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A comparative study of Dexmedetomidine and Tramadol for prevention of post-spinal anesthesia shivering.

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Abstract.

Introduction

Shivering, a physiological response to core hypothermia is a common side effect of subarachnoid block. It increases the oxygen consumption by 200% to 400%, increases carbon dioxide production, increases wound pain and delayed the discharge from the post anesthesia care unit. In this study a comparison has been made to evaluate the effect of dexmedetomidine and tramadol in controlling shivering following spinal anesthesia.

Materials and Methods.

60 patients of ASA grade I and II were divided into two groups. On occurrence of grade 3 or 4 shivering, one group was administered 0.5µgm/kg of dexmedetomidine and the other group was administered 0.5mg/kg of tramadol. Both the drugs were diluted to 5ml volume and administered slow over 5 minutes. If there was any recurrence of shivering each study drug was repeated. The patients were recorded for the time taken for cessation of shivering, recurrence rate, effectiveness of the drug and any side effects.

Observations and discussions.

Both groups were comparable with respect to age, gender, ASA grade, duration of surgery and the duration of spinal anesthesia. The time taken for cessation of shivering was 3.45 ± 1.23 minutes in dexmedetomidine group whereas it was 5.27 ± 1.08 minutes in tramadol group which is statistically significant. The response rate and recurrence rate was comparable in both the groups. The incidence of nausea and vomitting was significantly higher in tramadol group as compared to dexmedetomidine group whereas the incidence of sedation was comparable in both the groups.

Key words: Shivering, Hypotension, Sedation, Nausea and vomiting.

Introduction.

Shivering, a common post-anesthesia occurrence is defined as an involuntary, repetitive contraction of skeletal muscles. The incidence of shivering is approximately 40-50% in different studies[1]. It can double or even triple oxygen consumption and carbon dioxide production [2]. Shivering increases intraocular and intracranial pressure, and may contribute to increased wound pain, delayed wound healing, and delayed discharge from post-anesthesia care unit [3,4]. The causes of intra and post-operative shivering are loss of body temperature, increased sympathetic tone, pain, and release of pyrogens. Spinal anesthesia significantly impairs thermoregulation by inhibiting tonic vasoconstriction, which plays a

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significant role in temperature regulation. It also redistributes core heat from the trunk to the peripheral tissues [5].

The non-pharmacological management of shivering is use of forced air warming, warming blankets, warmed fluids etc. The most frequently used pharmacological interventions include clonidine, pethidine, tramadol, nefopam and ketamine[6]. No gold standard treatment is available till date. Every drug has its own side effects which are taken care during its administration.

During the last decade, Tramadol, a favoured and commonly used drug for post-spinal anesthesia shivering has many adverse effects like nausea, vomiting, dizziness etc. Dexmedetomidine, a highly selective α2-adrenoceptor agonist has been used as a sedative agent and is known to reduce the shivering threshold[7]. Few studies which have explored its antishivering potential have inferred, dexmedetomidine is an effective drug without any major adverse effect and provides good haemodynamic stability[7-8]. Mittal Geeta, Gupta K , Katyal S etal (2014) [9] evaluate and compare the efficacy, haemodynamic and adverse effects of dexmedetomidine with tramadol, for post-spinal anesthesia shivering and found that time taken for cessation of shivering was significantly less with dexmedetomidine when compared to tramadol. Nausea and vomiting was observed only in tramadol group (28% and; 20% respectively). There was not much difference in the sedation profile of both the drugs. However, dexmedetomidine has few adverse effects, whereas tramadol is associated with significant nausea and vomiting. Karaman S, Gunusen I, Ceylan MA et al (2013) [10]conducted the study to evaluate the efficacy of dexmedetomidine in preventing post operative shivering and concluded that intraoperative dexmedetomidine infusion reduces postoperative shivering in patients undergoing gynaecologic laparoscopy .

Hence, this study was planned to do a comparative study of the efficacy, hemodynamic, and adverse effects of tramadol and dexmedetomidine when used for the control of post-spinal anesthesia shivering.

Materials and methods

The present study was conducted at S.C.B Medical College , Cuttack after approval by the Institutional Ethical Committee over a period of 12 months from November 2019 to October 2020 . Written informed consents were obtained from each patient recruited in this study. It is a prospective, randomized, double blind study including 60 patients, 30 in each group.

Group D (n = 30) received Dexmedetomidine 0.5 μg/kg i.v.

Group T (n = 30) received Tramadol 0.5 mg/kg i.v.

Patient undergoing elective lower abdominal, lower limb, orthopaedic and plastic surgeries under spinal anaesthesia, age 18-65 years, ASA grade I and II were included in the study. Patients with known hypersensitivity to dexmedetomidine or tramadol, hyperthyroidism, psychiatric disorder, severe diabetes or autonomic neuropathies, known history of substance or alcohol abuse and patients receiving any medication for cardiac, pulmonary, renal or hepatic disease were excluded from the study.

On the day before surgery base line investigations, preanaesthetic check up was done and patients were kept nil per oral six hours before surgery. Before starting the procedure, standard monitors such as heart rate , non-invasive blood pressure (NIBP), oxygen saturation (SpO2), electrocardiography (ECG) and body temperature (axillary) were recorded. Subarachnoid anesthesia was administered with 0.5% bupivacaine heavy (15 mg) at L3-L4 or L4-L5 interspace using 25G Quincke's spinal needle. Operation theatres were maintained at an ambient temperature of 24°C-25°C. Supplemental oxygen was administered at 5 l/min with face mask. IV fluids and anesthetics were administered at ambient temperature. Vital parameters such as HR, NIBP, and SPO2 were recorded at intervals of every 5 min for first 30 min, every 15 min for 60 min and then every 60 min for the rest of the observation period. Shivering grade was assessed and the patients with grade 3 or 4 were enrolled and included in the study.

The drugs were diluted to a volume of 5 ml in a 5 ml syringe and presented as coded syringes as per randomization list and was administered slow IV over 10 minutes.

Shivering was graded using a four point scale as per Wrench [11].

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Grade 0: No shivering

Grade 1: One or more of the following: Piloerection, peripheral vasoconstriction, peripheral cyanosis, but without visible muscle activity

Grade 2: Visible muscle activity confined to one muscle group

Grade 3: Visible muscle activity in more than 1 muscle group

Grade 4: Gross muscle activity involving the whole body.

The patients were recorded for start of shivering after spinal anesthesia, severity of the shivering, time to the disappearance of shivering and response rate (shivering ceasing within 15 min after treatment). Duration of surgery and duration of spinal anaesthesia was noted by assessing spontaneous recovery of sensory block using the pin-prick method and observing spontaneous movements of limbs in the post-operative period. Recurrence of shivering was also noted. In case there was recurrence of shivering, patients were treated with an additional dose of dexmedetomidine (0.5 μg/kg IV) or tramadol (0.5 mg/kg IV) in the respective groups. Adverse effects like nausea, vomiting, bradycardia (<50/min), hypotension (<20 % of baseline), dizziness and sedation score were noted.

The degree of sedation was graded on a four point scale as per Filos et al [12].

Grade 1: Awake and alert,

Grade 2: Drowsy, responsive to verbal stimuli,

Grade 3: Drowsy, arousable to physical stimuli,

Grade 4: Unarousable.

Nausea and vomiting were treated with injection ondansetron 4mg IV as and when required.

Statistical analysis

Numerical data were presented as mean±SD and categorical data as proportion. The comparison of the mean levels of all variables between two groups were made by the independent t-test. *P* value was calculated and $P < 0.05$ was considered to be statistically significant.

Observations

TABLE 1: AGE DISTRIBUTION OF TWO GROUPS

	GROUP D	GROUP T	*P* VALUE
AGE MEAN ± SD	38.87 ± 11.35	37.30 ± 10.60	0.583
MALE	16 (53.33%)	18 (60%)	0.602
FEMALE	14 (46.66)%	12 (40%)	0.602

The mean age and sex for two groups were comparable.

TABLE 2: DURATION OF SURGERY IN TWO GROUP

GROUP	DURATION OF SURGERY(MINUTES) MEAN ± SD	*P* VALUE
GROUP D	61.23±13.597	0.231
GROUP T	57.13±12.613	

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The p value between two groups had been calculated using independent t test.The mean duration of surgery for two groups were comparable.

TABLE 3 : DURATION OF SPINAL ANAESTHESIA IN TWO GROUPS

DURATION OF SA (MINUTES)	GROUP D (%)	GROUP T (%)
90-110	5 (16.66%)	6 (20%)
111-130	14 (46.66%)	11 (36.66%)
131-150	11 (36.66%)	13 (43.33%)
TOTAL	30	30

3(B)

GROUP	DURATION OF SA (MINUTES) MEAN ± SD	*P* VALUE
GROUP D	124.23±14.75	0.865
GROUP T	124.90±15.441	

The mean duration of spinal anesthesia for two groups were comparable.

TABLE 4 : ONSET OF SHIVERING IN TWO GROUPS

Onset of shivering (Minutes)	Group D(%)	Group T(%)
	4 (13.33%)	6 (20%)
16-20	8 (26.66%)	9 (30%)
21-25	14 (46.66%)	11 (36.66%)
26-30	4 (13.33%)	4 (13.33%)
TOTAL	30	30

4(B)

GROUP	ONSET OF SHIVERING (MINUTES) MEAN ± SD	*P* VALUE
GROUP D	21.53 ±4.15	0.369
GROUP T	20.50 ± 4.60	

The p value between two groups had been calculated using independent t test and it showed that the mean onset of shivering for two groups were comparable.

TABLE-5(A); TIME FOR CESSATION OF SHIVERING IN TWO GROUPS

TIME FOR CESSATION (MINUTES)	GROUP D (%)	GROUP T (%)
2.0-3.0	15 (50%)	3 (10%)
3.1-4.0	5(16.7%)	1 (3.3%)
4.1-5.0	5(16.7%)	6 (20%)
5.1-6.0	4(13.3%)	14 (46.7%)
6.1-7.0	1 (3.3%)	6 (20%)

5(B)

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GROUP	TIME FOR CESSATION (MINUTES) MEAN ± SD	*P* VALUE
GROUP D	3.45 ± 1.23	0.001
GROUP T	5.27 ± 1.08	

The p value between two groups had been calculated using independent t- test and it showed that the mean time for cessation of shivering was significantly less in Group D than Group T (*p* value <0.05).

TABLE 6: RECURRENCE OF SHIVERING IN TWO GROUPS

RECURRENCE	GROUP D(%)	GROUP T(%)	*P* VALUE
PRESENT	1(3.3)	2(6.6)	0.50
ABSENT	29(96.7)	28(93.4)	

The difference between two groups were found to be statistically insignificant (*p* value > 0.05)

TABLE 7 : RESPONSE RATE (%) IN TWO GROUPS

RESPONSE RATE (%)	GROUP D	GROUP T
RESPONDER	100	100
NON RESPONDER	0	0

TABLE 8 : ADVERSE EFFECTS IN TWO GROUPS

ADVERSE EFFECT	GROUP D(%) n=30	GROUP T(%) n=30
NAUSEA	0	8(26.7)
VOMITING	0	8(26.7)
SEDATION	6(20)	7(23.3)
HYPOTENSION	0	0
BRADYCARDIA	0	0
RESPIRATORY DEPRESSION	0	0

TABLE 9 : SEDATION SCORE IN TWO GROUPS

GROUP	1	2	3	4
GROUP D	0	6	0	0
GROUP T	0	7	0	0

The above table shows sedation score of two groups.

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TABLE 10 : INTRAOPERATIVE BODY TEMPERATURE IN ^{O}C OF TWO GROUPS

TEMPERATURE	GROUP D	GROUP T	*P* VALUE
BASELINE	36.39± 0.20	36.41± 0.22	0.724
5MIN	35.39± 0.23	35.44± 0.24	0.370
10MIN	35.41± 0.19	35.50± 0.22	0.090
15MIN	35.46± 0.17	35.50± 0.19	0.508
20MIN	35.43± 0.14	35.52± 0.22	0.060
25MIN	35.46± 0.18	35.49± 0.19	0.590
30MIN	35.84± 0.21	35.90± 0.15	0.230
45MIN	35.52± 0.18	35.60± 0.20	0.110
60MIN	36.08± 0.21	36.14± 0.21	0.283
1HR30MIN	35.58± 0.24	35.54± 0.19	0.595
2HR	35.49± 0.24	35.47 ± 0.21	0.716
2HR30MIN	35.49± 0.20	35.49± 0.19	0.948

Discussion

Shivering is a distressing experience for the patient undergoing surgery under regional anesthesia. The causes of shivering include impairment of central thermoregulation, internal redistribution of body heat due to vasodilatation, and heat loss to the environment. Potential risk factors for hypothermia in spinal anesthesia include age, gender, BMI, duration of anesthesia and surgery, level of sensory block, temperature of the operation theatre, IV fluids etc.

Tramadol is an opioid analgesic with opioid effect mainly mediated via μ receptor with minimal effect on kappa and delta receptors. Tramadol activates the monoaminergic receptors of the descending spinal inhibitory pain pathway. The anti-shivering action of tramadol is mediated via its opioid or serotonergic and noradrenergic activity or both[13-15]. It is a most frequently used agent in the treatment of post-anesthesia shivering.

Dexmedetomidine is an α2 adrenoceptor agonist with antihypertensive, sedative, analgesic and anti-shivering properties[16]. The anti shivering effects of α adrenoceptor agonists are mediated by binding of these drugs to α2 receptors that mediate vasoconstriction and the anti shivering effects. It also has hypothalamic thermoregulatory activity[17]. Dexmedetomidine comparatively reduces the vasoconstriction and shivering thresholds as it acts primarily on the central thermoregulatory systems rather than preventing shivering peripherally[18]. It has been used successfully as an adjunct to local anesthetic agents in spinal anesthesia and regional nerve blocks, for sedation of mechanically ventilated patients in the intensive care units and as a supplemental agent in post operative analgesia[16,19].

Both the groups were comparable with respect to age, gender, ASA status and the duration of spinal anaesthesia. The duration of surgery varied from 30 min to 90 min. Duration of spinal anaesthesia ranged from 90 minutes to 150 minutes which was similar to the study conducted by Mittal G. et al[9] . All the patients had Grade 3 shivering. There was no statistically significant difference in time for the onset of shivering between the two groups which was similar with the study of Mittal G. et al[9] .The time interval between the administration of drug and cesation of shivering was significantly shorter in the

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dexmedetomidine group as compared to tramadol group. This finding were similar with study conducted by Mittal G.et al[9]. Recurrence of shivering was observed in one patient in dexmedetomidine group and two patients in tramadol group. The patients were given rescue doses of dexmedetomidine or tramadol, respectively. Maheshwari et al.[20] reported almost similar recurrence rate with tramadol as in our study (6.6%) but the dose used in their study was 1 mg/kg[20]. The recurrence rate in the study by Shukla et al.[21] was 5%, which is similar to our results. With same dose, that is, 0.5 mg/kg of tramadol, the response rate reported by Shukla et al.[21] was 92.5%, by Reddy and Chiruvella[22] as 95.56% and by Tsai and Chu, 87%[23].

The incidence of nausea and vomiting was 26.7% in tramadol group in our study. The results correspond with that of other studies by Reddy and Chiruvella[22], Tsai and Chu[23]; Bansal and Jain[24] However, in the study by Shukla et al.[21], the incidence of nausea was quite high (77.5%), whereas Wason et al. have reported 4% incidence of nausea and vomiting[25]. These variations could be explained by the peculiar patient characteristics in different studies. Maheshwari et al[20] have reported a 84% sedation rate where as we found 24% sedation rate in tramadol group in our patients.

. In our study, the incidence of sedation was 20% in dexmedetomidine group, which is similar to other studies. But Karaman et al found intra-operative dexmedetomidine infusion caused negligible sedation inspite of using a loading dose of 1 μg/kg followed by a maintenance infusion of 0.5 μg/kg/h[10]. Almost similar number of patients were sedated in both groups and the sedation score in all the patients was 2 which was similar with the study conducted by Mittal G. et al[9]. Respiratory depression, hypotension or bradycardia were not recorded in any patients in both the study groups. Heart rate, mean blood pressure, body temperature, and SPO2 remained within normal limits throughout the procedure in both groups which was similar with the study conducted by Mittal G. et al .

So to conclude dexmedetomidine takes lesser time to control shivering than tramadol. The incidence of adverse effects like nausea and vomiting was found to be higher in patients receiving tramadol as compared to dexmedetomidine.

Bibliography

1. De Witte J, Sessler DI. Perioperative shivering: Physiology and pharma- cology. Anesthesiology 2002;96:467-84.
2. Bhattacharya P, Bhattacharya L. Postanaesthetic shivering (PAS): A review. Indian J Anaesth 2003;47:88-93.
3. Katyal S, Tewari A. Shivering: Anaesthetic considerations. J Anaesth Clin Pharmacol 2002;18:363-76.
4. Kranke P, Eberhart LH, Roewer N, Tramèr MR. Pharmacological treatment of postoperative shivering: A quantitative systematic review of randomized controlled trials. Anesth Analg 2002;94:453-60.
5. Sessler DI. Temperature regulation and monitoring. In: Millar RD, editor. 7th ed. Textbook of Anaesthesia. New York: Churchill Livingstone Inc.; 2010. p. 1533-56.
6. Park SM, Mangat HS, Berger K, Rosengart AJ. Efficacy spectrum of antishivering medications: Meta-analysis of randomized controlled trials. Crit Care Med 2012;40:3070-82.
7. Bajwa SJ, Gupta S, Kaur J, Singh A, Parmar S. Reduction in the incidence of shivering with perioperative dexmedetomidine: A randomized prospective study. J Anaesthesiol Clin Pharmacol 2012;28:86-91.
8. Usta B, Gozdemir M, Demircioglu RI, Muslu B, Sert H, Yaldiz A. Dexmedetomidine for the prevention of shivering during spinal anesthesia. Clinics (Sao Paulo) 2011;66:1187-91.
9. Mittal G, Gupta K, Katyal S, Kaushal **S**. Randomised double-blind comparative study of dexmedetomidine and tramadolMay 2014Indian Journal of Anaesthesia 58(3):257-62

ISSN:0975-3583,0976-2833 VOL13,ISSUE05,2022

10. Karaman S, Gunusen I, Ceylan MA, Karaman Y, Cetin EN, Derbent A, et al. Dexmedetomidine infusion prevents postoperative shivering in patients undergoing gynaecologic laparoscopic surgery. Turk J Med Sci 2013;43:232-7.
11. Wrench IJ, Singh P, Dennis AR, Mahajan RP, Crossley AW. The minimum effective doses of pethidine and doxapram in the treatment of post- anaesthetic shivering. Anaesthesia 1997;52:32-6.
12. Filos KS, Goudas LC, Patroni O, Polyzou V. Hemodynamic and analgesic profile after intrathecal clonidine in humans. A dose-response study. Anesthesiology 1994;81:591-601.
13. Lee CR, McTavish D, Sorkin EM. Tramadol. A preliminary review of its pharmacodynamic and pharmacokinetic properties, and therapeutic potential in acute and chronic pain states. Drugs 1993;46:313-40.
14. Mathews S, Al Mulla A, Varghese PK, Radim K, Mumtaz S. Postanaesthetic shivering – A new look at tramadol. Anaesthesia 2002;57:394-8.
15. Tsai YC, Chu KS. A comparison of tramadol, amitriptyline, and meperidine for postepidural anesthetic shivering in parturients. Anesth Analg 2001;93:1288-92.
16. Grewal A. Dexmedetomidine: New avenues. J Anaesthesiol Clin Pharmacol 2011;27:297-302.
17. Bajwa SJ, Bajwa SK, Kaur J, Singh G, Arora V, Gupta S, et al. Dexmedetomidine and clonidine in epidural anaesthesia:A comparative evaluation. Indian J Anaesth 2011;55:116-21.
18. Talke P, Tayefeh F, Sessler DI, Jeffrey R, Noursalehi M, Richardson C. Dexmedetomidine does not alter the sweating threshold, but comparably and linearly decreases the vasoconstriction and shivering thresholds. Anesthesiology 1997;87:835-41.
19. Kamibayashi T, Maze M. Clinical uses of alpha2 -adrenergic agonists. Anesthesiology 2000;93:1345-9.
20. Maheshwari BS, Shah SK, Chadha IA. Tramadol and butrophanol for control of shivering: Randomised double blind comparative study. J Anaesth Clin Pharmacol 2008;24:343-6.
21. Shukla U, Malhotra K, Prabhakar T. A comparative study of the effect of clonidine and tramadol on post-spinal anaesthesia shivering. Indian J Anaesth 2011;55:242-6.
22. Reddy VS, Chiruvella S. Clonidine versus tramadol for post spinal shivering during caesarean section: A randomized double blind clinical study. J Obstet Anaesth Crit Care 2011;1:26-9.
23. Tsai YC, Chu KS. A comparison of tramadol, amitriptyline, and meperidine for postepidural anesthetic shivering in parturients. Anesth Analg 2001;93:1288-92.
24. Bansal P, Jain G. Control of shivering with clonidine, butorphanol, and tramadol under spinal anesthesia: A comparative study. Local Reg Anesth 2011;4:29-34.
25. Wason R, Jain N, Gupta P, Gogia AR. Randomized double-blind comparison of prophylactic ketamine, clonidine and tramadol for the control of shivering under neuraxial anaesthesia. Indian J Anaesth 2012;56:370-5.