OPEN ACCESS
Saudi Journal of Medicine
Abbreviated Key Title: Saudi J Med
ISSN 2518-3389 (Print) |ISSN 2518-3397 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com/journal/sjm/home

Original Research Article

Efficacy of Dexmedetomidine, Tramadol and Pethidine in the Management of Shivering In Cased Under Spinal Anaesthesia – A Comparative Study

Dr. V. Umamaheswara Rao[1], Dr. Mittapally Shankar[2*]

[1]Associate Professor, Maheshwara Medical College & Hospital, Isnapur, Patancheru, Sangareddy, Telangana, India
[2]Assistant Professor, MNR Medical College& Hospital, Fasalwadi, Sangareddy, Medak, Telangana, India

***Corresponding author:** Dr. Mittapally Shankar
| **Received:** 03.06.2019 | **Accepted:** 10.06.2019 | **Published:** 30.06.2019
DOI: 10.36348/sjm.2019.v04i06.003

Abstract

Introduction: Incidence of shivering after spinal anaesthesia is common complaint in present anaesthesia practice. Several drugs available to manage shivering such as Pethidine, Tramadol, Dexmedetomidine etc. Among all Dexmedetomidine is effective. This study was designed to assess the efficacy of Dexmedetomidine, Tramadol and Pethidine in the management of shivering under spinal anaesthesia. ***Materials and Methods:*** A total 120 cases between age group 21 to 60 years, undergoing elective lower abdominal and lower limb surgeries under spinal anaesthesia method between ASA grade I&II were recruited. Based on drug administered study cases were randomly divided into 3 groups Group 1 with Inj. Tramadol 0.5mg/kg, Group 2 with Inj. Pethidine 0.5mg/kg and Group 3 with Inj. Dexmedetomidine 0.5µg/kg. Heart rate, BP, temperature, Shivering grades and seduction grades was noted for every 5 minutes interval till 15 min and then 15 min interval till 120 minutes. ***Results:*** Dexmedetomidine drug was showed better outcome than other drugs. Among the 40 cases, three cases who were given dexmedetomidine had shivering. In tramadol and Pethidine drug groups, 22 and 9 cases had shivering respectively at various time intervals. Dexmedetomidine had onset of sedation at 5 minutes with sedation score 3. In tramadol group, onset of sedation was seen at 15 minutes with sedation score 2. In Dexmedetomidine group, 5 cases had bradycardia and 3 cases had hypotension which was statistically not significant. None of the cases with above symptoms was found in tramadol and Pethidine group. ***Conclusion:*** Dexmedetomidine 0.5 µg/kg has been shown effective in reducing shivering than tramadol 0.5 mg/kg and Pethidine 0.5 mg/kg. Dexmedetomidine had higher degree of sedation rate than tramadol and Pethidine.

Keywords: Shivering, Pethidine, Tramadol, Dexmedetomidine, Sedation.

INTRODUCTION

Postoperative shivering is the sixth most common condition associated with anaesthesia practice. In 33% of cases recovering from regional anaesthesia and 5-65% of cases recovering from general anaesthesia has incidence of postoperative shivering [1, 2]. Shivering is an involuntary and repetitive muscular activity usually seen in 40-50% cases under spinal anaesthesia [3].

Numerous drug choices available to manage and prevent postoperative shivering i.e. pethidine, tramadol, dexmedetomidine, physostigmine, clonidine, ketamine, and magnesium. But these drugs have side effects such as bradycardia, hypotension and respiratory depression. Dexmedetomidine is a highly selective α-2 adrenoreceptor agonist a preferable choice among all due to its dual effects of anti-shivering and sedation [4-6].

Taramadol, a centrally acting analgesic drug inhibits the neuronal reintake of noradrenaline and 5-hydroxytryptamine. It also facilitates 5-HT release and activates the µ-opioid receptors which influence thermoregulatory control [7]. Study by Chan *et al.*, found tramadol is effective in reducing postoperative shivering during Caesarean delivery [8]. Pethidine, an opioid derivative, acts directly on the thermoregulatory centre and reduces shivering [9]. Dexmedetomidine, a potent alpha 2-adrenergic receptor agonist, is effective to reduce shivering threshold and is an effective sedative agent. This study was designed to evaluate the efficacy of Dexmedetomidine, Tramadol and Pethidine in the management of shivering under spinal anaesthesia.

MATERIALS AND METHODS

The present prospective study was conducted in Department of Anaesthesiology, MNR Medical College and Hospital, Sangareddy and Maheshwara Medical College, Patancheru during December 2017 to September 2018. A total 120 cases between age group 21 to 60 years, undergoing elective lower abdominal and lower limb surgeries under spinal anaesthesia method were recruited. Cases fulfilling the selection criteria and belongs to ASA grade I or II were included. Cases with renal & cardiovascular complications, hyper or hypothyroidism, Adverse to the study drugs, pregnancy, lactation and not willing to participate were excluded from the study.

Study cases were divided randomly into 3 groups. Group 1 administered with Inj. Tramadol 0.5mg/kg in 100 ml NS, Group 2 administered with Inj. Pethidine 0.5mg/kg in 100 ml NS and Group 3 administered with Inj. Dexmedetomidine 0.5µg/kg in 100 ml NS. All the patients were placed in the right lateral decubitus position and under strict aseptic precautions, subarachnoid block performed in L3-4 interspace after infiltrating skin with 2 ml of 2% lignocaine. 25G quincke needle was inserted intra thecally and 15mg of 0.5% hyperbaric bupivacaine (3ml) injected after checking for free flow of clear CSF. Patients were turned to supine position and infusion of the study drug in 100ml NS by a blinded observer over 10 minutes in a three way adapter along with IV fluid administration at 6ml/kg/hr. Inj. Ondansetron 4mg IV was given to all the patients. Surgery will commence when the level of sensory block reaches T8. Patients were monitored for a period of 120 minutes or the end of the surgery whichever was longer. Heart rate, BP, SpO2 and temperature was noted for every 5 minutes interval till 15 min and then 15 min interval till 120 minutes.

Seduction was evaluated by four grade point scale according to Filos *et al.*, [10] i.e. Grade 1 - awake and alert, Grade 2 – response to vertebral stimuli and drowsy, Grade 3 – arousable to physical stimuli and drowsy and Grade 4 – unarousable.

Shivering was assessed by grading system according to Wrench *et al.*, [11].

Grade	Features
Grade 0	Without shivering
Grade 1	Peripheral vasoconstriction, peripheral cyanosis, piloerection
Grade 2	Muscular activity of one group muscles
Grade 3	Muscular activity of more than one group
Grade 4	Whole body muscular activity

Statistical Analysis

The statistical analysis was conducted by statistical software package SPSS 16.0 using chi-square test.

RESULTS

Table-1: Age wise distribution of cases

Age (In years)	Group 1		Group 2		Group 3	
	Number	Percentage	Number	Percentage	Number	Percentage
21-30	09	22.5%	08	20%	09	22.5%
31-40	10	25%	16	40%	14	35%
41-50	15	37.5%	10	25%	11	27.5%
51-60	06	15%	06	15%	06	15%
Mean ± SD	40.32 ± 8.56		39.21 ± 9.28		40.36 ± 8.86	
P- Value	0.546					

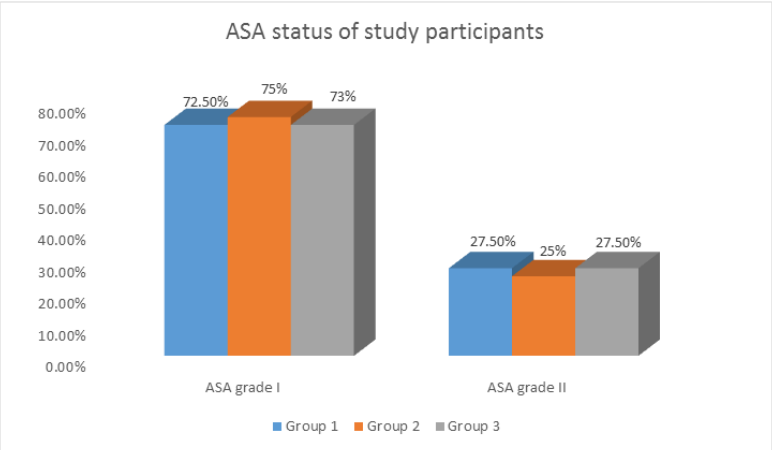

Fig-1: ASA status of study cases

Table-2: Grades of shivering in study participants

		Grades of Shivering					Grades of Sedation			
		G-0	G-1	G-2	G-3	P-Value	G-1	G-2	G-3	P-Value
At 5	Group 1	40	00	00	00	-	40	00	00	0.001
	Group 2	40	00	00	00		40	00	00	
	Group 3	40	00	00	00		11	21	08	
At 10	Group 1	40	00	00	00	-	39	01	00	0.001
	Group 2	40	00	00	00		39	01	00	
	Group 3	40	00	00	00		05	14	21	
At 15	Group 1	30	03	06	01	0.036	32	08	00	0.001
	Group 2	39	00	00	01		17	20	03	
	Group 3	40	00	00	00		05	09	26	
At 30	Group 1	25	11	03	01	0.0028	21	16	03	0.005
	Group 2	35	04	00	01		13	24	03	
	Group 3	39	00	00	01		03	11	26	
At 45	Group 1	35	03	01	01	0.34	24	16	00	0.004
	Group 2	39	00	00	01		13	25	02	
	Group 3	39	01	00	00		04	10	26	
At 60	Group 1	39	00	00	01	0.41	21	18	01	0.000
	Group 2	40	00	00	00		24	14	02	
	Group 3	39	01	00	00		06	19	15	
At 75	Group 1	39	00	01	00	0.38	27	09	04	0.000
	Group 2	39	00	01	00		24	16	00	
	Group 3	40	00	00	00		10	22	08	
At 90	Group 1	40	00	00	00	-	30	10	00	0.001
	Group 2	40	00	00	00		31	09	00	
	Group 3	40	00	00	00		12	24	04	
At 105	Group 1	40	00	00	00	0.28	39	01	00	0.001
	Group 2	39	00	01	00		38	02	00	
	Group 3	40	00	00	00		14	24	02	
At 120	Group 1	40	00	00	00	0.32	40	00	00	0.001
	Group 2	39	00	00	00		40	00	00	
	Group 3	40	00	00	00		40	00	00	

G 0 = No shivering, G 1 = Grade 1 shivering, G 2 = Grade 2 shivering, G 3 = Grade 3 shivering, Group 1= Dexmedetomidine group, Group 2 = Pethidine group, Group 3= Tramadol group.

Table-3: Details of heart rate and details of temperature in study cases

Time (In Min)	Heart rate			P-Value	Temperature			P-Value
	Group 1	Group 2	Group 3		Group 1	Group 2	Group 3	
At 0	81.28	81.95	83.28	0.651	36.32	36.42	36.38	0.440
At 5	80.52	81.02	82.64	0.598	36.24	36.21	36.21	0.572
At 10	80.13	81.62	81.82	0.426	36.24	36.24	36.24	0.698
At 15	81.79	80.84	78.44	0.264	36.10	36.14	36.01	0.634
At 30	81.54	80.12	79.26	0.348	36.14	36.09	36.08	0.645
At 45	81.16	80.41	79.84	0.662	36.18	36.16	36.21	0.701
At 60	80.98	80.98	80.45	0.784	36.24	36.19	36.23	0.522
At 75	80.65	81.22	79.12	0.528	36.16	36.25	36.30	0.224
At 90	79.25	80.68	78.86	0.354	36.34	36.29	36.33	0.108
At 105	78.64	80.26	78.04	0.410	36.45	36.31	36.36	0.664
At 120	79.72	79.64	79.18	0.712	36.52	36.44	36.40	0.498

Table-4: Systolic blood pressure and diastolic blood pressure in study cases

Time (In Min)	Systolic blood pressure (SBP)			P-Value	Diastolic blood pressure (DBP)			P-Value
	G 1	G 2	G 3		G 1	G 2	G 3	
At 0	125.8	125.2	123.7	0.356	76.1	75.2	75.7	0.622
At 5	124.2	121.1	120.1	0.382	73.5	72.8	72.6	0.718
At 10	116.5	115.6	114.3	0.674	69.5	71.1	71.1	0.624
At 15	118.2	117.9	117.8	0.686	70.5	72.5	71.9	0.392
At 30	120.3	118.6	118.2	0.785	71.2	72.6	73.8	0.510
At 45	122.2	118.9	120.5	0.542	72.3	72.1	73.4	0.368
At 60	122.8	120.7	122.8	0.569	72.6	71.9	73.6	0.312
At 75	120.6	121.4	122.4	0.604	72.9	71.8	73.9	0.589
At 90	120.1	121.4	121.3	0.598	72.4	71.4	73.1	0.367
At 105	120.9	121.2	121.2	0.736	72.1	71.2	72.8	0.660
At 120	119.8	120.6	121.0	0.636	72.8	72.1	72.4	0.741

Table-5: Details of usage of rescue drug, Hypotension and Bradycardia of study participants

	Group 1	Group 2	Group 3	P-value
Usage of rescue drug				
Administered	17	05	03	-
Not administered	23	35	37	-
Hypotension				
	0	00	03	0.715
Bradycardia				
	0	00	05	0.067

DISCUSSION

This study included 120 cases between age group 21-60 years with mean age 40.32 years in group 1, 39.12 years in group 2 and 40.36 in group 3 which is statistically not significant (p>0.005) (Table-1). Cases with less than 20 years were excluded due to unable to perform spinal anaesthesia and the geriatric patients will have age related changes which can influence the variables. All study participants based on drug administered were divided randomly in to 3 groups. In group 1, 72.5% cases belong to ASA grade I and 27.5% cases belong to ASA grade II. Whereas in group 2, 75% & 25% and in group 3 73% & 27% belong to ASA grade I & II respectively (Figure-2).

In prevention of shivering, dexmedetomidine drug was showed better outcome than other drugs. Among the 40 cases, three cases who were given dexmedetomidine had shivering. In tramadol and Pethidine drug groups, 22 and 9 cases had shivering respectively at various time intervals (Table-2). Study by Nihar Ameta *et al*., and Bozgeyik *et al*., found that Dexmedetomidine and Tremadol are effective in reducing shivering after spinal anaesthesia [12, 13]. Study by Usta *et al*., found that usage of Dexmedetomidine infusion in the preoperative period decreases shivering in associated with spinal anaesthesia and is adequate for sedation [14]. Study by Nihar Ameta *et al.*, found that the mean heart rate was statistically significant throughout the surgery [12]. Vyas V *et al*., in his study on tramadol and clonidine found that rate of recurrence of shivering was more with tramadol as compared to clonidine [15]. Study by Kundra TS *et al.*, stated that recurrence rate of shivering is more group administered with tramadol than Dexmedetomidine group [16].

During surgical procedure, no specific sedatives was used because all the study drugs leads to a certain degree of sedation. Dexmedetomidine drug was showed effective outcome than other drugs. Dexmedetomidine had onset of sedation at 5 minutes with sedation score 3. In tramadol group, onset of sedation was seen at 15 minutes with sedation score 2. And onset of sedation was slow in this drug group. Study by Bozgeyik *et al.*, stated that Dexmedetomidine had good property and is enough to control the anxiety without any side effects [13].

In Dexmedetomidine drug group, 5 cases had bradycardia and 3 cases had hypotension which was statistically not significant. None of the cases with above symptoms was found in tramadol and Pethidine group. Vyas V *et al*., in his study on tramadol and clonidine found that the rates of Bradycardia and hypotension was lower in tramadol group than clonidine group cases. Whereas mean pulse rate and systolic blood pressure were significantly higher in tramadol group [15]. The mean heart rate and systolic blood pressure and diastolic blood pressure was comparable between all drug groups and was not statistically significant. The axillary temperature between groups was statistically not significant.

Study by Usta *et al*., concluded that preoperative infusion of Dexmedetomidine significantly reduces shivering and is a good choice to reduce shivering in cases undergoing spinal anaesthesia [14]. In the present study Dexmedetomidine was effective in prevention of shivering when compared to tramadol and Pethidine. Dexmedetomidine is a good choice during spinal anaesthesia to prevent shivering. Study by *Arjun Verma* et al., *in their study on* Dexmedetomidine and tramadol stated that Dexmedetomidine when used at a dose of 0.5 µg/kg IV is more effective and rapid than tramadol used at a dose of 0.5 mg/kg IV to treat shivering as developed after spinal anaesthesia without any increased side effects as well as inducing a comfortable sedation for the patient [17]. Study by Sathyamoorthy V *et al.*, found that dexmedetomidine and tramadol were better in the prevention of post spinal shivering. But Dexmedetomidine had better sedation profile with minimal side effects [18]. Study by Lim Ferna and Karis Misiran found that dexmedetomidine, pethidine and tramadol effective in the treatment to controls the shivering under spinal anaesthesia and study concluded that Dexmedetomidine appears to be more effective than Pethidine and tramadol [19]. This study has limitation with minimal sample size, need randomized controlled trials for confirm of outcome.

CONCLUSION

The results of this study concludes that Dexmedetomidine 0.5 µg/kg has been shown effective in reducing shivering than tramadol 0.5 mg/kg and Pethidine 0.5 mg/kg. In related incidence of bradycardia and hypotension, tramadol and Pethidine had minimal incidence rate than Dexmedetomidine. Dexmedetomidine had higher degree of sedation rate than tramadol and Pethidine.

REFERENCES

1. Elvan, E. G., Öç, B., Uzun, Ş., Karabulut, E., Coşkun, F., & Aypar, Ü. (2008). Dexmedetomidine and postoperative shivering in patients undergoing elective abdominal hysterectomy. *European journal of anaesthesiology*, *25*(5), 357-364.
2. Bhukal, I., Solanki, S. L., Kumar, S., & Jain, A. (2011). Pre-induction low dose pethidine does not decrease incidence of postoperative shivering in laparoscopic gynecological surgeries. *Journal of anaesthesiology, clinical pharmacology*, *27*(3), 349-353.
3. Witte, D. J., & Sessler, D. I. (2002). Perioperative shivering: Pathophysiology and Pharmacology. *Anesthesiology*, 96:467-484.
4. Schwarzkopf, K. R., Hoff, H., Hartmann, M., & Fritz, H. G. (2001). A comparison between meperidine, clonidine and urapidil in the treatment of postanesthetic shivering. *Anesthesia & Analgesia*, *92*(1), 257-260.
5. Lenhardt, R., Orhan-Sungur, M., Komatsu, R., Govinda, R., Kasuya, Y., Sessler, D. I., & Wadhwa, A. (2009). Suppression of shivering during hypothermia using a novel drug combination in healthy volunteers. *Anesthesiology: The Journal of the American Society of Anesthesiologists*, *111*(1), 110-115.
6. Alfonsi, P., Passard, A., Gaude–Joindreau, V., Guignard, B., Sessler, D. I., & Chauvin, M. (2009). Nefopam and alfentanil additively reduce the shivering threshold in humans whereas nefopam and clonidine do not. *Anesthesiology: The Journal of the American Society of Anesthesiologists*, *111*(1), 102-109.
7. De Witte, J. L., Kim, J. S., Sessler, D. I., Bastanmehr, H., & Bjorksten, A. R. (1998). Tramadol reduces the sweating, vasoconstriction, and shivering thresholds. *Anesthesia & Analgesia*, *87*(1), 173-179.
8. Chan, A. M. H., Ng, K. F. J., Tong, E. W. N., & Jan, G. S. K. (1999). Control of shivering under regional anesthesia in obstetric patients with tramadol. *Canadian Journal of Anesthesia*, *46*(3), 253-258.
9. Tsai, Y. C., & Chu, K. S. (2001). A comparison of tramadol, amitriptyline, and meperidine for postepidural anesthetic shivering in parturients. *Anesthesia & Analgesia*, *93*(5), 1288-1292.
10. Filos, K. S., Goudas, L. C., Patroni, O., & Polyzou, V. (1994). Hemodynamic and analgesic profile after intrathecal clonidine in humans. A dose-response study. *Anesthesiology*, *81*(3), 591-601.
11. Wrench, I. J., Singh, P., Dennis, A. R., Mahajan, R. P., & Crossley, A. W. A. (1997). The minimum effective doses of pethidine and doxapram in the treatment of post-anaesthetic shivering. *Anaesthesia*, *52*(1), 32-36.
12. Ameta, N., Jacob, M., Hasnain, S., & Ramesh, G. (2018). Comparison of prophylactic use of ketamine, tramadol, and dexmedetomidine for prevention of shivering after spinal anesthesia. *Journal of anaesthesiology, clinical pharmacology*, *34*(3), 352-356.
13. Bozgeyik, S., Mizrak, A., Kılıç, E., Yendi, F., & Ugur, B. K. (2014). The effects of preemptive tramadol and dexmedetomidine on shivering during arthroscopy. *Saudi journal of anaesthesia*, *8*(2), 238-243.
14. Usta, B., Gozdemir, M., Demircioglu, R. I., Muslu, B., Sert, H., & Yaldiz, A. (2011). Dexmedetomidine for the prevention of shivering during spinal anesthesia. *Clinics*, *66*(7), 1187-1191.
15. Vyas, V., Gupta, R., & Dubey, P. (2018). Comparative efficacy and safety of intravenous clonidine and tramadol for control of postspinal anesthesia shivering. *Anesthesia, essays and researches*, *12*(3), 663-668.
16. Kundra, T. S., Kuthiala, G., Shrivastava, A., & Kaur, P. (2017). A comparative study on the efficacy of dexmedetomidine and tramadol on post-spinal anesthesia shivering. *Saudi journal of anaesthesia*, *11*(1), 2-8.
17. Verma, A., Bhandari, D., Dhande, P., Jain, S., & Tidke, S. (2018). Comparative Evaluation of Dexmedetomidine and Tramadol for Attenuation of Post-Spinal Anaesthesia Shivering. *Journal of Clinical & Diagnostic Research*, *12*(6): UC01.
18. Sathyamoorthy, V., Subramanian, A., Karmegam, G., & Anandan, H. (2016). Compare the Efficacy of Dexmedetomidine and Tramadol in Preventing Intraoperative Shivering in Patients Undergoing Elective Lower Abdominal Surgeries Under Subarachnoid Block. *International Journal Of Scientific Study*, *4*(5), 65-69.
19. Fern, L., & Misiran, K. (2015). Comparison of dexmedetomidine, pethidine and tramadol in the treatment of post-neuraxial anaesthesia shivering. *Southern African Journal of Anaesthesia and Analgesia*, *21*(1), 14-18.