Regional Anesthesia in Obese Patients

Essay

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List of Abbreviations

A-aDO2	**:**	Alveolar arterial oxygen gradient
ACC	**:**	American College of Cardiology
AF	**:**	Atrial fibrillation
AGB	**:**	Adjustable gastric banding
AHA	**:**	American Heart Association
AHI	**:**	An apnea / hypopnea index
AO	**:**	Atlanto-occipital
ATBF	**:**	Adipose tissue blood flow
%BF	**:**	Percent of body fat
BMI	**:**	Body mass index
BPD	**:**	Biliopancreatic diversion
BUN	**:**	Blood urea nitrogen
BVI	**:**	Body Volume Index
CBC	**:**	Complete blood count
COX-2	**:**	Cyclooxygenase 2
CPAP	**:**	Continuous positive airway pressure
CPNB	**:**	Continuous peripheral nerve block
DVT	**:**	Deep venous thrombosis
EAT	**:**	Epicardial adipose tissue
ECG	**:**	Electrocardiogram
ERV	**:**	Expiratory reserve volume
EWAT	**:**	Epididymal white adipose tissue
FEV1	**:**	Forced expiratory volumes in one second
FFA	**:**	Free fatty acid
FRC	**:**	Functional residual capacity

FVC	**:**	Forced vital capacity
GA	**:**	General anaesthesia
GERD	**:**	Gastroesophageal reflux disease
Hb A1C	**:**	Glycated haemoglobin (A1C)
IBW	**:**	Ideal body weight
IL	**:**	Interleukin
LAD	**:**	Left atrial dilatation
LBW	**:**	Lean body weight
LFTs	**:**	Liver function tests
LMA™	**:**	Laryngeal mask airway
LMWH	**:**	Low molecular weight heparin
LV	**:**	Left ventricle
MetS	**:**	Metabolic syndrome
METs	**:**	Metabolic equivalents
MI	**:**	Myocardial infarction
MO	**:**	Morbidly obese
NAFLD	**:**	Nonalcoholic fatty liver disease
NF-kB	**:**	Nuclear factor kappa B
NIV	**:**	Non invasive
NSAIDS	**:**	Non-steroidal anti-inflammatory drugs
NYHA	**:**	New York heart association
OHS	**:**	Obesity hypoventilation syndrome
OSA	**:**	Obstructive sleep apnea
OS-MRS	**:**	Obesity surgery mortality risk score
PACU	**:**	Post anesthesia care unit
PCV	**:**	Pressure controlled ventilation

PEEP	**:**	Positive end-expiratory pressure
PNB	**:**	Peripheral nerve blocks
PSG	**:**	Polysomnography
RA	**:**	Regional anaesthesia
RAAS	**:**	Rennin angiotensin aldosterone system
RV	**:**	Right ventricle
RV	**:**	Residual volume
RYGB	**:**	Roux-en-Y gastric bypass
SG	**:**	Sleeve gastrectomy
SHS	**:**	Supine hypotension syndrome
SVF	**:**	Stromal vascular fraction
TAP	**:**	Transversus abdominis plane
TBW	**:**	Total body weight
TIA	**:**	Transient ischemic attack
TKA	**:**	Total knee arthroplasty
TNF-α	**:**	Tumor necrosis factor α
TOF	**:**	Train-of-four
US	**:**	Ultrasound
VBG	**:**	Vertical banded gastroplasty
VCV	**:**	Volume-controlled ventilation
VTE	**:**	Venous thromboembolism
ZEEP	**:**	Zero end expiratory pressure

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Introduction

Obesity is a worldwide healthcare problem that is often defined as a condition of abnormal or excessive fat accumulation in adipose tissue to the extent that heath may be impaired. The underlying process is positive energy balance and weight gain.

Obesity is a multisystem chronic pro-inflammatory disorder with increase morbidity and mortality. Adipocytes are far more than storage vessels for lipids, they secrete a large number of physiologically active substances called adipokines that lead to inflammation, vascular, cardiac remodelling, airway inflammation and altered microvasclar flow patterns ***(Cullen and Ferguson, 2012).***

Obesity is often expressed with reference to body mass index (BMI) that defined as the body weight in kilogram divided by the square of the body height in meters.

Obesity has defined as BMI more than 30 kg/m^2 and morbid obesity as BMI more than 40 kg/m^2 or BMI more than 35 kg/m^2 with obesity related co morbidity.

BMI alone isn't a good predictor of the distribution of excess body fat; central obesity with elevated visceral fat

levels is associated with greater metabolic impact and complications than widespread subcutaneous fat. BMI may be misleading in patients with significant muscle bulk. It is also critical to understand that patients can have elevated body fat content despite a normal BMI, so called " normal body weight obesity" and this too can have an impact on organ function ***(Kosmala et al., 2012)***.

With the risk of metabolic abnormalities and hypertension increasing as the percent of body fat (% BF) increases ***(Romero- Corral et al., 2010).***

The number of obese patients is gradually increasing worldwide. The World Health Organization estimates that by 2015, there will be 2.3 billion overweight (BMI 25-30 Kg/m^2) and 700 million obese (BMI >30 Kg/m^2) adults worldwide ***(WHO, 2008).***

Anatomic and physiological alterations occur in association with obesity, particulary in the airway, cardiovascular, respiratory, gastrointestinal and neurological organ systems. These changes increase the incidence of co-morbidity and cause limitations and problems in anesthesiology procedures ***(Leykin et al., 2006).***

For obese patients, regional anesthesia provides many advantages compared to general anesthesia, such as avoiding airway manipulation, systemic effects of anesthetic agents and provides better post operative pain control ***(Ingrande et al., 2009).*** However, the failure rate in regional anesthesia procedures performed in obese patients due to the increased depth of nerve structures, the disappearance of landmarks, and difficulties in positioning ***(Parra and Loftus, 2013).***

On the other hand, the increase in the use of ultrasonography in recent years eliminates many limitations. Ultrasonography enables direct visualization of nerve structures, reduction in complications, and identification of new nerve block approaches ***(Koscielniak-Nielsen, 2008).***

Aim of the work

To discuss the advantages of regional anesthesia especially ultrasound guided in obese patients versus general anesthesia.

Anatomical changes in obese patient

Obesity is described anatomically as an elevated level of fat storage in the form of hypertrophy (increased size) and/or hyperplasia (increased number) of fat cells, known as adipocytes.

Given the complexities of body composition analysis, the body mass index (BMI) acts as a surrogate for the amount of body fat.

Body mass index is defined as the body weight in kg divided by the square of the body height in metres (kg_m-2). Obesity has been defined as a BMI >30 kg_m-2, and morbid obesity has been referred to as a BMI>40 kg_m-2 or a BMI>35 kg_m-2 with an obesity-related comorbidity.

Body mass index alone is not a good predictor of the distribution of excess body fat; central obesity with elevated visceral fat levels is associated with greater metabolic impact and complications than widespread subcutaneous fat. Body mass index may be misleading in patients with significant muscle bulk. It is also critical to understand that patients can have elevated body fat content despite a normal BMI, so-called ‘‘normal weight obesity’’,

and this too can have an impact on organ function, with the risk of metabolic abnormalities and hypertension increasing as the percent of body fat (%BF) increases ***(Kosmola et al., 2012).***

Deposit of excessive adipose tissue modifies the anatomy of Morbid obese (MO) patients. When severe, these alterations present additional challenges in their anesthetic care. Airway management (face-mask ventilation and tracheal intubation) ***(Gonzalez et al., 2008)***, Mechanical ventilation, peripheral and or central vascular access, regional anesthesia and other competencies related to anesthetic care are usually more difficult in these patients ***(Eichenberger et al., 2002).***

The air way

In the obese patient, the airway undergoes progressive adipose Infiltration. This occurs at all levels from the oropharynx through to the glottis and vocal cords. Adipose Infiltration causes progressive narrowing and reduction in airway diameter, which may reduce by 50% or more from the physiological male normal of about 20 mm in the hypopharynx.