

A Study Of Comparison Of 0.8mg Vs 1.4mg Of Intrathecal Nalbuphine In 3.5ml Of Inj. Bupivacaine Heavy 0.5% In Lower Abdominal And Lower Limb Surgeries

Research Article

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Abstract

Background: Spinal anaesthesia is a commonly employed technique which provides safe, effective, low cost surgical anaesthesia with good post-operative analgesia. Nalbuphine is a semi synthetic opioid with mixed antagonist and k agonist properties. In present study we have compared 0.8mg vs 1.4mg of Intrathecal inj. Nalbuphine with inj. bupivacaine heavy 0.5% 3.5cc to determine the most optimal dose for effective anaesthesia and maximum postoperative analgesia in lower abdominal surgeries. We also observed about the common side effects that occur with opioids like, pruritus, nausea, vomiting, sedation.

Material and Methods: Patients were randomly allocated into two groups of 30 participants each. They received either nalbuphine 0.8 mg (group A) or nalbuphine 1.4 mg (group B) diluted upto 0.5ml with normal saline, mixed with 17.5 mg of hyperbaric bupivacaine 0.5% (3.5 ml). The onset of sensory blockade, onset of motor blockade, duration of sensory blockade, two-segment regression time from highest level of sensory blockade and duration of motor blockade were recorded following procedure.

Results: In this study, we found that intrathecal injection Nalbuphine combined with intrathecal bupivacaine provides faster onset of sensory and motor blockage along with intraoperative hemodynamic stability. Addition of 1.4 mg intrathecal Nalbuphine in comparison with 0.8 mg provides better postoperative analgesia. The duration of sensory and motor blockade were increased without significantly increasing the incidence of side effects such as sedation, pruritus, nausea/vomiting and respiratory depression.

Conclusion: In conclusion, Intrathecal Nalbuphine (1.4mg) added to Intrathecal Bupivacaine 0.5% heavy (17.5mg) provides prolonged postoperative analgesia without increasing risk of side effects. Further studies are required to determine optimal dosage of intrathecal Nalbuphine.

Keywords: Spinal Anaesthesia; Nalbuphine; Bupivacaine Analgesia.

Introduction

Spinal anaesthesia is a very commonly used anaesthesia technique for various lower abdominal and lower limb surgeries. This approach has various advantages like cost effectiveness, better performance, enhanced margin of safety, and also helps in providing good post-operative analgesia. The stress response associated with general anaesthesia and side effects of various drugs used for general anaesthesia were also blunted. Various adjuvants including opioids, have been used with local anaesthetics in spinal anaesthesia to reduce complications as well as to increase peri and post-

operative analgesia. Nalbuphine is a semi synthetic opioid with mixed antagonist and k agonist properties [1, 2]. Previous studies have shown that Intrathecal administration of Nalbuphine produced a significant analgesia accompanied by minimal pruritus and respiratory depression. Various doses of Nalbuphine were tried but still there is a controversy about the most effective dose. In present study we have compared 0.8mg VS 1.4mg of Intrathecal inj. Nalbuphine with inj. bupivacaine heavy 0.5% 3.5cc to establish the most effective dose for maximum postoperative analgesia in lower abdominal and lower limb surgeries. We also observed the common side effects that occur with opioids like, pruritus, nausea, vomiting, sedation and respiratory depression.

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Materials and Methods

The study was approved by the local institutional ethics committee and written informed consent was obtained from all patients before participation. Sixty patients with ASA physical status I or II, aged 20-60 years, weighing 40- 80 kgs, scheduled for elective lower abdominal and lower limb surgeries, of duration less than 2 hrs, under subarachnoid block, were included in the study. Patients were randomly allocated to one of two groups. They received either nalbuphine 0.8 mg (group A) or nalbuphine 1.4 mg (group B) diluted upto 0.5ml with normal saline, mixed with 17.5 mg of hyperbaric bupivacaine 0.5% (3.5 ml). After overnight fasting, all the participants were premedicated with inj. Rantac 50mg i.v. 1 hour before surgery. Patients basal vital parameters were recorded preoperatively using multiparameter monitor in the O.T. Spinal block was performed with 25G Quincke's spinal needle at the level of L3-L4 or L4-L5 intervertebral space, in the left lateral position, maintaining aseptic precautions. Following free flow of CSF, drug was injected slowly over 10 seconds and patients were immediately placed in the supine position for surgery. I.V fluids were given intraoperatively as and when necessary. The onset of sensory blockade i.e. time taken from the end of injection to loss of pin prick sensation at L1 dermatome, onset of complete motor blockade i.e. time taken from the end of injection to development of grade II motor block (modified Bromage's criteria), two-segment regression time from highest level of sensory blockade, duration of complete analgesia i.e. time from the intrathecal injection to the first complain of pain, duration of motor blockade (time required for motor blockade to return to Bromage's grade 0 from the time of onset of motor blockade) were studied and recorded. The changes in pulse rate, systolic and diastolic blood pressure, oxygen saturation (SpO₂) and respiratory rate were monitored and recorded at 0, 5,10, 20 and 30

min and thereafter at every 30-min intervals up to 120 min after subarachnoid Block. Any side effects in the form of intra or post-operative hypotension, bradycardia, sedation, respiratory depression, nausea and vomiting and pruritus were recorded and treated appropriately. Intensity of pain was assessed by visual analogue score at 0, 10, 15, 30 and 60 minutes and then at 30-min intervals till 300 min after injection or until the patient received a rescue analgesic. Patients reporting a visual analogue score 3 or more or demand analgesia, were given rescue analgesics in the form of injection Diclofenac 1.5mg/kg IM.

Results

The data obtained from the study were collected and subjected to statistical analysis.

The level of significance was 0.05.

Table 1 shows that all participants in both groups were comparable with regard to age and weight distribution and duration of surgery. There was no significant difference in between them.

We can see from table no 2 that the onset time of sensory blockade in both the groups (Group A 94.17 ± 13.06, Group B 88.83 ± 10.93) were comparable and there is no significant difference with p value 0.0912.

As shown in table 3, the onset time of Motor block in group A (78.5 ± 11.18) and in group B (77.5 ± 08.86) were comparable and there is no significant difference. (P = 0.7024).

Table 4 is showing that Two segment regression time in group A (60 ± 7.02) is much shorter than group B (75.66 ± 6.26) minutes

Table 1. Age, Weight and Duration of surgery.

		GROUP A	GROUP B	P VALUE	INFERENCE
AGE	MEAN	38.60	40.53	0.4585	NS
	SD	11.58	11.07		
WEIGHT	MEAN	55.77	57.40	0.3204	NS
	SD	7.68	5.83		
DURATION OF SURGERY (MIN)	MEAN	89.40	88.37	0.7399	NS
	SD	16.72	15.29		

Table 2. Onset time of Sensory Block at LI Sensory level.

CHARACTERISTICS	TIME(SEC)	GROUP A	GROUP B	P VALUE	INFERENCE
ONSET OF SENSORY BLOCK (SEC)	50-60	1	0		
	61-70	0	2		
	71-80	1	3		
	81-90	10	12		
	91-100	10	10		
	101-110	4	2		
	111-120	4	1		
	RANGE	50-120	60-120	P=0.0912	NS
	MEAN	94.17	88.83		
	SD	13.06	10.93		

and the difference is highly significant ($p < 0.0001$).

Table 5 is showing that duration of complete postoperative analgesia (in minutes) in group A (216.33 ± 24.33) is much shorter than group B (256.33 ± 24.50) and the difference is highly significant ($p < 0.0001$).

Table no 6 reveals duration of motor blockade in group A and group B as 194.66 ± 26.20 and 228.83 ± 29.71 min respectively and the difference is significant with $P < 0.0001$.

From table no 7, we can see that complication rate in both the groups are similar. While 2 patients in group A have developed vomiting, in group B, 3 patients have developed vomiting which were treated with inj. Ondansetron 4mg IV. Incidences of hypotension were similar in both the group. Episodes of hypotension were treated with IV Fluids and Vasopressor inj. Ephedrine. Transient bradycardia was seen in only 1 patient in group A which was treated with inj. Atropine. None of the patient developed either pruritus or respiratory depression which were typical of opioid related.

Discussion

Intrathecal opioids have been demonstrated to provide effective postoperative analgesia by acting on the opioid receptors in the spinal cord. Addition of opioids to local anaesthetics for intrathecal administration offers several advantages like faster onset, prolonged duration of action, reduced requirement of local anaesthetics along with decreased incidences of adverse effects. The combination has been shown to augment the sensory effect without affecting the duration of motor blockade.

In our study, the onset time of sensory block at LI sensory level (in seconds) in group A (94.17 ± 13.06) and group B (88.83 ± 10.93) were comparable and there was no significant difference ($P = 0.912$). And the onset time of Motor block (in seconds) in group A (78.5 ± 11.18), and group B (77.5 ± 08.88) were also comparable and there is no significant difference ($P=0.7024$). This is in contrast to the results obtained by Mukherjee A et al, [3]. In 2011 when they compared effect of different doses of nalbuphine as adjuvant to bupivacaine on sensory and motor blockade. They found that the onset time of sensory blockade following intrathecal injection of study solution containing 0.5 ml normal saline (NS) or 0.2, 0.4 and 0.8 mg Nalbuphine made

Table 3. onset of motor blockade.

CHARACTERISTICS	TIME(SEC)	GROUP A	GROUP B	P-VALUE	INFERENCE
Onset of motor blockade bromage II	41-50	1	0	P=0.7024	NS
	51-60	1	2		
	61-70	2	2		
	71-80	14	15		
	81-90	8	10		
	91-100	4	1		
RANGE	RANGE	40-100	40-100	P=0.7024	NS
	MEAN	78.5	77.5		
	SD	11.18	8.86		

Table 4. Two segment regression time.

CHARACTERISTICS	TIME (MIN)	GROUP A	GROUP B	P VALUE	INFERENCE
TWO SEGMENT REGRESSION TIME	46-50	1	0	P<0.0001	Significant
	51-55	8	0		
	56-60	8	1		
	61-65	8	1		
	66-70	2	2		
	71-75	2	9		
	76-80	1	13		
	81-85		2		
	86-90		2		
	91-95		0		
	96-100		0		
	101-105		0		
RANGE	RANGE	46-80	56-90	P<0.0001	Significant
	MEAN	60	75.66		
	SD	7.02	6.26		

Table 5. Duration Of Post-Operative Analgesia.

CHARACTERISTICS	TIME (MIN)	GROUP A	GROUP B	P VALUE	INFERENCE
Duration of complete post-operative analgesia(min)	151-175	3	0		
	176-200	3	0		
	201-225	11	2		
	226-250	13	12		
	251-275	0	9		
	276-300	0	6		
	301-325	0	1		
	326-350	0	0		
	RANGE	151-275	201-325	P<0.0001	VERY SIGNIFICANT
	MEAN	216.33	256.33		
	SD	24.33	24.5		

Table 6. Duration of motor blockade.

CHARACTERISTICS	TIME (MIN)	GROUP A	GROUP B	P VALUE	INFERENCE
Duration of motor blockade (min)	151-175	7	0		
	176-200	13	6		
	201-225	6	6		
	226-250	3	14		
	251-275	1	2		
	276-300	0	1		
	301-325	0	1		
	326-350	0	0		
	RANGE	151-275	176-325	P<0.0001	VERY SIGNIFICANT
	MEAN	194.66	228.83		
	SD	26.2	29.71		

Table 7. Complications.

COMPLICATIONS	GROUP A	GROUP B
Nausea/vomiting	2	3
Hypotension	5	7
Bradycardia	1	0
Pruritus	0	0
Respiratory Depression	0	0

up to 0.5 ml with NS added to 0.5% hyperbaric bupivacaine 12.5 mg (total volume 3 ml) to patients belonging to group A, group B, group C and group D were 1.75 ± 0.27, 1.69 ± 0.20, 1.63 ± 0.24, and 1.59 ± 0.18 minutes respectively. Similarly, onset time of motor blockade in group A, group B, group C and group D were 5.9 ± 0.57, 5.8 ± 0.76, 5.7 ± 0.62 and 5.6 ± 0.53 minutes respectively. Among the groups, onset time of sensory and motor blockade were comparable and found to be statistically insignificant (P > 0.05) but when compared to our study, the early onset time in our study may be due to larger dose of inj. Nalbuphine and also use of different assessment criteria (for sensory blockade, use of L1 dermatome instead of T10 and for motor blockade, use of Bromage II instead of Bromage IV).

Tiwari A.K. et al., [4] in 2011, did a comparative study between two different doses of Intrathecal Nalbuphine admixed with 2.5ml of Bupivacaine. They randomly allocated 75 patients to 1 of 3 groups. Group A (n = 25) received 2.5 mL of 0.5% hyperbaric bupivacaine + 1ml sterile water Intrathecally; group B (n = 25) received 2.5ml of 0.5% hyperbaric bupivacaine + 1ml (200mcg) Nalbuphine Intrathecally and group C (n = 25) received 2.5ml of 0.5% hyperbaric bupivacaine + 1 mL (400 mcg) Nalbuphine Intrathecally. It was found from the study that, two segment regression time of sensory blockade as well as duration of analgesia were maximally prolonged in group C compared to group A and group B (P < 0.05). similar results were found in our study, the two-segment regression time (in minutes) in group A (60 ± 7.02) and group B (75.66 ± 6.26) were prolonged and

the difference is significant ($P=0.0001$) and correlates with above mentioned study.

The analgesic as well as motor blocking effect of Nalbuphine appears to increase with increase in the dosage. Mostafa GM. et al., [5] found that 2mg of Nalbuphine when used intrathecally as an adjuvant to Bupivacaine, has produced comparatively prolonged analgesic and motor blocking effect lasting for 8.5 ± 3.67 hours and 5.9 ± 0.9 hours respectively. Mukherjee A et al., [3] in 2011, studied the effect of varying dose of intrathecal Nalbuphine (0.2mg vs. 0.4mg vs. 0.8mg) on duration of analgesia and motor blockade when used as an adjuvant to Bupivacaine. The duration of analgesia was progressively prolonged in groups 0.2mg, 0.4mg and 0.8mg with $P < 0.05$. 0.8mg recorded the longest duration of analgesia with a mean of 278.5 min compared with 237.3 min in 0.4mg. They recommend 0.4 mg as the optimal dose of Nalbuphine if used Intrathecally along with bupivacaine. The motor blockade was not altered significantly with change in the dosage of Nalbuphine.

In our study, the duration of sensory blockade (in minutes) in group A (216 ± 24.33) is much shorter than group B (256.00 ± 24.5) and the difference is highly significant ($p < 0.0001$). Similarly, duration of motor blockade in group A (194.66 ± 26.20) is much shorter than group B (228.83 ± 29.71) and the difference is found to be highly significant and also it does not correlate with above mentioned studies.

Several authors have compared the intrathecal Nalbuphine with intrathecal morphine and revealed varied results.

Lin ML [6] in 1992, compared the analgesic effect of subarachnoid administration of low dose morphine with that of Nalbuphine when administered as adjuvant with tetracaine for spinal anaesthesia and they didn't find significant differences in duration of analgesia between the groups.

Fournier et al., [7] in 2000, compared Intrathecal morphine with Nalbuphine for postoperative pain relief after total hip replacement. They concluded that administration of Intrathecal Nalbuphine resulted in a shorter duration of analgesia than Intrathecal morphine.

Culebras X et al., [8] in 2000, compared effects of intrathecal morphine with that of Nalbuphine. They found that durations of complete and effective analgesia were significantly increased in morphine 0.2 mg (275 ± 228 min., 585 ± 446 min.) compared with Nalbuphine 0.2mg (108 ± 23 min., 136 ± 22 min.), Nalbuphine 0.8 mg (176 ± 62 min., 212 ± 72 min.), Nalbuphine 1.6 mg (148 ± 45 min., 193 ± 77 min) and further they found that increasing the Nalbuphine dose to 1.6 mg did not further improve analgesia.

Use of intrathecal opioids is associated with complications like pruritus, nausea/vomiting, sedation, hypotension, bradycardia and respiratory depression. Authors like Lin ML, have reported less side effects following Nalbuphine than with morphine.

Mukherjee A et al., reported dose dependent increase in incidence of complications in terms of hypotension, bradycardia, nausea/vomiting and pruritus following Nalbuphine.

In our study, 2 patients from group A and 3 patients from group B developed vomiting and were treated with inj. Ondansetron 4mg IV. Significant hypotension was seen in 5 patients in group A and 7 patients in group B. They were given IV fluids and Vasopressors. Only one patient had developed bradycardia and was treated with inj. Atropine. None of the patients developed pruritus or respiratory depression.

Conclusion

Intrathecal Nalbuphine (1.4mg) added to Intrathecal Bupivacaine 0.5% heavy (17.5mg) provides prolonged postoperative analgesia without increasing risk of side effects. Further studies are required to determine optimal dosage of intrathecal Nalbuphine.

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