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A Comparative study of intrathecal butorphanol and fentanyl as an adjuvant to bupivacaine(heavy) for lower limb orthopedic Surgeries.

Dr. Vikas kumar Gupta Assistant Professor, Department of Anaesthesiology, Gandhi Medical College, Bhopal

Dr. Abhay Raj Yadav Resident, Post Graduate Student, Department ofAnaesthesiology, Gandhi Medical College, Bhopal - Corresponding Author

Dr. Aditya Agarwal Professor, Department of Anaesthesiology, Gandhi Medical College, Bhopal

ABSTRACT

INTRODUCTION Neuraxial block for lower limb surgeries are becoming popular as it has many advantages over general anaesthesia .Spinal anaesthesia consists of temporary interruption of nerve transmission in the subarachnoid space produced by the injection of a local anaesthetic solution in the subarachnoid space Neuraxial opioids are widely used in conjunction with local anesthetics (LA) as they permit the use of lower dose of LA while providing adequate anesthesia and analgesia. The objective of the study was to compare the efficacy of butorphanol and Fentanyl as an adjuvant to local anaesthetics in relation to onset, degree and recovery time of sensory and motor blockade and Hemodynamic changes in orthopaedic procedures done under spinal anaesthesia.

Materials & Methods The present study were be conducted in the Department of anaesthesiology, Gandhi Medical College and Hamidia Hospital, Bhopal on patients of diagnosis were lower limb orthopedic Surgeries scheduled for elective surgeries. A detailed physical examination was carried out a day before the proposed surgery, Written and informed consent before participation in study were be taken

Inclusion Criteria:- After obtaining approval from institutional ethics committee and informed written consent from patients. 80 consented adult patient of ASA Grade I & II, Aged between 20-60 years, were included in the study.

Exclusion criteria:- Patients refusal to participate in the study, contraindications for spinal anesthesia ,Sensitivity to study drugs, Recent onset of MI (<3months) , hypovolemic patient, patients with renal or hepatic impairment.

RESULT : Both butorphanol and fentanyl given intrathecally with hyperbaric bupivacaine provide effective and safe anesthesia for lower limb surgeries with minor side effects.

CONCLUSION Intrathecal bupivacaine-butorphanol provides longer duration of sensory blockade and better quality of analgesia than intrathecal fentanyl-bupivacaine.

KEYWORDS : Hyperbaric Bupivacaine, Fentanyl, Butorphanol, Subarachnoid Block, Post-Operative Analgesia

INTRODUCTION

Spinal anaesthesia has emerged as an important technique, with simplicity, effectiveness, safety and success. To improve the effect and duration of spinal anesthesia various drugs are used as an adjuvant to hyperbaric bupivacaine. Butorphanol is a lipophilic opioid agonist-antagonist analgesic with a published affinity for opioid receptors in vitro of 1:4:25 (mu: delta: kappa). A dose-dependent increase in the duration of analgesia provided by epidural butorphanol for relief of post-cesarean section pain. Fentanyl, a highly lipid soluble, pure μ-agonist opioid with rapid onset and short duration of action, has been used with various local anesthetics for a wide variety of surgical procedures.

MATERIALS AND METHODS

This prospective, observational hospital based study was conducted after approval from the institutional ethics committee and written informed consent of patients. Eighty patients, aged 20-60 years, belonging to ASA physical status I or II and scheduled for elective, lower limb orthopedic surgeries were divided into two groups.

Group A: - Intrathecal injection of 25μg butorphanol with 15 mg of 0.5 % Bupivacaine (heavy).

Group B: -. Intrathecal injection of 25μg fentanyl with 15 mg of 0.5 % Bupivacaine (heavy).

The total volume injected was 3.5 ml in both the groups.
Baseline vitals like Heart rate, Non-invasive blood pressure, respiratory rate, ECG, oxygen saturation were recorded. All patients were preloaded with 10ml/kg ringer lactate.

Patients were placed in sitting position on the operation table. With strict aseptic precautions, midline approach subarachnoid block was achieved in L3-L4 space with 25G disposable Quincke spinal needle. Patients were immediately placed in the supine position with no tilt given to the table. The onset of sensory analgesia was tested by pinprick ,checking in a caudal to cephalic direction. Time taken to achieve highest sensory level was noted. Time taken for onset of maximum motor blockade was noted. Maximum grade of motor blockade achieved using modified Bromage score was noted. Time to return of Modified Bromage score to zero was recorded.

Routine monitoring of pulse, BP, SpO2, ECG was instituted intra-operatively.

Fluid administration was continued intra-operatively. Decrease in mean arterial pressure greater than 15% below the pre-anaesthetic base line value was treated with incremental doses of injection Mephenteremine 6 mg IV. A decrease in heart rate below 50 beats/min was treated with incremental doses of atropine 0.3 mg IV. Post operatively, pain assessment was carried out by VAS and duration of motor block was assessed by Bromage scale. Intramuscular injection diclofenac (75 mg) was given in the gluteal region as rescue analgesic on demand. At that time, VAS score was recorded, duration of effective analgesia was measured as time from intrathecal drug administration to patients 1st request for analgesic either in recovery room or in ward. Patient was kept under observation for a total period of 24 hrs. to observe for the total number of doses of analgesic required and any side-effect .

STATISTICAL ANALYSIS

Difference between the groups in the demographic data and baseline values were analyzed using unpaired t-test. Analysis was performed using software IBM SPSS statistics for windows, Data were presented as mean ± standard deviation. A $P < 0.05$ was considered statistically significant.

Result

Both The groups were comparable with respect to age, sex, weight and ASA physical status.

Table 1: Demographic profile of patients:

Demographic profile	Butorphanol (GP-A) (Mean±SD)	Fentanyl(GP-B) (Mean±SD)	p-value
Age(yrs)	31.06±4.96	30.13±5.34	>0.05
Gender(M:F)	22:18	24:16	>0.05
Weight(kg)	48.13	48.06	>0.05

Characteristics of Sensory block

Parameters	Butorphanol (GP-A) Mean SD	Fentanyl (GP-B) Mean SD	P-Value
Highest Sensory level (median range)	T7 (T 6-8)	T8 (T5 - 8)	-
Time from injection to highest sensory level (min)	7.0± 1.8	7.2 ± 2.1	P>0.05
Time of two segment regression (min)	106 ± 21	85 ± 25	P<0.001
Time for sensory regression to S2 (min)	158 ± 22	135.36 ± 22	P<0.001

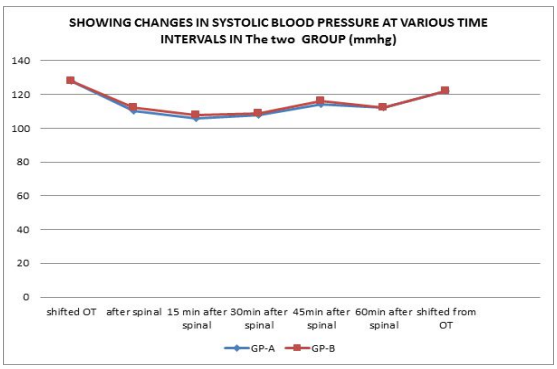
Times are presented in minutes (mean ± SD) .P < 0.001

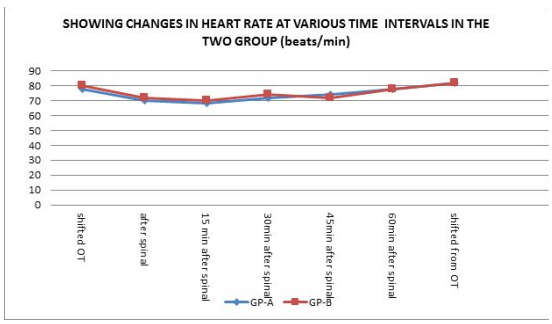
The highest sensory level achieved and the times to reach peak sensory level were comparable among the two groups. Significantly slower two segment regression were observed in the group A receiving butorphanol as compared to fentanyl and time to S2 regression were significantly more with intrathecal butorphanol (158 ± 22min.) than intrathecal fentanyl (135.36 ± 22min.).

Characteristics of motor block

Parameters	Butorphanol (A) Mean SD	Fentanyl (B) Mean SD	P-Value
Onset of max. motor block (min)	8.0 ± 2.8	8.2 ± 3.5	P>0.05
Duration of grade III motor block (min)	115 ± 22	110 ± 20	P<0.001
Duration of grade II motor block (min)	140 ± 28	132 ± 25	P<0.001
Duration of grade I motor block (min)	165 ± 30	162 ± 32	P<0.001

There was no difference in the onset of grade III motor block in Butorphanol (A) and Fentanyl (B) group (8.0 ± 2.8 ,8.2 ± 3.5 minutes), respectively, but the duration of grade III, II or I motor block was higher in Butorphanol (A) as compare Fentanyl (B) group.





Comparison hemodynamic variables between two groups

Parameters	Mean±SD values		P-Value
	GP-A	GP-B	
Systolic BP(mmHg)	114.28±6.28	115.28± 5.04	P-Value
Diastolic BP(mmHg)	74.57± 4.32	75.42± 3.42	P>0.05
Heart rate (/min.)	78.47±5.02	80.22±2.28	p>0.05
Resp. rate(/min.)	16.01	16.05	P>0.05

The mean pulse rate changes were observed between Butorphanol group and Fentanyl group were statistically nonsignificant (p>0.05)

The systolic blood pressure changes were statistically nonsignificant in both the groups(>0.05). change in mean respiratory rate between two groups was statistically nonsignificant (p>0.05). Diastolic blood pressure changes were statistically nonsignificant in both the groups. (p>0.05)

Discussion:

Low dose bupivacaine although reduces the cardiovascular effects, it was not enough to provide adequate level of sensory blockade and prolonged post-operative analgesia.[16]

Intrathecal opioids used as adjuncts are capable of producing analgesia of prolonged duration but allow early ambulation of patients because of their sympathetic and motor nerve sparing activities.

The principal findings in our study are that intrathecal butorphanol-bupivacaine provides longer duration of sensory blockade and superior analgesia with lesser requirement for rescue analgesia as compared to intrathecal fentanyl-bupivacaine.

Local anesthetics such as bupivacaine act mainly by blockade of voltage gated Na+ channels in the axonal membrane and presynaptic inhibiton of calcium channels

The use of opioids in conjunction with local anesthetic for spinal anesthesia has been associated with decreased pain scores and reduced analgesic requirement in the postoperative period[6,9]

Results of previous studies have demonstrated that intrathecal opioids not only enhance analgesia when added to subtherapeutic doses of local anesthetics but also prolong recovery.[2,7,10]

In our study, there was not much of a difference for the onset of sensory and motor blockade in between the two groups, which is correlated with study of Mukherji et. al. and Kumar et al.[18,19]

The highest sensory level achieved by group-A (7.0± 1.8 min.) and group-B (7.2 ± 2.1 min.) were comparable (T10).

Two segment regression time was significantly prolonged in group A(106 ± 21 min.) compared to group B (85 ± 25 min.) and (p<0.001) which is statistically highly significant, which supports the results obtained from Mukherjee A et.al[19] Kumar B et.al[20].

They concluded that though both Butorphanol and Fentanyl prolonged duration of sensory block of Bupivacaine, Butorphanol is better in terms of longer duration of action Duration of effective analgesia (VAS≥4), was significantly prolonged in group A compared to group B (p<0.001). Mean regression time to Bromage 0 motor block was significantly higher in Butorphanol group than Fentanyl group.

In our study we defined hypotension as a decrease of systolic B.P of more than 30% of baseline, 2 patients had hypotension in group A . the patients were treated with one dose of Inj. Ephedrine 3 mg IV each after treating with IV fluids. It has been reported that neuraxial administration of opioids with local anesthetics can lead to an increased incidence of hypotension.[15] It has been postulated by Adkinsson et al that increased incidence of hypotension following

co-administration of fentanyl and lidocaine could be due to higher sensory level achieved[16]

CONCLUSION

Both Butorphanol and Fentanyl in combination with low dose hyperbaric bupivacaine (15mg) are efficacious in patients undergoing lower limb orthopedic surgeries instead of bupivacaine alone because both opioids having haemodynamic stability with these combinations is good, effective and prolonged duration of sensory analgesia, Butorphanol with low-dose bupivacaine in spinal anesthesia is better acceptable clinically in terms of characteristics of sensory block, motor block, duration of analgesia and greater hemodynamic stability as compared with Fentanyl-bupivacaine .

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