Section: Anaesthesia

Original Research Article

A COMPARATIVE STUDY OF EFFICACY OF POST-OPERATIVE ANALGESIA BETWEEN INTRATHECAL BUPIVACAINE -FENTANYL AND INTRATHECAL BUPIVACAINE- NEOSTIGMINE FOR MAJOR LOWER LIMB AND LOWER ABDOMINAL SURGERIES – RETROSPECTIVE STUDY

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Abstract

Background: Spinal anaesthesia is the most popular technique for both elective and emergency surgical procedures, particularly caesarean operations, lower abdominal surgeries, orthopaedic lower limb surgeries, and urological surgeries, because it does not cause post-operative nausea, vomiting, respiratory or neurological depression. **Materials and Methods:** Out of 100 adult patients aged between 18 to 65 were grouped into two – one group is administered hyperbaric bupivacaine (15 mg) + Neostigmine (25 mcg) and another group was administered hyperbaric bupivacaine (15mg) + Fentanyl (25 mcg). A necessary hematological examination and ECG were also recorded in all patients. In both groups, the duration of motor and sensory blockades was compared. **Results:** Duration of sensory and motor blockade, duration of post-operative analgesia. outcomes of variables and visual analogues had significant p values ($p<0.001$). **Conclusion:** The present pragmatic clinical study has proved that, the use of a low dose of 25mcg of intrathecal Neostigmine as an adjuvant to Bupivacaine for long duration surgical procedures is due to its profound anaesthetic and analgesic properties with the fewest side effects.

INTRODUCTION

Central neuraxial blockade in the form of spinal epidural is very popular for lower abdominal and lower limb surgeries, as these techniques avoid the disadvantages associated with general anaesthesia like airway manipulation, polypharmacy, and other untoward effects like post-operative nausea, vomiting and the need for supplemental intravenous analgesics.

Spinal anaesthesia was introduced into clinical practice by Karl August Bier in 1898.[1] Spinal anaesthesia is defined as the regional anaesthesia obtained by blocking the subarachnoid space. The advantages of an awake patient, a simple procedure with a rapid onset of action, minimal drug cost, minimal stress response, and relatively few side effects have made this technique the choice for many surgical procedures.[2]

Though bupivacaine 0.5% is cardiotoxic, it produces motor blockade for prolonged duration. The administration of local anaesthesia in combination with opioids intrathecally is an excellent technique for managing post-operative pain.[3] Fentanyl is the most widely used intrathecal opioid along with Bupivacaine and has been associated with decreased pain scores and reduced analgesic requirements in the postoperative period, but may cause hemodynamic instability, whereas Neostigmine, a reversible inhibitor of enzyme cholinesterase, is widely used with Bupivacaine because it causes no hypotension, sedation, respiration depression, or neurological dysfunction, but higher dosages cause postoperative complications.[4] Nausea and vomiting (PONV) are seen, which is stressful for the patient.

Hence attempt is made to compare the efficacy of post-operative analgesia between both drugs mixed with Bupivacaine.

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MATERIALS AND METHODS

One hundred patients admitted to the surgical ward of JJM Medical College, Davanagare, Karantaka-577004, were studied.

Inclusive Criteria: Patients in grades ASA I and II, age group between 18 to 65 years patients have given their consent for surgery in writing.

Exclusive Criteria: Patients having neurological and spine deformities, pregnant women, and lactating mothers. Patients who were allergic to the drugs used in the present study, Patients who were on anticoagulant therapy or known to have an anticoagulant disorder, patient with short stature were excluded from the study.

Methods

Pre-anaesthesia check-up was carried out the previous day of surgery with a detailed history, general physical examination, systemic examination, airway assessment, and spine examination. A routine blood examination included a complete hemogram, Fasting blood sugar, renal function, and ECG. All patients were kept nil orally for 8-10 hours. Out of 100 patients, 50 patients in group BN, 50 patients group BF were divided randomly. Group BN: Hyperbaric Bupivacaine (15 mg) and Neostigmine (25 mcg) Group BF: Hyperbaric Bupivacaine (15 mg) – Fentanyl (25 mcg)

All patients were given Tablet Ranitidine and Alprazolam 0.5 mg orally the previous night of the elective surgery.

Procedure – Patients were shifted to OT table and intravenous access established on the forearm with an 18 gauze IV cannula and preloaded with Ringers lactate solution (10 ml/kg intravenously) before the block was premedicated with an injection of ondansterone (4 mg IV). ECG, non-invasive blood pressure pulse oximeters were noted, and baseline parameters were recorded.

Patients in sitting or left lateral position under aseptic precautions sub-archnoid block was performed by midline approach using a 25G Quincke Babcock spinal needle at L2-L2 or L3-L4 intervertebral space, and the patients received one of the two drugs: either 3ml of 0.5% hyperbaric bupivacaine (15 mg) + 0.5 ml (25 mcg) of preservative free Neostigmine, or 3 ml of 5% hyper-Bupivacaine (15 mg) + 0.5 ml of fentanyl (25 mcg). Heart rate, sensory blockade, and motor blockade were assessed at different intervals of time.

The duration of the study was May 2015 to April 2018.

Statistical analysis: Age, ASA grades, height, and weight were compared in both groups, and results were insignifican., Motor and sensory blockade, the duration of post-operative analgesia, visual analogue scale was compared with a t test, and significant results were noted. The statistical analysis was carried out in SPSS software. The ratio of male and female was 2:1.

RESULTS

Table1: Comparison of outcome variable in both groups

In sensory blockade – 1.62 (± 0.68) in BN group, 2.34 (± 0.47) in BF group, unpaired t test and p<0.001

In motor blockade study – 2.53 (± 0.57) in BN group, 2.88 (± 0.71) in BF group unpaired t test and p<0.001.

Table 2: Comparison of duration of sensory and motor block (minutes) in both groups –

Sensory blockade (in Minutes) – 309.8 (± 28.2) in BN group, 243.6 (± 30.1) in F group unpaired t test and p<0.001.

In motor blockade study (in minutes) 175.18 (± 16.9) in N group, 162.62 (± 24.96) in BF group unpaired t test and p<0.001.

Table 3: Comparison of duration of post-operative Analgesic –

367.7 (± 26.6) BN group, 286.4 (± 26.3) in BF group, unpaired t test and p value is highly significant (p<0.001).

Table 4: Comparison of visual analysis (VAS) scores post operatively.

- At three hours 0.04 (± 0.20) in BN group, 0.96 (± 1.03) and p<0.01,
- AT 6 hours – 3.38 (± 0.97) in BN group, 4.74 (± 1.07) in BF group and p<0.001
- At 12 hours 6.24 (± 0.96) in BN group, 6.8 (± 0.97) in BF group and p<0.001

Table 1: Comparison of outcome variables in two groups studied

Onset of Blockade (in min)	Group		p value
	Bupivacaine with Neostigmine (n=50) Mean (SD)	Bupivacaine with Fentanyl (n=50) Mean (SD)	
Sensory	1.62 (0.68)	2.34 (0.47)	<0.001
Motor	2.53 (0.57)	2.88 (0.71)	0.010
Unpaired t Test, P value Significant			

Table 2: Comparison of duration of sensory and motor block (min) in two groups of patients studied

Duration of Blockade (in min)	Group		p value
	Bapivacaine with Neostigmine (n=50) Mean (SD)	Bupivacaine with Fentanyl (n=50) Mean (SD)	
Sensory	309.82 (28.25)	243.66 (30.17)	<0.001
Motor	175.18 (16.90)	162.62 (24.96)	0.004
Unpaired t Test, P value Significant			

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Table 3: Comparison of duration of Postoperative Analgesia

Duration of post-operative analgesia (in min)	GROUP BN (Bupivacaine +Neostigmine (n=50)	GROUP BF (Bupivacaine + Fentanyl) (n=50)	p value
	367.7 + 26.6	286.4 + 26.3	0.001
	Unpaired t Test, P value Significant		

Table 4: Visual Analogue scale (VAN) scores post operatively

TIME	GROUP BN	GROUP BF	P VALUE
3 hrs	0.04 + 0.20	0.96 + 1.03	< 0.001
6 hrs	3.38 + 0.97	4.74 + 1.07	< 0.001
12 hrs	6.24 + 0.96	6.80 + 0.97	<0.05

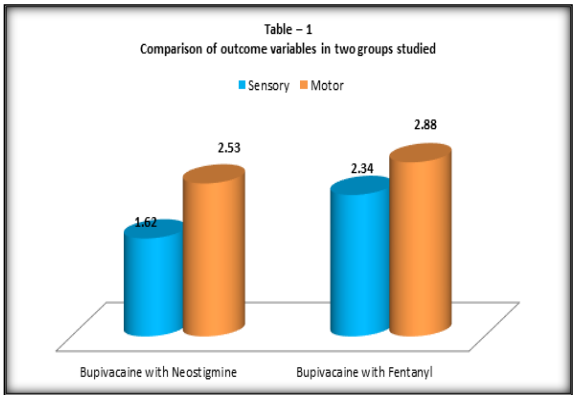

Figure 1: Comparison of outcome variables in two groups studied

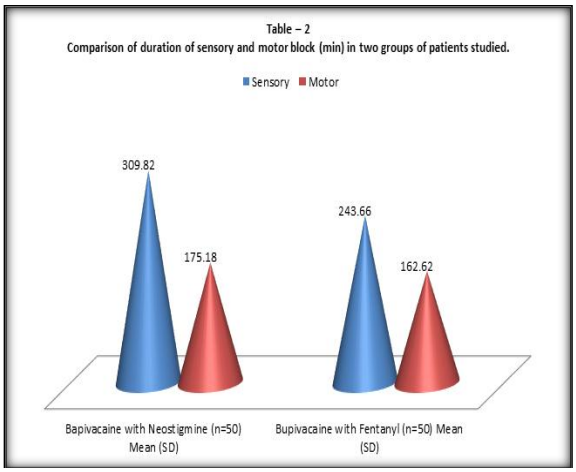

Figure 2: Comparison of duration of sensory and motor block (min) in two groups of patients studied

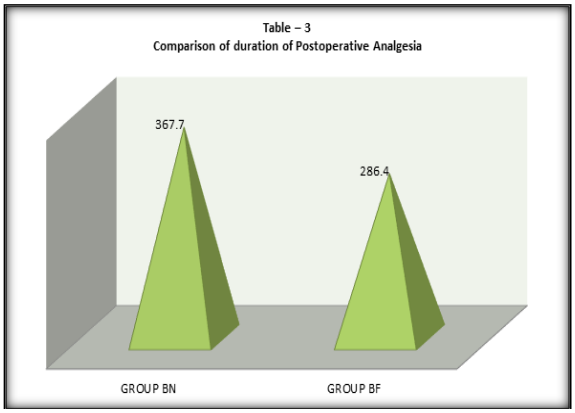

Figure 3: Comparison of duration of Postoperative Analgesia

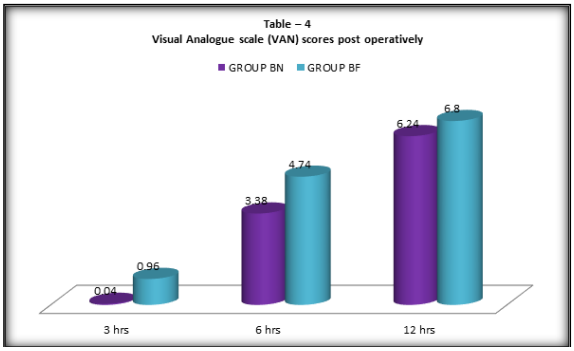

Figure 4: Visual Analogue scale (VAN) scores post operatively

DISCUSSION

Present comparative study of the efficacy of post-operation analgesia between intrathecal Bupivacaine + fentanyl and intrathecal Bupivacaine + neostigmine for lower abdomen and lower limb surgeries. In the comparison of outcome variables in how groups onset of sensory blockade 1.62 (± 0.68) in BN group 2.34 (± 0.47) in BF group unpaired t test and p<0.001. In the onset of motor blockade – 2.33 (± 0.57) in the BN group and 2.85 (± 0.71) in BF group showed p<0.001 (Table-1). Comparison of the duration of sensory and motor blocks (in minutes) in both groups. The duration of sensory was 309.82 (± 28.25) in the BN group, 243.66 (± 30.17) in the BF group, and p<0.001. The duration of motor blockade was 175.18 (± 16.9) in the BN group, 162.62 (± 24.96) in the BF group, and p<0.001 (Table-2). Comparison of duration of post-operative analgesia was 367.7 (± 26.6) in the BN group, 286.4 (± 26.3) in BF group, and p<0.001 (p value highly significant) (Table-3). In comparison of visual analogue score (VAS) in both groups at different intervals at 3 hours – 0.04 (± 0.20) in the BN group, 0.96 (± 1.03) in F group, and p< 0.001. At 6 hours, it was 3.38 (± 0.97) in the BN group, 4.74 (± 1.07) in the BF group, p<0.001. At 12 hours, 6.24 (± 0.96) in the BN group, 6.80 (± 0.97) and p<0.001 (Table-4) These findings are more or less in agreement with previous studies.[5,6,7]

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Spinal anaesthesia consists of the temporary interruption of nerve transmission within the subarachnoid space by the injection of a local anaesthetic solution into the cerebrospinal fluid. It is a commonly employed anaesthetic technique for performing surgeries of the lower abdomen and lower limbs.

Bupivacaine is of local anaesthetic used routinely for spinal anaesthesia because of its high potency. Though cardio toxicity is not concerned in sub-arachnoids block the quality of sensory blockade motor blockade hemodynamic changes and side effects profile are some considerations in selecting a drug for spinal anaesthesia.

Opoids added to local anaesthetics for spinal anaesthesia for extending post-operative analgesia without prolonging the recovery and producing minimal side effects.

Intrathecally Neostigmine inhibits the activity of both true pseudo cholinesterase's and thereby enhancing acetylcholine at various cholinergic sites which have been shown to cause analgesia hence BN group showed faster onset of sensory and motor blocks than BF group.

It is reported that highest level of block achieved in group BN was T6 with 70% of patients T6 with 86% of patients and 13% with T8 but BF has achieved sensory blockade only 5% up to T8 and 2% up to T10. Hence BN technique was quite efficient than BF group (8)(9). Moreover duration of motor blockade (time to recovery of complete motor block had BN group had achieved longer duration of motor blockade in previous studies.[10,11]

Hypotension and bradycardia was least in the BN group as compared to BF. It was also confirmed by previous studies, moreover shivering and prurities occurred with BF group in previous studies.[12]

CONCLUSION

In the present comparative study, 25 mcg Neostigmine to 0.5% hyperbaric Bupivacaine 15 mg (3 ml) in spinal anaesthesia prolongs the duration and improves the quality of postoperative analgesia with better hemodynamic stability as compared to 25 mcg Fentanyl to hyperbaric Bupivacaine 1 mg (3 ml). It is an ideal alternative to other adjuvants for prolonging spinal anaesthesia. But this study demands that such clinical trials be conducted in large numbers of patients where the latest techniques are available to combat any type of side effect to confirm the significant results of the present study results.

Limitation of the study

Owing to the tertiary location of the research centre, the small number of patients, and the lack of the latest technologies, we have limited findings and results.

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