Original Research Article

Effect of intrathecal ketamine as an adjuvant on the dose of intrathecal bupivacaine

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Abstract

Background: A randomized control study was done to evlauate the effect of ketamine on the dose of bupivacaine when added as an adjuvant to intrathecal bupivacaine. **Materials and Methods:** 90 patients were divided randomly into 3 groups of 30 each. Group - 1 received 0.5% heavy Bupivacaine 3cc, Group 2 received 0.5% heavy Bupivacaine +preservative free ketamine 25mg. Group 3 received 0.5% heavy Bupivacaine 2.5cc + 0.5cc normalsaline. All patients after thorough checkup, after obtaining informed consent, recording basal parameters were shifted to O.T. Spinal anaesthesia was given in sitting position in L3-L4 space with 25G Quincke spinal needle, group specific drug was injected and immediately made supine. Monitoring was done by another person. Time of onset of T12 blockade, height of blockade, onset and duration of motor and sesory blockade and haemodynamic parameters were noted down. **Observations and Results:** Onset of sensory block, motor block were fast with Gr 2 then Gr 1 lastly with Gr3. Intensity of motor block (assessed by modified Bromage scale) is good with Gr1, then with Gr 2 and last with Gr 3. Haemodynamics are better maintained with Gr 2 than Gr 1. Recoveryfrom block (2 segment regression) was early in Gr 3 then Gr 2 last with Gr 1 motor block. **Conclusion:** When preservative free ketamine 25mg is added to bupivacaine 2.5 cc (0.5% heavy) produces early and good analgesia, adequate relaxation for infraumbilical surgeries compared to 2.5cc of Bupivacaine alone and better maintained haemodynamics and early recovery from block than 3cc of Buppivacaine so that dose of intrathecal dose of Bupivacaine can be reduced.

Key Words: Intrthecal, bupivacaine, preservative free ketamine.

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INTRODUCTION

Spinal anaesthesia is preferred for infraumbilical surgeries. It is practiced for day care surgeries also. Bupivacaine in low dose may not produce adequateanalgesia and relaxation. Bupivacaine when given in high dose produces good relaxation but has longer duration of actionand haemodynamics are not maintained well[1,2,3,4,5] Many adjuvant s are added to the intrathecal local anaesthetic drug for quick onset of action, prolonged duration, postoperative analgesia. Early onset and early recovery are preferred in day care surgeries. Opioids[6], adrenaline, neostigmine[7], clonidine[8], dexmeditomidine[9] midazolzm[10], ketamine[11] etc. are tried. Ketamine was tried for postop analgesia also[12]. Ketamine when given as a sole anaesthetic agent produces psychomimmetic disturbences[13] and inadequate analgesia and is not in practice. But when added as an adjuvant it not only quickens the onset of action but also reduces the dose of local anaesthetic agent required[14]. Spinal ketamine produces sensory and motor blockade. The onset of sensory block and motor paralysis is found to be earliar than conventional local anaesthetic drugs. Intensity of sensory block is better as it is described to be due to potent analgesic effect of ketamine.[15]

MATERIALS AND METHODS

90 patients of both sexes, age group 20-50 years, ASA grade 1 and 2, posted for lower llimbs urgeries, hydrocoele, simple inguinal hernioplasty, minor gynecological procedures were included in the study.

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After obtaining hospital ethical committee approval, the procedure is explained to the patients and written informed consent was obtained. The patients were randomly divided into 3 groups.

Group-1……0. 5% heavy Bupivacaine 3cc

Group 2…… 0.5%heavy.Bupivacaine 2.5cc+preservative free ketamine0.5cc.

Group 3……..5%heavy Bupivacaine 2.5cc +normalsaline 0.5cc

Thorough pre anaesthetic checkup was done. Routine investigations like complete blood picture, complete urine examination, blood sugar, blood urea, serum creatinine, serum electrolytes, ECG and X-ray when necessary were done. All patients received tb.alprazolam 0.25mg the night before surgery. On the day of surgery basal B.P, heartrate were noted and shifted into O.T. Monitors were connected. I.V acess secured with 18G ivcath and preloaded 500ml of Ringerlactate. Under aseptic precautions L.P performed with 25G Quincke spinal needle at L3-L4 space in sitting position and drug was injected and immediately made supine. monitoring was done by another person. The following parameters were recorded intraoperatively.

1. Time required for achieving T12 sensory block
2. Assessment of motor block
3. Height of block achieved
4. Duration of the block
5. Haemodynamic variables

The time of onsets of sensory block was determined by gentle pinprick method till the absence of sensation. Intensity of blockade was graded by modified bromage scale. Grade 0: No paralysis; Grade1: Inability to raise extended leg; Grade2: Inability to flex the knee Grade3 Inability flex the ankle and digits. The vital parameters like heaartrate, B.P were noted 15 minutes before performing subarachnoid block to recovery at regular intervals. The fall in B.P>20% of basal level was treated with inj.ephidrine5mgI.V repeated if necessary and bradycardia with inj atropine 0.6mg I.V. All patients were given 4lt oxygen by mask till the surgery was over.

Exclusion Criteria

Patient's refusal for spinal anaesthesia

Patients with Contraindications for spinal anaesthesia

Any allergic reaction to local anaesthetic drugs.

OBSERVATIONS AND RESULTS

There was no significant difference in demographic variables. age, sex, height and weight were similar in the 3 groups.

Table 1

	Group -1	Group-2	Group-3
Age	20 -50 yr	20 -50 yr	20 -50yr
Sex	16male;14female	15male;15female	14male;16female
Height	150 -154cm	150 -154cm	150 -154cm
Weight	50-80 kg	50-75kg	50-75kg

Table 2

Time in Minutes	Group - 1	Group -2	Group -3	P value
Onset time T12sensory	4.6 ±1.1	2.4 ±0.5	5.2 ±1	<0.001
Onset time Motor block	5.7±0.4	2.4±0.8	6 ±2	<0.001
Duration of Motor block	140 ±24	115 ±4	98±10	<0.001
Duration of Sensory block	160 ±12.4	113 ±2.8	110 ±4.2	<0.001

Table 3: Height of block achieved: No of patients

Level of analgesia	Group 1	Group 2	Group 3
T10 level	4	5	28
T8 level	11	12	2
T6 level	15	13	0

P value is <.001

Table 4: Assessment of Motorblock: No of patients

Grade	Group 1	Group 2	Group 3
grade 2	6	7	18
grade 3	24	23	12

P value is 0.003

The onset of sensoryblock is earliest in Gr 2 followed by Gr 1 and last in Gr 3. Onset time for motor block is also early in Gr 2, then in Gr1 and last in Gr3 The level of analgesia is comparable between Gr 1 and Gr 2 least with Gr 3. Motor block is good in Gr 1 compared to Gr 2 and last with Gr 3. The duration of sensory aswellas motor block is more in Gr 1 then Gr 2 and least with Gr 3. Recovery from block (2 segment regression) is early with Gr 3, then Gr 2 and late in Gr 1.

Table 5: Haemodynamic variables: HR-beat/mint; SBP and DBP-mmHg

Time	Parameters	Group 1	Group 2	Group 3
Pre.op:	HR	81±4	80±2	80±2
	S.B.P	122±4	120±4	118±6
	D.B.P	80±4	76±2	8±2
2mint	HR	83±2.2	81±4	84±1.2
	SBP	116±2.2	122+/4	118.38±1.68
	DBP	76±1.8	80±4	70.65±1.26
5mint	HR	76.1±2.1	81±2.1	82.2±1.2
	SBP	102±2.4	116±2.8	112.432±1.682
	DBP	78±5.67	76±3.4	70.342±1.238
10mint	HR	65±2.2	79.1±1.7	78.4±1.1
	SBP	90.4±2.5	109±2.141	110.42±1.26
	DBP	71±5.6	70.967±1.264	71.3±1.134
15mint	HR	60±2.8	78.2±1.6	78.4±2.6
	SBP	92.4±1.8	112.5±2.14	116.5±1.83
	DBP	64±11.1	70.9±1.264	71.933±1.25
20mint	HR	64±3.8	78.2±1.6	78.6±3.2
	SBP	92.86±0.86	112.5±2.14	118.5±1.611
	DBP	60.5±1.21	72.9±1.293	72.26±1.25
30mint	HR	68±4.2	80±1.2	80.1±2.8
	SBP	99.4±1.9	116.4±2.1	122.4±1.38
	DBP	62.2±1.1	72±1.4	72.4±1.68
40mint	HR	70±2.8	82.2`±1.1	81.65±3.8
	SBP	110±1.2	122.6±1.467	122.1±1.38
	DBP	68±1.026	72.267±1.25	74.3±1.2
50mint	HR	72.2±3.8	82.2±1.1	82.4±2.4
	SBP	112.6±1.4	122.6±1.467	124.4±1.82
	DBP	68±1.2	72.267±1.24	78.4±1.42
60mint	HR	72.4±2.6	82.4±1.2	82.4±2.4
	SBP	118±2.4	122.0±1.4	124.2±1.86
	DBP	72±1.6	76±1.24	78.6±1.46

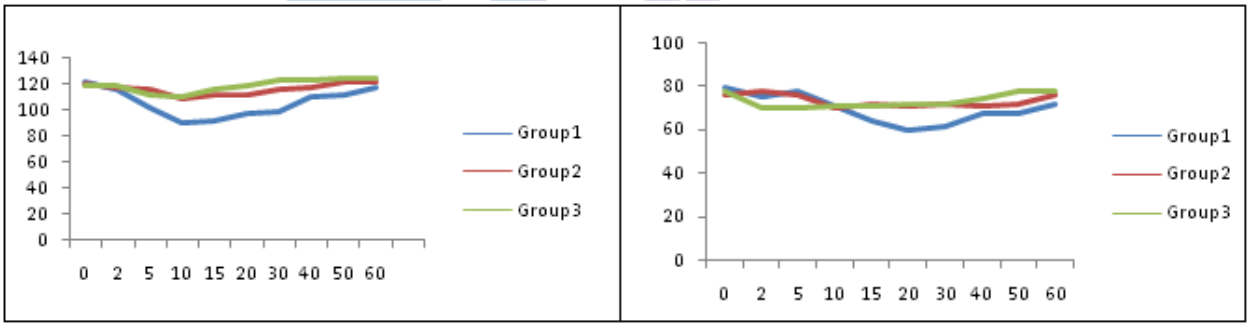

Figure 1: Heart rate (HR)

Figure 2: Systolic blood pressure (SBP)

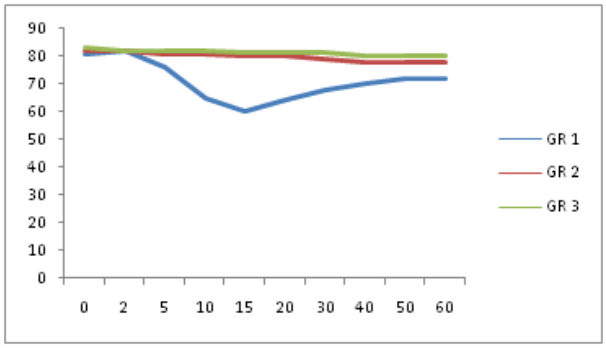

Figure 3: Diastolic blood pressure (DBP)

There is significant fall in blood pressure and heartrate over a period of time with Gr1 compared to Gr2 and Gr3.

DISCUSSION

Bupivacaine has prolonged duration of action but slow in onset. Bupivacaine when given in low dose does not produce adequate relaxation analgesia may be inadequate. When given in high dose it produces good relaxation but effect is prolonged incidence of hypotension and bradycardia are more. In the present study preservative free ketamine is added as an adjuvant to bupivacaine and the onset of sensory block, motor block, duration of sensory and motor block, haemodynamic variables for 60 minutes after the administration of the drug were studied and compered to Bupivacaine 3cc and Bupivacaine2.5cc. Ketamine has analgesic properties which are mediated by number of mechanisms. It is used as ansadjuvant both intrathecally and epidurally[16,17,18,19] It binds sterio specifically to opiate receptors[20], The significant contribution to its analgesic property comes from interaction with cholinergic, adrenergic and 5-hydroxy tryptamine systems. a direct action of ketamine on dorsal horn is also reported. Ketamine can prevent action potential conduction by an effect on sodium and potassium channels in the nerve membranes and hence is considered to have local anaesthetic properties. Ketamine can selectively block the NMDA excitation of central neurons[21]. The combination of analgesic activity makes its use in intrathecal and epidural injection[22,23]. As studied by Patel et.al in 25 parturients bupivacaine+ preservative free ketamine has rapid onset of action, better haemodynamic stability[24,25]. It may be attributed to spinal analgesic action of ketaminegantenbein *et.al.* reported that local anaesthetic activity of bupivacaine was significantly enhanced by ketamine. They explainned that this result was probably due to inhibiting effect of ketamine on the metabolism of bupivacaine. when given in higher doses ketamine may producehallucinations, behavioural, psychomimmetic or neurological complications which were not recorded in our study as low dose was used. Ketamine acts on the local spinalcord nociceptors and does not act systemically. ketamine may produce nausea and vomiting and sedation, which were not significant in our study. Thus ketamine a phencyclidine derivative used in low dose (25mg) intrathecally Gr 2is safe and provides better intraoperative haemodynamic stability, early onset and quick recovery compared to Gr 1 where duration of action is prolonged, incidence of hypotnsion and bradycardia were more and to Gr 3 where onset is slow, inadequate analgesia and motor block. However the central effects of ketamine should be kept in mind.

CONCLUSION

Onset time of sensory and motor block is quickened, recovery is early and haemodynamics are better maintained when low dose preservative free ketamine (25mg) is added to low dose bupivacaine (2.5cc of 0.5%heavy. This combination may be preferred in daycare surgeries because of low dose of local anaesthetic agent and early recovery.

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