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Original Research Paper

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EFFICACY OF INTRATHECAL NALBUPHINE AS AN ADJUVANT TO LEVOBUPIVACAINE IN SPINAL ANESTHESIA

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ABSTRACT

Objective: To elucidate the efficacy of intrathecal nalbuphine as an adjuvant to levobupivacaine for lower abdominal and lower limb surgeries in comparision with control.

Materials and methods: A prospective study was done including 80 patients with ASA physical status I and II undergoing lower limb and lower abdominal surgeries under spinal anaesthesia. The study population was divided into two groups of 40 each. Group A patients were administered spinal anesthesia of intrathecal levobupivacine with nalbuphine and Group B patients were administered spinal anesthesia of intrathecal levobupivacine with normal saline. Outcome measures assessed in this study were duration of onset of sensory and motor block, pain score using visual analogue scale (VAS), duration of rescue analgesia and adverse effects.

Results: The two groups were comparable in baseline characteristics like age, gender and weight and the duration of surgery of the patients. There was no significant difference between the two groups with regard to sensory and motor block characteristics. The VAS pain score was significantly higher in the group B compared to group A at 12, 16 and 20 hours post operatively ($p < 0.05$). The mean duration of rescue analgesia required in group A patients was 14.13 ± 3.4 hours which was significantly higher than 9.76 ± 2.6 hours in group B patients ($p < 0.01$). The mean total number of analgesic doses required post operatively were significantly higher in group B patients (2.64 ± 0.87) compared to 1.45 ± 0.59 in group A patients ($p < 0.01$). Conclusion: The nalbuphine as an adjuvant with levobupivacaine in spinal anesthesia clearly reduces the pain of the patients post operatively, provides increased duration of analgesia and reduces the number of analgesics required.

KEYWORDS : Nalbuphine, levobupivacaine, intrathecal, spinal anaesthesia

INTRODUCTION:

The surgical stress will be usually high during the postoperative days and has major effects on almost all systems of the human body. A pain and stress-free postoperative period definitely reduces morbidity and mortality of any surgical procedures. Spinal anaesthesia is one of the most commonly used techniques for lower abdominal and lower limb surgeries. Levobupivacaine has become popular for central neuraxial blocks in this century [(1)(2)(3)(4)]. The main advantage includes ease of technique and reliability. Levobup ivacaine a, pure s – enantiomers of bupivacaine are safer alternative for regional anaesthesia than its counterpart with lower toxicity profile[(5)]. Nalbuphine is one of the synthetic opioid analgesics with agonist–antagonist activity and acts as agonist at κ receptors to provide potent analgesia and antagonist at μ receptors. Nalbuphine, whenever used as adjuvant to bupivacaine, it was found to improve the quality of perioperative analgesia with comparatively lesser side effects and nil neurotoxicity [(6)(7)]. Efficacy of nalbuphine as an adjuvant to levobupivacaine in spinal anaesthesia has not been strongly evidenced. In order to gain more evidence on this indication, this study was performed to compare the sensory and motor block and analgesic characteristics of intrathecal levobupivacaine alone and combined with nalbuphine for lower abdominal surgeries and lower limb surgeries done with spinal anaesthesia.

MATERIALS AND METHODS

A prospective study was done including 80 patients undergoing lower limb and lower abdominal surgeries under spinal anaesthesia conducted in the Department of Anesthesiology in Shri Sathya Sai Medical College and Research Institute. Patients in the age range of 18 to 60 years with ASA physical status I and II were included. Patients allergic to local anaesthesia or nalbuphine, patients with coagulation disorder and local site infection and patients with Body Mass Index > 30 or Height < 140 cm were excluded from the study. The study population was divided into two groups of 40 each. Group A patients were administered spinal anesthesia of intrathecal levobupivacine with nalbuphine and Group B patients were administered spinal anesthesia of intrathecal levobupivacine. Outcome measures assessed in this study were duration of onset of sensory and motor block, pain score using Visual analogue scale (VAS), duration of rescue analgesia and adverse effects. Ethical committee approval was obtained for this study from the Institutional Human ethics committee.

Patients were asked to be on nil per oral at least for 6 hours before surgery. All the patients in the study group were pre medicated with Tab. diazepam 5 mg and Tab. Ranitidine 150 mg on the night before surgery. Informed written consent was taken from all patients. On arrival in the operating theatre 18 gauge venous cannula was placed and 10 ml/kg of RL solution was infused. The Standard Monitoring of vitals were connected and monitored throughout the study with non invasive arterial blood pressure (NIBP), Heart Rate, continuous ECG and pulse oximetry. Also, 0.03 mg/kg of midazolam was administered IV as premedication.

With the patient in sitting position under strict aseptic precaution, L3 L4 inter space was identified using midline approach and skin was infiltrated with 2 ml of 2% of lidocaine. Sub arachnoid block was performed through mid line approach with 25gauge Quincke's spinal needle.

Group A patients received 3ml of 0.5 % of levobupivacaine + 0.8 mg of nalbuphine comprising a total volume of 3.5 ml and Group B patient received 3 ml of 0.5 % levobupivacaine and 0.5 ml of normal saline comprising a total volume of 3.5 ml. For group A, 1ml of injection nalbuphine (10mg) was diluted with 4 ml of normal saline and from this 1ml of injection nalbuphine (2mg) was taken in to insulin syringe. From this insulin syringe, 0.4 ml of drug (0.8mg) was added to 3 ml of levobuphivacaine. From another insulin syringe 0.1 ml of normal saline was added to levobupivacaine, making total of 3.5 ml. For group B 0.5 ml of normal saline from insulin syringe was added to 3ml of levobuphivacaine. For both the groups the drugs ware prepared under strict aseptic precaution by an independent investigator and the syringes was handed over to the anaesthesiologist performing sub arachnoid block. Following intrathecal drug injection all patient were positioned in supine position.

Time of injection of drug into subarachnoid space is considered as 0 min. Patients were put in supine position and sensory level was checked by using 26G hypodermic needle by pin prick method. Sensory block was measured with pin prick test at a three point scale as follows: 0 - Sharp pain; 1 – Dull pain (analgesia); 2- No pain (anaesthesia). Onset of Sensory Block was considered when there was complete loss of sensation to pin prick. The block was judged to have failed if anaesthesia was not present in 2 or more peripheral nerve distributions. Sensory Level was checked by every 2 min in first 20 min followed by every 5 min for another 20 min. 2 consecutive same readings after 20 minute can be taken as maximum sensory level. Onset of motor block was considered as time from injection to the inability of the patient to move his feet or knees. Degree of motor blockade was assessed using modified Bromage scale. Parameters like heart rate, blood pressure, SPO2 were monitored continuously intra operatively every 2min for 20min then every 10min till the end of the surgery. Pain was measured using Visual Analog Score (VAS) rated from 0 to 10 subjectively with 0 for no pain and 10 for maximum pain. Duration when patient demand for rescue analgesia (Injection Diclofenac 75mg i.m. on demand when patient complaints of pain) and total analgesics required in 24hrs were noted. Post operative adverse effects like vomiting, shivering, pruritus were observed.

The data collected were entered in MS Excel and analyzed using SPSS (version 21). Descriptive statistics were presented as mean and standard deviation for continuous variables and frequency and percentages for categorical variables. Inferential statistics for continuous variables were calculated using Student 't' test and for categorical variables using Chi square test or Fisher exact test.

RESULTS

The study population included 80 patients in two groups with 40 patients in each group. Group A patients had been administered intrathecal levobupivacine with adjuvant as nalbuphine and group B with levobupivacaine and normal saline.

Table 1: Distribution of demographic characteristics of the study population

CHARACTERISTIC		Group A	Group B	p value
Age (years)		33.13 ± 8.83	33.7 ± 8.72	0.770
Sex	Male	18 (45%)	16 (40%)	0.651
	Female	22 (55%)	24 (60%)	
Weight (kg)		68.22 ± 11.29	69.14 ± 13.27	0.739
Duration of surgery (min)		100.23 ± 26.51	105.13 ± 26.08	0.407

The two groups were comparable in baseline characteristics like age, gender and weight of the patients. The mean duration of surgery for the patients in both groups had no significant difference.

Table 2: Distribution of sensory and motor blockade charac teristics of the study population

CHARACTERISTIC	Group A	Group B	p value
Onset of sensory block duration (minutes)	6.03 ± 1.21	6.25 ± 1.15	0.396
Onset of motor block duration (minutes)	6.68 ± 0.54	6.65 ± 0.53	0.755
Time for maximum sensory loss (minutes)	13.45 ± 1.11	13.23 ± 1.03	0.349
Maximum sensory level	T7 (T4 – T10)	T8 (T4 – T10)	0.459

Regarding the sensory and motor block, the mean duration for onset of sensory block and onset of motor block was around 6 minutes and mean time for maximum sensory loss was around 13 minutes. There was no significant difference between the two groups with regard to sensory and motor block characteristics.

The VAS pain score was significantly higher in the group B compared to group A at 12, 16 and 20 hours post operatively ($p < 0.05$).

Fig 1: Distribution of VAS score of the study population

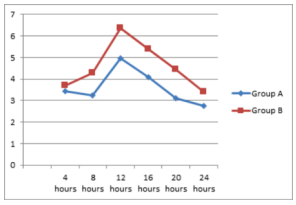
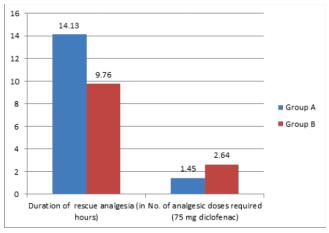


Fig 2: Distribution of post operative analgesic characteristics of the study population



The mean duration of rescue analgesia required in group A patients was 14.13 ± 3.4 hours which was significantly higher than group B patients (9.76 ± 2.6 hours). The mean total number of analgesic doses required post operatively were significantly higher in group B patients (2.64 ± 0.87) compared to group A patients (1.45 ± 0.59).

Table 3: Distribution of adverse effects perceived in the study population

Adverse Effects	Group A	Group B	p value
Vomiting	18 (46.2%)	21 (53.8%)	0.502
Pruritus	19 (52.8%)	17 (47.2%)	0.653
Shivering	18 (47.4%)	20 (52.6%)	0.654

Regarding the adverse effects, the vomiting and shivering was slightly high in group B and pruritus higher in group A but the difference was not significant between the two groups.

DISCUSSION

Surgical pain or "post-operative pain" is a common phenomenon experienced by patients all over the world, yet paradoxically after all efforts are taken to make intraoperative period pain and stress free, the patients is left to fend for himself in the postoperative period. Use of intrathecal opioid as adjuncts has its own hold in the recent regional anesthesia practice[8]. Opioid analgesics activate the receptors which are located in the afferent neurons in order to activate the pain modulating systems with minimal adverse effects. This activation in turn results either directly reducing neurotransmission or also it may stop the excitatory neurotrans mitter's release.

The mean age of the patients in the group A was 33.13 ± 8.83 years and in group B was 33.7 ± 8.72 years. The difference was not statistically significant. This was comparable with Agarwal et al[9] study which showed me age in both groups between 37 to 38 years. The gender distribution was almost equal in both groups since it included all type of lower abdominal surgeries and also lower limb surgeries performed under spinal anesthesia.

In the present study, the duration of onset of sensory block in both groups (6.03 ± 1.21 and 6.25 ± 1.15) had no significant difference. The duration of onset of motor block was 6.68 ± 0.54 minutes in group A compared to 6.65 ± 0.53 minutes in group B with no significant difference. Osama et al [10] also showed mean duration of onset of sensory block between 5.63 to 6.73 minutes and the mean duration of onset of motor block between 5.09 to 5.22 minutes. It also showed mean time for maximum sensory loss around 16.7 minutes which was slightly higher than the present study which showed a mean duration of 13.23 to 13.45 minutes with no significant difference between the groups. Maximum sensory loss was found in T7, T8 and T9 dermatomes in both the groups. The highest median sensory blockade was found in T7 in group A

compared to T8 in group B. There was no statistically significant difference between the two groups with regard to sensory levels. Osama et al also showed a peak sensory blockade level at T7. The sensory and motor blockade characteristics are comparable with other similar studies.

The post operative pain score (VAS score) at 12 hours, 16 hours and 20 hours was significantly lower in group A patients administered with nalbuphine compared to group B patients. The mean post operative VAS score of group A patients was 3.59 ± 1.09 which was significantly lower than group B patients which was 4.59 ± 1.31. Agarwal et al showed a significantly lower VAS score at 8, 12 and 16 hours post operatively in nalbuphine group compared to control group.

The mean duration of rescue analgesia or the post operative duration when the first analgesic required was 14.13 ± 3.4 hours in group A patients administered with nalbuphine which was significantly higher than group B patients whose mean duration was 9.76±2.6 hours. Also the number of analgesic doses required post operatively in nalbuphine group was 1.45 ± 0.59 doses of 75 mg diclofenac which was significantly lower than control group which required 2.64 ± 0.87 doses. Agarwal et al showed a mean duration of rescue analgesia of 15.64 hours in nalbuphine group compared to 6.92 hours in control group.

The incidence of adverse effects like vomiting, shivering and pruritus were almost same in both groups with no statistically significant difference. Agarwal et al also showed no difference in nausea and vomiting between the nalbuphine and control group.
Nalbuphine a synthetic opioid with agonist activity at κ receptors and antagonist activity at μ receptors provides a better analgesic effect when given as adjuvant in spinal anaesthesia.

CONCLUSION

The nalbuphine as an adjuvant with levobupivacaine in spinal anesthesia clearly reduces the pain of the patients post operatively, provides increased duration of analgesia and reduces the number of analgesics required.

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