Intravenous Ondansetron for Attenuation of Post Spinal Anesthesia Hypotension

Thesis

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By

Hazem Mohamed Sabry Abdel Aziz Ahmed
M.B.B.Ch., Faculty of Medicine, Ain Shams University

Under Supervision of

Prof. Dr / Ahmed Saeed Mohamed Ibrahim
Professor of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr / Rania Mahrous Aly Hussien
Lecturer of Anesthesia, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Faculty of Medicine, Ain Shams University
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List of Contents

Title	Page No.
List of Tables	5
List of Figures	7
List of Abbreviations	8
Introduction	- 1 -
Aim of the Work	3
Review of Literature	
▪ Spinal Anesthesia (Anatomy & Physiology)	4
▪ Pharmacology	31
Patients and Methods	48
Results	56
Discussion	75
Summary	86
Conclusion	89
References	90
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table 1:	Nerve fibers classification	7
Table 2:	Summarizes the pharmacological properties of commonly used local anesthetics	38
Table 3:	Comparison between ondansetron group and placebo group regarding demographic data, anthropometric measures, ASA score and total time of surgery	57
Table 4:	Comparison between ondansetron group and placebo group regarding systolic blood pressure at different time of measurement	59
Table 5:	Comparison between ondansetron group and placebo group regarding diastolic blood pressure at different time of measurement	61
Table 6:	Comparison between ondansetron group and placebo group regarding mean arterial blood pressure at different time of measurement	63
Table 7:	Comparison between ondansetron group and placebo group regarding O2 saturation SaO2 at different time of measurement	65
Table 8:	Comparison between ondansetron group and placebo group regarding heart rate at different time of measurement	67
Table 9:	Comparison between ondansetron group and placebo group regarding incidence of hypotension at different time of measurement	69
Table 10:	Comparison between ondansetron group and placebo group regarding incidence of bradycardia at different time of measurement	71

List of Tables cont...

Table No.	Title	Page No.

Table 11: Comparison between ondansetron group and placebo group regarding incidence of shivering at different time of measurement..... 72

Table 12: Comparison between ondansetron group and placebo group regarding ECG changes, pruritis, nausea and vomiting..... 74

List of Figures

Fig. No.	Title	Page No.
Figure 1:	Sagital section through lumbar vertebrae	5
Figure 2:	Chemical structure of local anesthetics	36
Figure 3:	Mean age of the two studied groups	58
Figure 4:	Gender distribution in the two studied groups	58
Figure 5:	Mean systolic blood pressure in the two studied groups at different time of measurement	60
Figure 6:	Mean diastolic blood pressure in the two studied groups at different time of measurement.	62
Figure 7:	Mean arterial blood pressure in the two studied groups at different time of measurement	64
Figure 8:	SaO2 (%) in the two studied groups at different time of measurement	66
Figure 9:	Heart rate (beat/min) in the two studied groups at different time of measurement	68
Figure 10:	Incidence of hypotension in the two studied groups immediately after spinal and at 5 min.	70
Figure 11:	Incidence of shivering at 5 min in the two studied groups.	73
Figure 12:	Incidence of pruritis, nausea and vomiting in the two studied groups.	74

List of Abbreviations

Abb.	Full term
5-HT	*Five hydroxytriptamine*
5HT3	*Five hydroxytriptamine subtybe 3*
ASA	*American Society of Anesthesiologists*
BJR	*Bezold Jarisch Reflex*
BMI	*Body Mass Index*
C	*Cervical*
Cm	*Centimeter*
CNS	*Central Nervous System*
CSF	*Cerebro Spinal Fluid*
CTZ	*Chemoreceptor Trigger Zone*
CYP	*Cytochrome P540*
DBP	*Diastolic Blood Pressure*
ECG	*Electro Cardio Gram*
FDA	*Food and Drug Administration*
G	*Gauge*
GI	*Gastrointestinal*
HR	*Heart Rate*
Hr	*Hour*
Im	*Intramascular*
Iv	*Intravascular*
Kg	*Kilogram*
L	*Lumbar*
M2	*Muscarinic Receptor subtybe-2*
MABP	*Mean Arterial Blood Pressure*

List of Abbreviations cont...

Abb.	Full term
Mg	*Milligram*
Mm	*Millimeter*
O2	*Oxygen*
PABA	*Para Amino Benzoic Acid*
PACU	*Post Operative Care Unit*
PDPH	*Post Dural Puncture Headache*
PKU	*PhenylKetonuria*
PONV	*Post Operative Nausea and Vomiting*
S	*Sacral*
SaO2	*Arterial Oxygen Saturation*
SBP	*Systolic Blood Pressure*
SD	*Standard Deviation*
SIH	*Spinal anesthesia Induced Hypotension*
STATA	*Statistics and Data*
T	*Thoracic*

INTRODUCTION

Spinal anesthesia is one of the common methods of providing anesthesia for various surgeries, it's most commonly used for surgeries below the umbilicus, Surgeries performed under spinal anesthesia include abdominal, lower extremities, and perineum. Despite the popularity and ease of its use, this procedure is frequently associated with hemodynamic instability ***(Cook and Heidotten, 2016).***

However, spinal anesthesia does carry some risks. The most common adverse event is hypotension resulting from a near complete sympathetic block; this can occur because the level of blocking must be at least at T4 to ensure adequate analgesia ***(Russell, 1995).*** A large prospective observational study has demonstrated the incidence of hypotension and bradycardia during spinal anesthesia to be 33% and 13%, respectively, among non - obstetric patients. The majority of these patients received spinal anesthesia during surgery without the prophylactic use of vasoactive agents (96%). However, a small number of patients received concurrent ephedrine (2%), atropine (0.5%), or ephedrine and atropine (0.25%) ***(Carpenter et al., 1992).***

Probably reduction in vascular resistance by sympathetic nerve blockade is the main reason of hypotension. Relative dominance of parasympathetic system, activation of Bezold–Jarisch reflex and increased baroreceptor activity may lead to

bradycardia and some degree of hypotension. The responsible receptors for the Bezold–Jarisch reflex are mechanoreceptors located in the heart walls which participate in systemic responses to hyper and hypovolemia. They also include chemoreceptors sensitive to serotonin (5-HT3) receptors ***(Yamano et al., 1994; Aviado and Guevara, 2001).***

The Bezold-Jarisch reflex results from decreased filling of the right atrium, which reduces the outflow from some intrinsic chronotropic stretch mechanoreceptors in the ventricular wall ***(Aviado and Guevara, 2001).*** Animal studies have demonstrated that serotonin (5 - HT) could be associated with the induction of the Bezold-Jarisch reflex in the setting of decreased blood volume ***(Martinek, 2004).*** this effect can be blocked at (5 - HT3) receptors ***(Yamano et al., 1994).***

Some animal and human studies illustrated that Bezold–Jarisch reflex can be decreased by (5-HT3) antagonists ***(White et al., 1998; Sahoo et al., 2013).*** On the other hand; serotonin (5-HT) is a critical thermoregulatory neurotransmitter. In non-anesthetized individuals, ondansetron, decreases core temperature attenuation that triggers shivering ***(Carpenter et al., 1992).***

AIM OF THE WORK

To find out the effectiveness of prophylactic administration of intravenous ondansetron for attenuation of spinal anesthesia induced hypotension in non-obstetric spinal anesthesia surgeries.

And to find out effectiveness of Ondansetron on spinal anesthesia induced shivering.

SPINAL ANESTHESIA (ANATOMY & PHYSIOLOGY)

Anatomical consideration:

1. The Vertebral Column:

The spine is composed of the vertebral bones and fibrocartilaginous intervertebral disks. There are 7 cervical, 12 thoracic, and 5 lumbar vertebrae. The sacrum is a fusion of 5 sacral vertebrae, and there are small rudimentary coccygeal vertebrae. The spine as a whole provides structural support for the body and protection for the spinal cord and nerves, and allows a degree of mobility in several spatial planes. At each vertebral level, paired spinal nerves exit the central nervous system ***(Kleinman and Mikhail, 2006).***

2. Cerebrospinal fluid (CSF):

CSF is an isotonic, aqueous medium with a constitution similar to interstitial fluid. CSF is contained between the pia and arachnoid matters in the subarachnoid space ***(Kleinman and Mikhail, 2006).***

3. The Spinal cord:

The spinal cord normally extends from the foramen magnum to the level of L1 in adults. The anterior and posterior nerve roots at each spinal level join one another and exit the

intervertebral foramina forming spinal nerves from C1 to S5. At the cervical level, the nerves arise above their respective vertebrae, but starting at T1 they exit below their vertebrae. Because the spinal cord normally ends at L1, lower nerve roots course some distance before exiting the intervertebral foramina. These lower spinal nerves form the caudaequina "horse tail". Therefore, performing a lumbar (subarachnoid) puncture below L1 in an adult avoids potential needle trauma to the cord, damage to the caudaequina is unlikely as these nerve roots float in the dural sac below L1 and tend to be pushed away (rather than pierced) by an advancing needle ***(Brown, 2005).***

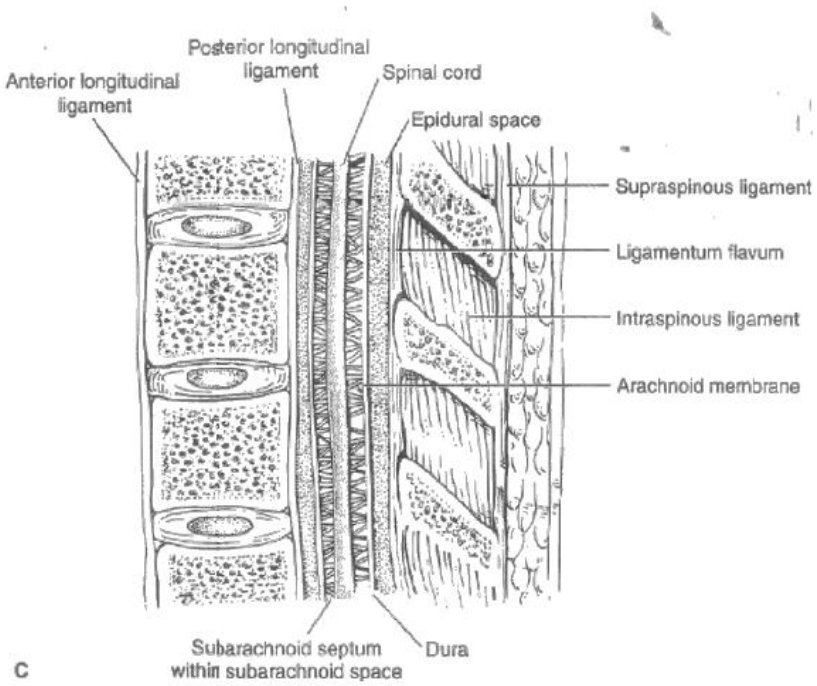

Figure 1: Sagital section through lumbar vertebrae ***(Kleinman and Mikhail, 2006).***

When performing spinal anesthesia using the midline approach, the layers of anatomy that are traversed (from posterior to anterior) are skin, subcutaneous fat, supraspinous ligament, interspinous ligament, ligamentum flavum, dura mater, subdural space, arachnoid mater, and finally the subarachnoid space. When the paramedian technique is applied, the spinal needle should traverse the skin, subcutaneous fat, ligamentum flavum, dura mater, subdural space, arachnoid mater, and then pass into the subarachnoid space ***(Kleinman and Mikhail, 2006).***

Physiological Consideration:

The physiologic response to central block is determined by the effects of interrupting the afferent and efferent innervations of somatic and visceral structures. Somatic structures are traditionally related with sensory and motor innervations, while the visceral structures are more related to the autonomic nervous system ***(Kleinman and Mikhail, 2006).***

1- **Somatic Blockade:**

Prevention of pain and skeletal muscle relaxation are classic objectives of central blockade. Nerve fibers are not homogenous. There are three main types of nerve fibers designated A, B and C. The A group has four sub-groups alpha, beta, gamma and delta. The minimum concentration of local anesthetic required to stop transmission varies depending upon fiber size ***(Casey, 2000).***