Original Research Article

Comparative study between intrathecal Nalbuphine and Fentanyl as an adjuvant to hyperbaric Bupivacaine in transabdominal hysterectomy

Chethanananda T N[1], Annamreddy Anantha Rao[2*], Suhana Banu[3], Ranjitha C[4]

[1]Professor, [3,4]Post graduates, Department of Anaesthesiology, Adichunchanagiri Institute of Medical Sciences, Adichunchanagiri University, B G Nagara 571448, Mandya Dist, Karnataka, INDIA.
[2]Senior Specialist, Vizag Steel General Hospital, RINL, Ukkunagaram, Sector 6, Visakhapatnam 530032, Andhrapradesh, INDIA.
Email: ranjithachandru1@gmail.com

Abstract

Background: The study was to compare the sensory and motor blockade characteristics and duration of postoperative analgesia between Nalbuphine and Fentanyl as an adjunct to intrathecal Bupivacaine in spinal anaesthesia. **Settings and design:** To compare the clinical efficacy of hyperbaric Bupivacaine with Fentanyl and hyperbaric Bupivacaine with Nalbuphine with reference to onset and duration of sensory block, onset and duration of motor block, duration of post op analgesia, hemodynamic stability, level of sedation and complications. **Methodology:** 60 female patients of 30-55 years of age with ASA I, II undergoing elective trans-abdominal hysterectomy under spinal anaesthesia were randomly allocated to two groups. Group BUF - 0.5ml (25µg) Fentanyl and Group BUN - 0.5 ml (1 mg) Nalbuphine, with 3ml of 0.5% hyperbaric Bupivacaine. Onset and duration of sensory block, duration of post op analgesia, hemodynamic stability, level of sedation and complications were assessed. **Statistical analysis: Data** were analysed using Student t test and Chi-square test for parameters on continuous scale and categorical scale respectively p value < 0.05 was considered significant. **Results:** Though onset of sensory and motor block was faster in BUF, the BUN group had prolonged post op analgesia. Mean VAPS reduction at 24hr in BUN (3.26+/- 0.541) compared to BUF (2.78+/-0.585) was statistically significant with p value 0.0016(<0.05). No statistical significance was seen with respect to hemodynamic stability and duration of motor block. **Conclusion:** Nalbuphine, an agonist-antagonist is a good adjuvant to intrathecal Bupivacaine, providing intense and prolonged postoperative analgesia without any significant adverse effects.

Key Words: Spinal anaesthesia, Bupivacaine, Nalbuphine, Fentanyl, Postop analgesia.

[*]**Address for Correspondence:**
Dr Annamreddy Anantha Rao, Senior Specialist, Vizag Steel General Hospital, RINL, Ukkunagaram, Sector 6, Visakhapatnam 530032, Andhrapradesh, INDIA.
Email: ranjithachandru1@gmail.com
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INTRODUCTION

Spinal anaesthesia has many potential advantages over general anaesthesia, especially for operations involving the lower abdomen, the perineum and the lower extremities.[1] Spinal anaesthesia with hyperbaric Bupivacaine 0.5% is popular method for longer procedures due to its prolonged duration. Addition of intrathecal opioids is needed to intensify and enhance the duration of sensory blockade and post-operative analgesia without increasing the sympathetic block[2]. Local anaesthetics work by inhibiting voltage-gated sodium channels in the spinal cord by interfering with afferent and efferent sensory and motor impulses while intrathecal opioids activate opioid receptors

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in the dorsal grey matter of the spinal cord (substantia gelatinosa) to modulate the function of afferent pain fibers.[3] This study is designed to quantitatively examine the effects of adding Nalbuphine and Fentanyl to hyperbaric Bupivacaine hydrochloride in spinal anaesthesia, to evaluate the efficacy, to know the duration of postoperative analgesia and to know the complications if any. Highly hydrophilic opioids such as Morphine, though provides very good intra and post-operative analgesia, its use becomes limited because of delayed respiratory depression that it causes due to rostral spread in intrathecal space.[4] Fentanyl is a potent synthetic opioid agonist and Nalbuphine is a synthetic opioid agonist-antagonist analgesic.[5]

MATERIALS AND METHODS

A single blinded randomised prospective study was conducted after obtaining clearance from Institutional ethical committee. Written informed consent was taken from sixty patients who were included in the study at Adichunchanagiri Institute of Medical Sciences, Mandya District. 60 patients of 30-55 years of age with ASA I, II undergoing elective trans-abdominal hysterectomy under spinal anaesthesia, were randomly allocated to two groups by computer-generated table of random numbers. Group BUF (n=30) - Inj. hyperbaric Bupivacaine 0.5% of 3 ml (15mg), Fentanyl 0.5ml (25µg) intrathecally. Group BUN (n=30) -Inj hyperbaric Bupivacaine 0.5% of 3 ml (15 mg) plus Nalbuphine 0.5 ml (1 mg) intrathecally. Patients who have not given consent, with medical disorders, coagulation abnormalities and those with local skin infection were excluded from the study. A detailed pre-anaesthetic evaluation and relevant laboratory and radiological investigations was undertaken. All patients received tablet Ranitidine 150 mg and tablet Alprazolam 0.5 mg as pre-medication in the night and were advised nil per orally from 12 midnight prior to the day of surgery. On the day of surgery, all the resuscitation equipments, E.T tubes, anaesthesia machine, emergency drugs were kept ready. Patients were preloaded with Ringer lactate solution at the rate of 15ml / kg via 18 G IV cannula. Monitors connected [continuous electrocardiogram (ECG), SpO2, noninvasive blood pressure (NIBP)], respiratory rate and baseline readings were noted. Under strict aseptic precautions, mid line lumbar puncture was done at L3- L4 interspace using 26 G spinal needle with patient in lateral position. The study drug was injected into the subarachnoid space after noting the clear free flow of CSF at the rate of 0.2ml/ second. Patients were turned supine immediately. The pulse rate, systolic BP, diastolic BP, SPO2 and respiratory rate were recorded every 2min for 5minutes, and every 5 min for 30 minutes and every 15 min there after till 60 min, then every 30 min till 150 min. A fall of systolic blood pressure >30mmHg from the baseline or MAP <60 mmHg reading was taken as hypotension and was treated with intravenous fluids and incremental dose of Inj. Ephedrine 6mg. Bradycardia defined as heart rate < 60 beats per min and treated with IV atropine 0.6 mg. Respiratory depression defined as respiratory rate less than 8/min (or) SPO2<85% and oxygen supplementation was given through face mask for such cases. Onset of sensory block was taken as time from intrathecal injection to loss of pin prick sensation at T10 level. Motor block was assessed using the modified Bromage score. Time for two- segment regression from the highest sensory level and time for rescue analgesia was the time taken in minutes from the time of injection to the time when the patient complained of pain at surgical site with VAPS of > 4 and was treated with suitable analgesics. Duration of motor block was till the patient attained complete motor recovery of lower limb. Sedation was assessed by Ramsay sedation scale. Side effect like nausea, vomiting, hypotension, respiratory depression, pruritus, shivering, allergic reactions were noted and managed if necessary.

Statistical analysis

Data were analyzed using software version SPSS-20 (IBM SPSS statistics for windows, version 20.0. Armonk, NY, USA). Student t test for parameters on continuous scale. Chi-square test for parameters on categorical scale. Standard tests of significance were applied to determine "p" value, $p<0.05$ was considered statistically significant. Trend graphs and bar graphs were drawn accordingly.

RESULTS

Demographic profile

The groups were comparable with respect to the demographic profile.

Table 1: Comparison of Mean VAPS reduction at 24hr between groups

GROUP	Mean	Standard deviation	P value
BUF	2.78	0.585	0.0016
BUN	3.26	0.541	

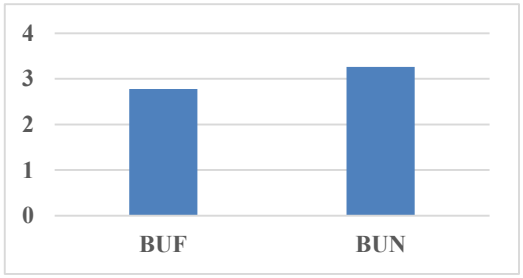


Figure 1: Mean VAPS reduction at 24hr

Table 2: Comparison of Onset time of Sensory Blockade between groups

GROUP	Mean (in min)	Standard deviation	P value
BUF	3.03	0.49	0.004
BUN	3.50	3.03	

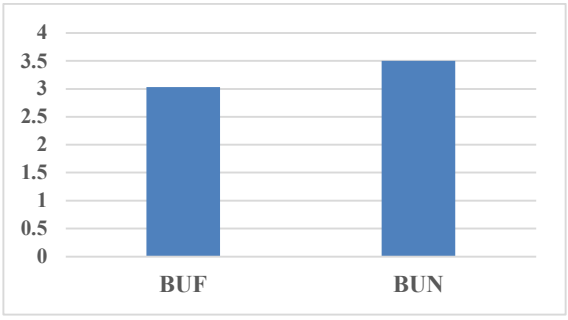


Figure 2: Onset of sensory blockade

Table 3: Comparison of Onset of Motor Blockade between groups

GROUP	Mean (in min)	Standard deviation	P value
BUF	3.83	1.13	<0.001
BUN	4.76	0.986	

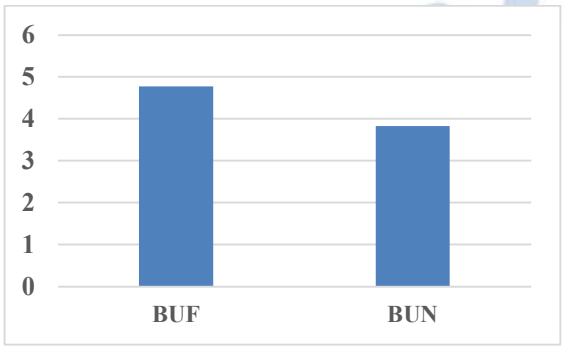


Figure 3: Onset of Motor blockade

Table 4: Comparison of Mean duration of two segment regression of sensory level between groups

GROUP	Mean (in min)	Standard deviation	P value
BUF	87.6	3.9	<0.001
BUN	95.3	5.07	

Table 5: Comparison of Mean duration of motor block between groups

GROUP	Mean (in min)	Standard deviation	P value
BUF	143.87	4.2	0.76
BUN	140.73	11.7	

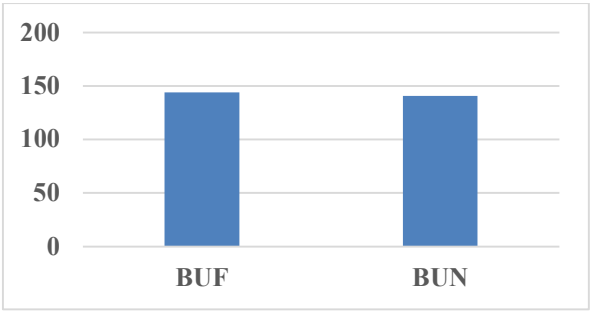


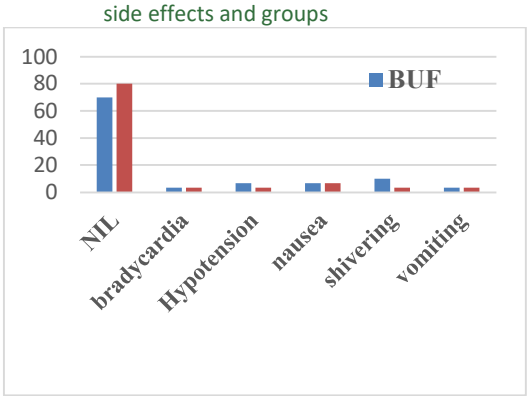
Table 6: Comparison of Mean duration of rescue analgesic requirement between groups

GROUP	Mean (in min)	Standard deviation	P value
BUF	285.97	8.8	<0.001
BUN	430.3	11.13	

Table 7: Distribution of subjects according to side effects between the groups

Side Effect	Group		
	BUF	BUN	Total
Nil	21	24	45
	70.0%	80.0%	75.0%
Bradycardia	1	1	2
	3.3%	3.3%	3.3%
Hypotension	2	1	3
	6.7%	3.3%	5.0%
Nausea	2	2	4
	6.7%	6.7%	6.7%
Shivering	3	1	4
	10.0%	3.3%	6.7%
Vomiting	1	1	2
	3.3%	3.3%	3.3%
Total	**30**	**30**	**60**
	100.0%	**100.0%**	**100.0%**

There was no statistically significant difference found between side effects and groups



RESULTS

Though onset of sensory and motor block was faster in Fentanyl group, the Nalbuphine group had prolonged post op analgesia. Mean VAPS reduction at 24hr in Nalbuphine (3.26+/- 0.541) compared to Fentanyl (2.78+/-0.585) was statistically significant with p value 0.0016(<0.05). Both groups showed no significant differences with respect to demographic profile and hemodynamic parameters.

DISCUSSION

Opioid analogues as adjuvants to intrathecal Bupivacaine enhances the onset of sensory and motor block, provides postoperative analgesia and prolongs the duration of block. Fentanyl acts by binding with opioid receptors in the dorsal horn of spinal cord and may also have its action via supraspinal spread when given intrathecally and has been used as an adjuvant to local anesthetics in subarachnoid block, and reduces both visceral and somatic pain [6]. Harbhej singh et al.[7] in 1995, BN Biswas et al..[8] in 2002, Khanna MS et al.[9] in 2002 had chosen 25 micrograms of Fentanyl as an additive to intrathecal hyperbaric Bupivacaine in their studies. Hence in our study, we chose 25 micrograms of Fentanyl as an additive to hyperbaric Bupivacaine.

Nalbuphine[10, 11] is a synthetic lipophilic opioid with agonist action at the kappa opioid receptor and antagonist at the mu receptor. It inhibits release of neurotransmitter that mediates pain such as substance P. In addition it acts as post synaptic inhibitor on the interneuron and output neuron of spinothalamic tract which transports nociceptive information. It improves quality of block and offers prolonged and long lasting postoperative analgesia. It has low incidence of adverse effects known for other opioids (respiratory depression, nausea, vomiting, pruritis). Onset of sensory and motor block was faster in Fentanyl group as compared to Nalbuphine group as in a study conducted by Shagufta et al. [12] and Bisth s et al.[13] Two segment regression was more prolonged with Nalbuphine group compared with Fentanyl which was consistent with that of a study by Gomaa et al.[2] There was no significant difference among two groups in duration of motor block with p value (p>0.05) supported by the study conducted by Gupta et al.[3] In a study conducted by Gupta et al.[3] and Culebras et al.[14] , Nalbuphine prolonged the duration of post-operative analgesia. Requirement of Rescue analgesics and Visual analogue scores were significantly low in Nalbuphine than Fentanyl, similar to the study done by Tiwari and Tomar[15] As far as side effects of intrathecal opioids were concerned in our study, patients in both groups had minimal side effects. No pruritus, respiratory depression, euphoria, dysphoria, desaturation was observed in both the groups.

CONCLUSION

Intrathecal Nalbuphine is a good adjuvant to Bupivacaine, providing intense and prolonged postoperative analgesia without any significant adverse effects. Being an agonist-antagonist, it is devoid of the usual opioid side effects. Unlike Fentanyl, it is not included under the Narcotic Act, hence it is easily available in the pharmacy on prescription.

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