly for six hours postoperatively.

Scale	Definition
1	Patient is anxious and agitated or restless, or both
2	Patient is co-operative, oriented, and tranquil
3	Patient responds to commands only
4	Patient exhibits brisk response to light glabellar tap or loud auditory stimulus
5	Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus
6	Patient exhibits no response

Table (1): Ramsey sedation scale

6- Patient satisfaction:

The degree of patient satisfaction was assessed by patient satisfaction scale.⁽²²³⁾

Degree of satisfaction	point
Extremely dissatisfied	1
Dissatisfied	2
Neither satisfied nor dissatisfied.	3
Satisfied	4
Extremely satisfied.	5

It was assessed after the end of the procedure at the recovery room.

7- Surgeon satisfaction:

The degree of surgeon satisfaction was assessed by surgeon satisfaction scale.^(223, 224)

Degree of satisfaction	point
Extremely dissatisfied	1
Dissatisfied	2
Neither satisfied nor dissatisfied.	3
Satisfied	4
Extremely satisfied.	5

It was assessed after the end of the procedure.

8- Complications:

Complications for example: hypotension, bradycardia, respiratory depression, shoulder pain, nausea and vomiting, chest pain, pruritis and hypersensitivity reaction were reported and properly treated.

Hypotension was defined as decrease in the mean arterial blood pressure by more than twenty percent from the base line value before intrathecal injection. It was treated by ephedrine increments (10 mg / dose).

STATISTICAL ANALYSIS

The data obtained clinically were statistically analyzed using the Predictive Analytics Software (PASW Statistics 18).

1. **Qualitative data:** were described using number and percent. Association between categorical variables was tested using **Chi-square test**. When more than 20% of the cells have expected count less than 5, correction for chi-square was conducted using **Monte Carlo correction**.

2. **Quantitative data:** were described using median, minimum and maximum as well as mean and standard deviation.

The distributions of quantitative variables were tested for normality using **Kolmogorov-Smirnov test and Shapiro-Wilk test**.

D'Agstino test was used if there was a conflict between the two previous tests. If it reveals normal data distribution, parametric tests was applied. If the data were abnormally distributed, non-parametric tests were used.

❖ **For normally distributed data:** comparison between more than two population using **Analyzed F-test (ANOVA) and Post Hoc test (LSD)**.

❖ **For abnormally distributed data: Mann-Whitney Test** (for data distribution that was significantly deviated from normal) were used to analyze two independent population. If more than two population were analyzed **Kruskal Wallis** test to be used.

❖ Significance test results are quoted as two-tailed probabilities. Significance of the obtained results was judged at the 5% level.

RESULTS

This study was performed in Alexandria Main University Hospital on 40 adult patients of both sexes, with American Society of Anesthesiologists classification (ASA) I and II physical health status and scheduled for laparoscopic cholecystectomy by subarachnoid block technique. Subarachnoid block technique was successfully performed with no technical problems. Patients were divided into 2 groups (20 patients each).

1) Demographic data:

A. Age (years): [Tables 2. Figure 10]

In group I (Ondansetron group), it was 29.30 ± 5.98 and in group II (Control group), it was 30.15 ± 5.57 . There was no significant difference between the two groups ($P = 0.644$).

B. Weight (kilograms): [Tables 3. Figure 10]

In group I, it was 65.55 ± 8.95 and in group II, it was 67.0 ± 9.83 . There was no significant difference between the two groups ($P = 0.629$).

C. Duration of the operation (minutes): [Tables 4. Figure 10]

In group I, it was 86.60 ± 15.45 and in group II, it was 87.50 ± 14.76 . There was no significant difference between the two groups ($P = 0.852$).

D. Gender (percentage): [Tables 5. Figures 11 and 12]

In group I, there were 12 females (60%) and 8 males (40%). In group II, there were 11 females (55%) and 9 males (45%). There was no significant difference between the two groups ($P = 0.749$).

Table (2): Age differences in the two studied groups (years).

Patient No.	Age (years)	
	Group I	Group II
1	31	34
2	28	20
3	27	32
4	25	31
5	40	30
6	27	29
7	24	27
8	26	38
9	27	28
10	28	27
11	29	28
12	30	31
13	40	33
14	22	29
15	21	28
16	23	36
17	35	24
18	33	22
19	42	45
20	28	31
Min	21.0	20.0
Max	42.0	45.0
Mean	29.30	30.15
SD	5.98	5.57
t(p)	0.465 (0.644)	

t: Student t-test

Table (3): Weight differences in the two studied groups (Kg).

Patient No.	Weight	
	Group I	Group II
1	80	70
2	50	76
3	52	70
4	61	62
5	73	65
6	50	78
7	55	70
8	70	75
9	66	55
10	70	75
11	62	50
12	60	77
13	64	48
14	70	60
15	72	50
16	75	67
17	69	70
18	80	68
19	67	79
20	65	75
Min	50.0	48.0
Max	80.0	79.0
Mean	65.55	67.0
SD	8.95	9.83
t(p)	0.488 (0.629)	

t: Student t-test

Table (4): Duration of the operation differences in the two studied groups (minutes).

Patient No.	Duration of the operation (minutes)	
	Group I	Group II
1	60	83
2	75	93
3	80	72
4	89	104
5	91	66
6	80	80
7	74	107
8	65	95
9	87	75
10	92	83
11	110	101
12	65	63
13	73	92
14	79	104
15	110	99
16	103	69
17	97	76
18	107	85
19	89	115
20	106	88
Min	60.0	63.0
Max	110.0	115.0
Mean	86.60	87.50
SD	15.54	14.76
t(p)	0.188 (0.852)	

t: Student t-test

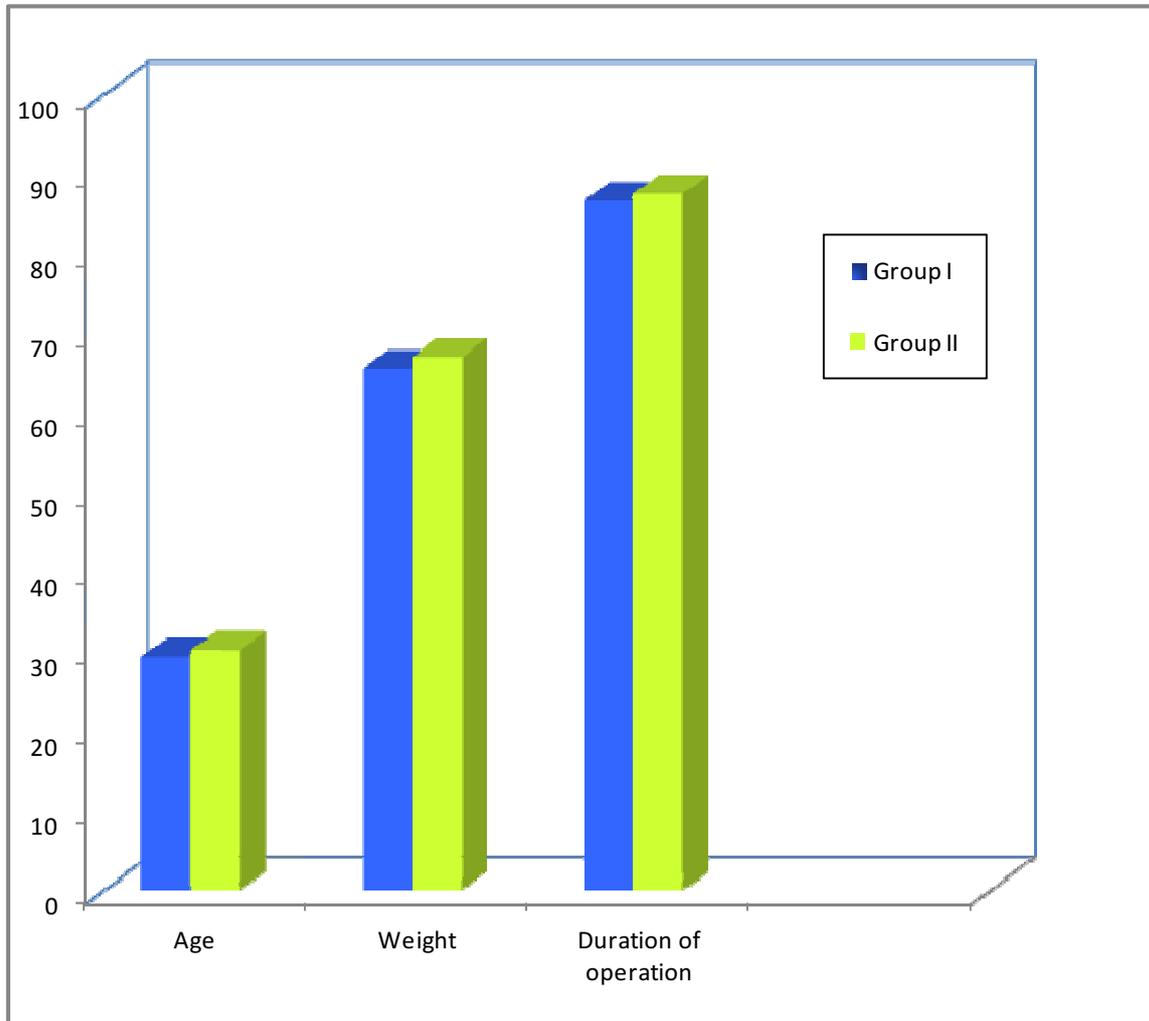


Figure (10): Age (years), weight (Kg) and duration of the operation (minutes) differences in the two studied groups.

Table (5): Sex differences in the two studied groups (percentage).

Patient No.	Sex	
	Group I	Group II
1	F	F
2	F	F
3	M	M
4	F	F
5	M	F
6	F	F
7	M	M
8	F	F
9	F	M
10	M	F
11	F	M
12	M	F
13	F	M
14	M	F
15	F	M
16	M	M
17	F	F
18	F	F
19	F	M
20	M	M
Females	12(60%)	11(55%)
Males	8(40%)	9(45%)
$\chi^2(p)$	0.102 (0.749)	

χ^2 : Chi square test

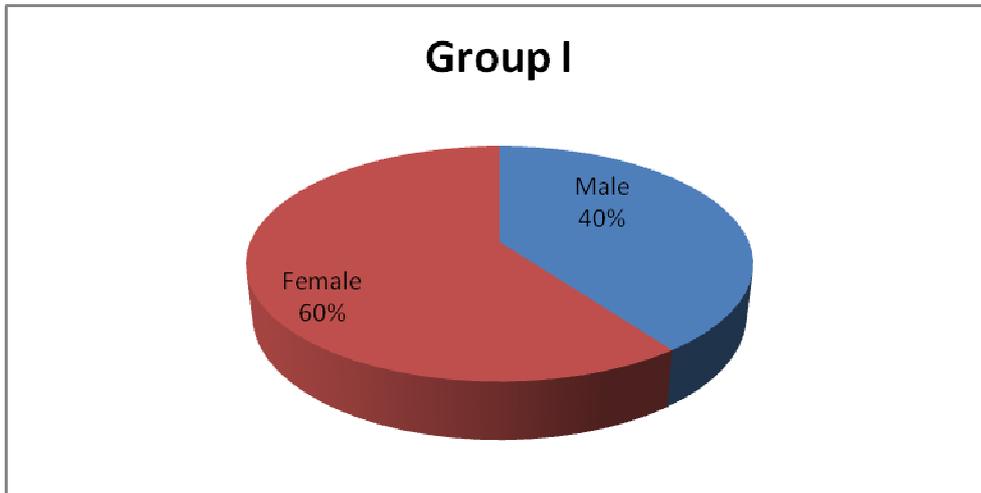


Figure (11): Sex differences in group I.

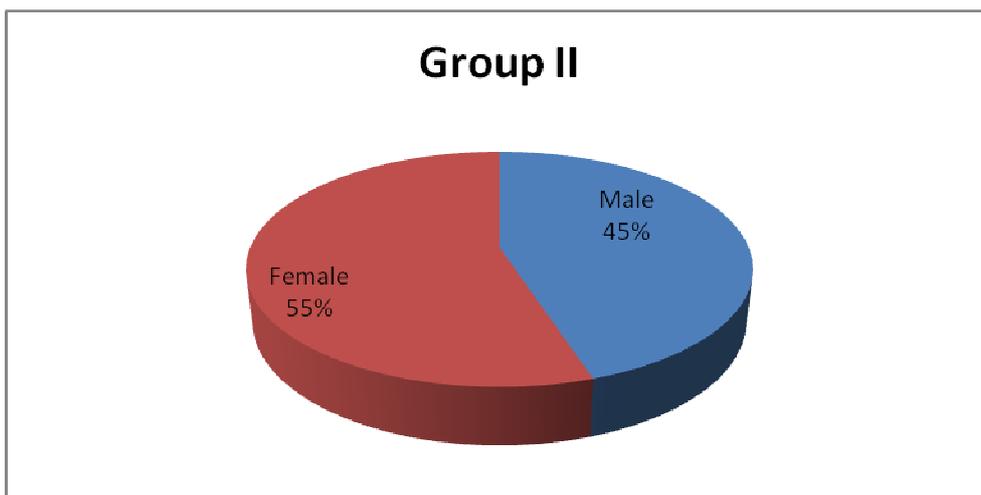


Figure (12): Sex differences in group II.

2) Heart rate (beats per minute):

- **In group I: [Tables 6]**

It was 88.95 ± 6.08 immediately before intrathecal injection. It increased insignificantly to 89.10 ± 6.55 and 89.90 ± 4.83 immediately and 5 minutes after intrathecal injection, it increased insignificantly also to 90.85 ± 5.32 , 92.40 ± 4.99 after 4 and 5 hours postoperatively. It decreased insignificantly to 87.55 ± 6.27 , 87.45 ± 6.02 , 85.85 ± 5.33 , 85.70 ± 3.48 , 85.75 ± 2.71 , 84.35 ± 2.94 , 84.75 ± 8.50 , 87.20 ± 5.43 , 88.70 ± 7.64 after 10, 15, 30, 45, 60, 75, 90, 105 and 120 minutes from intrathecal injection respectively. It decreased insignificantly to 88.85 ± 6.75 , 87.60 ± 6.50 , 84.40 ± 6.95 and 84.55 ± 6.13 after 1, 2, 3 and 6 hours postoperatively after the end of surgery respectively.

- **In group II: [Tables 7]**

It was 89.10 ± 5.39 immediately before intrathecal injection. It decreased insignificantly to 86.80 ± 6.46 , 83.30 ± 5.55 , 81.40 ± 7.21 and 80.70 ± 7.33 immediately and 5, 10, 15 minutes respectively after intrathecal injection. It decreased significantly to 78.80 ± 4.71 , 79.45 ± 5.84 , 79.0 ± 5.96 , 77.90 ± 4.84 and 79.0 ± 6.68 at 30, 45, 60, 75 and 90 minutes after intrathecal injection respectively. It also decreased insignificantly to 80.95 ± 5.84 and 83.95 ± 6.04 105 and 120 minutes after intrathecal injection respectively. Also it decreased insignificantly to 83.50 ± 6.08 , 87.60 ± 6.18 , 86.35 ± 7.36 and 83.60 ± 5.52 after 1, 2, 3 and 6 hours postoperatively respectively. It increased insignificantly to 89.35 ± 6.04 and 92.05 ± 4.15 after 4 and 5 hours postoperatively respectively.

- **Comparison between the two groups: [Tables 8. Figure 13]**

There was no significant change immediately after intrathecal injection. It was significantly lower in group II than in group I at 5, 10, 15, 30, 45, 60, 75, 90, 105 and 120 minutes after intrathecal injection and at one hour postoperatively. There was no significant difference between the two groups at 2, 3, 4, 5 and 6 hours postoperatively.

Table (6): Changes of the heart rate in group I (beats per minutes).

Group I (Ondansetron group)	Heart rate (beats per minute)																	
	Preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	86	93	95	93	92	86	90	89	81	89	80	95	95	87	81	85	95	83
2	91	94	81	94	93	90	90	88	81	87	89	76	84	93	95	98	100	95
3	92	95	92	90	91	91	82	87	80	83	85	94	88	76	76	79	89	75
4	78	91	89	91	91	90	89	83	85	85	94	93	90	88	76	95	95	80
5	93	94	94	79	79	84	91	82	85	87	80	87	95	86	80	85	90	89
6	94	87	90	90	91	86	88	86	87	80	91	93	92	94	76	93	90	80
7	95	94	93	95	95	90	90	88	85	85	95	95	85	93	95	94	95	85
8	83	75	95	94	94	87	87	88	87	87	80	95	75	85	91	95	98	85
9	95	91	94	86	85	90	81	85	87	81	80	94	95	94	81	92	96	91
10	93	94	94	81	81	77	82	87	89	88	91	95	75	89	76	94	90	75
11	83	92	94	81	82	90	87	86	85	87	89	76	87	87	85	90	95	90
12	93	93	92	76	76	75	81	83	83	82	87	85	95	94	79	81	85	80
13	83	77	84	89	90	91	85	84	90	80	80	95	88	75	94	94	97	90
14	81	84	93	90	90	85	85	90	80	83	87	83	95	83	91	90	92	93
15	94	91	88	95	92	80	88	80	86	81	90	82	92	94	95	95	93	90
16	94	83	86	88	88	90	80	85	80	82	92	78	95	94	80	92	95	80
17	92	76	80	85	83	91	86	87	83	82	80	95	76	77	85	96	97	83
18	87	93	91	95	95	75	84	89	85	88	88	93	92	89	80	84	80	75
19	95	90	91	81	83	84	86	82	83	88	92	75	91	94	87	90	85	83
20	77	95	82	78	78	85	82	86	85	90	94	95	92	80	85	95	91	89
Min	77.0	75.0	80.0	76.0	76.0	75.0	80.0	80.0	80.0	80.0	80.0	75.0	75.0	75.0	76.0	79.0	80.0	75.0
Max	95.0	95.0	95.0	95.0	95.0	91.0	91.0	90.0	90.0	90.0	95.0	95.0	95.0	94.0	95.0	98.0	100.0	95.0
Mean	88.95	89.10	89.90	87.55	87.45	85.85	85.70	85.75	84.35	84.75	87.20	88.70	88.85	87.60	84.40	90.85	92.40	84.55
SD	6.08	6.55	4.83	6.27	6.02	5.33	3.48	2.71	2.94	3.24	5.43	7.64	6.75	6.50	6.95	5.32	4.99	6.13
Mean diff. (p)		0.150 (NS)	0.950	-1.40	-1.50	-3.10	-3.25	-3.20	-4.60	-4.20	-1.75	-0.250	-0.100	-1.35	-4.55	1.90	3.45	-4.40

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

Table (7): Changes of the heart rate in group II (beats per minutes)..

Group II (Control group)	Heart rate (beats per minute)																	
	Preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	94	91	84	88	86	83	74	76	85	74	90	90	90	88	94	76	95	89
2	94	94	70	88	87	83	81	73	80	71	75	73	78	94	84	85	90	85
3	93	82	84	87	87	84	86	86	85	86	83	90	78	75	94	94	93	90
4	94	83	89	74	74	81	79	75	75	70	75	86	76	80	94	87	95	85
5	82	75	89	85	87	82	86	85	78	85	88	80	90	80	75	92	91	76
6	94	82	77	78	79	85	85	74	70	70	80	80	77	94	89	94	93	85
7	78	80	84	69	70	74	71	77	85	71	87	88	72	82	84	91	93	80
8	86	95	89	84	82	82	80	74	78	71	75	88	80	87	94	96	89	87
9	84	84	86	88	88	83	86	70	83	80	84	90	90	94	94	94	97	92
10	94	93	89	70	69	74	75	86	76	87	87	74	81	87	75	76	82	75
11	90	80	85	88	88	82	83	71	84	74	75	83	88	93	83	88	90	80
12	89	92	80	75	76	77	85	82	71	76	76	90	79	94	79	94	95	78
13	83	81	74	72	72	80	79	86	77	87	75	88	90	84	89	88	92	85
14	94	86	78	70	69	75	85	75	78	74	75	87	90	91	77	89	90	76
15	88	89	79	80	80	75	71	82	81	83	83	81	80	86	94	88	93	85
16	86	95	89	88	87	70	82	86	72	87	88	72	82	94	93	94	96	90
17	91	88	89	87	92	81	75	71	79	83	85	87	90	78	89	93	96	89
18	94	78	87	87	74	70	85	85	74	87	75	78	89	94	80	94	93	80
19	94	95	82	88	85	81	71	86	72	85	75	84	90	92	91	94	96	89
20	80	93	82	82	82	74	70	80	75	79	88	90	80	85	75	80	82	76
Min	78.0	75.0	70.0	69.0	69.0	70.0	70.0	70.0	70.0	70.0	75.0	72.0	72.0	75.0	75.0	76.0	82.0	75.0
Max	94.0	95.0	89.0	88.0	92.0	85.0	86.0	86.0	85.0	87.0	90.0	90.0	90.0	94.0	94.0	96.0	97.0	92.0
Mean	89.10	86.80	83.30	81.40	80.70	78.80	79.45	79.0	77.90	79.0	80.95	83.95	83.50	87.60	86.35	89.35	92.05	83.60
SD	5.39	6.46	5.55	7.21	7.33	4.71	5.84	5.96	4.84	6.68	5.84	6.04	6.08	6.18	7.36	6.04	4.15	5.52
Mean diff. (p)		-2.300	-5.800	-7.700	-8.400	-10.300 ($<0.001^*$)	-9.650 (0.001^*)	-10.100 (0.005^*)	-11.200 (0.001^*)	-10.100 (0.010^*)	-8.150	-5.150	-5.600	-1.500	-2.750	0.250	2.950	-5.500

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

*: Statistically significant at $p \leq 0.05$

Table (8): Heart rate changes in the two studied groups (beats per minutes).

Groups	Heart rate (beats per minute)																	
	preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
Group I (Ondansetron)																		
Min	77.0	75.0	80.0	76.0	76.0	75.0	80.0	80.0	80.0	80.0	80.0	75.0	75.0	75.0	76.0	79.0	80.0	75.0
Max	95.0	95.0	95.0	95.0	95.0	91.0	91.0	90.0	90.0	90.0	95.0	95.0	95.0	94.0	95.0	98.0	100.0	95.0
Mean	88.95	89.10	89.90	87.55	87.45	85.85	85.70	85.75	84.35	84.75	87.20	88.70	88.85	87.60	84.40	90.85	92.40	84.55
SD	6.08	6.55	4.83	6.27	6.02	5.33	3.48	2.71	2.94	3.24	5.43	7.64	6.75	6.50	6.95	5.32	4.99	6.13
Group II (Control)																		
Min	78.0	75.0	70.0	69.0	69.0	70.0	70.0	70.0	70.0	70.0	75.0	72.0	72.0	75.0	75.0	76.0	82.0	75.0
Max	94.0	95.0	89.0	88.0	92.0	85.0	86.0	86.0	85.0	87.0	90.0	90.0	90.0	94.0	94.0	96.0	97.0	92.0
Mean	89.10	86.80	83.30	81.40	80.70	78.80	79.45	79.0	77.90	79.0	80.95	83.95	83.50	87.60	86.35	89.35	92.05	83.60
SD	5.39	6.46	5.55	7.21	7.33	4.71	5.84	5.96	4.84	6.68	5.84	6.04	6.08	6.18	7.36	6.04	4.15	5.52
t	0.083	1.118	4.013*	2.879*	3.181*	4.431*	4.114*	4.607*	5.089*	3.463*	3.508*	2.182*	2.634*	0.0	0.862	0.833	0.241	0.515
p	0.935	0.271	<0.001*	0.007*	0.003*	<0.001*	<0.001*	<0.001*	<0.001*	0.002*	0.001*	0.035*	0.012*	1.000	0.394	0.410	0.811	0.610

t: Student t-test

*: Statistically significant at $p \leq 0.05$

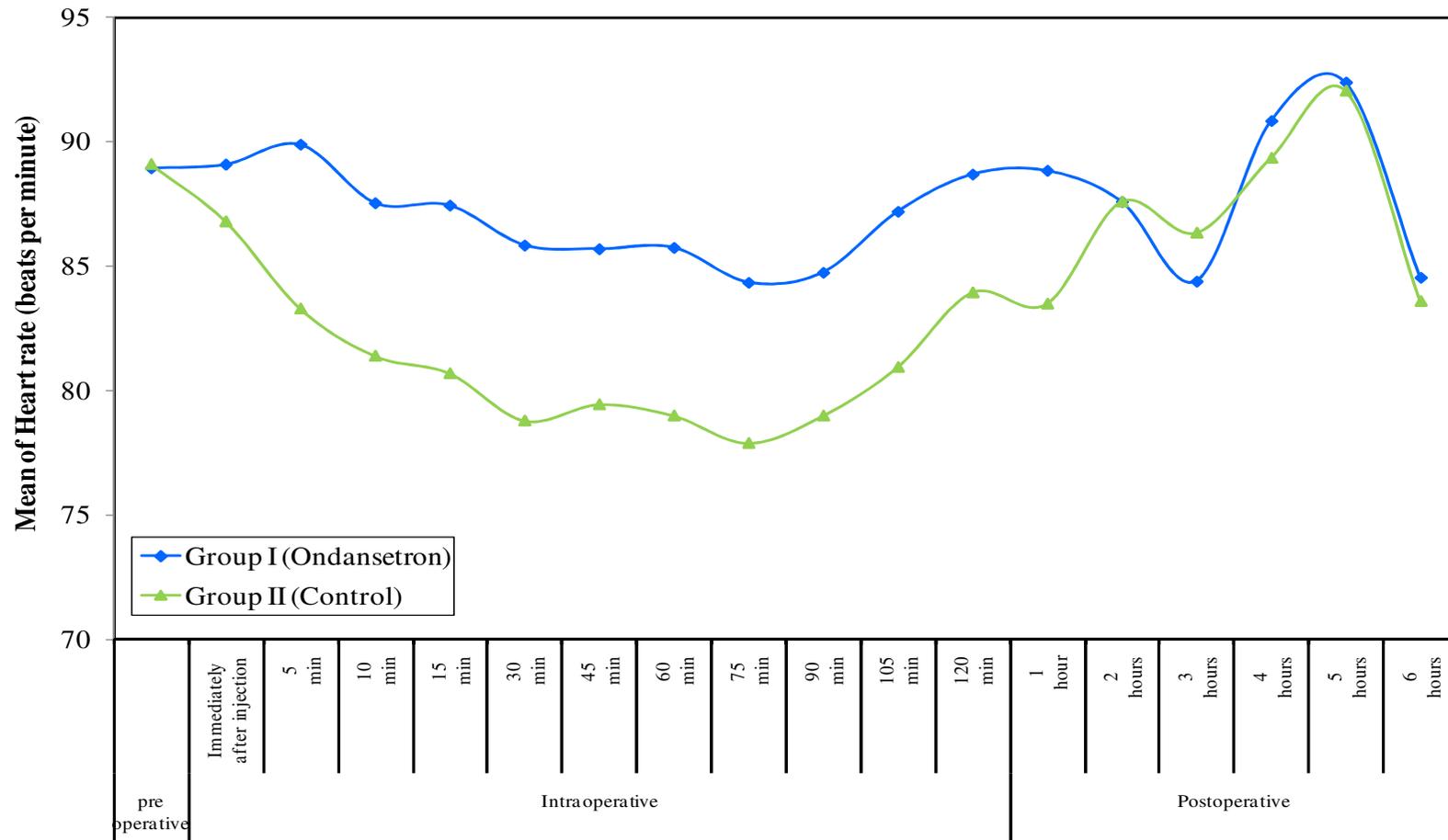


Figure (13): Heart rate changes in the two studied groups (beats per minutes).

3) Mean arterial blood pressure (MABP) (mmHg):

- **In group I: [Tables 9]**

It was 92.95 ± 3.68 mmHg immediately before intrathecal injection. It decreased insignificantly to 92.85 ± 3.20 , 91.95 ± 3.87 immediately and 5 minutes after intrathecal injection. It decreased significantly to 84.65 ± 3.94 , 85.35 ± 2.81 and 85.90 ± 3.24 after 10, 15 and 30 minutes after intrathecal injection. There were no other significant changes throughout the times of measurement intra or postoperatively.

- **In group II : [Tables 10]**

It was 92.95 ± 4.32 mmHg immediately before intrathecal injection. It decreased insignificantly to 92.45 ± 4.42 and 92.05 ± 3.12 immediately and 5 minutes after intrathecal injection. It decreased significantly to 79.05 ± 3.35 , 80.10 ± 2.94 , 80.95 ± 3.78 , 82.15 ± 3.25 , 82.55 ± 4.99 and 83.75 ± 4.83 after 10, 15, 30, 45, 60 and 75 minutes after intrathecal injection respectively. There were no other significant changes throughout the times of measurement intra or postoperatively.

- **Comparison between the two groups: [Tables 11. Figure 14]**

There was no significant difference between the two groups immediately and at 5 minutes after intrathecal injection. It was significantly lower in group II than in group I at 10, 15, 30, 45, 60, 75, 90, 105 and 120 minutes after intrathecal injection. There was no significant difference between the two groups in the postoperative period.

Table (9): Changes of the MABP in group I.

Group I (Ondansetron group)	MABP (mmHg)																	
	Preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	86	92	97	88	85	86	94	85	95	98	90	85	92	93	90	89	94	89
2	91	97	85	80	81	86	84	82	86	88	87	98	96	93	93	92	95	91
3	86	95	93	80	90	81	90	95	90	95	93	98	92	97	88	89	94	90
4	93	92	98	84	87	88	95	84	96	87	92	85	88	93	86	93	91	91
5	97	96	91	87	84	90	85	87	85	92	91	93	97	88	85	90	94	91
6	98	97	92	90	87	87	91	95	91	95	94	94	90	90	89	92	90	90
7	96	90	89	90	85	89	85	88	87	87	93	94	92	87	89	92	93	92
8	93	93	92	80	86	89	90	85	93	90	97	89	98	86	93	93	95	91
9	95	88	89	80	83	82	83	86	86	87	93	87	89	94	90	98	99	96
10	91	95	95	80	81	89	90	95	90	87	96	89	90	92	89	96	92	95
11	93	97	95	82	86	80	90	89	92	98	92	96	91	97	91	93	96	92
12	97	96	87	83	86	82	83	88	85	92	97	92	86	87	93	95	94	94
13	97	96	86	90	80	82	85	86	84	89	93	88	85	93	87	89	92	89
14	92	88	97	83	86	89	96	86	94	89	98	87	94	85	94	95	94	94
15	96	92	94	81	90	90	94	90	92	95	92	94	87	87	92	93	91	92
16	96	87	91	85	82	84	83	95	85	94	98	93	90	98	80	89	93	90
17	91	92	91	85	86	86	89	85	90	94	97	88	89	85	90	94	95	93
18	89	93	94	90	88	83	91	89	93	87	92	90	97	96	96	94	93	94
19	88	90	96	90	88	88	84	88	85	85	95	89	98	98	85	90	86	91
20	4	91	87	85	86	87	81	88	85	96	97	91	93	95	93	95	92	95
Min	86.0	87.0	85.0	80.0	80.0	80.0	81.0	82.0	84.0	85.0	87.0	85.0	85.0	85.0	80.0	89.0	86.0	89.0
Max	98.0	97.0	98.0	90.0	90.0	90.0	96.0	95.0	96.0	98.0	98.0	98.0	98.0	98.0	96.0	98.0	99.0	96.0
Mean	92.95	92.85	91.95	84.65	85.35	85.90	88.15	88.30	89.20	91.25	93.85	91.0	91.70	91.70	89.65	92.55	93.15	92.0
SD	3.68	3.20	3.87	3.94	2.81	3.24	4.60	3.92	3.93	4.13	2.96	3.93	3.96	4.49	3.79	2.61	2.62	2.08
Mean diff. (p)		-0.10	-1.0	-8.30* ($<0.001^*$)	-7.60* ($<0.001^*$)	-7.05* ($<0.001^*$)	-4.80	-4.65	-3.75	-1.70	0.90	-1.95	-1.25	-1.25	-3.30	-0.40	0.20	-0.950

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

*: Statistically significant at $p \leq 0.05$

Table (10): Changes of the MABP in group II.

Group II (Control group)	MABP (mmHg)																	
	Preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	100	100	87	76	80	84	80	77	79	86	83	89	93	95	95	88	95	87
2	103	92	95	77	80	85	83	73	78	98	86	92	98	89	86	94	93	95
3	93	95	92	75	85	84	85	90	94	90	89	91	94	96	86	95	92	93
4	100	103	97	81	82	75	78	80	81	82	96	84	87	101	99	93	97	92
5	94	94	90	83	83	84	82	77	81	82	87	86	95	100	93	94	94	93
6	91	90	88	84	84	81	79	85	79	95	98	97	98	86	86	96	93	96
7	95	92	90	82	81	85	88	84	93	83	96	85	103	102	95	88	87	86
8	91	99	93	84	80	80	82	90	85	83	97	84	87	98	100	95	90	96
9	98	95	95	84	82	84	85	84	86	90	82	95	92	86	96	101	102	98
10	87	90	90	78	80	75	78	76	81	86	89	97	88	97	86	90	92	89
11	87	93	93	81	82	81	84	84	85	98	84	84	96	97	97	95	93	93
12	92	96	92	75	75	77	78	83	79	87	92	84	103	86	92	91	95	93
13	90	100	97	80	81	81	85	90	86	94	92	90	89	88	90	90	96	92
14	90	88	92	75	78	85	88	82	90	82	90	84	89	97	86	90	95	91
15	94	92	89	77	76	85	82	84	79	94	86	85	90	103	89	87	90	89
16	92	90	88	81	78	85	83	81	81	81	87	91	96	89	90	94	95	92
17	90	96	92	75	77	77	81	90	84	93	88	94	98	86	90	93	97	93
18	90	99	98	75	84	78	85	82	90	81	83	84	86	103	86	99	98	97
19	91	87	91	80	75	77	79	82	83	84	86	84	100	96	91	93	95	91
20	91	98	92	78	79	76	78	77	81	90	85	84	87	86	93	98	100	98
Min	87.0	87.0	87.0	75.0	75.0	75.0	78.0	73.0	78.0	81.0	82.0	84.0	86.0	86.0	86.0	87.0	87.0	86.0
Max	103.0	103.0	98.0	84.0	85.0	85.0	88.0	90.0	94.0	98.0	98.0	97.0	103.0	103.0	100.0	101.0	102.0	98.0
Mean	92.95	92.45	92.05	79.05	80.10	80.95	82.15	82.55	83.75	87.95	88.80	88.20	93.45	94.05	91.30	93.20	94.45	92.70
SD	4.32	4.42	3.12	3.35	2.94	3.78	3.25	4.99	4.83	5.80	4.92	4.79	5.46	6.36	4.60	3.74	3.49	3.36
Mean diff. (p)		1.500	-0.900	-13.90* ($<0.001^*$)	-12.85* ($<0.001^*$)	-12.00* ($<0.001^*$)	-10.80* ($<0.001^*$)	-10.40* (0.001^*)	-9.20* (0.003^*)	-5.000	-4.150	-4.750	0.500	1.100	-1.650	0.250	1.500	0.250

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

*: Statistically significant at $p \leq 0.05$

Table (11): Changes of the MABP in the two studied groups.

Groups	MABP (mmHg)																	
	preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
Group I (Ondansetron)																		
Min	86.0	87.0	85.0	80.0	80.0	80.0	81.0	82.0	84.0	85.0	87.0	85.0	85.0	85.0	80.0	89.0	86.0	89.0
Max	98.0	97.0	98.0	90.0	90.0	90.0	96.0	95.0	96.0	98.0	98.0	98.0	98.0	98.0	96.0	98.0	99.0	96.0
Mean	92.95	92.85	91.95	84.65	85.35	85.90	88.15	88.30	89.20	91.25	93.85	91.0	91.70	91.70	89.65	92.55	93.15	92.0
SD	3.68	3.20	3.87	3.94	2.81	3.24	4.60	3.92	3.93	4.13	2.96	3.93	3.96	4.49	3.79	2.61	2.62	2.08
Group II (Control)																		
Min	87.0	87.0	87.0	75.0	75.0	75.0	78.0	73.0	78.0	81.0	82.0	84.0	86.0	86.0	86.0	87.0	87.0	86.0
Max	103.0	103.0	98.0	84.0	85.0	85.0	88.0	90.0	94.0	98.0	98.0	97.0	103.0	103.0	100.0	101.0	102.0	98.0
Mean	92.95	92.45	92.05	79.05	80.10	80.95	82.15	82.55	83.75	87.95	88.80	88.20	93.45	94.05	91.30	93.20	94.45	92.70
SD	4.32	4.42	3.12	3.35	2.94	3.78	3.25	4.99	4.83	5.80	4.92	4.79	5.46	6.36	4.60	3.74	3.49	3.36
t	0.0	1.312	0.090	4.846*	5.772*	4.447*	4.763*	4.052*	3.914*	2.073*	3.935*	2.021*	1.160	1.350	1.238	0.638	1.333	0.793
p	1.000	0.198	0.929	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	0.045*	<0.001*	0.050*	0.253	0.186	0.223	0.527	0.191	0.433

t: Student t-test

*: Statistically significant at $p \leq 0.05$

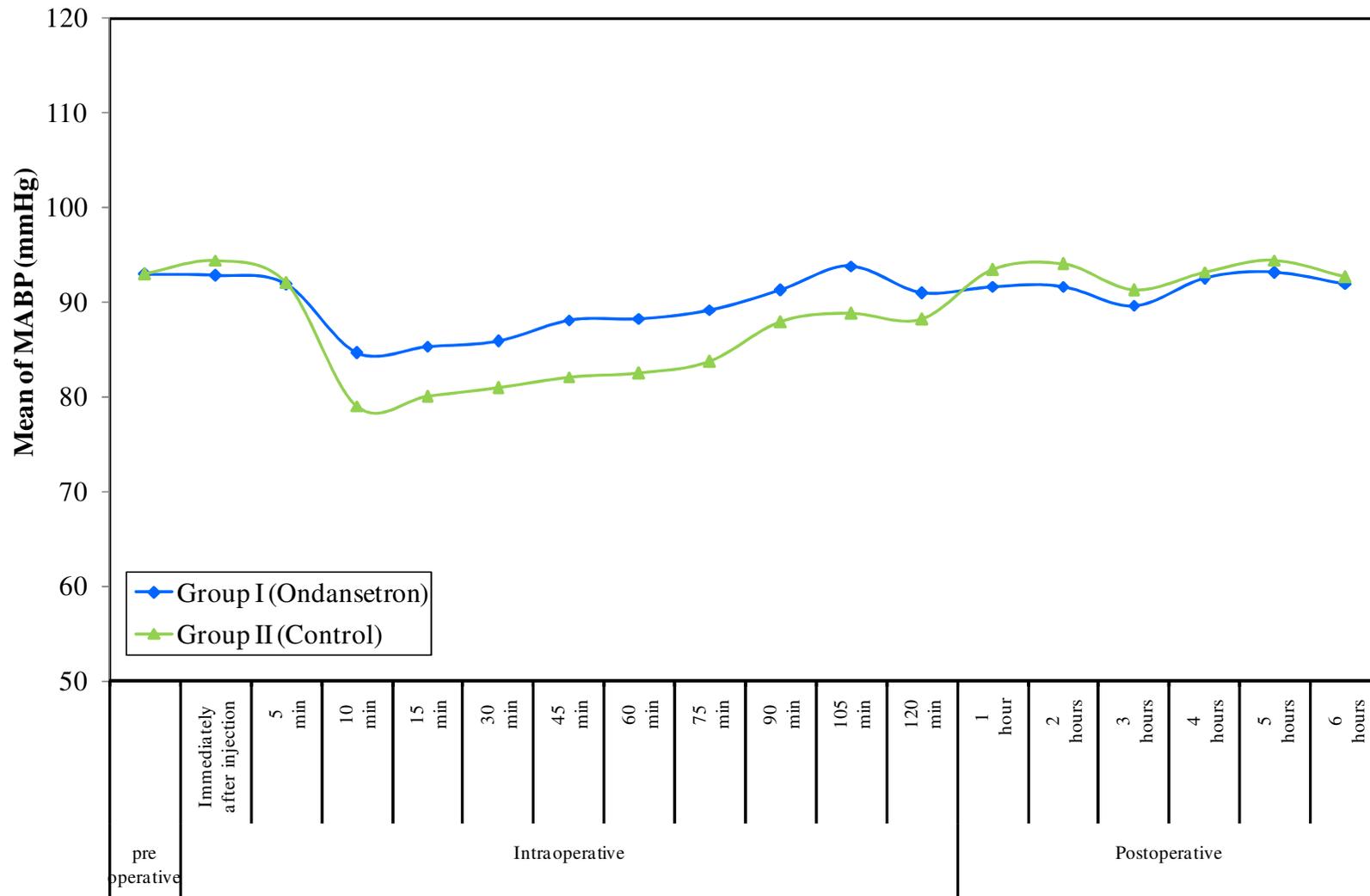


Figure (14): Changes of the MABP in the two studied groups..

4) Arterial oxygen saturation (SpO₂%):

- **In group I: [Tables 12]**

It was 97.15 ± 1.04 % immediately before intrathecal injection. There were no significant changes throughout the times of measurement intra or postoperatively.

- **In group II: [Tables 13]**

It was 97.50 ± 1.47 % immediately before intrathecal injection. There were no significant changes throughout the times of measurement intra or postoperatively.

- **Comparison between the two groups: [Tables 14. Figure 15]**

There was no significant difference between the two studied groups throughout intra and postoperative periods.

Table (12): Changes of the arterial oxygen saturation in group I

Group I (Ondansetron group)	Arterial oxygen saturation																	
	Preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	97	95	98	96	96	96	97	97	97	98	98	98	97	95	98	98	97	97
2	98	99	100	99	100	99	98	99	98	99	98	98	98	99	100	99	100	99
3	97	99	100	99	99	100	99	99	98	99	99	98	97	99	100	99	99	100
4	96	97	95	98	96	97	96	96	98	96	98	96	96	97	95	98	96	98
5	96	95	92	94	95	97	95	96	96	98	98	96	96	95	92	96	95	99
6	95	92	93	95	97	95	96	96	96	98	98	97	95	92	93	97	97	96
7	98	97	96	98	98	96	96	96	98	97	97	98	98	97	96	98	98	97
8	97	97	95	96	99	98	97	95	97	97	98	98	97	97	95	96	99	98
9	99	98	98	97	98	97	98	95	96	97	97	96	99	98	98	99	98	97
10	97	96	97	95	96	96	97	96	96	97	97	98	97	96	97	95	96	96
11	98	99	98	98	97	95	94	95	94	95	95	96	98	99	98	98	97	96
12	97	95	97	98	96	95	96	97	97	97	98	97	97	95	97	98	96	95
13	96	95	96	95	94	96	98	97	98	98	99	98	96	95	96	99	94	96
14	97	97	95	96	95	97	97	96	97	97	97	97	97	97	95	98	95	98
15	99	98	98	97	96	96	97	96	96	97	97	97	99	98	98	99	96	96
16	98	98	100	99	100	99	98	99	98	99	98	98	98	98	100	99	100	99
17	98	97	100	99	99	100	99	99	98	99	99	98	98	97	100	99	99	100
18	97	96	95	98	96	97	96	96	98	96	98	96	97	96	95	98	96	97
19	97	97	92	94	95	97	95	96	96	98	98	96	97	97	92	94	95	97
20	96	95	96	95	97	95	96	96	96	98	98	97	96	95	96	95	97	97
Min	95.0	92.0	92.0	94.0	94.0	95.0	94.0	95.0	94.0	95.0	95.0	96.0	95.0	92.0	92.0	94.0	94.0	95.0
Max	99.0	99.0	100.0	99.0	100.0	100.0	99.0	99.0	98.0	99.0	99.0	98.0	99.0	99.0	100.0	99.0	100.0	100.0
Mean	97.15	96.60	96.55	96.80	96.95	96.90	96.75	96.60	96.90	97.50	97.75	97.15	97.15	96.60	96.55	97.60	97.0	97.40
SD	1.04	1.76	2.52	1.74	1.76	1.59	1.33	1.35	1.12	1.10	0.91	0.88	1.04	1.76	2.52	1.57	1.75	1.43
Mean diff. (p)		-0.55	-0.60	-0.35	-0.20	-0.25	-0.40	-0.55	-0.25	0.35	0.60	0.0	0.0	-0.55	-0.60	0.45	-0.15	0.25

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

*: Statistically significant at $p \leq 0.05$

Table (13): Changes of the arterial oxygen saturation in group II.

Group II (Control group)	Arterial oxygen saturation																	
	Preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	96	98	97	96	97	95	96	97	98	97	97	98	96	98	97	96	97	97
2	98	97	96	98	97	98	99	98	98	98	97	97	98	97	96	98	97	98
3	99	98	97	98	99	97	98	97	97	98	98	98	99	98	97	98	99	97
4	98	98	96	97	98	98	99	96	96	96	99	96	98	98	98	97	98	98
5	96	97	95	94	96	97	96	97	97	98	98	98	96	97	97	98	96	97
6	95	96	98	98	99	98	96	96	97	97	98	96	95	96	98	98	99	98
7	99	99	98	99	97	97	95	97	96	95	98	96	99	99	98	99	97	97
8	99	98	97	96	98	97	98	98	98	98	97	98	99	98	97	96	98	97
9	97	97	95	94	95	95	94	97	96	96	97	96	97	97	97	98	97	99
10	97	95	99	98	97	96	95	97	97	98	98	98	97	96	99	98	97	96
11	98	96	97	99	97	99	97	99	99	98	98	98	98	96	97	99	97	99
12	99	98	95	97	98	98	99	95	94	96	97	97	99	98	96	97	98	98
13	98	99	99	98	95	96	97	96	96	96	98	98	98	99	99	98	97	96
14	100	99	98	99	98	99	98	97	97	98	98	96	100	99	98	99	98	99
15	97	96	99	97	96	97	98	97	98	98	97	97	97	96	99	97	98	97
16	98	97	96	98	97	98	99	98	98	98	97	97	98	97	96	98	97	98
17	98	98	96	97	98	98	99	96	96	97	99	96	98	98	96	97	98	98
18	95	96	98	98	99	98	96	96	97	97	98	96	97	96	98	98	99	98
19	95	96	98	98	99	98	96	96	97	97	96	96	97	96	98	98	99	98
20	98	96	97	99	97	99	97	99	99	98	98	98	98	96	97	99	97	99
Min	95.0	95.0	95.0	94.0	95.0	95.0	94.0	95.0	94.0	95.0	96.0	96.0	95.0	96.0	96.0	96.0	96.0	96.0
Max	100.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	98.0	99.0	98.0	100.0	99.0	99.0	99.0	99.0	99.0
Mean	97.50	97.20	97.05	97.40	97.35	97.40	97.10	96.95	97.05	97.20	97.65	97.0	97.70	97.25	97.40	97.80	97.65	97.70
SD	1.47	1.20	1.32	1.47	1.23	1.19	1.55	1.05	1.19	0.95	0.75	0.92	1.22	1.12	0.99	0.89	0.88	0.92
Mean diff. (p)		-0.30	-0.45	-0.10	-0.15	-0.10	-0.40	-0.55	-0.45	-0.30	0.15	-0.50	0.20	-0.25	-0.10	0.30	0.15	0.20

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

*: Statistically significant at $p \leq 0.05$

Table (14): Changes of the arterial oxygen saturation in the two studied groups.

Groups	Arterial oxygen saturation																	
	preoperative	Intraoperative											Postoperative					
		Immediately after injection	5 min	10 min	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
Group I (Ondansetron)																		
Min	95.0	92.0	92.0	94.0	94.0	95.0	94.0	95.0	94.0	95.0	95.0	96.0	95.0	92.0	92.0	94.0	94.0	95.0
Max	99.0	99.0	100.0	99.0	100.0	100.0	99.0	99.0	98.0	99.0	99.0	98.0	99.0	99.0	100.0	99.0	100.0	100.0
Mean	97.15	96.60	96.55	96.80	96.95	96.90	96.75	96.60	96.90	97.50	97.75	97.15	97.15	96.60	96.55	97.60	97.0	97.40
SD	1.04	1.76	2.52	1.74	1.76	1.59	1.33	1.35	1.12	1.10	0.91	0.88	1.04	1.76	2.52	1.57	1.75	1.43
Group II (Control)																		
Min	95.0	95.0	95.0	94.0	95.0	95.0	94.0	95.0	94.0	95.0	96.0	96.0	95.0	96.0	96.0	96.0	96.0	96.0
Max	100.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	98.0	99.0	98.0	100.0	99.0	99.0	99.0	99.0	99.0
Mean	97.50	97.20	97.05	97.40	97.35	97.40	97.10	96.95	97.05	97.20	97.65	97.0	97.70	97.25	97.40	97.80	97.65	97.70
SD	1.47	1.20	1.32	1.47	1.23	1.19	1.55	1.05	1.19	0.95	0.75	0.92	1.22	1.12	0.99	0.89	0.88	0.92
t	0.870	1.261	0.786	1.181	0.834	1.128	0.765	0.914	0.410	0.922	0.380	0.529	1.536	1.395	1.402	0.495	1.488	0.789
p	0.390	0.215	0.439	0.245	0.410	0.266	0.449	0.367	0.684	0.362	0.706	0.600	0.133	0.171	0.173	0.624	0.148	0.436

t: Student t-test

*: Statistically significant at $p \leq 0.05$

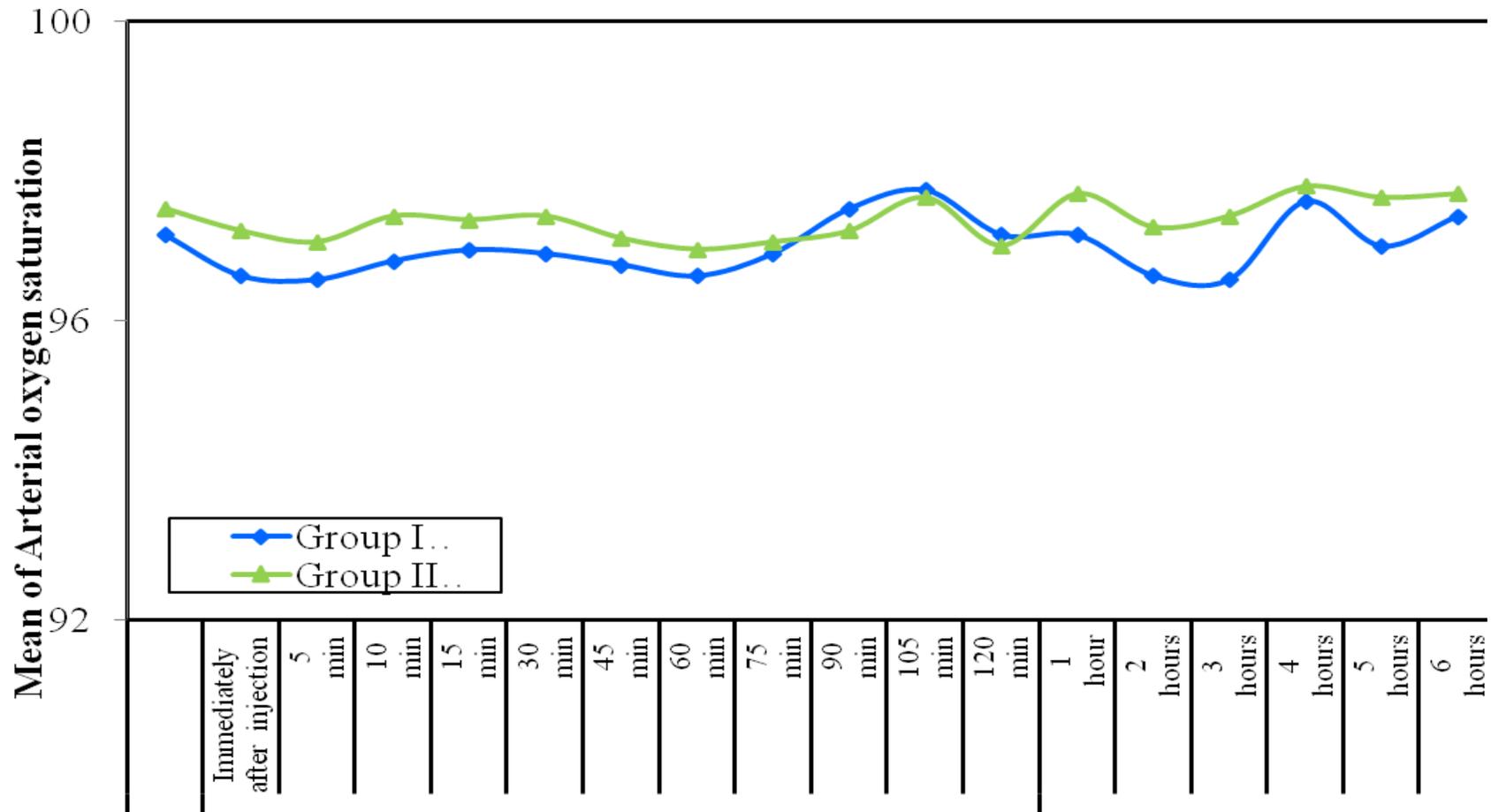


Figure (15): Changes of the arterial oxygen saturation in the two studied groups.

5) End tidal CO₂:

- **In group I: [Tables 15]**

It was 32.85 ± 1.50 immediately before intrathecal injection. It increased insignificantly to 33.05 ± 1.23 immediately after intrathecal injection. It increased significantly to 37.15 ± 1.39 , 38.40 ± 1.50 , 39.05 ± 1.36 , 39.40 ± 1.05 , 38.40 ± 1.14 , 37.10 ± 1.37 , 35.95 ± 1.15 and 34.70 ± 1.08 at 15, 30, 45, 60, 75, 90, 105 and 120 minutes after intrathecal injection respectively.

- **In group II : [Tables 16]**

It was 33.0 ± 1.56 immediately before intrathecal injection. It increased insignificantly to 33.50 ± 1.57 immediately after intrathecal injection. It increased significantly to 37.0 ± 1.26 , 38.50 ± 1.61 , 39.15 ± 1.04 , 39.10 ± 1.07 , 38.0 ± 1.26 , 36.65 ± 1.23 , 35.60 ± 1.05 and 34.60 ± 1.10 at 15, 30, 45, 60, 75, 90, 105 and 120 minutes after intrathecal injection respectively.

- **Comparison between the two groups: [Tables 17. Figure 16]**

There was no significant difference between the two groups throughout the whole intraoperative period.

Table (15): Changes of the End Tidal CO2 in group I

Group I (Ondansetron group)	End Tidal CO2 in group I									
	Preoperative	Intraoperative								
		Immediately after injection	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min
1	33	34	38	39	40	39	39	38	37	35
2	34	34	39	38	39	41	40	41	38	37
3	31	31	37	37	38	39	37	36	35	34
4	32	31	35	38	38	40	39	38	37	35
5	33	34	39	41	40	40	39	38	37	34
6	35	34	36	37	36	37	39	36	34	34
7	32	33	38	38	39	40	37	36	35	34
8	34	34	37	38	40	41	39	38	36	33
9	32	32	36	38	38	39	37	35	35	35
10	31	33	37	40	40	39	38	37	35	34
11	35	32	36	37	39	40	40	37	35	33
12	34	34	39	40	39	39	38	37	37	35
13	33	31	36	35	37	38	36	36	35	35
14	32	34	39	39	42	39	39	38	36	36
15	34	34	37	39	40	41	39	38	37	37
16	34	35	38	40	39	40	39	37	37	35
17	35	34	39	41	39	40	40	38	37	35
18	32	32	36	38	38	38	37	36	34	34
19	31	33	36	37	39	39	38	35	36	34
20	30	32	35	38	41	39	38	37	36	35
Min	30.0	31.0	35.0	35.0	36.0	37.0	36.0	35.0	34.0	33.0
Max	35.0	35.0	39.0	41.0	42.0	41.0	40.0	41.0	38.0	37.0
Mean	32.85	33.05	37.15	38.40	39.05	39.40	38.40	37.10	35.95	34.70
SD	1.50	1.23	1.39	1.50	1.36	1.05	1.14	1.37	1.15	1.08
Mean diff. (p)		0.200	4.300* ($<0.001^*$)	5.550* ($<0.001^*$)	6.200* ($<0.001^*$)	6.550* ($<0.001^*$)	5.550* ($<0.001^*$)	4.250* ($<0.001^*$)	3.100* ($<0.001^*$)	1.850* (0.008^*)

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

*: Statistically significant at $p \leq 0.05$

Table (16): Changes of the End Tidal CO₂ in group II

Group II (Control group)	End Tidal CO ₂ in group II									
	Preoperative	Intraoperative								
		Immediately after injection	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min
1	34	34	37	38	40	41	39	38	36	33
2	30	32	35	38	41	39	38	37	36	35
3	34	34	39	40	39	39	38	37	37	35
4	33	31	36	35	37	38	36	36	35	35
5	33	34	38	39	40	39	39	38	37	35
6	32	31	35	38	38	40	39	38	37	35
7	31	31	37	37	38	39	37	36	35	34
8	35	34	39	41	39	40	40	38	37	35
9	33	35	38	39	40	39	39	37	35	35
10	32	32	36	38	38	39	37	35	35	35
11	34	36	38	40	40	39	38	36	34	33
12	35	34	36	42	40	39	37	35	34	34
13	32	35	39	39	38	37	36	34	35	36
14	34	34	37	38	40	40	39	38	36	33
15	35	32	36	37	39	40	40	37	35	33
16	31	35	37	37	40	39	38	37	36	34
17	35	36	38	39	38	37	36	37	35	36
18	32	33	36	38	39	38	37	36	34	35
19	34	34	37	40	40	41	39	38	37	37
20	31	33	36	37	39	39	38	35	36	34
Min	30.0	31.0	35.0	35.0	37.0	37.0	36.0	34.0	34.0	33.0
Max	35.0	36.0	39.0	42.0	41.0	41.0	40.0	38.0	37.0	37.0
Mean	33.0	33.50	37.0	38.50	39.15	39.10	38.0	36.65	35.60	34.60
SD	1.56	1.57	1.26	1.61	1.04	1.07	1.26	1.23	1.05	1.10
Mean diff. (p)		0.500	4.000* (<0.001*)	5.500* (<0.001*)	6.150* (<0.001*)	6.100* (<0.001*)	5.000* (<0.001*)	3.650* (<0.001*)	2.600* (<0.001*)	1.600* (<0.001*)

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between pre with each other period

*: Statistically significant at $p \leq 0.05$

Table (17): Changes of the end tidal CO2 in the two studied groups.

Groups	End tidal CO2									
	Preoperative	Intraoperative								
		Immediately after injection	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min
Group I (Ondansetron group)										
Min	30.0	31.0	35.0	35.0	36.0	37.0	36.0	35.0	34.0	33.0
Max	35.0	35.0	39.0	41.0	42.0	41.0	40.0	41.0	38.0	37.0
Mean	32.85	33.05	37.15	38.40	39.05	39.40	38.40	37.10	35.95	34.70
SD	1.50	1.23	1.39	1.50	1.36	1.05	1.14	1.37	1.15	1.08
Group II (Control)										
Min	30.0	31.0	35.0	35.0	37.0	37.0	36.0	34.0	34.0	33.0
Max	35.0	36.0	39.0	42.0	41.0	41.0	40.0	38.0	37.0	37.0
Mean	33.0	33.50	37.0	38.50	39.15	39.10	38.0	36.65	35.60	34.60
SD	1.56	1.57	1.26	1.61	1.04	1.07	1.26	1.23	1.05	1.10
t	0.311	1.007	0.358	0.203	0.262	0.896	1.053	1.094	1.009	0.291
p	0.758	0.321	0.722	0.840	0.795	0.376	0.299	0.281	0.319	0.773

t: Student t-test

*: Statistically significant at $p \leq 0.05$

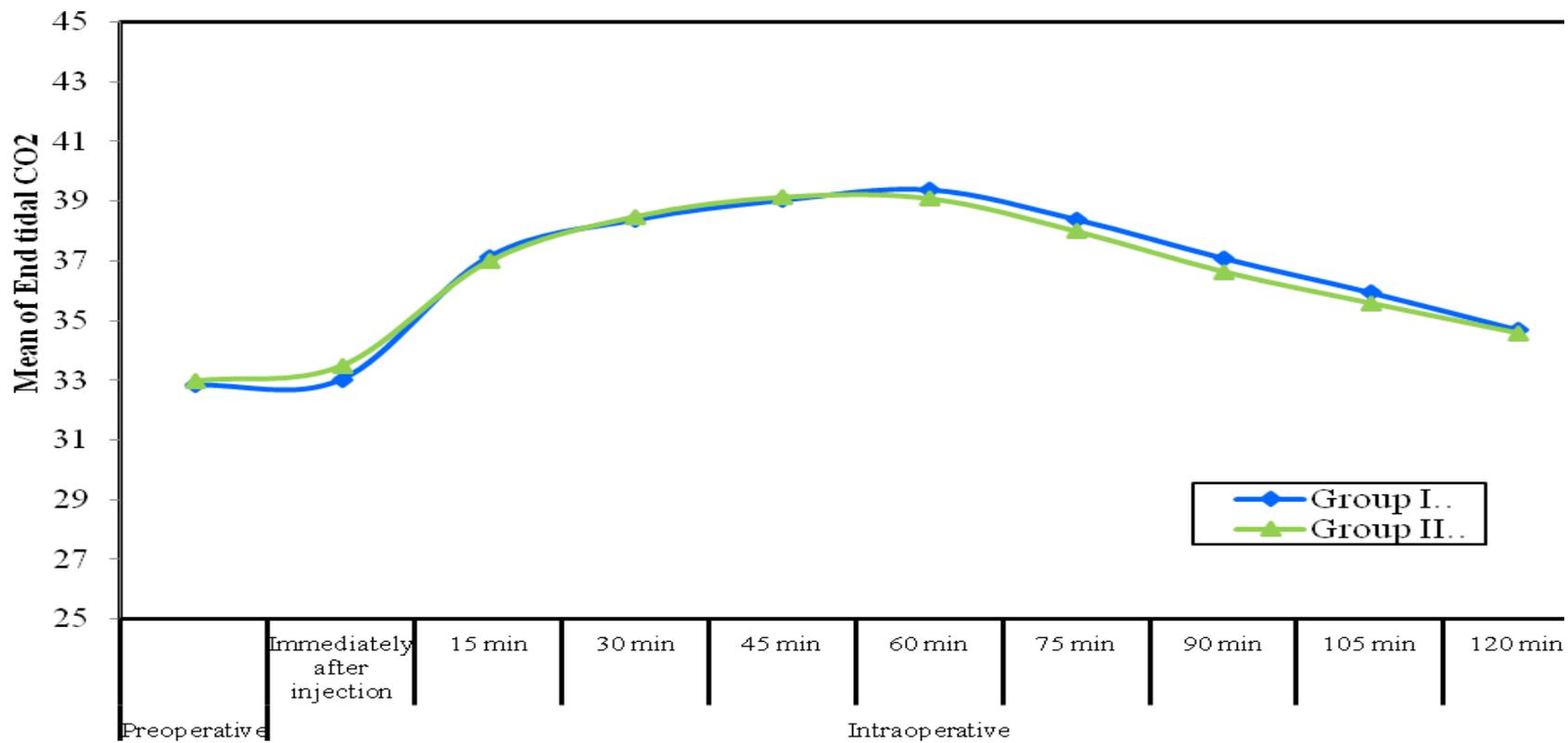


Figure (16): Changes of the end tidal CO2 in the two studied groups.

6) Nausea and vomiting score:

- **In group I: [Table 18]**

It increased insignificantly from 0 immediately before intrathecal injection to 0.05, 0.10, 0.05 and 0.05 at 15, 30, 60 and 105 minutes after intrathecal injection respectively. It also increased insignificantly to 0.05, 0.10, 0.20 and 0.20 at 1, 2, 3 and 4 hours postoperatively respectively.

- **In group II: [Table 19]**

It increased significantly from 0 immediately before intrathecal injection to 0.50, 0.40, 0.40 and 0.25, at 15, 30, 45 and 75 minutes respectively after intrathecal injection. It also increased significantly to 0.35, 0.45, 0.50 and 0.30 at 1, 2, 3 and 4 hours postoperatively respectively.

- **Comparison between the two groups: [Table 20. Figure 17]**

It was significantly higher in group II than in group I at 15, 45 and 75 minutes after intrathecal injection intraoperatively and at 5 hours postoperatively. There were no other significant differences between the two groups intra and postoperatively.

Table (18): Changes of nausea and vomiting score in group I.

Group I (Ondansetron group)	Nausea and Vomiting score														
	Preoperative	Intraoperative								Postoperative					
		15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0
9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
14	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0 (%)	20 (100.0)	19 (95.0)	18 (90.0)	20 (100)	19 (95.0)	20 (100)	20 (100)	19 (95.0)	20 (100)	19 (95.0)	18 (90.0)	18 (90.0)	17 (85.0)	20 (100)	20 (100)
1 (%)	0 (0.0)	1 (5.0)	2 (10.0)	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	1 (5.0)	0 (0.0)	1 (5.0)	2 (10.0)	2 (10.0)	2 (10.0)	0 (0.0)	0 (0.0)
2 (%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max	0.0	1.0	1.0	0.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	2.0	0.0	0.0
Mean	0.0	0.05	0.10	0.0	0.05	0.0	0.0	0.05	0.0	0.05	0.10	0.10	0.20	0.0	0.0
SD	0.0	0.22	0.31	0.0	0.22	0.0	0.0	0.22	0.0	0.22	0.31	0.31	0.52	0.0	0.0
Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean diff. (p)		(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)	(>0.05)

p: p value for Wilcoxon signed ranks test between Preoperative and each other periods

Table (19): Changes of nausea and vomiting score in group II.

Group II (Control group)	Nausea and Vomiting score														
	Preoperative	Intraoperative								Postoperative					
		15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	
2	0	0	0	0	1	0	2	0	0	0	0	0	0	0	
3	0	0	0	1	0	1	0	0	0	0	1	0	0	0	
4	0	1	0	0	0	0	0	0	0	1	2	0	0	0	
5	0	0	0	2	0	0	0	1	0	0	2	0	1	1	
6	0	0	1	0	0	1	0	0	0	0	0	2	0	0	
7	0	2	0	0	0	1	0	0	0	0	1	0	0	0	
8	0	0	0	1	0	0	0	0	0	1	2	0	1	0	
9	0	1	0	0	0	1	0	0	0	0	0	1	0	0	
10	0	0	0	0	0	1	2	0	0	0	0	2	0	1	
11	0	0	2	0	0	0	0	1	0	0	1	2	1	0	
12	0	0	0	2	1	0	0	0	0	2	0	0	0	0	
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	0	1	2	0	0	0	0	0	0	0	0	1	0	0	
15	0	2	0	0	0	0	1	0	0	2	0	1	1	2	
16	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
17	0	1	0	0	0	0	0	0	0	0	0	1	0	0	
18	0	0	2	0	0	0	0	0	0	0	0	0	0	0	
19	0	2	0	0	0	0	0	0	0	0	0	0	0	0	
20	0	0	0	0	0	0	0	1	0	1	0	0	1	1	
0 (%)	20 (100.0)	13 (65.0)	15 (75.0)	15 (75.0)	18 (90.0)	15 (75.0)	17 (85.0)	17 (85.0)	20(100.0)	15 (75.0)	14 (70.0)	13 (65.0)	14 (70.0)	16 (80.0)	
1 (%)	0 (0.0)	4 (20.0)	2 (10.0)	2 (10.0)	2 (10.0)	5 (25.0)	1 (5.0)	3 (15.0)	0 (0.0)	3 (15.0)	3 (15.0)	4 (20.0)	6 (30.0)	3 (15.0)	
2 (%)	0 (0.0)	3 (15.0)	3 (15.0)	3 (15.0)	0 (0.0)	0 (0.0)	2 (10.0)	0 (0.0)	0 (0.0)	2 (10.0)	3 (15.0)	3 (15.0)	0 (0.0)	1 (5.0)	
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Max	0.0	2.0	2.0	2.0	1.0	1.0	2.0	1.0	0.0	2.0	2.0	2.0	1.0	2.0	
Mean	0.0	0.50	0.40	0.40	0.10	0.25	0.15	0.15	0.0	0.35	0.45	0.50	0.30	0.25	
SD	0.0	0.76	0.75	0.75	0.31	0.44	0.64	0.37	0.0	0.67	0.76	0.76	0.47	0.55	
Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Mean diff. (p)		0.015*	0.038*	0.038*	(>0.05)	0.025*	(>0.05)	(>0.05)	(>0.05)	0.038*	0.024*	0.015*	0.014*	(>0.05)	

p: p value for Wilcoxon signed ranks test between Preoperative and each other periods

Table (20) Changes of nausea and vomiting score in the two studied groups.

Groups	Nausea and vomiting score														
	Preoperative	Intraoperative								Postoperative					
		15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1hour	2 hours	3 hours	4 hours	5 hours	6 hours
Group I (Ondansetron group)															
0 (%)	20 (100.0)	19 (95.0)	18 (90.0)	20 (100.0)	19 (95.0)	20 (100.0)	20 (100.0)	19 (95.0)	20 (100.0)	19 (95.0)	18 (90.0)	16 (80.0)	17 (85.0)	20 (100.0)	20 (100.0)
1 (%)	0 (0.0)	1 (5.0)	2 (10.0)	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)	1 (5.0)	0 (0.0)	1 (5.0)	2 (10.0)	4 (20.0)	2 (10.0)	0 (0.0)	0 (0.0)
2 (%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.0)	0 (0.0)	0 (0.0)
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max	0.0	1.0	1.0	0.0	1.0	0.0	0.0	1.0	0.0	1.0	1.0	1.0	2.0	0.0	0.0
Mean	0.0	0.05	0.10	0.0	0.05	0.0	0.0	0.05	0.0	0.05	0.10	0.10	0.20	0.0	0.0
SD	0.0	0.22	0.31	0.0	0.22	0.0	0.0	0.22	0.0	0.22	0.31	0.31	0.52	0.0	0.0
Group II (Control)															
0 (%)	20 (100.0)	13 (65.0)	15 (75.0)	15 (75.0)	18 (90.0)	15 (75.0)	17 (85.0)	17 (85.0)	20 (100.0)	15 (75.0)	14 (70.0)	13 (65.0)	14 (70.0)	16 (80.0)	17 (85.0)
1 (%)	0 (0.0)	4 (20.0)	2 (10.0)	2 (10.0)	2 (10.0)	5 (25.0)	1 (5.0)	3 (15.0)	0 (0.0)	3 (15.0)	3 (15.0)	4 (20.0)	6 (30.0)	3 (15.0)	2 (10.0)
2 (%)	0 (0.0)	3 (15.0)	3 (15.0)	3 (15.0)	0 (0.0)	0 (0.0)	2 (10.0)	0 (0.0)	0 (0.0)	2 (10.0)	3 (15.0)	3 (15.0)	0 (0.0)	1 (5.0)	1 (5.0)
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max	0.0	2.0	2.0	2.0	1.0	1.0	2.0	1.0	0.0	2.0	2.0	2.0	1.0	2.0	2.0
Mean	0.0	0.50	0.40	0.40	0.10	0.25	0.15	0.15	0.0	0.35	0.45	0.50	0.30	0.25	0.20
SD	0.0	0.76	0.75	0.75	0.31	0.44	0.64	0.37	0.0	0.67	0.76	0.76	0.47	0.55	0.52
Z	0.0	2.386*	1.350	2.355*	0.593	2.360*	1.777	1.041	0.0	1.787	1.669	1.330	1.006	2.080*	1.777
p	1.000	0.017*	0.177	0.019*	0.553	0.018*	0.076	0.298	1.000	0.074	0.095	0.168	0.314	0.038*	0.076

Z: Z for Mann Whitney test

*: Statistically significant at $p \leq 0.05$

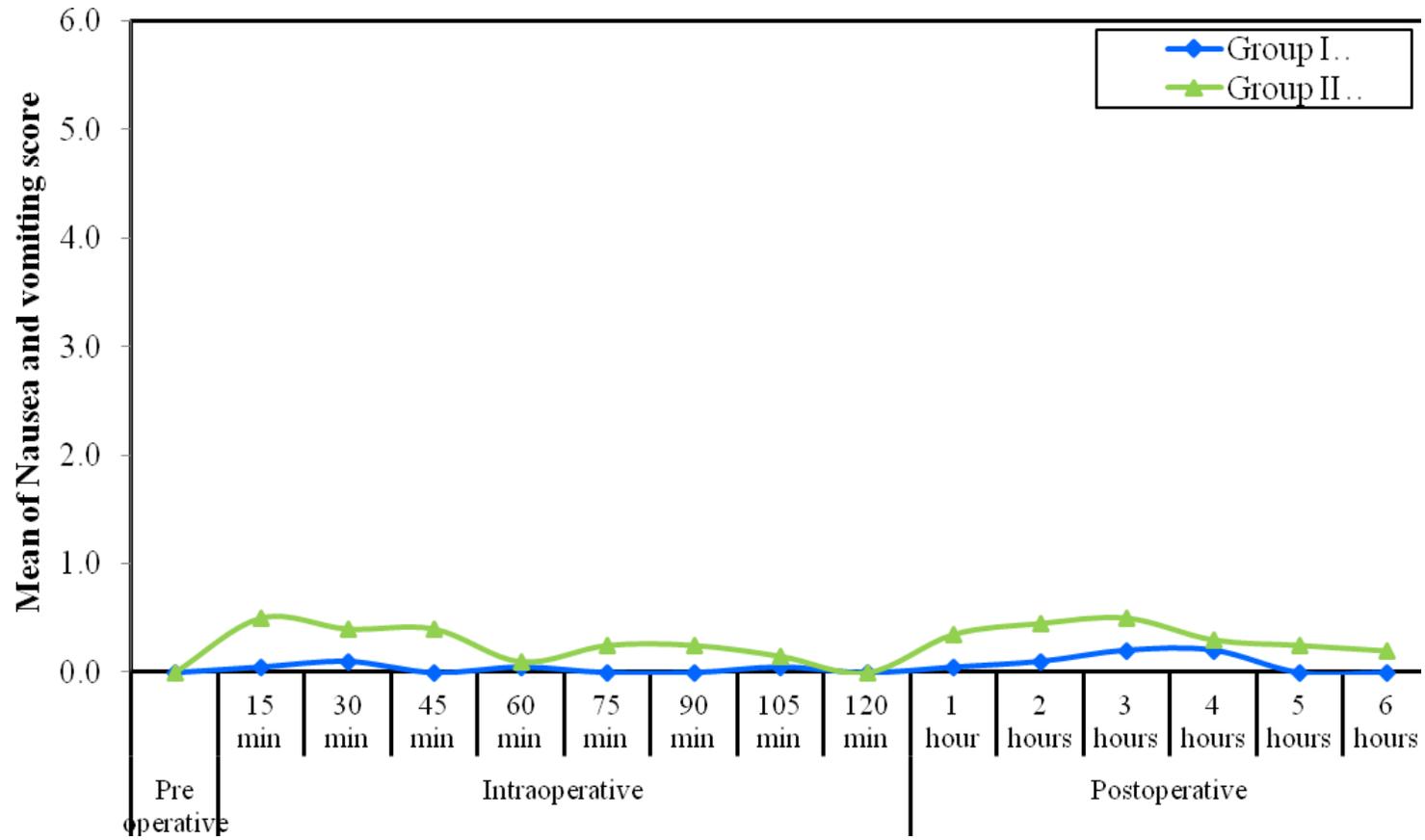


Figure (17): Changes of nausea and vomiting score in the two studied groups.

7) Sedation score:

- **In group I: [Table 21]**

It decreased insignificantly from 4.05 at 15 minutes after intrathecal injection to 3.36 at 75 minutes after intrathecal injection. It decreased significantly to 3.85, 3.60, 3.45, 3.05 and 2.65 at 45, 60, 90, 105 and 120 minutes after intrathecal injection respectively. It also decreased significantly to 1.90, 1.80, 2, 2, 2 and 2 at 1, 2, 3, 4, 5 and 6 hours postoperatively respectively.

- **In group II: [Table 22]**

It increased insignificantly from 4.0 at 15 minutes after intrathecal injection to 4.10 and 4.05 at 30 and 45 minutes after intrathecal injection. It decreased significantly to 3.65, 3.30, 3.15, 2.65 and 2.40 at 60, 75, 90, 105 and 120 minutes after intrathecal injection respectively. It also decreased significantly to 1.90, 1.75, 2, 2, 2 and 2 at 1, 2, 3, 4, 5 and 6 hours postoperatively respectively.

- **Comparison between the two groups: [Table 23. Figure 18]**

There was no significant difference between the two groups during intra and postoperative periods.

Table (21): Sedation score in group I.

Group I (Ondansetron group)	Sedation score													
	Intraoperative								Postoperative					
	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	5	5	5	4	4	3	3	2	2	2	2	2	2	2
2	4	4	4	4	3	3	3	3	2	2	2	2	2	2
3	4	4	4	3	3	3	2	2	2	2	2	2	2	2
4	3	3	3	3	3	3	3	3	1	2	2	2	2	2
5	4	4	4	4	3	3	3	3	2	2	2	2	2	2
6	5	5	4	3	4	4	4	3	2	2	2	2	2	2
7	4	4	3	4	3	3	3	3	2	2	2	2	2	2
8	3	3	3	3	4	4	4	3	2	1	2	2	2	2
9	3	3	3	3	4	4	3	3	2	2	2	2	2	2
10	5	5	5	5	4	4	4	4	2	2	2	2	2	2
11	5	5	5	4	4	4	3	3	2	2	2	2	2	2
12	5	5	4	5	4	4	4	3	2	1	2	2	2	2
13	4	4	3	4	4	4	3	2	2	2	2	2	2	2
14	3	3	3	3	3	3	2	2	2	2	2	2	2	2
15	4	4	4	3	3	3	3	2	2	1	2	2	2	2
16	4	4	4	3	3	3	2	2	2	2	2	2	2	2
17	4	4	4	3	4	4	2	2	2	2	2	2	2	2
18	5	5	5	4	4	4	4	3	1	1	2	2	2	2
19	4	4	4	3	3	3	3	3	2	2	2	2	2	2
20	3	3	3	4	4	3	3	2	2	2	2	2	2	2
Min	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	1.0	1.0	2.0	2.0	2.0	2.0
Max	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	4.05	4.05	3.85	3.60	3.36	3.45	3.05	2.65	1.90	1.80	2.0	2.0	2.0	2.0
SD	0.76	0.76	0.75	0.68	0.47	0.51	0.69	0.59	0.31	0.41	0.0	0.0	0.0	0.0
Median	4.0	4.0	4.0	3.50	4.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean diff. (p)		(>0.05)	0.046*	0.013*	(>0.05)	0.005*	0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*

p: p value for Wilcoxon signed ranks test between Preoperative and each other periods

Table (22): Sedation score in group II.

Group II (Control group)	Sedation score													
	Intraoperative								Postoperative					
	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
1	5	5	4	4	4	3	3	2	2	2	2	2	2	2
2	4	5	5	4	4	4	3	3	2	2	2	2	2	2
3	5	5	5	5	4	4	4	3	2	1	2	2	2	2
4	4	4	4	3	3	3	2	2	2	2	2	2	2	2
5	3	4	4	4	3	3	3	2	2	2	2	2	2	2
6	4	4	4	4	3	3	3	3	1	2	2	2	2	2
7	5	5	5	4	4	4	3	3	2	2	2	2	2	2
8	3	3	3	3	3	3	2	2	2	1	2	2	2	2
9	4	4	4	3	3	3	2	2	2	2	2	2	2	2
10	5	5	5	5	4	4	3	3	2	2	2	2	2	2
11	3	3	3	3	3	2	2	2	1	1	2	2	2	2
12	4	4	4	4	3	3	3	3	2	2	2	2	2	2
13	4	4	4	3	3	3	2	2	2	2	2	2	2	2
14	3	3	3	3	2	2	2	2	2	1	2	2	2	2
15	5	5	5	4	4	4	3	3	2	2	2	2	2	2
16	5	5	5	4	4	3	3	3	2	2	2	2	2	2
17	4	4	4	3	3	3	2	2	2	2	2	2	2	2
18	4	4	4	4	3	3	3	2	2	1	2	2	2	2
19	3	3	3	3	3	3	2	2	2	2	2	2	2	2
20	3	3	3	3	3	3	3	2	2	2	2	2	2	2
Min	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0	2.0	2.0	2.0
Max	5.0	5.0	5.0	5.0	4.0	4.0	4.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	4.0	4.10	4.05	3.65	3.30	3.15	2.65	2.40	1.90	1.75	2.0	2.0	2.0	2.0
SD	0.79	0.79	0.76	0.67	0.57	0.59	0.59	0.50	0.31	0.44	0.0	0.0	0.0	0.0
Median	4.0	4.0	4.0	4.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean diff. (p)		(>0.05)	(>0.05)	0.020*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*

p: p value for Wilcoxon signed ranks test between Preoperative and each other periods

Table (23): Changes in the sedation score in the two studied groups.

Groups	Sedation score													
	Intraoperative								Postoperative					
	15 min	30 min	45 min	60 min	75 min	90 min	105 min	120 min	1 hour	2 hours	3 hours	4 hours	5 hours	6 hours
Group I (Ondansetron group)														
Min	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	1.0	1.0	2.0	2.0	2.0	2.0
Max	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	4.05	4.05	3.85	3.60	3.36	3.45	3.05	2.65	1.90	1.80	2.0	2.0	2.0	2.0
SD	0.76	0.76	0.75	0.68	0.47	0.51	0.69	0.59	0.31	0.41	0.0	0.0	0.0	0.0
Group II (Control)														
Min	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	1.0	1.0	2.0	2.0	2.0	2.0
Max	5.0	5.0	5.0	5.0	4.0	4.0	4.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	4.0	4.10	4.05	3.65	3.30	3.15	2.65	2.40	1.90	1.75	2.0	2.0	2.0	2.0
SD	0.79	0.79	0.76	0.67	0.57	0.59	0.59	0.50	0.31	0.44	0.0	0.0	0.0	0.0
Z	0.202	0.217	0.843	0.270	2.276	1.602	1.871	1.358	0.0	0.374	0.0	0.0	0.0	0.0
p	0.840	0.828	0.399	0.787	0.783	0.106	0.061	0.175	1.000	0.708	1.000	1.000	1.000	1.000

Z: Z for Mann Whitney test

*: Statistically significant at $p \leq 0.05$

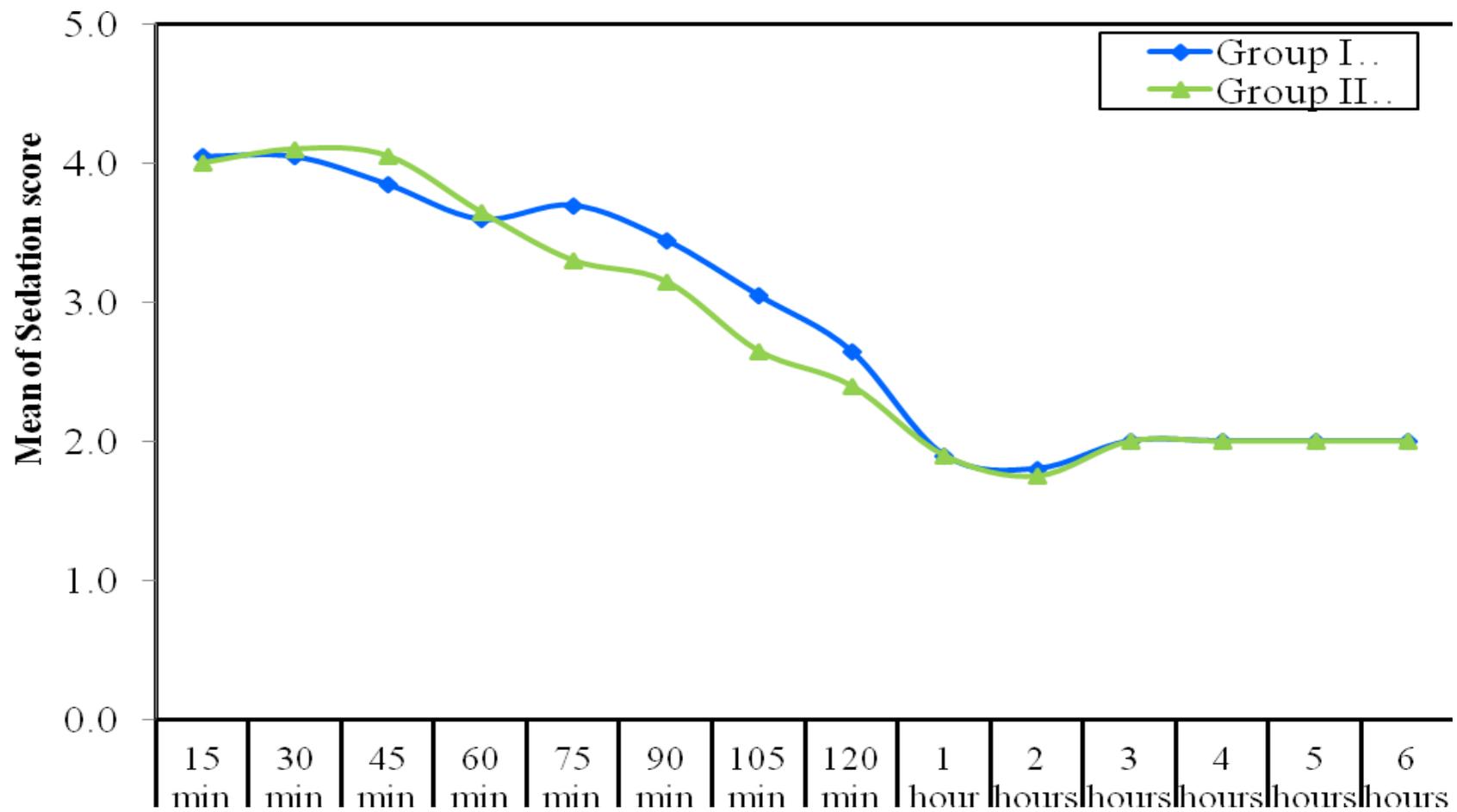


Figure (18): Changes in the sedation score in the two studied groups.

8) Patient satisfaction scale: [Table 24; Figure 19]

- **In group I:**

There were 9 (45%) extremely satisfied patients, 8 (40%) satisfied patients and 3 (15%) patients neither satisfied nor dissatisfied.

- **In group II:**

There were 4 (20%) extremely satisfied patients, 6 (30%) satisfied patients, 6 (30%) patients neither satisfied nor dissatisfied and 4 (20%) dissatisfied patients.

- **Comparison between the two groups:**

It was significantly higher in group I than in group II ($p= 0.014$)

Table (24): Changes of patient satisfaction score in the two studied groups.

Patient No.	Patient satisfaction scale	
	Group I	Group II
1	5	3
2	3	5
3	3	4
4	4	2
5	5	4
6	5	5
7	4	3
8	3	2
9	5	5
10	5	5
11	5	4
12	4	4
13	4	3
14	5	4
15	4	2
16	4	3
17	4	4
18	5	2
19	5	3
20	4	3
Min	3.0	2.0
Max	5.0	5.0
Mean	4.30	3.50
SD	0.73	1.05
Median	4.0	3.50
Z(p)	2.466* (0.014*)	

Z: Z for Mann Whitney test

*: Statistically significant at $p \leq 0.05$

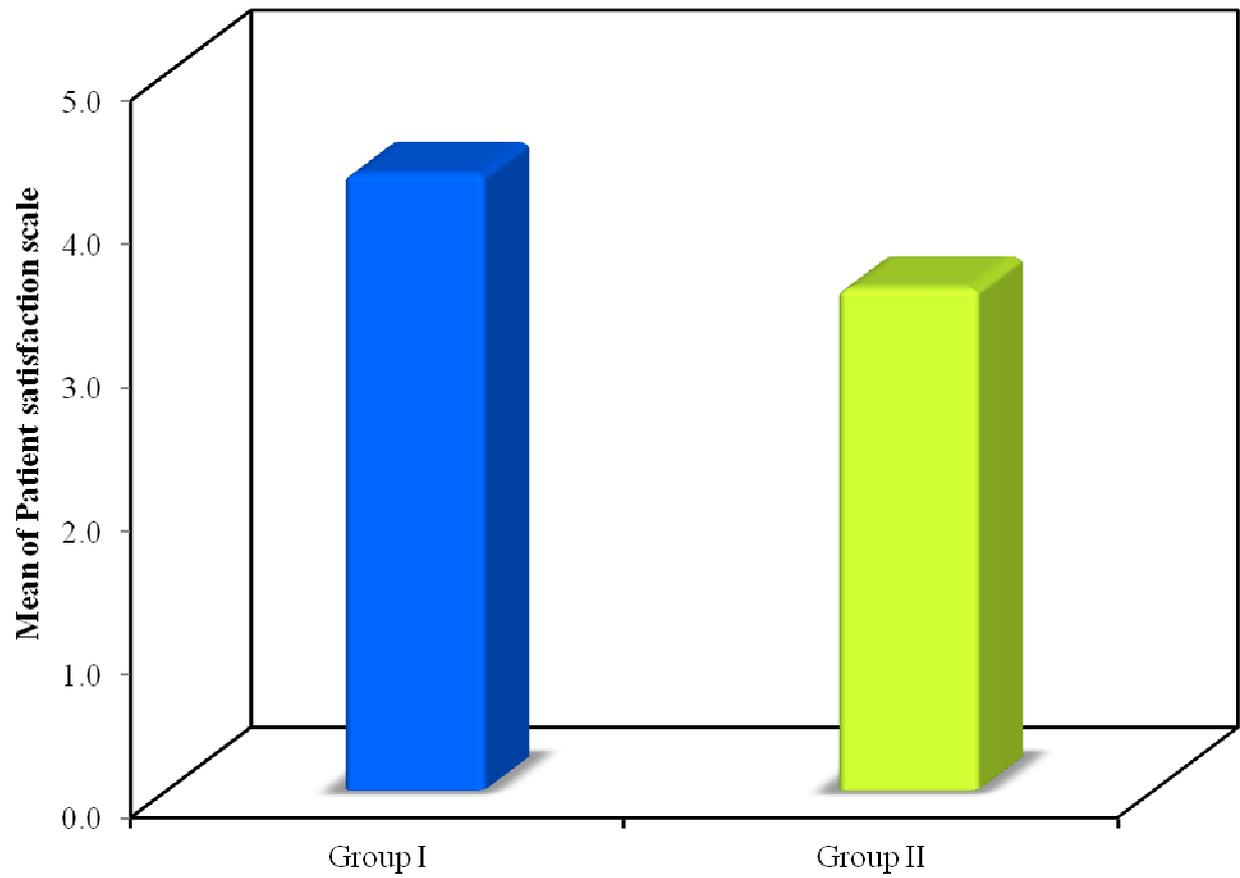


Figure (19): Changes of patient satisfaction score in the two studied groups.

9) **Surgeon satisfaction score:** [Table 25; Figure 20]

- **In group I:**

There were 10 (50%) extremely satisfied surgeons, 8 (40%) satisfied surgeons and 2 (10%) surgeons neither satisfied nor dissatisfied.

- **In group II :**

There were 3 (15%) extremely satisfied surgeons, 7 (35%) satisfied surgeons, 9 (45%) surgeons neither satisfied nor dissatisfied and 1 (5%) dissatisfied surgeons.

- **Comparison between the two groups (p value):**

It was significantly higher in group I than in group II ($p= 0.003$)

Table (25): Changes of surgeon satisfaction score in the two studied groups.

Patient No.	Surgeon satisfaction scale	
	Group I	Group II
1	4	4
2	5	4
3	5	3
4	4	3
5	5	2
6	5	5
7	4	4
8	4	3
9	5	4
10	5	4
11	3	3
12	4	3
13	4	4
14	5	5
15	5	3
16	4	3
17	4	4
18	5	3
19	3	3
20	5	5
Min	3.0	2.0
Max	5.0	5.0
Mean	4.40	3.60
SD	0.68	0.82
Median	4.50	3.50
Z(p)	2.978* (0.003*)	

Z: Z for Mann Whitney test

*: Statistically significant at $p \leq 0.05$

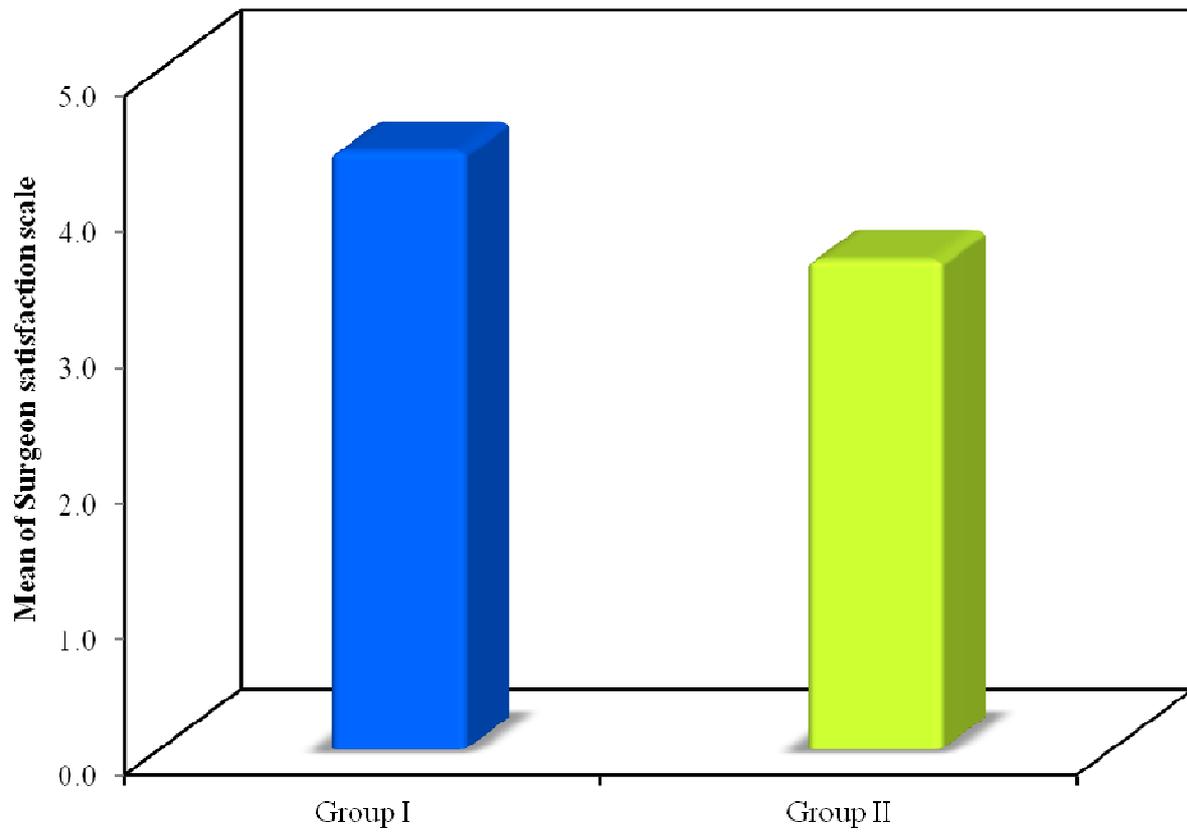


Figure (20): Changes of surgeon satisfaction score in the two studied groups.

10) Complications: [Table 26].

- **In group I:**

Two patients (10%) complained of shoulder pain. There was no incidence of respiratory depression, chest pain, pruritis, urine retention or postdural puncture headache.

- **In group II:**

One patient (5%) complained of shoulder pain and one patient (5%) had postdural puncture headache. There was no incidence of respiratory depression, chest pain, pruritis or urine retention.

- **Comparison between the two groups :**

There was no significant difference between the two groups.

Table (26): Comparison between the different groups according to complications.

Complications	Group I (n = 20)		Group II (n = 20)		χ^2	FE p
	No	%	No	%		
Respiratory depression	0	0.0	0	0.0	-	-
Shoulder pain	2	10.0	1	5.0	0.360	1.000
Chest pain	0	0.0	0	0.0	-	-
Pruritis	0	0.0	0	0.0	-	-
Urine retention	0	0.0	0	0.0	-	-
Postdural puncture headache	0	0.0	1	5.0	1.026	1.000

χ^2 : Chi square test

FE: Fisher Exact test