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ORIGINAL RESEARCH

A randomized clinical comparative assessment of fentanyl and nalbhuphine as adjuvant to levobupivacaine in spinal anesthesia for lower abdomen surgery

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ABSTRACT

Aim: The aim of the present study was comparing the duration of analgesia in terms of the time of the first analgesic requirement of intrathecal levobupivacaine combined with nalbuphine and fentanyl for lower abdominal surgeries.**Methods:** This randomized double-blinded study was conducted on 100 patients from November 1, 2023 to Nov 5, 2024 at Department of Anesthesiology, Madha Medical College and Hospital, Kovur Chennai. The study received Institutional Ethical Committee approval before its initiation.**Results:** There were 26 patients in the age group of <30 years in group A and 24 patients who underwent surgery in group B. 10 patients were in the age group of 31-40 years in each group from the study participants. Most study participants were females in both groups, with 28 female patients in group A and 32 female patients in group B. 5 and 6 patients were below 50 kgs weight in groups A and B, respectively. 60-90 mins of surgery were performed among 24 group A participants and 10 participants in group B. The surgery duration for 14 and 124 patients was 91- 120 minutes in groups A and B, respectively. The maximum sensory loss was found in T6, T7, T8, and T9 dermatomes in both groups. A smaller number of patients encountered sensory loss in T4 and T5 dermatomes. The mean and SD for the onset of sensory function were 6.03±1.21 and 6.20±1.10 in groups A and B, respectively. The mean and SD values for the onset of motor function after anaesthesia were 13.32±1.06 in group A and 13.28±1.06 in group B. time for maximum sensory loss was 13.40±1.11 and 13.22±1.03 in groups A and B, respectively.**Conclusion:** We concluded that intrathecal nalbuphine combined with levobupivacaine is comparatively better than intrathecal fentanyl combined with levobupivacaine in terms of postoperative pain relief. Thus, doses of analgesics required during the postoperative period were less, with no difference in hemodynamic parameters like pulse rate, systolic and diastolic blood pressure, and oxygen saturation.

Key words: Analgesia, levobupivacaine, nalbuphine, fentanyl, lower abdominal surgeries

INTRODUCTION

Intrathecal adjuvants to local anaesthesia have been introduced to boost clinical effectiveness and duration of analgesia following orthopedic surgical operations as spinal anaesthesia alone provides poor postoperative analgesia. Intrathecal opioid effectively extends postoperative analgesia[1,2]. Opioid analgesics cause the main afferent neuron's opioid receptors to become active, which in turn cause pain-modulating systems to become active. Inhibiting the production of excitatory neurotransmitters or directly reducing neurotransmission are both possible effects of their activation[3,4].

Fentanyl, an opioid agonist acts on mu receptors, causing supraspinal and spinal analgesia as well as drowsiness, nausea, vomiting, pruritus and respiratory depression. Nalbuphine, an opioid agonist-antagonist primarily affecting kappa in the substantia gelatinosa of the spinal cord, has been shown to improve the quality of perioperative analgesia without the side effects of pure agonists[5]. Only a few trials have studied the efficacy of intrathecal fentanyl and

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nalbuphine as adjuvants to hyperbaric bupivacaine in lower limb orthopedic surgeries[6,7].

Lower abdomen and lower limb procedures are most commonly performed surgeries. These surgeries are done on an elective/emergency basis and this helps in early rehabilitation and resuming of normal life. These procedures cause more pain. Hence it is essential to provide adequate intraoperative and postoperative analgesia. The incidence of cardiorespiratory complications is decreased and early ambulation[8,9] and complete recovery is seen when good postoperative analgesia is provided leading to lesser medical cost. We can perform both regional anesthesia and general anesthesia for lower abdomen and lower limb surgeries. Spinal anesthesia is a simpler procedure when compared to epidural and is easily performed. It helps to avoid the problems of general anesthesia like intraoperative blood loss, stress response, polypharmacy. Spinal anesthesia also provides a faster onset of sensory and motor blockade[10] with less failure rates, less postoperative morbidity and preservation of mental status and normal reflexes. A quest for search of newer and safer anesthetic agents in anesthesiology practice has been there always[11].

Bupivacaine a drug used regularly is known to cause cardiotoxicity and neurotoxicity on inadvertent intravascular injection[12].Levobupivacaine, a levorotatory isomer of bupivacaine has a good pharmacokinetic profile[13-15] is effective and less cardiotoxic and neurotoxic.Therefore it is preferred for spinal anesthesia even in the elderly[16, 17].Adjuvants like opioids (morphine, fentanyl), ketamine, clonidine, dexmedetomidine are added to intrathecal local anesthetics in order to potentiate the effects[11, 18].

The aim of the present study was compare the duration of analgesia in terms of the time of the first analgesic requirement of intrathecal levobupivacaine combined with nalbuphine and fentanyl for lower abdominal surgeries.

MATERIALS AND METHODS

This randomised double-blinded study was conducted on 100 patients from November 1, 2023 to Nov 5, 2024 at Department of Anesthesiology, Madha Medical College and Hospital, Kovur Chennai. The study received Institutional Ethical Committee approval before its initiation.

INCLUSION CRITERIA

The study includes patients in the age range of 18 to 60 years, ASA physical status I and II and patients posted for lower abdominal and lower limb surgeries under spinal anaesthesia.

EXCLUSION CRITERIA

Patient refusal, patients allergic to local anaesthesia/ nalbuphine/fentanyl, ASA physical status III or more, patients with coagulation disorder, local site infection BMI >30 and height<140 cm were excluded.

Group A patients received 3ml of 0.5% levobupivacaine + 0.8 mg of nalbuphine, a total volume of 3.5 ml,and Group B patients received 3 ml of 0.5% levobupivacaine + 25 µg of fentanyl, a total volume of 3.5 ml.

The outcomes were assessed, including the duration of sensory block (time of onset, duration, and recovery), duration of motor block (time of onset, duration, and recovery), degree of fall in arterial blood pressure, heart rate and pain score using a visual analogue scale (VAS) and adverse effect like vomiting, shivering.

The informed consent was obtained from all the patients. All the patients were assessed for the following parameters, including the time of injection of the drug into subarachnoid space is considered as 0 min, patients were put in the supine position and sensory level was checked by using 26G hypodermic needle by pinprick method, the level was checked by every 2 minutes in first 20 minutes followed by every 5 min for another 20 minutes. Two consecutive readings after 20 minutes can be taken as maximum sensory level. The degree of motor blockade and duration of surgery were assessed using a modified Bromage scale. Intraoperative parameters were monitored, including heart rate, blood pressure, SPO2, and sedation.

Ramsay sedation score and VAS score were assessed, duration when a patient demands rescue analgesia (Injection Diclo 75mg IM on demand when patient complaints of pain), total analgesics are required in 24 hours, observations for postoperative side effects: Nausea was monitored, and vomiting was noted as several emetic episodes. The second episode was treated with metoclopramide 10 mg IV. Patients were observed for 24 hours for postoperative complications like nausea, vomiting, pruritus, shivering, respiratory depression, hypotension, and bradycardia.

STATISTICAL ANALYSIS

The data was entered into an Excel sheet and analysed using SPSS (version 16). Descriptive statistics with mean, standard deviation, and proportion (%) were calculated, and statistical tests used were independent sample T Test and Chi-square test as appropriate.

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RESULTS

Table 1: Demographic data of the study

		Frequency			P value
		Group A	Group B	Total	
Age (years)	< 30	26	24	50	0.933
	31-40	10	10	20	
	41-50	8	12	20	
	51-60	6	4	10	
Sex	Male	22	18	40	0.651
	Female	28	32	60	
Weight (kg)	<50	5	6	11	0.877
	51-60	15	18	33	
	61-70	11	5	16	
	71-80	6	6	12	
	> 80	13	15	28	
Duration of surgery (mins)	60-90	24	10	34	0.156
	91-120	14	24	38	
	120-150	12	16	28	
Level sensory loss	T4	5	3	8	0.444
	T5	6	6	12	
	T6	5	3	8	
	T7	10	12	22	
	T8	3	1	4	
	T9	12	12	24	
	T10	9	13	22	

There were 26 patients in the age group of <30 years in group A and 24 patients who underwent surgery in group B. 10 patients were in the age group of 31-40 years in each group from the study participants. Most study participants were females in both groups, with 28 female patients in group A and 32 female patients in group B. 5 and 6 patients were below 50 kgs weight in groups A and B, respectively. 60-90 mins of surgery were performed among 24 group A participants and 10 participants in group B. The surgery duration for 14 and 124 patients was 91-120 minutes in groups A and B, respectively. The maximum sensory loss was found in T6, T7, T8, and T9 dermatomes in both groups. A smaller number of patients encountered sensory loss in T4 and T5 dermatomes.

Table 2: Onset of sensory, onset of motor, and time for maximum loss between the groups

	Group A	Group B
Onset of sensory	6.05±1.18	6.20±1.10
Onset of motor	13.32±1.06	13.28±1.06
Time for maximum loss	13.40±1.11	13.22±1.03

The mean and SD for the onset of sensory function were 6.03±1.21 and 6.20±1.10 in groups A and B, respectively. The mean and SD values for the onset of motor function after anaesthesia were 13.32±1.06 in group A and 13.28±1.06 in group B. time for maximum sensorylosswas13.40±1.11and 13.22±1.03 in groups A and B, respectively.

Table 3: Postoperative pulse rate between the groups

Pulse rate	Group A	Group B
Post op 4th hour	78.35	79.38
Post op 5th hour	78.60	78.15
Post op 12th hour	79.05	78.55
Post op 16th hour	79.18	79.40
Post op 20th hour	79.20	79.68
Post op 24th hour	78.22	78.24

There was little difference in the mean and SD of pulse rate in both groups.

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Table 4: Postoperative systolic blood pressure between the groups

SBP	Group A	Group B
Post op 4th hour	115.80	114.60
Post op 5th hour	114.78	114.40
Post op 12th hour	113.7	115.30
Post op 16th hour	113.88	115.25
Post op 20th hour	113.48	116.33
Post op 24th hour	114.20	112.70

Systolic blood pressure after 24 hours postoperatively was found to be 114.20 in Group A and 112.70 in Group B.

Table 5: Postoperative diastolic blood pressure between the groups

DBP	Group A	Group B
Post op 4th hour	75.9	77.6
Post op 5th hour	76.8	75
Post op 12th hour	75.5	76.4
Post op 16th hour	75.9	76.7
Post op 20th hour	75.8	77.9
Post op 24th hour	76	77

Diastolic blood pressure after 24 hours postoperatively was found to be76 in Group A and 77 in Group B.

Table 5: Symptoms between the groups

		Mean ± SD		P value
		Group A	Group B	
Analgesic requirement	The first dose of analgesic is required at (in hours)	14.16±3.37	9.71±2.58	<0.001
	Number of doses required	1.45±0.59	2.64±0.87	0.001
Vomiting	Yes	8	25	0.01
	No	42	25	
Pruritis	Yes	4	16	0.012
	No	46	34	
Shivering	Yes	5	12	0.176
	No	45	38	
Sedation	Yes	2	2	1
	No	48	48	

The mean value for the first dose of analgesic required at (in hours) in group A was 14.16, and SD was 3.37, whereas in group B, the mean value was 9.71, and SD was 2.64. The difference was highly statistically significant ($p<0.001$). The mean and SD for the number of anaesthetic doses required in group A was 1.45±0.59, and in group B was 2.64±0.87, which was statistically significant ($p=0.001$). Vomiting was present in 8 patients in group A and 25 patients in group B, and the difference was found to be statistically significant ($p<0.01$).

DISCUSSION

Surgical procedures cause severe tissue damage, leading to postoperative pain. Despite efforts to make the intraoperative period pain-free, patients are left to deal with the stress and its effects on their body systems. A pain-free postoperative period reduces morbidity and mortality. Modern medical science offers various postoperative pain relief methods, including epidural catheters, peripheral nerve blocks, and local anaesthetic drug infiltration. Additives like systemic benzodiazepines and synthetic and semisynthetic opioids are simple, effective and commonly adopted ways of postoperative pain relief. The sub-arachnoid block has been very popular in recent times. Various local anaesthetics have been in use for a long time. Regional anaesthesia has several advantages compared to general anaesthesia (GA), including decreased stress response. Spinal anaesthesia is a technique used for lower abdominal surgeries. Levobupivacaine has become popular for central neuraxial blocks in this century[19-22].

There were 26 patients in the age group of <30 years in group A and 24 patients who underwent surgery in group B. 10 patients were in the age group of 31-40 years in each group from the study participants. Most study participants were females in both groups, with 28 female patients in group A and 32 female patients in group B. This result is comparable with the study conducted by Jitendra Agrawal *et al*.[23] which reported female preponderance was noted in both groups, 25 in

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Group N and 26 in Group C, with insignificant (p=0.749).

5 and 6 patients were below 50 kgs weight in groups A and B, respectively. 60-90 mins of surgery were performed among 24 group A participants and 10 participants in group B. The surgery duration for 14 and 124 patients was 91-120 minutes in groups A and B, respectively. The maximum sensory loss was found in T6, T7, T8, and T9 dermatomes in both groups. del-Rio-Vellosillo M *et al*.[24] compared levobupivacaine2.5ml and hyperbaric bupivacaine 2.5ml in patients under-going knee arthroplasty surgeries and found the mean time for sensory block onset with levobupivacaine to be 3min similar to our study. Karaca F *et al*.[25] when comparing 1.5ml of levobupivacaine and 10µg fentanyl with hyperbaric bupivacaine 1.5ml and 10µg fentanyl in patients undergoing caeserean section, found out that, the time for sensory block onset with levobupivacaine and fentanyl was 2min which is same as our study.

The mean and SD for the onset of sensory function were 6.03±1.21 and 6.20±1.10 in groups A and B, respectively. The mean and SD values for the onset of motor function after anaesthesia were 13.32±1.06 in group A and 13.28±1.06 in group B. time for maximum sensorylosswas13.40±1.11and 13.22±1.03 in groups A and B, respectively. There was little difference in the mean and SD of pulse rate in both groups. Systolic blood pressure after 24 hours postoperatively was found to be 114.20 in Group A and 112.70 in Group B. Diastolic blood pressure after 24 hours postoperatively was found to be 76 in Group A and 77 in Group B. The mean value for the first dose of analgesic required at (in hours) in group A was 14.16, and SD was 3.37, whereas in group B, the mean value was 9.71, and SD was 2.64. The difference was highly statistically significant ($p<0.001$). The mean and SD for the number of anaesthetic doses required in group A was 1.45±0.59, and in group B was 2.64±0.87, which was statistically significant (p=0.001). Vomiting was present in 8 patients in group A and 25 patients in group B, and the difference was found to be statistically significant ($p<0.01$). Saleh *et al*.[26] reported that the time to first analgesia was significantly higher in Group L +N ($p<0.01$) compared to another group. The mean time for first rescue analgesia was 5.9± 1.0 hours and 11.2 ± 1.6 hours in Group L and Group L+N, respectively. On comparing the pain scores of the two groups at 2, 4, 6, 12, and 24 postoperative hours, it was found that there was a statistically significant difference between Group L+ N and Group L at 4, 6, and 12 h with higher pain scores in the (Group L) than in the other Group (L + N). Vomiting was present in 5 (8.3%) patients in group A and 15 (25%) patients in group B, and the difference was found to be statistically significant ($p<0.01$).

Conclusion

The duration of postoperative analgesia and the effective analgesic time was more prolonged in the nalbuphine group than in the fentanyl group, with a statistically significant difference. As regards the side effects, they were less in the nalbuphine group than in the fentanyl group, with no statistically significant difference. We concluded that intrathecal nalbuphine combined with levobupivacaine is comparatively better than intrathecal fentanyl combined with levobupivacaine in terms of postoperative pain relief. Thus, doses of analgesics required during the postoperative period were less, with no difference in hemodynamic parameters like pulse rate, systolic and diastolic blood pressure, and oxygen saturation.

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