BAROREFLEX INTEGRITY: A COMPARATIVE STUDY BETWEEN PROPOFOL, SEVOFLURANE AND PROPOFOL WITH SEVOFLURANE ANESTHESIA

Thesis
Submitted for partial fulfillment of MD degree in Anesthesiology

By
Mona Hamed El Sherbiny
(M.B.B.Ch.,) MSc Anesthesiology

Supervised By

Prof. Dr. Tarek Mahmoud Fahmy Abdel Barr
Professor of Anesthesiology
Faculty of Medicine
Cairo University

Prof. Dr. Jehan Helmy Ibrahim
Ass. Professor of Anesthesiology
Faculty of Medicine
Cairo University

Prof. Dr. Ahmed Abdalla Mohamed
Ass. Professor of Anesthesiology
Faculty of Medicine
Cairo University

Dr. Mohamed Hussien Abd El Aziz
Lecturer of Anesthesiology
Faculty of Medicine, Cairo University

Faculty of Medicine
Cairo University
2014

بسم الله الرحمن الرحيم

[وأنزل اللـه عليـك الكتــاب
والحكمة وعَلَّمَكَ مَا لَمْ تَكُن تَعْلَمُ
وكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيماً]

صدق الله العظيم

النساء .. آية ١١٣

Acknowledgement

First of all thanks to Allah who helped me to do this work.

I would like to express my sincere appreciation and gratitude to ***Prof. Dr. Tarek Mahmoud Fahmy Abdelbarr,*** *Professor of Anesthesia, Faculty of medicine, Cairo University & to* ***Prof. Dr. Jehan Helmy Ibrahim,*** *Assisstant Professor of Anesthesia, Faculty of medicine, Cairo university for their generous supervision and kind guidance to make the realization of this work much easy.*

I am deeply grateful to ***Prof. Dr. Ahmed Abdalla Mohammed,*** *Assisstant Professor of Anesthesia, Faculty of Medicine, Cairo University & to* ***Dr. Mohammed Hussien Abdelaziz*** *, Lecturer of Anestheia, Faculty of medicine for their eager share, their kind support and guidance.*

Deepest gratitude to ***Dr. Ashraf Elmasry,*** *Lecturer of Anestheia, Faculty of medicine for his great effort in conducting the statistics for our study & for his kind support and guidance.*

Abstract

Background: The baroreceptor reflex is the main mechanism for short-term regulation of blood pressure and a major determinant of the blood pressure responses associated with various behaviors. Baroreflex sensitivity (BRS) is the amount of change in beat-to-beat interval (RR) against a 1mm Hg systolic blood pressure deviation. BRS is traditionally measured by bolus injection of vasoactive drugs such as phenylephrine which causes increase in systolic blood pressure (SBP) or Na nitroprusside (NTP) which causes decrease in systolic blood pressure .

Methods: This comparative study included 60 patients who were scheduled for laparoscopic gynecological surgery. Patients were divided into three groups (Propofol-group) , (Sevo-group) & (combined Propofol & Sevo group) with 20 patient in each group.Pressor & depressor tests were done pre,intra & postoperative with recording systolic blood pressure & R-R interval as well as the diastolic overshoot in the awake atate,under anesthesia & postoperatively

Results: There were no significant differences in patient population demographic data, awake pretest SBP and HR. The results of our study suggest that there was no significant depression of baroreceptors except for the depressor slopes in the propofol group after induction of anesthesia with full recovery of baroreceptors in the postoperative results.Also, Our study stated that blood pressure was significantly lower among patients confined to sevoflurane group as compared to other two groups suggesting that haemodynamics were more affected when using sevoflurane alone than using propofol alone or in the combined group.

Conclusion: Data obtained from this study showed that use of propofol alone may lead to depression of baroreceptors as compared to sevoflurane alone or combined use of them. On the other hand, haemodynamics were affected when using sevoflurane alone than using propofol or combined use of them.

Key words:

Anesthesia –Propofol-Sevoflurane-Baroreflex .

List of Contents

List Of Abbreviations

Abbreviation	The Full Term
ABP	arterial blood pressure.
ABR	arterial baroreflex.
ACTH	adrenocorticotropic hormone.
AP	arterial pressure.
ARDS	acute respiratory distress syndrome.
ASA	american society of anesthesiologists.
BP	blood pressure.
BRS	Baroreflex sensitivity.
CBF	cerebral blood flow.
cGMP	cyclic guanosine 3',5'-monophosphate.
CMR	cerebral metabolic rate.
CNS	central nervous system.
CO	cardiac output.
CO2	carbon dioxide.
ECG	electrocardiogram.
EEG	electroencephalogram.
ED_{95}	effective dose for desired effect in 95 % of population exposed to it.
Fe^{2+}	iron.
GABA	gamma-amiobutyric acid.
HBF	Hepatic blood flow.
Hgb Fe^{3+}	methemoglobin.
HR	heart rate.
HRV	heart rate variability.
IBI	inter-beat interval.

ICA	**internal carotid artery.**
ICP	**intracranial pressure.**
ICU	**intensive care unit.**
IM	**intramuscular.**
IV	**intravenous.**
LMA	**laryngeal mask airway.**
LRFA	**laparoscopic radiofrequency ablation of liver tumors.**
MAC	**minimum alveolar concentration.**
MAO	**mono amine oxidase.**
MAP	**mean arterial pressure.**
mmHg	**millimeter mercury.**
NO	**nitrogen oxide.**
N_2O	**nitrous oxide.**
NTP	**Na nitroprusside.**
NTS	**nucleus of the tractus solitaries.**
PEEP	**positive end expiratory pressure.**
RR	**beat-to-beat interval.**
SBP	**systolic blood pressure.**
SBR	**spontaneous baroreflex.**
SQ	**subcutaneous.**
***V*d**	**volume of distribution.**
VM	**Valsalva maneuver.**

List Of Tables

List of Figures

INTRODUCTION AND AIM OF THE STUDY

The baroreceptor reflex is the main mechanism for short-term regulation of blood pressure and a major determinant of the blood pressure responses associated with various behaviors. The cardiac branch of the baroreflex that relates blood pressure to inter-beat interval (IBI) is one relevant source of vagal influences and cardiac autonomic regulation, being the main generator of autonomic measures such as respiratory sinus arrhythmia and heart rate variability.

The baroreceptor reflex consists of two important limbs, including the sympathetic baroreflex and the cardiovagal reflex systems. Impairment of cardiovagal reflex responses has been associated with some physiological or pathologic conditions, such as aging and hypertension. More importantly, its clinical application has been highlighted by the increased incidence of cardiac dysrhythmias and decreased survival after myocardial infarction in patients with diminished cardiovagal baroreflex function.

Baroreflex sensitivity (BRS) is the amount of change in beat-to-beat interval (RR) against a 1mm Hg systolic blood pressure deviation. BRS is traditionally measured by bolus injection of vasoactive drugs such as phenylephrine which causes increase in systolic blood pressure (SBP) or Na nitroprusside (NTP) which causes decrease in systolic blood pressure . The increase /decrease in

SBP tempts an increase /decrease in the corresponding RR interval(milliseconds).

Potent volatile anesthetics cause concentration dependent depressions in pharmacological baroreflex gains and continue to exert depressive effects after emergence from general anesthesia in humans. Previous studies suggest a rapid return of baroreflex sensitivities to preanesthesia, premedicated conditions after surgeries with halothane and isoflurane anesthesia.

Sevoflurane is a volatile anesthetic agent with low blood–gas solubility (0.6). Sevoflurane is now widely used for its desirable properties of rapid induction and emergence and quick control of anesthetic depth.

Propofol, an intravenous anaesthetic, is now widely used in clinical practice because of its favorable recovery profile and low incidence of side effects.

The effects of contemporary available general anesthetics, such as propofol or sevoflurane on baroreflex control of heart rate (HR) have been extensively investigated in humans. More importantly, how long volatile & intravenous anesthetics exert depressive effects on the baroreflex function after general anesthesia and, thus, how full recovery of baroreflex function actually takes place.

AIM OF THE STUDY

This study aims to evaluate the effect of using different anaesthetic drugs as sevoflurane, an inhalational anaesthetic, or propofol, an intravenous anaesthetic, on the integrity of barorecepter reflex and its recovery after emergence from anaesthesia.

.

ANATOMY

A variety of receptors transmit information about cardiovascular status to the brain. The pressure receptors that respond to the tension of the arterial walls, the arterial baroreceptors, are located near the output of the heart (in the aortic branch) and in the carotid arteries where they monitor the pressure in the vessels that are essential for the brain's blood supply. There exist a number of histologically discriminable baroreceptors in the wall of the arteria carotis communis. (1)

Three different types have been identified by means of electron microscopy. The afferent information is transmitted via both myelinated and unmyelinated fibers.(2) Another cluster of receptors is located in the aortic branch and still others are found in the walls of the larger artieries.(3)

Finally, baroreceptors have been identified at various locations in the heart. The type A receptors in the atrium fire maximally during the arterial systole while the atrial type B receptors respond to filling.(4)

It is thought that the human baroreceptor system is mainly located in the proximal portion of the internal carotid artery (ICA), termed the carotid sinus. The exact neuroanatomy of the human carotid sinus is a matter of debate. A recent macroscopic study of adjacent neuronal networks demonstrates that innervation of the sinus is variable and unpredictable.(5)