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Research Article

EFFECTIVENESS OF INTRATHECAL KETAMINE HCL WITH THAT OF INTRATHECAL XYLOCAINE 5% FOR LOWER ABDOMINAL AND LOWER LIMB SURGERIES – A COMPARATIVE STUDY

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ABSTRACT
Spinal Analgesia 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. In the present study the effectiveness of Ketamine Hcl as a spinal anaesthetic with Xylocaine 5% has been compared. The parameters used for comparison are latency of onset of sensory and motor blockade, degree of sensory and motor blockade, duration of sensory and motor blockade, duration of post operative analgesia and the incidence of adverse effects and complications intra operatively and post operatively. From the present study it is concluded that intrathecal Ketamine in the doses of 76 and 100mg is a safe, effective and reliable alternative to 5% Xylocaine especially in cases of trauma and emergency surgeries of lower limbs.

Keywords: *Ketamine HCL, Intrathecal Xylocaine***,** Spinal Analgesia, Anaesthesia

INTRODUCTION
Melzack and Wall (1967) put forward their "gate theory of pain". Attention was now being focused on pain relief intra operatively and post operatively this was achieved by synthetic analgesics. In 1983, Ahuja injected ketamine intrathecally to rats and in Carrasco *et al.*, (1984) to dogs and observed no adverse effects on spinal cord. Bion (1984) used intrathecal ketamine for the first time in Humans. He administered ketamine intrathecally to war injured patients. He administered 50 mg. of ketamin in 3 ml. 5% Dextrose with addition of 0.1 mg. adrenaline. He concluded that there was distinct sensory level of anaesthesia with motor loss. The duration of anaesthesia lasted for 45-90 minutes. There was no interference with the cardio vascular or respiratory functions. Ketamine alone did not produce motor blockade but addition of adrenaline resulted in complete motor blockade and may have intensified sensory blockade. Bion attributes the action of added adrenaline to be analgesic rather than delaying the spinal anaesthesia by asoconstriction as the alpha adranegic agonists intrathecally have been shown to produce analgesia in cats lastly for 60-90 minutes.
Pragnya *et al.*, (1993) first used Intratecal Ketamine in India for trauma cases with lower limb injuries. They observed that the duration of surgical analgesia was from 60-90 minutes and duration of post operative analgesia was found to be 4 hours. They stated that ketamine acts intrathecally via the spinal nocieptors and not systemically.
Bansal *et al.*, (1994) evaluated the usefulness of intrathecal ketamine in emergency surgeries of lower abdomen and lower limbs. They observed that intrathecally injected ketamine induces analgesia almost immediately. The onset of anaesthesia is not dose dependant and the presence of adrenaline does not significantly effect it. They also stated that addition of adrenaline to the injected mixture produces complete motor loss without significantly affecting the induction time. They did not observe any side effects like respiratory depression, urinary retention, nausea, vomiting etc. they concluded that ketamine is a potential drug for use as a spinal anaesthetic especially in emergency surgeries of lower limb and lower abdomen (where the use of local anaesthethics may be detrimental (hypotension, bradycardia) due to its stimulatory effects on cardiovascular and respiratory systems.
Gebhart (1994) administered ketamine intrathecally and epidurally and explained that binding to local opiate receptors seems to play only a minor role, whereas significant analgesia after even low doses of

ketamine is the result of antagonism to NMDA receptors. In vitro and animal data suggest an involvement of the descending inhibitory pathways mainly through inhibition of reuptake of neurotransmitters.
Borgbjerg *et al.,* (1994) did histopathological studies after repeated intrathecal injections of preservative free ketamine in rabbits. They concluded that repeated intrathecal administration of preservative free ketamine confirms the lack of neurotoxicity from single dose studies.

MATERIALS AND METHODS

This study was undertaken at Government General Hospital, Gulbarga attached to M.R.Medical College, Gulbarga. This study was conduct in hundred patients of either sex undergoing surgeries below umbilicus, ranging in age between 20-55 years. After taking consent, all patients were thoroughly examined for general health and systemic diseases, only patients belonging to ASA grade I & II were selected for the study. Those having history of neurological diseases, cardiovascular diseases, liver diseases, bleeding disorders and those with spinal deformaties were excluded.
100 patients are randomly divided in 4 (four) groups:
Group I: Received 1.5 cc of 5% xylocaine with adrenaline (0.2 mg).
Group II: Received 2 cc of 5% xylocaine with adrenaline (0.2 mg).
Group III: Received 1.5 cc (75 mg) of preservative free ketamine with adrenaline (0.2 mg) + 1.5 cc of 5% dextrose.
Group IV: Received 2 cc (100 mg) of preservative free ketamine with adrenaline (0.2 mg) + 1 cc of 5% dextrose.

Premedication: All patients were premedicated with injection phenergan (promethazine) 25 mg intramuscularly thirty minutes prior to surgery. Phenergan was used to allay anxiety, produce sedation and for its antiemetic and antisialogogue effects.
When the patient was brought to the operation theatre, his or her pulse rate and blood pressure were recorded. An intravenous drip was set up with lactated ringers solution.
The patients were then put in left lateral position with back parallel to the edge of the operating table, head, spine, hips and knees flexed. The back was prepared as for any surgical procedure, the area draped properly with sterile towels. The inter space chosen for lumbar puncture for every case was between third and fourth lumbar spine. The line joining highest points on the iliac crests passing through the space between third and fourth lumbar vertebral spine was taken as guideline.
After infilteration of skin with 2% lignocaine, lumbar puncture was made with lumbar puncture needle of 23 gauge. After lumbar puncture, any abnormal pressure in CSF or hemorrhagic tap was excluded. Spinal anesthetic solutions were injected depending upon the group to which the patients belonged with a constant speed. Immediately after the injection of the drug into the subarachnoid space, the needle was withdrawn and the patient was made supine and a pillow was kept below the head and neck.
After drug injection, assessment of sensory and motor blockade and vital parameters were done initially every 30 seconds for 5 minutes and later every 3 minutes for 15 minutes, and then every 10 minutes till the surgery was over. Post operatively vital parameters were monitor hourly for 6 hours.
Highest level of analgesia was determined bilaterally by loss of pain sensation on pin prick.
Following parameters were note:
1. Time of injection of spinal anaesthetic.
2. Time of onset of analgesia: it is interval between the injection of drug and the highest level of analgesia achieved.
3. Duration of analgesia: it is the period between the onset of analgesia and time of regression of analgesia by two dermatiomes.
4. Degree of analgesia (sensory blockade). This was grades as follows:
Grade I: Perfect analgesia. No supplementation with analgesics and sedatives required.
Grade II: Analgesia satisfactory but sedatives and analgesics were needed to supplement analgesia.
Grade III: Complete failure, when general anaesthesia was required.

5. Degree of motor blockade: This was assessed using bromage scale.
Grade 0: No motor blockade (0%) full movements of lower limbs, knees, and feet.
Grade I: Partial blockede (33%) just able to flex the knees.
Grade II: Almost acceptable (66%) unable to flex the knees.
Grade III: Complete motor blockade (100%) unable to move the legs.
6. Intra operative and post operative complications.
All the patients were assessed on the day of surgery and on the first, second and seventh day postoperatively to note any complications like headache, backache, and for any signs of meningeal irritation and nevrological.

RESUTS AND DISCUSSION

Table 1: The distribution of cases in four groups according to type of surgery. Number of cases studied in group I and III and group II and IV are same for each type of surgery

Operations	Group I	Group II	Group III	Group IV
Appendicectomy	4	8	4	8
Fissure in Ano	4	--	4	--
Fistula in Ano	2	--	2	--
Herniorapphy	7	--	7	--
Hydrocele	6	--	6	--
Orchidectomy	--	1	--	1
Orthopaedic lower limb surgery	--	5	--	5
Prostatectomy	--	3	--	3
Tubectomy	2	--	2	--
Vaginal Hysterectomies	--	8	--	8
Total	**25**	**25**	**25**	**25**

Table 1 shows the distribution of cases in four groups according to type of surgery. Number of cases studied in group I and III and group II and IV are same for each type of surgery.

Table 2: shows the mean onset of analgesia observed in four groups

Group I	--	3 minutes
Group II	--	3 minutes
Group III	--	3 min. 40 sec.
Group IV	--	3 min. 40 sec.

Mean onset of analgesia observation in group I & II 3 minutes and group III and IV are d3 min. 40 sec.
Mean onset time of analgesia was slightly more with ketamine but this did not vary with the dose of ketamine used.

Table 3: Present the duration of analgesia observation in four groups

Time in min.	Group I	Group II	Group III	Group IV
30-60	8	5	7	--
61-90	15	8	16	3
91-120	2	12	2	10
121-150	--	--	--	12

Duration of analgesia was noticed in I, II, III & IV groups. Duration of analgesia observed with Ketamine was more than xylocaine and it was directly related to the dose of Ketamine used.

Table 4: Shows the degree of analgesia observation in four groups

Degree of analgesia	Group I	Group II	Group III	Group IV
I	24	25	20	22
II	1	--	3	2
III	--	--	1	1

The degree of analgesia observed in Group I and II were nearly 100% and no analgesic supplementations are needed.
Majority of cases in Group III (80%), the degree of analgesia was complete but few needed supplementation (20%).
Majority of cases in Group IV (88%), analgesia was complete and no supplementations are needed. Rest of the cases had adequate analgesia on narcotric supplementation.
One case from each Group III and IV needed general anaesthesia. Degree of analgesia with Ketamine was excellent in majority of the cases and it was more when larger doses were administered.

Table 5: Presents the Degree of Motor Blockade observed in four Groups

Grade of motor blockade	Group I	Group II	Group III	Group IV
0	--	--	--	--
I	1	--	--	--
II	2	1	3	2
III	22	24	22	23

The grade of motor blockade observed in Group I and II are nearly 100% and satisfactory.
The grade of motor blockade in Group III and IV was satisfactory in majority of cases (90%) and are comparable to xylocaine).

Table 6: Shows Variation in Pulse Rate Observed in four Groups

Pulse rate change	Group I	Group II	Group III	Group IV
Change less than 10% from pre-operative value	-23	-22		
Changes between 11-20% from pre-operative value	-2	-3	+24	+22
Changes more than 20% from pre-operative value			+1	+3

Index (+) – increase in pulse rate
(-) – decrease in pulse rate

Changes in the pulse rate observed in Group I and II are minimal.
In majority of cases in Group III and IV the pulse rate increased between 11-20% from preoperative value.
Intrathecal Ketamine increases the pulse rate which is of minor magnitude and duration and not related to the dose of Ketamine used.

Table 7: Shows the Variations in Blood Pressure observed in four Groups

Blood pressure change	Group I	Group II	Group III	Group IV
Change less than 10% from pre-operative value	-18	-10	+17	+10
Changes between 11-20% from pre-operative value	-2	-3	+24	+22
Changes more than 20% from pre-operative value	--	-3	--	--

Index (+) – increase in blood pressure
(-) – decrease in blood pressure

Changes in Blood Pressure in Group I and II are minimal in majority of the cases and it is directly proportional to the dose used. The blood pressure increased in majority of the cases in Group III and IV which is of short duration and did not hamper the operative procedure.

Table 8: Presents the duration of Post Operative Analgesia in four groups

Time in minutes	Group I	Group II	Group III	Group IV
30-60	5	6	--	--
61-120	--	2	10	--
121-180	--	--	14	9
181-240	--	--	--	16

Post operative analgesia was observed in 5 patients in Group I and varied between 30-60 minutes.
Post operative analgesia was observed in 8 patients in Group II and varied between 30-60 minutes in 24% patients and 61-120 minutes in 8% patients.
Post operative analgesia observed in Group III varied between 61-120 minutes in 40% patients and between 121-180 minutes in 60% patients.
Post operative analgesia observed in Group IV varied between 121-180 minutes in 36% patients and between 181-240 minutes in 74% patients.
The post operative analgesia observed with intrathecal ketamine is directly proportional to the dosage used.

Table 9: Shows intraoperative and postoperative complications observed in four Groups

Complication	Group I	Group II	Group III	Group IV
Hypotension				
Mild	10	18	--	--
Moderative	2	4	--	--
Severe	--	--	--	--
Emergence phenomena	--	--	2	4
Nausea	1	2	1	1
Vomiting	--	2	1	--
Retention of urine	--	1	--	1
Headache	1	2	--	1
Backache	--	1	--	--

Hypotension was classified as:
Mild: Fall in Blood Pressure less than 25% of preanaesthetic value.
Moderate: Fall in B.P. between 26-50% of preanaesthetic value.
Severe: Fall in B.P. more than 50% of preanaesthetic value.
In Group I mild hypotension is observed in 10 (40%) of patients and moderate hypotension in 2 (8%) patients. In Group II, mild hypotension is noted in 18 (72%) patients and moderate hypotension in 4 (16%) patients. Hypotension was not observed in Group III and IV. Hypotension observed in Group I and II are treated by raising the legs, I.V. fluids and in few cases vasopressors are used. A comparative study of intrathecal Ketamine and xylocaine 5% for lower abdominal and lower limb surgeries was undertaken at Government General Hospital, M.R.Medical College, Gulbarga. It included 100 patients between the age group 20-55 years, posted for lower abdominal and lower limb surgeries.
The patients are divided into four Groups:
Group I: Received 1.5 cc of 5% xylocaine with adrenaline (0.2mg)
Group II: Received 2 cc of 5% xylocaine with adrenaline (0.2mg)
Group III: Received 1.5 cc (75 mg) of preservative free ketamine with adrenaline (0.2 mg) + 1.5 cc of 5% dextrose.
Group IV: Received 2 cc (100 mg) of preservative free ketamine with adrenaline (0.2 mg) + 1 cc of 5% dextrose.
The following parameters are studied :
1. Onset of analgesia
2. Duration of analgesia
3. Degree of analgesia
4. Degree of Motor blockade
5. Changes in pulse rate and blood pressure
6. Intraoperative and postoperative complications

From the results of present study following conclusions are drawn.
1. Xylocaine with adrenaline has a quicker onset of action compared to ketamine.
2. The duration of analgesia observed with ketamine is more than xylocaine and directly related to the dose of ketamine used.
3. The degree of analgesia with ketamine is good and comparable to xylocaine.
4. The degree of motor blockade with ketamine is satisfactory and comparable to xylocaine.
5. The increase in the pulse rate and blood pressure observed with ketamine are mild to moderate and this fact is useful in patients with clinical conditions like hypotension and shock.
6. The postoperative analgesia observed with ketamine is fair and directly related to the dosage used.
7. Intrathecal ketamine does not produce any significant intraoperative and postoperative complications.

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