

A Comparative Study of 0.5% Bupivacaine (Hyperbaric) and 0.5% Bupivacaine (Hyperbaric) with Dexmedetomidine for Spinal Anesthesia in Lower Abdominal Surgeries

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Abstract: Spinal anesthesia is preferred choice of anesthesia in lower abdominal surgeries since long time. However, problem with this is limited duration of action, so for long duration surgeries alternative are required. Dexmedetomidine is a highly selective α -2-adrenergic agonist has property to potentiate the action of local anesthetic used in spinal anesthesia. To evaluate the effects of intrathecal dexmedetomidine on spinal anesthesia with respect to:- Onset and duration of sensory blockade, Onset and duration of motor blockade, Time of two segment regression, Duration of analgesia, Haemodynamic stability, Side effects / complications.

Keywords: Dexmedetomidine, Hyperbaric bupivacaine, Spinal anesthesia

1. Introduction

Spinal anaesthesia continues to be a fundamental technique in contemporary anaesthesiology, despite fluctuations in its popularity over the past century since its clinical introduction. It circumvents biochemical processes and metabolic alterations resulting from the stress of general anaesthesia for surgical procedures, while also establishing conditions that are nearly optimal for surgery. The primary advantage is its simplicity, ease of execution, reliability, minimal apparatus requirements, and limited impact on blood chemistry, in addition to generating substantial sensory and motor blockade.

The primary drawback pertains to its restricted duration of action, resulting in insufficient long-lasting post-operative analgesia. In recent years, the utilization of intrathecal adjuvants has increased, aiming to extend the duration of the block, enhance success rates, improve patient satisfaction, reduce resource utilization compared to general anesthesia, and facilitate faster recovery. The addition of opioids, including morphine, fentanyl, and sufentanil, as well as other agents such as dexmedetomidine, clonidine, magnesium sulfate, neostigmine, ketamine, and midazolam, has been shown to enhance the quality of spinal anaesthesia.

Dexmedetomidine:

Dexmedetomidine is an α -2-adrenoreceptor agonist approved for use as an intravenous sedative and co-analgesic agent. Intravenous Dexmedetomidine produces a notable opioid-sparing effect and reduces the need for inhalational anesthetics.^{7,8}

Mechanism of Action:

Intrathecal α -2-agonists serve as adjuvant agents to local anesthetics, enhancing their effects and facilitating a reduction in the necessary dosages.

Aim

This study examines the effectiveness of intrathecal 0.5% heavy bupivacaine alone compared to its use with Dexmedetomidine as an adjuvant for lower abdominal

surgeries.

Objective

To evaluate the effects of intrathecal dexmedetomidine on spinal anaesthesia with respect to:

- Onset and duration of sensory blockade.
- Onset and duration of motor blockade.
- Time of two segment regression.
- Duration of analgesia.
- Haemodynamic stability.
- Side effects / complications.

2. Methodology

A total of 60 patients were randomly allocated in two Groups D and Group B. Group D were injected with inj. Bupivacaine 0.5 % heavy (3 ml) + (5mcg) dexmedetomidine. Group B were received inj. Bupivacaine 0.5% heavy (3ml). we assessed the spinal block characteristics, Mean arterial pressure, Mean pulse rate, sedation and side effects were studied during intra-operative and postoperative period (over a period of 6 hours)

3. Results

Comparison of Age wise distribution in Both the Groups (N=60)

Age in Years	Group D (n=30)	Group B (n=30)
20- 30	3 (10.00%)	2 (6.67%)
31- 40	4 (13.33%)	5 (16.67%)
41- 50	9 (30.00%)	8 (26.67%)
51- 60	14 (46.67%)	15 (50.00%)

Age wise distribution is similar in both the groups

Comparison of Weight wise distribution in Both the Groups (N=60)

Weight in Kilograms	Group D (n=30)	Group B (n=30)
44- 50	9 (30%)	10 (33.34%)
51- 60	10 (33.33%)	9 (30%)
61- 70	6 (20%)	5 (16.67%)
71- 80	5 (16.67%)	6 (20%)

Comparison of Height Wise Distribution in Both the Groups (N=60)

Height in Centimeters	Group D (n=30)	Group B (n=30)
155- 164	18 (60%)	16 (53.33%)
165- 174	12 (40%)	14 (46.64%)

M: F ratio is comparable in both the groups.

Comparison of Age (Mean±SD) in Both the Groups (N=60)

	Group D (n=30)	Group B (n=30)	p-value
Mean Age in years	42.1 ± 7.81	40.60 ± 7.95	P > 0.05

P-value <0.05 is taken as significant.

Mean age is comparable between both the groups.

Comparison of Gender in Both the Groups (N=60)

Gender	Group D (n=30)	Group B (n=30)
Male	24 (80.33%)	25 (83.33%)
Female	6 (20.67%)	5 (16.67%)

Height wise distribution is similar in both the groups.

Comparison of weight (Mean±SD) in Both the Groups (N=60)

	Group D (n=30)	Group B (n=30)	p-value
Mean weight in Kilograms	57.63 ± 8.98	58.27 ± 8.94	P > 0.05

P-value <0.05 is taken as significant.

Mean weight is comparable between both the groups.

Comparison of Maximum height wise Distribution sensory blockade in Both the Groups (N=60)

Mean of maximum height of sensory blockade (Segments)	Group D (n=30)	Group B (n=30)
T4	3 (10.0%)	1 (3.33%)
T6	13 (43.33%)	12 (40%)
T8	11 (36.66%)	15 (50.0%)
T10	3 (10.0%)	2 (6.67%)

Maximum height of sensory blockade is similar in both the groups.

Comparison of Mean of maximum height of sensory blockade in Both the Groups (N=60)

	Group D (n=30)	Group B (n=30)
Mean of maximum height of sensory blockade (Segments)	T6- T8	T6- T8

Mean of maximum height of sensory blockade is similar in both the group.

Comparison of time of Onset of analgesia (Mean±SD) in Both the Groups (N=60)

	Group D (n=30)	Group B (n=30)	p-value
Time in minutes	2.18 ± 0.1	2.4 ± 0.2	P < 0.05

P-value <0.05 is taken as significant.

Onset of analgesia is significantly faster in group D (Dexmedetomidine group).

Comparison of time of Onset of motor blockade (Mean±SD) in Both the Groups (N=60)

	Group D (n=30)	Group B (n=30)	p-value
Time in minutes	3.78 ± 0.175	5.38 ± 0.14	P < 0.05

P-value <0.05 is taken as significant.

Onset of motor blockade is significantly faster in group D (Dexmedetomidine group).

Comparison of time of Two segment regression (Mean±SD) in Both the Groups (N=60)

	Group D (n=30)	Group B (n=30)	p-value
Time in minutes	126.7 ± 7.25	86.7 ± 9.5	P < 0.05

P-value <0.05 is taken as significant.

Two segment regression is significantly prolonged in group D (Dexmedetomidine group).

Comparison of Duration of motor blockade (Mean±SD) in Both the Groups (N=60)

	Group D (n=30)	Group B (n=30)	p-value
Time in minutes	279.9 ± 19.6	163.4 ± 14.4	P < 0.05

P-value <0.05 is taken as significant.

Duration of motor blockade is significantly prolonged in group D (Dexmedetomidine group).

Comparison of Duration of Analgesia (Mean±SD) in Both the Groups (N=60)

Time in minutes	Group D (n=30)	Group B (n=30)	p-value
Mean ± SD	310.9 ± 20.0	184.4 ± 13.6	P < 0.05

P-value <0.05 is taken as significant.

Duration of analgesia is significantly prolonged in group D (Dexmedetomidine group).

Comparison of Occurrence of Side Effects in Both the Groups (N=60)

Complications	Group D (n=30)	Group B (n=30)
Nausea	2 (6.66%)	1 (3.33%)
Sedation	1 (3.33%)	0
Dry mouth	2 (6.66%)	1 (3.33%)
Bradycardia	4 (13.3%)	1 (3.33%)
Hypotension	5 (16.66%)	3 (10.33%)

Bradycardia, hypotension and dry mouth were more in group D (Dexmedetomidine group).

Comparison of heart rate (Beats/Min) (Mean ± SD) in both the groups, (N= 60)

Time in Minutes	Group D (n=30)	Group B (n=30)	p-value
Baseline	80 ± 10.5	80.60 ± 3.60	P > 0.05
SAB	79.60 ± 3.53	78.00 ± 10.14	P > 0.05
2	78.00 ± 10.83	79.20 ± 12.48	P > 0.05
4	75.80 ± 6.63	77.00 ± 11.38	P > 0.05
6	74.60 ± 8.02	76.40 ± 8.25	P > 0.05
8	74.20 ± 5.97	76.10 ± 8.18	P > 0.05
10	73.40 ± 6.63	75.00 ± 10.52	P > 0.05
20	72.00 ± 11.88	74.20 ± 9.75	P > 0.05
30	72.50 ± 10.83	75.00 ± 7.13	P > 0.05

60	73.50 ± 8.02	76.40 ± 10.73	P > 0.05
90	75.70 ± 10.27	74.50 ± 10.14	P > 0.05
120	76.80 ± 10.83	78.70 ± 12.48	P > 0.05
150	78.90 ± 5.97	80.00 ± 11.38	P > 0.05
180	79.00 ± 6.63	83.10 ± 8.25	P > 0.05
240	79.20 ± 8.07	83.50 ± 12.48	P > 0.05
300	80.50 ± 8.02	84.60 ± 11.38	P > 0.05

P-value <0.05 is taken as significant.

Mean heart rate are comparable between both the groups.

Comparison of systolic blood pressure (mmHg) (Mean ± SD) in both the groups, (N= 60)

Time in Minutes	Group D (n=30)	Group B (n=30)	p-value
Baseline	125 ± 6.82	124.97 ± 10.90	P > 0.05
SAB	123.36 ± 11.47	125.7 ± 12.36	P > 0.05
2	120.23 ± 9.02	119.21 ± 8.78	P > 0.05
4	119.45 ± 7.8	118.94 ± 8.11	P > 0.05
6	118.39 ± 9.92	118.7 ± 10.14	P > 0.05
8	116 ± 8.61	117 ± 13.46	P > 0.05
10	116.85 ± 8.93	116.32 ± 10.64	P > 0.05
20	114.3 ± 6.88	115.26 ± 7.82	P > 0.05
30	114.28 ± 10.90	114 ± 9.02	P > 0.05
60	115.82 ± 12.36	115.38 ± 9.92	P > 0.05
90	116.1 ± 8.78	117.16 ± 8.76	P > 0.05
120	116.86 ± 11.47	116.66 ± 12.56	P > 0.05
150	116.66 ± 9.02	116.83 ± 13.54	P > 0.05
180	118.43 ± 7.8	119 ± 12.65	P > 0.05
240	118.96 ± 9.92	119.93 ± 45.76	P > 0.05
300	120.9 ± 8.61	120.66 ± 34.76	P > 0.05

P-value <0.05 is taken as significant.

Mean systolic blood pressure are comparable between both the groups.

Comparison of diastolic blood pressure (mmHg) (Mean ± SD) in both the groups, (N= 60)

Time in Minutes	Group D (n=30)	Group B (n=30)	p-value
Baseline	78.10 ± 11.88	79.2 ± 8.63	P > 0.05
SAB	77.86 ± 10.77	77.03 ± 8.41	P > 0.05
2	77.58 ± 7.52	77.00 ± 7.15	P > 0.05
4	77.38 ± 7.80	76.89 ± 7.14	P > 0.05
6	76.98 ± 8.86	76.45 ± 6.63	P > 0.05
8	76.73 ± 7.98	76.00 ± 9.33	P > 0.05
10	74.34 ± 7.55	75.78 ± 6.09	P > 0.05
20	73.96 ± 8.71	74.46 ± 6.86	P > 0.05
30	72.94 ± 8.63	73.10 ± 11.88	P > 0.05
60	73.93 ± 8.41	72.45 ± 10.77	P > 0.05
90	74.93 ± 7.15	73.26 ± 7.52	P > 0.05
120	75.80 ± 7.14	74.60 ± 7.80	P > 0.05
150	75.86 ± 6.63	75.00 ± 8.86	P > 0.05
180	76.33 ± 9.33	76.46 ± 7.98	P > 0.05
240	76.56 ± 6.09	77.40 ± 7.55	P > 0.05
300	78.66 ± 6.86	78.10 ± 8.71	P > 0.05

P-value <0.05 is taken as significant.

Mean diastolic blood pressure are comparable between both the groups.

Comparison of mean arterial pressure (mmHg) (Mean ± SD) in both the groups (N= 60)

Time in Minutes	Group D (n=30)	Group B (n=30)	p-value
Baseline	93.73 ± 6.56	94.45 ± 6.14	P > 0.05
SAB	93.69 ± 5.87	93.25 ± 5.45	P > 0.05
2	91.79 ± 7.67	91.07 ± 7.54	P > 0.05
4	91.07 ± 3.55	90.9 ± 4.21	P > 0.05
6	90.78 ± 8.34	90.53 ± 8.11	P > 0.05
8	90.48 ± 6.75	90 ± 6.66	P > 0.05
10	89.17 ± 7.56	89.62 ± 7.11	P > 0.05
20	88.74 ± 6.12	88.39 ± 6.55	P > 0.05
30	87.72 ± 5.74	87.73 ± 7.61	P > 0.05
60	87.72 ± 5.89	86.09 ± 7.84	P > 0.05
90	88.32 ± 3.98	87.22 ± 8.10	P > 0.05
120	88.82 ± 5.76	87.62 ± 7.25	P > 0.05
150	89.46 ± 7.23	89.94 ± 6.25	P > 0.05
180	90.36 ± 8.10	90.64 ± 5.33	P > 0.05
240	91.02 ± 5.77	91.24 ± 6.11	P > 0.05
300	91.4 ± 6.56	92.95 ± 5.78	P > 0.05

P-value <0.05 is taken as significant.

Mean of mean arterial pressure are comparable between both the groups.

From the present study, it is concluded that addition of 5µg of dexmedetomidine to 3ml of 0.5% bupivacaine (heavy) intrathecally for spinal anaesthesia for lower abdominal surgeries has the following advantages.

- 1) Onset of sensory and motor blockade is faster.
- 2) It prolongs the duration of analgesia.
- 3) It prolongs the duration of motor blockade.
- 4) It is haemodynamically stable with insignificant side effects like one episode of bradycardia and hypotension at the initial 6-10 minutes of SAB.
- 5) It was not associated with side effects like respiratory depression. It is an attractive alternative to opioids for prolonging spinal anesthesia

4. Conclusion

Based on the current study, it can be said that intrathecal low dose Dexmedetomidine at a dose of 5 mcg combined with 0.5% hyperbaric bupivacaine results in excellent postoperative analgesia, stable hemodynamic conditions, and an earlier onset and longer duration of sensory and motor blockade.

In conclusion, anesthesiologists can now use intrathecal low dose Dexmedetomidine at a dose of 5 mcg in conjunction with 0.5% hyperbaric bupivacaine to provide spinal anesthesia to patients undergoing elective lower abdomen procedures.