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ORIGINAL ARTICLE

Hyperbaric Bupivacaine alone Versus Hyperbaric Bupivacaine and Tramadol Combination for Shivering in Spinal Anaesthesia Surgeries

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ABSTRACT

Background: Shivering is a normal physiologic protective mechanism of the body, which in response to core hypothermia, increases metabolic heat production that results in involuntary, oscillatory muscle activity. Spinal anesthesia promotes redistribution of body heat from central to the peripheral compartments. After spinal anesthesia shivering occurs in 40-60% of patients. Tramadol is synthetic codeine analog that is weak Mu opioid receptor agonist. It also has effect of norepinephrine and serotonin reuptake inhibition. It proves to be more effective in prevention and treatment of shivering and it also has less side effects then Mu opioid agonists.

Objective: To compare the outcome of hyperbaric bupivacaine alone, with combination of hyperbaric bupivacaine and tramadol to prevent frequency of shivering in spinal anaesthesia.

Study Design: Randomized clinical trial study.

Place and Duration of Study: Department of Anaesthesiology & Gynaecology, POF Hospital, Wah Cantt, HIT Taxilla and Izzat Ali Shah Hospital, Wah Cantt from 1st December 2018 to 31st December 2020.

Methodology: One hundred and 100 patients were included and divided into two equal groups. Patients in Group A received 2ml of 0.75% hyperbaric bupivacaine (15mg) and group B received 2ml of 0.75% hyperbaric bupivacaine (15mg) and preservative free tramadol (10mg, 0.2ml) in spinal anesthesia.

Results: There were 13 (26%) female patients in group A and 37 (74%) male patients. In group B there were 35 (70%) male patients and 15 (30%) female patients. The mean age in group A was 42±8.05 years and 42±8.02 years in group B. Thirty two (64%) in whom shivering was present and 18 (36%) no shivering accrued in group A while in group B, 11 (22%) in whom shivering was present and 39 (78%) no shivering accrued (P<0.05).

Conclusion: Post-anesthetic shivering appeared to be present in post spinal anaesthesia patients very commonly. Administration of tramadol has proved to significantly reduce incidence of shivering. More studies still need to be done on tramadol to confirm its efficacy in preveting and stopping shivering without systemic effects on patients.

Keywords: Spinal anaesthesia, Bupivacaine, Tramadol, Shivering

INTRODUCTION

Shivering is a normal physiologic protective mechanism of the body, which in response to core hypothermia, increases metabolic heat production that results in involuntary, oscillatory muscle activity. Spinal anesthesia causes body heat redistribution resulting in shivering during and post procedure which is cumbersome for patients.[1]

Shivering is controlled by posterior hypothalamus. Thermoregulatory responses consist of three components: afferent sensory heat response, central heat regulatory response and efferent motor and muscular responses. Integration of heat sensation occurs at spinal level.[2]

After spinal anesthesia shivering occurs in 40-60% of patients. As a result it increases metabolic heat production up to 400%. It increases oxygen consumption resulting in hypoxemia, increase carbon dioxide production and causes lactic acidosis.[3]

After spinal anesthesia hypothermia many not be perceived by patient and sometimes missed by anesthetist as well, resulting in detrimental effects in patients with limited cardiovascular reserve and their ECG, BP and oxygen saturation monitoring.[4, 5]

Tramadol a synthetic codeine analog that is weak Mu opioid receptor agonist, it also has effect of norepinephrine and serotonin reuptake inhibition. This action of tramadol influences thermoregulatory control on posterior hypothalamus in turn responsible for anti-shivering effect. It proves to be more effective in prevention and treatment of shivering and it also has less side effects then Mu opioid agonists. Other drugs used to abolish shivering include clonidine, dexmedetomidine, nalbuphine, pethidine, doxapram.[6]

In 2015, Prasad et al[7] reported shivering in 66% of patients with use of hyperbaric bupivacaine only and in 16% cases with use of tramadol along with hyperbaric bupivacaine (p<0.001). Arora[8] in 2014 also reported high incidence of shivering in 100% cases at 15 minutes with use of tramadol with hyperbaric bupivacaine (p>0.05).

MATERIALS AND METHODS

This randomized clinical trial was carried out from 1st December 2018 to 31st December 2020. A total of 100 patients under spinal anaesthesia were included and divided into two equal groups of 50 patients each. Patients between age 20-60 years of either sex of ASA class 1 and 2 category undergoing following procedures; anorectal diseases, lower segment cesarean section and inguinal hernia surgery were included in study. Patients in ASA class 3 and 4, patients on vasodilators or vasoconstrictors, morbidly obese, psychiatric disorders and substance abuse were excluded from study

After approval from hospital ethical committee and informed written consent basic demographic information including name, age, gender and date of surgery of all patients were recorded. All the patients were randomly divided into two equal groups of patients by lottery method. Patients included in Group A received 2ml of 0.75% hyperbaric bupivacaine (15mg) and group B received2ml of 0.75% hyperbaric bupivacaine (15mg) and preservative free tramadol (10mg, 0.2ml) in spinal anesthesia. Spinal anesthesia was given by consultant anesthetist under aseptic technique, subarachnoid block performed in L3-L4 space in sitting position, with use of disposable 25 gauge Quinke's spinal needle. After administration of spinal anesthesia patients were observed for shivering whether present or not within 15 minutes of completion of procedure. Observation was done and recorded by another consultant anesthetist.

All the collected data was entered and analyzed through SPSS-21. Chi-Square test was used to compare both groups in

term of frequency of shivering. P value ≤0.05 was considered significant.

RESULTS

There were 13 (26%) females and 37 (74%) male patients in group A while in group B, 35 (70%) males and 15 (30%) female patients. There were 5 (10%) patients between 20-29 years, 15 (30%) patients between 30-39 years, 22 (44) patients between 40-49 years and 8 (16%) patients between 50-60 years with mean age was 42±8.05 years in group A. While in group B, 4 (6%) patients between 20-29 years, 17 (34%) patients between 30-39 years, 22 (44%) patients between 40-49 years and 8 (16%) patients between 50-60 years with mean age was 42±8.02 years (Table 1).

According to ASA category, there were 17 (34%) female patients and 33 (66%) were male patients in group A while in group B in ASA category there were 18 (36%) female patients and 32 (64%) were male patients (Fig. 1). Thirty two (64%) in whom shivering was present and in 18 (36%) no shivering accrued in group A while in group B, 11 (22%) in whom shivering was present and in 39 (78%) no shivering accrued (P<0.05) [(Table 2).

In group A, out of 37 male patients there were 24 in whom shivering occurred and in group B out of 35 males in 07 shivering was present (P<0.05). In group A, out of 13 female patients there were 8 in whom shivering occurred and in group B out of 15 females in 4 shivering was present (P<0.05) [Table 3).

When the ages between 20-29, 30-39 and 40-49 years were compared with occurrence of shivering, statistically the difference was found significant (P<0.05) in group A and B. Not significant (P>0.05) difference was found between 50-60 years with occurrence of shivering in group A and group B (Table 4).

In ASA I category, in group A, 22 patients with shivering while in group B, 7 patients in whom shivering was present, statistically significant (P<0.05) difference found. In ASA II category, group A; 10 patients with shivering and in group B 4 patients in whom shivering was present and statistically significant (P<0.05) was found (Table 5).

Table 1: Demographic information of the patients (n=100)

Variable	Group A	Group B
Gender		
Male	37 (74%)	35 (70%)
Female	13 (26%)	15 (30%)
Age (years)		
20 – 29	5 (10%)	3 (6%)
30 – 39	15 (30%)	17 (34%)
40 – 49	22 (44%)	22 (44%)
50-60	6 (12%)	6 (16%)

Table 2: Comparison of occurrence of shivering in both groups

Occurrence of shivering	Group A	Group B	P value
Yes	32 (64%)	11 (22%)	0.0001
No	18 (36%)	39 (78%)	

Table 3: Comparison of gender according to occurrence of shivering in both groups

Gender	occurrence of shivering				P value
	Bupivacaine Group		Bupivacaine plus Tramadol Group		
	Yes	No	Yes	No	
Male	24	13	7	35	0.001
Female	8	5	4	11	0.063

Table 4: Comparison of age according to occurrence of shivering in both groups

Age (years)	occurrence of shivering				P value
	Bupivacaine Group		Bupivacaine plus Tramadol Group		
	Yes	No	Yes	No	
20-29	4	1	-	3	0.028
30-39	9	6	5	12	0.052
40-49	16	6	4	18	0.001
50-60	3	5	2	6	0.590

Table 5: Comparison of ASA category according to occurrence of shivering in both groups

ASA category	occurrence of shivering				P value
	Bupivacaine Group		Bupivacaine plus Tramadol Group		
	Yes	No	Yes	No	
ASA I	22	11	7	25	0.001
ASAII	10	7	4	14	0.027

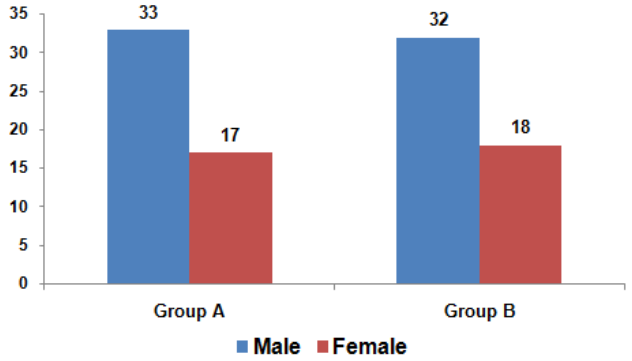

Fig. 1: Frequency of ASA category according to genders (n=100)

DISCUSSION

In our study there were 32 (64%) in whom shivering was present and 18 (36%) no shivering in group A. While in group B, there were 11 (22%) in whom shivering was present and 39 (78%) no shivering (P<0.05). Post spinal anaesthesia shivering is common phenomenon after c section. It has been observed tramadol can prevent and treat shivering in such patients. A randomized clinical trial including 70 obstetric patients undergoing cesarean delivery under regional anesthesia. Group A; 35 patients were administered 1 mg kg^{-1} tramadol in normal saline and group B; 35 patients received saline normal only. Patients receiving tramadol had much less incidence of shivering (28.57% vs 65.71; p<0.0001).[9]

Shukla U et al. in another RCT included 80 patients; for different surgeries under spinal anaesthesia. Total of 80 patients were included in the study. They were divided into two groups (n =40). In Group C; clonidine 0.5mg/kg was administered intravenously (IV) and in Group T; tramadol 0.5 mg/kg was administered intravenously. Results showed shivering improved significantly earlier in clonidine group (2.54±0.76) than tramadol group (5.01±1.02) (P=0.001). [10]

Talakoub et al[11] in 2006 conducted RCT including 73 patients undergoing cesarean section under spinal anesthesia. All patients suffered from shivering post operatively. They were randomly divided into two groups. Group A patients received tramadol and group B patients received meperidine for treatment of postoperative shivering. The time delay from administration of drug till alleviation of shivering was significantly less (P = 0.001) in tramadol group.[11]

Tsai et al[12] conducted RCT including forty-five obstetrics patients experienced shivering during casarean section. Patients were randomly divided into 3 groups (n = 15). Group T was given tramadol 0.5 mg/kg, Group M was given meperidine 0.5 mg/kg, and Group A was given amitriptyline 15 or 20 mg. Shivering improved in 87% patients of tramadol group and 93% patients of mepridine group and only 13% in amitriptyline group (P=0.01).[12]

In 2016; RCT was conducted including 120 patients undergoing elective laparoscopic cholecystectomy under general anesthesia were randomized into four group (n=30). Group 1 received clonidine 2 µg/kg, group 2 received tramadol 1 mg/kg, group 3 received dexmedetomidine 1 mcg/kg. Group 4 received only normal saline intravenous 5 ml. Results showed shivering incidence in clonidine group 10%, in tramadol group 3.3%, in dexmedetomidine group 13.3% and normal saline group 40%. (P<0.01).[13]

Another randomised controlled trial conducted in 2016, including 144 pregnant women at term undergoing caesarean delivery. Patients were randomized into three groups. Tramadol group (Group T1 and Group T2) and Normal saline group (Group TNS). Group T1; was administered 0.5 mg/kg of tramadol, Group T2; was administered 0.25 mg/kg tramadol and Group TNS received 0.05 ml/kg of normal saline. All groups had 47 patients each. 80.1% improved shivering after treatment in group T1, 44.7% patients in T2 group and 4.3% patients in TNS group improved post treatment showing statistically significant differences among the groups (P=0.000).[14]

CONCLUSION

Post-anesthetic shivering appeared to be present in post spinal anaesthesia patients very commonly. Administration of tramadol has proved to significantly reduce incidence of shivering. More studies still need to be done on tramadol to confirm its efficacy in preventing and stopping shivering without systemic effects on patients.

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