A CLINICAL STUDY OF INTRATHECAL KETAMINE WITH ADRENALINE FOR LOWER ABDOMINAL SURGERIES

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ABSTRACT

Background: *This study was designed to evaluate the efficacy, onset and duration of sensory and motor blockade, occurrence of delirium reaction and other complications of Ketamine with Adrenaline given intrathecally.*

Methods: *100 patients belonging to ASA grade-I & II of both sexes scheduled for lower abdominal surgery were randomly selected for the study. 7All the patients received injection Ketamine 75mg with Adrenaline 100 microgram intrathecally. The onset of sensory and motor blockade, maximum level and time taken for sensory level, quality and duration of sensory and motor blockade, intra-operative complications were assessed.*

Results: *The onset of sensory and motor blockade was in 2.60±0.64 minutes, 4.33±0.60 minutes respectively. The duration of sensory and motor blockade was 85.48±11.68 minutes, 108.36±11.78 minutes respectively. The maximum level achieved ranged from T_6-T_{10}. The time taken to achieve maximum sensory blockade ranged from 2-8 minutes. There were no significant changes in mean systolic and diastolic arterial blood pressure or pulse rate. Intra-operatively, nystagmus was seen in all patients. Sedation and delirium was seen in 70 patients and 4 patients respectively.*

Conclusion: *Ketamine with adrenaline produced a quicker onset of sensory blockade with good muscle relaxation. Ketamine stimulated the cardiovascular and respiratory systems, which may be an advantageous in maintaining stable haemodynamics over local anaesthetics during perioperative period for lower abdominal surgeries.*

Keywords: *Ketamine; Adrenaline; Intrathecal; Anaesthesia*

INTRODUCTION

Spinal anaesthesia is simplest regional anaesthesia technique which was first performed by August Bier. Safe practice of spinal anaesthesia depends on proper selection, preparation of patient with appropriate drugs and managing the physiologic side effects throughout the procedure as well as in early recovery phase[1]

Over a 100 years, local anaesthetics were used for neuraxial blockade and in subsequent time after discovery of opioid receptors in spinal cord, usage of opioids as adjuvants in neuraxial anaesthesia became famous. This lead to research on discovery of transmitter and receptors involved in pain transmission and modulation by using different pharmacological agents[2].

It is known that Ketamine at high doses possesses local anaesthetic properties and these have been compared with lignocaine and prilocaine[3]. In animal studies most investigators found that in the absence of adrenaline ketamine induced motor block was variable and short lived[4,5,6].

A study of intrathecal Ketamine for surgical anaesthesia in war casualities patients (emergency cases) has been conducted and proved intrathecal ketamine with adrenaline has the properties like local anaesthetics with limited duration (average 58 minutes)[7].

A comparative study between intrathecal Ketamine and 0.5% Bupivacaine heavy concluded intrathecal Ketamine produced shorter onset and duration of motor block with minimal changes in haemodynamics with increased central effects (sedation) for lower extremity surgeries[8].

A comparative study between 0.5 to 0.7mg/kg of intrathecal Ketamine in TURP Patients, at 0.7mg/kg of intrathecal dose of Ketamine produced 30% of Psychomimetic side effects[9].

A comparative study between different dosages of intrathecal Ketamine With or without Adrenaline in emergency lower limb and lower abdominal Surgeries, concluded mixture of Ketamine with Adrenaline is better for inducing and maintaining spinal anaesthesia with relatively free of any side effects with advantage over local anaesthetics regarding hemodynamics.[10]

In Previous studies, efficacy of Ketamine was proved in emergency situation in lower extremity surgeris (with limited duration of action) rather than in elective cases. Hence this clinical study is designed for intrathecal Ketamine with Adrenaline in lower abdominal surgeries with following objectives.

Study the efficacy of Ketamine with Adrenaline given intrathecally as a spinal anesthetic agent.

To study its onset of analgesia, duration of analgesia, motor blockade.

To study the occurrence of delirium reaction and other complication, if any.

Whether Ketamine with Adrenaline can be safely recommended for elective lower abdominal surgeries.

A phencyclidine derivative Ketamine, potent analgesic, stimulates the cardiovascular system and maintains the respiratory response to carbon dioxide. Thus intrathecally administered Ketamine presents certain advantage to combine its beneficial effects on the cardiovascular system and respiratory functions along with the analgesia of spinal anaesthesia.

MATERIAL AND METHODOLOGY

After ethical committee approval and informed and written consent, ASA Physical status I and II aged 18-60 years, of either sex randomly selected 100 Patients for elective lower abdominal surgeries were been enrolled after inclusion and exclusion criteria. Patients with severe systemic disease metabolic disorders, neurological, congenital or cardiovascular diseases were excluded from this study.

On the eve of surgery, all the patients were visited and a detailed examination is done along with routine investigations like CBC, Urine routine, random blood sugar ECG, chest X ray, blood grouping, blood urea and serum Creatinine whenever necessary.

Once the patient was shifted to the operating room, patient was connected to routine standard monitors and keeping ready anaesthesia trolly and machine.

After securing wide bore intravenous access all patients were premedicated with injection Ranitidine 50 mg, injection Ondansetron, 4 mg, injection Midazolam 2 mg intravenously. Baseline haemodynamcis were noted and under aseptic precaution in left lateral position by midline approach spinal anaesthesia is performed using disposable Quincke spinal needle (23-25G) between L3-L4 intervertebral space and injected 75 mg of Ketamine with 100 microgram of adrenaline after clear free flow of CSF. Continuous monitoring of pulse rate and blood pressure were recorded at 0, 5, 10, 20, 30, 45, 60, 90 and 120 minutes along with assessment of sensory and motor blockade by pinprick and Bromage scale.

Assessment of sensory blockade was done by pinprick method by following parameters

a. Time of onset of sensory blockade(from injection of drug to loss of pinprick sensation),
b. Time to achieve maximum sensory blockade(from injection of drug to highest dermatomal level),
c. Duration of analgesia (two dermatomal regression),
d. Degree of analgesia (sensory blockade). Incomplete analgesia or poor analgesia was supplemented with general anaesthesia.

Assessment of motor blockade was done using Bromage scale by following parameters.

a. Time of onset of motor blockade: Time nterval between injection of drug into subarachnoid space to the patients inability to lift the straight extended leg.
b. Duration of motor blockade was recorded from onset time to the time when patient was able to lift extended leg.
c. Degree of motor blockade: This was assessed by Bromage scale.

Bromage Scale: Full flexion of knee and feet, no motor blockade Just able to flex knee, full flexion of feet, partial blockade.
Unable to flex knee, but some flexion of feet possible. Almost complete block Unable to move legs or feet: Complete motor blockade.

The side effects such as nausea, vomiting, hypotension, neurological sequelae, delirium reaction, sedation, dizziness, nystagmus were noted down.

OBSERVATION AND RESULTS

Table 1: Age and Sex Distribution of the patients scheduled for study

Age (Yrs.)	Male	Female
16-25	8	6
26-35	19	7
36-45	15	8
46-55	17	7
55-65	10	2
> 65	1	0
Total	70	30

In the present study, the male-female ratio was 2.33:1. The majority of males (51 patients) and females (24 patients) were in 26-55 years age group

Table 2: Onset of Sensory Blockade (minutes)

Time (Min)	Male	Female
1	0	0
2	29	20
3	33	10
4	8	0
>4	0	0
Total	70	30

In the present study, the onset of analgesia ranged from 2- 4 minutes. Majority of the males (62 patients) had onset of sensory blockade within 2-3 minutes and all the females had sensory blockade between 2-3 minutes

Table 3: Onset of Motor Blockade (minutes)

Time (minutes)	Male	Female
1	-	-
2	-	-
3	7	-
4	40	13
5	23	17
> 5	-	-
Total	70	30

In the present study, the onset of motor blockade ranged from 2- 5 minutes. Majority of the males (63 patients) and all the females had onset of motor blockade between 3-5 minutes.

Table 4: Duration of Sensory Blockade (Minutes)

Duration (Minutes)	No. of Cases	
	Male	Female
40-60	3	2
60-80	24	8
81-100	42	19
101-120	1	1
> 120	-	-
Total	70	30

In the present study, the duration of sensory blockade ranged from 58-108 minutes. In majority of the males (42 patients) and females (19 patients) the duration of sensory blockade ranged from 81-100 minutes.

Table-5: Duration of Motor Blockade (Minutes)

Duration (Minutes)	No. of Cases	
	Male	Female
80-90	7	2
91-100	12	3
101-110	20	11
111-120	17	8
121-130	14	6
> 130	-	-
Total	70	30

In the present study, the duration of motor blockade ranged from 80-126 minutes. In the majority of the males (37 patients) and females (19 patients), it ranged from 101-120 minutes.

Table-6: Maximum Level Achieved

Level	No. of Cases	
	Male	Female
T_6	1	1
T_8	11	5
T10	58	24
> T_{10}	-	-
Total	70	30

In the present study the maximum level achieved ranged from T_6-T_{10} and in majority of the males (58 patients) and females (24 patients) the maximum level was T_{10}.

Table 7: Time of Maximum Sensory Blockade

Times (Minutes)	No. of Cases	
	Male	Female
<4	2	2
4	13	4
5	16	11
6	27	13
7	9	-
>7	3	-
Total	70	30

In the present study, the time taken to achieve maximum sensory blockade ranged from 2-8 minutes. In majority of the males (43 patients) it ranged from 4-6, while in females (26 patients) it ranged from 5.1 – 7 minutes.

There was no much variation in heart rate, mean systolic and diastolic blood pressure.

Table 8: Complications

Complication	Male	Female
Hypotension	--	--
Nausea	--	--
Vomiting	--	--
Delirium reaction	3	1
Neurological	--	--
Sequelae		
Sedation	45	25
Nystagmus	70	30
Dizziness	--	--

In the present study, the most common complication was nystagmus, which was present in all males and females, followed by sedation, which occurred in 45 males and 25 females. Only 4 patients had delirium reaction

DISCUSSION

Spinal anaesthesia is a time honoured procedure for producing surgical analgesia and its importance is increasing day by day as it possesses certain advantages over general anaesthesia.

Though a number of drugs have been used for inducing spinal anaesthesia their use has been usually associated with the occurrence of undesirable side effects such as hypotension and bradycardia in lower abdominal surgeries.

Therefore, there is a need for find out a safer, effective and reliable spinal anaesthetic, which has rapid onset of action, excellent analgesia, and satisfactory muscle relaxation with a wide margin of safety.

Ketamine a phencyclidine derivative is a potent analgesic and its sympathomimetic effects may be useful in trauma and emergency cases. The present study is to evaluate the efficacy of Ketamine given intrathecally as spinal anaesthesia agent and to study its onset of sensory blockade, duration of sensory blockade, motor blockade and the occurrence of

delirium reaction and other complications if any and whether Ketamine can be safely recommended for lower abdominal surgeries.

Patient Characteristics in the Study Group: In the present study 100 patients satisfied the criteria for the study. Male to female ratio was 2.33:1. Majority of males and female were in 26-55 years of age group.

Sensory Parameters: Onset of Sensory Blockade: In the present study the onset of sensory blockade ranged from (2-4 minutes) mean 2.60±0.64 (Table-4)
In the study conducted by Dipasri Bhattacharya in 2004[8], it was reported that onset of sensory blockade ranged from 1-2 minutes with a mean of 1.38±0.05 (SE). In the present study the onset of sensory blockade was delayed compared to their study, the reason could be the use of hyperbasic solution (5% dextrose was added), which might have enhanced the fixation of the drug and led to faster onset of sensory blockade.

Duration of Sensory Blockade: In the present study duration of sensory blockade ranged from 58-108 minutes with a mean of (85.48±11.68) (Table-6).
In the study conducted by Dipasri Bhattacharya in 2004[8], it was reported that duration of sensory blockade ranged from 90-140 minutes with a mean of 122±3.34.
In the present study the duration of sensory blockade was less compared to their study, the reason for this could be criteria for duration of sensory blockade.
In the present study, duration of sensory blockade was taken as time taken for two segment recession in their study duration of sensory blockade was calculated as the regression time of sensation to return to the L2-3 dermatome.

Maximum Level Achieved: In the present study, the maximum level achieved ranged from T6-T10. In majority of the male and females, the maximum level achieved was T10 (Table-8).
In the study conducted by Bion JF in 1984[7], they reported that the maximum level achieved ranged from T10-T12 in majority of them the maximum level achieved was T0. The present study was in accordance with their study.

Time taken for maximum sensory blockade: In the present study, the time taken for maximum sensory blockade ranged from 2-8 minutes (Table-9).
In the study conducted by Bion JF[7], the time taken for maximum sensory blockade ranged from 5-7 minutes.
The present study is in accordance with their study.

Degree of Sensory Blockade: In the present study, the degree of sensory blockade was grade-I in all the 100 patients. In the study conducted by Dipashri Bhattacharya in 2004[8], it was reported that 100% of the patients had grade-I sensory blockade. The present study is in accordance with their study.

Motor Blockade: Onset of motor blockade: In the present study, the onset of motor blockade ranged from 2-5 minutes with a mean of 4.33±0.60 (Table-5).
In the study conducted by Dipasri Bhattacharya in 2004[8] the onset of motor blockade ranged from 2-4 minutes with a mean of 2.35±0.07.
The present study is in accordance with their study.

Duration of Motor Blockade: In the present study, the duration of motor blockade ranged from 80-126 minutes with a mean of 108.36±11.78 (Table-7).
In the study conducted by Dipasri Bhattacharya in 2004[8], it was reported that the duration of motor blockade ranged from 90 to 140 minutes with a mean of 127±1.79.
The present study is in accordance with their study.

Degree of Motor Blockade: In the present study, the quality of motor blockade assessed by the Bromage scale was grade-III in all the 100 patients. In the study conducted by Dipashri Bhattacharya in 2004[8], it was reported that 100% of the patients had grade-III motor blockade.
The present study is in accordance with their study.

Changes in the perioperative cardiovascular parameters: In the present study, there was increase in the resting blood pressure and pulse rate (Table-10, 11 and 12).
In the study conducted by Bansal SK in 1994, they reported that there was a significant increase in the resting blood pressure, pulse rate irrespective of the addition of adrenaline to the injected mixture.
The present study is in accordance with their study.

Complications: In the present study the most common complication was nystagmus, which occurred in all the patients. Sedation was seen in 70 patients and delirium reaction was seen in 4 patients (Table-13).
In the study conducted by Chris Hawksworth in 1998, nystagmus occurred in six out of ten patients, four patients developed psychomimetic disturbance. One complained of simply feeling strange and three patients had frank hallucination.
In the study conducted by Bansal SK in 1994, sedation was observed with all the doses used in the study, which was however of mild or moderate intensity with the patient being easily awaken from the sleep.
The present study is in accordance with their studies.
With all the above observations we can conclude that intra thecal ketamine with adrenaline produces a reliable anaesthesia, better operative conditions and patients comfort with minimal side effects in elective lower abdominal surgeries.

CONCLUSION

Ketamine with adrenaline produced a quicker onset of sensory blockade with good muscle relaxation. Ketamine stimulated the cardiovascular and respiratory systems, which may be an advantageous in maintaining stable haemodynamics over local anaesthetics during perioperative period for lower abdominal surgeries

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