

## **AIM OF THE WORK**

Aim of the work is to evaluate the effects of pre-emptive paracetamol with or without gabapentin on post-operative pain after laparoscopic sleeve gastrectomy under general anesthesia.

## PATIENTS

After approval of the local ethics committee, a written informed consent was obtained from all patients. The present study was carried out in Alexandria Main University Hospital, on fifty patients having BMI > 35kg/m<sup>2</sup>, ASA physical status I and II, of both sexes, aged 18-50 years who were scheduled for elective laparoscopic sleeve gastrectomy under general anaesthesia.

### Exclusion criteria

1. Patients with history of chronic pain treated with gabapentin, pergabalin or opioids.
2. History of hypersensitivity to any of drugs used in the study.
3. History of depression, mania or treatment with antidepressant drugs in the last 2 weeks.
4. History of epilepsy or antiepileptic drugs.
5. History of addiction or alcoholism.

Patients were randomly categorized into two equal groups (each of 25 patients) according to closed envelope method as follows:

**Group (I): (control group):** patients received 1 g paracetamol intravenous infusion (IVI) 30 minutes before induction of anaesthesia<sup>(129)</sup>

**Group (II): (gabapentin group):** patients received 1.2 g oral gabapentin two hours preoperatively with 1 g paracetamol IVI 30 minutes before induction of anaesthesia.<sup>(129)</sup>

## METHODS

After a detailed history taking, proper clinical examination and routine laboratory investigations, all patients were premedicated with IV ranitidine 50 mg and IV metoclopramide 10 mg on the night before surgery and another dose was given one hour prior to induction of anaesthesia via a 20gauge intravenous line. Then, patients received:

**Group (I) : (control group)** patients received 1g paracetamol IVI 30 minutes before induction of anaesthesia.<sup>(129)</sup>

**Group (II): (gabapentin group)** patients received 1.2 g oral gabapentin two hours preoperatively using sips of water and IVI of 1g paracetamol; 30 minutes before induction of anaesthesia.<sup>(129)</sup>

On arrival to operation room, each patient was attached to a multi-channel Philips, Suresigns VM8, U.S.A monitor to display:

- Continuous ECG monitoring for heart rate (beats /min) and detection of dysrhythmias (lead II).
- Non-invasive arterial blood pressure monitoring.
- Arterial oxygen saturation (SpO<sub>2</sub>).
- Endtidal CO<sub>2</sub>.

After Preoxygenation for 5 minutes, IV induction for all patients was achieved by fentanyl 1µg/kg lean body weight (LBW) which was followed after 5 min by injection of lidocaine 1 mg/kg ideal body weight (IBW) followed after 1 min by propofol 2 mg/kg (LBW) and finally, rocuronium 1 mg/kg (IBW) was injected after loss of consciousness. After complete muscle paralysis, endotracheal intubation was done and confirmed by EtCO<sub>2</sub> and bilateral chest auscultation. Orogastric tube was inserted to decompress the stomach. Anaesthesia was maintained with isoflurane 1.5% in 100% oxygen and rocuronium (0.1 mg/kg IBW) guided by nerve stimulator till the end of surgery. Tidal volume was set to 8 ml/kg and respiratory rate was adjusted to maintain EtCO<sub>2</sub> level at 35-40mmHg. Fentanyl increments (0.5µg/kg LBW) were given every 30min intraoperatively but not within 30min of the estimated end of the operation. All patients received IV ketorolac (0.5mg/kg IBW) and IV ondansetron 4mg at the end of surgery. Neuromuscular paralysis was reversed with neostigmine (0.05 mg/kg LBW) and atropine (0.02 mg/kg IBW). After satisfactory recovery, patients were extubated and discharged to ICU. Patients received regular IV ketorolac (0.5mg/kg IBW every 6h) started 6h after the intraoperative dose. Nalbuphine was used as rescue analgesia when VAS was  $\geq 4$  at rest or  $\geq 7$  on movement. Ondansetron 4mg IV was used to treat PONV grade II-III.

## **Measurements:**

The following parameters were measured:

### **I. Demographic data:**

- Age (years).
- Sex (F/M).
- Duration of surgery (minutes).
- Body mass index in kg/m<sup>2</sup> (BMI)

### **II. Hemodynamic Parameters:**

- Heart rate (beats per minute) using lead II electrocardiogram (ECG) waves.
- Mean arterial blood pressure: (MAP) was measured in mmHg.
- Arterial oxygen saturation (SpO<sub>2</sub>): using pulse oximeters.

These parameters were monitored continuously and recorded at the following times:

- 2 hours before induction of anaesthesia as a base line data.
- Just before induction.
- Just before endotracheal intubation.
- Immediately after endotracheal intubation.
- Every 30 minutes intraoperatively for 2 hours.
- Immediately after endotracheal extubation.
- Every six hours postoperatively for 24 hours.

### **III. Postoperative pain:**

Patients were instructed the day before operation about how to use a visual analogue scale (VAS)<sup>(130)</sup> to assess pain both at rest (static) and during cough (dynamic). Pain was assessed on a linear scale (a 10 cm graded horizontal line). Assessment of pain was done at these times:

- On arrival of patient to ICU (zero time).
- Every 30 minutes in the first two hours then;
- Every hour for 6 hours then;
- Every two hours for the rest of 24 hours.

### **IV. Total analgesic requirements:**

Patients received regular intravenous (IV) ketorolac (0.5mg/kg IBW) every 6 hours started 6 hours after the intraoperative dose of ketorolac. When VAS was  $\geq 4$  at rest or  $\geq 7$  at movement, patients received 6mg nalbuphine IV and VAS was assessed 30 minutes after nalbuphine to assess further need for rescue analgesia; then the total administered dose was recorded over 24hours.

### **V. Time of first rescue analgesia:**

Time of first rescue analgesia was recorded and compared in both study groups.

**VI. Level of Sedation:**

It was assessed using Ramsay sedation scale as follows:<sup>(131)</sup>

- 1) Patient is anxious and agitated or restless, or both.
- 2) Patient is cooperative, 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.

Assessment of sedation was done on arrival of patient to ICU (zero time) and then every 2 h till the end of the study, that is, 24 h after operation. Patients with a sedation scale of  $\geq 2$  were considered as sedated.

**VII. Postoperative nausea and vomiting (PONV):**

The severity of PONV was graded on a four-point ordinal scale;

0. No nausea or vomiting.
1. Mild nausea.
2. Moderate nausea.
3. Severe nausea with vomiting.

Rescue antiemetic IV ondansetron 4 mg was given to all patients with PONV of grade  $\geq 2$ .

**VIII. Postoperative side effects other than PONV:**

Other complications during postoperative 24 hours were reported and properly treated such as dizziness, vertigo, ataxia, nystagmus, urinary retention, dry mouth, etc...

**Statistical analysis**<sup>(132)</sup>

Data entry into the computer was done followed by tabulation and analysis. Analysis was done using SPSS-16 for windows.

The following were the formulae used in statistical analysis of the results

**a- Arithmetic mean ( $\bar{X}$ ):** was calculated as follows:

$$\bar{X} = \frac{\sum X}{n}$$

Where:  $\sum X$  = sum of observations

n = the number of observations

**b- Standard deviation (S.D.):** was calculated as follows:

$$SD = \sqrt{\frac{\sum X^2 - \frac{(\sum X)^2}{n}}{n-1}}$$

Where:  $\sum X^2$  = sum of squared observations

$(\sum X)^2$  = square of the sum of observations

**c- Student “t” test for unpaired comparison:** was used to test the significance of the difference between two groups.

It was applied on analysis of haemodynamic and some demographic parameters and on total dose of nalbuphine required.

It was calculated according to the formula:

$$T_2 = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S^2P}{n_1} + \frac{S^2P}{n_2}}}$$

$$\text{Pooled variance: } (SP^2) \quad (SP^2) = \frac{S_1^2(n_1 - 1) + S_2^2(n_2 - 1)}{n_1 + n_2 - 2}$$

Where:  $n_1$  = number of observations of the first group  
 $n_2$  = number of observations of the second group  
 $X_1$  = mean of 1<sup>st</sup> group  
 $X_2$  = mean of 2<sup>nd</sup> group  
 $S_1^2$  = standard deviation of the first group  
 $S_2^2$  = standard deviation of the second group

**d- Pearson Chi-square test ( $X^2$ ):** was used for testing association between two qualitative variables. In cases of small cell frequency, **Fisher's Extract test** was used.

It was applied on analysis of some demographic parameters and on the presence of other side effects.

**e. Mann-Whitney test:** was used for testing whether one of two non-parametric samples of independent observations tends to be significant.

It was applied when comparing VAS scores, sedation score and scores for nausea and vomiting.

**f. Log Rank (Mantel-Cox) test:** was used for comparing the survival distributions of two non-parametric samples at each observed event time, i.e. when measurements are the time to event. They are presented using **Kaplan-Meier survival curves**.

It was applied when calculating the time needed for administration of first dose of nalbuphine.

**All statistical analysis were considered significant when  $P \leq 0.05$**

## RESULTS

The present study was carried out in Alexandria University Main Hospital on fifty patients, ASA physical status I and II, of both sexes, aged 18-50 years scheduled for elective laparoscopic sleeve gastrectomy under general anaesthesia. From the present study, the following results were obtained:

### I. Demographic data: Table (1) and figures (9-12):

#### Age (years)

The mean age for the two studied groups was  $33.4 \pm 5.53$  and  $32.68 \pm 5.74$  respectively. There were no statistical significant differences between the two studied groups ( $p=0.653$ ).

#### Sex (M/F)

Group I was comprised of 17 female (68%) and 8 males (32%) while group II was comprised of 16 females (64%) and 9 males (36%). There were no statistical significant differences between the two studied groups ( $p=0.765$ ).

#### Duration of Surgery (minutes)

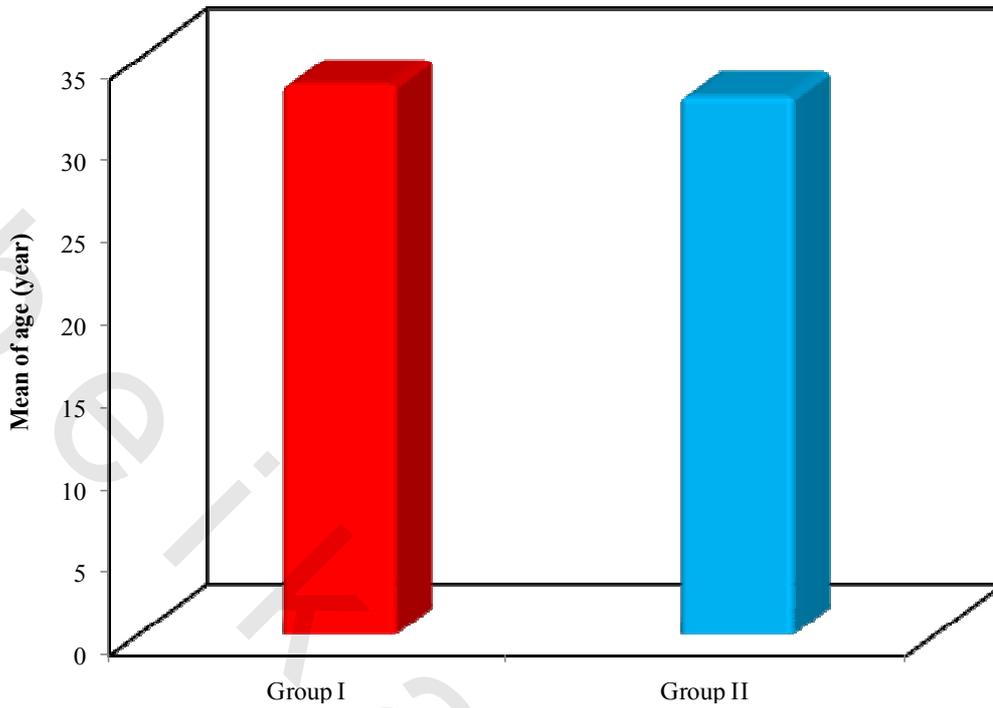
The mean duration of surgeries for the two studied groups was  $123.4 \pm 10.079$ ,  $123.04 \pm 10.143$  respectively. There were no statistical significant differences between the studied groups ( $p=0.9004$ ).

#### Body mass index (BMI) ( $\text{kg}/\text{m}^2$ )

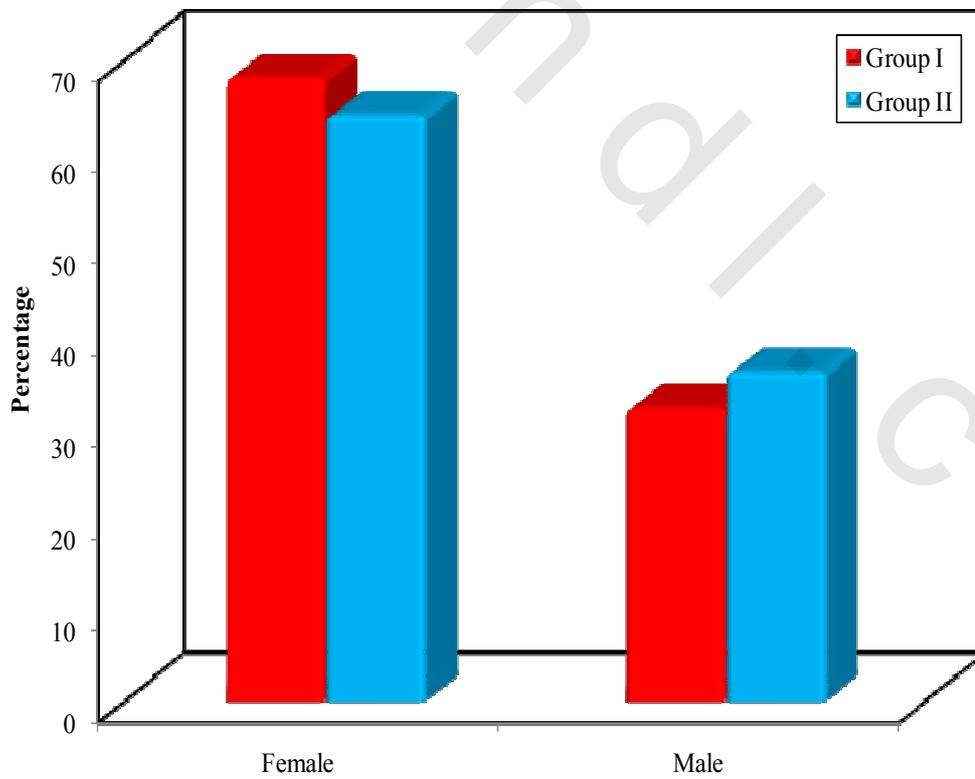
The mean value of BMI for the two studied groups was  $43.92 \pm 3.90$  and  $43.88 \pm 3.77$  respectively. There were no statistical significant differences between the studied groups ( $p=0.971$ ).

**Table (1): Demographic data in the two studied groups**

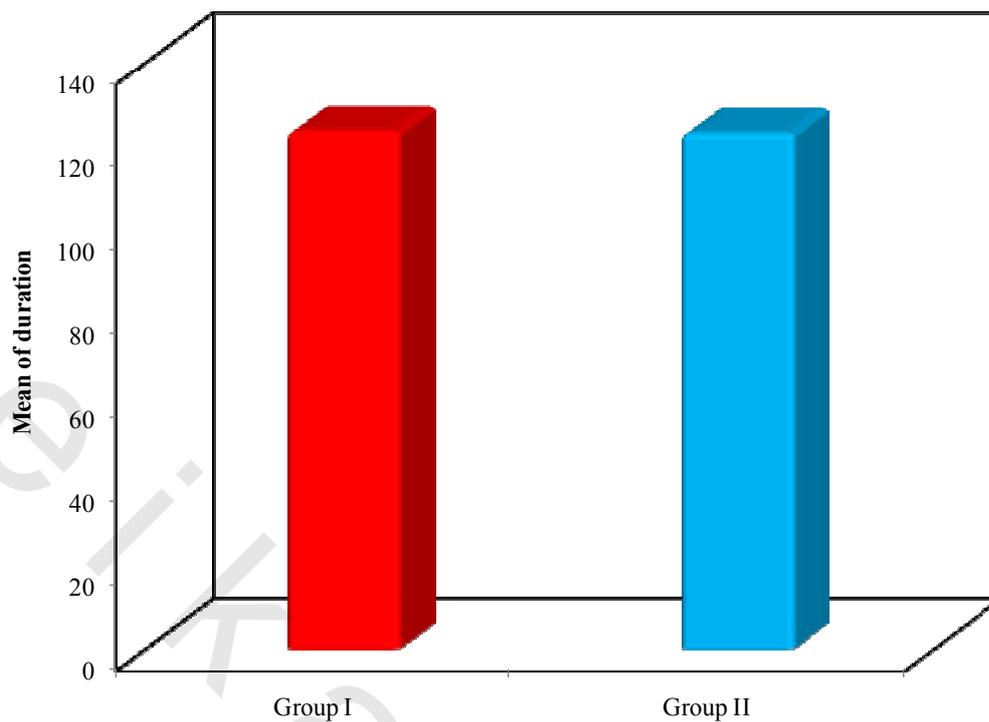
Studied Parameter		Group I	Group II	Test	P
Age (years)	Range	25 - 45	21 - 44	t = 0.452	0.653
	Mean $\pm$ S.D	$33.40 \pm 5.53$	$32.68 \pm 5.74$		
Sex	Female: Male	17 (68%): 8 (32%)	16 (64%): 9 (36%)	$X^2 = 0.089$	0.765
Duration (minutes)	Range	93-137	95-134	t = 0.126	0.9004
	Mean $\pm$ S.D	$123.40 \pm 10.079$	$123.04 \pm 10.143$		
BMI ( $\text{kg}/\text{m}^2$ )	Range	38-52	38-53	t = 0.036	0.971
	Mean $\pm$ S.D	$43.92 \pm 3.98$	$43.88 \pm 3.85$		



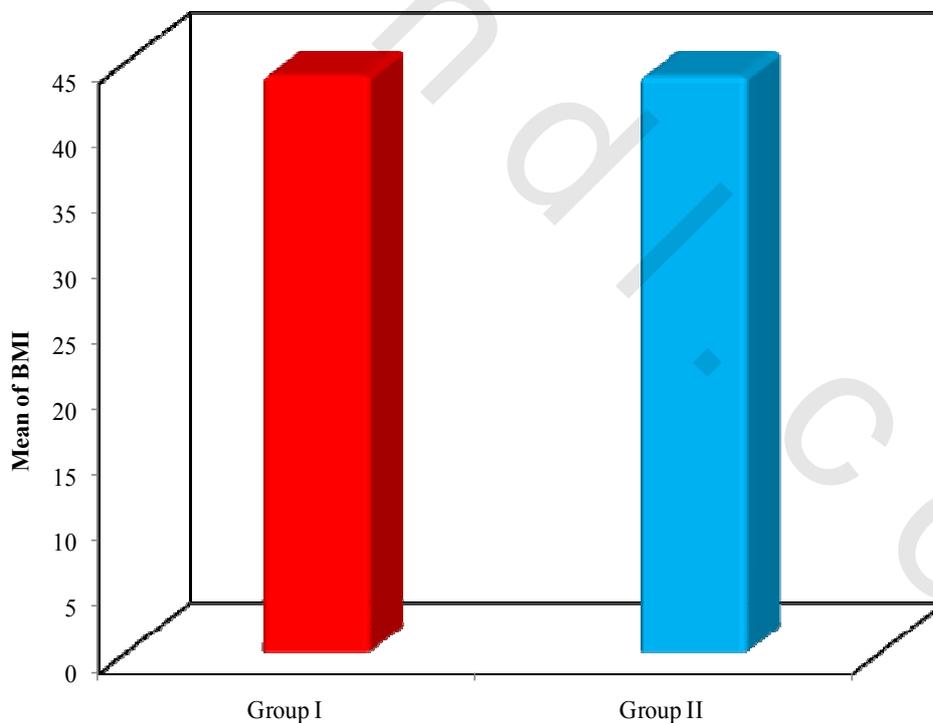
**Figure (9): Age difference in the two studied groups**



**Figure (10): Sex difference in the two studied groups**



**Figure (11): Duration of surgery in the two studied groups**



**Figure (12): Changes of BMI in the two studied groups**

## **II. Hemodynamic changes:**

### **A. Heart Rate (beats/minute): Tables (2-4) and figure (13)**

In group I, the mean HR 2 h before induction of anaesthesia was  $86.04 \pm 7.18$  (base value). There was a significant increase just before induction of anaesthesia to a mean of  $89.04 \pm 7.61$ . It decreased significantly before endotracheal intubation to a mean of  $77.36 \pm 5.50$ . Again, it increased significantly after endotracheal intubation to a mean of  $92.08 \pm 6.51$ . It decreased significantly at 30 and 60 min intraoperatively with a mean of  $80.28 \pm 2.96$  and  $82.08 \pm 4.06$  respectively. It decreased insignificantly at 90 and 120 min intraoperatively with a mean of  $83.28 \pm 2.21$  and  $82.79 \pm 2.95$  respectively. Again, it increased significantly after extubation and at 6 h postoperatively, to a mean of  $92.40 \pm 6.37$  and  $90.0 \pm 6.01$  respectively. It decreased insignificantly at 12 h postoperatively to a mean of  $84.68 \pm 6.45$ . It increased again insignificantly at 18 and 24 h postoperatively to a mean of  $87.12 \pm 5.88$  and  $86.72 \pm 5.45$  respectively.

In group II, the mean HR 2 h before induction of anaesthesia was  $85.44 \pm 6.66$  (base value). There was insignificant decrease just before induction of anaesthesia with a mean of  $84.84 \pm 7.08$ . It significantly decreased just before endotracheal intubation to a mean of  $75.40 \pm 4.97$ . It increased significantly after endotracheal intubation and after extubation to a mean of  $87.44 \pm 6.66$  and  $88.36 \pm 5.39$  respectively. It decreased significantly at 30, 60, 90 and 120 minutes intraoperatively with a mean of  $80.28 \pm 3.42$ ,  $79.92 \pm 2.71$ ,  $80.60 \pm 2.16$  and  $79.81 \pm 3.06$  respectively. It decreased insignificantly at postoperative 6, 12 and 18 h with a mean of  $84.0 \pm 6.54$ ,  $84.16 \pm 8.93$  and  $83.20 \pm 4.52$  respectively. It decreased significantly again at 24 h postoperatively to a mean of  $82.60 \pm 4.18$ .

On comparing the two studied groups, there was a significant decrease in group II compared to group I at all times of measurement except at 2h before induction of anaesthesia (base value), just before endotracheal intubation and 12 h postoperatively where this decrease was insignificant.

## Results

**Table (2): Heart rate changes in group I**

Case Number	Heart rate changes in group I												
	2h before induction	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
1	86	89	81	90	80	83	83	82	89	85	88	87	84
2	79	83	76	88	79	79	82	81	89	86	84	84	86
3	96	99	81	98	84	84	85	82	99	92	98	86	89
4	99	104	85	106	85	82	84	83	107	95	92	85	84
5	81	86	82	91	80	79	81	.	90	83	94	83	83
6	83	85	80	88	83	84	83	85	89	85	82	84	86
7	89	91	82	98	85	81	82	84	97	84	85	85	89
8	88	90	79	91	82	81	82	.	92	88	86	88	88
9	88	90	69	93	83	79	83	.	92	80	81	83	85
10	75	76	71	81	81	86	84	84	82	90	89	85	87
11	76	78	71	83	82	81	84	83	82	83	85	102	99
12	80	84	72	88	78	75	81	.	89	87	94	93	83
13	89	93	83	98	80	77	81	84	97	95	77	85	84
14	84	89	69	91	84	75	79	74	92	92	72	81	85
15	100	103	66	105	79	78	80	81	104	92	87	91	90
16	83	86	76	91	85	79	81	79	90	91	79	85	83
17	89	91	83	97	79	81	83	85	102	94	86	95	101
18	88	91	84	93	83	89	87	88	95	94	87	102	85
19	80	84	80	88	82	83	84	81	89	82	84	82	84
20	99	103	82	96	89	91	88	.	95	106	82	92	83
21	76	77	71	81	79	83	85	84	83	89	73	79	82
22	91	94	82	100	88	87	86	.	98	96	79	84	79
23	87	89	75	87	83	87	85	84	89	91	77	90	84
24	86	90	76	92	87	83	86	86	90	100	91	84	86
25	79	81	78	88	84	85	83	83	89	90	85	83	99
Min.	75.0	76.0	66.0	81.0	78.0	75.0	79.0	74.0	82.0	80.0	72.0	79.0	79.0
Max.	100.0	104.0	85.0	106.0	89.0	91.0	88.0	88.0	107.0	106.0	98.0	102.0	101.0
Mean	86.04	89.04	77.36	92.08	82.56	82.08	83.28	82.79	92.40	90.0	84.68	87.12	86.72
SD.	7.18	7.61	5.50	6.51	2.96	4.06	2.21	2.95	6.37	6.01	6.45	5.88	5.45
P		<0.001*	<0.001*	<0.001*	0.014*	0.016*	0.065	0.152	<0.001*	0.005*	0.446	0.535	0.723

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between 2h before induction with each other period

t: Paired t-test

\*: Statistically significant at  $p \leq 0.05$

Table (3): Heart rate changes in group II

Case number	Heart rate changes in group II												
	2h before induction	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After Extubation	6 h	12 h	18 h	24 h
1	81	80	80	84	86	82	82	81	86	84	83	82	77
2	89	87	76	89	83	81	83	83	87	78	77	80	83
3	86	85	74	88	78	80	80	.	89	82	79	84	80
4	91	92	81	95	87	84	83	84	94	90	88	87	91
5	76	77	70	81	86	82	83	81	82	102	99	72	78
6	91	89	83	89	84	82	81	.	88	88	81	84	87
7	90	88	79	91	83	81	82	78	92	87	80	89	78
8	86	83	69	89	81	82	81	83	88	85	105	83	87
9	80	81	68	80	78	83	83	82	82	86	83	79	82
10	76	76	70	83	78	78	79	81	81	83	92	86	84
11	80	78	69	79	74	77	81	80	81	81	74	80	77
12	77	79	78	88	77	79	80	.	86	77	73	79	82
13	97	99	80	101	82	81	81	79	99	87	101	91	90
14	100	102	85	102	83	79	79	77	105	91	98	85	83
15	83	85	79	86	79	78	81	78	88	80	73	77	80
16	86	84	80	87	77	79	78	79	90	76	81	88	86
17	83	80	71	85	79	78	81	82	89	81	86	87	79
18	84	83	76	86	82	83	82	.	91	80	84	83	83
19	89	86	79	89	80	81	82	79	85	82	79	83	83
20	87	85	72	87	80	81	79	80	91	86	80	84	79
21	81	79	69	84	76	75	78	77	85	76	77	79	77
22	98	100	78	90	81	82	81	83	89	99	86	85	86
23	78	79	73	83	76	72	73	70	84	76	75	78	79
24	87	85	75	89	80	78	81	81	88	81	90	91	88
25	80	79	71	81	77	80	81	78	89	82	80	84	86
Min.	76.0	76.0	68.0	79.0	74.0	72.0	73.0	70.0	81.0	76.0	73.0	72.0	77.0
Max.	100.0	102.0	85.0	102.0	87.0	84.0	83.0	84.0	105.0	102.0	105.0	91.0	91.0
Mean	85.44	84.84	75.40	87.44	80.28	79.92	80.60	79.81	88.36	84.0	84.16	83.20	82.60
SD.	6.66	7.08	4.97	5.66	3.42	2.71	2.16	3.06	5.39	6.54	8.93	4.52	4.18
P		0.109	<0.001*	0.007*	<0.001*	<0.001*	0.001*	0.001*	0.002*	0.339	0.496	0.053	0.023*

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between 2h before induction with each other period

t: Paired t-test

\*: Statistically significant at  $p \leq 0.05$

Table (4): Heart rate changes in the two studied groups

	Heart rate changes in the two studied groups												
	2h before induction	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
<b>Group I</b>													
Min.	75.0	76.0	66.0	81.0	78.0	75.0	79.0	74.0	82.0	80.0	72.0	79.0	79.0
Max.	100.0	104.0	85.0	106.0	89.0	91.0	88.0	88.0	107.0	106.0	98.0	102.0	101.0
Mean	86.04	89.04	77.36	92.08	82.56	82.08	83.28	82.79	92.40	90.0	84.68	87.12	86.72
SD.	7.18	7.61	5.50	6.51	2.96	4.06	2.21	2.95	6.37	6.01	6.45	5.88	5.45
<b>Group II</b>													
Min.	76.0	76.0	68.0	79.0	74.0	72.0	73.0	70.0	81.0	76.0	73.0	72.0	77.0
Max.	100.0	102.0	85.0	102.0	87.0	84.0	83.0	84.0	105.0	102.0	105.0	91.0	91.0
Mean	85.44	84.84	75.40	87.44	80.28	79.92	80.60	79.81	88.36	84.0	84.16	83.20	82.60
SD.	6.66	7.08	4.97	5.66	3.42	2.71	2.16	3.06	5.39	6.54	8.93	4.52	4.18
<b>T</b>	0.306	2.021*	1.323	2.691*	2.520*	2.213*	4.338*	3.126*	2.420*	3.379*	0.236	2.642*	2.998*
<b>P</b>	0.761	0.049*	0.192	0.010*	0.015*	0.032*	<0.001*	0.003*	0.019*	0.001*	0.814	0.011*	0.004*

t: Student t-test

\*: Statistically significant at  $p \leq 0.05$

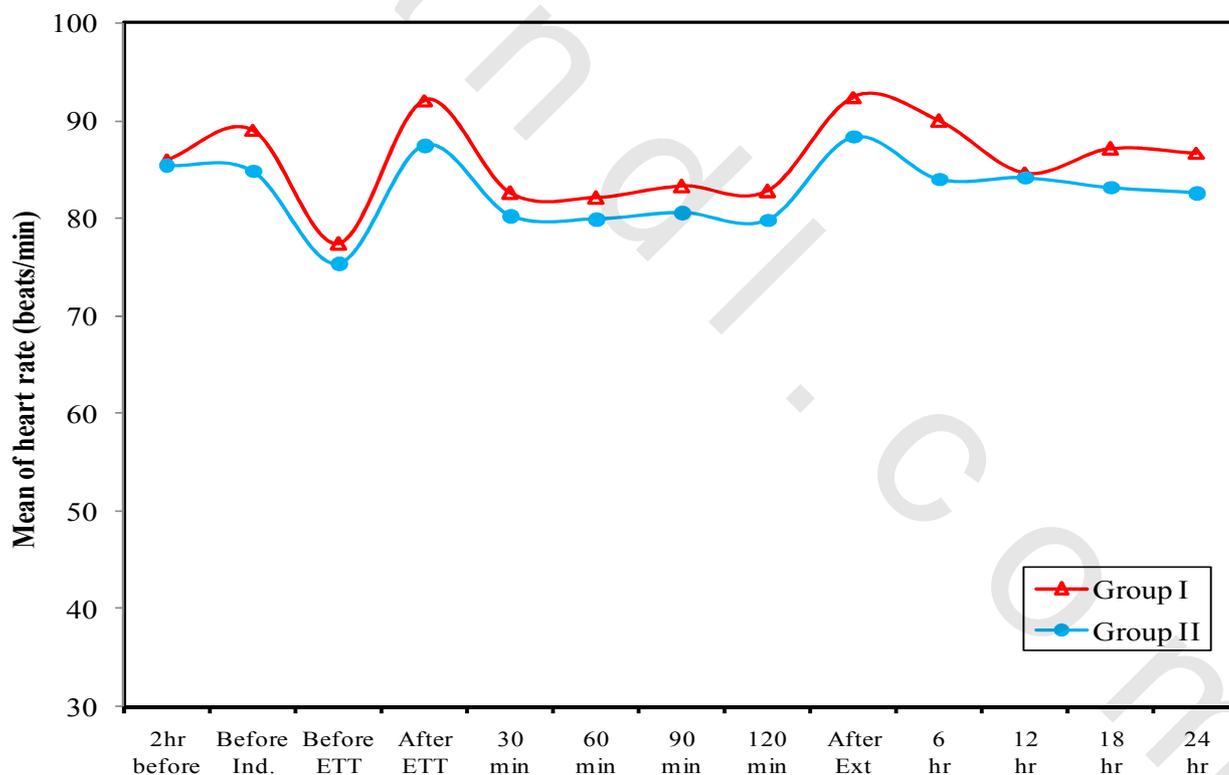


Figure (13): Heart rate changes in the two studied groups

**B. Mean arterial blood pressure (MAP) changes (mmHg): (Tables 5-7, Figure 14)**

In group I, MAP 2 hr before induction of anaesthesia was  $94.64 \pm 4.91$  (base value). It decreased insignificantly just before induction of anaesthesia and before endotracheal intubation to a mean of  $94.52 \pm 5.78$  and  $93.20 \pm 3.74$  respectively. It increased significantly after endotracheal intubation to a mean of  $95.76 \pm 4.38$ . It decreased insignificantly at 30 min intraoperatively to a mean of  $93.32 \pm 7.58$ . It increased insignificantly at 60 min intraoperatively to a mean of  $94.68 \pm 7.54$ . It decreased insignificantly again at 90 min intraoperatively to a mean of  $94.44 \pm 7.52$ . It increased insignificantly again at 120 min intraoperatively to a mean of  $96.05 \pm 6.80$ . It increased significantly again after extubation to a mean of  $96.36 \pm 4.18$ . Afterwards, MAP was insignificantly increased at 6, 12, 18 and 24h postoperatively with a mean of  $95.40 \pm 6.32$ ,  $95.60 \pm 4.65$ ,  $95.28 \pm 5.81$  and  $96.72 \pm 8.0$  respectively.

In group II, MAP 2 hr before induction of anaesthesia was  $92.84 \pm 6.56$  (base value). It decreased insignificantly before induction of anaesthesia to a mean of  $92.20 \pm 7.57$ . It increased insignificantly just before endotracheal intubation and after intubation to a mean of  $93.0 \pm 5.81$ ,  $92.88 \pm 5.56$  respectively. It decreased insignificantly during all the time of surgery to a mean of  $92.24 \pm 5.75$ ,  $91.80 \pm 5.45$ ,  $92.0 \pm 5.64$  and  $90.52 \pm 6.49$  at intraoperative 30, 60, 90 and 120 min respectively. It increased significantly again after extubation to a mean of  $93.40 \pm 4.14$ . It decreased insignificantly again in the postoperative period to a mean of  $91.56 \pm 5.51$ ,  $92.44 \pm 5.90$ ,  $92.16 \pm 4.96$ ,  $91.96 \pm 5.87$  at postoperative 6, 12, 18 and 24 h respectively.

On comparing the two studied groups, there was a significant decrease in group II compared to group I after endotracheal intubation, at 120 minutes intraoperatively, after extubation and during all the postoperative period. Also, there was insignificant decrease in group II compared to group I at 2h before induction of anaesthesia, just before induction of anaesthesia, just before intubation, at 30, 60 and 120 min intraoperatively.

## Results

**Table (5): Mean arterial blood pressure (MAP) changes in group I**

Case number	Mean arterial blood pressure changes in group I												
	2h before induction	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
1	92	91	88	93	89	97	98	95	94	91	92	96	99
2	94	93	87	95	91	99	96	98	97	91	95	97	98
3	100	101	97	98	99	107	105	106	102	106	105	112	112
4	102	103	96	103	94	105	104	109	106	105	103	108	111
5	90	89	95	92	91	92	93	.	93	97	97	96	105
6	92	91	93	93	93	89	87	94	98	93	91	89	89
7	91	92	87	92	91	93	92	93	95	101	96	98	97
8	89	90	94	90	92	94	92	.	92	92	93	91	93
9	91	89	94	93	94	93	94	.	94	89	89	89	94
10	92	91	90	93	87	87	85	89	91	91	92	92	91
11	93	95	89	94	90	93	94	93	97	100	98	99	97
12	89	88	90	91	81	91	89	.	92	91	92	88	87
13	106	108	99	109	112	109	111	109	102	105	105	104	111
14	103	104	98	101	106	104	109	106	104	102	93	92	109
15	92	89	94	95	83	81	86	93	93	86	92	95	93
16	93	91	95	96	91	90	88	94	96	92	94	93	94
17	91	92	87	93	86	85	87	89	92	88	93	96	92
18	91	93	91	92	89	93	96	87	96	93	97	94	91
19	93	89	94	97	89	87	89	89	95	94	93	94	99
20	105	107	98	102	109	110	108	.	102	110	103	93	105
21	96	97	96	98	89	91	87	95	95	95	92	90	84
22	93	94	95	95	94	89	91	.	95	89	94	89	86
23	97	95	94	96	92	93	94	95	101	93	93	93	92
24	94	96	91	94	104	99	91	92	92	97	95	98	94
25	97	95	98	99	97	96	95	99	95	94	103	96	95
Min.	89.0	88.0	87.0	90.0	81.0	81.0	85.0	87.0	91.0	86.0	89.0	88.0	84.0
Max.	106.0	108.0	99.0	109.0	112.0	110.0	111.0	109.0	106.0	110.0	105.0	112.0	112.0
Mean	94.64	94.52	93.20	95.76	93.32	94.68	94.44	96.05	96.36	95.40	95.60	95.28	96.72
SD.	4.91	5.78	3.74	4.38	7.58	7.54	7.52	6.80	4.18	6.32	4.65	5.81	8.0
<b>P</b>		0.737	0.063	0.003*	0.170	0.966	0.822	0.264	0.003*	0.353	0.220	0.568	0.088

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between 2h before induction with each other period

t: Paired t-test

\*: Statistically significant at  $p \leq 0.05$

**Table (6): Mean arterial blood pressure (MAP) changes in group II**

Case number	Mean arterial blood pressure changes in group II												
	2h before induction	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
1	88	86	85	91	87	86	86	90	90	85	88	91	90
2	106	105	103	102	101	103	102	88	103	97	92	96	103
3	97	94	98	93	99	96	96	.	99	96	93	91	98
4	101	103	100	96	98	99	98	102	104	99	89	97	99
5	89	91	93	91	94	86	91	91	91	90	100	88	87
6	102	101	103	101	102	99	101	.	94	98	85	96	96
7	92	89	90	91	91	95	93	91	96	93	87	91	91
8	90	92	92	88	88	89	90	83	97	87	102	93	91
9	91	93	92	93	89	89	92	85	92	93	89	94	93
10	94	92	93	95	92	95	96	85	93	93	87	93	90
11	92	90	94	91	93	91	90	84	95	87	94	94	93
12	90	87	92	91	91	88	89	.	90	86	91	92	86
13	103	104	101	105	101	100	102	106	92	105	103	105	103
14	101	103	99	102	98	99	98	84	93	98	102	101	99
15	93	92	95	91	94	94	94	101	87	87	93	87	96
16	84	81	87	86	82	85	83	84	90	84	87	86	85
17	92	91	91	93	89	93	89	85	93	95	86	89	91
18	85	82	87	84	87	86	87	.	88	83	93	87	83
19	87	83	86	89	86	88	89	88	90	89	102	88	88
20	89	87	90	92	92	91	86	92	93	90	83	87	86
21	86	88	88	91	87	85	85	96	92	89	93	91	87
22	105	108	103	102	101	95	99	95	97	97	95	101	101
23	90	87	89	89	92	91	91	87	93	92	86	87	88
24	88	87	89	88	87	87	86	91	90	89	96	90	87
25	86	89	85	87	85	85	87	93	93	87	95	89	88
Min.	84.0	81.0	85.0	84.0	82.0	85.0	83.0	83.0	87.0	83.0	83.0	86.0	83.0
Max.	106.0	108.0	103.0	105.0	102.0	103.0	102.0	106.0	104.0	105.0	103.0	105.0	103.0
Mean	92.84	92.20	93.0	92.88	92.24	91.80	92.0	90.52	93.40	91.56	92.44	92.16	91.96
SD.	6.56	7.57	5.81	5.56	5.75	5.45	5.64	6.49	4.14	5.51	5.90	4.96	5.87
P		0.172	0.689	0.936	0.216	0.052	0.061	0.201	0.586	0.070	0.813	0.375	0.073

p: Stands for adjusted Bonferroni p-value for ANOVA with repeated measures for comparison between 2h before induction with each other period

t: Paired t-test

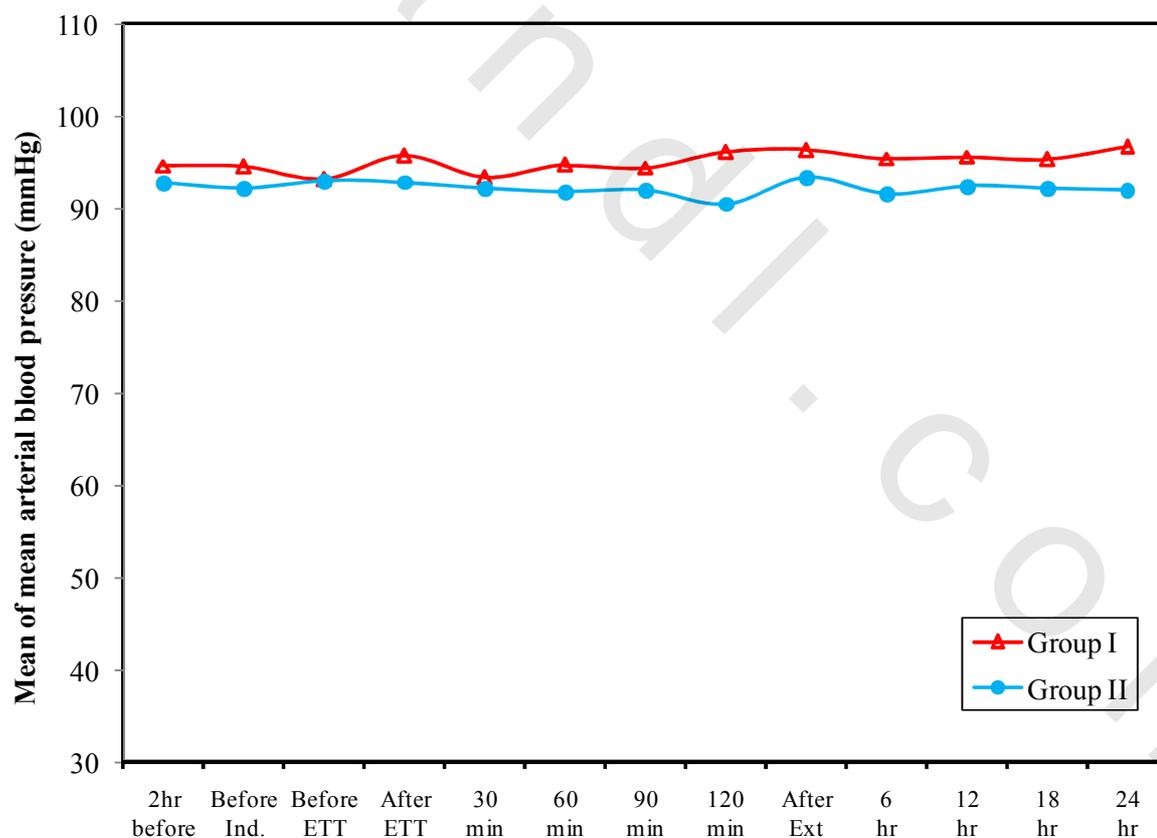
## Results

**Table (7): Mean arterial blood pressure (MAP) changes in the two studied groups**

	Mean arterial blood pressure changes in the two studied groups												
	2h before induction	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
<b>Group I</b>													
Min.	89.0	88.0	87.0	90.0	81.0	81.0	85.0	87.0	91.0	86.0	89.0	88.0	84.0
Max.	106.0	108.0	99.0	109.0	112.0	110.0	111.0	109.0	106.0	110.0	105.0	112.0	112.0
Mean	94.64	94.52	93.20	95.76	93.32	94.68	94.44	96.05	96.36	95.40	95.60	95.28	96.72
SD.	4.91	5.78	3.74	4.38	7.58	7.54	7.52	6.80	4.18	6.32	4.65	5.81	8.0
<b>Group II</b>													
Min.	84.0	81.0	85.0	84.0	82.0	85.0	83.0	83.0	87.0	83.0	83.0	86.0	83.0
Max.	106.0	108.0	103.0	105.0	102.0	103.0	102.0	106.0	104.0	105.0	103.0	105.0	103.0
Mean	92.84	92.20	93.0	92.88	92.24	91.80	92.0	90.52	93.40	91.56	92.44	92.16	91.96
SD.	6.56	7.57	5.81	5.56	5.75	5.45	5.64	6.49	4.14	5.51	5.90	4.96	5.87
<b>T</b>	1.098	1.218	0.145	2.035*	0.568	1.549	1.298	2.631*	2.514*	2.291*	2.103*	2.042*	2.399*
<b>P</b>	0.278	0.229	0.886	0.047*	0.573	0.128	0.200	0.012*	0.015*	0.026*	0.041*	0.047*	0.020*

t: Student t-test

\*: Statistically significant at  $p \leq 0.05$



**Figure (14): Mean arterial blood pressure (MAP) changes in the two studied groups**

**C. Arterial Oxygen Saturation (SPO<sub>2</sub>) changes: (Tables 8-10, figure 15)**

In group I, the mean of SPO<sub>2</sub>% just before induction of anaesthesia was 98.12±0.53 (base value). It increased insignificantly before endotracheal intubation to a mean of 99.36±0.64. It increased insignificantly after intubation, at 30, 60, 90 and 120 min intraoperatively with a mean of 99.28±0.74, 99.48±0.59, 99.56±0.58, 99.36± 0.57 and 99.40±0.50 respectively. It increased insignificantly after extubation, 6, 12, 18 and 24hr postoperatively with a mean of 98.24±1.16, 98.48±1.16, 98.24±1.27, 98.20±0.91 and 98.12±0.93 respectively.

In group II, the mean of SPO<sub>2</sub>% just before induction of anaesthesia was 98.28±0.54 (base value). It increased insignificantly before endotracheal intubation to a mean of 99.36±0.57. It increased insignificantly after intubation, at 30, 60, 90 and 120 min intraoperatively with a mean of 99.48±0.71, 99.52±0.51, 99.28±0.54, 99.52± 0.51 and 99.44±0.58 respectively. It increased insignificantly after extubation, 6, 12, 18 and 24hr postoperatively with a mean of 98.44±1.16, 98.32±0.95, 98.52±0.92, 98.40±1.04 and 98.32±0.95 respectively.

On comparing the two studied groups, there was no significant difference during all times of measurement.

## Results

**Table (8): Changes in Arterial Oxygen Saturation (SPO<sub>2</sub>%) in group I**

Case number	Arterial Oxygen Saturation changes in group I											
	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
1	99.0	100.0	99.0	99.0	99.0	100.0	99.0	98.0	98.0	98.0	99.0	99.0
2	98.0	99.0	99.0	100.0	99.0	100.0	100.0	99.0	99.0	98.0	98.0	98.0
3	98.0	100.0	100.0	99.0	100.0	99.0	99.0	98.0	99.0	100.0	99.0	98.0
4	98.0	99.0	99.0	100.0	99.0	99.0	100.0	100.0	98.0	98.0	98.0	100.0
5	98.0	99.0	100.0	99.0	100.0	99.0	99.0	98.0	97.0	96.0	96.0	97.0
6	97.0	98.0	97.0	100.0	99.0	100.0	100.0	96.0	100.0	100.0	98.0	98.0
7	98.0	100.0	99.0	99.0	100.0	100.0	99.0	98.0	98.0	98.0	98.0	99.0
8	99.0	100.0	100.0	99.0	100.0	99.0	100.0	100.0	99.0	98.0	98.0	100.0
9	98.0	99.0	99.0	100.0	100.0	100.0	99.0	98.0	100.0	99.0	98.0	99.0
10	98.0	100.0	99.0	100.0	99.0	100.0	99.0	98.0	100.0	98.0	98.0	98.0
11	98.0	99.0	100.0	99.0	100.0	100.0	100.0	98.0	99.0	99.0	98.0	96.0
12	98.0	99.0	100.0	100.0	100.0	99.0	99.0	100.0	98.0	100.0	98.0	98.0
13	98.0	99.0	100.0	99.0	100.0	100.0	100.0	98.0	97.0	96.0	98.0	97.0
14	99.0	99.0	100.0	100.0	99.0	98.0	99.0	98.0	98.0	95.0	98.0	99.0
15	99.0	100.0	99.0	100.0	99.0	99.0	100.0	100.0	99.0	99.0	98.0	98.0
16	98.0	100.0	100.0	99.0	100.0	99.0	100.0	98.0	98.0	99.0	100.0	98.0
17	99.0	100.0	99.0	98.0	100.0	100.0	99.0	100.0	99.0	98.0	98.0	98.0
18	98.0	99.0	99.0	100.0	100.0	99.0	99.0	98.0	98.0	100.0	99.0	98.0
19	97.0	98.0	99.0	100.0	100.0	99.0	99.0	95.0	98.0	98.0	99.0	97.0
20	98.0	100.0	98.0	100.0	99.0	99.0	100.0	98.0	99.0	98.0	96.0	97.0
21	98.0	99.0	99.0	99.0	98.0	99.0	100.0	98.0	100.0	98.0	99.0	98.0
22	98.0	99.0	99.0	99.0	100.0	100.0	99.0	98.0	98.0	99.0	100.0	98.0
23	98.0	100.0	100.0	100.0	99.0	99.0	99.0	98.0	100.0	98.0	98.0	98.0
24	98.0	100.0	99.0	100.0	100.0	99.0	99.0	98.0	98.0	99.0	98.0	98.0
25	98.0	99.0	100.0	99.0	100.0	99.0	99.0	98.0	95.0	97.0	98.0	99.0
Min.	97.0	98.0	97.0	98.0	98.0	98.0	99.0	95.0	95.0	95.0	96.0	96.0
Max.	99.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean	98.12	99.36	99.28	99.48	99.56	99.36	99.40	98.24	98.48	98.24	98.20	98.12
SD.	0.53	0.64	0.74	0.59	0.58	0.57	0.50	1.16	1.16	1.27	0.91	0.93

**Results**

**Table (9): Changes in Arterial Oxygen Saturation (SPO<sub>2</sub>%) in group II**

Case number	Arterial Oxygen Saturation changes in group II											
	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
1	98.0	99.0	100.0	99.0	100.0	99.0	99.0	98.0	100.0	98.0	98.0	100.0
2	98.0	99.0	100.0	100.0	99.0	100.0	100.0	99.0	98.0	98.0	99.0	98.0
3	98.0	100.0	100.0	100.0	99.0	100.0	100.0	98.0	99.0	100.0	98.0	98.0
4	98.0	99.0	100.0	100.0	99.0	100.0	100.0	98.0	99.0	99.0	98.0	100.0
5	98.0	99.0	99.0	100.0	99.0	99.0	99.0	98.0	98.0	99.0	98.0	98.0
6	99.0	99.0	99.0	100.0	99.0	99.0	100.0	100.0	97.0	98.0	98.0	98.0
7	99.0	99.0	99.0	99.0	98.0	99.0	99.0	100.0	98.0	98.0	100.0	98.0
8	98.0	99.0	99.0	99.0	100.0	99.0	99.0	99.0	99.0	98.0	98.0	98.0
9	98.0	99.0	100.0	99.0	100.0	100.0	99.0	99.0	98.0	99.0	99.0	98.0
10	99.0	99.0	100.0	99.0	100.0	100.0	99.0	100.0	98.0	99.0	100.0	99.0
11	98.0	100.0	100.0	99.0	100.0	100.0	99.0	98.0	98.0	100.0	99.0	98.0
12	98.0	100.0	100.0	99.0	99.0	99.0	99.0	98.0	99.0	98.0	99.0	98.0
13	98.0	100.0	100.0	100.0	100.0	99.0	100.0	98.0	98.0	99.0	100.0	99.0
14	99.0	100.0	99.0	100.0	99.0	100.0	100.0	100.0	96.0	98.0	98.0	99.0
15	98.0	99.0	99.0	100.0	99.0	100.0	100.0	98.0	99.0	98.0	98.0	96.0
16	98.0	99.0	100.0	99.0	99.0	100.0	100.0	99.0	98.0	99.0	98.0	98.0
17	99.0	100.0	100.0	99.0	99.0	99.0	99.0	98.0	100.0	98.0	99.0	98.0
18	98.0	100.0	100.0	99.0	99.0	99.0	99.0	98.0	98.0	99.0	98.0	100.0
19	99.0	100.0	99.0	100.0	100.0	99.0	99.0	99.0	98.0	100.0	96.0	97.0
20	99.0	99.0	99.0	99.0	100.0	99.0	100.0	98.0	98.0	98.0	100.0	99.0
21	98.0	99.0	100.0	100.0	99.0	100.0	100.0	98.0	98.0	98.0	98.0	99.0
22	97.0	98.0	97.0	100.0	99.0	100.0	98.0	95.0	97.0	96.0	96.0	97.0
23	98.0	99.0	100.0	99.0	99.0	100.0	100.0	98.0	98.0	98.0	98.0	98.0
24	98.0	100.0	99.0	100.0	99.0	100.0	99.0	98.0	99.0	100.0	99.0	98.0
25	99.0	100.0	99.0	100.0	99.0	99.0	100.0	99.0	100.0	98.0	98.0	99.0
Min.	97.0	98.0	97.0	99.0	98.0	99.0	98.0	95.0	96.0	96.0	96.0	96.0
Max.	99.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean	98.28	99.36	99.48	99.52	99.28	99.52	99.44	98.44	98.32	98.52	98.40	98.32
SD.	0.54	0.57	0.71	0.51	0.54	0.51	0.58	1.04	0.95	0.92	1.04	0.95

Table (10): Changes in Arterial Oxygen Saturation in the two studied groups

	Arterial Oxygen Saturation changes in the two studied groups											
	Before induction	Before ETT	After ETT	30 min	60 min	90 min	120 min	After extubation	6 h	12 h	18 h	24 h
<b>Group I</b>												
Min.	97.0	98.0	97.0	98.0	98.0	98.0	99.0	95.0	95.0	95.0	96.0	96.0
Max.	99.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean	98.12	99.36	99.28	99.48	99.56	99.36	99.40	98.24	98.48	98.24	98.20	98.12
SD.	0.53	0.64	0.74	0.59	0.58	0.57	0.50	1.16	1.16	1.27	0.91	0.93
<b>Group II</b>												
Min.	97.0	98.0	97.0	99.0	98.0	99.0	98.0	95.0	96.0	96.0	96.0	96.0
Max.	99.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean	98.28	99.36	99.48	99.52	99.28	99.52	99.44	98.44	98.32	98.52	98.40	98.32
SD.	0.54	0.57	0.71	0.51	0.54	0.51	0.58	1.04	0.95	0.92	1.04	0.95
<b>T</b>	1.060	0.0	0.974	0.257	1.759	1.047	0.260	0.639	0.535	0.894	0.722	0.755
<b>P</b>	0.295	1.000	0.335	0.798	0.085	0.300	0.796	0.526	0.595	0.376	0.474	0.454

t: Student t-test

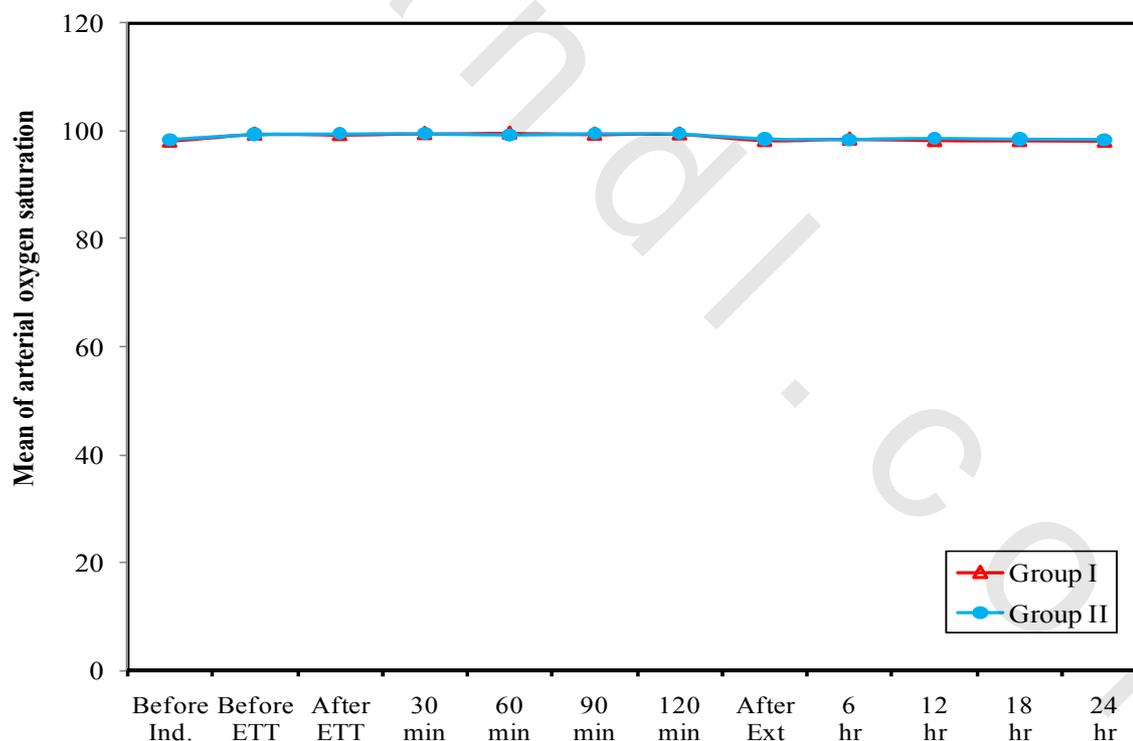


Figure (15): Changes in Arterial Oxygen Saturation in the two studied groups

### **III. Post-operative pain assessment:**

#### **1. VAS at rest (static pain): (Tables 11-13, Figure 8)**

##### **In group I:**

The mean value of VAS at 10 minutes after reaching ICU was  $3.36 \pm 1.11$  (base value). It decreased significantly at 30 and 60 min postoperatively to a mean of  $2.36 \pm 0.642$  and  $2.68 \pm 0.69$  respectively. Also, there was a significant decrease at 120 min, 3, 4, 5, 7 and 8 h to a mean of  $2.54 \pm 1.15$ ,  $2.48 \pm 0.92$ ,  $2.56 \pm 0.82$ ,  $2.60 \pm 0.7$ ,  $2.48 \pm 0.59$  and  $2.44 \pm 0.58$  respectively. The only exception was at 90 min and 6 h where it decreased insignificantly to a mean of  $2.88 \pm 0.83$  and  $2.88 \pm 1.01$  respectively. Then VAS continued to be significantly decreased at 10, 12, 14, 16, 18, 20, 22 and 24 h with a mean of  $2.12 \pm 0.67$ ,  $2.52 \pm 0.59$ ,  $2.04 \pm 0.45$ ,  $2.20 \pm 0.41$ ,  $2.12 \pm 0.53$ ,  $2.44 \pm 0.59$ ,  $2.40 \pm 0.58$  and  $2.48 \pm 0.71$  respectively.

##### **In group II**

The mean value of VAS at 10 minutes after reaching ICU was  $2.04 \pm 1.34$  (base value). It decreased insignificantly at 30 and 60 min to a mean of  $1.52 \pm 0.87$  and  $1.56 \pm 0.87$  respectively. It increased insignificantly at 90 min to a mean of  $2.12 \pm 0.97$ . At 120 min, it decreased insignificantly to a mean of  $1.68 \pm 1.07$ . At 3 h, it was nearly equal to the base value with a mean of  $2.04 \pm 1.24$ . At 4 h, it decreased insignificantly again to a mean of  $1.80 \pm 1.04$ . It increased insignificantly at 5 and 6 h with a mean of  $2.24 \pm 0.97$  and  $2.20 \pm 1.0$  respectively. At 7 h it decreased insignificantly to a mean of  $1.96 \pm 1.10$ . It increased insignificantly at 8 and 10 h with a mean of  $2.08 \pm 0.81$  and  $2.12 \pm 0.73$  respectively. It decreased insignificantly at 12, 14, 16, 18, 20, 22 and 24h with a mean of  $1.92 \pm 0.57$ ,  $1.64 \pm 0.49$ ,  $1.76 \pm 0.52$ ,  $1.80 \pm 0.58$ ,  $1.92 \pm 0.91$ ,  $2.0 \pm 0.96$  and  $1.80 \pm 0.91$  respectively.

On comparing the two groups, there was a significant decrease in group II compared to group I over all times of measurement except at 3, 5, 7, 8, 10 and 22h where this decrease was insignificant.

Table (11): Changes of visual analogue scale (static pain) in group I

Cases	Static visual analogue scale in group I																		
	Zero time	30 min	60 min	90 min	120 min	3h	4h	5h	6h	7h	8h	10h	12h	14h	16h	18h	20h	22h	24h
1	3	2	3	4	4	2	2	3	4	2	3	3	3	2	3	3	2	2	2
2	5	2	2	2	4	2	3	2	2	3	3	3	2	3	2	3	3	3	1
3	4	2	2	3	3	3	4	2	2	3	3	2	2	3	3	2	3	3	3
4	4	2	3	3	4	1	1	2	4	2	2	1	2	2	2	2	2	3	3
5	4	2	2	3	4	1	2	3	3	2	1	1	2	2	2	3	2	2	3
6	4	3	4	2	3	4	1	2	3	2	2	2	3	2	3	3	3	3	2
7	3	2	2	3	4	2	2	2	3	3	2	2	3	3	3	3	3	3	3
8	4	1	3	3	1	2	3	3	3	3	3	2	3	2	2	2	3	3	4
9	3	2	2	3	1	2	3	4	1	2	2	2	2	2	2	2	3	3	3
10	2	2	2	3	4	2	3	3	3	3	3	2	3	2	2	3	2	2	2
11	2	3	3	3	3	4	2	2	2	2	3	1	2	2	2	2	3	1	2
12	3	2	2	2	3	4	2	3	3	3	3	3	3	2	2	3	2	2	3
13	4	3	3	4	1	2	3	3	4	2	2	2	3	2	2	2	2	2	2
14	4	2	3	3	3	3	4	2	4	2	2	2	3	2	2	3	2	2	3
15	2	3	3	4	1	2	3	2	2	2	2	2	2	2	2	1	2	3	2
16	3	4	1	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2
17	1	3	3	3	4	2	3	3	3	3	3	2	2	2	2	3	2	2	2
18	1	3	3	1	2	4	2	2	3	3	3	2	3	2	2	2	3	3	3
19	5	3	3	3	3	1	2	2	2	3	3	3	3	2	3	3	3	3	3
20	5	3	4	1	3	3	3	3	4	4	2	1	2	1	2	2	2	2	2
21	4	2	3	3	3	3	3	2	3	3	3	3	1	1	2	2	3	2	2
22	3	2	3	4	2	3	4	3	4	2	3	3	3	2	2	2	2	3	4
23	4	2	3	4	1	2	3	4	1	2	2	3	3	2	2	2	2	2	2
24	4	2	3	3	2	3	2	2	5	2	2	2	3	2	2	2	3	2	2
25	3	2	2	3	1	2	2	4	2	2	2	2	3	2	2	1	2	2	2
Min.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0
Max.	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0
Mean	3.36	2.36	2.68	2.88	2.64	2.48	2.56	2.60	2.88	2.48	2.44	2.12	2.52	2.04	2.20	2.32	2.44	2.40	2.48
SD.	1.11	0.64	0.69	0.83	1.15	0.92	0.82	0.71	1.01	0.59	0.58	0.67	0.59	0.45	0.41	0.63	0.51	0.58	0.71
Median	4.0	2.0	3.0	3.0	3.0	2.0	3.0	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0
p		0.004*	0.018*	0.132	0.032*	0.016*	0.010*	0.011*	0.122	0.005*	0.007*	<0.001*	0.006*	<0.001*	<0.001*	0.001*	0.002*	0.002*	0.005*

Z: Z for Wilcoxon signed ranks test

\*: Statistically significant at  $p \leq 0.05$

Table (12): Changes of visual analogue scale (static pain) in group II

Cases	Static visual analogue scale in group II																		
	Zero time	30 min	60 min	90 min	120 min	3h	4h	5h	6h	7h	8h	10h	12h	14h	16h	18h	20h	22h	24h
1	0	1	1	2	2	2	0	4	1	1	2	2	2	1	1	2	2	2	2
2	4	1	1	2	2	2	3	0	1	1	2	2	2	1	1	1	1	1	1
3	2	2	2	3	2	2	1	4	2	2	2	2	2	2	1	2	2	1	1
4	0	1	1	2	2	4	1	1	1	1	2	2	2	2	2	2	1	1	2
5	2	2	2	2	4	1	2	2	4	0	1	1	1	1	2	2	2	3	0
6	1	1	1	2	4	1	2	2	3	3	3	3	2	2	1	2	2	2	2
7	1	1	1	4	1	1	2	2	3	3	3	3	3	1	1	3	3	3	3
8	2	2	2	4	0	1	2	2	2	3	0	1	1	2	2	2	2	2	2
9	3	2	4	0	1	2	2	2	3	2	3	3	2	2	2	2	2	1	2
10	4	4	1	2	2	2	3	1	1	2	3	3	2	1	1	1	0	1	1
11	2	3	3	3	1	1	2	3	2	2	2	4	1	2	2	1	0	1	2
12	1	1	1	2	2	4	0	2	2	2	2	2	2	2	2	2	3	2	2
13	4	0	0	1	1	2	2	3	1	2	2	2	2	2	2	2	2	2	1
14	4	0	1	2	3	2	3	3	3	1	2	2	2	1	2	2	1	2	2
15	3	2	2	2	2	1	2	2	3	4	3	2	2	2	2	2	3	4	0
16	1	2	2	2	2	4	1	2	2	2	2	2	3	2	2	1	2	2	2
17	0	1	1	2	1	0	1	2	2	2	3	3	2	2	2	1	2	3	2
18	2	1	1	4	1	2	3	4	0	0	1	1	1	2	2	2	2	2	2
19	4	2	2	2	0	1	2	2	3	3	3	2	3	2	2	2	3	0	1
20	2	1	1	1	2	4	1	2	3	2	2	2	2	1	2	2	3	3	3
21	3	1	1	1	1	4	1	2	2	2	2	2	2	2	3	3	1	1	1
22	2	2	2	2	3	2	4	2	3	0	1	2	2	1	2	1	3	3	4
23	0	2	2	2	2	4	0	1	2	2	2	2	2	1	1	2	3	3	3
24	2	1	1	3	0	1	2	3	4	3	3	2	2	2	2	1	2	3	2
25	2	2	3	1	1	1	3	3	2	4	1	1	1	2	2	2	1	2	2
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
Max.	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	2.0	3.0	3.0	3.0	4.0	4.0
Mean	2.04	1.52	1.56	2.12	1.68	2.04	1.80	2.24	2.20	1.96	2.08	2.12	1.92	1.64	1.76	1.80	1.92	2.0	1.80
SD.	1.34	0.87	0.87	0.97	1.07	1.24	1.04	0.97	1.0	1.10	0.81	0.73	0.57	0.49	0.52	0.58	0.91	0.96	0.91
Median	2.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
p		0.129	0.172	0.901	0.354	1.000	0.268	0.428	0.594	0.727	0.803	0.646	0.872	0.202	0.291	0.469	0.759	0.882	0.427

Z: Z for Wilcoxon signed ranks test

\*: Statistically significant at  $p \leq 0.05$

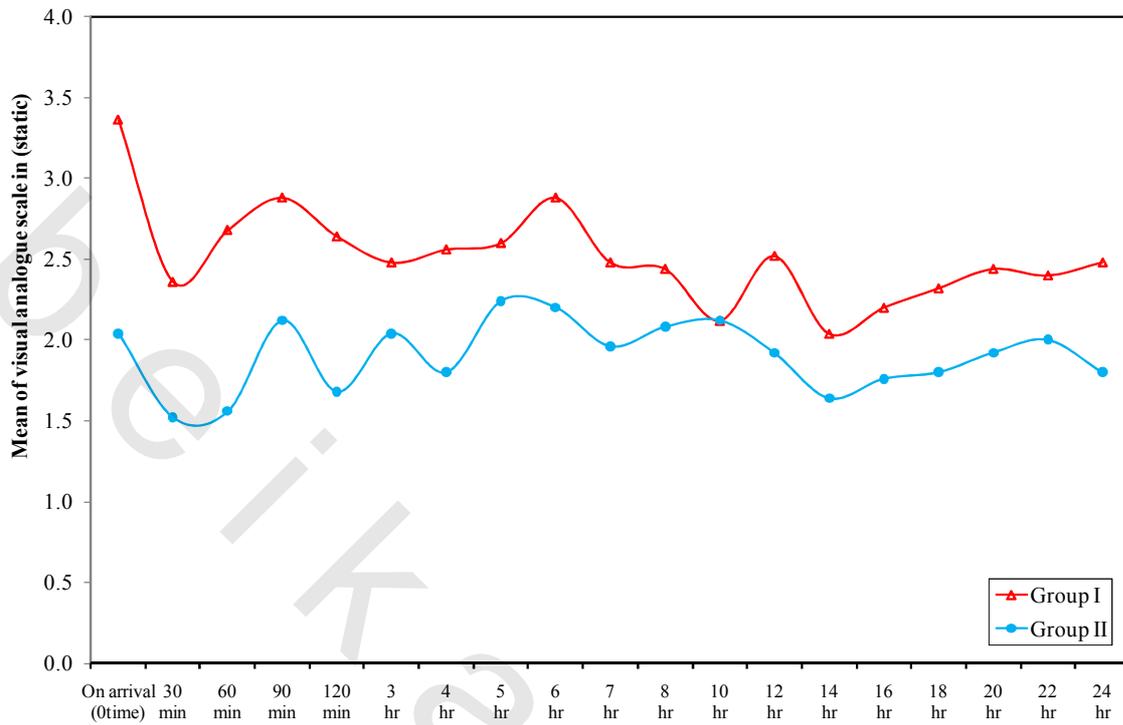
Table (13): Changes of visual analogue scale (static pain) in the two studied groups

	Static visual analogue scale in the two studied groups																		
	Zero time	30 min	60 min	90 min	120 min	3h	4h	5h	6h	7h	8h	10h	12h	14h	16h	18h	20h	22h	24h
<b>Group I</b>																			
Min.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0
Max.	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0
Mean	3.36	2.36	2.68	2.88	2.64	2.48	2.56	2.60	2.88	2.48	2.44	2.12	2.52	2.04	2.20	2.32	2.44	2.40	2.48
SD.	1.11	0.64	0.69	0.83	1.15	0.92	0.82	0.71	1.01	0.59	0.58	0.67	0.59	0.45	0.41	0.63	0.51	0.58	0.71
Median	4.0	2.0	3.0	3.0	3.0	2.0	3.0	2.0	3.0	2.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0
<b>Group II</b>																			
Min.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0
Max.	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	2.0	3.0	3.0	3.0	4.0	4.0
Mean	2.04	1.52	1.56	2.12	1.68	2.04	1.80	2.24	2.20	1.96	2.08	2.12	1.92	1.64	1.76	1.80	1.92	2.0	1.80
SD.	1.34	0.87	0.87	0.97	1.07	1.24	1.04	0.97	1.0	1.10	0.81	0.73	0.57	0.49	0.52	0.58	0.91	0.96	0.91
Median	2.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
<b>Z</b>	3.316*	3.723*	4.265*	2.972*	2.748*	1.717	2.611*	1.486	2.183*	1.929	1.592	0.153	3.337*	2.756*	3.030*	2.835*	2.111*	1.670	2.800*
<b>p</b>	0.001*	<0.001*	<0.001*	0.003*	0.006*	0.086	0.009*	0.137	0.029*	0.054	0.111	0.878	0.001*	0.006*	0.002*	0.005*	0.035*	0.095	0.005*

Z: Z for Mann Whitney test

\*: Statistically significant at  $p \leq 0.05$

## Results



**Figure (16): Changes of visual analogue scale (static pain) in the two studied groups**

### 2. Changes of VAS at movement (dynamic pain): (Tables 14-16, Figure 9)

#### In group I:

The mean value of VAS at 10 minutes after reaching ICU was  $6.46 \pm 1.55$  (base value). It decreased significantly at 30 min, 60 min, 90 min, 120 min, 3, 4, 5, 6, 7 and 8h to a mean of  $4.80 \pm 0.87$ ,  $5.40 \pm 1.15$ ,  $5.76 \pm 1.42$ ,  $5.40 \pm 1.15$ ,  $5.56 \pm 1.45$ ,  $5.60 \pm 1.22$ ,  $5.68 \pm 1.14$ ,  $5.96 \pm 1.37$ ,  $5.28 \pm 0.89$  and  $5.20 \pm 1.04$  respectively. There was a highly significant decrease at 10, 12, 14, 16, 18, 20, 22 and 24 h with a mean of  $4.84 \pm 1.11$ ,  $5.08 \pm 0.91$ ,  $5.12 \pm 0.67$ ,  $5.12 \pm 0.78$  and  $4.6 \pm 1.04$ ,  $5.24 \pm 0.83$ ,  $5.36 \pm 0.95$  and  $5.52 \pm 1.08$  respectively.

#### In group II

The mean value of VAS at 10 minutes after reaching ICU was  $4.44 \pm 1.69$  (base value). It decreased insignificantly over the first hour with a mean of  $3.92 \pm 1.15$  and  $4.20 \pm 1.08$ , at 30 and 60 min respectively. At 90 min it increased insignificantly to a mean of  $4.80 \pm 1.44$ . It decreased insignificantly again to a mean of  $4.24 \pm 1.45$  at 120 min. There was insignificant increase at 3, 4, 5, 6, and 7hr with a mean of  $4.84 \pm 1.70$ ,  $4.48 \pm 1.69$ ,  $4.96 \pm 1.40$ ,  $4.88 \pm 1.39$  and  $4.60 \pm 1.35$  respectively. It decreased insignificantly again to at 8, 10, 12, 14, 16, 20, 22 and 24 h with a mean of  $4.28 \pm 0.98$ ,  $4.24 \pm 1.01$ ,  $4.32 \pm 0.99$ ,  $3.80 \pm 0.71$ ,  $3.92 \pm 0.70$ ,  $4.24 \pm 1.23$ ,  $4.36 \pm 1.29$  and  $4.28 \pm 1.34$  respectively. The only exception during the late postoperative period was at 18 h when it increased insignificantly to a mean of  $4.56 \pm 1.003$ .

On comparing the two groups, there was a significant decrease in VAS at dynamic pain assessment in group II compared to group I over all time of assessment except at 3 and 18h postoperatively where this decrease was insignificant.

Table (14): Changes of visual analogue scale (dynamic pain) in group I

Cases	dynamic visual analogue scale in group I																		
	Zero time	30 min	60 min	90 min	120 min	3h	4h	5h	6h	7h	8h	10h	12h	14h	16h	18h	20h	22h	24h
1	6	3	5	7	7	6	6	6	7	4	5	6	7	5	6	4	5	5	6
2	7	4	4	4	7	6	7	5	6	6	6	7	4	6	5	5	6	6	4
3	8	4	4	5	5	5	7	5	5	6	7	5	6	5	7	4	5	6	6
4	9	4	5	5	7	4	4	5	7	5	4	3	4	5	5	5	6	6	7
5	8	4	5	6	6	4	5	6	7	5	3	3	4	5	5	4	5	5	6
6	6	6	9	5	6	7	3	4	5	5	5	5	6	6	6	6	6	7	5
7	6	5	5	5	8	5	6	6	6	6	5	5	5	6	6	5	6	6	6
8	8	4	6	7	4	4	5	6	6	6	6	6	6	5	6	6	6	6	7
9	6	5	5	7	3	5	6	8	3	4	5	5	5	5	5	5	6	6	6
10	5	5	5	5	7	5	5	6	6	5	5	5	6	5	5	5	5	5	5
11	4	5	5	5	6	7	5	5	5	6	8	3	5	5	5	4	7	3	4
12	5	5	5	5	6	8	5	6	6	6	5	5	6	4	5	7	4	5	7
13	8	5	5	8	3	5	5	6	8	4	4	4	5	5	4	4	5	5	5
14	9	4	5	6	5	6	8	4	8	4	4	5	5	5	4	4	5	4	4
15	5	6	6	9	3	6	7	5	5	6	5	4	4	4	4	3	5	5	5
16	6	7	4	5	6	9	4	6	6	6	6	5	5	5	4	3	4	4	5
17	4	5	5	5	7	4	5	5	5	5	6	5	5	5	5	4	4	4	4
18	5	5	7	4	5	8	4	6	6	6	6	4	5	5	5	5	5	6	6
19	8	5	5	5	7	3	5	6	6	6	5	6	6	6	6	6	6	7	6
20	9	6	8	3	5	6	7	5	8	7	4	3	4	4	4	4	4	5	6
21	7	4	5	5	6	6	7	4	5	6	6	7	3	4	5	4	6	6	6
22	8	5	6	7	4	5	7	5	8	4	5	5	5	6	5	6	6	6	8
23	7	4	5	8	4	4	6	9	3	5	5	5	6	6	5	4	5	5	5
24	7	5	6	6	5	6	5	6	7	4	5	5	5	6	6	5	5	6	5
25	5	5	5	7	3	5	6	7	5	5	5	5	5	5	5	3	4	5	4
Min.	4.0	3.0	4.0	3.0	3.0	3.0	3.0	4.0	3.0	4.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0
Max.	9.0	7.0	9.0	9.0	8.0	9.0	8.0	9.0	8.0	7.0	8.0	7.0	7.0	6.0	7.0	7.0	7.0	7.0	8.0
Mean	6.64	4.80	5.40	5.76	5.40	5.56	5.60	5.68	5.96	5.28	5.20	4.84	5.08	5.12	5.12	4.60	5.24	5.36	5.52
SD.	1.55	0.87	1.15	1.42	1.50	1.45	1.22	1.14	1.37	0.89	1.04	1.11	0.91	0.67	0.78	1.04	0.83	0.95	1.08
Median	7.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	6.0
P		0.001*	0.006*	0.049*	0.013*	0.042*	0.007*	0.022*	0.027*	0.002*	0.005*	<0.001*	0.001*	<0.001*	0.001*	<0.001*	0.002*	0.001*	0.003*

Z: Z for Wilcoxon signed ranks test

\*: Statistically significant at  $p \leq 0.05$

Table (15): Changes of visual analogue scale (dynamic pain) in group II

Cases	dynamic visual analogue scale in group II																		
	Zero time	30 min	60 min	90 min	120 min	3h	4h	5h	6h	7h	8h	10h	12h	14h	16h	18h	20h	22h	24h
1	2	3	3	4	5	5	2	7	4	4	4	4	4	3	3	4	4	4	4
2	7	3	3	4	4	5	8	2	3	4	4	5	4	3	3	4	3	3	3
3	4	4	4	5	5	5	3	7	4	5	5	4	4	4	3	4	4	3	3
4	2	3	4	6	6	7	3	3	4	4	4	4	5	4	4	4	3	3	4
5	4	4	4	5	8	4	5	4	8	2	3	3	4	3	4	5	4	7	3
6	3	4	4	5	7	3	5	5	5	5	5	5	4	4	3	4	4	4	4
7	3	4	5	8	3	3	4	5	5	6	6	5	7	3	3	5	5	5	5
8	4	5	5	7	3	4	5	5	5	7	2	3	3	4	4	4	4	4	5
9	5	5	7	3	4	4	5	6	6	5	5	5	4	5	4	5	4	3	4
10	6	7	3	4	4	5	7	3	4	4	5	5	4	3	3	3	2	3	3
11	4	5	6	5	3	4	5	5	5	5	4	7	3	4	4	3	2	3	4
12	3	4	4	5	5	7	2	6	6	6	5	4	4	4	4	5	5	4	5
13	8	2	3	3	3	5	5	7	3	4	5	4	4	4	5	4	6	4	3
14	7	3	3	4	5	6	5	6	7	3	4	4	5	3	4	5	3	4	4
15	5	6	5	5	4	4	5	5	5	7	5	4	4	4	5	5	5	7	2
16	3	4	4	4	5	8	3	4	4	4	4	4	5	4	4	4	4	5	5
17	3	3	3	7	2	2	3	4	4	5	5	5	4	5	4	5	5	6	5
18	4	3	3	7	3	4	6	8	2	2	4	3	4	5	4	4	5	5	5
19	7	3	4	4	3	3	4	4	5	5	5	5	5	4	5	5	7	3	3
20	4	3	4	3	5	8	3	5	5	4	4	5	7	3	4	6	5	5	7
21	7	3	4	4	4	7	4	5	5	4	5	5	5	4	5	7	3	3	3
22	4	5	5	4	5	5	8	4	7	3	3	4	4	3	4	4	6	6	7
23	3	3	4	4	5	7	2	4	4	5	4	3	4	3	3	4	5	6	7
24	4	4	5	7	2	3	4	5	7	5	5	4	4	5	4	4	5	5	5
25	5	5	6	3	3	3	6	5	5	7	2	2	3	4	5	7	3	4	4
Min.	2.0	2.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0
Max.	8.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	6.0	7.0	7.0	5.0	5.0	7.0	7.0	7.0	7.0
Mean	4.44	3.92	4.20	4.80	4.24	4.84	4.48	4.96	4.88	4.60	4.28	4.24	4.32	3.80	3.92	4.56	4.24	4.36	4.28
SD.	1.69	1.15	1.08	1.44	1.45	1.70	1.69	1.40	1.39	1.35	0.98	1.01	0.99	0.71	0.70	1.003	1.23	1.29	1.34
Median	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
p		0.698	0.835	0.550	0.697	0.552	0.868	0.190	0.308	0.805	0.609	0.677	0.719	0.161	0.096	0.790	0.733	0.920	0.829

Z: Z for Wilcoxon signed ranks test

\*: Statistically significant at  $p \leq 0.05$

Table (16): Changes of visual analogue scale (dynamic pain) in the two studied groups

	dynamic visual analogue scale in the two studied groups																		
	Zero	30 min	60 min	90 min	120	3h	4h	5h	6h	7h	8h	10h	12h	14h	16h	18h	20h	22h	24h
<b>Group I</b>																			
Min.	4.0	3.0	4.0	3.0	3.0	3.0	3.0	4.0	3.0	4.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0
Max.	9.0	7.0	9.0	9.0	8.0	9.0	8.0	9.0	8.0	7.0	8.0	7.0	7.0	6.0	7.0	7.0	7.0	7.0	8.0
Mean	6.64	4.80	5.40	5.76	5.40	5.56	5.60	5.68	5.96	5.28	5.20	4.84	5.08	5.12	5.12	4.60	5.24	5.36	5.52
SD.	1.55	0.87	1.15	1.42	1.50	1.45	1.22	1.14	1.37	0.89	1.04	1.11	0.91	0.67	0.78	1.04	0.83	0.95	1.08
Median	7.0	5.0	5.0	5.0	6.0	5.0	5.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	6.0
<b>Group II</b>																			
Min.	2.0	2.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	2.0	3.0	2.0
Max.	8.0	7.0	7.0	8.0	8.0	8.0	8.0	8.0	8.0	7.0	6.0	7.0	7.0	5.0	5.0	7.0	7.0	7.0	7.0
Mean	4.44	3.92	4.20	4.80	4.24	4.84	4.48	4.96	4.88	4.60	4.28	4.24	4.32	3.80	3.92	4.56	4.24	4.36	4.28
SD.	1.69	1.15	1.08	1.44	1.45	1.70	1.69	1.40	1.39	1.35	0.98	1.01	0.99	0.71	0.70	1.003	1.23	1.29	1.34
Median	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
<b>Z</b>	4.052*	3.040*	3.703*	2.498*	2.660*	1.690	2.607*	2.009*	2.803*	2.049*	2.964*	2.135*	3.109*	4.967*	4.544*	0.216	3.051*	2.922*	3.337*
<b>p</b>	<0.001*	0.002*	<0.001*	0.012*	0.008*	0.091	0.009*	0.045*	0.005*	0.040*	0.003*	0.033*	0.002*	<0.001*	<0.001*	0.891	0.002*	0.003*	0.001*

Z: Z for Mann Whitney test

\*: Statistically significant at  $p \leq 0.05$

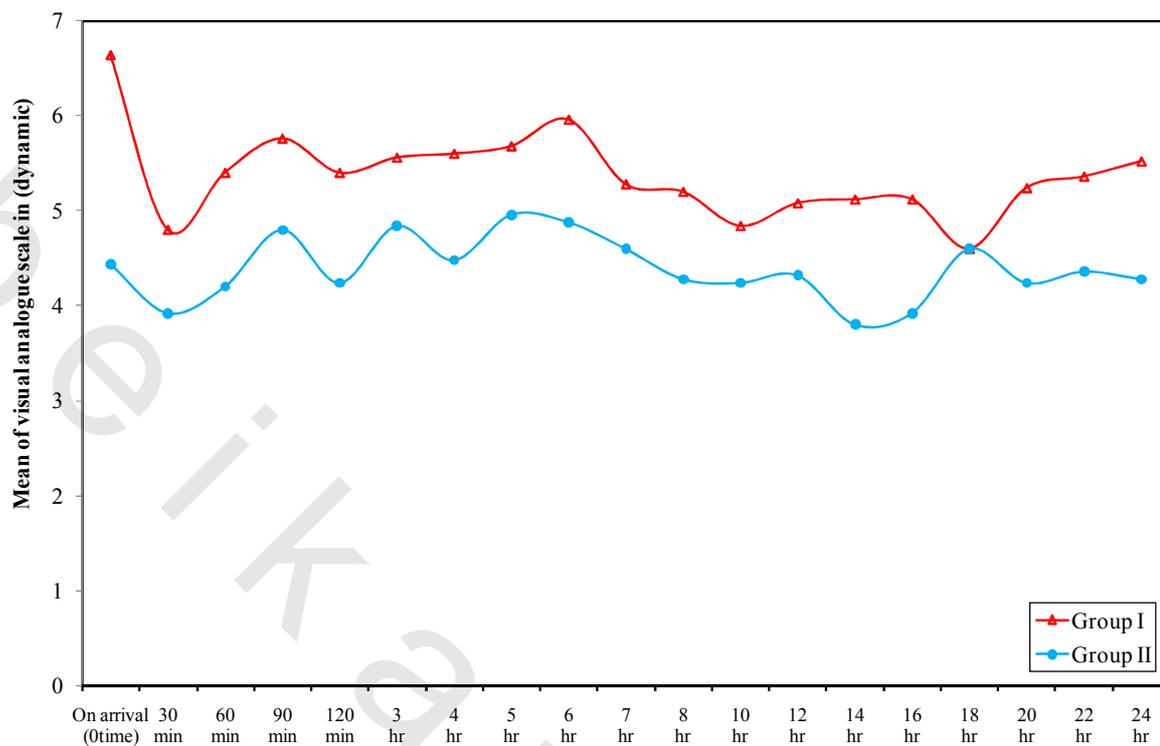


Figure (17): Changes of visual analogue scale (dynamic pain) in the two studied groups

**IV. Time of first rescue analgesia (minutes): (Table 17, Figure 10)**

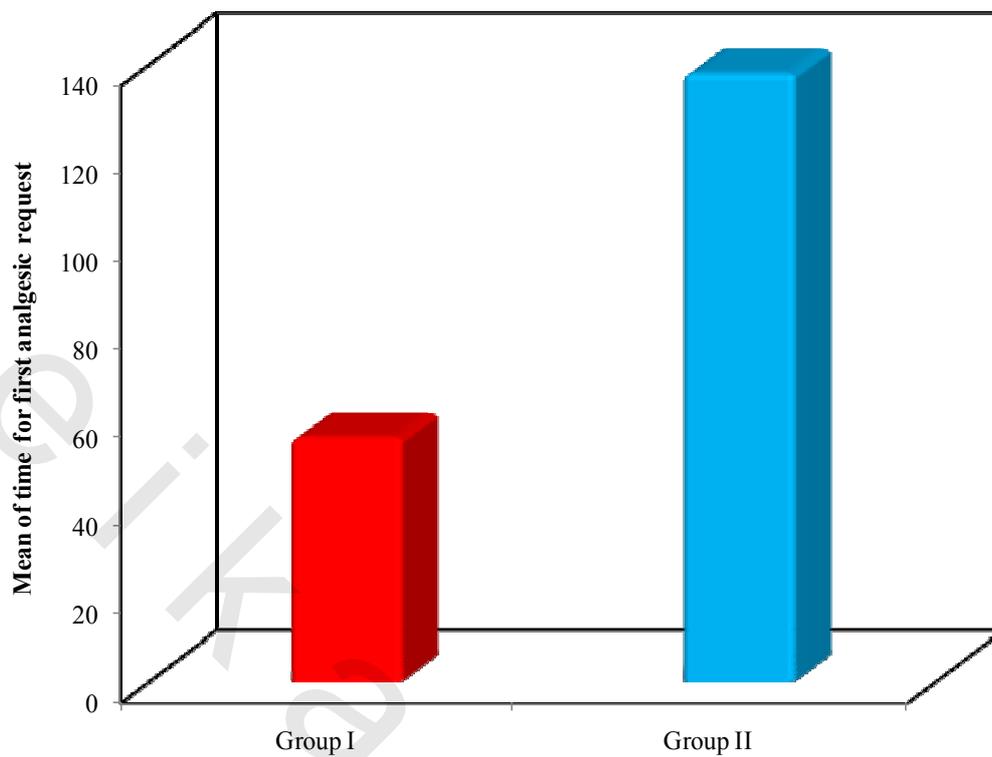
The mean time of first rescue analgesia was 55.12±64.50 in group I and 137.80±95.28 in group II respectively. On comparing the two groups, there was a significant increase in time of first rescue analgesia in group II compared to group I.

**Table (17): Time of first rescue analgesia (minutes) in both groups**

Cases	Group I	Group II
1	91	300
2	122	0
3	0	90
4	0	180
5	0	120
6	0	124
7	120	90
8	0	302
9	119	63
10	120	37
11	183	0
12	180	183
13	0	0
14	0	302
15	90	120
16	34	179
17	126	90
18	0	240
19	0	97
20	0	182
21	0	184
22	92	0
23	0	181
24	0	258
25	101	123
Min. – Max.	0 - 183	0 - 302
Mean ± SD.	55.12±64.50	137.80±95.28
Median	0.0	123.0
Z	3.070*	
P	0.002*	

Z: Z for Mann Whitney test

\*: Statistically significant at  $p \leq 0.05$



**Figure (18): Time of first rescue analgesia (minutes) in the two groups.**

**V. Total analgesic requirements (mg/24h), (Table18, Figure11)**

- **In group I:** The mean value for total amount of IV nalbuphine consumed during postoperative period was  $17.76 \pm 6.36$ .
- **In group II:** The mean value for total amount of IV nalbuphine consumed during postoperative period was  $10.56 \pm 4.34$ .

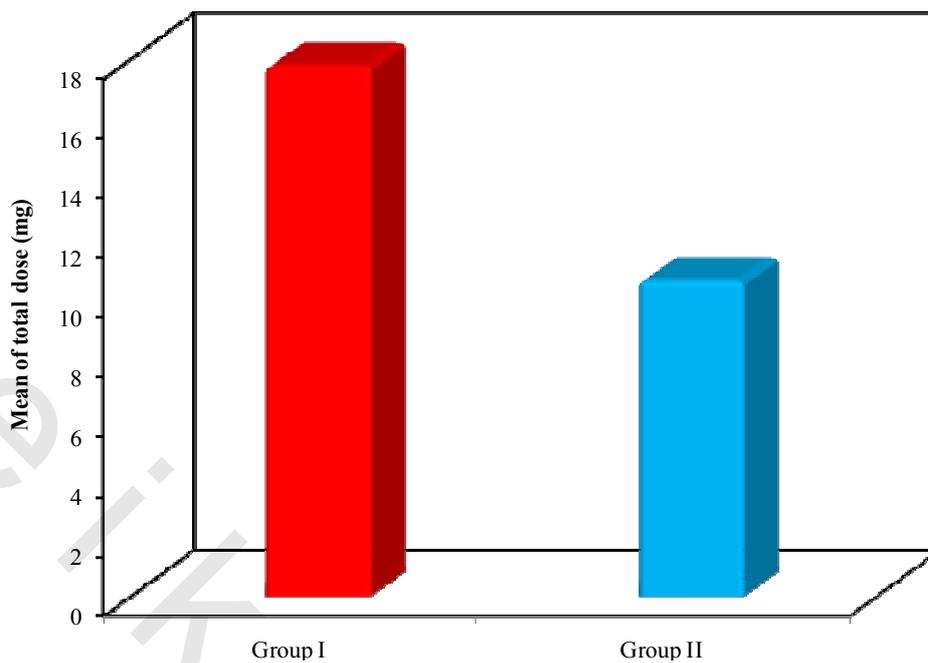
The comparison between the two studied groups illustrated that the total consumed amount of postoperative IV nalbuphine was significantly less in group II than in group I.

**Table (18): Total analgesic requirements (mg/24h) in the two groups**

Cases	Total dose (mg)	
	Group I	Group I
1	24	6
2	24	12
3	24	6
4	24	6
5	18	18
6	24	6
7	6	12
8	18	12
9	12	6
10	6	12
11	18	6
12	18	6
13	18	12
14	18	12
15	12	12
16	12	6
17	12	6
18	12	12
19	18	12
20	30	18
21	18	18
22	30	18
23	18	12
24	12	6
25	18	12
Min. – Max.	6.0 – 30.0	6.0 – 18.0
Mean ± SD.	$17.76 \pm 6.36$	$10.56 \pm 4.34$
Median	18.0	12.0
<b>Z (p)</b>	<b>3.946 (&lt;0.001*)</b>	

Z: Z for Mann Whitney test

\*: Statistically significant at  $p \leq 0.05$



**Figure (19): Total analgesic requirements (mg/24h) in the two studied groups**

## **VI. Post-operative level of sedation: (Table 19-21, Figure 12)**

In group I, the mean value of post-operative Ramsey sedation score at 10 minutes after reaching ICU was  $1.88 \pm 0.73$  (base value). It increased insignificantly at 2 and 4 h with a mean of  $1.92 \pm 0.28$  and  $2.0 \pm 0.5$  respectively. It decreased insignificantly to a mean of  $1.68 \pm 0.48$  at 6hr. It increased insignificantly again at 8, 10, 12, 14, 16, 18, 20 and 22h to a mean of  $1.96 \pm 0.35$ ,  $1.92 \pm 0.28$ ,  $1.96 \pm 0.2$ ,  $2.0 \pm 0.0$ ,  $1.96 \pm 0.2$ ,  $1.96 \pm 0.2$  and  $1.88 \pm 0.33$  respectively. It decreased insignificantly at 24h to a mean of  $1.84 \pm 0.37$ .

In group II, the mean value of post-operative Ramsey sedation score at 10 minutes after reaching ICU was  $2.44 \pm 1.04$  (base value). It decreased insignificantly at 2 h to a mean of  $2.32 \pm 0.90$ . There was a significant decrease at 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24h to a mean of  $1.80 \pm 0.5$ ,  $1.88 \pm 0.33$ ,  $2.0 \pm 0.0$ ,  $2.0 \pm 0.0$ ,  $1.92 \pm 0.28$ ,  $2.0 \pm 0.0$ ,  $2.0 \pm 0.0$ ,  $1.92 \pm 0.28$ ,  $1.96 \pm 0.20$ ,  $1.92 \pm 0.28$  and  $1.88 \pm 0.33$  respectively.

On comparing the two studied groups, there was a significantly increased Ramsey sedation score in group II compared to group I at zero time and 2 h postoperatively. It was insignificantly higher in group II during the remaining times of measurement except at 6 and 18 h when it was insignificantly higher in group I compared to group II.

**Table (19): Post-operative level of sedation in group I**

Case number	Post-operative level of sedation												
	Zero time	2h	4h	6h	8h	10h	12h	14h	16h	18h	20h	22h	24h
1	2	2	2	1	2	2	1	2	2	1	2	2	2
2	2	2	1	2	2	1	2	2	2	2	2	1	2
3	1	2	2	2	1	2	2	2	1	2	2	2	2
4	1	2	2	1	2	2	2	2	2	2	2	2	1
5	2	1	2	1	2	2	2	2	2	2	2	2	2
6	1	1	2	2	2	2	2	2	2	2	2	1	2
7	2	2	2	2	2	2	2	2	2	2	2	2	2
8	1	2	2	2	2	2	2	2	2	2	2	2	1
9	2	2	2	2	2	2	2	2	2	2	2	2	2
10	2	2	2	2	2	2	2	2	2	2	2	2	2
11	3	2	1	2	1	2	2	2	2	2	1	2	2
12	2	2	2	2	2	2	2	2	2	2	2	2	1
13	1	2	2	1	2	2	2	2	2	2	2	2	2
14	1	2	2	1	2	2	2	2	2	2	2	2	2
15	2	2	2	2	2	2	2	2	2	2	2	2	2
16	2	2	2	2	2	2	2	2	2	2	2	2	2
17	3	2	2	2	2	2	2	2	2	2	2	2	2
18	3	2	2	2	2	2	2	2	2	2	2	2	2
19	1	2	3	2	2	2	2	2	2	2	2	1	2
20	2	2	2	2	2	2	2	2	2	2	2	2	2
21	3	2	3	1	2	1	2	2	2	2	2	2	2
22	2	2	2	2	3	2	2	2	2	2	2	2	1
23	1	2	1	1	2	2	2	2	2	2	2	2	2
24	2	2	2	2	2	2	2	2	2	2	2	2	2
25	3	2	3	1	2	2	2	2	2	2	2	2	2
Min.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0
Max.	3.0	2.0	3.0	2.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	1.88	1.92	2.0	1.68	1.96	1.92	1.96	2.0	1.96	1.96	1.96	1.88	1.84
SD.	0.73	0.28	0.50	0.48	0.35	0.28	0.20	0.0	0.20	0.20	0.20	0.33	0.37
Median	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
P		NS >0.05											

p: p value for Wilcoxon signed ranks test for comparing between on arrival to ICU with each other stages

\*: Statistically significant at  $p \leq 0.05$

**Results**

**Table (20): Post-operative level of sedation in group II**

Case number	Post-operative level of sedation												
	Zero time	2h	4h	6h	8h	10h	12h	14h	16h	18h	20h	22h	24h
1	3	2	2	2	2	2	2	2	2	2	2	2	2
2	1	2	1	2	2	2	2	2	2	2	2	2	2
3	4	3	1	2	2	2	2	2	2	2	2	2	2
4	3	1	2	2	2	2	2	2	2	2	2	2	2
5	2	1	2	1	2	2	2	2	2	2	2	1	2
6	2	3	2	2	2	2	2	2	2	2	2	2	2
7	2	1	2	2	2	2	1	2	2	2	2	2	2
8	1	3	2	2	2	2	2	2	2	2	2	2	2
9	2	4	2	2	2	2	2	2	2	2	2	2	2
10	2	1	2	2	2	2	2	2	2	2	2	2	2
11	4	3	2	2	2	2	2	2	2	2	2	2	2
12	3	3	2	2	2	2	2	2	2	2	2	2	2
13	1	3	2	2	2	2	2	2	2	2	2	2	2
14	1	2	2	1	2	2	2	2	2	2	2	2	2
15	4	2	1	2	2	2	2	2	2	2	2	1	2
16	3	2	2	2	2	2	2	2	2	2	2	2	2
17	2	1	3	2	2	2	2	2	2	2	2	2	2
18	2	3	2	2	2	2	2	2	2	2	2	2	2
19	1	1	2	2	2	2	2	2	2	2	2	2	2
20	2	3	2	2	2	2	1	2	2	2	2	2	1
21	4	3	1	2	2	2	2	2	2	1	1	2	2
22	3	2	1	1	2	2	2	2	2	2	2	2	1
23	2	3	1	2	2	2	2	2	2	2	2	2	1
24	3	3	2	2	2	2	2	2	2	2	2	2	2
25	4	3	2	2	2	2	2	2	2	1	2	2	2
Min.	1.0	1.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0
Max.	4.0	4.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	2.44	2.32	1.80	1.88	2.0	2.0	1.92	2.0	2.0	1.92	1.96	1.92	1.88
SD.	1.04	0.90	0.50	0.33	0.0	0.0	0.28	0.0	0.0	0.28	0.20	0.28	0.33
Median	2.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
P		NS >0.05	0.023*	0.014*	0.040*	0.040*	0.021*	0.040*	0.040*	0.041*	0.041*	0.030*	0.016*

p: p value for Wilcoxon signed ranks test for comparing between on arrival to ICU with each other stages

\*: Statistically significant at  $p \leq 0.05$

**Table (21): Post-operative level of sedation in the two studied groups**

	Postoperative level of sedation												
	Zero time	2h	4h	6h	8h	10h	12h	14h	16h	18h	20h	22h	24h
<b>Group I</b>													
Min.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0
Max.	3.0	2.0	3.0	2.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	1.88	1.92	2.0	1.68	1.96	1.92	1.96	2.0	1.96	1.96	1.96	1.88	1.84
SD.	0.73	0.28	0.50	0.48	0.35	0.28	0.20	0.0	0.20	0.20	0.20	0.33	0.37
Median	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
<b>Group II</b>													
Min.	1.0	1.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0	1.0	1.0
Max.	4.0	4.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Mean	2.44	2.32	1.80	1.88	2.0	2.0	1.92	2.0	2.0	1.92	1.96	1.92	1.88
SD.	1.04	0.90	0.50	0.33	0.0	0.0	0.28	0.0	0.0	0.28	0.20	0.28	0.33
Median	2.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
<b>Z</b>	1.915*	2.176*	1.391	1.690	0.589	1.429	0.590	0.0	1.000	0.590	0.0	0.467	0.403
<b>P</b>	0.045*	0.030*	0.164	0.091	0.556	0.153	0.556	1.000	0.317	0.556	1.000	0.641	0.687

Z: Z for Mann Whitney test

\*: Statistically significant at  $p \leq 0.05$

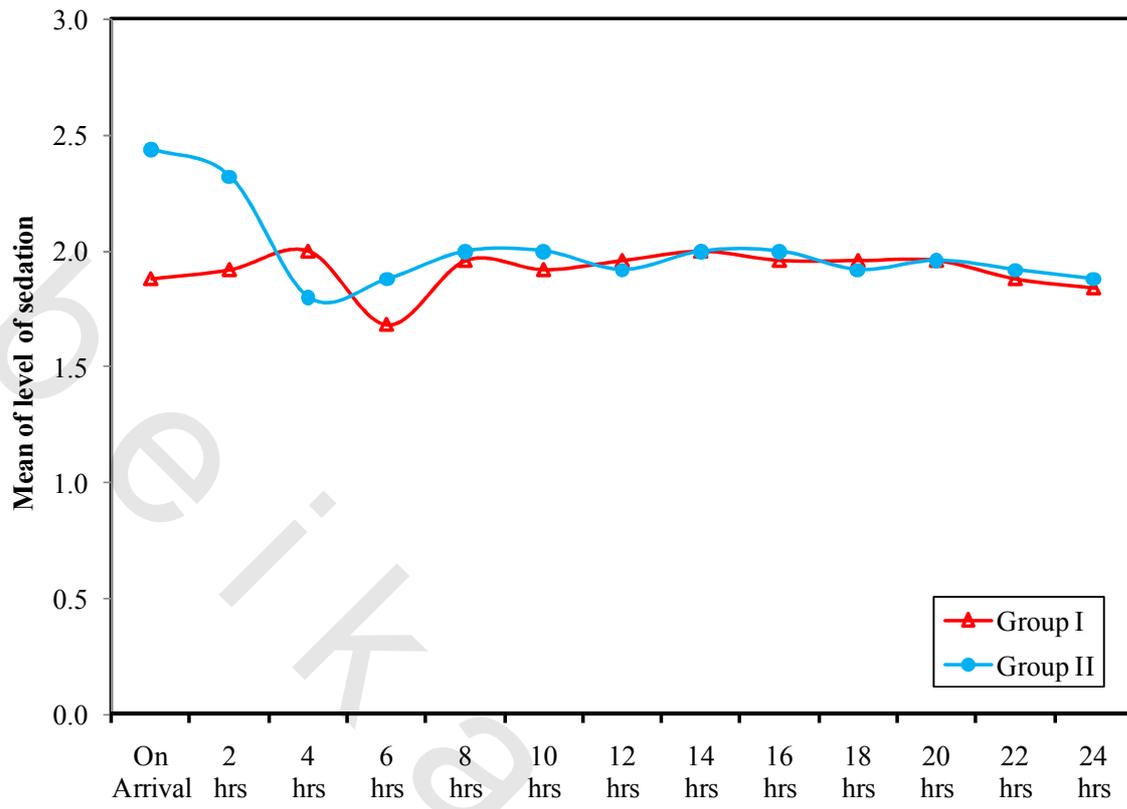


Figure (20): Post-operative level of sedation in the two studied groups

## **VII. Postoperative nausea and vomiting (PONV) (Table 22, figure 13)**

**In group I**, 11 patients (44%) developed nausea grade I without vomiting, 4 patients (16%) developed nausea grade II and 4 patients (16%) developed nausea grade III that was associated with vomiting. On the other hand, 6 patients (24%) did not develop nausea or vomiting at all.

**In group II**, 6 patients (24%) developed nausea grade I without vomiting, 3 patients (12%) developed nausea grade II and 2 patients (8%) developed nausea grade III that was associated with vomiting. On the other hand, 14 patients (56%) did not develop nausea or vomiting at all. Ondansetron was used to treat nausea grade II and III in both groups.

On comparing the two studied groups, there was a significant decrease of PONV in group II compared to group I during postoperative 24hr.

**Table (22): PONV in the two studied groups**

Case No.	Group I	Group II
1	0	1
2	1	1
3	3	2
4	1	0
5	3	0
6	2	0
7	1	0
8	2	0
9	1	1
10	3	1
11	1	2
12	0	1
13	2	2
14	1	1
15	1	0
16	0	0
17	1	0
18	0	0
19	1	0
20	1	0
21	3	3
22	2	0
23	0	3
24	1	0
25	0	0
0	6 (24%)	14 (56%)
1	11 (44%)	6 (24%)
2	4 (16%)	3 (23%)
3	4 (16%)	2 (8%)
Min. –Max.	0.0 – 3.0	0.0 – 3.0
Mean ±SD.	1.24 ± 1.01	0.72 ± 0.98
Median	1.0	0.0
<b>Z (p)</b>	<b>2.023* (0.043*)</b>	

Z: Z for Mann Whitney test

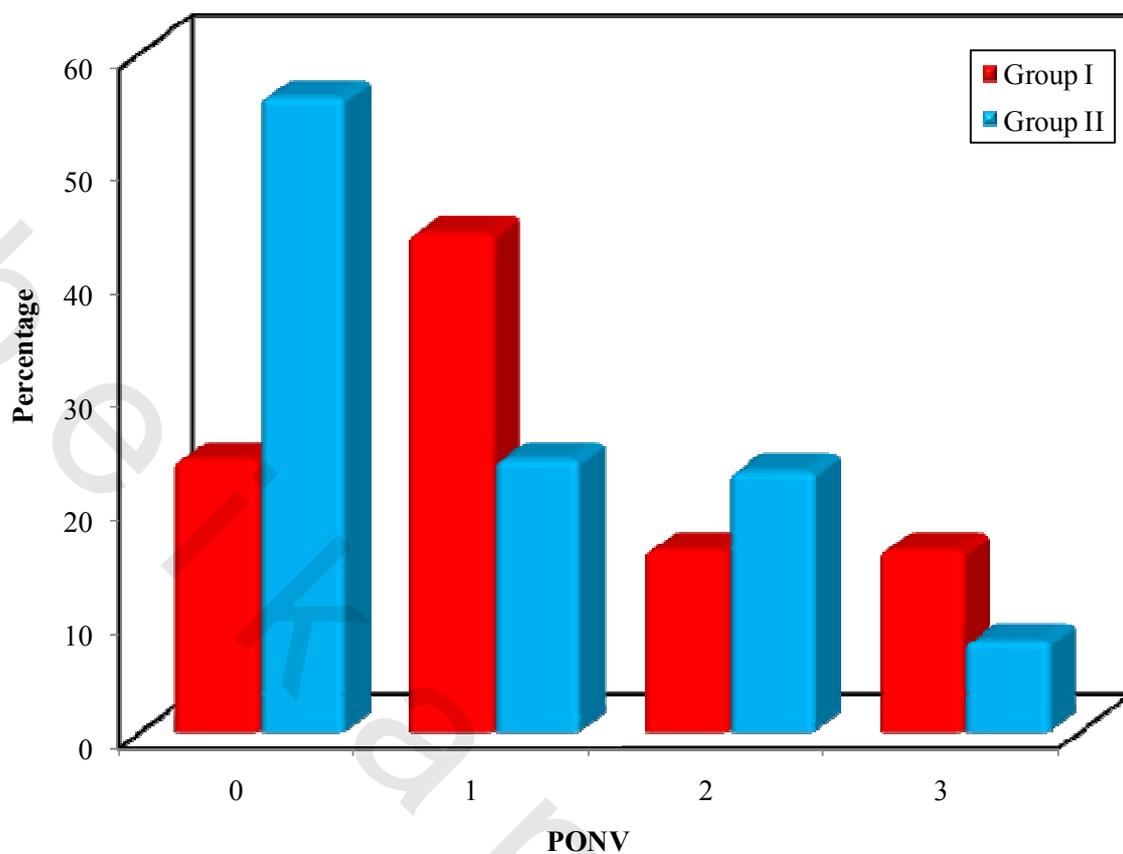


Figure (21): PONV in the two studied groups

### VIII. Post-operative side effects other than PONV:

No other adverse effects such as headache, tremor, ataxia, nystagmus, excessive sedation, or respiratory depression were recorded.