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Research Article

Effect of intrathecal meperidine and intravenous amino acid infusion in reducing intraoperative shivering during spinal anesthesia: A prospective randomized trial ☆

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KEYWORDS

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Abstract *Background:* This is a prospective randomized double blind study to compare the efficacy of intravenous amino acid infusion versus meperidine added to intrathecal hyperbaric bupivacaine in reducing intraoperative shivering in parturient undergoing elective cesarean section under spinal anesthesia.

Methods: Sixty patients were randomly allocated into two groups. Group (A) (Amino-acid) (n = 30) who received 2 ml of 0.5% hyperbaric bupivacaine and ½ ml normal saline 0.9% (total volume 2.5 ml) intrathecal with intravenous administration of amino acids (Aminoven 5%, Fresenius Kabi), infused at rate 3 ml/kg/h with the start of spinal anesthesia and throughout the operation. Group (M) (meperidine) (n = 30) who received 2 ml of 0.5% hyperbaric bupivacaine with 10 mg meperidine in ½ ml volume (total volume 2.5 ml) intrathecal with intravenous administration of normal saline 0.9% at 3 ml/kg/h with the start of spinal anesthesia.

Results: Group (A) showed significantly higher core temperature from 20 to 60 min than group (M) ($p < 0.001$), also the amino acid group (group A) had a significantly higher skin temperature from 10 to 60 min during surgery, and lower shivering score than group (M) ($p < 0.05$), during spinal anesthesia in parturients undergoing cesarean section.

Conclusion: Amino acids infusion decreased the incidence of shivering, increased peripheral and core temperature than intrathecal meperidine, which seems a safer alternative, more effective with lesser side effects than intrathecal meperidine in parturients undergoing cesarean section under spinal anesthesia.

☆ The study was conducted at obstetrics and gynecology teaching hospital of Ain shams university, Cairo, Egypt.

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1. Introduction

Shivering may occur as an adverse effect of surgery and anesthesia. Shivering associated with spinal anesthesia is a frequent event, and the reported median incidence of shivering related to neuraxial anesthesia is up to 55% [1]. The mechanism of shivering in patients undergoing spinal anesthesia is not clear but hypothermia due to redistribution of heat caused by vasodilation below the level of a neuraxial block is suggested. Spinal anesthesia also impairs the thermoregulation system by inhibiting vasoconstriction. Shivering increases oxygen consumption, metabolic rate, lactic acidosis, carbon dioxide production, plasma catecholamines and cardiac output. Shivering movement may interfere with monitoring of hemodynamics as well as increasing patient discomfort and distress. Therefore, it is very important to prevent shivering during spinal anesthesia [2]. Core temperature is maintained within normal limits of 36.5, 37.5 °C [3], even in the presence of an adverse environmental temperature, by a combination of behavioral and physiological responses. Anesthesia abolishes behavioral mechanisms and has the potential to disrupt the physiological mechanisms of thermoregulation. Intraoperative core temperature depends both on distribution of heat within the body and on systemic heat balance. During the first four hours of anesthesia, core-to-peripheral redistribution of heat is the primary cause of core hypothermia [4]. Hypothermia results from heat loss exceeding heat production [5] as anesthetics profoundly impair thermoregulatory control [6,7]. Factors that increase thermogenesis or reduce loss of heat to the environment moderate the rate at which intraoperative hypothermia develops [8–10].

Enteral or parenteral administration of amino acid solution stimulates oxidative metabolism, typically increasing metabolic rate by 20% [11,12]. Thermo-genesis associated with amino acid infusions has been shown in numerous studies to help preserve intraoperative core temperature [8,13] and to moderate complications associated with hypothermia [14–16].

Meperidine possesses special antishivering properties that are not shared by pure μ-receptor opioids. There are many studies for meperidine via intravenous, Intrathecal, and epidural administrations [17]. Possible suggested mechanisms for the antishivering effect of meperidine include κ-opioid receptor activity, anticholinergic action, biogenic monoamine reuptake inhibition, NMDA receptor antagonism or stimulation of α-adrenoceptors [18–21].

This prospective, randomized, double blind study was performed to compare the antishivering effects of intravenous administered amino acid solution versus meperidine added to intrathecal hyperbaric bupivacaine in patients who underwent elective cesarean delivery under spinal anesthesia.

2. Patients and methods

After receiving approval from the ethics committee at obstetrics and gynecology teaching hospital of Ain Shams University and informed written consent from patients, 60 patients (ASA physical status I or II) scheduled for elective cesarean delivery under spinal anesthesia, were enrolled in the study. Patients with contraindications to regional anesthesia, allergy to the study medications, obesity (Body Mass Index (BMI) = 30 kg/m^2, class I and above), preeclampsia, placenta previa or diabetes were excluded.

Patients were divided into two groups by using computer generated random tables with closed sealed envelopes. An assistant who was not involved in the study prepared the medication before giving spinal anesthesia. Heart rate, blood pressure and oxygen saturation monitoring were established. Patients were given intravenous Ringer's solution. Oxygen 3 liters per minute (3 LPM) was administered through nasal prongs during anesthesia. Spinal anesthesia in the sitting position at the L_{3-4} interspace with a midline approach uses 25 G or 27 G Quincke needle. In group A (Amino-acid group, $n = 30$), Spinal anesthesia consisted of 2 ml of 0.5% hyperbaric bupivacaine + ½ ml. of normal saline 0.9%, total volume 2½ ml, together with intravenous administration of Aminoven 5%, Fresenius Kabi, (that can be given in a peripheral venous access) at a rate of 3 ml/kg/h, while, Group M (meperidine group $n = 30$), received 2 ml of 0.5% hyperbaric bupivacaine, plus 10 mg pethidine in ½ ml volume, total volume 2½ ml. intrathecal, together with intravenous administration of normal saline 0.9% at a rate of 3 ml/kg/h. After giving spinal anesthesia, patients were positioned supine with a wedge beneath the right hip to maintain a pelvic tilt of 30°. Sensory levels were determined by pinprick and the motor blockage was evaluated using Bromage's criteria. Core temperature was measured from the rectum where the rectal probe was inserted during urinary bladder catheterization of the patient and skin temperature was taken from the forehead before establishing regional anesthesia as baseline and at 10 min interval. Shivering was recorded during surgery and in the recovery room by a blind observer. Shivering was graded on a scale:

- 0 = no shivering.
- 1 = piloerection or peripheral vasoconstriction but no visible shivering.
- 2 = muscular activity in only one muscle group.
- 3 = muscular activity in more than one muscle group but not generalized shivering.
- 4 = shivering involving the whole body [22].

The operating room temperature was maintained at 23–25 °C, and perioperative side effects including pruritus, sedation, nausea and vomiting were recorded.

3. Statistical analysis

Analysis of data was done by using SPSS (statistical program for social science version 16) where, quantitative variables were expressed as mean, SD and range, while qualitative variables as number and percentage. Chi-square test was used to compare qualitative variables between groups, whereas, unpaired *t*-test was used to compare two independent groups as regards quantitative variable. *P* value > 0.05 was considered non-significant, $P < 0.05$ significant, and $P < 0.001$ highly significant.

Reference

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4. Results

The study was conducted from May 2014 to February 2015; 60 women participated in the study and all completed the study. Demographic variables were similar in both groups, ($p > 0.05$) (Table 1).