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Comparative Randomized Controlled Blinded Study of the Anti-shivering Effect of Hydrocortisone, Granisetron and Meperidine in Post-spinal Anesthesia in Patients Undergoing Cesarean Section

Thesis

Submitted for Fulfillment of Requirements of Master Degree in Anesthesiology

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2018

سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to **ALLAH**, *the Most Kind and Most Merciful.*

I'd like to express my respectful thanks and profound gratitude to **Prof. Dr. Mohamed Sidky Mahmoud Zaki,** *Professor of Anesthesiology, Intensive Care Medicine & Pain Management, Faculty of Medicine, Ain Shams University, for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to **Dr. Ahmed Mohamed El Sayed El Hennawy,** *Assistant Professor of Anesthesiology, Intensive Care Medicine & Pain Management, Faculty of Medicine, Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I am deeply thankful to **Dr. Yahia Mamdouh Hassan Mekki,** *Lecturer of Anesthesiology, Intensive Care Medicine & Pain Management, Faculty of Medicine, Ain Shams University, for his great help, active participation and guidance.*

I would like to express my hearty thanks to all my family for their support till this work was completed.

Last but not least my sincere thanks and appreciation to all patients participated in this study.

Moustafa Atef

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List of Abbreviations

Abb.	Full term

5-HT3.....5-hydroxytryptamine

Ad.....A- delta

ASA .....American Society of Anaesthesiologist

CBC .....Complete Blood Count

IV .....Intravenous

KFT .....Kidney Function Tests

LFT .....Liver Function Tests

PACU .....Post anaesthesia Care Unit

PT .....Prothrombin Time

PTT .....Partial Thromboplastin Time

RBS.....Random Blood Sugar

ABSTRACT

Automatic readings of heart rate, mean arterial blood pressure, respiratory rate, and saturation using pulse oximetry were obtained. Recording of obtained measures were done at baseline and every 15 minutes, starting half an hour before induction of regional anaesthesia extending to 3 hours postoperatively.

Our results indicate that pethidine, granisetron and hydrocortisone were effective in prevention of post spinal shivering in patients undergoing elective cesarean section and these results agreed with other results of studies done before.

Keywords: Liver Function Tests - Kidney Function Tests - 5-hydroxytryptamine

INTRODUCTION

It was observed that a considerable proportion of patients undergoing surgery experience intraoperative and postoperative hypothermia and it was found that misregulation of body temperature due to anesthesia as well as the cold temperature of the operation room were the main cause ***(Buggy and Crossley, 2000).***

Shivering is a common problem encountered by an anesthesiologist during intraoperative as well as in postoperative period. Shivering occurs during both general anesthesia and regional anesthesia. Incidence of shivering is up to 33% in the patients undergoing surgery under regional anesthesia and up to 56–66% under general anesthesia. A number of factors including age, duration of surgery, temperature of the operating room, type of regional anesthesia (spinal or epidural), and infusion solution are risk factors for hypothermia and shivering ***(Bhattacharya et al., 2003).***

Perioperative shivering causes patient discomfort because of severe muscle movements, it also induces elevated blood pressure and tachycardia, aggravates wound pain by stretching incision, increase intra ocular pressure and increase intracranial pressure. Shivering may also increase tissue oxygen demand by as much as 150% and accompanied by increase in minute ventilation and cardiac output to maintain aerobic metabolism this eventually leads to increased oxygen

consumption, increased carbon dioxide synthesis that results in an increased pulmonary ventilation capacity and cardiac workload, and an increase in the metabolic rate by up to 400%. Shivering may also interfere with the monitoring of patients by causing artifacts of electrocardiography, blood pressure and pulse oximetry ***(Sajedi et al., 2008).***

Spinal anesthesia can be simply and quickly induced and is more advantageous than general anesthesia because it causes fewer systemic complications. Therefore, Spinal anesthesia is widely used for abdominal and lower limb surgery. In spinal anesthesia the anesthetized area, i.e., the sympathetic nerve innervated in the lower limb and lower abdomen, is blocked. This blockage re-distribute the body heat from the center of the body to the periphery. As a result, the afferent temperature signal in the anesthetized area is not transmitted to the thermoregulation center located in the hypothalamus. This causes a disruption of normal temperature regulation, resulting in a decreased core temperature and increased shivering ***(Sagir et al., 2007).***

Neuraxial anesthetic techniques are the most commonly indicated for cesarean section due to lower rates of maternal morbidity and mortality and less neonatal depression compared with general anesthesia. The combination of lipophilic opioids with hyperbaric bupivacaine during spinal anesthesia for cesarean section provides reduced latency, longer duration, and better quality of anesthesia without

increasing the incidence of neonatal depression. Another known effect of opioids is the prevention and treatment of postoperative shivering ***(Kim et al., 2010).***

Various methods have been used to prevent and treat shivering in patients who receive spinal anesthesia, one of these, meperidine appears to be the most effective treatment agent for perioperative shivering, although meperidine is the best studied drug in the treatment of post anesthetic shivering, other drugs like tramadol, hydrochloride, ketamine and magnesium sulfate infusion were used ***(Pawer et al., 2011).***

Aim of the Work

Compare the anti-shivering effect of meperidine, hydrocortisone and granisetron after spinal anesthesia during elective cesarean section.

Chapter 1
PHYSICS OF HEAT TRANSFER

Heat loss occurs primarily from the skin of a patient to the environment through several processes, including radiation, conduction, convection, and evaporation. Of these, radiation is most significant and accounts for 60% of total heat loss. Radiation is emitted in the form of infrared rays, a type of electromagnetic wave. Heat from core body tissues is transported in blood to subcutaneous vessels, where heat is lost to the environment through radiation. This manner of heat loss is the basis for the familiar technology used to sense and identify the locations of persons in buildings who are out of normal view. Radiation is the major source of heat loss in most surgical patients ***(Guyton and Hall, 2006).***

Conduction refers to loss of kinetic energy from molecular motion in skin tissues to surrounding air. Water absorbs far more conducted heat than air, and this accounts for more rapid hypothermia during accidental drowning, as well as the efficacy of water baths to cool hyperthermic patients. For this to be effective, warmed air or water must be moved away from the skin surface by currents, a process called convection. This accounts for the cooling effect of wind and laminar airflow in many surgical suites. Conduction and convection account for 15% of body heat loss ***(Morgan et al., 2006).***

Roughly, 22% of heat loss occurs by evaporation, as energy in the form of heat consumed during the vaporization of water. Water evaporates from the body even when not sweating, but mechanisms that enhance sweating increase evaporation. As long as skin temperature is greater than its surroundings, radiation and conduction provide heat loss. At very high environmental temperatures, these processes cannot work, and evaporation is the only manner in which heat can be dissipated. This generally is not the case in the clinical setting ***(Hanania and Zimmerman, 2005).***

Fundamental Processes in Thermoregulation

Skin temperature rises and falls with the temperature of a patient's surroundings. However, the temperature of deep body tissues, that is, the core temperature, remains relatively constant at 37°C (98.0°F to 98.6°F). In fact, core temperature normally remains between 36°C and 37.5°C (97°F and 100°F), even while environmental temperatures fluctuate from as low as 12.5°C (55°F) to as high as 54°C (130°F). This is due to a remarkable thermoregulatory system that is conventionally organized into three components: afferent sensing, central control, and efferent responses ***(Guyton and Hall, 2006).***

Afferent Sensing:

Afferent input is triggered by thermal-sensitive cells (receptors) found not only in skin but also throughout most of the body. Receptors for cold are anatomically and physiologically distinct from those for heat. Cold receptors are excited by temperatures below a set threshold and generate impulses that travel mainly via Ad (A- delta) nerve fibers. Temperatures above threshold excite heat receptors that generate impulses along unmyelinated C fibers, which also conduct pain sensation. For this reason, patients frequently are unable to discriminate between sharp pain and intense heat. Information is then integrated at several levels within the spinal cord and brain, finally arriving at the primary thermoregulatory center within the hypothalamus ***(Sessler, 2005).***

Central Control:

Although some integration and temperature regulation may occur at the spinal cord level, the hypothalamus is the primary center for thermoregulatory control, integrating most afferent input and coordinating the various efferent outputs required to maintain a normothermic level. The precise manner by which the body establishes temperature thresholds is unclear, but it appears to involve the interactions of several neurotransmitters, including norepinephrine, dopamine, 5-hydroxytryptamine (serotonin), acetylcholine, prostaglandin E1, and other neuropeptides. Additional factors such as circadian rhythm, exercise, food intake, infection, thyroid dysfunction, menstrual cycle, anesthetics, and other drugs are known to alter temperature thresholds ***(Guyton and Hall, 2006).***