Original Research Article

Comparative study of ketamine, clonidine and tramadol for control of shivering under neuroaxial anaesthesia

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Abstract

Background: Shivering is one of the consequences of post-operative hypothermia. It occurs frequently after anaesthesia and mechanism and aetiology is not clearly understood. Hence it is wise to use such anaesthetic which cause minimum shivering and can be controlled by pharmacological strategies. **Method:** Out of 102, 34 were classified as group A, B, C. group-A was given ketamine, group-B clonidine and group-C Tramodol and the grade of shivering and grade of sedation was studied and compared in all three groups. **Results:** Shivering grades were highest in group-A (ketamine) and grade-IV was zero in all three anaesthetic drugs and p value was insignificant (p>0.38) and chi-square value was 416. In sedation score study grade-III and grade-IV was highest in group-A patients (Ketamine) chi-square value was 27.1 and p value was significant (p<0.001) Ketamine had higher heart rate and MBP as compared to other groups. **Conclusion:** Among all three drugs ketamine was more beneficial because of improved hemodynamic in different grades of shivering and prolonged sedation as compared to clonidine and tramadol, ketamine provided more comfortable to patients during surgery.
Keywords: Ketamine, Clonidine, Tramadol, Shevering, Sedation

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INTRODUCTION

Shivering is one of the consequences of preoperative hypothermia. It occurs frequently after anaesthesia and the mechanism which causes shivering is poorly stood.[1] Post anaesthesia shivering is a common complication of anaesthesia and may affect up to 58% to 65% of patients during anaesthesia and 33% of patients during epidural regional anaesthesia.[2] Post-anaesthetic shivering may be associated with increased oxygen consumption CO_2 output and minute ventilation catecholamine release increased cardiac output tachycardia and hypertension increased intra ocular pressure.[3] Shivering may also decrease mixed venous oxygen saturation and may also interfere with monitoring. Shivering is uncomfortable for the patients and has been reported worse than surgical pain. Shivering may aggravate post-operative pain by stretching the surgical incision. Increase in metabolic requirement may pre dispose difficulties in intra pulmonary shunts and cardiac out-puts may prove fatal to the patients. Hence attempt was made to study three different anaesthetics agents which cause least shivering which can be managed by using pharmacological strategies in selected surgical patients.[4]

MATERIAL AND METHOD

102 patients aged between 18 to 60 years admitted in surgery department of SVS medical College Hospital, Mahabub Nagar, Telangana were studied.

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

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Exclusion Criteria: The patients suffering from neuro-vascular disease hypothyroidism, history of cardio-Pulmonary disease, pregnant females, patients on anti-psychiatric treatment, history of febrile illness, immune compromised patients were excluded from study.

Method: present study was hospital based coparative study condected in the department of anaesthesiology, at SVS medical collage and hospital Mahabubnagar, Telangana Every patient was certified fitness from physician. 102 patients were classified in three groups. Group ABC. All patients were pre-loaded with ringer lactate infusion before giving neuro-axial blockage. The drugs used in the study (Ketamine, Bupivacaine, Tramadol) and saline were preheated to 37°C before administration.

Group A: 34 patients received preservative free ketamine 20 mg with 3ml Bupivacaine 0.5%

Group B: 34 patients received clonidne 20 microgram with 3ml Bipivacaine.

Group C: 34 patients received preservative free Tramadol 20 mg with 3ml Bupivacaine.

I V 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-3. (34X3=102) spinal sub-archanoid block was instituted at either L3-L4, L4-L5 interspaces using 25 gauges Quinke spinal needle. 3 ml of hyperbaric Bupivacaine 0.5% IV fluid along with drug under study and total volume was made study and total volume was made to 3.5 ml using normal saline. During the intra-operative period, after nothing the base line parameters, pulse rate, non-invasive blood pressure (NIBP), oxygen saturation, temperature (core and surface) and level of sensory block were assessed at every 5 minutes interval till there was no change in the level of anaesthesia and every 15 minutes thereafter. The core temperature was measured surface temperature thermometer and surface temperature by an axillary thermometer. Shivering was graded by using scale validated by Tsai and Chus. Grade-0, Grade-I=pillio erection but no visible shivering. Grade-II=Muscular activity in only one muscle group Grade-III Muscular activity in more than one muscle group, but not generalised. 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 exhibit grade-III shivering any time during the surgery and I. V. Fentanyl 25 micrograms was administrated as rescue drug. The side effect such as hypotension, nausea, vomiting, hallucinations and sedation were also recorded. Hypotension was defined as decrease in mean blood pressure (MBP) of more than 20% from the base line. Hypotension was treated with IV intramental bolus dosage of Mephentermine 3mg and further IV infusion of ringer lactate via 16 gauge canula. If patients develop nausea and vomiting was treated with IV metaclopromide 10mg, Hallucinations were as side effect of was defined as false sensory experience when patients reported that they saw, heard, smelled, tasted or felt something that was not existent. The degree of sedation was on 5-point scale.1=Fully awake and oriented, 2=Drowsy, 3=Eyes closed but arousable to mild physical stimulation, 5=Eyes closed but un-arousable to mild physical stimulation.Duration of study was between December 2019 to march 2020

Statistical analysis: Findings of all three groups were studied statistically by applying chi-square (x^2) test. Data were analysed using SPSS software V.23 (IBM Statistics, Chicago, USA) and Microsoft office 2007.

This research paper was approved by ethical committee of SVS Medical College Mehabub Nagar Telangana.

OBSERVATION AND RESULT

Table-1: Distribution of shivering grades in three groups Grade-0-25 (73.5%) in group-A, 30 (88.2%) in group-B, 29 (85.3%) in group-C. Grade-I – 2 (5.9%) in group-A, 0 (0%) in group-B and C. Grade-II – 2 (5.9%) in group-A and 1 (2.9%) in group-B and C. Grade-III – 5 (14.7%) in group-A, 3 (8.8%) in group-B, 4 (11.8%) in group-C. Grade-IV – 0 (0%) in all groups and Chi-Sq value = 4.16 and p value was 0.384 (p>0.384) Insignificant

Table-2: Distribution of sedation score between three groups. Grade-I – 5 (14.7%) in group-A, 17 (50%) in group-B, 20 (58.8%) in group-C. Grade-II – 7 (20.6%) in group-A, 11 (32.4%) in group-B, 10 (29.4%) in group-C. Grade-III – 19 (55.9%) in group-A, 5 (14.7%) in group-B, 4 (11.8%) in group-C. Grade-IV – 3 (8.8%) in group-A, 1 (2.9%) in group-B and 0 (0%) in group-C. Chi-Sq value was 27.16 and p value was 0.001 p<0.001 (highly significant).

Table 1: Comparison of Shivering Grade between Study Groups

Shivering Grade	Ketamine Group A 34		Clonidine Group B 34		Tramadol Group C 34	
	N	%	N	%	N	%
Grade-0	25	73.5%	30	88.2%	29	85.3%
Grade-1	2	5.9%	0	0.0%	0	0.0%
Grade-II	2	5.9%	1	2.9%	1	2.9%
Grade-III	5	14.7%	3	8.8%	4	11.8%
Grade-IV	0	0.0%	0	0.0%	0	0.0%
Total	34	100.0%	34	100.0%	34	100.0%

Chi sq value =4.16, p value=0.384

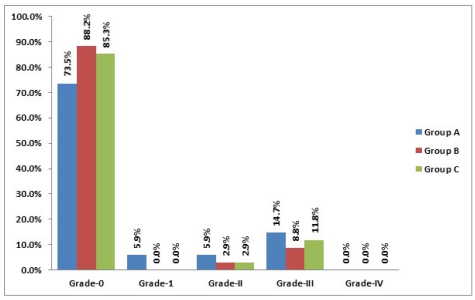

Figure 1: Shivering Grade

Table 2: Comparison of Sedation Score between Study Groups

Sedation Score	Ketamine Group A 34		Clonidine Group B 34		Tramadol Group C 34	
	N	%	N	%	N	%
Grade-1	5	14.7%	17	50.0%	20	58.8%
Grade-II	7	20.6%	11	32.4%	10	29.4%
Grade-III	19	55.9%	5	14.7%	4	11.8%
Grade-IV	3	8.8%	1	2.9%	0	0.0%
Total	**34**	**100.0%**	**34**	**100.0%**	**34**	**100.0%**

Chi sq value =27.16, p value=<0.001*

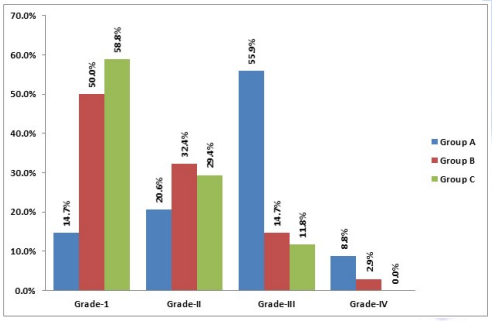

Figure 2: Sedation Score

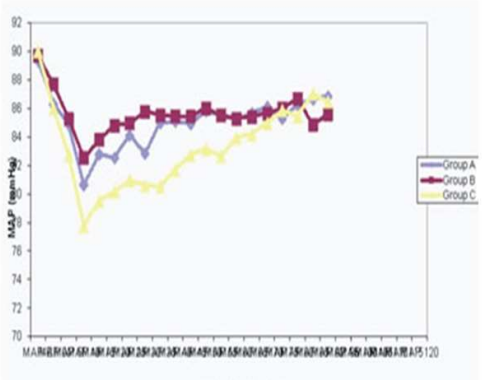

Figure 3: Trends in Blood pressure in three groups

DISCUSSION

Present comparative studies of Ketamine, clonidine and tramadol for the control of shivering, under neuroaxial anaesthesia. The degree of shivering grade-IV had no any patients observed (0%) in grade-III had 5 (14.7%) in group-A 3 (8.8%) in group-B, 4 (11.8%) in group-C, Grade-II 2 (5.9%) in group-A and 1 (2.9%) in both B and C Groups, Grade-I – 2 (5.9%) in group-A and 0 (0%) in B and C groups. In Grade-O had 25 (73.5%) in groups-A, 30 (88.2%) in group-B, 29 (85.63%) in group-C and chi-square value was 4.16 and p=0.38 (p value was insignificant) (Table-1). In comparison of sedation score In grade-I highest score was 20 (58.8%) in group-C, 17 (5.0%) in group-B, 5 (14.7%) in group-A respectively. In grade-I shivering score – highest was 11 (32.4%) in group-B, 10 (29.4%) in group-C, 7 (20.6%) in group-A. In grade-III highest score was 19 (55.9%) in group-A, 5 (14.7%) in group-B, 4 (11.8%) in group-C. In grade-IV highest score was 3 (8.8%) in group-A, 1 (2.9%) in group-B, 0 (0%) in group-C. Chi-square – 27.1, p<0.001, p value was highly significant (Table-2). In study of trends in Blood pressure ketamine shared high heart rate and mean blood pressure as compared to other groups (Table-3). These findings are more or less in agreement with previous studies.[5,6,7] Various hypotheses have been proposed to explain the shivering after spinal anaesthesia. Neuro-axial anaesthesia–induced inhibition of thermo regulatory mechanism leading to preoperative hypothermia is the primary cause. Preoperative shivering hence occurs as thermoregulatory response to hypothermia. However in the post-operative period, shivering may occur even with normo-thermia which suggests that mechanism other than heat loss and subsequent decrease in core temperature may lead to shivering. These mechanisms may be sympathetic over activity, uninhibited spinal reflexes post-operative pain, adrenal suppression and respiratory alkalosis. Recovery of patients may suffer due to shivering. Shivering itself may aggravate post-operative 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 thermo genesis, either by its effects on hypothalamus or by the α-androgenic effect of nor epinephrine Tramadol is an opoid analgesic with actions preferably mediated via μ receptor 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] Clonidine is centrally acting selective α^2 agonist clonidine exerts its anti-shivering effects in three levels. Hypothalamus, locus ceruleans and spinal cord hence it may cause severe adverse effects like hypotension, hallucination moreover sedation is lesser in clonidine administrated patients.[10] Ketamine may also cause confusion or hallucination but mean blood pressure is maintained. Tramadol had potential to cause nausea and vomiting and clonide is known to cause hypotension and bradycardia. In the present study ketamine had significant role in sedation degrees as compare to other groups and

maintained the cardio-respiratory stability and prevented recall of alarming events during and post-surgically.

SUMMARY AND 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 anaesthesia. Apart from preventing shivering ketamine offers prolonged sedation without any respiratory depression. But this demands further genetic, hemodynamic, neuro-physiological, neuro-transmitters, pharmacological studies because exact mechanism of drugs which causes shivering during anaesthesia is still un-clear.

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