

A Study on the Efficacy of Ketamine Given Intrathecally as a Spinal Anesthetic Agent

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Abstract

Introduction: Ketamine a phencyclidine derivative with potent analgesic properties possesses few advantages over the other local anesthetics as it tends to stimulate the cardiovascular system and maintains the respiratory response to carbon dioxide.

Methodology: On the eve of the surgery, all the patients were visited and a detailed examination including history, clinical examination, systemic examination of cardiovascular, respiratory and central nervous system and examination of spine for deformity, infection was carried out.

Results: 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.

Conclusion: In the present study, the quality of motor blockade assessed by the Bromage scale was grade-III in all the patients

Keywords: Ketamine; Spinal anaesthesia; Efficacy.

Introduction

Spinal anesthesia results from the delivery of the anesthetic agents into the cerebrospinal fluid. It is one

of the simplest regional anesthetic techniques to perform. It is chiefly distinguished from its cousin epidural anesthesia by the production of subarachnoid neural blockage covering wide areas of the body with minute quantities of anesthetic agents. Safe practice of spinal anesthesia includes properly selecting and preparing accessing the CSF, administering appropriate anesthetic drugs and adjuvants managing physiologic side effects and overseeing the patient throughout the procedure as well as in the early recovery process [1].

August Bier performed the first spinal anesthetic more than a century ago, by injecting cocaine into the cerebrospinal fluid of a patient. For most of the subsequent hundred years, local anesthetics were the only substances used for neuraxial blockade. This changed with the discovery of opioid receptors in the spinal cord in the 1970s, and epidural and intrathecal opioid administration alone or in combination with local anesthetics became widespread. Since then driven by the ongoing discovery of multiple spinal transmitter and receptors involved in pain transmission many diverse groups of pharmacological agents are being investigated for neuraxial administration [2].

Ketamine a phencyclidine derivative with potent analgesic properties possesses few advantages over the other local anesthetics as it tends to stimulate the cardiovascular system and

maintains the respiratory response to carbon dioxide. Thus intrathecally administered ketamine presents certain advantage as it might be possible to combine its beneficial effects on the cardiovascular system and respiratory functions along with the analgesia of spinal anesthesia.

Methodology

100 patients undergoing elective operative procedure under spinal anesthesia for lower abdominal surgeries formed the study subjects

Inclusion Criteria

1. Patients of either sex
2. Patients with ASA grade-I and II.
3. Patients aged between 18-60 years.

Exclusion Criteria

Patients with severe systemic disease metabolic disorders, neurological, congenital or

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cardiovascular disease were excluded from this study.

Perioperative Period

On the eve of the surgery, all the patients were visited and a detailed examination including history, clinical examination, systemic examination of cardiovascular, respiratory and central nervous system and examination of spine for deformity, infection was carried out.

Routine investigations like hemogram, total leucocyte count, differential leucocyte count, ESR, complete urine examination, random blood sugar, electrocardiogram, chest X-ray, blood grouping, blood urea, serum creatinine, etc. were done wherever necessary.

Intraoperative Periods

Once the patient was shifted to the operating room, the patients was connected to the routine monitors, which included electrocardiogram, non-invasive blood pressure and pulse oximeter. All resuscitation equipments like intubation trolley with airways, laryngoscopes, endotracheal tubes along with drugs like atropine, mephentramine was kept ready. The

anaesthesia machine was also checked along with oxygen delivery system.

A wide bore intravenous access was obtained and secured. All patients were premedicated with injection ranitidine 50mg, injection Odansetron, 4mg, injection diazepam 5mg intravenously. All patients were preloaded with 500ml of ringer lactate prior to spinal anesthesia. Baseline pulse rate, blood pressure, respiratory rate, SPO₂ were noted.

Under strict aseptic precaution lumbar puncture was performed in left lateral position by midline approach by using disposable quince spinal needle (22-25 G) at L3 L4 intervertebral space and injection ketamine 100mg (2ml) + injection adrenaline 0.1 mg (0.1ml of 1:1000) was injected intrathecally after free flow of CSF. Patients were monitored continuously using sphygmomanometer, pulse oximeter and electrocardiogram. After spinal anesthesia the patients pulse rate and blood pressure were recorded at 0, 5, 10, 20, 30, 45, 60, 90 and 120 minutes.

Results

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 1: Age and sex distribution of the patients scheduled for study

Age (Years)	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

Table 2: Onset of sensory blockade (minutes)

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

Table 3: Onset of motor blockade (minute)

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 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.

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.

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.

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 4: Duration of sensory blockade (minutes)

Time (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

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 maximum level achieved ranged from T₆-T₁₀ and in majority of the males (58 patients) and females (24 patients) the maximum level was T₁₀.

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.

Table 6: Maximum level achieved

Level	No. of Cases	
	Male	Female
T ₆	1	1
T ₈	11	5
T ₁₀	58	24
> T ₁₀	-	-
Total	70	30

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

Discussion

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

Though a number of drugs have been used for inducing spinal anesthesia their use has been usually associated with occurrence of undesirable side effects such as hypotension and bradycardia. Thus, they are not ideal for use in trauma and emergency cases that are susceptible for hypotension and shock.

Therefore, there is a need to find out a safer, effective and reliable spinal anesthetic, which has rapid onset of action, excellent analgesia, 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 anesthesia 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 .

In the study conducted by Dipasri Bhattacharya in 2004 [3], 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

(85.48 ± 11.68). In the study conducted by Dipasri Bhattacharya in 2004 [3], it was reported that duration of sensory blockade ranged from 90-140 minutes with a mean of 122 ± 3.34 .

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.

In the study conducted by Bion JF in 1984 [4], they reported that the maximum level achieved ranged from T10-T12 in majority of them maximum level achieved was T10. 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.

In the study conducted Bion JF [4], 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 Dipasri Bhattacharya in 2004 [3], 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 . In the study conducted by Dipasri Bhattacharya in 2004 the onset of motor from 2-5 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 . In the study conducted by Dipasri

Bhattacharya in 2004, it was reported that the duration of motor blockade ranged from 90-140 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, it was reported that 100% of the patients had grade-III motor blockade. The present study is in accordance with their study.

Conclusion

Ketamine with adrenaline produced a quicker

onset of sensory blockade with good muscle relaxation

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