Perioperative Anesthetic Management of Laparoscopic Surgeries in Obese Patients

Essay

Submitted for partial fulfillment of Master Degree of Anesthesia

By

Mohamed Sayed Mohamed Rawi

(***M.B.B. Ch.***)

Supervision by

Dr. Waleed Abdelmaged Mohamed Al-Taher

Professor of Anesthesia, intensive care and pain management
Faculty of Medicine
Ain Shams University

Dr. Hanaa Abdalla El Gendy

Assistant Professor of Anesthesia, intensive care and pain management
Faculty of Medicine
Ain Shams University

Dr. Tamer Nabil Mohamed Toaima

Lecturer of Anesthesia, intensive care and pain management
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain Shams University
2016

﴿وقُل رَّبِّ زِدْنِي عِلْماً﴾

سورة طه الآيه رقم114

Acknowledgement

I would like to begin by thanking ***Allah*** *for his guidance and protection, may his blessing always guide us.*

Moreover I would like to express my sincere and profound gratitude to ***Dr. Waleed Abdelmaged Mohamed Al-Taher,*** *Professor of Anesthesiology, intensive care, and pain management, Faculty of Medicine - Ain Shams University, for his meticulous supervision, loyal encouragement and valuable advises throughout the work.*

I wish to express deep appreciation to ***Dr. Hanaa Abdalla El Gendy,*** *Assistant professor of Anesthesiology, intensive care, and pain management, Faculty of Medicine - Ain Shams University, for her continuous guidance, unique supervision and kind care.*

I am also grateful to ***Dr. Tamer Nabil Mohamed Toaima,*** *Lecturer of Anesthesiology, intensive care, and pain management, Faculty of Medicine - Ain Shams University, for his kind effort, assistance he offered me throughout the performance of this work.*

Mohamed Sayed Mohamed Rawi

Abstract

Obesity is considered a serious medical condition. Comorbidities that are related to obese patients are numerous and can be hazardous to patient's life. Comorbidities related to obesity include: metabolic, respiratory,and CVS diseases.Obesity persists as an anesthetic challenge accompanied with many common difficulties that need careful anesthetic planning.Obese patients are liable tohigher risks of perioperative cardiopulmonary complications while needing a prolonged hospital stay postoperatively.Laparoscopic surgeries have many advantages over open surgeries. Laparoscopic surgeries carry also a risk of many complications that might harm the patient.

Keywords: Laparoscopic, Surgeries, Anesthesia, Obesity, Obese, Management, comorbidities

Contents

List of Abbreviations

AAGA	Accidental awareness under general anesthesia
ABW	Adjusted body weight
ADH	Anti-diuretic hormone
AF	Atrial fibrillation
BMI	Body mass index
CAD	Coronary artery disease
CDC	Centers for disease control
CHD	Coronary heart disease
CKD	Chronic kidney disease
cm	Centimeter
cmH_2O	Centimeter water
COPD	Chronic obstructive pulmonary disease
CPAP	Continuous positive airway pressure
CPET	Cardiopulmonary exercise testing
CPR	Cardiopulmonary resuscitation
CV	Cardiovascular
CVS	Cardiovascular system
DLCO	Diffusion capacity in the lung for carbon monoxide
DM	Diabetes mellitus
DVT	Deep venous thrombosis
ECG	Electrocardiogram
ERV	Expiratory reserve volume
FEV_1	Forced expiratory volume in 1 second
FG	French gauge
Fig	Figure
FRC	Functional residual capacity
FVC	Forced vital capacity
GA	General Anesthesia
GERD	Gastroesophageal reflux disease
GFR	Glomerular filtration rate
GIT	Gastrointestinal tract
h	Hour
HCL	Hydrochloric acid

List of Abbreviations(Cont.)

HDL	High density lipoproteins
IAP	Intra-abdominal pressure
IBW	Ideal body weight
ICP	Intracranial pressure
kg	kilogram
Kpa	Kilopascal
L(n.)	Lumbar vertebra number()
LBW	Lean body weight
LMA	Laryngeal mask airway
m^{-2}	Per square meter
mg	Milligram
min	Minute
ml	Milliliter
mmol	Millimole
mRNA	Messenger ribonucleic acid
n	Number
NMB	Neuromuscular blockers
OA	Osteoarthritis
OHS	Obesity hypoventilation syndrome
OSA	Obstructive sleep apnea
OSAS	Obstructive sleep apnea syndrome
OS-MRS	Obesity surgery mortality risk stratification score
$PaCO_2$	Pressure of arterial carbon dioxide
PACU	Post anesthesia care unit
PAP	Positive airway pressure
PCO_2	Pressure of carbon dioxide
PCOS	Polycystic ovarian syndrome
PEEP	Positive end expiratory pressure
PH	Pulmonary hypertension
PONV	Post-operative nausea and vomiting
PP	Pneumoperitoneum
PV0	Pressure at zero volume
PVR	Pulmonary vascular resistance

List of Abbreviations(Cont.)

PYY	Peptide YY
RAAS	Renin aldosterone angiotensin system
RNA	Ribonucleic acid
RV	Residual volume
SDB	Sleep disordered breathing
SOBA	Society for obesity and bariatric anesthesia
Sod.chl.	Sodium chloride
STEMIs	ST elevation myocardial infarctions
SVR	Systemic vascular resistance
T(n.)	Thoracic vertebra number()
TIIDM	Type II diabetes mellitus
TAB	Transversal abdominal block
TBW	Total body weight
TCI	Target controlled infusion
TED	Thromboembolic device
TLC	Total lung capacity
TOF	Train of four
ug	Microgram
UK	United Kingdom
VC	Vital capacity
VTE	Venous thromboembolism
WHR	Waist to hip ratio
µg	Microgram

List of Figures

List of Tables

Page No.	Title	Fig. No.

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and/or increased health problems. Obesity has a major effect on normal body physiologic functions and different body systems such as cardiovascular system, respiratory system, endocrinal system, liver and kidney functions (**Sinha, 2009).**

These changes and others affect anesthetic management for this specific group of patients and needs special care for possible comorbidities (**Eastwood et al., 2010).**

Laparoscopic surgery has recently become the preferred method for performing many general surgery procedures such as laparoscopic cholecystectomy and many bariatric surgeries which all emerged during the early to mid-1990s. Laparoscopic surgeries offer major benefits to the obese patient such as minimized incision size and trauma with reduced postoperative discomfort, shortened recovery rates, and a lower incidence of postoperative wound infections. These factors all contribute to shorter in-patient stay and reduced perioperative morbidity (**Veldkamp et al., 2005).**

However, laparoscopic surgery is not without its own specific risks, either due to the risks associated with

individual laparoscopic techniques or due to the physiological changes associated with the creation of a pneumoperitoneum related to carbon dioxide inflation, also extremes of patient positioning are a risk factor (**Gurusamy et al., 2009**).

Perioperative anesthetic management for obese patients undergoing a laparoscopic surgery includes many challenges. Preoperative assessment of an obese patient should pay attention to focus on assessment of different body systems such as cardiorespiratory status and possible comorbidities associated with obesity. Peripheral and central venous access and arterial cannulation sites should be evaluated (**Karason et al., 2000).**

Drugs with weak or moderate lipophilicity can be administered according to ideal body weight (IBW), as their volume of distribution (VD) remains relatively consistent between obese and normal-weight individuals. A more accurate calculation of the drug dosage uses the lean body mass, which requires addition of 20% to IBW (**Ogunnaike et al., 2002).**

Pain management in obese patients undergoing laparoscopic surgeries should be opioid-sparing or -free because of a well-documented risk of sedation and serious respiratory depression. Potential advantages of thoracic

epidural analgesia in the setting of laparoscopic surgeries in obese patients should be considered (**Ramirez et al., 2009).**

Multimodal thromboprophylactic measures must be used as deep venous thrombosis (DVT) and thromboembolism are amongst the most common complications in morbidly obese patients (**Ahmad et al., 2008).**

Post-operative monitoring and care for liable complications is needed starting from post anesthesia care unit (PACU) especially for development of post-operative atelectasis and respiratory depression. Patients with a history of severe sleep apnea may require overnight observation in the intensive care unit because prolonged obstructive apnea is a real possibility, especially when parenteral narcotics are used (**Noseda et al., 2004).**

Aim of the Essay

The aim of this work is to focus on perioperative anesthetic management and considerations in managing laparoscopic surgeries in obese patients and to discuss the advantages and drawbacks of laparoscopic surgeries in these patients from anesthetic point of view.

Chapter I

Pathophysiology of Obesity

Definition of Obesity and Overweight:

Obesity is a condition of excessive body fat. The name comes from the word *obesus*, which is a Latin word that means being fat by eating. The difference between normality and obesity is arbitrary, however, a patient is considered obese when fat tissue amount increases to the degree that affects both physical and mental health and life expectancy is reduced ***(Adams and Murphy, 2000)***.

Body Mass index (BMI) is a widely used formula relating weight and height of an individual. BMI is calculated as the body weight in kilograms divided by the square of height in meters ***(Weisell, 2002)***.

A person with a BMI of 25-30 kg m^{-2} is considered overweight with low risk of serious medical complications. Patients with a BMI of >30, >35 and >55 kg m^{-2} respectively are considered obese, morbidly obese and super-morbidly obese ***(Adams and Murphy, 2000)***.

Morbidly obese patients are those with a body mass index (BMI) more than 40, or more than 35 associated with comorbidities like diabetes mellitus (DM) and systemic hypertension. Patients suffering morbid obesity are