Original Research

A COMPARATIVE STUDY OF PROPHYLACTIC INTRAVENOUS INJ. GRANISETRON AND INTRAVENOUS INJ. ONDANSETRON FOR PREVENTION OF SPINAL ANAESTHESIA INDUCED HYPOTENSION AND BRADYCARDIA

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ABSTRACT

Background & Aims: Spinal anaesthesia is popular procedure for abdomen and lower limb surgeries. Sympathetic blockade and BJR are important causes for hypotension and Bradycardia following spinal anaesthesia. Bezold Jarisch reflex (BJR) is mediated by peripheral serotonin receptors of the 5-HT_3 type. The aim of the study was to compare prophylactic intravenous inj. Granisetron and inj. Ondansetron for the prevention of spinal anaesthesia induced hypotension and bradycardia to verify the hypothesis that blockade of $5HT_3$ serotonin receptors by both drugs might reduce hypotension and bradycardia.

Material & Methods: A Total 104 patients with ASA grade I, II, aged 18-60 years, either gender, weighing of 40-60 kg were divided into two groups (52 patients in each group). Group A received Inj. Ondansetron 4 mg intravenously and Group B received Inj. Granisetron 1 mg intravenously 5 mins before spinal anaesthesia. SBP, DBP, MAP, PR, SpO2 recorded at basal, 5mins intervals for the first 30minutes,10 mins interval up to 1 hour, 15mins interval till end of surgery. Adverse events were also noted. Requirement of total dose of Atropine and Mephentermine was measured.

Results: There was statistically significant difference of SBP between group A and group B at 5, 10,15,20,25,30 minutes ($p<0.05$), and MAP at 10,15,20,25minutes ($p<0.05$). There was statistically no significant difference of mean heart rate and DBP between group A and group B ($p > 0.05$).

Conclusion: Intravenous ondansetron is better in preventing hypotension than intravenous granisetron. Requirement of vasopressors was also reduced in the ondansetron group.

Keywords: Ondansetron, Granisetron, Hypotension, Spinal Anaesthesia.

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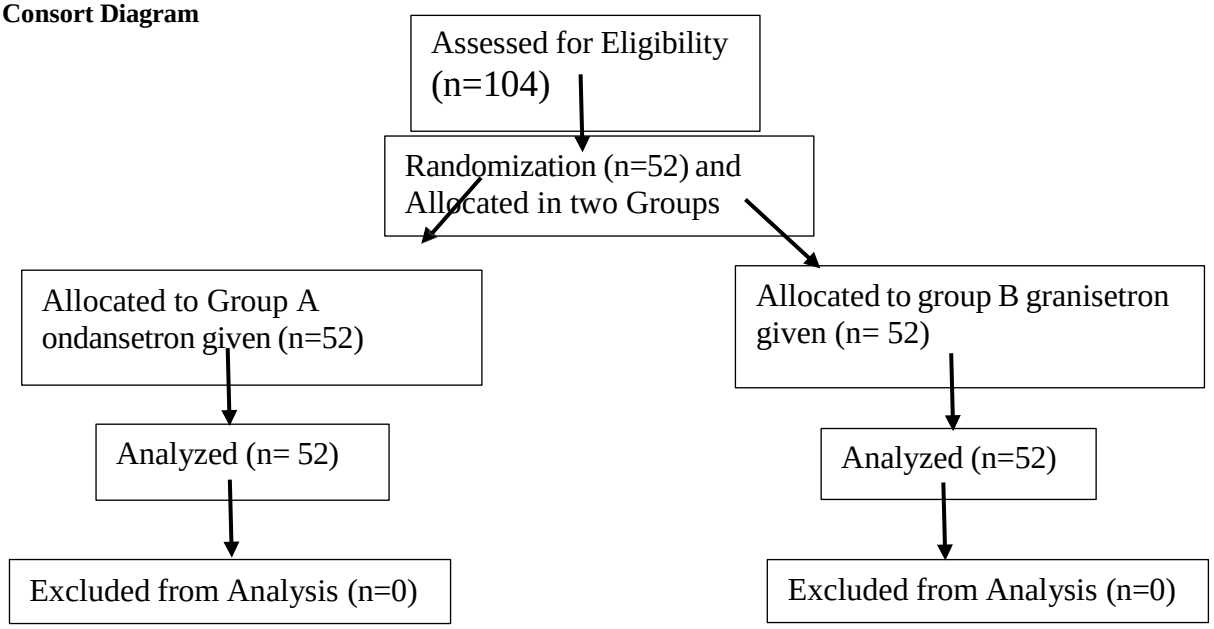
Consort Diagram



INTRODUCTION

Spinal anaesthesia is most commonly used for lower limb and lower abdominal surgeries. It having advantages over general anaesthesia that it provides post-operative analgesia with fewer complications. [1]

Primarily cause of hypotension is sympathetic nerve block which leads to decrease peripheral vascular resistance and venous return**.** This activates the BJR (Bezold- Jarisch reflex) via mechanoreceptors in the heart walls (sensitive to hypovolemia) and chemoreceptors (5- HT_3 receptors) sensitive to serotonin located intracardiac vagal nerve endings. Serotonin release from activated thrombocytes stimulates these peripheral 5- HT_3 receptors, increasing parasympathetic activity and resulting in hypotension and Bradycardia.[1-8]

Various studies suggests that cardiovascular response via BJR can be blockade at the 5-HT_3 receptor by 5- HT_3 receptor antagonist.[1,3,9-12]

Ondansetron and granisetron are most commonly used 5HT_3 receptors antagonists for prevention of post-operative nausea and vomiting.[13] Its role for maintenance of hemodynamic stability is recently evaluated. Therefore, we have planned this study.

The aim of this study was to compare prophylactic intravenous inj. granisetron and inj ondansetron for the prevention of spinal anaesthesia induced hypotension and bradycardia.

MATERIAL AND METHODS

This prospective, comparative, randomized, single blind study was carried out after obtaining institutional ethical committee approval and written informed consent from all participants at tertiary care centre. The study was registered at CTRI with the number CTRI/2025/02/080277

Total 104 participants aged 18-60 years, of either sex, ASA-I/II, with weight 40-60 kg. Scheduled for elective surgery under spinal anaesthesia. Patients with history of allergy drugs, bleeding disorders or on anticoagulant therapy, contraindications to spinal anaesthesia, not willing to give consent were excluded from the study.

Patients were assessed preoperatively about history and examination. Routine investigations including routine hemogram, renal function tests, liver function test, coagulation profile, ECG, chest X-ray were advised and reviewed on the day of surgery. Patients were nil per oral for 6 hours before surgery. The procedure explained to the patient and taken inside the operation theatre. Monitors such as ECG, pulse oximeter, NIBP, SpO2 were attached and baseline parameters were recorded (SBP, DBP, MAP, SpO2, PR). Peripheral intravenous line was secured with 20 G IV cannula and infusion of ringers lactate started at the rate of 15ml/kg. Patients were randomly divided into two groups, 52 patients in each group. Randomization was performed using a computer-generated randomization to allocate patients to various study groups using the method of random number. Group A patients received Inj. Ondansetron 4mg IV and Group B patients received Inj. Granisetron 1mg IV , both drugs diluted in 10cc normal saline. Study drug was given 5mins before spinal procedure.

Spinal anaesthesia was given under all aseptic and antiseptic precautions in sitting position. Inj. Lignocaine 2% 2cc given in skin and subcutaneous tissue after negative aspiration of blood. 23G spinal needle inserted in L3-L4 subarachnoid space via midline approach. Inj. Bupivacaine 0.5% Heavy 3.5ml were given after clear and free flow of CSF. Patient was immediately turned to the supine

position. Time at the completion of intrathecal injection noted as zero time. Onset and duration of sensory and motor block were recorded. Sensory blockage was checked with pin prick method and motor block was measured by modified Bromage scale. O_2 supplementation given via simple O_2 mask at 6 lit/minute.

Intraoperatively **SBP, DBP, MAP, PR, SpO2** were recorded at basal, 5mins interval for 30mins,10 mins interval up to 1 hour, 15mins interval till end of surgery.

Systolic blood pressure 90 mm of Hg or decrease in by 20% of baseline was consider as hypotension and treated with 6mg Mephentermine intravenously and decrease in HR below 50/min was consider as bradycardia and treated with 0.6mg Atropine.

Other adverse events like nausea, vomiting and shivering were noted.

Requirement of total dose of Atropine and Mephentermine was measured.

The sample size was calculated using Pocock's formula for sample size estimation for two proportion studies-

Where: n=desired sample size

Z α=standard normal deviation at 5% significance level (1.96) for a two- sided test

Z β=power of the test (0.84)

P1=Proportion of interest of the inj. ondansetron

P2=Proportion of interest of the inj. granisetron

The previous study showed the incidence of post spinal hypotension and bradycardia granisetron and ondansetron was to be 40% and 15% respectively

$$n = \frac{(0.40(1-0.40) + 0.15(1-0.15)(1.96+0.84)2}{(0.40-0.15)2} = 47$$

To make up for protocol violation/attrition 10% was added to the calculated sample size i.e., 47+5=52 for each group

Chi-square test was used to find the significance of study parameters on categorical scale between groups. Z test used to find the significance of study parameters on continuous scale between two groups (intergroup analysis) on metric parameters. Significance assessed at 5 % level of significance. Any p – value less than 0.05 ($p<0.05$) was considered as significant.

RESULTS

There was no statistically significant difference in respect to demographic data Age, hight, weight and BMI and ASA grading. (Table 1)

There was no statistically significant difference of heart Rate, mean DBP and SpO_2 between group A and group B. (Graph-1,3)

There was statistically significant difference of mean SBP between group A and group B at 5min(p=0.013), 10min(p=0.000), 15min(p=0.001), 20min(p=0.001), 25min(p=0.002), 30min(p=0.012). (Graph-2)

There was statistically significant difference of mean MAP between group A and group B at 10min (p=0.039), 15min(p=0.022), 20min (p= 0.044) and 25min(p=0.048). (Graph-4)

There was statistically significant difference in regards to requirement of mean bolus dose of Mephentermine between group A (1.04±2.84) and group B (3.00 ±4.03) (p=0.005). (Graph-5)

there was statistically no significant difference of use of total dose of atropine between group A and group B, there was no atropine used in any group(p=0).

there was no statistically significant difference in regards to complications between the groups except hypotension. (Table 2)

DISCUSSION

Serotonin causes triggering of BJR (Bezold Jarisch reflex) leads to systemic response like vasodilatation, hypotension and bradycardia after spinal anaesthesia.[4,6,14-17] Ondansetron and granisetron are selective 5 HT_3 receptor antagonist.[5] Previously Anisha et al, Rasad MM et al, Vadhanan P et al, Hajian P et al, Gao L et al, studied either ondansetron alone or comparison of ondansetron with grenisetron or with other agents in attenuating hypotension during spinal anaesthesia in patients undergoing cesarean section.[5,6,18-20] while comparative study by usha Shukla et al and Kumar A et al were in elective non obstetric surgery. [1,21] Effects of ondansetron on attenuating spinal anaesthesia induced hypotension and bradycardia evaluated in obstetric and non-obstetric subjects in systemic review and meta-analysis by tubog TD et al.[22] So we selected present study to compare ondansetron and granisetron for prevention of hypotension during spinal anaesthesia in lower abdominal and lower limb surgery.

In our study, there was fall in Heart Rate after spinal anaesthesia in both the groups observed from immediate to 20 minutes after spinal anaesthesia, but statistically no significant difference between group A and B.

Shrestha BK et al observed that there was a trend of decrease in heart rate in both groups after spinal anaesthesia but the difference was not statistically significant.[11] Rashad MM et al and kumar A et al also found that there was no significant difference in the Heart Rate among the t groups.[6,21]

In our study, there was reduction of systolic blood pressure and mean arterial pressure in both groups which was statistically significant between groups A and B up to 30 minutes. There was decrease in diastolic blood pressure after spinal anaesthesia in both the groups but no significant difference between the groups.

Kumar A et al found that ondansetron and granisetron significantly attenuates the fall in SBP, DBP, & MAP after SA but ondansetron was found to be more effective than granisetron in attenuating the fall in systolic B.P.,DBP,MAP after spinal anaesthesia.[21]

Rashad MM et al compared ondansetron and Granisetron as regard their hemodynamic effects on C.S. and found that granisetron had no effects on the hemodynamic variables.[6] Chaudhary et al also found that, no significant effect on hemodynamics with administration of 1 mg granisetron and 0.075 mg palanosetron before spinal anaesthesia for patients undergoing abdominal hysterectomy.[23]

Usha Shukla et al found that MAP remained more stable in ondansetron group compared to the granisetron group but mean difference was statistically not significant between the groups (p>0.005).[1]

Owczuk R et al compared ondansetron with placebo group and found that fall in systolic & MAP was reduced in ondansetron group compared to placebo group.[2]

Shrestha BK et al used granisetron IV for prevention of hypotension and bradycardia due to spinal anaesthesia and found that it attenuates the fall of diastolic and MAP but does not decrease the incidence of hypotension and bradycardia.[11]

Fating DR et al observed that ondansetron is better than granisetron for prevention of hypotension & Bradycardia after spinal anaesthesia in lower abdominal surgery.[24] This results are similar to our study.

Wang M et al studied different dosage of ondansetron 2mg, 4mg, 6mg, 8mg or normal saline 5 ml and observed that 4 mg of ondansetron was the optimal dose to prevent maternal hypotension, nausea and other effects during cesarean section.[25]

Potdar M et al also used 4mg and 8 mg of ondansetron and concluded that just increasing the dose of ondansetron from 4 mg to 8 mg not benefit and decreases the incidence of hypotension.[13]

Eldaba AA et al , Anisha et al , Rashad MM et al and Usha Shukla et al used 4 mg ondansetron and 1 mg granisetron in their study.[1,5,6,26]

So, in our study we used inj. ondansetron 4 mg diluted in 10 cc normal saline and granisetron 1 mg diluted in 10cc normal saline intravenously was given 5 minutes before spinal procedure.

Mean bolus dose requirement of Mephentermine was higher with granisetron group compared to ondansetron group (p=0.008). Total mean dose requirement was also higher with granisetron group and was statistically significant (p=0.005).

There was no usage of atropine in both the groups.

Anisha et al found that ephedrine requirement was significantly higher in granisetron group (23%) compared to ondansetron group (3%), also HR was comparable in Granisetrone and ondansetron group.[5] Kumar A et al showed that lesser use of mephentermine in ondansetron and granisetron group compared to saline group.[21] Similar findings in study of Usha Shukla et al suggests that use of ephedrine was statistically significantly more in normal saline group compared to ondansetron and granisetron group.[1]

Lamichhane also observed that ephedrine requirement was significantly reduced in granisetron group compared to saline group.[27]

There was statistically significant difference in regard to hypotension in group B (50%) compared to group A (17.3) p=0.000, there was no incidence of bradycardia in both groups.

There was no significant difference in regard to shivering between group A and group B

Rashad MM et al found that there were no statistically significant difference in occurrence of nausea and shivering in patients receiving ondansetron and granisetron.[6] Sayed et al found that ondansetron 4 mg and granisetron 1 mg reduces the incidence of nausea, vomiting and shivering compared to saline group.[28] Megahad MAB et al concluded that there was significant decreases in incidence of nausea ,vomiting and shivering in both ondansetron and granisetron group compared to control group.[29]

Shakya et al observed that 4 mg ondansetron IV reduces the incidence of shivering. [30]

The study was done only in ASA grade I and II patients. Mephentermine was only vasopressor used for hypotension. That was limitations in study. Strength of the study was $5HT_3$ receptor blockers prevents hypotension in non-obstetric surgery more with ondansetron. In future other $5HT_3$ blockers with different dosage can be use in different types of surgery under general anaesthesia to observe hemodynamic stability.

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Conflicts of interest (if present, give details)**:** No conflict of interest

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Tables

Table 1: Demographic Data

Parameter	**Group A**	**Group B**	**P Value**
	Mean ± SD	**Mean ± SD**	
Age	46.48 ± 15.93	45.40 ± 16.37	0.735
Height (cm)	158.38 ± 5.51	159.98 ± 4.20	0.100
Weight (kg)	58.12 ± 3.31	58.00 ± 3.12	0.855
BMI (kg/m²)	23.22 ± 1.77	22.67 ± 1.11	0.060
ASA I ASA II (No. (%))	24 (46.2%) 28 (53.8%)	24 (46.2%) 28 (53.8%)	1.000

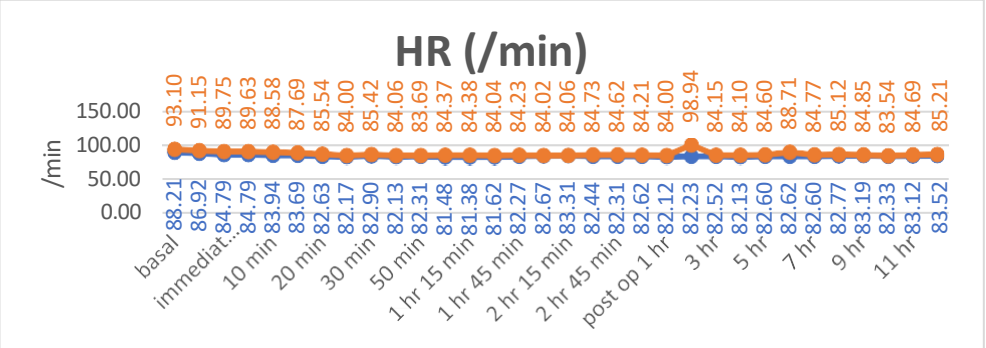
Both groups were comparable in respect to Age, Height, Weight, BMI and ASA grading were statistically not significant.

Table 2: Complications

Complications	**Group A**		**Group B**		**P value**
	No.	**Percentage**	**No.**	**Percentage**	
Hypotension	9	17.3%	26	50.0%	0.000
Shivering	11	21.2%	17	32.7%	0.185

There was no statistically significant difference for shivering between the

groups (p=0.185). But there was statistically significant difference in regards to hypotension (p=0.000).

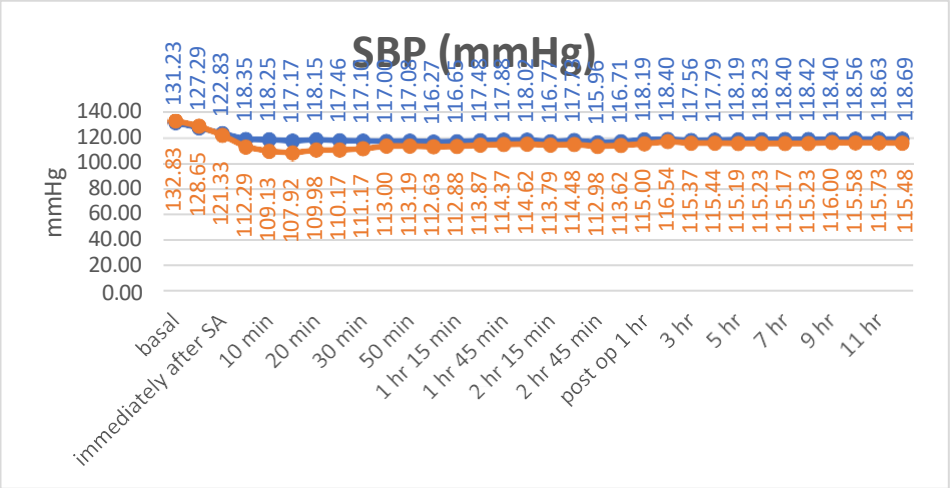


Graph 1 heart Rate Changes

Table3: Data for Heart Rate Changes (Graph 1)

HR (/min)	Group A	Group B	P Value
	Mean ± SD	Mean ± SD	
basal	88.21 ± 15.16	93.10 ± 10.97	0.063
after giving study drug	86.92 ± 15.25	91.15 ± 10.40	0.101
immediately after SA	84.79 ± 16.02	89.75 ± 11.43	0.072
5 min	84.79 ± 16.70	89.63 ± 12.71	0.099
10 min	83.94 ± 17.06	88.58 ± 11.34	0.106
15 min	83.69 ± 16.45	87.69 ± 10.51	0.143
20 min	82.63 ± 16.52	85.54 ± 10.89	0.292
25 min	82.17 ± 15.26	84.00 ± 11.01	0.486
30 min	82.90 ± 14.62	85.42 ± 11.52	0.331
40 min	82.13 ± 14.53	84.06 ± 9.68	0.429
50 min	82.31 ± 14.97	83.69 ± 10.40	0.585
60 min	81.48 ± 14.52	84.37 ± 9.68	0.236
1 hr 15 min	81.38 ± 14.75	84.38 ± 11.17	0.245
1 hr 30 min	81.62 ± 15.20	84.04 ± 9.93	0.338
1 hr 45 min	82.27 ± 13.87	84.23 ± 10.02	0.410
2 hr	82.67 ± 14.57	84.02 ± 9.89	0.583
2 hr 15 min	83.31 ± 13.82	84.06 ± 9.28	0.746
2 hr 30 min	82.44 ± 14.33	84.73 ± 9.47	0.339
2 hr 45 min	82.31 ± 14.32	84.62 ± 8.52	0.320
3 hr	82.62 ± 14.60	84.21 ± 9.18	0.506
post op 1 hr	82.12 ± 13.20	84.00 ± 8.77	0.393
2 hr	82.23 ± 13.91	98.94 ± 105.80	0.261
3 hr	82.52 ± 13.50	84.15 ± 9.99	0.485
4 hr	82.13 ± 13.29	84.10 ± 9.74	0.393
5 hr	82.60 ± 13.82	84.60 ± 9.72	0.395
6 hr	82.62 ± 13.77	88.71 ± 29.04	0.174
7 hr	82.60 ± 14.22	84.77 ± 9.65	0.364
8 hr	82.77 ± 13.99	85.12 ± 9.53	0.320
9 hr	83.19 ± 14.13	84.85 ± 8.91	0.477
10 hr	82.33 ± 14.25	83.54 ± 9.51	0.611
11 hr	83.12 ± 14.62	84.69 ± 9.01	0.509
12 hr	83.52 ± 14.96	85.21 ± 8.40	0.479

There was statistically no significant difference of heart rate changes between group A and group B.



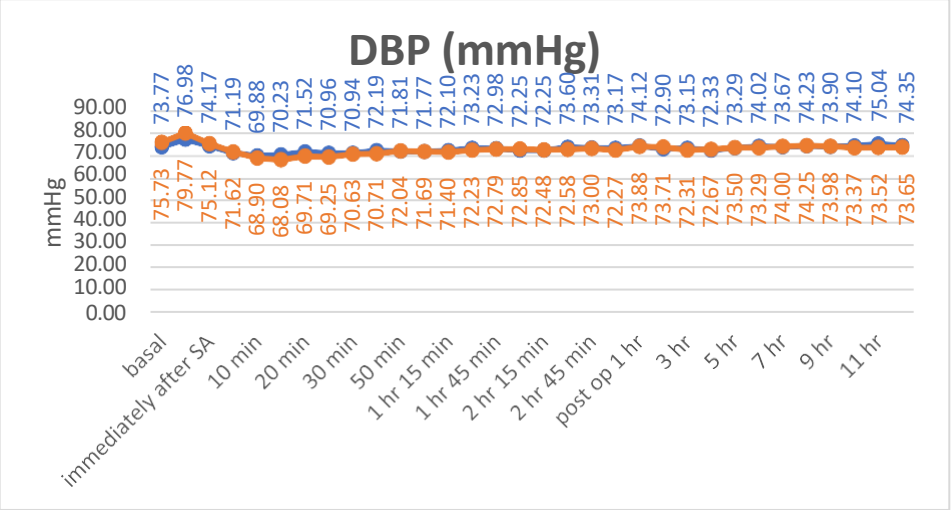
Graph 2: Systolic Blood Pressure Changes

TABLE 4: Data for Systolic Blood Pressure Changes (Graph 2)

SBP (mmHg)	Group A	Group B	P Value
	Mean ± SD	Mean ± SD	
basal	131.23 ± 11.73	132.83 ± 10.67	0.470
after giving study drug	127.29 ± 11.77	128.65 ± 9.38	0.515
immediately after SA	122.83 ± 12.19	121.33 ± 11.30	0.517
5 min	118.35 ± 12.27	112.29 ± 12.06	0.013
10 min	118.25 ± 11.78	109.13 ± 10.48	0.000
15 min	117.17 ± 13.83	107.92 ± 12.86	0.001
20 min	118.15 ± 11.16	109.98 ± 13.24	0.001
25 min	117.46 ± 12.61	110.17 ± 10.91	0.002
30 min	117.10 ± 12.47	111.17 ± 11.23	0.012
40 min	117.00 ± 10.76	113.00 ± 10.92	0.063
50 min	117.08 ± 11.00	113.19 ± 10.87	0.073
60 min	116.27 ± 10.54	112.63 ± 9.00	0.061
1 hr 15 min	116.65 ± 11.21	112.88 ± 8.84	0.060
1 hr 30 min	117.48 ± 11.34	113.87 ± 8.74	0.072
1 hr 45 min	117.88 ± 11.55	114.37 ± 8.10	0.075
2 hr	118.02 ± 11.39	114.62 ± 8.95	0.093
2 hr 15 min	116.77 ± 9.98	113.79 ± 7.73	0.092
2 hr 30 min	117.73 ± 10.10	114.48 ± 7.45	0.065
2 hr 45 min	115.96 ± 9.33	112.98 ± 7.60	0.077
3 hr	116.71 ± 9.90	113.62 ± 6.94	0.068
post op 1 hr	118.19 ± 10.00	115.00 ± 7.43	0.068
2 hr	118.40 ± 10.33	116.54 ± 7.47	0.294
3 hr	117.56 ± 10.91	115.37 ± 7.42	0.234
4 hr	117.79 ± 10.30	115.44 ± 7.76	0.192
5 hr	118.19 ± 10.05	115.19 ± 7.02	0.081
6 hr	118.23 ± 8.28	115.23 ± 7.56	0.056
7 hr	118.40 ± 9.94	115.17 ± 7.69	0.067
8 hr	118.42 ± 9.16	115.23 ± 7.78	0.058
9 hr	118.40 ± 9.05	116.00 ± 8.49	0.166
10 hr	118.56 ± 9.65	115.58 ± 7.31	0.079
11 hr	118.63 ± 10.41	115.73 ± 7.48	0.106
12 hr	118.69 ± 9.95	115.48 ± 7.38	0.064

There was statistically significant difference of mean systolic blood pressure between group A and

group B at 5 (p=0.013), 10 (p=0.000),15 (p=0.001),20 (p=0.001),25 (p=0.002),30 (p=0.012)minutes

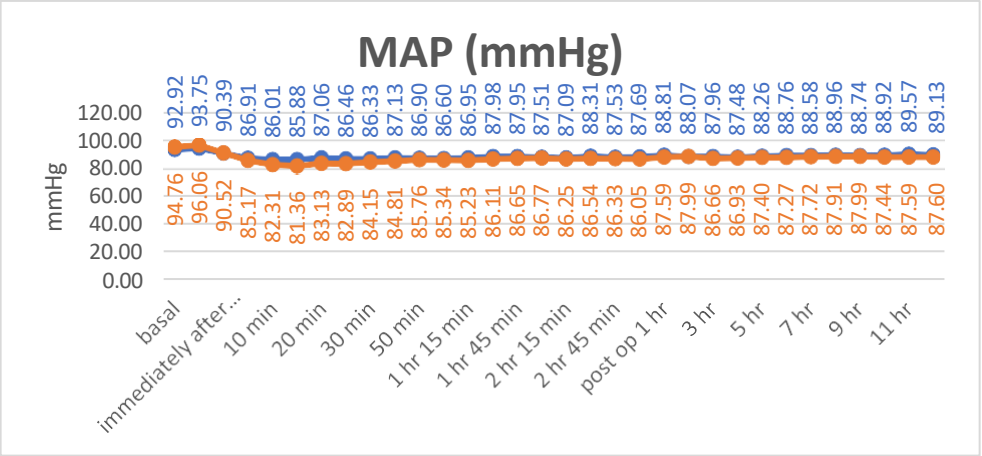


Graph 3: Diastolic Blood Pressure Changes

Table 5: Data for Diastolic Blood Pressure Changes (Graph 3)

DBP (mmHg)	Group A	Group B	P Value
	Mean ± SD	Mean ± SD	
basal	73.77 ± 8.27	75.73 ± 6.69	0.187
after giving study drug	76.98 ± 8.81	79.77 ± 7.09	0.078
immediately after SA	74.17 ± 9.02	75.12 ± 7.66	0.567
5 min	71.19 ± 9.08	71.62 ± 8.21	0.804
10 min	69.88 ± 10.61	68.90 ± 8.23	0.600
15 min	70.23 ± 10.49	68.08 ± 8.95	0.263
20 min	71.52 ± 10.26	69.71 ± 9.65	0.357
25 min	70.96 ± 9.17	69.25 ± 8.88	0.336
30 min	70.94 ± 9.68	70.63 ± 9.16	0.868
40 min	72.19 ± 8.62	70.71 ± 9.39	0.404
50 min	71.81 ± 8.76	72.04 ± 9.26	0.896
60 min	71.77 ± 9.92	71.69 ± 8.30	0.966
1 hr 15 min	72.10 ± 9.65	71.40 ± 8.61	0.700
1 hr 30 min	73.23 ± 8.95	72.23 ± 7.79	0.545
1 hr 45 min	72.98 ± 8.75	72.79 ± 7.95	0.907
2 hr	72.25 ± 8.91	72.85 ± 7.42	0.712
2 hr 15 min	72.25 ± 8.16	72.48 ± 7.23	0.879
2 hr 30 min	73.60 ± 7.62	72.58 ± 7.02	0.480
2 hr 45 min	73.31 ± 7.02	73.00 ± 7.12	0.825
3 hr	73.17 ± 7.56	72.27 ± 7.21	0.534
post op 1 hr	74.12 ± 8.46	73.88 ± 8.12	0.887
2 hr	72.90 ± 8.43	73.71 ± 7.83	0.614
3 hr	73.15 ± 7.75	72.31 ± 6.77	0.554
4 hr	72.33 ± 8.78	72.67 ± 6.50	0.820
5 hr	73.29 ± 8.53	73.50 ± 6.79	0.889
6 hr	74.02 ± 8.77	73.29 ± 6.76	0.635
7 hr	73.67 ± 7.70	74.00 ± 6.93	0.820
8 hr	74.23 ± 7.47	74.25 ± 8.03	0.990
9 hr	73.90 ± 7.54	73.98 ± 8.13	0.960
10 hr	74.10 ± 8.07	73.37 ± 8.20	0.648
11 hr	75.04 ± 8.28	73.52 ± 8.05	0.315
12 hr	74.35 ± 8.18	73.65 ± 6.91	0.642

There was statistically no significant difference of diastolic blood pressure changes between group A and group B.

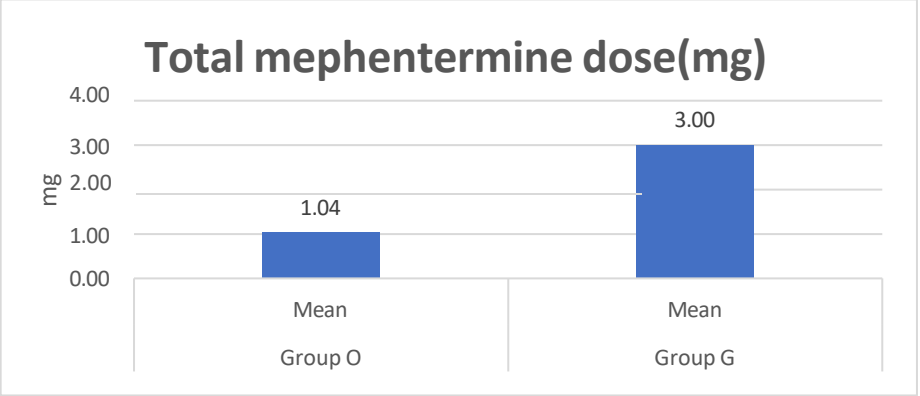


Graph 4: Mean Blood Pressure Changes

Table 6: Data for Mean Arterial Pressure Changes (Graph 4)

MAP (mmHg)	Group A	Group B	P Value
	Mean ± SD	Mean ± SD	
basal	92.92 ± 8.10	94.76 ± 6.11	0.194
after giving study drug	93.75 ± 8.60	96.06 ± 5.91	0.113
immediately after SA	90.39 ± 9.01	90.52 ± 7.37	0.937
5 min	86.91 ± 9.07	85.17 ± 8.14	0.306
10 min	86.01 ± 10.03	82.31 ± 7.85	0.039
15 min	85.88 ± 10.71	81.36 ± 9.10	0.022
20 min	87.06 ± 9.59	83.13 ± 10.06	0.044
25 min	86.46 ± 9.47	82.89 ± 8.66	0.048
30 min	86.33 ± 9.91	84.15 ± 9.32	0.251
40 min	87.13 ± 8.32	84.81 ± 9.33	0.184
50 min	86.90 ± 8.80	85.76 ± 8.97	0.514
60 min	86.60 ± 9.04	85.34 ± 7.71	0.445
1 hr 15 min	86.95 ± 9.39	85.23 ± 7.97	0.317
1 hr 30 min	87.98 ± 8.63	86.11 ± 7.26	0.234
1 hr 45 min	87.95 ± 8.93	86.65 ± 7.15	0.414
2 hr	87.51 ± 8.79	86.77 ± 7.03	0.638
2 hr 15 min	87.09 ± 7.80	86.25 ± 6.52	0.553
2 hr 30 min	88.31 ± 7.34	86.54 ± 6.06	0.185
2 hr 45 min	87.53 ± 6.61	86.33 ± 6.41	0.350
3 hr	87.69 ± 6.99	86.05 ± 6.23	0.211
post op 1 hr	88.81 ± 7.91	87.59 ± 6.76	0.401
2 hr	88.07 ± 8.23	87.99 ± 6.59	0.955
3 hr	87.96 ± 7.89	86.66 ± 5.85	0.344
4 hr	87.48 ± 8.47	86.93 ± 6.14	0.705
5 hr	88.26 ± 7.69	87.40 ± 6.15	0.531
6 hr	88.76 ± 7.55	87.27 ± 6.27	0.277
7 hr	88.58 ± 7.62	87.72 ± 6.45	0.536
8 hr	88.96 ± 7.26	87.91 ± 7.30	0.463
9 hr	88.74 ± 7.12	87.99 ± 7.57	0.604
10 hr	88.92 ± 7.79	87.44 ± 7.21	0.317
11 hr	89.57 ± 7.30	87.59 ± 7.18	0.166
12 hr	89.13 ± 7.54	87.60 ± 6.46	0.268

There was statistically significant difference of mean arterial pressure between group A and group B at 10 (p=0.039), 15 (p=0.022),20 (p=0.044),25 (p=0.048) minutes



Graph 5: Mean Total Dose of Mephentermine

Table 7: Data for Mean Total Dose of Mephentermine (Graph 5)

Parameter	Group A		Group B		P Value
	Mean	SD	Mean	SD	
Mean dose mephentermine (mg)	1.04	2.84	3.00	4.03	0.005

There was statistically significant difference of total dose of mephentermine between group A and group B (p=0.005).

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