Faculty of Medicine
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Comparative Study between Pressure Control Ventilation and Pressure Regulated Volume Targeted Ventilation in Management of Obese Patients with ARDS

Thesis Submitted for the Partial Fulfillment of
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By

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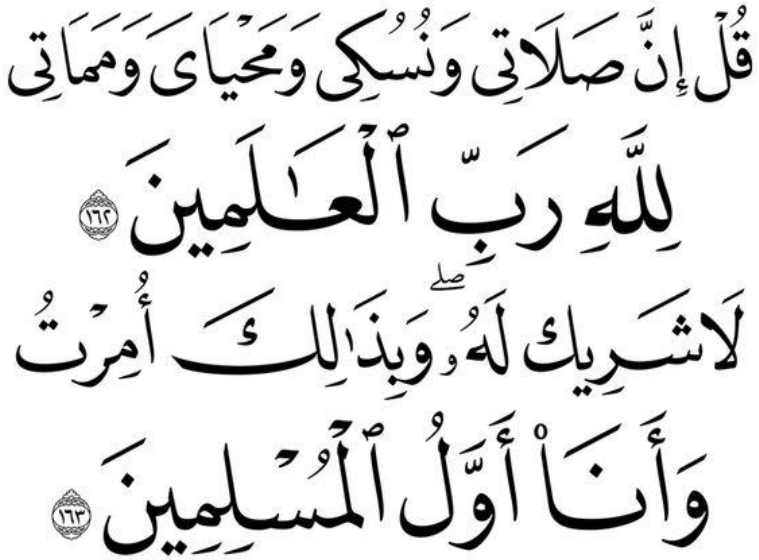
بسم الله الرحمن الرحيم



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List of abbreviations

ABP	Arterial blood pressure
AECC	American-European Consensus Conference
ALI	Acute lung injury
ANOVA	A one-way analysis of variance
ARDS	Adult Respiratory Distress Syndrome
BMI	Body mass index
Cdyn	Dynamic compliance
CO2	Carbon dioxide
COPD	Chronic obstructive pulmonary disease
Cr.Cl	Creatinine clearance
Cstat	Static compliance
CT	Computed tomography
CVP	Central venous pressure
CXR	Chest x-ray
DcR3	Decoy receptor 3
DIC	Dissiminated intravascular coagulopathy

ECMO	Extracorporeal membrane oxygenation
$ETCO_2$	End tidal carbon dioxide
FiO_2	Fraction inspired oxygen concentration
FRC	Functional residual capacity
GI	Gastrointestinal
GM-CSF	Granulocyte-macrophage colony-stimulating factor
GRE	Glucocorticoids-response elements
HR	Heart rate
I:E ratio	Inspiratory to expiratory time
ICU	Intensive care unit
IL	Interleukin
IV	Intra venous
LIP	Lower inflection point
MP	Mean pressure
MV	Mechanical ventilation
NF-kB	Nuclear factor receptor kB
NO	Nitric oxide
OI	Oxygenation index
P	Change in pressure
PCV	Pressure controlled ventilation

PEEP	Positive end-expiratory pressure
PIP	Peak inspiratory pressure
Pmean	Mean airway pressure
PRVC	Pressure-regulated volume control
PSV	Pressure support ventilation
Pt	Patient
RCT	Randomized controlled trials
RMs	Recruitment maneuvers
RR	Respiratory rate
SD	Standard deviation
SIMV	Synchronized intermittent mandatory ventilation
SPO2	Blood saturation
SPSS	Statistical program for social science
TLC	Total lung capacity
TNF	Tumor necrosis factor
TRALI	Transfusion related acute lung injury
UIP	Upper inflection point
V	Change in volume
VALI	Ventilator associated lung injury
VAP	Ventilator associated pneumonia

VC Vital capacity

VCV Volume controlled ventilation

Vt Tidal volume

WOB Work of breathing

Introduction

Acute respiratory distress syndrome (ARDS) is a clinical syndrome that is defined as the rapid onset of hypoxia with a PaO_2/FiO_2 (P/F) ratio≤300 and bilateral pulmonary infiltrates in the absence of left atrial hypertension **(Ferguson *et al*., 2012).**

Obesity prevalence continues to increase globally, with figures exceeding 30% of some populations. Patients who are obese experience alterations in baseline pulmonary mechanics, including airflow obstruction, decreased lung volumes, and impaired gas exchange. The unique physiology of obese patients affects the presentation and patho-physiology of ARDS **(Hibbert *et al.,* 2012).**

Obesity expressed as body mass index (BMI) has been associated with increased risk of development of ARDS in a weight dependent manner. Also, obesity has been found to be associated with increased ICU and hospital length of stay **(Gong *et al.,* 2010).**

Mechanical ventilation is commonly required in the management of ARDS .However it can cause damage to healthy lungs by excessive end inspiratory lung volume (ventilator induced lung injury). Survival of ARDS patients who are undergoing mechanical ventilation has been shown to increase from a reduction in tidal volume and a limitation of end inspiratory plateau pressure **(Pradnya *et al*., 2013).**

Patients with reduced chest wall compliance most commonly due to obesity may have higher plateau pressures at baseline and during ARDS than non-obese patients. However it is

possible that in some obese patients, titrating tidal volumes to plateau pressures < 30 cm H2O may be inadequate and result in worsened hypoventilation **(Bein *et al.,* 2013).**

Pressure-regulated volume control (PRVC) mode is a kind of dual-control ventilation that uses tidal volume as a feed back control for continuously adjusting the pressure limit. In PRVC, all breaths are mandatory, the rate is fixed, and the inspiratory pressure is varied to maintain a preset tidal volume. PRVC is used during lung-protective ventilation because the high, variable, peak inspiratory flow rate reduces patient work of breathing **(Richard *et al*., 2005).**

Aim of the work

The aim of this work is to compare and evaluate the superiority of either pressure controlled ventilation or pressure regulated volume targeted ventilation in management of obese patients with ARDS.

Acute respiratory distress syndrome & obesity

Introduction:

Acute respiratory distress syndrome (ARDS) is a life threatening respiratory condition characterized by hypoxemia, and stiff lungs. Without mechanical ventilation most patients would die. ARDS represents a response to many different inciting insults both direct & indirect **(Ware & Matthay, 2000).**

ARDS is an acute respiratory failure produced by an inflammatory edema secondary to increased lung capillary permeability. This causes alveolar flooding and subsequently deep hypoxemia, with intrapulmonary shunt as its most important underlying mechanism **(Cutts *et al*., 2017).**

Characteristically, this alteration is unresponsive to high FiO_2 and only reverses with positive end-expiratory pressure (PEEP). Pulmonary infiltrates on CXR and CT are the hallmark, together with decreased lung compliance **(Estenssoro & Dubin, 2016).**

There are several clinical disorders associated with the development of ARDS, but the pathogenesis involves inflammatory injury to the lung endothelium and epithelium, which causes a marked increase in lung vascular and epithelial permeability and the passage of protein-rich edema fluid into the air spaces **(Matthay & Zemans, 2011).**