Original Article

Comparison of Tramadol and Pethidine for the Treatment of Shivering during Spinal Anesthesia

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Author`s Contribution

[1,2,3] *Conception of study*
[1,2,3] *Experimentation/Study conduction*
[1,2,3] *Analysis/Interpretation/Discussion*
[1,2,3] *Manuscript Writing*
[1,2] *Critical Review*
[1,2] *Facilitation and Material analysis*

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Article info.

Received: *19/2/19*
Accepted: *16/8/19*

Cite this Article: *Wahid, F., Hussain, A., & Rehman, F. (2019). Comparison of Tramadol and Pethidine for the treatment of shivering during spinal anesthesia. Journal of Rawalpindi Medical College, 23(3), 148-152.*

Conflict of Interest: *Nil*
Funding Source: *Nil*

Access Online:

https://journalrmc.com/index.php/JRMC/article/view/1202

Abstract

Background: Spinal anesthesia is a commonly used technique the world over. It is very easy to perform and has the potential to provide excellent operating conditions for the surgery. This study was conducting in Department of anesthesiology and pain medicine, Combined Military Hospital Malir Cantt Karachi from 1st September to 31st December 2017. The aim of the study is to compare the effectiveness of tramadol vs pethidine for treatment of shivering occurring after spinal anesthesia by using Double blind comparative study..

Methods: 70 patients were selected following non-random convenient sampling and were divided into Group A and B. Group A received 0.25mg/kg tramadol while Group B received 0.35mg/kg pethidine. Time to complete control of shivering was noted. Nausea and vomiting were also evaluated by using a four-point scale (Table1).

Results: Shivering was successfully controlled in 91.4% and 85.7% respectively in group A and B; success rates were not statistically different (p=0.23). Average time between injection tramadol to complete control of shivering in successfully treated Group A patients was 210±63 seconds (range of 100 to 310 seconds) and for pethidine average time was 174±52 seconds (range of 90 to 258 seconds). Pethidine showed a shorter time to control shivering which was statistically significant (p=0.09) but in real time amounted to an average of 0.6 minutes (Figure 2). Nausea and vomiting were more frequent (14.3% vs 8.6%) in group B as compared to Group A and this was statistically significant (p=0.03).

Conclusion: Tramadol was found to be as effective as pethidine in controlling shivering with fewer side effects in spinal anesthesia

Keywords: Tramadol, Pethidine, Spinal Anesthesia.

Introduction

Spinal anesthesia is a commonly used technique the world over. It is very easy to perform and has the potential to provide excellent operating conditions for the surgery.

There are many advantages of spinal anesthesia as compared to the general anesthesia. They include low

cost, fewer adverse effects on respiration, reduced risk of airway obstruction or aspiration, excellent muscle relaxation for lower abdominal or lower limb surgery, less blood loss as compared to when the same operation is done under general anesthesia etc.

However spinal anesthesia does have certain shortcomings. Few of the include hypotension, high neural blockade, urinary retention, post dural puncture headache.

One of the problems arising during spinal anesthesia is shivering which may quite distressful for the patient, which include increased oxygen consumption, increased carbon dioxide production, increased lung ventilation and cardiac output, and decreased mixed venous oxygen saturation. It has been shown to increase metabolic rate by up to 400%[1, 2].

When the core body temperature drops, the shivering reflex is triggered to maintain homeostasis. Skeletal muscles begin to shake in small movements, creating warmth by expending energy. In most of the cases shivering can be prevented and controlled by maintaining ambient temperature, using warm blankets, head wraps, administering warm intravenous fluids, using fluid warmers.

Pharmacological control of shivering however is an effective alternate modality. Various drugs have been used for control of per-operative and post-operative shivering including morphine, pethidine, tramadol[3], clonidine[4], nefopam[5], and doxapram[6]. It has been reported that tramadol and pethidine were more effective in controlling post operative shivering[7, 8, 9].

For the control of shivering during anesthesia minimum effective dose for pethidine has been reported to be 0.35 mg/kg body weight[6]. Tramadol, on the other hand modulates central monoaminergic pathways, inhibiting the neuronal uptake of norepinephrine and serotonin[10]. It is a centrally acting analgesic drug with weak opioid agonist properties and is also effective in the treatment of postoperative shivering[11]. The minimum dosage used for the treatment of shivering has been reported as 0.25mg/kg[12].

This study was carried out to compare the two most commonly used drugs to treat shivering during spinal anesthesia.

Materials and Methods

A double blind comparative study was conducted from 1st September 2017 to 31st December 2017 at Combined Military Hospital Malir Cantt Karachi, Pakistan. After institutional committee approval and written informed consent, a total of 70 patients of ASA physical status I and II, aged between 25 to 35 year who developed shivering under spinal anesthesia were selected by non-random convenient sampling. They were divided and group A and B each comprising of 35 patients. Patients with physical status above ASA II, any contraindication to spinal anesthesia, tramadol, pethidine, patients with body temperature above 38 ^{o}C, patients with history of taking anti-depressants, alcohol or illicit drugs were excluded.

Group A patients were given tramadol 0.25 mg/kg over 30 seconds when they developed shivering. Group B patients were given pethidine 0.35 mg/ kg over 30 seconds when they developed shivering. The operating room temperature was kept between 24^{o}C to 28 ^{o}C. All infused fluids ad drugs were given at room temperature.

Data was recorded on a specified Performa. The standard monitoring was used including electrocardiography, pulseoximetry, non-invasive blood pressure and heart rate. The time of onset of shivering relative to the duration of anesthesia and the time of injection were noted. Time to complete control of shivering was also noted. Nausea and vomiting were evaluated by using a four point scale. If patients developed severe nausea or vomiting metoclopramide 10mg was administered intravenously.

Univariate analysis was done and P-values using student t-test, z-test and F-test to find out the strength of the association between the variables. Fisher Exact Probability test was used for nominal data. Correlation between variables was studied using Regression analysis. The statistical analysis was done on SPSS v21 and Microsoft excel. P value less than 0.05 was considered significant.

Result

A total of seventy patients of both sexes who developed severe shivering i-e grade 3 or 4 on a 0-4 point scale (Table 3), during spinal anesthesia were included in the study. There were 27 female and 43 males (38.6% and 61.4%). Their ages ranged 20 to 65 years, mean age 40.0±13.8 years. The patients were divided in two groups for the interventional study.

Group A included 35 patients who received I.V tramadol 0.35 mg/kg body weight for the treatment of shivering during spinal anesthesia. Group B included 35 patients who received I.V tramadol 0.25 mg/kg for the treatment of shivering during spinal anesthesia.

In Group A there were 14 females and 21 males, with age range between 20 to 65 years, mean age of 41.1±14.0 years, with a mean weight of 62.7±10 kg. In

Group B there were 13 females and 22 males, with age range between 20 to 64 years, mean age of 39.0±13.4 years weighing on an average 63.8±11.2 kg.

Total duration of anesthesia ranged between 25-120 minutes in Group A patients with an average of 75±34 minutes. In Group B patients the total duration of anesthesia ranged between 30-135 minutes with an average of 85±35 minutes. Time between induction of spinal anesthesia and onset of shivering for Group A ranged from 9.30 to 56.10 minutes with an average interval of 28.30±12.00 minutes. In Group B the time between induction of anesthesia and onset of shivering ranged between 11.00 to 59.30 minutes. The time interval before onset of shivering for all patients was 9.30 to 59.30 minutes with an average time interval of 28.50±11.50 minutes.

Shivering was successfully controlled in 32 out of 35 patients of Group A and 30 out of 35 patients of Group B, showing success rate of 91.4% and 85.7% of tramadol and pethidine respectively.

Table 1: Nausea vomiting evaluation 4 point scale

Score	Nausea	Vomiting
0	No nausea	No vomiting
1	Once	Once
2	Twice	Twice
3	Three or more times	Three or more times

Table 2: Summary of Patient characteristics

Tramadol (n=35)		*Pethidine (n=35)*
Gender		
Female	14	13
Male	21	22
Age (yr)	41.1± 14.0	39±13.4
Weight (Kg)	62.7±10	53.8±11.2
ASA		
Class I	16	20
Class II	21	15
Total duration of anesthesia (min)	75±34	84.7±35
Time to onset of shivering (min.sec)	28.30±12.00	29.30±12.30
Shivering grade before treatment	21	19
Grade 3	14	16
Grade 4		
Time to control shivering (sec)	210±63	174±52

Time between injection of tramadol to complete control of shivering in successfully treated Group A patients was observed to range from 100 to 310 seconds, with an average time of 210±63 seconds. Time taken for female patients to respond was 199±72 seconds and for males it was 216±53 seconds. In Group B patients the time between injection of pethidine to complete control of shivering was observed to range from 90 to 258 seconds, with an average time of 174±52 seconds in successfully treated subjects. The time taken for female patients to respond was 157±58 seconds and for males it was 184±46 seconds.

In this study we also noted down the severity of nausea and vomiting (Table 1). Group A who received injection tramadol, two patients complained of mild nausea (grade 1) and one complained of severe nausea (grade 2) and no patient vomited, a total of three patients complaining of this side effect (8.6%, 4 grade points). In Group B who received injection pethidine, two patients complained of mild nausea (grade 1) and one patient had severe nausea (grade 2) and one vomited (grade 3), a total of five patients complaining this side effect (14.3%, 11 grade points).

The nominal data was analyzed using Fisher Exact Probability Test. The calculated probability was 0.23. Hence the difference between the success rates of tramadol and pethidine to control shivering was not statistically significant at a p-value of 0.05. The statistical analysis using Students t-Test showed a statistically significant difference between the times taken by tramadol and by pethidine to control shivering (p value of 0.009331). Similarly z-test for two samples means analysis on the same data also showed statistically significant difference between the times taken by tramadol and by pethidine to control shivering (p value of 0.007488).

Statistical analysis using Student t-Test failed to show and statistically significant difference between the time taken by tramadol to control shivering in female and male patients at p value of 0.05(p value of 0.244387). Similarly z-test for two sample means analysis on the same data also failed to show a statistically significant difference between the times taken by tramadol to control shivering in female and male patients at p value of 0.05 (p value of 0.240104).

Table 3: Shivering evaluation 4 point scale

Score	*Type of shivering*	*Location*
0	None	No shivering detected
1	Patient feeling cold but no shivering	No shivering detected
2	Mild	Shivering localized to neck and thorax

3	Moderate	Shivering involves gross movement of upper extremities in addition to neck and thorax
4	Severe	Shivering involves gross movement of the trunk and upper and lower extremities

Statistical analysis using Students t-Test failed to show any statistically significant difference between the times taken by pethidine to control shivering in female and male patients at p value of 0.05 (p value of 0.100). Similarly z-test for two sample means analysis on the same data failed to show a statistically significant difference between the times taken by tramadol to control shivering in female and male patients at p value of 0.05 (p value 0.240104).

Discussion

A total of seventy patients of both sexes who developed severe shivering i-e grade 3 or 4 on a 0-4 point scale (Table 3), during spinal anesthesia were included in the study. There were 27 female and 43 males (38.6% and 61.4%). Their ages ranged 20 to 65 years, mean age 40.0±13.8 years. The patients were divided in two groups for the interventional study.

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Statistical analysis using Students t-Test failed to show any statistically significant difference between the times taken by pethidine to control shivering in female and male patients at p value of 0.05 (p value of 0.100).

Similarly z-test for two sample means analysis on the same data failed to show a statistically significant difference between the times taken by tramadol to control shivering in female and male patients at p value of 0.05 (p value 0.240104).

Conclusion

On the basis of this study we concluded that Both tramadol and pethidine exhibited a high success rate for controlling shivering during spinal anesthesia, with no statistically significant difference between the two success rates. Pethidine showed a shorter time to control shivering during spinal anesthesia as compared to tramadol. This was statistically significant, but in real time the difference was 0.6 minutes. With pethidine the incidence and severity of side effects of nausea and vomiting was somewhat higher that with tramadol, and this difference was statistically significant. Tramadol is cheap and readily available, unlike pethidine which is a controlled drug.

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