Original Article

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A Comparative Study of Intrathecal Hyperbaric Bupivacaine 0.5% with Fentanyl versus Hyperbaric Bupivacaine 0.5% with Buprenorphine in Lower Limb and Lower Abdominal Surgeries

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Abstract

Background: Various adjuvants have been added to bupivacaine to shorten the onset of block and prolong the duration of block. Present study was undertaken to compare the efficacy of intrathecal fentanyl or buprenorphine with bupivacaine for all infraumbilical surgeries.

Materials and Methods: 60 ASA I and II patients posted for various infraumbilical surgeries were chosen for the study and the patients were divided into two groups of 30 each. Group F received 3ml of 0.5% bupivacaine with 25µg of fentanyl and group B received 3ml of 0.5% bupivacaine with 60µg of buprenorphine.Sensory block was tested with pinprick method and motor block was assessed by onset of Bromage scale 3.

Results: Patient in Buprenorphine group showed a significantly prolonged duration of motor and sensory block than patients in fentanyl groyp and also postoperative VAS scores were significantly low for the buprenorphine group when compared with fentanyl.

Conclusion: To summarise, buprenorphine has higher efficacy with intrathecal bupivacaine with prolonged duration of sensory and motor blockade with decreased incidence of side effects, better haemodynamic stability and also analgesic sparing effect in the postoperative period when compared to fentanyl.

Key words: Bupivacaine; Buprenorphine; Fentanyl; Spinal Anaesthesia.

Introduction

Spinal anesthesia is the most commonly used technique for lower abdominal surgeries as it is very economical and easy to administer. The advantages of subarachnoid block are limited by its short duration of action, limited side effects and minimal hospital stay which makes it to be the choice of anaesthesia technique for various surgeries.[1]

However, postoperative analgesia is the main concern as spinal anaesthesia with local anaesthetics alone has short duration of action and hence requires early analgesic supplementation in postoperative period.Many adjuvents have been added to local anaesthetic such as morphine, midazolam, clonidine, fentanyl, buprenorphine and others to prolong duration of postoperative analgesia.[2,3]

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Fentanyl, a lipophilic opioid, has rapid onset of action following intrathecal administration. Addition of fentanyl to spinal anesthesia produces synergistic analgesia for somatic and visceral pain without increased sympathetic block.[7] Therefore, fentanyl provides better intraoperative analgesia and a safer alternative than morphine for management of early postoperative pain.

Buprenorphine is a centrally acting lipid soluble analogue of alkaloid thebaine. It exhibits analgesic property both at spinal and supraspinal level, when used intrathecally in combination with bupivacaine it has known to improve the quality and duration of postoperative analgesia compared to bupivacaine alone.[8]

Material and Methods

After taking written and informed consent,this clinical trial was done on 60 patients aged between 18-60 yrs belonging to ASA grade 1 and 2 who were posted for elective urological, lower abdominal, lower limb and gynecological procedure under spinal anaesthesia after getting clearance from ethical committee of the institution over a period of one and half year.

Patients were randomly assigned into two groups by a slip generated by computer with 30 patients in each.

Group "BB"- 0.5% hyperbaric bupivacaine 3ml +60µg Buphrenorphine.

Group "BF" -0.5% hyperbaric bupivacaine 3ml + 25µg Fentanyl.

Incusion Criteria

- Patients aged between 18 to 60 yearsof both sex planned for lower limb and lower abdominal surgeries.
- Patients belonging ASA grade 1 and 2.

Exclusion Criteria

- Patient refusal, infection at site of injection, hypersensitivity to study drugs, coagulopathy or other bleeding disorders, patients with heart blocks and patients with peripheral neuropathy, cardiac, hepatic, pulmonary, renal failure.

Procedure

After shifting of the patient to the OT table IV access with 18 guage cannula was obtained on the forearm and RL infusion started IV before the block. The monitors were attached to the patient which include NIBP,pulse oximeter and baseline PR, BP, RR and SpO_2 were recorded.

The patients were placed in left lateral or sitting position. Under all aseptic precautions,lumbar puncture was done by midline approach using disposable Quincke spinal needle (25G) at L3-L4 intervertebral space and study drug was injected after confirming CSF free flow. Patients were monitored intraoperatively using NIBP, pulse oximeter and ECG. Oxygen (5L/min) by facemask was given after spinal anaesthesia and fluid therapy was maintained with RL.

Hypotension defined as a decrease of systolic blood pressure by more than 20% from base line, was treated with IV bolus of ephedrine 5mg and IV fluids as required. Bradycardia was defined as heart rate less than 50 beats/minute, treated with IV atropine 0.6mg. Incidence of other side effects were noted and treated accordingly. Onset of sensory blockade was assessed by loss of pin prick sensation to hypodermic needle and highest level of dermatomal spread and time for two segment regression of sensory level and duration of sensory blockade was noted. Onset of motor blockade was assessed by modified bromage scale and duration of motor block was noted. Postoperatively pain was evaluated using visual analogue pain scale score at 3, 6, 12 hours. Injection Diclofenac 75mg in 100ml NS was given IV as rescue analgesia when VAS was ≤ 4.

The data obtained were entered in a Microsoft Excel sheet, and statistical analysis was performed using statistical package for the social sciences (Verson 17). Results are presented as drawings, Mean±SD, counts and percentages. Results were compared using Independent t test, Mann Whitney U test and Friedman test with Dunn's post hoc test.

For all tests, significant was achieved at $p<0.05$.

Results

Both the groups were comparable with respect to age, gender, height and weight as shown in table 1, which shows no significant difference. The mean time for onset of sensory block in Group BB was 3.27±0.98 and group BF 3.23±0.728. The mean time for onset of motor block in Group BB was 6.67±1.36 and Group BF was 5.70±1.11. There was no statistical significance in both the groups with regards to onset of motor and sensory block. The time for two segment regression was considerably slower in Group BB with 118.87±6.99 compared to Group BF which was 101.97±7.97 which was statistically significant. The mean duration of

Table 1: Demographic Profile.

Basic variables	Bupivacaine + Buprenorphine		Bupivacaine+Fentanyl		Unpaired t test/ Mann Whitney U test	P value
	Mean	±SD	Mean	±SD		
Age(Years)	35.43	12.461	38.03	11.801	t=0.810	P=0.410
Height	5.53	.507	5.43	.302	U=415.000	P=0.595
Weight	58.13	7.394	57.53	8.460	t=0.292	P=0.771
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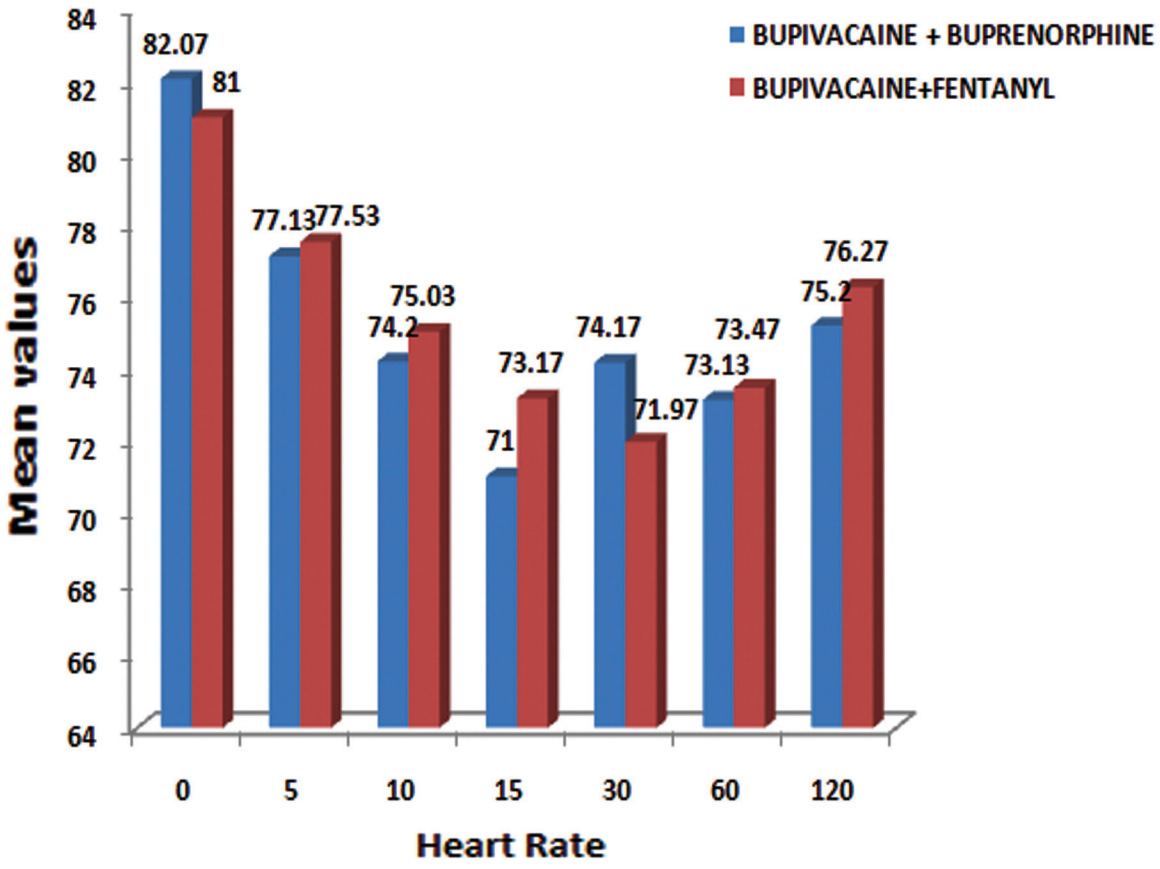
Table 2: Recovery Parameters.

Basic variables	Bupivacaine + Buprenorphine		Bupivacaine+ Fentanyl		Mann Whitney U test	P value
	Mean	±SD	Mean	±SD		
Time for two segment regression	118.87	6.996	101.97	7.972	U=42.000	P=0.001*
Time to complete Motor recovery	247.33	15.522	179.07	11.209	U=0.500	P=0.001*
Time to complete Sensory recovery	281.23	16.245	207.50	14.248	U=0.000	P=0.001*
*:Statistically significant						



sensory block (time for complete sensory recovery) in Group BB was 281.23±16.2 and in Group BF was 207.50±14.23 which was statistically significant (table 2). The mean duration of motor recovery in Group BB was 247.33±15.52 and Group BF was 179.07±11.209. The mean duration of complete analgesia in Group BB was 300±17.01 and Group BF was 179.9±19.59 which was statistically significant. First rescue analgesia was given after 307 minutes in Group BB and in Group BF after 207 minutes which was significant statistically. At any interval the two groups did not differ statistically with respect to heart (Fig. 1). In group BB 3 patients had bradycardia which was treated with Inj. Atropine 0.6mg IV successfully. In Group BB 3.3% had nausea and 16% had hypotension and Group BF 6.66% had nausea and vomiting, 6.66% had hypotension.

Discussion

Spinal opioids and local anaesthetics have been shown to act synergistically at the spinal level in animal studies.[6] The advantage of combining the two types of agents in this manner is thought to be explained by their different analgesic properties and their ability to block pain at two different sites. Opioids produce analgesia by specifically binding and activating the opiate receptors in the substantia gelatinosa, whereas local anaesthetics provide analgesia by blocking impulse transmission at the nerve roots and dorsal root ganglia.[7]

Fentanyl, a lipophilic opiod agonist when used as an adjuvant prolongs the duration of spinal anaesthesia. Fentanyl is a lipophilic μ-receptor agonist opioid. Intrathecally fentanyl exerts its effect by combining with opioid receptor in the dorsal horn of spinal cord and may have supra-spinal spread and action.

Buprenorphine is a mixed agonist-antagonist type of opioid with a long duration. The high lipid soluability, high affinity for opioid receptors end prolonged duration of action makes buprenorphine a suitable choice for intrathecal and peripheral nerve site administration.

In our study, the intrathecal dose of Buprenorphine and Fentanyl was selected based on previous study conducted by Bhukya N et al. Our study showed, addition of 2mcg/kg Buprenorphine with hyperbaric bupivacaine significantly increased duration of both sensory and motor block. Bhukya N et al[8]. had studied the effect of addition of 2mcg/kg buprenorphine and 0.5mcg/kg fentanyl intrathecal to 3 ml hyperbaric bupivacaine for lower limb and lower abdominal surgeries concluded that duration of sensory block, motor block, analgesia and time to first rescue analgesia was significantly longer in buprenorphine group compared to fentanyl group, our results correlate with this study. Rashmi Pal, K.K. Arora, N.S. Doneria et al[9] conducted study on about 90 patient to evaluate the effect of adding clonidine, fentanyl and buprenorphine to intrathecal bupivacaine on spinal block and concluded that time for complete sensory recovery and motor recovery in buprenorphine group was slower compared to fentanyl group and the duration of analgesia and time for first rescue analgesia was significantly longer in buprenorphine group compared to fentanly group,our results correlate with this study.

In our study there is no significant difference with respect to change in mean systolic blood pressure in both the groups. But with regard to DBP there is statistical significant difference in reduction of mean DBP but not clinically (to become clinically significant, reduction in BP should be more than 20% of baseline).

Hence based on our clinical comparative study, we thus conclude that the addition of 60μg buprenorphine to hyperbaric Bupivacaine for spinal anaesthesia is a good alternative compared to 25μg Fentanyl. It provides longer duration of both sensory and motor blockade, good quality of both Intraoperative and postoperative analgesia. It had minimal side effects and better hemodynamic stability.

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