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WARM AND COLD BUPIVACAINE;

COMPARING THE EFFECT ON SHIVERING DURING INFRAUMBLICAL SURGERIES IN CHILDREN

1. Associate Professor of Anaesthesia Nishtar Medical College and Hospital Multan
2. Associate professor of Anaesthesia Nishtar Medical College and Hospital Multan
3. Assistant Professor of Anaesthesia Nishtar Institute of Dentistry and Nishtar Medical College Multan.
4. Professor of Anaesthesia Nishtar Medical College and Hospital Multan.

Correspondence Address:
Dr. Aamlr Furqan
Assistant Professor of Anaesthesia
Nishtar Institute of Dentistry and
Nishtar Medical College Multan
draamir2009@hotmail.com

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Dr. Munir Ahmad[1], Dr. Nadeem Ahmad Khan[2], Dr. Aamir Furqan[3], Prof. Salman Waris[4]

ABSTRACT... Objectives: To compare the effect of warm and cold bupivacain on shivering during infraumblical surgeries in children under spinal anesthesia. **Study Design:** Randomized control trial. **Setting:** Department of anesthesiology, Nishtar Medical College and Hospital, Multan. **Period:** April 2015 to April 2016. **Materials and Methods:** A total of 62 patients were selected for this study. SPSS version 16 was used for data analysis. Frequency and percentages were calculated for qualitative data and mean ± standard deviation was calculated for quantitative data. **Results:** There was a remarkable difference shivering score in both groups. Mean shivering score for warm group was 1.1 ± 1.9 and for cold group it was 2.4 ± 1.2. Effectiveness was (74%) in warm group and (19.3%) in cold group. **Conclusion:** There are thermo sensory fibers in spinal cord that can induce or intensify the onset of shivering, intensity of shivering can be reduced by using warm local anesthetic solution, so anesthetic solution must be warm before using in spinal anesthesia.

Key words: Warm bupivacain, Cold bupivacain, Spinal anesthesia, Shivering

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INTRODUCTION

After spinal anesthesia shivering occurs in 55% of patients that is a common complication.[1] Due to shivering it is difficult to monitor patient's vital electrocardiogram and oxygenation.[2] Increased systemic energy, oxygen consumption, cardiac effort and Co2 production are the main hemodynamic consequences of shivering.[3] These effects are irritable for patients especially in obstetrical cases.[4] Main mechanisms behind shivering in surgical patients are pain, increased sympathetic tone, production of pyrogens and temperature loss during surgery.[5,6,7]

Other than of these factors direct effect of local anesthetic temperature on neurons is also a main factor shivering.[8,9,10] Body sends thermal signal to urge central nervous system for regulation of whole body temperature. Lot of studies have been conducted to address the exact mechanism of shivering after spinal anesthesia but there is not sufficient data exact cause of shivering and it's treatment options.[2,7] Prewarming and prewarming are two major moralities which are used to prevent shivering during surgery under spinal block but prewarming is not sufficient to change the core temperature. Similarly upper body air warming is also uncomfortable for patient.[11] Now in these days spinal anesthesia due to its rapid onset and high success rates is very popular for lower abdominal surgeries. In a study conducted by Magenta et al. Reported that combined use of warm anesthetic agent and warm parental fluid reduce the incidence of shivering.[12]

On the other hand in some studies it is reported that cooling the extradural space mah stimulate shivering.[13,14,15] To overcome this controversy Abdoleraza et al. Conducted a study on warn and cold bupivacain used as a local anesthetic in ciserian delivery and reported that out of 78 patients, frequency of shivering in warm group was 8.3% and in cold group it was 39.1 %. After intraoperative, postoperative shivering is also a challenge that can be control with drugs e.g clonidine, alfantanil, tramadol, ketanserin and keta mine.[16]

MATERIALS AND METHODS

This randomized study was conducted in

department of Anesthesiology, Nishtar Medical college and Hosptal Multan, from April 20015 to April 20016, after obtaining local ethics committee approval and patient's informed consent. A total of 62 patients meeting the inclusion criteria scheduled for infraumblical surgeries under spinal block were included in our study. The patients were divided into 2 equal groups by lottery method for spinal anesthesia. Patients of emergency cases, known history of hypersensitivity from amides local anesthetics, any contraindication to regional anesthesia like deformity of spine, active hepatic disease like acute hepatitis were excluded from study. Before the start of spinal anesthesia, the patients were placed under monitoring for vitals and Ringer's solution (10mg per kg) was given IV. Proper oxygen for better saturation was given during maintenance of anesthesia. All patients were covered with sheets as per operation theater protocol but patients were not warmed actively. Temperature of 37^{0}C was used to warm the fluids. The standard group (W) received 2 mL heavy bupivacaine 0.5% (10 mg) stored at room temperature 23°C (warm group) by using properly calibrated temperature. The control group(C) was received heavy bupivacaine 0.5% 0.3 mg/kg stored at 4°C (cold group). Anesthesia was given in a sitting position at the L4-L5 interspaced with a midline approach, using a 25-gauge Quincke needle and solutions were made by another anesthesiologist because the anesthesiologist giving spinal block was blind to the drug that was injected. The patient was place in a supine position with left uterine displacement. At the end of injection time was labelled as T0. Sensory anesthesia was evaluated by using hot and cold swab after 1 min gap for 10 minutes, after 5 minutes gap for 35 minutes and then 10-min intervals until regression to L4. Shivering was noted and graded on a scale described by Crossly and Mahajan[15]: if score is 0, there is no shivering; if score is 1, there is piloerection or peripheral vasoconstriction but no visible shivering; if score is 2, muscular contraction in a single muscle group; if score is 3, muscular contractility in more than one group of muscles and not generalized; and if score is 4, whole body shivering. Shivering score 0 and 1 was considered as effective more than 1 was considered as non-effective. The demographic variables such as name, age, gender and address was recorded. Data was collected by a blinded observer. All the collected information was uploaded and analyzed on SPSS version 10, and results were calculated. A standard chi square test was applied. P value of ≤ 0.05 will be taken as significant.

RESULTS

A total of 62 patients divided into two equal groups, W group (n=31) and group C (n=31). There was no significant difference in demographic variables of patients in both groups. Mean age in warm group was 10.1 ± 1.5 and in cold group it was 9.7 ± 1.4. There were 17 (54.83%) male in warm group and 18 (58.06%) in cold group female were 14 (45.1%) in warm group and 13 (41.9%) in cold group. Similarly when we concern about ASA status; ASA-1 in warm group was 18 (58.06%) and in cold group it was 17 (54.83%) and ASA-II in warm group was 13 (41.9%) and in cold group it was 14 (45.1%) but there was a difference in shivering score in both groups; in warm group mean shivering score was 1.1 ± 1.9 versus 2.4 ± 1.2 in cold group. Similarly there was a significant difference in duration of surgery in both groups; patients in warm group were having mean duration of surgery 60.7 ± 24.3 versus 70.2 ± 22.0 in cold group (Table-I). When we compare shivering score in both groups to calculate the effectiveness of both groups it was found that there were 23 (74%) patients in warm group having shivering score 0-1 (effective results) and 6 (19.3%) patients in cold group were having shivering score 0-1 (effective results). Overall effectiveness in both groups was 46.7%. P value was 0.001 a significant value.

	Group-W (31)	Group-C (31)
Age	10.1 ± 1.5	9.7 ± 1.4
Weight	25.9 ± 5.8	24.7 ± 6.4
Shivering Score	1.1 ± 1.9	2.4 ± 1.2
Duration of surgery	60.7 ± 24.3	70.2 ± 22.0
Male	17 (54.83%)	18 (58.06%)
Female	14 (45.1%)	13 (41.9%)
ASA Status of Patients		
ASA-I	18 (58.06%)	17 (54.83%)
ASA-II	13 (41.9%)	14 (45.1%)

Table-I. Demographic variables

Groups	Shivering Score					Total
	0	1	2	3	4	
W group	11 (78.6%)	12 (80.0%)	2 (18.2%)	3 (27.3%)	3 (27.3%)	31 (50.0%)
C group	3 (21.4%)	3 (20.0%)	9 (81.8%)	8 (72.7%)	8 (72.7%)	31 (50.0%)
Total	14 (100.0%)	15 (100.0%)	11 (100.0%)	11 (100.0%)	11 (100.0%)	62 (100.0%)
P Value			**0.001**			

Table-II. Inferential Results

DISCUSSION

This study was conducted to investigate the effect of warm and cold bupivacain used in spinal anesthesia for infraumblical surgeries in children. Results of this study show that warming bupivacain at 23^{0}C decreases the occurrence and severity of shivering without any hemodynamic changes.

Control of internal body temperature depends on thermal signals from thermo sensitive neurons situated in body and CNS.[17] Thermo sensitive neurons of both sides in CNS are connected to form neural network.[18,19] In some vivo experiments it is observed that when local temperature of spinal cord is changed, there is a significant change in the heat gain and heat loss mechanisms such as panting and shivering separating distinctive warm and cold fibers of anterolateral tract of spinal cord.[20,21]

In our study 74% patients in with warm bupivacain did not start shivering or having minimum shivering and with cold bupivacain (cold at 4^{0}c), 19.3% remains at status of minimum or no shivering. Our study concluded that before spinal anesthesia local anesthetic must be warmed to reduce the incidence and intensity of shivering.

In a study conducted by Nand K et al on spinal anesthesia for cesarean section the temperature of Bupivacain affects the onset of shivering but not the incidence. Temperature of Bupivacain was adjusted to 4 ^{0}C, 22 ^{0}C and 37 ^{0}C in the different groups for spinal anesthesia. Overall incidence of shivering in this study was 49.2% but is no difference in in incidence of shivering in three groups.

Ponte et al conducted a study to test the theory that cooling the extradural space can enhance shivering. In this study three injections of 80-ml warm and cold saline was given extraduraly to 4 healthy persons and their central temperature and electromayographic activity was observed.[22] First injection (always cold) did not bring on shivering in any person. Second and third injections that are randomly warm and cold were injected after start of shivering but there is no shivering observed. So this study shows that shivering does not start from cooling of extradural space.

Similarly Santo et al conducted a study to test the severity of shivering during spinal anesthesia in patients of cesarean section. Dibutain 0.5% 2 ml injected in L4, L5 interspace. It is observed that temperature of tympanic membrane rapidly decreased in start and then decreased gradually at a rate of 0.5^{0}C/h. This study shows that intensity of shivering decreases during spinal anesthesia.

In another study role of temperature of local anesthetic was investigated. Warm bupivacain at 37^{0}c was injected in 20 patients of C-section in one group and cold bupivacain at 4^{0}c was injected in 20 patients in other group. Shivering occurs in 2 patients (27.5%) in warm group and 9 (45%) in cold group. This study concluded that, there are thermo sensory fibers in spinal cord, so anesthetic solution must be warm before injection.

CONCLUSION

There are thermo sensory fibers in spinal cord that can induce or intensify the onset of shivering, intensity of shivering can be reduced by using warm local anesthetic solution, so anesthetic solution must be warm before using in spinal anesthesia.

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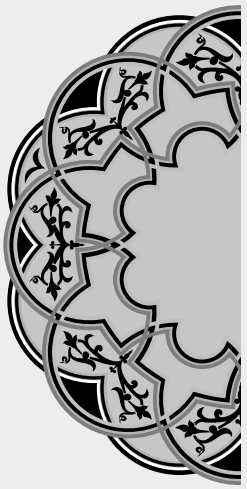

"Fear makes the wolf bigger than he is."

German Proverb

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Dr. Munir Ahmad	Concieve idea, Manuscript writing	
2	Dr. Nadeem Ahmad Khan	Study design, Data collection	
3	Dr. Aamir Furqan	Data Analysis, Statistical analysis	
4	Prof. Salman Waris	Proof Reading, Given final approval	