Biomedical & Pharmacology Journal Vol. **8**(2), 869-874 (2015)

Comparison of the Level of Sensory Blockage in Spinal Anesthesia with Bupivacaine %0.5 and Lidocaine %5 in Surgical Patients

SEYYED MOHSEN POURYAGHOBI[1] , MOJTABA AHMADINEJAD[2] , BANAFSHEH MASHAK[1], MOHSEN EBRAHIMI[3] , EHSAN BOLVARDI[3] , AMIR MASOUD HASHEMIAN[3] and KOOROSH AHMADI[4]*

[1]Department of Anesthesiology,Alborz University of Medical Sciences,Karaj,Iran.
[2]Department of Surgery, Alborz University of Medical Sciences,Karaj,Iran.
[3] Assistant Professor of Emergency Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.
[4]Associate Professor of Emergency Medicine, Alborz University of Medical Sciences,Karaj,Iran.
*Corresponding author E-mail : ahmadik@mums.ac.ir

DOI: http://dx.doi.org/10.13005/bpj/836

(Received: October 05, 2015; accepted: November 19, 2015)

ABSTRACT

Spinal anesthesia is commonly done using lidocaine %5 and bupivacaine %0/5 in various surgeries. This method is accompanied with many complications including spreading anesthetic level to areas higher than that of local injection site. The aim of this study was to determine the spread of sensory block level in spinal anesthesia by using oflidocaine %5 and bupivacaine %0/5 in surgical patients. In a randomized clinical trial, 300 male and female patients who had undergone surgery by spinal anesthesia were randomly divided into two groups (lidocaine %5 and bupivacaine %0/5). After spinal anesthesia, the sensory block levels were checked every 5 minutes by the way of pin prick test and the results were recorded in a checklist. Data were analyzed using SPSS software. The highest anesthetic level in lidocaine %5 and bupivacaine %0/5 groups was C2 with %0.7 and C5 with %0.7 of cases respectively (p> 0/05). The mean times of getting to the highest sensory block level in lidocaine %5 and bupivacaine %0/5 groups were 11.53 minutes (+/- 6.24) and 11.87 minutes (+/- 5.54) respectively after spinal anesthesia (p> 0.05). Anesthetic spreading to C1- C7 and T1- T4 dermatoms in lidocaine %5 group was accomplished in %1.3 and %10 of cases, and it was also reported for the same dermatoms in bupivacaine group %0.7 and %8 of cases respectively (p <0.05). Spinal anesthesia with bupivacaine %0/5 had lower sensory block distribution as compared to lidocaine %5, and it had lower complications compared to lidocaine%5. Therefore, in order to obtain the desirable sensory block level, the use of bupivacaine %0/5 is recommended.

Key words: Spinal anesthesia, Lidocaine %5, Bupivacaine %0/5, Sensory block level.

INTRODUCTION

Spread of the anesthesia area to the places above the site of the injection of local anesthetics in cerebrospinal fluid will result in the unpleasnt sense of breathing inability, heavy breath, hypoventilation, apnea, hypoxia, a sharp drop in arterial blood pressure, a drop in heart beat, heart stoppage, nausea and vomiting, larynx and pharynx numbness and consequently pulmonary aspiration, problems in speaking and coughing, anxiety, numbness and paralysis of upper organs, cranial nerve involvement and coma[1]. These side effects may result in the death of the patient in some cases. On the other hand, these problems may worry the surgent and disrupt his performance. The pevalnce of anesthesia area spread in spinal anesthesia is completely unclear. There are some case-reports and case series as post spinal anesthesia problems. Two studies have reported

the prevalence of anesthesia area spread up to high spinal around 1%[2]. The studies conducted in Furst have reported limited information about the collapse of cardivascular and respiratory devices and the prevalence of total spinal anesthesia was reported to be around 0.001 up to 0.027%[3]. Another study has reported similar results concerning the prevalence of anesthesia area spread using Bupivacaine 0.5% and Lidocaine 5%. A limited study conducted on 20 cases has reported the spread of anesthesia are with both drugs up to T4 and T5. There is no doubt that spread of anesthesia area where the drug has been injected . L3-L4 up to L5 is more probable as this area is quite close to the site of injection[4]. No detailed and correct study concerning this issue is available now. In this plan, the spread of sensory block surface in spinal anesthesia with bupivacaine 0.5% and lidocaine 5% in the patients candidated for surgery were compared against one another. By introducing the appropriate drug for spinal anesthesia which demonstrates less sensory block spread, the results of this study will provide appropriate conditions for the surgical team and put the patient in a state of mental and physical calm and prevent the serious and worrying side effects[5].Thus implementing this plan will get the researcher to the conclusion that choosing the appropriate anesthetic drug will prevent serious respiratory side effects, dangerous changes in hemodynamics, lethal pulmonary aspiration, coma and death.

MATERIALS AND METHODOLOGY

This is a clinical trial study and the population includes all the patients candidated for spinal anesthesia resorting to operation rooms of Shahid Madani and Shahid Bahonar hospitals of Karaj. Patients above 16 years old with the stimated operation time of maximally 90 minutes, BMI of less than 30 kg/m^2, without taking Aspirin and Anticoagulant in the last seven days before operation, without spinal column deformity, without any past records of lumbar surgery, without abscess or infection of the spinal needle insertion area, no records of lumbar disc herniation, without any records of allergy to bupivacaine and liducaine and chronic headaches and migraine took part in the expriment.

Pregnant patients and those with a BMI of more than 30 kg/m^2, trendelenburg and anti-trendelenburg condition, pateints taking sleeping and narcotic drugs (which disrupt patient's response to Pin Prick test) were removed from the expriment. Convenience sampling method was utilized and samples were divided into lidocaine 5% and Bupivacaine 0.5%.

The epidermic anesthesia level was measured using needle 23 every 5 minutes and registered in the questionnaire. The information gathered through the questionnaires were sent to SPSS software and described in the confidence range of 95% using the principles of descriptive statistics and tables and diagrams after calculating the number, frequency and mean. Comparisons were statistically analyzed using chi-square analysis, T-test, and appropriate methods of Mann Whitney and Friedman and Spearman correlation coefficients.

RESULTS

300 patients were selected in this study and randomly placed in 2 equal groups of 150 people under lidocaine 5% and bupivacaine 0.5% spinal anesthesia. The average age of the patients in both groups was 38.72 (+/- 16.28) and 39.15 (+/- 17.23) years old respectively and the majority of the patients were male and formed 78 to 86 percent of the cases. Comparison of age, height, weight, BMI and patients' gender showed no significant difference in both study groups. Based on the level of anesthesia, patients were classified into 2 groups of the most dangerous (T4 dermatome anesthesia and above) and least dangerous (T5 dermatome and lower) patients. Description of quantitative data was presented with the mean, average and standard deviation in the confidence range of 95%. Shapiro-Wilk test was used to study the normality of variables' distribution. Independent T-test, Mann Whitney test, Chi-square and Fisher exact test were utilized in order to compare the data.

The results show that the highest levels of anesthesia in groups of Lidocaine 5% and Bupivacaine 0.5% are observed in C2 (0.7%) and C5 (0.7%) dermatomes. No significant difference

was observed between them (P>0.05). The average time to get to the highest level of anesthesia in groups of Lidocaine 5% and Bupivacaine 0.5% was 11.53 min. (+/- 6.24) and 11.87 min. (+/- 5.54) and this difference was not significant. The highest level of anesthesia in groups of Lidocaine 5% took place 6 to 10 minutes after spinal anesthesia in 49.3% of the cases. Concerning the group of Bupivacaine 0.5%, this number included 48% of the cases and this difference was not significance (P>0.05). Spread of anesthesia to the areas of C1-C7 and T1-T4 in the group of Lidocaine 5% was observed

Table 1: The demographic information of patients in terms of age, height, weight and BMI in both groups

Variable	Group	Mean	Average	Standard deviation	Significance
age (years)	lidocaine	34	38.72	16.28	0.823
	Bupivacaine	33	39.15	17.23	
height (cm)	lidocaine	170	170	0.09	0.124
	Bupivacaine	172	172	0.09	
weight (kg)	lidocaine	70	70	11.20	0.462
	Bupivacaine	70	71.06	11.82	
BMI	lidocaine	24.22	24.20	3.04	0.734
	Bupivacaine	1.72	24.08	3.24	

Table 2: Gender information of patients in both groups

Variable	Group	Percentage (number)		Significance
		Male	Female	
gender	Lidocaine group	78 (117)	22 (33)	0.07
	Bupivacaine group	86 (129)	14 (21)	

Table 3: Frequency distribution of highest level of anesthesia in Lidocaine group

Dermatomes	Number	Percentage	Cumulative Percentage
L2	2	1.30	1.30
L1	4	2.70	4
T12	18	12	16
T11	17	11.30	27.30
T10	20	13.30	40.60
T9	15	10	50.60
T8	21	14	64.60
T7	17	11.30	75.90
T6	13	8.70	84.60
T5	6	4	88.60
T3	4	2.70	91.30
T2	5	3.30	94.60
T1	6	4	98.60
C6	1	0.70	99.30
C2	1	0.70	100.0
total	150	100	

in 1.3% and 10% of the cases respectively, while these numbers in the group of Bupivacaine 0.5% were 0.7% and 8% respectively and this difference was significant in both groups (P<0.05). No significant difference was observed between the highest levels of anesthesia in highly dangerous groups (T4 dermatome anesthesia and higher) and less dangerous groups (T5 dermatome anesthesia and lower) of Lidocaine 5% and Bupivacaine 0.5% (P>0.05).

Table 4: Frequency distribution of highest level of anesthesia in Bupivacaine group

Dermatomes	Number	Percentage	Cumulative percentage
L3	2	1.30	1.30
L2	7	4.70	6
L1	10	6.70	12.70
T12	16	1.70	23.30
T11	17	11.30	34.70
T10	22	14.70	49.30
T9	12	8	57.30
T8	15	10	67.30
T7	20	13.30	80.70
T6	10	6.70	87.30
T5	6	4	91.30
T4	5	3.30	84.70
T3	6	4	98.70
T2	1	0.70	99.30
C5	1	0.70	100
total	150	100	

Table 5: Relative frequency of the time needed to get to the highest level of anesthesia level

Herbal medicines	Time (min.)	Number	Percentage	Cumulative percentage
Lidocaine 5%	5	30	20	20
	10	74	49.30	69.30
	15	31	20.70	90
	20	9	6	96
	25	4	2.70	98.70
	45	1	0.70	99.30
	50	1	0.70	100
	total	150	100	
Bupivacaine 0.5%	5	26	17.30	17.30
	10	72	48	65.30
	15	33	22	87.30
	20	12	8	95.30
	25	5	3.30	98.70
	30	1	0.70	99.30
	40	1	0.70	100
	total	150	100	

DISCUSSION

Spread of anesthesia level during spinal anesthesia is due to a large set of factors some of which are due to physiological causes (such as pregnancy) and the others include causes such as spinal cord deformity, ascites or the inappropriate position of the patient, injection of a large quantity of local anesthetics, etc. The extent of sympathetic block is correlated to the extent of spinal anesthesia spread and may result in drop of blood pressure, bradycardia, respiratory weakness, spnea, nausea and vomiting. Althought eh spread of anesthesia level can be predicted to a large extent, these estimations are not always successful due to the above-mentioned reasons . Based on the experience of the researcher, the type of the medicine can probabely influence the spread of anesthesia level[6]. The studies conducted by Bruce Newman & Forest have reported the prevalence of the spread of anesthesia up to High Spinal around 1%[7]. However in our research, the prevalence of the spread of anesthesia to C7 dermatome and higher in the group of lidocaine 5% is 1.3%, while the prevalence in the group of bupivacaine 0.5% is around 0.7% and it was 1% on the average which shows no difference. In the study conducted by Bishwas Pradhan, the anesthesia spread levels with both medicines have been reported to be similar[8]. In our study, the highest levels of anesthesia in the groups of lidocaine 5% and Bupivacaine 0.5% were observed in C2 and C5 respectively, however in the research conducted by Dr. Ewart & Robbin, anesthesia spread level with both medicines has been reported up to T4 and T5 dermatomes[9]. The most important finding in this

Table 6: The time needed to get to the highest level of anesthesia

Medical group	Mean	Average	Standard deviation	Significance
lidocaine 5%	10	11.53	6.24	0.386
Bupivacaine 0.5%	10	11.87	5.54	

Table 7: Comparison of the highest level of anesthesia in 4 groups of dermatome

Medical groups		Highest level of anesthesia in 4 groups				Total
		C1-C7	T1-T4	T5-T12	L1-L5	
lidocaine 5%	number	2	15	127	6	150
	percentage	1.30%	10%	84.70%	4%	100%
Bupivacaine 0.50%	number	1	12	118	19	150
	percentage	0.70%	8%	78.70%	12.70%	100%
total	number	3	27	245	25	300
	percentage	1%	9%	81.70%	8.30%	100%

Table 8: Comparison of highest level of anesthesia in both highly and less dangerous groups

Medical groups		Highest levels of anesthesia in 2 groups		Total
		C1-T4 (highly dangerous)	T5-S5 (less dangerous)	
lidocaine 5%	number	17	133	150
	percentage	11.30%	88.70%	100%
Bupivacaine 0.5%	number	13	137	150
	percentage	8.70%	91.30%	100%
total	number	30	270	300
	percentage	10%	90%	100%

research is the fact that the prevalence of anesthesia level spread to C1-C7 and T1-T4 dermatomes in lidocaine 5% group is significanlt higher than Bupivacaine 0.5%.

CONCLUSION

Considering the total population of the world, this research believes using Bupivacaine 0.5% in spinal anesthesia of the patients candidated for surgery is more valuable than using Lidocaine 5%. It is reocommended to use Bupivacaine 0.5% for spinal anesthesia.

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