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Original Research Article

A Study on Effects of Intravenous Tramadol and Pethidine for Post Operative Shivering of Patients Under Spinal Anaesthesia

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Abstract:

Shivering is very unpleasant and stressful for the patient after undergoing a comfortable analgesic surgery. It may induce arterial hypoxemia, lactic acidosis, increased intracranial pressure and intraocular pressure, interferes with haemodynamics and increase wound pain. Various pharmacological and non-pharmacological methods are available for control of shivering. Drugs like Clonidine, Doxapram, Pethidine, Tramadol etc have been tried but debate on an ideal antishivering drug still continues. Thus in a patient with limited myocardial oxygen reserve or known coronary artery disease, shivering may further compromise myocardial function. Here we are comparing a synthetic opioid, IV Tramadol at 1mg/kg with IV Pethidine 0.5mg/kg, standard drug for treatment of shivering in quest for a safer and more efficacious drug.

Materials and Methods: Seventy four patients who developed shivering after elective surgery under spinal anaesthesia were randomized into two groups each having thirty seven patients-tramadol group (Group 1) and pethidine group (Group 2). Patients were treated with 1mg/kg tramadol (Group 1) and 0.5mg/kg pethidine (Group 2).

Results: After intravenous administration of tramadol 1 mg/kg, cesation of shivering occured immediately. Shivering lasted for more time after administration of pethidine 0.5 mg/kg. Recurrence rate in tramadol group was found to be less than pethidine group. Nausea and vomiting were more in tramadol group.

Conclusions: Intravenous tramadol is more effective than pethidine in controlling post spinal anaesthesia shivering. Tramadol has less response rate and recurrence. It is cheap as compared to pethidine and freely available without drug licence.

Keywords: Tramadol, Pethidine, Postoperative Shivering, Spinal Anaesthesia.

Introduction

Spinal anaesthesia is a popular and safe anaesthetic technique for various surgeries. Around 40-60% of the patients under spinal anaesthesia develop shivering. The incidence varies depending on the type of anaesthesia, gender, age, and the duration of the anaesthesia or the operation. Neutral temperature is defined as ambient temperature that results in least oxygen consumption. It varies according to age. It is 34°C in preterm neonate, 32°C in term neonate, 28°C in adults. Critical temperature is that ambient temperature below which an unclothed, unanaesthetised person cannot maintain normal core body temperature.[1]

Shivering is described as an involuntary, oscillatory muscular activity. It is a physiological response of body to raise core temperature by increasing the metabolic heat production.[2] It may be normal thermoregulatory shivering in response to body's core hypothermia or may be a result of release of cytokines in response to surgical intervention.[3] In a patient with shivering, oxygen consumption may increase by 200-500% along with rise in CO_2 production. In a patient with known coronary artery disease or limited myocardial oxygen reserve, shivering may affect the myocardial function. Shivering elevates intraocular pressure, intracerebral pressure and may increase wound pain. Even though shivering is not a life-threatening process, it can be a discomfort for the patient, and may interfere with pulse oxygen saturation, electrocardiogram and blood pressure monitoring.[4] Tramadol is a synthetic opioid with moderate affinity for mu receptors and weak delta and kappa receptor affinity. It inhibits neuronal reuptake of norepinephrine and 5-HT. It has analgesic action with less chance of depression of

ventilation. Studies[1] have proved that intravenous tramadol in a dose of 1-2 mg/kg is effective in post operative shivering.[2] Tramadol has high safety profile and weak sedative properties. Pethidine is a synthetic opioid agonist at mu and kappa opioid receptors. It is a potent alpha$_2$ agonist, it might contribute to antishivering effects. It may produce analgesia postoperatively and during labour and delivery.[3] Studies have shown that role of k opioid receptors are more significant than μ opioid receptors in the treatment of post anaesthetic shivering. In our study we are analysing the effect of tramadol (1 mg/kg) and pethidine (0.5 mg/kg) intravenously for post spinal anaesthesia shivering.[5]

Materials and Methods:

This study conducted in the Department of Anaesthesiology and Critical care, ESIC Medical College, Kalaburagi. Seventy-four patients who developed shivering after elective surgery under spinal anaesthesia were randomized into two groups each having thirty-seven patients-tramadol group (Group 1) and pethidine group (Group 2). Patients were treated with 1mg/kg tramadol (Group 1) and 0.5mg/kg pethidine (Group 2). Haemodynamic stability, onset of action of each drug and side effects were closely monitored at different time intervals before shivering, during shivering and at 5-minute interval for 15 minutes.

Inclusion criteria:

- Patients giving valid consent.
- Patients under ASA (American Society of Anaesthesiologist) physical status I and II.ASA I-Normal healthy patients, ASA II-Patients with mild systemic disease without any functional limitation.
- Patients undergoing surgery under spinal anaesthesia.
- Patients of both genders aged between 20 to 65 years.

Exclusion criteria:

- Patients who are not giving consent.
- Patients with ASA physical status III or more.
- Patients who are allergic to any of these drugs.
- Patients with thyroid disease, obesity, fever and compromised cardiovascular status, seizure disorder. Contraindication to spinal anaesthesia like raised intracranial pressure, coagulopathy, patient's refusal etc.

Results

Table 1: Comparison of demographic data between the groups

Demographic data	Group-I (Tramadol)	Group-II (Pethidine)
Age (years) (MEAN±SD)	44.45±1.21	42.18±1.39
Gender		
Male	16 (43.24 %)	19 (51.35 %)
Female	21 (56.76 %)	18 (48.65 %)
Body weight (Kg) (MEAN±SD)	56.81±8.69	57.21±8.61

The demographic data of age, gender and weight are expressed as numbers and percentages. In both study groups the age distribution is more or less the same. In group I,16 males (43.24%) and 21 females (56.76%) were included whereas in group II,19 males (51.35%) and 18 (48.65%) were included. Most of the patients in the study had weight between 40-60 kg

Table 2: Comparison of time of onset, duration

Shivering parameters	Group-I (Tramadol) (MEAN±SD)	Group-II (Pethidine) (MEAN±SD)	P value
Time of onset	17.70±11.40	13.37±8.66	**0.07**
Duration of shivering	5.08±4.81	7.11±4.78*	**0.03**
Grade of shivering	2.24±0.43	2.21±0.41	**0.48**

<0.05 significant compared group-I with group-II)

Time of onset of shivering post operatively was noted. It cannot be compared as this study includes different types of surgeries.

Duration of shivering signifies the onset of drug action. Group I has lesser duration of shivering as compared to group II. That means tramadol ceases shivering faster than pethidine.

Only patients with 2 or 3 grades of shivering are included in the study.

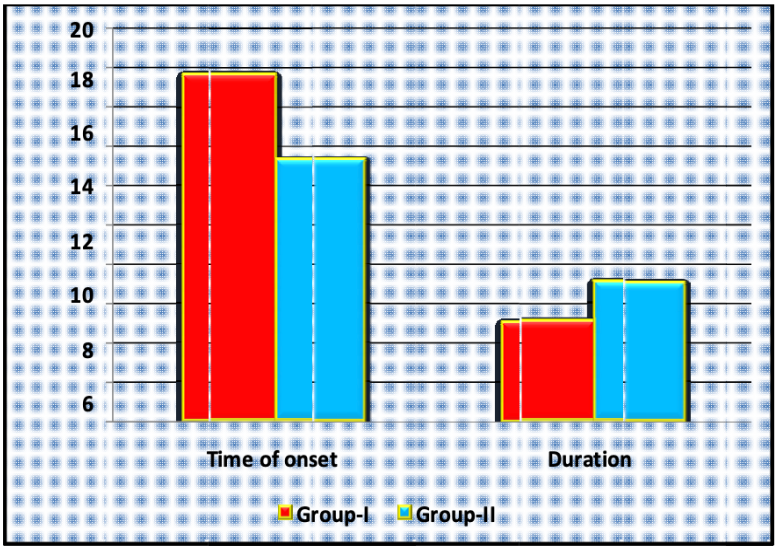

Figure 1: Comparison of time of onset and duration of shivering between two groups

The same values in the above table are represented as graph.

Table 3: Distribution of patients according to grade of shivering

Grade of shivering	Group-I		Group-II	
	Number	Percentage (%)	Number	Percentage (%)
0 grade	0	00.00	0	00.00
1st grade	0	00.00	0	00.00
2nd grade	28	75.66	29	78.38
3rd grade	9	24.34	8	21.62

In group I, 28 patients had grade 2 shivering and 9 patients had grade 3 shivering. In group II, 29 patients had grade 2 shivering and 8 patients had grade 3 shivering.

Table 4: Distribution of patients according to time of onset

Time of onset of shivering	Group-I		Group-II	
	Number	Percentage (%)	Number	Percentage (%)
1-10 min	19	51.36	23	62.16
11-20 min	7	18.92	8	21.63
21-30 min	7	18.92	5	13.51
31-40 min	3	08.10	1	02.70
41-50 min	1	02.70	0	

In group I and II, greater number of patients developed shivering within first 10 minutes in recovery room.

Table 5: Distribution of patients according to duration of shivering

Duration of shivering	Group-I		Group-II	
	Number	Percentage (%)	Number	Percentage (%)
1-10 min	36	97.30	34	91.89
11-20 min	0	00.00	2	05.41
21-30 min	1	02.70	1	02.70

Most of the patients in group I stopped shivering in first 10 minutes compared to patients in group II.

Discussion

Shivering is an unpleasant condition especially after a surgery. It increases intra ocular pressure, intracranial pressure, increase oxygen consumption, result in wound pain. The cause of shivering after regional anesthesia is not well known, but the probable causes could be decrease in core body temperature after sympathetic block; enhanced cutaneous blood flow, peripheral vasodilatation; which leads to increased heat loss through skin; rapid infusion of cold intravenous fluids; cold temperature of operation room; and cold anesthetic drugs stimulating thermosensitive receptors in the spinal cord. So, shivering should be effectively controlled as fast as possible. Many methods have been tried for control of shivering like body warmers, using warm iv fluids, blankets etc. Many drugs have been studied for their effectiveness for control of shivering like pethidine, nalbuphine, tramadol or butorphanol, ketanserin, ondansetron propofol, granisetron, doxapram, clonidine, physostigmine, and nefopam etc. But still

an effective drug for control of shivering not yet found. In our study we could not find any relationship of shivering to age, gender, type of surgery, duration of surgery. Most of the patients were normothermic, so shivering related to hypothermia is ruled out. In this study, we have compared two drugs : pethidine - which was considered standard drug for shivering and tramadol – a new synthetic opioid. Many causes of shivering has been postulated but still exact cause is unclear. Pethidine is a phenylpiperidine derivative. It has agonist action at κ and μ opioid receptors.This should not be used in higher dosage as it can cause hemodynamic instability, myocardial depression, seizures due to accumulation of its metabolite, nausea , vomiting, sedation and respiratory depression. Total daily dose should not exceed 1000mg.

In this study, group II patients with grade 2 or 3 shivering received 0.5 mg/kg and we did not observe any serious complications in our patients other than nausea and vomiting for 3 patients and sedation for 5 patients. Nausea, vomiting of patients could be managed with promethazine or ondansetron. The main disadvantage of pethidine noted in this study was their recurrence rate and on comparing to tramadol, it took more time to cease shivering. Availability of this drug is a problem as it need drug registration. Singh[6] et al found that patients had respiratory depression, nausea and vomiting and reduction in oxygen saturation associated with pethidine 0.5 mg/kg. Zahedi[7] et al also had same complications with pethidine used in control of shivering in patients under general anaesthesia.

Tramadol hydrochloride, a μ-opioid receptor agonist, act on central mono-aminergic pathways, and cause inhibition of the neuronal uptake of serotonin or noradrenaline and encourage hydroxytryptamine secretion which has a major role in regulating the body temperature regulation center.

Group I patients in our study received tramadol 1 mg/kg when they developed grade 2 or 3 shivering. In most of the cases, it could cease shivering within 3 minutes and recurrence rate was also less compared to group II. Disadvantage of this drug noted was nausea and vomiting, but it could be managed with ondansetron. Tramadol is freely available without drug licence and it is cheaper than pethidine.

Many studies have been conducted to find the ideal drug for shivering. But such a drug is under debate. Javaherforoosh F [8] et al. studied prophylactic effect of 1mg/kg tramadol for caesarian section. Only 8.8 % patients developed shivering after receiving tramadol. Heidari[9] et al studied effectiveness of oral tramadol as premedication. They concluded that it reduced incidence of shivering. Dar [10] et al compared tramadol and ketamine for prevention of shivering. Bhatnagar et al concluded in his study that tramadol 1 mg/kg is effective in controlling shivering with less side effects. That is the reason why we chose the same dose in our study.

Manouchehrian N[11] et al conducted a double blind study for comparison of therapeutic effect of pethidine and tramadol for treatment of post spinal anaesthesia shivering in elective caesarian section.

As in our study, they also found response time of tramadol is less comparatively. In our study, there was variation in heart rate in pethidine group before, during and after shivering. But they found variation in heart rate, oxygen saturation and respiratory rate in pethidine group. As contradiction to our study, they found nausea and vomiting more in pethidine group.

Mathew[12] et al. studied different doses of tramadol and found 96% success with 1 mg/kg tramadol and 98 % success with 2 mg/kg. Philip et al conducted study on tramadol and pethidine for shivering control for patients under epidural anaesthesia. They had simlar findings as in our study with 50 mg tramadol and 25 mg pethidine for all patients irrespective of their weight. Joshi SS[14] et al compared tramadol with ondansetron and butorphanaol and found patients who received tramadol and butorphanal had good postoperative analgesia. But there are many other studies with contradictory results. Abdelrahman RS[13] compared tramadol plus ketamine, midazolam plus ketamine, tramadol and ketamine for prevention of shivering and found drugs given in combination were more effective than drugs used alone. Fern L[15] et al. compared tramadol, pethidine and dexmedetomidine for post operative shivering and found dexmedetomidine associated bradycardia and hypotension.

Conclusions

Intravenous tramadol is more effective than pethidine in controlling post spinal anaesthesia shivering. Tramadol has less response rate and recurrence. It is cheap as compared to pethidine and freely available without drug licence.

References

1. Bhatnagar S, Saxena A, Kannan TR, Punj J, Panigrahi M, Mishra S. Tramadol for postoperative shivering: a double-blind comparison with Pethidine. Anesth Intensivecare. 2001; 29:149-54.
2. Chan AM, Nq KF, Tong EW, Jan GS. Control of shivering under regional anaesthesia in obstetric patients with Tramadol. Can J Anesth.1999;46(3):253-58.
3. Tarkkila P, Tuominen M, Lindgen L. Comparison of respiratory effects of tramadol and pethidine. Eur J Anaesthesiol.1998 Jan;15(1):64-8.
4. Israel DJ, Pozos RS. Synchronized slow-amplitude modulations in the electromyograms of shivering muscles. J Appl Physiol. 1989; 66: 2358– 63.

5. Lopez M, Sessler DI, Walter K, Emerick T, Ozaki M. Rate and gender dependence of the sweating, vasoconstriction, and shivering thresholds in humans. Anesthesiology. 1994; 80:780–8
6. SN Singh, BP Sah, A Ghimire, JN Prasad, DD Baral. Comparison of tramadol with pethidine for prevention of post anaesthetic shivering in elective abdominal surgery. Health Renaissance. 2012;10(3):220-223
7. Zahedi H. Comparison of tramadol and pethidine for post anaesthetic shivering in elective cataract surgery. Journal of Research in Medical Sciences. 2004;5:235-239.
8. Javaherforoosh F, Akhondzadeh R, Aein KB, Olapour A, Samimi M. Effects of Tramadol on shivering post spinal anesthesia in elective cesarean section. Pak J Med Sci. 2009;25(1):12-17
9. Heidari SM, Rahimi M, Soltani H, Hashemi SJ, Shabahang S. Premedication with oral tramadol reduces severity of postoperative shivering after general anesthesia. Adv Biomed Res. 2014; 3:64.
10. Nasir A, Dar FA, Javed T.A comparative study:Prophylactic Intravenous ketamine and tramadol in preventing intraoperative shivering in patients undergoing elective lower limb surgery under spinal anaesthesia. American Journal of Advanced Drug Delivery. 2015; 3(1):11-17.
11. Nahid M, Ali M, Mohammad SS, Nasrin FTK, Mehdi S. Acomparison of therapeutic effect of tramadol and meperidine for treatment of shivering after spinal anaesthesia in elective caesarian section. Archives of Anaesthesiology and Critical Care. (Spring 2015);1(2):50-54.
12. Mathew S, Mulla AA, Varghese PK, Radim K, Mumtaz S. Postanaesthetic shivering- a new look at tramadol. AGBI J. 2002 Apr;57(4):387-403
13. Reda SA. Prevention of shivering during regional anaesthesia: Comparison of Midazolam, Midazolam plus Ketamine, Tramadol and Tramadol plus Ketamine. Life Science J. 2012; 9(2):132-39
14. Joshi SS, Arora A, George A, Shidhaye RV. Comparison of intravenous butorphanol, ondansetron and tramadol for shivering during regional anesthesia: A prospective randomized double-blind study. Anaesth Pain & Intensive Care. 2013;17(1):33-39.
15. Lim F,Karis M.Comparison of dexmedetomidine, pethidine and tramadol in the treatment of post neuraxial anaesthesia shivering. South Afr J Anaesth Analog. 2015;21(1):21-26