MINIMIZING PULMONARY COMPLICATIONS DURING GASTROPLASTY

Essay
Submitted for partial fulfillment of
Master degree in Anesthesiology

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2005**

Acknowledgement

First of all, I would like to thank **GOD** *for every thing and especially for my steady steps I have been taking in my career.*

I would like to express my sincere gratitude and deepest thanks to **Professor Dr. Yosry Ropin,** *Professor of Anesthesiology, faculty of medicine, Ain Shams University for his helpful and valuable supervision and expert assistance.*

My deepest thanks and sincere respect to **Professor Dr. Galal Abu El Sood,** *Professor of Anesthesiology, faculty of medicine, Ain Shams University for his valuable guidance and assistance.*

With deepest thanks to **Dr. Adel Mikhail,** *Lecturer of Anesthesiology, faculty of medicine, Ain Shams University for his continuous encouragement and great effort.*

Great thanks to my family for their patience and support.

Emad Makram

Cairo, 2005.

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MO	Morbid obese
PPCS	Perioperative pulmonary complications
CPAP	Continuous positive airway pressure
ECF	Extracellular fluid
ECG	Electrocardiogram
FiO_2	Fraction of inspired oxygen
FRC	Functional residual capacity
GA	General anesthesia
GERD	Gastroesophageal reflux disease
HR	Heart rate
ICF	Intracellular fluid
IM	Intramuscular
IV	Intravenous
MAC	Minimal alveolar concentration
$PaCO_2$	Partial pressure of arterial carbon dioxide
PaO2	Partial pressure of arterial oxygen
PEEP	Positive end expiratory pressure
PO	Per os
PVR	Pulmonary vascular resistance
RDS	Respiratory distress syndrome
SC	Subcutaneous
SO_2	Oxyhemoglobin saturation
SPO_2	Oxygen saturation
SVR	Systemic vascular resistance
TCD	Transcranial Doppler
TEE	Trans-esophageal echo
TLC	Total lung capacity
URTI	Upper respiratory tract infection
V/Q	Ventilation perfusion ratio
VC	Vital capacity
VD	Dead space
VE	Minute volume
Vt	Tidal volume
IAP	Intra-abdominal pressure

INTRODUCTION

Obesity is a disorder of energy balance in which energy intake exceeds the need of the body and the surplus calories are stored as fat.

According to the National Institutes of Health, obesity is a major health problem with clearly established health implications, including an increased risk for coronary artery disease, hypertension, dyslipidemia, diabetes mellitus, obstructive sleep apnea, and socioeconomic and psychosocial impairment ***(NIH conference; 1991).***

Bariatric surgery is a viable option in the management of obese patients when non surgical treatment options have been unsuccessful. Anesthetic management of these patients should take in to consideration the specific problems associated with obesity and optimize them before surgery .

Pulmonary complications are the most common form of perioperative morbidity experienced by the patients who undergo bariatric surgery .

This essay is to discuss the hazards and problems of anesthesia in the obese patients undergoing gastroplasty as well as anesthetic management for such patients to avoid operative as well as post operative pulmonary complications.

SURGICAL CONSIDERATIONS

In order to prevent possible pulmonary complications of gastroplastic operations, it is vital to understand the operative details and its effects on the respiratory system.

In 1966 Mason and Ito reported the results of weight loss using a gastric bypass with division of the stomach into a small upper pouch connected to loop gastroenterostomy ***(Balsiger et al; 2000)*.** The technique for gastroplasty was simplified with the use of stapling instruments. In gastroplasty, the stomach is only stapled, leaving a small opening to permit the normal passage of food into the distal stomach and duodenum.

Types Of Gastroplasty:

1- Horizontal gastroplasty

2- Vertical gastroplasty

3- Laparoscopic vertical banded gastroplasty

4- Silastic ring vertical gastroplasty

5- Magenstrasse and Mill procedure

6- Gastric wrap

1- Horizontal gastroplasty:

It is no longer indicated for surgical treatment of obesity, because of high failure rates and increased incidence of complications.

2- Vertical Banded Gastroplasty (VBGP):

It is a procedure in which a stapled opening is made in the stomach with a stapling device 5 cm from the cardio-esophageal junction**.** One application of 90-mm stapling device with four parallel rows of staples are made between this opening and the angle of His, a strip of polypropylene mesh is wrapped around the stoma on the lesser curvature and sutured to itself but not to the stomach, creating 5-cm circumference outlet of the small uppers gastric pouch. **(Maclean, 1990).**

3- Laparoscopic VBGP:

After the advance of laparoscopy, the Vertical Banded Gastroplasty can be done laparoscopically. Laparoscopy is a minimally invasive procedure allowing endoscopic access to the peritoneal cavity after insufflation of a gas (CO2) to create space between the anterior abdominal wall and viscera. The space is necessary for the safe manipulation of instruments and organs.

Patient is placed in reverse trendelenburg and is either supine with the surgeon on the right and assistant on the left or in a modified lithotomy position with the surgeon between the patient's legs. Five ports are placed in the upper abdomen and a self-retaining retractor holds the liver lobe **(IBSR; 2001)**.

4- Silastic ring vertical gastroplasty:

It is another form of gastroplasties in which a polypropylene or silastic band is placed around the stomach just below the gastroesophageal junction. **(Kirby, 1989).**

An adjustable, inflatable band has been developed and may have more acceptable results; however, confirmatory data are not yet available **(Kuzmack, 1990).**

Non pulmonary Complications of gastroplasty:

1- Stenosis with persistent vomiting:

If persistent vomiting occurs after gastroplasty, upper gastrointestinal endoscopy is performed to examine the gastroplasty outlet. If a bolus is impacted, this can be cleared using the endoscope.

2- Leak and staple line disruption.

3-Deep venous thrombosis (DVT).

4- Tight stoma; Symptoms of stomal stenosis include post-prandial epigastric pain and vomiting **(Maclean et al; 1990)**.

5- Incisional hernia and wound infection (more common in open surgery)

6-Marginal ulceration and ulcerative eosophagities.

7-Complications of laparoscopic surgery as co_2 embolism, and accidental perforation of viscera.

Pulmonary Complications

a. Pulmonary aspiration, aspiration pneumonitis, lung abscess.

b. Pulmonary embolism.

c. Pneumothorax.

d. Difficult airway-management.

e. Postoperative hypoventilation.

f. Ventilation/ perfusion abnormalities.

Definition:

Definition of obesity requires standardization, which has proved difficult and elusive. Obesity has been defined as excessive accumulation of triglycerides in the adipose tissue depots of the body **(Lauer; 1991).** Although body weight is the simplest index of obesity, it is not always the best reflection of the relative proportion of adipose tissue in the body or of total adipose mass. Weight adjusted to body size gives a better indication than body weight alone **(Bierman,1984)**.

Indices based on height and weight have been developed to eliminate the contribution of height to weight. These include the weight-to-height ratio (W/H) and a widely used method correlated to the relative amount of adipose tissue; the body mass index (BMI).

BMI is defined as the body weight in kilograms divided by heights in meters squared. It appears to be a very useful method. **(Marek and Varon,1998).**

The BMI has been to divided into five subgroups:

a) 20-25: non-obese.

b) 25-30: low risk.

c) 30-35: moderate risk.

d)35-40: high risk.

e) >40 : very high risk of illness.

Still, heavily muscled individuals would be considered obese with this classification **(Bray, 1988)**.

Ideal weight for height tables are standard in the insurance industry and suggest that mortality is lowest in individuals within a certain weight range for a given height. According to these tables, overweight is defined as body weight as much as 20% greater than the predicted ideal weight. morbid obesity is defined as body weight more than twice ideal weight.

In practice, the Broca's index is used. It is equal to:

For men : Ideal weight (Kg) = height (cm) – 100

For women : Ideal weight (Kg) = height (cm) – 105

(Buckley et al, 1990)

Morbidity and mortality is increased with rising BMI, because obesity by itself can lead to diseases and aggravate other diseases **(Figure:2-1)**.

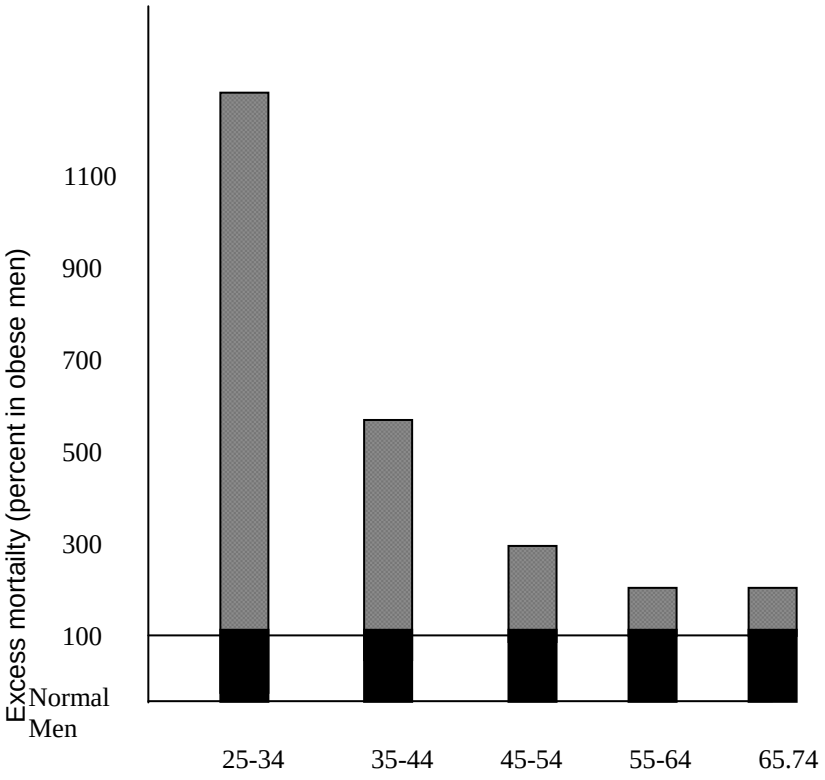

Figure (2-1): High mortality rates among morbidly obese men, computed by decade,compared with overall mortality for men in the united states (Dernick et al, 1980).

How to predict perioperative pulmonary complications of Gastroplasty ?