

A Study to Compare Pulse Rate, Blood Pressure and Respiratory Rate between Groups using Bupivacaine along with Clonidine and Low Dose Dexmedetomidine

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Abstract

Background: Relief of pain during operation is one of the mainstay of balanced anesthesia. So, any experience acquired in this field should be extended to the postoperative period also which could be done by use of suitable anesthesia. **Objectives:** To compare the effects of Clonidine and Low Dose Dexmedetomidine along with Bupivacaine on Pulse Rate, Blood Pressure and Respiratory Rate. **Materials and Methods:** A Comparative study was carried out by the Department of Anesthesiology, G.R. Medical College and J.A. Group of Hospitals, Gwalior (M.P.). The study was done on 120 patients of ASA grade I & II of either sex with age group 18-60 years scheduled for elective lower limb surgeries. 40 Patients were allocated into different groups by randomization technique. **Results:** The demographic data of the three groups was comparable and the differences were not statistically significant ($p > 0.05$). There was no statistically significant difference of (mean \pm SD) of Pulse Rate, Blood Pressure and Respiratory rate at different time intervals between three groups. **Conclusion:** We conclude that either, Intrathecal administration of clonidine (30 μ g) or dexmedetomidine (5 μ g) with hyperbaric bupivacaine 0.5% resulted without producing significant Hemodynamic or Respiratory Complication either during the time or surgery or post-surgery. Moreover, dexmedetomidine did not offer significant advantage over clonidine.

Keywords: Spinal; Clonidine; Pulse; Blood Pressure; Respiratory Rate.

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Introduction

Relief of pain during operation is one of the mainstay of balanced anesthesia. So, any experience acquired in this field should be extended to the postoperative period also which could be done by use of suitable anesthesia.

Spinal anaesthesia was introduced into clinical practice by Karl August Bier in 1898 [5]. More than a century has passed and even today, it is one of the most popular techniques for both elective and emergency surgical procedures particularly

Caesarean sections, lower abdominal surgeries, orthopedic and urological surgeries just to name a few [1].

$\alpha 2$ adrenoreceptor agonist that has been shown to effectively prolong the duration of analgesia when administered intrathecally or in the epidural space [2,3].

$\alpha 2$ adrenoceptors are located on primary afferent terminals (both at peripheral and spinal endings), on neurons in the superficial laminae of the spinal cord, and within several brainstem nuclei implicated in analgesia, supporting the possibility

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of analgesic action of $\alpha 2$ adrenoreceptor agonist at peripheral, spinal, and brainstem sites.

Bupivacaine was the first local anaesthetic that combined the properties of an acceptable onset and profound conduction blockade and long duration of action. Bupivacaine is three to four times as potent as lignocaine and considerably longer acting. Its speed of onset is sometimes to be marginally slower than that of lignocaine.

Clonidine, an Imidazole derivative, was synthesized in the early 1960s and was found to produce vasoconstriction which was mediated by α -receptors [4,5,6].

Clonidine is a centrally acting α -adrenergic receptor agonist with more affinity for $\alpha 2$ than $\alpha 1$. Clonidine stimulates $\alpha 2$ adrenergic inhibitory neurons in the medullary center, decreases sympathetic outflow from CNS to peripheral tissue, decreased sympathetic outflow causes decrease in BP, decrease in HR, decrease in CO, and decrease in diastolic pressure is more significant than systolic pressure. In the periphery its action on presynaptic $\alpha 2$ - adrenoceptors at sympathetic terminals reduces the release of norepinephrine causing vasorelaxation and reduced chronotropic drive. The brainstem and peripheral effects of $\alpha 2$ - adrenoceptors stimulation are counter-balanced by direct peripheral vasoconstriction through its action on $\alpha 1$ -adrenoceptors from circulating concentrations of clonidine. As a result, the dose response for clonidine by neuraxial or systemic administration is U-shaped, with peripheral vasoconstriction from circulating drug concentrations at high doses opposing central sympatholysis [4,5,6].

Hence this study was done to compare the effects of Clonidine and Low Dose Dexmedetomidine along with Bupivacaine on Pulse Rate, Blood Pressure and Respiratory Rate.

Objective

To compare the effects of Clonidine and Low Dose Dexmedetomidine along with Bupivacaine on Pulse Rate, Blood Pressure and Respiratory Rate.

Materials and Methods

A comparative study was carried out on 120 patients of either sex aged between 18-60 years who were scheduled for elective lower limb surgeries at Department of Anesthesiology, G.R. Medical College and J.A. Group of Hospitals, Gwalior (M.P.).

The selected 120 patients were divided into three groups of 40 subjects in each of them, Group B was given 3ml of hyperbaric bupivacaine 0.5%+0.5 ml of normal saline injected intrathecal, Group C was given 3ml of hyperbaric bupivacaine 0.5%+0.5 ml of clonidine (30 μ g) injected intrathecal and Group D was given 3ml of hyperbaric bupivacaine 0.5%+0.5 ml of dexmedetomidine (5 μ g) injected intrathecal.

Baseline observations were recorded before intrathecal drug injection. Pulse rate, electrocardiogram, systolic and diastolic BP, respiratory rate and peripheral arterial hemoglobin oxygen saturation were monitored intraoperatively. Data monitoring performed continuously but for statistical analysis data were recorded at 0, 5, 10, 15, 30, 60 minutes after intrathecal injection and thereafter every hour until patient complaints of pain and requesting for analgesia.

Criteria for

- Bradycardia*: a pulse rate of 60/min or less was treated by injection atropine i/v.
- Hypotension*: a fall in systolic BP 30% or greater from the base line value was treated by injection mephentermine i/v, intravenous fluids (crystalloid, colloid and blood) as per requirement and oxygen by face mask.
- Respiratory depression*: a respiratory rate of less than 10 breaths per min or peripheral arterial hemoglobin oxygen saturation less than 90% was treated by oxygen supplementation through face mask.

Results

Out of the total 120 study subjects, 40 subjects were chosen in each of the groups B, C and D. All the parameters were compared between the groups like Group B Vs C, Group B Vs D, Group C Vs D

The demographic data of the three groups was comparable and the differences were not statistically significant ($p > 0.05$) (Table 1).

The Table 2 shows the mean and standard deviation of pulse rate at different intervals in all the three groups.

The inter-group statistical analysis of pulse rate done at different time intervals among three groups. There was no statistically significant difference of (mean \pm SD) of pulse rate at different time intervals between three groups (Table 3).

In the Table 4 the (mean±SD) of Systolic blood pressure at different time intervals in all the three groups are shown.

The inter-group statistical analysis of Systolic BP at different time intervals among three groups. There was no statistically significant difference of

Table 1: Statistical Comparison of Demographic Data

S. No	Groups	Group B vs C		Group B vs D		Group C vs D	
		t-value	p-value	t-value	p-value	t-value	p-value
1	Age (yrs.)	0.27	0.78#	0.29	0.76#	0.01	0.98#
2	Weight (in Kg)	0.07	0.93#	0.33	0.73#	0.38	0.69#
3	Height (in cm)	1.82	0.07#	0.61	0.53#	1.07	0.28#

- Not significant, \$ - Significant

Table 2: Statistical analysis of pulse rate between three groups

Time (min)	Group B		Group C		Group D	
	Mean	±SD	Mean	±SD	Mean	±SD
Pre Induction	87.05	10.00	88.03	10.35	87.05	9.66
0	87.15	10.27	88.70	10.29	87.73	10.51
5	84.95	8.52	85.00	10.03	85.20	8.45
10	81.93	8.24	80.40	13.14	82.15	7.61
15	80.38	8.49	80.88	10.21	80.33	7.83
30	77.98	7.90	79.98	8.49	78.20	7.38
60	77.88	8.35	78.20	8.72	78.08	7.67
120	76.43	8.84	76.20	9.24	77.03	8.19
180	75.78	8.32	74.13	7.91	76.45	7.72
240	76.48	7.70	73.98	6.12	76.83	6.96

Table 3: Inter-Group Statistical Analysis of Pulse Rate Between Three Groups

Time (min)	Group B vs C		Group B vs D		Group C vs D	
	t-value	p-value	t-value	p-value	t-value	p-value
Pre Induction	0.43	0.66#	0.00	1.00#	0.44	0.66#
0	0.67	0.50#	0.25	0.80#	0.42	0.68#
5	0.02	0.98#	0.13	0.89#	0.09	0.92#
10	0.62	0.53#	0.12	0.90#	0.72	0.46#
15	0.29	0.66#	0.00	1.00#	0.44	0.66#
30	0.67	0.50#	0.25	0.80#	0.42	0.68#
60	0.16	0.86#	0.13	0.89#	0.06	0.94#
120	0.11	0.90#	0.12	0.90#	0.42	0.67#
180	0.29	0.81#	0.02	0.98#	0.27	0.79#
240	1.09	0.28#	0.12	0.89#	1.00	0.32#

- Not significant, \$ - Significant

Table 4: Statistical Analysis of Systolic Blood Pressure Between Three Groups

Time (min)	Group B		Group C		Group D	
	Mean	±SD	Mean	±SD	Mean	±SD
Pre Induction	122.25	7.93	121.80	7.66	121.20	8.06
0	120.60	7.32	122.20	6.16	121.05	6.78
5	119.20	7.03	118.45	6.18	117.35	6.44
10	114.55	6.64	117.40	5.86	116.25	6.28
15	112.60	6.52	113.45	6.08	112.60	6.13
30	111.00	6.67	111.90	5.22	110.80	5.36
60	110.25	5.49	109.73	6.60	108.35	6.95
120	110.45	5.25	109.35	6.36	108.25	6.30
180	109.00	4.62	107.63	6.57	106.43	6.43
240	108.55	5.34	107.90	6.56	107.10	6.16

(mean ±SD) of Systolic BP at different time intervals between three groups (Table 5).

In the table 6 the (mean ±SD) of Diastolic blood pressure at different time intervals in all the three groups are shown.

The inter-group statistical analysis of Diastolic BP at different time intervals among three groups. There was no statistically significant difference of (mean±SD) of Diastolic BP at different time intervals among three groups (Table 7).

In the Table 8 the (mean ±SD) Respiratory Rate at different time intervals in all the three groups are shown.

The inter-group statistical analysis of Respiratory rate at different time intervals among three groups. There was no statistically significant difference of (mean ±SD) of Respiratory rate among three groups.

Table 5: Inter-Group Statistical Analysis of Systolic Blood Pressure Between Three Groups

Time (min)	Group B vs C		Group B vs D		Group C vs D	
	t-value	p-value	t-value	p-value	t-value	p-value
Pre Induction	0.26	0.79#	0.58	0.55#	0.34	0.73#
0	1.05	0.29#	0.28	0.77#	0.79	0.42#
5	0.50	0.61#	1.22	0.22#	0.77	0.43#
10	2.03	0.06#	1.17	0.24#	0.84	0.39#
15	0.60	0.54#	0.00	1.00#	0.62	0.53#
30	0.67	0.50#	0.14	0.88#	0.93	0.35#
60	0.38	0.70#	1.35	0.17#	0.91	0.36#
120	0.84	0.40#	1.69	0.09#	0.77	0.43#
180	1.07	0.28#	1.90	0.06#	0.82	0.41#
240	0.48	0.62#	1.12	0.26#	0.56	0.57#

- Not significant, \$ - Significant

Table 6: Statistical Analysis of Diastolic Blood Pressure Between Three Groups

Time (min)	Group B		Group C		Group D	
	Mean	±SD	Mean	±SD	Mean	±SD
Pre Induction	73.75	5.40	74.85	8.46	75.35	8.02
0	73.25	4.74	74.95	7.88	75.00	7.51
5	72.95	5.10	73.85	7.69	73.90	7.50
10	73.00	5.16	73.40	7.16	73.50	6.40
15	72.30	6.10	73.15	6.82	72.65	6.41
30	72.00	5.58	71.75	7.47	70.85	7.06
60	71.55	4.91	70.00	8.57	69.05	8.26
120	71.35	4.97	68.90	9.16	68.30	8.26
180	70.90	4.92	69.05	7.75	69.05	6.87
240	70.55	6.01	69.30	7.02	69.60	5.70

Table 7: Inter-Group Statistical Analysis of Diastolic Blood Pressure Between Three Groups

Time (min)	Group B vs C		Group B vs D		Group C vs D	
	t-value	p-value	t-value	p-value	t-value	p-value
Pre Induction	0.69	0.49#	1.04	0.29#	0.27	0.78#
0	1.16	0.24#	1.24	0.21#	0.02	0.97#
5	0.61	0.53#	0.66	0.50#	0.02	0.97#
10	0.28	0.77#	0.38	0.70#	0.06	0.94#
15	0.58	0.55#	0.25	0.80#	0.33	0.73#
30	0.17	0.86#	0.80	0.42#	0.55	0.58#
60	0.99	0.32#	1.64	0.10#	0.50	0.61#
120	1.48	0.14#	1.98	0.06#	0.30	0.75#
180	1.27	0.20#	1.38	0.17#	0.00	1.00#
240	0.85	0.39#	0.72	0.47#	0.21	0.83#

- Not significant, \$ - Significant

Table 8: Statistical Analysis of Respiratory Rate Between Three Groups

Time (min)	Group B		Group C		Group D	
	Mean	±SD	Mean	±SD	Mean	±SD
Pre Induction	15.63	0.63	15.75	0.44	15.60	0.67
0	15.68	0.62	15.85	0.66	15.80	0.52
5	15.75	0.67	15.60	0.90	15.83	0.59
10	15.78	0.83	15.53	0.93	15.65	0.66
15	15.60	0.90	15.53	0.91	15.45	0.75
30	15.48	0.88	15.63	0.95	15.28	0.78
60	15.50	0.88	15.65	0.74	15.63	0.77
120	15.48	0.75	15.65	0.53	15.55	0.85
180	15.60	0.63	15.75	0.44	15.58	0.75
240	15.65	0.53	15.75	0.74	15.60	0.63

Table 9: Inter-Group Statistical Analysis of Respiratory Rate Between Three Groups

Time (min)	Group B vs C		Group B vs D		Group C vs D	
	t-value	p-value	t-value	p-value	t-value	p-value
Pre Induction	0.98	0.32#	0.20	0.83#	1.18	0.24#
0	1.18	0.23#	0.93	0.31#	0.37	0.70#
5	0.84	0.40#	0.56	0.57#	1.35	0.18#
10	1.26	0.20#	0.77	0.44#	0.66	0.50#
15	0.34	0.73#	0.81	0.42#	0.42	0.66#
30	0.73	0.46#	1.07	0.28#	1.80	0.07#
60	0.92	0.35#	0.70	0.48#	0.11	0.90#
120	1.17	0.24#	0.39	0.69#	0.63	0.52#
180	1.23	0.22#	0.12	0.89#	1.23	0.22#
240	0.69	0.48#	0.38	0.70#	0.97	0.33#

- Not significant, \$ - Significant

Discussion

In the present study 120 patients of ASA grade I and II of either sex planned for elective lower limb surgeries were selected. There were 40 patients in each group. Group B (control group) received 3ml hyperbaric bupivacaine 0.5% with 0.5 ml normal saline intrathecal. Group C received 3ml hyperbaric bupivacaine 0.5% and 0.5 ml (30µg) clonidine intrathecal. Group D received 3 ml hyperbaric bupivacaine 0.5% and 0.5 ml (5µg) dexmedetomidine intrathecally.

In the present study, majority of patients were middle aged in all the three groups. The sex ratio, mean height and the mean weight in all three groups were comparable. As shown in table 1 demographic data of all three groups were comparable and the differences were statistically insignificant ($p > 0.05$).

The (mean±SD), pulse rate before intrathecal injection was found to be 87.05±10.00 mins in Group B, 88.03±10.35mins in Group C & 87.05±9.66 in Group D..

There was statistically significant fall in mean pulse rate, 10min after intrathecal injection in all three groups ($p < 0.05$). Inter-group statistical analysis of

mean pulse rate shows no statistically significant difference (mean ±SD) at different time intervals.

The (mean ±SD), systolic blood pressure in mmHg before intrathecal injection was 122.25±7.93, 121.80±7.66, 121.20±8.06. There was statistically significant fall in Systolic blood pressure, 10min after intrathecal injection in all three groups ($p < 0.05$). On Inter-group comparison the difference was statistically insignificant ($p > 0.05$).

The (mean ±SD) diastolic blood pressure in mmHg was 73.75±5.40, 74.85±8.46, 75.35±8.02 in Group B, C & D respectively. There was statistically significant fall in mean diastolic blood pressure, 30min after intrathecal injection in all three groups ($p < 0.05$). On Inter-group comparison the difference was statistically insignificant ($p > 0.05$).

Kanazi et al. [7] found no increase in incidence of hemodynamic instability by addition of either 30 µg clonidine or 3 µg dexmedetomidine to hyperbaric bupivacaine.

Heo et al. [8] evaluated the effect of clonidine in hyperbaric 0.5% bupivacaine spinal anesthesia. There were no significant differences in hemodynamic changes (blood pressure and heart rate) between clonidine treated and control group.

Kaabachi et al. [9] used intrathecal clonidine 2mg/kg as an adjuvant to hyperbaric bupivacaine and found that clonidine was associated with higher incidence of hypotension 54% vs. 36% & bradycardia 30% vs. 0%.

Seah et al. [10] found that side effects such as hypotension and bradycardia are more common in patients who received 150µg intrathecal clonidine as an adjuvant to hyperbaric bupivacaine as compared to patients in control group.

Elia et al. [11] in their systemic review found that clonidine 15-150mg as adjuvant to local anaesthetic was associated with more episodes of arterial hypotension without evidence of dose-responsiveness

Clonidine reduces heart rate by stimulating presynaptic α_2 receptors present in medulla and hypothalamus which decreases sympathetic out flow and partly by a vagomimetic effect.

The (mean \pm SD), respiratory rate before induction was found to be 15.63 \pm 0.63 mins in Group B, 15.75 \pm 0.44 mins in Group C & 15.60 \pm 0.67 in Group D. and the (mean \pm SD), SpO₂ was found to be 98.38 \pm 0.49 mins in Group B, 98.43 \pm 0.59 mins in Group C & 98.55 \pm 0.50 in Group D.

Sethi et al. [12] concluded that addition of clonidine 1 µg/kg to 12.5 mg 0.5% bupivacaine does not produce respiratory depression.

Conclusion

We conclude that either, Intrathecal administration of clonidine (30µg) or dexmedetomidine (5µg) with hyperbaric bupivacaine 0.5% resulted without producing significant Hemodynamic or Respiratory Complication either during the time or surgery or post-surgery. Moreover, dexmedetomidine did not offer significant advantage over clonidine.

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