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Original Research Article

A Retrospective Clinical Comparison of Hyperbaric Bupivacaine 0.5% and Hyperbaric 0.5% + Fentanyl 20 Micrograms in Spinal Anesthesia for Elective Lower Abdominal

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Abstract

Aim: The aim of the present study was to compare the hyperbaric bupivacaine 0.5% and hyperbaric 0.5%+Fentanyl 20 micrograms in spinal anesthesia for elective lower abdominal and lower limb surgery.

Methods: A retrospective study was conducted in Shree Narayan Medical Institute and Hospital, Saharsa, Bihar period of 12 months and 100 patients were included in the study.

Results: The groups were comparable with respect to age, weight, gender ratio and ASA status of patients. There was a significant difference in postoperative mean HR between two groups. SBP was observed win both groups with values being comparable at corresponding study stages except at 60 minutes and the difference was significant (p value<0.05). A similar trend of DBP was observed win both groups with values being comparable at corresponding study stages except at 60 minutes and the difference was significant (p value<0.05). Postoperative DBP was comparable between two groups. The mean time of onset of sensory blockade in Group A was 134.4 ±14.9 seconds and group B was 137.5 ± 13.5 seconds. The mean time of onset of motor blockade group A was 228.7 ± 20.5 seconds and the meantime of the onset of the motor blockade in Group B was 229.5 seconds. In this study out of 100 patients the visual analogue score at 3 hours was 0.6 in group A and 0.1 in Group B. At 6 hours postoperatively VAS was 4 in group A and 1.7 in group B. At 24 hours VAS was 4.0 in group A and 2.6 in Group B.

Conclusion: The addition of 20ug of fentanyl to 0.5% hyperbaric bupivacaine in spinal anesthesia, prolongs the duration of sensory and motor blockade, increase the duration and quality of postoperative analgesia 12 – 24 hours without causing any gross hemodynamic disturbances or adverse effects. Based on the above facts we conclude the addition of fentanyl has many advantages and can be recommended with all spinal anesthesia techniques.

Keywords: Fentanyl, Bupivacaine, Hyperbaric, Anesthesia

Introduction

Neuraxial opioids are widely used in conjunction with local anesthetics (LA) as they permit the use of lower dose of LA while providing adequate anesthesia and analgesia. [1] Neuraxial opioids also allow prolonged analgesia in the postoperative period and faster recovery from spinal anesthesia. [2] Antinociceptive synergism between LA and intrathecal opioids has been demonstrated in various animal studies. [3]

Local anesthetic like bupivacaine is commonly used in spinal anesthesia, but the duration of spinal anesthesia may be short and limited, and higher doses of rescue analgesics may be required in the postoperative period. This can be avoided by using higher doses of bupivacaine which again can produce cardiac toxicity. Studies have shown that duration of analgesia due to bupivacaine in spinal anesthesia can be prolonged by using adjuvants such as midazolam, opioids, neostigmine, dexmedetomidine, and clonidine. [4] Almost all opioids have been used as adjuvants intrathecally.

Most commonly used opioid in regional anesthesia is fentanyl citrate which is a μ1- and μ2-receptor agonist. It is a highly potent drug because of its high lipophilicity. It is preferred as an adjuvant in spinal anesthesia because of its rapid onset and short

duration of action with minimal cephalic spread. [5,6] However, pruritus, nausea, vomiting, respiratory depression, and urinary retention are other common side effects for which search for ideal nonopioid adjuvants goes on. [7] Clinical studies have suggested that intrathecal clonidine, an α2-receptor agonist, prolongs sensory and motor block in spinal anesthesia and provides prolonged postoperative analgesia. Clonidine has beneficial effects such as antiemesis, reduced post spinal shivering, anxiolysis, and sedation, thereby avoiding unwanted opioid-related side effects such as pruritus and respiratory depression. [8,9]

The aim of the present study was to compare the hyperbaric bupivacaine 0.5% and hyperbaric 0.5%+Fentanyl 20 micrograms in spinal anesthesia for elective lower abdominal and lower limb surgery.

Materials and Methods

A retrospective study was conducted in Shree Narayan Medical Institute and Hospital, Saharsa, Bihar period of 12 months and 100 patients were included in the study to compare the Hyperbaric bupivacaine 0.5% and hyperbaric 0.5%+ Fentanyl 20 micrograms in spinal anesthesia for elective lower abdominal and lower limb surgery under different study parameters like onset and duration of analgesia, duration of sensory and motor blockade, quality of analgesia and side effects or complications. Inclusion criteria include ASA grade I and II physical status, undergoing elective surgeries of lower abdomen and lower extremities aged 18 to 65 years and exclusion criteria include the history of allergy or sensitivity to local anesthetic or opioids, any contraindication to regional anesthesia and ASA grading III and IV. A detailed pre-anesthetic examination including history, clinical examinations, the systemic examination of the cardiovascular, respiratory, central nervous system and examination of spine for deformity was performed. Routine investigations like hemogram, bleeding time, clotting time, blood sugar, blood urea, serum creatinine, ECG, Chest X-Ray were done wherever necessary. Patients' weight and height were also recorded prior to surgery. Premedication was standardized with Tab diazepam 0.2mg/kg preoperative on the night before surgery. All patients were instructed about the visual analogue scale (VAS).

Patients were allocated into two groups viz., groups A, group B. In Group A 50 patients received 2.5ml of hyperbaric bupivacaine 0.5% with 0.4ml of Normal saline and in Group B 50 patients received 2.5ml of hyperbaric bupivacaine 0.5% with 0.4ml of (20ug) of fentanyl citrate and normal saline was added to 5ml syringe containing 2.5ml of bupivacaine using a 1ml syringe for accuracy. Before the start of the procedure, patients' pulse rate, blood pressure, respiratory rate, oxygen saturation was recorded. An intravenous line was secured using an 18G intravenous cannula. All patients were preloaded with 500mlof Ringer's lactate prior to spinal anesthesia. The patients were kept nil per orally for 8 – 10 hours before surgery. The side effects of intrathecal fentanyl-like nausea, vomiting, pruritis, shivering respiratory depression (respiratory rate<10min), drowsiness, hypotension euphoria, chest tightness and urinary retention were noted. Hypotension was defined as a decrease in systolic blood pressure more than 20% of the baseline values and was treated with injection mephentermine 5mg intravenous increments and bradycardia (pulse rate <60/min) was treated by atropine 0.6mg intravenous stat. Under aseptic precautions lumbar puncture was performed in the left lateral position or sitting position by midline approach by using disposable quincke spinal needle (23-26G) at L3- L4, intervertebral space. Patients were monitored continuously using sphygmomanometer, pulse oximeter and electrocardiogram, patients pulse rate, blood pressure, oxygen saturation were recorded at 0,5,10,20,30,60,120 and 180 minutes. The sensory level was tested by pinprick using a hypodermic needle and the motor level was assessed by the Bromage scale. A pretested proforma was used for collecting relevant data. Quantitative data were analysed by students "t" test and qualitative data was analyzed by the chi-square test.

Results

Table 1: Comparison of demographic parameters between two groups

Criterion	Group A n=50	Group B n = 50	p-value
Age (years)	36.33±11.08	40.43±12.71	0.135
Gender (M/F)	14/36	18/32	0.411
Weight (Kgs)	65.34±9.40	63.54±8.52	0.381
ASA (I/II)	38:12	36.14	0.949

The groups were comparable with respect to age, weight, gender ratio and ASA status of patients.

Table 2: Mean heart rate

Mean HR(beats/min)		**P – value**	
	Group D n=50	**Group P n = 50**	
Pre –op	89.74±9.57	85.43±11.02	0.070
2 MIN	92.21±8.46	94.60±7.60	0.196
4 MIN	88.60±7.12	86.21±5.64	0.106
6 MIN	85.63±9.89	86.30±7.58	0.740
8 MIN	88.80±5.89	87.11±6.23	0.225
10 MIN	82.32±11.27	89.76±7.3	0.264
20 MIN	84.70±10.9	82.33±10.11	0.326
30 MIN	80.1±9.23	85.30±7.67	0.680
40 MIN	76.23±9.0	83.90±12.03	0.174
50 MIN	78.34±5.42	82.84±7.4	0.094
60 MIN	78.76±10.34	77.5±8.0	0.004
POST OP	82.63±8.67	85.79±7.89	0.655

There was a significant difference in postoperative mean HR between two groups.

Table 3: Intergroup comparison of systolic blood pressure (SBP)

	Mean SBP(mm Hg)		**P – value**
	Group A n=50	Group B n = 50	
Pre –op	126.47±11.40	123.8±10.7	0.293
2 MIN	134.21±10.76	138.86±9.90	0.0523
4 MIN	128.50±13.45	128.48±11.98	0.9945
6 MIN	121.66±14.34	124.45±17.98	0.453
8 MIN	117.98±7.4	124.23±11.90	0.007
10 MIN	115.83±6.9	120.87±9.78	0.012
20 MIN	112.14±13.9	118.64±16.3	0.063
30 MIN	112.2±8.6	113.73±14.23	0.621
40 MIN	110.76±9.4	114.9±12.67	0.819
50 MIN	102.09±15.76	112.84±16.32	0.0009
60 MIN	104.6±10.33	119.27±17.62	<0.0001
POST OP	117.43±12.23	130.09±14.54	<0.0001

SBP was observed win both groups with values being comparable at corresponding study stages except at 60 minutes and the difference was significant (p value<0.05).

Table 4: Intergroup comparison of diastolic blood pressure (DBP)

	Mean DBP(mmHg)		**P – value**
	Group A n=50	**Group B n=50**	
Pre –op	73.12±10.26	74.31±8.64	0.584
2 MIN	76.43±8.76	77.01±10.23	0.789
4 MIN	74.72±6.99	76.5±7.15	0.272
6 MIN	71.6±7.28	73.24±6.78	0.309
8 MIN	74.02±7.28	72.62±5.27	0.337
10 MIN	70.23±6.31	71.25±6.58	0.489
20 MIN	68.60±5.86	68.90±7.66	0.847
30 MIN	66.52±4.12	67.91±5.82	0.229
40 MIN	64.23±6.12	65.42±5.91	0.388
50 MIN	63.33±4.21	63.81±5.76	0.676
60 MIN	62.19±6.33	66.42±5.99	0.003
POST OP	72.7±6.16	74.63±6.88	0.198

A similar trend of DBP was observed win both groups with values being comparable at corresponding study stages except at 60 minutes and the difference was significant (p value<0.05). Postoperative DBP was comparable between two groups.

Table 5: Onset of Sensory and motor blockade

	Group A	Group B
Onset of sensory blockade	134.4 ±14.9	137.5 ± 13.5
Onset of memory blockade	228.7 ± 20.5	229.5

The mean time of onset of sensory blockade in Group A was 134.4 ±14.9 seconds and group B was 137.5 ± 13.5 seconds. The mean time of onset of motor blockade group A was 228.7 ± 20.5 seconds and the meantime of the onset of the motor blockade in Group B was 229.5 seconds.

Table 6: VAS scale

	Group A	Group B
3 hours	0.6	0.1
6 hours	4	1.7
24 hours	4	2.6

In this study out of 100 patients the visual analogue score at 3 hours was 0.6 in group A and 0.1 in Group B. At 6 hours postoperatively VAS was 4 in group A and 1.7 in group B. At24 hours VAS was 4.0 in group A and 2.6 in Group B.

Discussion

Pain is defined according to the International Association for the study of pain, as "An unpleasant, sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage". [10] Spinal anaesthesia consists of the temporary interruption of nerve transmission within the subarachnoid space produced by injection of a local anesthetic solution into cerebrospinal fluid. SA is a routinely used anesthetic technique for operations involving the lower limbs, lower abdomen, pelvis and perineal surgeries. [11-13] An increasing proportion of the patients undergoing these surgical procedures are the elderly. [14] Age-related changes in physiology and pharmacology can affect every aspect of pre-operative care. [15]

The groups were comparable with respect to age, weight, gender ratio and ASA status of patients. There was a significant difference in postoperative mean HR between two groups. SBP was observed win both groups with values being comparable at corresponding study stages except at 60 minutes and the difference was significant (p value<0.05). A similar trend of DBP was observed win both groups with values being comparable at corresponding study stages except at 60 minutes and the difference was significant (p value<0.05). Postoperative DBP was comparable between two groups. The mean time of onset of sensory blockade in Group A was 134.4 ±14.9 seconds and group B was 137.5 ± 13.5 seconds. The mean time of onset of motor blockade group A was 228.7 ± 20.5 seconds and the meantime of the onset of the motor blockade in Group B was 229.5 seconds. Liu S et al [16] in 1995, Harbhej Singh et al [17] in 1998, Techanivate A et al [18] in2004 found that two-segment regression was significantly prolonged in patients who received intrathecal Fentanyl with bupivacaine and was similar to our studies. Hunt CO et al [19] in1989 conducted a study in 50 patients who received either 0, 2.5, 5,6.25, 25, 27.5 or 50ug of fentanyl along with bupivacaine. He noticed that at 60 minutes the number of segments regressed was prolonged in 50ug fentanyl groups. But by 120 minutes there were no differences= between groups in the number of segments regressed. In the study, the duration of motor and the sensory block was significantly prolonged in the fentanyl group.

In this study out of 100 patients the visual analogue score at 3 hours was 0.6 in group A and 0.1 in Group B. At 6 hours postoperatively VAS was 4 in group A and 1.7 in group B. At24 hours VAS was 4.0 in group A and 2.6 in Group B. In a study conducted by Kuusniemi KS et al [20] in 2000 he found there was no difference in the duration of motor block among patients who received bupivacaine10mgonly and bupivacaine 7.5ug and fentanyl 25ug, but the duration were prolonged in the group which received 10mg bupivacaine and 25ug fentanyl. The duration was shortest among the group which received 5mg bupivacaine + 25ug fentanyl. Similarly, the duration of sensory block was maximum in the group which received 10mg bupivacaine and fentanyl 25ugand least in the group which received 5mg bupivacaine 25ug of fentanyl. In our study the meantime for the first request of analgesics in group A was 246 minutes and group B was 333 minutes. This was statistically highly significant. Hunt CO et al [21] in 1987 found in their studies that fentanyl increases the duration of analgesia.

Conclusion

The addition of 20ug of fentanyl to 0.5% hyperbaric bupivacaine in spinal anesthesia, prolongs the duration of sensory and motor blockade, increase the duration and quality of postoperative analgesia 12 – 24 hours without causing any gross hemodynamic disturbances or adverse effects. Based on the above facts we conclude the addition of fentanyl has many

advantages and can be recommended with all spinal anaesthesia techniques.

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