Research Paper Medical Science

Prospective Double Blind Randomized Study To Compare Clonidine And Dexmedetomidine In Prevention of Shivering During Spinal Anaesthesia.

DR. ANIL GUPTA	Associate Professor, Department of Anaesthesia, NIMS Medical College, Jaipur.
DR. AMIT DAHIYA	Resident, Department of Anaesthesia , NIMS Medical College, Jaipur.
DR. KESHAV CHATURVEDI	Assistant Professor, Department of Anaesthesia, NIMS Medical College, Jaipur.
DR. MEENAXI SHARMA	Professor and Head Of Deptt., Department of Anaesthesia, NIMS Medical College, Jaipur.

ABSTRACT

BACKGROUND: This prospective double blind, randomized study was undertaken to compare Clonidine and Dexmedetomidine in prevention of shivering during spinal anaesthesia.

Materials and Methods: A total of 100 patients ASA grade I & II between 18-60 years of age, were randomly assigned into one of the two groups, containing 50 patients each. Group C received Clonidine 75 mcg i.v. and Group D received Dexmedetomidine 0.5mcg/kg i.v. both as bolus 5 minutes before subarachnoid block. Perioperative incidence and grade of shivering, level of sedation, hemodynamic parameters and adverse reactions were recorded.

RESULTS: There is decrease in both HR and MAP at 20, 40 and 60 min in both groups and the decrease is more in group C compare to group D and was found to be statistically significant (p<0.05). 45(90%) patients in group D developed grade 0 on shivering scale compare to 38(76%) patients in group C, grade 1 developed in 8(16%) patients in group C compare to 3(6%) patients in group D, grade 2 developed in 4(8%) patients in group C in compare to 2(4%) patients in group D and on statistical comparison none is found to be significant (p>0.05).The sedation scores was observed to be higher in group D.

Conclusion: Dexmedetomidine may emerge as an alternative to clonidine for prophylaxis of postspinal shivering in short duration cases, with a better sedation profile and better haemodynamic stability.

KEYWORDS : Shivering during spinal anaesthesia, clonidine, dexmedetomidine.

INTRODUCTION

Shivering, an involuntary, oscillatory muscular activity, is a physiological response to core hypothermia in an attempt to raise the metabolic heat production.[1] Prolonged impairment of thermoregulatory autonomic control under anesthesia along with the cold environment of operating rooms and cold infusion fluids, contributes to a fall in core body temperature, and hence shivering.[1,2] Perioperative hypothermia and shivering is one of the frequent, undesirable and unpleasant complications of both general and regional anaesthesia. The incidence of shivering is up to 40-60% even in regional anaesthesia.[3] Shivering increases oxygen consumption, lactic acidosis, carbon dioxide production, and metabolic rate by up to 400%.[4]Various pharmacological therapies aim to prevent or treat shivering include opioids (pethidine, nalbuphine, or tramadol), ketanserin, propofol, granisetron, doxapram, physostigmine, clonidine, and nefopam, but debate on an 'ideal anti-shivering drug' continues.[2,5]Clonidine, centrally acting alpha2-adrenergic agonist, has been reported to prevent perioperative shivering possibly by acting on the hypothalamic alpha2-adrenergic receptors.[6] Dexmedetomidine is a new powerful and highly selective, alpha2-adrenoceptor agonist with less hypotensive effect and an added a sedative effect.

MATERIAL AND METHOD

This study was conducted in National Institute Of Medical Sciences and Research medical college and hospital, Shobha nagar jaipur. After approval from institutional ethical committee and obtaining consent, 100 ASA grade I and II patients aged between 18 and 60 years who were undergoing elective infraumblical surgery under spinal anaesthesia procedures were enrolled for this prospective, randomized double-blind study. Unwilling patients, pregnant patients, patients with thyroid diseases, cardiopulmonary diseases, neuromuscular diseases, procedures requiring transfusion of blood or blood products, obese (body mass index >30 kg/m2) and those with established contraindications to spinal anesthesia were excluded from the study.

Patients were randomly allocated into two groups. Patients of Group C (n = 50) received intravenous (IV) clonidine 75 mcg iv diluted in 5 ml saline and patients of Group D (n = 50) received IV dexmedetomidine 0.5mcg/kg diluted in 5 ml saline 5 min prior to subarachnoid block. The operating room temperature was kept at 22°C ± 2°C. All patients were preloaded with ringer lactate 10 ml/kg before conducting neuroaxial block. IV fluids were administered at room temperature. Anaesthetic equipment and emergency drugs were kept ready at hand. In the operating room, standard monitoring was done including level of consciousness, electrocardiogram, SPO2, respiratory rate and non-invasive blood pressure. Normal drapping sheet is used to cover the patient. With all aseptic precautions, subarachnoid block was performed in L3-L4 space in sitting position, with 25 G disposable Quinke's spinal needle with 0.5% hyperbaric bupivacaine 15 mg. The level of spinal block was determined by pinprick at the midaxillary line after 5 min following spinal anaesthesia. When a block of T10 level was achieved, patients were prepared for operation. All cases were screened for shivering if any, and graded with a five point scale validated by Tsai and Tsu[7]where 0 = No shivering, 1 = piloerection or peripheral vasoconstriction but no visible shivering, 2 = muscular activity in only one muscle group, 3 = muscular activity in more than one muscle group, 4 = whole body shivering.

Level of sedation was assessed by a five point ordinal scale where 0 = Awake and alert, 1 = resting with eyes closed, 2 = drowsy and responsive to verbal stimuli, 3 = drowsy and responsive to physical stimuli, 4 = unarouseable.

Intraoperative fluid management was done in relation to body weight of the patient and intraoperative losses. All patients were given oxygen by Hudson's face mask at a rate of 4 L/min. Adverse events like bradycardia (HR <50 bpm), hypotension (mean arterial pressure <30% of pre operative value), respiratory depression (respiratory rate <8/min), urinary retention were also noted and recorded. Patients

with shivering score >2 was given tramadol 50 mg as rescue drug.

The student's t-test was used to compare intergroup differences and the X2 or Fisher's exact tests were used for categorical variables. The P- values were corrected by the Bonferroni method and a P-value < 0.05 was regarded as statistically significant.

RESULTS

There were no significant differences between the two groups with respect to age, sex, weight, duration of surgery. **[Table1]** The pre op heart rate (HR) and Mean arterial pressure (MAP) were comparable in two group and did not reveal any statistical significance, however there is decrease in both HR and MAP at 20, 40 and 60 min in both groups and the decrease is more in group C compare to group D and was found to be statistically significant (p<0.05)**. [Table2]** 45(90%) patients in group D developed grade 0 on shivering scale compare to 38(76%) patients in group C, grade 1 developed in 8(16%) patients in group C compare to 3(6%) patients in group D, grade 2 developed in 4(8%) patients in group C in compare to 2(4%) patients in group D and on statistical comparison none is found to be significant (p>0.05). **[Table3]** The sedation scores was observed to be higher in group D and was found to be statistically significant (p<0.05). **[Table4]** No significant untoward side effects were seen in both the groups.

DISCUSSION

Shivering is a thermoregulatory response to hypothermia to increase the metabolic heat production. Three principal reasons are there for hypothermia under spinal anaesthesia. First, it leads to an internal redistribution of heat from the core to the peripheral compartment. Second, there is thermoregulatory loss of vasoconstriction below the level of the spinal block. Third, there is altered thermoregulation under the central neuraxial block, characterized by a decrease in shivering thresholds.[8]

Shivering unfortunately presents as a common peri-operative problem causing hypertension, tachycardia and increase metabolic demands. Many pharmacological and non-pharmacological methods are used to prevent heat loss and decrease shivering. Non-pharmacological methods include radiant heat warmers, warming the operation theatre, blankets, warm IV fluids and using anaesthetic drugs at body temperature.[9]

Clonidine is an established antishivering drug, additionally it has well known sedative effects.[10][11] In antishivering studies, the sedative effects were noticed when clonidine was used in a dose of 3µg/kg.[12][13] Some studies have shown that lower doses were also effective in the reduction of shivering, so to minimise adverse effects, Clonidine was decided to administered in a dose of 75µg.[10][14] Dexmedetomidine, is a short acting potent α2-adrenoceptor agonist with an eight times higher affinity for the α2-adrenoceptor than clonidine with less hypotensive effect and an added a sedative effect. Dexmedetomidine has sedative and analgesia-sparing effects via central actions in the locus coeruleus and in the dorsal horn of the spinal cord, respectively.[15]

In our study we found that both dexmedetomidine and clonidine decreased the incidence of shivering but data was found to be statistically insignificant. Sedation score was higher with dexmeditomidine. In a study conducted in 2007 by Burhanettin usta et al, it was found that Dexmedetomidine exerts its dual effects while avoiding vasoconstriction and increasing the level of the shivering threshold.[16]

Dexmedetomidine displays specific and selective α2-adrenoceptor agonism in the brain and spinal cord. The responses to activation of these receptors include decreased sympathetic tone with attenuation of the neuroendocrine and hemodynamic responses to anesthesia and surgery. Thus, dexmedetomidine can attenuate the unwanted effects of shivering provoked by hypothermia, such as increased catecholamine concentrations, oxygen consumption, blood pressure, and heart rates.[17]Dexmedetomidine exerts its dual effects while avoiding vasoconstriction and increasing the level of the shivering threshold. Bicer and colleagues found the incidence of shivering as 15% with dexmedetomidine and 55% with placebo following general anesthesia.[15]

CONCLUSION

Dexmedetomidine and clonidine are comparable for prophylaxis of postspinal shivering. The hemodynamic profile remained more stable in patients receiving Dexmedetomidine. The sedation scores were higher in most patients receiving dexmedetomidine than clonidine. Dexmedetomidine may emerge as an alternative to clonidine for prophylaxis of postspinal shivering in short duration cases, with a better sedation profile and better haemodynamic stability.

Table1. Demographic Characteristics Data are Mean+/-SD, number (%)

	Group C (n=50)	Group D (n=50)	P Value
AGE	41.60+/-11.19	42.78+/-10.96	>0.05
SEX	M:8(16),F:42(84)	M:11(22),F:39(78)	>0.05
WEIGHT	68.2+/-5.4	66.8+/-4.8	>0.05
SURGERY DURATION	60.8+/-8.2	62.4+/-7.8	>0.05

*P <0.05 significant

Table2. Vital Parameters of Patients Data are Mean+/-SD

Vital Parameters	Group C (n=50)	Group D (n=50)	P Value
HR 0	78+/-3.4	78.6+/-2.7	0.082
20	70+/-1.8	73.3+/-2.7	0.0001
40	66.1+/-4.2	70.4+/-2.1	0.0001
60	68+/-2.1	70.1+/-2.3	0.0005
MAP 0	94.2+/-9	96.1+/-8.6	0.40
20	72.1+/-8.8	78.6+/-8.2	0.004
40	75.4+/-6.8	80.5+/-6.7	0.004
60	82.6+/-7.2	87.1+/-6.3	0.012

*P <0.05 significant

Table3. Comparative Incidence of Grade of Shivering in Both Groups

Shivering grade	Group C (n=50) (%)	Group D (n=50) (%)	P Value
0	38(76)	45(90)	0.11
1	8(16)	3(6)	0.20
2	4(8)	2(4)	0.67
3	0	0	-
4	0	0	-

*P <0.05 significant

Table4. Sedation Score Between Both Groups

Sedation score	Group C (n=50) (%)	Group D (n=50) (%)	P Value
0	43(86)	24(48)	.0001
1	6(12)	18(36)	.01
2	1(2)	8(16)	.03
3	0	0	-
4	0	0	-

*P <0.05 significant

References

1. De Witte J, Sessler DI. Perioperative shivering: physiology and pharmacology. Anaesthesiology. 2002;96:467–484.
2. Kranke P, Eberhart LH, Roewer N, Tramer MR. Pharmacological treatment of postoperative shivering: a quantitative systematic review of randomized controlled trials. Anesth Analg. 2002;94:453–460.
3. Bhattacharya PK, Bhattacharya L, Jain RK, Agrarwal RC. Post anaesthesia shivering (PAS): A review. Indian J Anaesth. 2003; 47 (2): 88–93.
4. Macintyre PE, Pavlin EG, Dwersteg JF. Effect of meperidine on oxygenconsumption, carbon dioxide production, and respiratory gas exchangein postanesthesia shivering. Anesth Analg. 1987; 66: 751.
5. Zhang Y, Wong KC. Anesthesia and postoperative shivering: its etiology, treatment and prevention. Acta Anaesthesiol Sin. 1999;37:115–120.
6. Buggy D, Higgins P, Moran C, O'Donovan F, McCarroll M.Clonidine at induction reduces shivering after generalanesthesia. Canadian journal of anesthesia = Journal canadien d'anesthesie 1997;44:263-7.
7. Tsai YC, Chu KS. A comparison of tramadol, amitriptyline, andmeperidine for postepidural anesthetic shivering in parturients. Anesth Analg. 2001; 93: 1288-92.
8. Matsukawa T, Sessler DI, Christensen R, Ozaki M, Schroeder M. Heat flow and distribution during epidural anesthesia. Anesthesiology 1995; 83: 961-7.
9. Shukla U, Malhotra K, Prabhakar T. A comparative study of the effect of clonidine and tram-

adol on post-spinal anaesthesia shivering. Ind. J. Anaesth 2011; 55(3): 242-246.
10. Delaunay L, Bonnet F, Liu N, Beydon L, Catoire P, Sessler DI. Clonidine comparably decreases the thermoregulatory threshold for vasoconstriction and shivering in humans. Anesthesiology 1993; 79: 470-4.
11. Sia S. I.v. clonidine prevents post-extradural shivering. Br J Anaesth 1998; 81:145-6.
12. Piper SN, Maleck WH, Boldt J, suttner SW, Schmidt CC, Reich DGP. A comparison of clonidine, meperidine and placebo in preventing postanesthetic shivering. Anesth Analg 2000; 90:954-7
13. Piper SN, Maleck WH, Boldt J, Suttner SW, Schmidt CC, Reich DGP. A comparison of urapidil, clonidine, meperidine and placebo in preventing postanesthetic shivering. Anesthesia and Analgesia 2000; 90: 954–7.
14. Buggy D, Higgins P, Moran C, O'Donovan F, McCarroll M. Clonidine at induction reduces shivering after general anaesthesia. Canadian Journal of Anaesthesia 1997; 44: 263–7.
15. Bicer C, Esmaoglu A, Akin A, Boyaci A. Dexmedetomidine and meperidine prevent postanesthetic shivering. European journal of anaesthesiology 2006; 23: 149-53.
16. Burhanettin Usta, Muhammet Gozdemir, et al. Dexmedetomidine for the prevention of shivering during spinal anesthesia, clinics (Sao Paulo).2011 July: 66 (7); 1187-1191.
17. Frank SM, Higgins MS, Breslow MJ, Fleisher LA, Gorman RB, Sitzmann JV, et al. The catecholamine, cortisol, and hemodynamic responses to mild perioperative hypothermia. Anesthesiology.1995; 82:83–93.