# Efficacy of Granisetron for Prevention of the Postoperative Nausea and Vomiting after Laparoscopic Surgery in Adults

Thesis

Submitted for Partial Fulfillment of MD Degree
In **Anesthesiology**

By

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**2015**

بِسْمِ اللّهِ الرّحمَنِ الرّحيمِ

[...رَبِّ أَوزِعنِي أَن أَشكُرَ نِعمَتَكَ

الّتِي أَنعَمْتَ عَلَيَّ وعَلى والِدَيَّ

وَأَنْ أَعْمَلَ صَالِحاً تَرْضَاهُ وأَدْخِلْنِي

بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ]

صدق الله العظيم

النمل.. اية رقم ١٩

# Acknowledgment

**P**raise be to **ALLAH**, The Merciful, The Compassionate for all the gifts **I** have been offered; one of the gifts is accomplishing this research work.

**W**ords cannot adequately assure my deepest thanks and gratitude to **Prof. Dr. / Nabil Mohammed Abdelmoaty,** Professor of Anesthesia and Intensive Care, Faculty of Medicine- Ain Shams University, for his continuous encouragement, constructive criticism and continuous assistance. I really have the honor to complete this work under his supervision.

**I** would like to express my deepest thanks and gratitude to **Prof. Dr./ Hala Gomaa Salama,** Professor of Anesthesia and Intensive Care, Faculty of Medicine- Ain Shams University, for her unlimited help, valuable guidance, continuous encouragement and forwarding her experience to help me complete this work.

**I** can't forget to thank with all appreciation and gratitude **Dr./ Waleed Ahmad Mansor,** Lecturer in Anesthesia and Intensive Care, Faculty of Medicine- Ain Shams University, for his valuable assistance, kind supervision and useful guidance throughout the whole work.

**I** can never forget to thank all patients who willingly participated in this study, as well as the physician and nurses, who were totally supportive during all steps of data collection.

**L**ast but not least all thank and gratitude go to my Family, especially my Parents, my Husband and my children, for pushing me forward in every step in my life.

Fatma Al Zahra Mosleh Ali

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# List of Abbreviations

| Abbr. | Full term |
|---|---|
| **5-HT** | : 5-hydroxy tryptamine |
| **ANOVA** | : Analysis of variance |
| **ASA** | : American Society of Anesthesiologists |
| **BMJ** | : British Medicine Journal |
| **CINV** | : Chemotherapy induced nausea & vomiting |
| **CNS** | : Central nervous system |
| **$CO_2$** | : Carbon dioxide |
| **CSF** | : Cerebro-spinal fluid |
| **CTZ** | : Chemoreceptor trigger zone |
| **CYP** | : Cytochrome P |
| **D** | : Dopamine |
| **ECG** | : Electrocardiography |
| **FDA** | : Food and Drug Administration |
| **GIT** | : Gastro-intestinal tract |
| **H** | : Histamine |
| **h** | : Hour |
| **IV** | : Intravenous |
| **$N_2O$** | : Nitrous oxide |
| **$NK_1$** | : Neurokinin$_1$ |
| **NVP** | : Nausea & vomiting of pregnancy |
| **PACU** | : Postanesthesia care unit |
| **PDNV** | : Post discharge nausea and vomiting |

# List of Abbreviations *(Cont...)*

**$PETCO_2$** : Partial end-tidal $CO_2$

**PINV** : Radiation induced nausea & vomiting

**PONV** : Postoperative nausea and vomiting

**RINV** : Radiation induced nausea and vomiting

**SD** : Standard deviation

**SP** : Substance P

**SSRIs** : Selective serotonin receptor inhibitors

**STN** : Solitary tract nucleus

**$T^1/_2$** : Half life

**VAS** : Visual analogue scale

**VC** : Vomiting center

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# Introduction

Postoperative nausea and vomiting (PONV) after laparoscopic surgeries remains a significant problem. The incidence of this distressing adverse effect can be reached up to 79% ***(Apfel et al., 2009)***.

Nausea is defined as the subjectively unpleasant sensation associated with awareness of the urge to vomit. Retching is defined as the laboured, spastic, rhythmic contraction of the respiratory muscles without the expulsion of gastric contents. Vomiting is defined as the forceful expulsion of gastric contents from the mouth ***(Fujii and Tanaka, 2006)***.

Most commonly used antiemetics occasionally cause undesirable effects, such as excessive sedation, hypotension, dry mouth, dysphoria, extrapyramidal syndrome and prolonged QT syndrome with droperidol ***(McCormick, 2002)***.

Granisetron, a selective serotonin type 3 receptor antagonist is effective for the treatment and prevention of PONV, radiation induced nausea and vomiting (RINV) and it is the most effective antiemetic drug in chemotherapy induced nausea and vomiting (CINV) ***(Roila and Fatigoni, 2006)***.

# Aim of the Work

This study was performed to evaluate the efficacy and potency of granisetron in the prevention of PONV after laparoscopic surgery in adults.

# I. Pathophysiological Pathway of Nausea and Vomiting

## The Centers and Afferent Pathway:

Vomiting centers involve two functionally distinct medullary centers: the vomiting center and the chemoreceptor trigger zone. The act of vomiting is integrated by the vomiting center, which is located in the dorsal portion of the reticular formation of the medulla near the sensory nuclei of the vagus (the subnucleus gelatinosus and nucleus tractus salitarius). The chemoreceptor trigger zone is located in a small area on the floor of the fourth ventricle called area of postrema, where it is exposed to both blood and cerebrospinal fluid. It is thought to mediate the emetic effects of blood-borne drugs and toxins ***(Carol, 2007).***

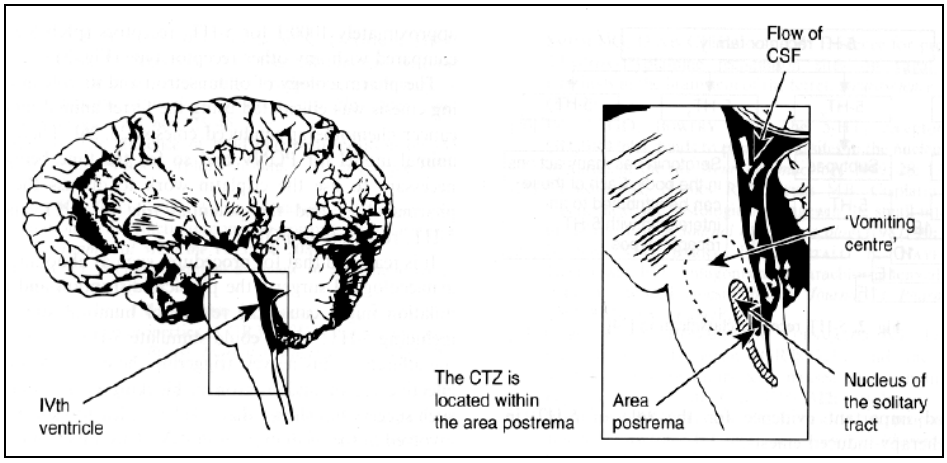


**Figure (1):** The anatomical location of the area postrema and the region of the vomiting center ***(Janicki, 2005).***

There are different ways in which the vomiting centers are stimulated:

(1) Irritation of upper GI mucosa is a common cause of vomiting by luminal stimuli (e.g. hypertonic solutions, copper sulphate) but the in-series tension receptors in the muscle could also be implicated if luminal stimuli evoked reflex motility changes via the enteric nervous system ***(Grundy, 2006).***

(2) Vomiting can also be initiated through the gag reflex by physical stimulation of the back of the throat. These afferent impulses reach the vomiting center through the IX and X cranial nerves ***(Sabyasachi, 2008).***

(3) Blood_borne emetics which include emetic drugs & toxins. Emetic drugs like apomorphine and ipecac can trigger vomiting. These stimulate the chemoreceptor trigger zone. Impulses from the chemoreceptor trigger zone are relayed to the vomiting center. The neurons in the chemoreceptor trigger zone appear to be dopaminergic and serotonergic. Dopamine and serotonin antagonists are therefore effective antimetic drugs. The vomiting that occurs in uremia and in radiation sickness is also mediated through the chemoreceptor trigger zone and occurs due to the endogenous production of emetic substance.

(4) Motion sickness is associated with vomiting. The stimulus causing such vomiting originates in the vestibular apparatus. The afferent impulses relay in the vestibular nuclei in the cerebellum and then in the chemoreceptor trigger zone before finally reaching the vomiting center.