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COMPARISON OF TWO DIFFERENT DOSES OF DEXMEDETOMIDINE FOR PREVENTION OF SHIVERING DURING SPINAL ANAESTHESIA.

Anaesthesiology

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ABSTRACT

Background: Shivering is a frequent and distressing complication of spinal anesthesia. It is not only unpleasant to patient but also delays recovery by increasing metabolic rate and aggravating pain. A variety of drugs and physical methods are used to control shivering. Physical methods require specialized equipment's, which may not be economically feasible in many settings due to cost constraint. Many pharmacological agents are available for prevention of shivering. Among pharmacological interventions dexmedetomidine, a congener of clonidine is a highly selective α-2 adrenoreceptor agonist found effective in controlling shivering. In present study we evaluated the two different doses of dexmedetomidine in prevention of shivering **Materials and methods:** 120 patients from either gender, aged 20-60 years, of American Society of Anesthesiologists (ASA) grade I and II undergoing various surgeries under spinal anesthesia were included The patients were randomly divided into 2 groups by computer generated random numbers. Group 1(n=60) received I.V Dexmedetomidine 0.25 µg/kg diluted in 50ml saline over 10 min immediately after spinal anesthesia. Group 2 (n=60) received I.V Dexmedetomidine 0.5 µg/kg diluted in 50ml saline over 10 min immediately after spinal anesthesia. Perioperative incidence and grade of shivering, level of sedation, hemodynamic parameters, and adverse reactions like nausea, vomiting were recorded. **Results:** 17 patients in group I (28.3%) and 8(13.3%) patients in group II experienced shivering (p=0.043). 3 patients in group 1 (3.3%) and 4 patients in group II (6.6%) had bradycardia(p=0.69). 5 patients in group I (8.3%) and 8 patients in group II (13.3%) had hypotension(p=0.378). No patients in either group experienced nausea or vomiting. Conclusion Dexmedetomidine in a dose of 0.5µg/kg is better for prevention of shivering than 0.25µg/kg in patients undergoing surgeries under spinal anesthesia. **Conclusion:** Dexmedetomidine in a dose of 0.5µg/kg is better for prevention of shivering than 0.25µg/kg in patients undergoing surgeries under spinal anesthesia.

KEYWORDS

Shivering, Dexmedetomidine, Spinal anesthesia, Minimum effective dose.

INTRODUCTION :

Shivering is defined as an involuntary, repetitive activity of skeletal muscles. Around 40-50% patients undergoing surgery under neuraxial anesthesia develop shivering. Shivering can be very unpleasant and physiologically stressful for patient. It increases metabolic rate and it can double or even triples O2 consumption. It also increases intraocular pressure and intracranial tension. It interferes with surgery and it causes stretch on suture lines. It interferes with monitoring like ECG, pulse oximetery and noninvasive blood pressure measurement., Shivering is encountered both after regional and general anaesthesia, with a little higher incidence in patients receiving general anaesthesia. The shivering that occurs during general and neuraxial anaesthesia share the same common pathway. Thus, it seems likely that agents that have proven successful in treatment of shivering following general anaesthesia might also be useful in management of shivering during neuraxial anaesthesia. Many physical and pharmacological interventions have been used to decrease the incidence and severity of shivering. Non pharmacological methods which use specialized equipments to prevent or to control shivering are expensive and not practical in all clinical settings. Many pharmacological agents like Pethidine,lonidine,Tramadol, Magnesium sulphate, Ketamine have been used to control shivering. These drugs have side effects like respiratory depression, bradycardia, hypotension etc. Among pharmacological interventions dexmedetomidine, a congener of clonidine is a highly selective α-2 adrenoreceptor agonist found effective in controlling shivering. 30 Studies have been done to evaluate the efficacy of dexmedetomidine at dose of 0.5 µg/kg for prevention of shivering but are associated with side effects like hypotension and bradycardia. Hence present study is aimed at evaluating the efficacy of two different doses of dexmedetomidine in prevention of shivering during spinal anaesthesia and to identify the minimum effective dose to achieve the prevention of shivering

Objective Of The Study :

Objective of the study is to evaluate the safety and efficacy of two different doses of dexmedetomidine in prevention of shivering during spinal anaesthesia and to identify the minimum effective dose to achieve the prevention of shivering.

Methodology:

The present study was undertaken at santiram medical college &general hospital nandyal, during the period from April 2022 to September 2022. Informed written consent was obtained from participating patients. It is a randomized controlled prospective study a total of 120 patients from either gender, aged 20-60 years undergoing various surgeries under spinal anaesthesia were included. The patients were randomly divided into 2 groups using computer generated random numbers.

Group 1(n=60) received I.V Dexmedetomidine 0.25 µg/kg diluted in 50ml saline over 10 min. Group 2 (n=60) received I.V Dexmedetomidine 0.5 µg/kg diluted in 50ml saline over 10 min.

Inclusion criteria

1. Patients undergoing various elective surgeries under spinal anesthesia
2. Patients between the age group of 20 to 60yrs.
3. American Society of Anesthesiologists physical status I or II

Exclusion criteria:

1. Patients with significant cardiovascular, renal, hepatic diseases.
2. Patients with thyroid disease.
3. Patients with known hypersensitivity to Dexmedetomidine

Selected Patients

All patients were visited on the day prior to the surgery and explained in detail about the anaesthetic procedure and written and informed consent was obtained. All patients were kept nil orally from 12 O'clock mid night prior to the day of surgery The study was conducted on 120 patients (of either sex). Patients were randomly divided into two groups using computer generated random numbers.

Group 1(n=60) received Dexmedetomidine 0.25 µg/kg diluted in 50ml saline over 10 min, immediately after spinal anaesthesia. Group 2(n=60) received Dexmedetomidine 0.5µg/kg diluted in 50 ml saline over 10 min, immediately after spinal anaesthesia.

Before spinal anaesthesia all the patients were preloaded with 500ml of lactated Ringer's solutions 15 minutes before surgery. Patients peripheral oxygen saturation, blood pressure (systolic, diastolic mean

arterial pressure), electrocardiogram were monitored. Basal values were recorded. The patients were placed in sitting position and dural puncture was performed at L3-L4 inter space. Hyperbaric bupivacaine 0.5% was injected intrathecally. The volume of the local anesthetic, volume of preloading fluid, use of vasopressors were determined by the attending anesthesiologists, and was not affected by inclusion in the study. The study drugs were administered just after spinal anaesthesia and it was prepared and given by investigator who is not otherwise involved in the study and thus the study is double blinded. A standard blanket was used to cover the chest and upper limb of the patients. All thepreloading fluids and drugs were given at room temperature. Ambient temperature of operation theatre was kept between 23-25oC.

Statistical Methods:

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Student t- test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Significant Figures :

Significant (P value:0.01<P ≤ 0.05) strongly significant (P value : P≤0.01)

Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS:

120 patients of either gender, aged between 20-60 years, of ASA grade I and II undergoing various surgeries under spinal anesthesia were included in study. The patients were randomly divided in to 2 groups using computer generated random numbers.

Group 1(n=60) received I.V Dexmedetomidine 0.25 µg/kg diluted in 50ml saline over 10 min.

Group 2 (n=60) received I.V Dexmedetomidine 0.5 µg/kg diluted in 50ml saline over 10 min.

The two groups were demographically similar

Table 1: Comparison of Pulse rate (rpm) of patients

Pulse Rate(rpm)	Group I	Group II	P value
Baseline	71.20±8.29	70.38±8.13	0.587
5min	68.88±8.41	68.00±8.24	0.562
10min	66.87±8.99	66.18±8.79	0.675
15min	64.93±8.28	64.50±6.86	0.757
20min	64.37±8.10	62.80±6.68	0.266
25min	65.06±8.71	62.84±6.45	0.060
30min	63.97±8.68	61.76±6.18	0.087
45min	64.14±6.98	61.65±7.24	0.088
60min	63.70±6.83	61.37±8.43	0.275

Statistically there is no significant difference in pulse rate between the two groups. Analysis was done by independent T test

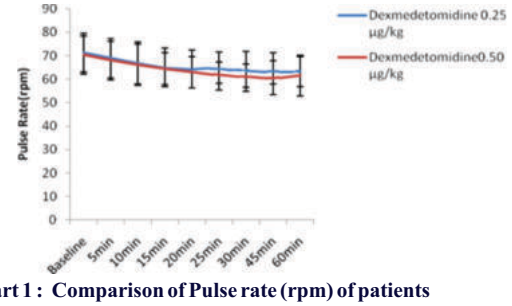

Chart 1 : Comparison of Pulse rate (rpm) of patients

Table 2 : Comparison of SBP (mm Hg) of the patients

SBP (mm Hg)	Group I	Group II	P value
Baseline	128.10±11.22	127.27±10.89	0.680
5min	122.58±11.35	123.10±10.07	0.792
10min	118.82±10.08	118.78±9.88	0.985
15min	115.85±9.67	116.37±10.68	0.782
20min	114.90±8.65	113.50±12.16	0.492
25min	114.92±8.83	112.07±9.95	0.126
30min	112.76±21.64	112.70±8.72	0.987
45min	113.45±10.32	113.82±9.61	0.885
60min	114.25±9.33	113.58±8.61	0.775

Statistically there is no significant difference in SBP among the two groups Analysis was done by independent T test

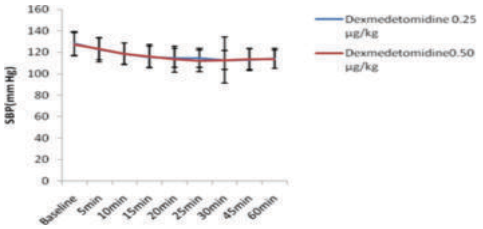

Chart 2 : Comparison of SBP (mm Hg) of patients

Table 3 : Comparison of DBP (mm Hg) of patients

DBP (mm Hg)	Group I	Group II	P value
Baseline	77.45±10.35	78.65±10.03	0.520
5min	73.90±9.69	75.57±9.57	0.345
10min	71.68±10.33	72.90±9.99	0.513
15min	70.61±9.60	71.22±10.88	0.748
20min	69.37±9.31	68.52±10.18	0.651
25min	70.91±9.73	67.86±7.74	0.187
30min	69.72±8.88	66.00±8.65	0.067
45min	67.91±7.58	66.94±9.21	0.667
60min	68.45±8.82	66.98±9.57	0.556

Statistically there is no significant difference in DBP between the two groups.Analysis was done by independent T test.

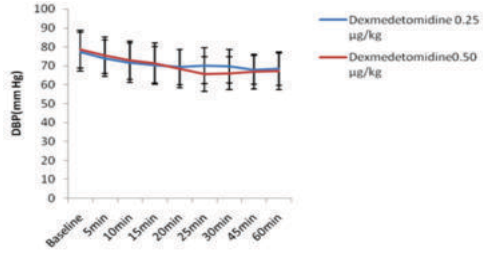

Chart 3: Comparison of DBP (mm Hg) of patients

Table 4: Comparison of Temperature (degrees) characteristics of patients

Temperature(o)	Group I	Group II	P value
Baseline	35.94±0.11	35.97±0.10	0.092
5min	35.94±0.11	35.97±0.11	0.133
10min	35.89±0.15	35.94±0.14	0.068
15min	35.82±0.14	35.80±0.17	0.677
20min	35.82±0.16	35.80±0.18	0.523
25min	35.79±0.15	35.72±0.23	0.073
30min	35.71±0.20	35.71±0.22	0.906
45min	35.64±0.22	35.67±0.26	0.655
60min	35.62±0.22	35.64±0.26	0.706

Statistically there is no significant difference in temperature among the two groups Analysis was done by independent T test

Table 5 : Comparison of Shivering Grades of patients

Shivering Grade	Group I		Group II	
	No	%	No	%
0	24	40.0	30	50.0
1	10	16.7	15	25.0
2	9	15.0	7	11.7
3	6	10.0	6	10.0

4	11	18.3	2	3.3
Total	60	100.0	60	100.0

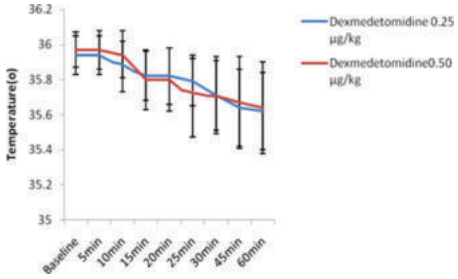

Chart 4. Comparison of Temperature (degrees) characteristics of patients

In this study shivering grade 3 and 4 were taken into consideration. The incidence of shivering was highest in group I than group II (p=0.043). Total 17 patients (28.3%) in group I and 8 (13.3%) patients in group II had shivering. 11 patients in group I had grade 4 shivering whereas only 2 patients in group II had grade 4 shivering. Dexmedetomidine in dose of 0.5µg/kg had significant advantage over dexmedetomidine 0.25µ/kg dose in prevention of shivering and it was statistically significant. Analysis was done by Chi-square test.

Table 6: Comparison of Sedation scores of patients

Sedation	Group I		Group II	
	No	%	No	%
1	27	45.0	17	28.3
2	23	38.3	32	53.3
3	9	15.0	6	10.0
4	1	1.7	5	8.3
Total	60	100.0	60	100.0

Intraoperative sedation score was higher in group II than group I.

DISCUSSION:

Shivering is a very unpleasant and physiologically stressful for the patients. It increases the metabolic rate and even doubles or triples oxygen consumption. It increases the intraocular pressure and increases the intracranial pressure. It interferes with surgery and causes stretch on suture lines and interferes with monitoring like ECG, NIBP, SPO2 Exact mechanism of development of shivering is not known. Several hypothesis have been raised and these include perioperative hypothermia, pain, postoperative heat loss, direct effects of certain anesthetics. OT temperature is usually kept between 23-25 C. This is to reduce bacterial growth and for the comfort of the surgical team.

Pharmacological methods are cost effective when compared to physical methods. Many drugs posses antishivering properties which act on neurotransmitter pathways involved in shivering like opioids receptors, alpha -2 receptors, serotonergic, anticholinergic receptors. Hence drugs acting on these systems include opioids (pethidine, tramadol), clonidine, dexmedetomidine and physiostigmine have been utilized in the treatment of shivering. However, adverse effects such as hypotension, hypertension, sedation, respiratory depression, nausea and vomiting limit their use.2 Alpha-2 adrenergic agonists are widely used nowadays in anaesthesia and intensive care settings. Dexmedetomidine is an α2 adrenoceptor agonist, with antihypertensive, sedative, analgesic, and anti-shivering properties. Dexmedetomidine reduces the vasoconstriction and shivering thresholds. In addition, it has hypothalamic thermoregulatory effects. It has been successfully used as an adjunct to local anaesthetics in spinal anaesthesia and peripheral nerve blockade,for the sedation of mechanically ventilated patients in the Intensive Care Unit,as well as supplementation of post-operative analgesia. The role of dexmedetomidine in the treatment of shivering has been evaluated in a few studies. It may be a good choice because of its dual effects related to 'anti-shivering' and sedation.

The incidence of shivering related to neuraxial anaesthesia is 40-50 %. We tried to bring down the incidence of shivering by using dexmedetomidine. Different doses have been used to control shivering. In present study we used two different doses of dexmedetomidine, 0.25µg/kg and 0.5µg/kg I.V. for prevention of shivering. 120 patients , aged between 20-60 years, of ASA grade I and II undergoing various surgeries under spinal anaesthesia were included in study. The study drugs were administered just after spinal anaesthesia. Attending anaesthesiologist recorded the time of appearance of shivering from the time of administration of dexmedetomidine . Total 17 patients (28.3%) in 0.25µg/kg dexmedetomidine group and 8 (13.3%) patients in 0.5µg/kg dexmedetomidine group had shivering (p=0.043).In majority of cases shivering appeared 15 to 25 mins after spinal anaesthesia.It has been found out from our study that dexmedetomidine in dose of 0.5µg/kg was more effective in prevention of shivering as compared to 0.25µg/kg dexmedetomidine and is statistically significant. We could reduce the incidence of shivering by 30 to 40%.

The current study showed no statistical difference between the two groups in PR, SBP, DBP, temperature. 3 patients in group I (3.3%) and 4 patients in group II (6.6%) had bradycardia (p=0.694) which was managed with Inj.atropine. 5 patients in group I (8.3%) and 8 patients in group II (13.3%) had hypotension (p=0.378) and was managed with Inj.ephedrine. No patients in either group experienced nausea or vomiting.

Limitation: The main limitation of the study was that core temperature was not monitored. However we have monitored the surface temperature. This would not have affected the incidence of shivering between the two groups because both groups were in similar environment and also statistically similar in terms of patient characteristics and duration of surgery.

CONCLUSION:

From the findings of the study it can be concluded that Dexmedetomidine in a dose of 0.5 µg/kg I.V is better than Dexmedetomidine at 0.25µg/kg I.V, for prevention of shivering in patients undergoing surgery under spinal anaesthesia with minimal side effects.

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