Section: Anaesthesia

Original Research Article

COMPARATIVE STUDY OF KETAMINE CLONIDINE AND TRAMADOL FOR SHEVERING UNDER NEUROAXIAL ANAESTHESIA IN ANDHRA PRADESH POPULATION

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Abstract

Background: Shevering has deleterious metabolic and cardiovascular effects. Hence, to prevent shivering by pharmacological effect, the double-blind comparison of ketamine, clonidine, and tramadol was used to control the shivering in neuroaxial anesthesia. **Materials and Methods:** Out of 90 (ninety), 30 were classified as group A, B, C, group-A was given ketamine, group B clonidine, and group C tramadol, and the grade of shivering and grade of sedation were studied and compared in all three groups. **Result:** Shevering grades were highest in ketamine but zero in grade IV was observed in all three groups, but the sedation was prolonged in the ketamine group as compared to clonidine and tramadol-administered patients. It was 03 in ketamine, 1 in clonidine, and zero in tramadol. **Conclusion:** It is confirmed that among all three anesthetic drugs, ketamine was more efficient because of improved hemodynamics in different grades of shivering and prolonged sedation as compared to the other two drugs and provided more comfort to patients during surgical procedures.

INTRODUCTION

Shivering is distressing for the patients undergoing surgery under both regional and general anesthesia. The main causes for shivering are intra/post-operatively loss of temperature, decreased sympathetic tone, and systemic release of pyrogens.[1] Shivering increases expenditure of cardiac and systemic energy, resulting in increased oxygen consumption and production of carbodioxide, lactic acidosis and raises intra-ocular and intracranial pressure.[2] It also interferes with hemodynamic monitoring intraoperatively.

Regional anesthesia produces vasodilation, which facilitates core-to-peripheral redistribution of heat.[3] It also increases sweating threshold. Management of intra- and post-operative shivering is usually done by external heating or pharmacological interventions. Various drugs from different groups, like opioids, 5-hydroxytryptamine receptor (5-HT3) antagonists, N-methyl-D-aspartate (NMDA) receptor antagonists, choline-mimetics, and biogenic amines. Due to shivering thermal discomfort, the quality of the patient's recovery suffers.[4] Moreover, shivering per se may aggravate post-operative pain, simply by stretching of the surgical incision. Hence an attempt is made to compare different anesthetic agents to rule out which have prophylactic anti-shivering properties and control other side effects also.

MATERIALS AND METHODS

90 (ninety) aged between 18 to 60 years admitted to the surgery department of the Nimra Institute of Medical Sciences (NIMS) in Jupidi, Ibrahim Patnam, Vijaywada, Krishna District-521456, Andhra Pradesh, were studied.

Inclusion Criteria

Patients having ASA grade I and grade II undergoing lower abdominal (perineum) or lower limb surgery were selected for study.

Exclusion Criteria

The patients suffering from neurovascular disease, hypothyroidism, history of cardiopulmonary disease, pregnant females, patients receiving antipsychotic treatment, and patients with a history of febrile illness were excluded from the study.

Method: Every patient was certified fitness by a physician. 90 patients were classified in three groups. Group ABC. All patients were pre-loaded with Ringer's lactate infusion before giving neuroaxial blockage. The drugs used in the study (ketamine, bupivacaine, tramadol) and saline were preheated to 30°C before administration.

Group A: 30 patients received preservative-free ketamine 20 mg with 3 ml Bupivacaine 0.5%.

Group B: 30 patients received clonidine 20 micrograms with 3 ml bupivacaine.

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Group C: 30 patients received preservative-free tramadol 20 mg with 3 ml bupivacaine.

IV fluids were warmed to 37°C before using for the patients; the temperature of the operation theatre was maintained at 24°C for all three groups. (30X3=90) spinal sub-archanoid block was instituted at either L3-L4 or L4-L5 interspaces using a 25-gauge Quirike spinal needle. 3 ml hyperbaric bupivacaine 0.5% IV along with the drug under study and total volume was made to 3.5 ml using normal saline. During the intraoperative period, after noting the baseline parameters, pulse rate, non-invasive blood pressure (NIBP), oxygen saturation, temperature (core and surface), and level of sensory block were assessed at every 5-minute interval till there was no change in the level of anesthesia and every 15 minutes thereafter. The core temperature was measured with a surface temperature thermometer and surface temperature by an axillary thermometer. Shivering was graded by using a scale validated by Tsia and Chus. Grade-0, Grade-1=pillio erection but no visible shivering Grade II = Muscular activity in only one muscle group Grade II muscular activity in more than one muscle group, but not generalized. Grade IV—Shivering involves the whole body. During surgery, shivering scale was recorded at every minute's interval up to 90 minutes of surgery. The prophylaxis was regarded as ineffective if the patient exhibited grade-III shivering any time during the surgery, and I.V. fentanyl 25 micrograms was administered as a rescue drug. The side effects, such as hypotension, nausea, vomiting, hallucinations, and sedation, were also recorded. Hypotension was defined as a decrease in mean blood pressure (MBP) of more than 20% from the base. The hypotension was treated with an IV intramuscular bolus dosage of Mephentermine 3 mg and further IV infusion of Ringer's lactate via a 16-gauge cannula. If patients develop nausea and vomiting, they were treated with IV metoclopramide 10 mg. Hallucinations were defined as false sensory experiences when patients reported that they saw, heard, smelled, tasted, or felt something that was not existent. The degree of sedation was on a 5-point scale. 1 = Fully awake and oriented, 2 = Drowsy, 3 = Eyes closed but arousable to mild physical stimulation, 5 = Eyes closed but unarousable to mild physical stimulation.

Duration of study was from September 2023 to October 2024.

Statistical Analysis: Findings of all three groups were studied statistically by ANOVA test. Date was analyzed using SPSS software V.23 (IBM statistics, Chicago, USA) and Microsoft Office 2007. The ratio of male and female was 2:1.

RESULTS

[Table 1] Comparison of different grades of shivering in all three groups –

- Sheving grade-1-0: 23 (± 0.5) in group A, 29 (± 3.8) in group B, 28 (± 3.2) in group C, $p < 0.001$, F state value 30.0 dift-2.
- Grade-I: 2 (± 0.2) group A, 0 in group B, 0 in group C, F state 1.33 df-2, $p < 0.001$
- Grade II: 2 (± 0.1) in group A, 1 (± 0.1) in group B, 1 (± 0.1) in group C, F state 1, df-2, and $p < 0.001$.
- Grade-III: 4 (± 0.2) in group A, 2 (±0.1) in group B, 3 (± 0.3) in group C, F state 64.2, df-2, and $p < 0.001$.
- Grade IV: all groups had a 0 grade, C, F state 64.2, df-2, $p < 0.001$.

[Table 2] Comparison of sedation score in all three groups

- Grade-I: 3 (± 0.5) in group A, 15 (± 1.5) in group B, 18 (± 1.8) in group C, F state 98.7, df-2, and $p < 0.001$.
- Grade II: 6 (± 1.2) in group A, 2 (± 1.3) in group B, 08 (± 1.2) in group C, F state 45.9, df-2, and $p < 0.001$.
- Grade-III: 17 (± 1.8) in group A, 0.5 (± 1.4) in group B, 3 (± 1.1) in group C, F state 64.2, df-2, and $p < 0.001$.
- Grade IV: 03 (± 0.5) in group A, 01 (± 0.2) in group B, and 00 in group C; F state 31.0, df-2, and $p < 0.001$.

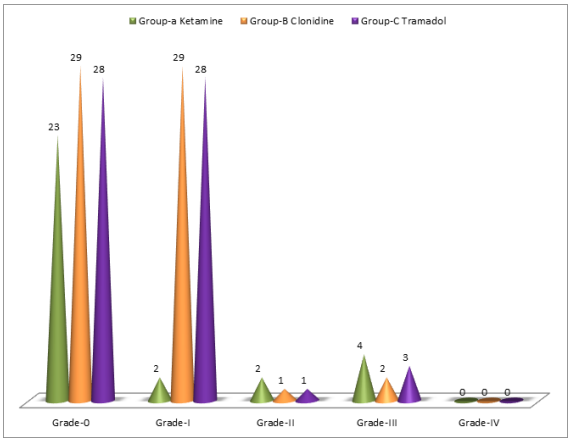

Figure 1: Comparison of different grades of shivering in all three groups

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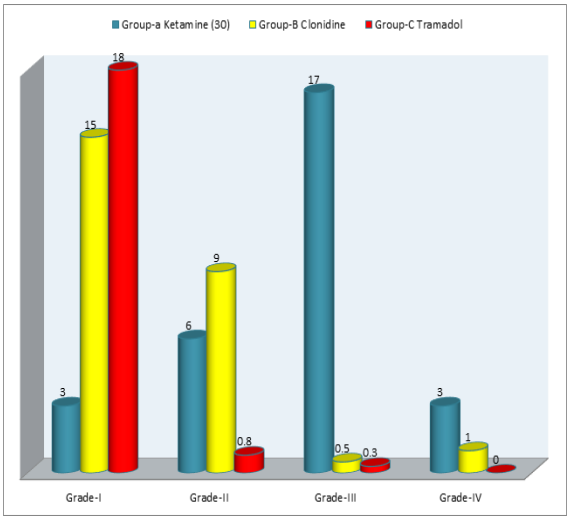

Figure 2: Comparison of sedation score

Table 1: Comparison of different grades of shivering in all three groups.

Shivering grade	Group-a Ketamine (30)	Group-B Clonidine (30)	Group-C Tramadol (30)	p value	F stat value	df
Grade-0	23 (±2.5)	29 (±3.2)	28 (±3.2)	P<0.001	30.0	2
Grade-I	2 (±0.2)	29 (±3.8)	28 (±3.2)	P<0.001	1.33	2
Grade-II	2 (±0.1)	1 (±0.1)	1 (±0.2)	P<0.001	11.1	2
Grade-III	4 (± 0.2)	2 (±0.1)	3 (±0.3)	P<0.001	64.2	2
Grade-IV	0	0	0	P<0.001	64.2	2

df = degree of freedom-2 and p<0.001 (p value is highly significant)

Table 2: Comparison of sedation score

Sedation score	Group-a Ketamine (30)	Group-B Clonidine (30)	Group-C Tramadol (30)	p value	F stat value	df
Grade-I	3 (±0.5)	15 (± 1.5)	18 (±1.8)	P<0.001	98.7	2
Grade-II	6 (± 1.2)	9 (± 1.3)	0.8 (±1.2)	P<0.001	45.9	2
Grade-III	17 (±1.8)	0.5 (± 1.4)	0.3 (±1.1)	P<0.001	80.4	2
Grade-IV	03 (±0.5)	01 (±0.2)	00	P<0.001	31.0	2

df = degree of freedom-2 and p<0.001 (p value is highly significant)

DISCUSSION

In the comparative study of ketamine, clonidine, and tramadol for shivering under neuroaxial anesthesia in the Andhra Pradesh population. Ketamine group patients had more grades of shivering in all grades, but zero grade was observed in all 3 groups. Ketamine had efficient potency to control shivering as compared to the other two groups; the p-value was highly significant, df was 2 [Table 1]. In the comparison, sedation with ketamine had a prolonged 3 (±0.5) as compared to the other two groups, df = 2, and p < 0.001 (p-value was highly significant) [Table 2]. Ketamine has maintained normal hemodynamicity as compared to the other two drugs [Table 3]. These findings are more or less in agreement with previous studies.[5-7]

Various hypotheses have been proposed to explain the shivering after spinal anesthesia. Neuroaxial anesthesia-induced inhibition of the thermoregulatory mechanism leading to preoperative hypothermia is the primary cause. Preoperative shivering hence occurs as a thermoregulatory response to hypothermia. However, in the post-operative period, shivering may occur even with normothermia, which suggests that a mechanism other than heat loss and subsequent decrease in cone temperature may lead to shivering. These mechanisms may be sympathetic overactivity, uninhibited spinal reflexes, postoperative pain, and adrenal suppression over respiratory alkalosis. Recovery of patients may suffer due to shivering. Shivering itself may aggravate postoperative pain by stretching the surgical incision.[8]

Ketamine causes sympathetic stimulation and vasoconstriction in patients at risk of hypothermia. Hence, ketamine controls shivering by non-shivering thermogenesis, either by its effects on the hypothalamus or by the α-androgenic effect of norepinephrine.

Tramadol is an opioid analgesic with actions preferably mediated via μ receptors with minimal effect on K and S receptors. However, it has adverse effects in the form of nausea, vomiting, and dizziness, which may cause discomfort to patients.[9]

Cionidine is a centrally acting selective α2 agonist. Clonidine exerts its anti-shivering effects in three levels. Hypothalamus, locus ceruleans, and spinal cord are hence a may because severe adverse effects like hypotension, hallucination, and moreover sedation are lesser in clonidine-administrated

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patients.[10] Ketamine may also cause confusion or hallucination, but mean blood pressure is maintained. Tramadol had the potential to cause nausea and vomiting, and clonidine is known to cause hypotension and bradycardia. In the present study, ketamine had a significant role in sedation degrees as compared to other groups and maintained cardio-respiratory stability and prevented recall of alarming events during and post-surgically.

CONCLUSION

In the present comparative study, it can be concluded that ketamine is effective and comparably better than tramadol and clonidine in preventing shivering after spinal anesthesia. Apart from preventing shivering, ketamine offers prolonged sedation without any respiratory depression. But this demands further genetic, hemodynamic, neurophysiological, neurotransmitter, and pharmacological studies because the exact mechanism of drugs that causes shivering during anesthesia is still unclear.

Limitation of Study: Owing to the tertiary location of the study institution, a small number of patients, lack the latest techniques, we have limited findings and results.

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