The Effect Of Assisted Mechanical Ventilation On Patient-Ventilator Asynchrony

An Essay

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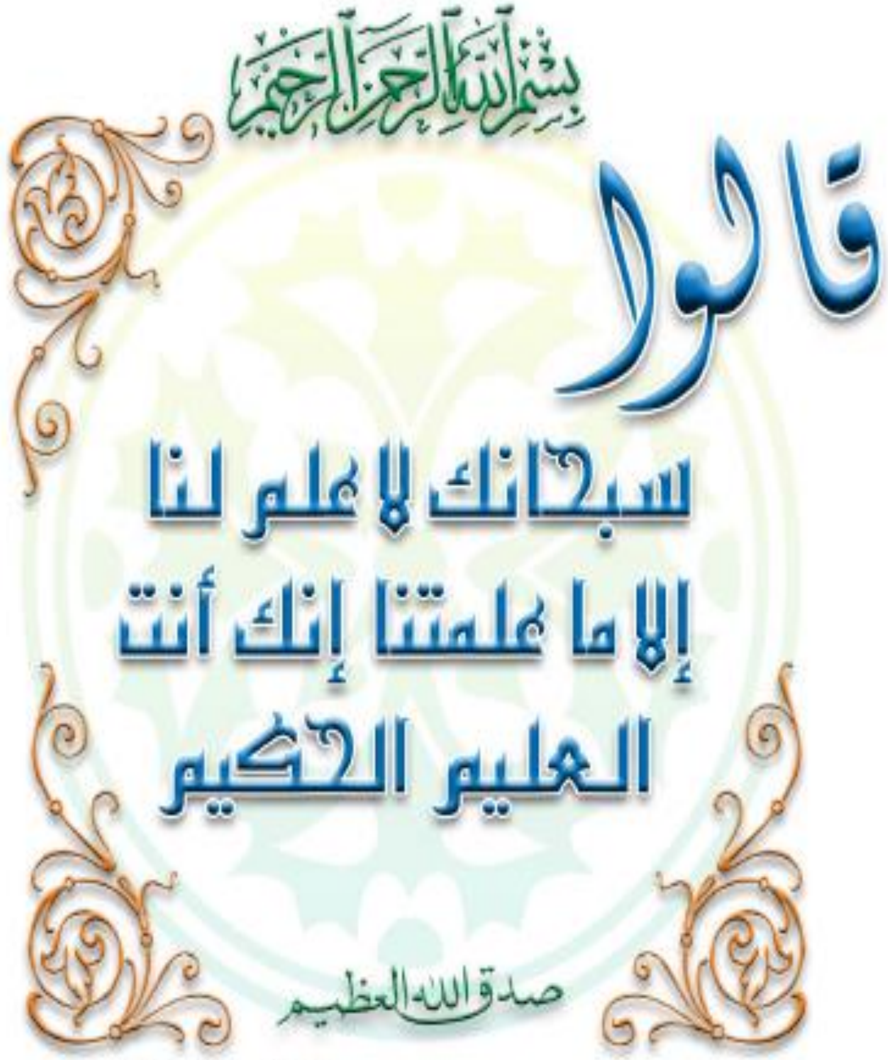

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List Of Abbreviations

Abb.	Full Term
2,3 DPG	2,3 Diphosphoglycerate
AAN	American Association Of Neurologists
ACMV	Assist-Control Ventilation
AI	Asynchrony Index
ALI	Acute Lung Injury
APRV	Airway Pressure Release Ventilation
ARDS	Acute Respiratory Distress Syndrome
As	Surface Area Of The Membrane
ASV	Adaptive Support Ventilation
BIPAP	Biphasic Positive Airway Pressure
Cdyn	Dynamic Compliance
Cl	Lung Compliance
CMV	Continuous Mandatory Ventilation
CNS	central nervous system
COPD	Chronic Obstructive Pulmonary Disease
CPAP	Continuous Positive Airway Pressure
CSF	Cerebrospinal Fluid
Cstat	Static Compliance
D	Gas Diffusion Coefficient
DP	Partial Pressure Difference Of The Gas

Abb.	Full Term
EAdi	Electromyographic Activity Of The Diaphragm
EMG	Electromyography
ERV	Expiratory Reserve Volume
ET	Endotracheal
EVT	Exhaled Tidal Volum
FEF	Forced Expiratory Flow
FEV1	Forced Expiratory Volume Of Air Exhaled In 1second
FRC	Functional Residual Capacity
FVC	Forced Vital Capacity
Hb	Hemoglobin
HFV	High- Frequency Ventilation
IBW	Ideal Body Weight
IC	Inspiratory Capacity
ICP	Intra Cranial Pressure
ICU	Intensive Care Unit
IMV	Invasive Mechanical Ventilation
IRV	Inspiratory Reserve Volume
MW	Molecular Weight
NAVA	Neurally Adjusted Ventilatory Assist
NICE	National Institute For Health And Clinical Excellence
NIV	Noninvasive Ventilation
NIV	Non-Invasive Ventilation

Abb.	Full Term
NPPV	Noninvasive Positive-Pressure Ventilation
PAV	Proportional-Assist Ventilation
PCV	Pressure-Controlled Ventilation
PEEP	Positive End Expiratory Pressure
PEEPi	Intrinsic PEEP
PIP	Peak Inspiratory Pressure
Pplat	Plateau Pressure
PSV	Pressure-Support Ventilation
PVA	Patient-Ventilator Asynchrony
PVBCs	Patient-Ventilator Breath Contributions
PVD	Patient-Ventilator Dyssynchrony
Raw	Airway Resistance
RBCs	Red Blood Cells
RF	Respiratory Failure
RV	Residual Volume
SIMV	Synchronised Intermittent Mandatory Ventilation
T	Membrane Thickness
TLC	Total Lung Capacity
VC	Vital Capacity
VCV	Volume-Controlled Ventilation
Vgas	Volume Of Gas Diffusig Across A Membrane Per Minute
Vt	Tidal Volume
WOB	Work Of Breathing

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INTRODUCTION

Mechanical ventilation can be a life-saving for many patients. In between the two extremes of complete and no ventilatory support, both the patient and the machine contribute to the ventilatory work. Ideally, gas delivery of the ventilator would perfectly match patient demand. This patient-ventilator interaction depends on the response of the ventilator to patient respiratory effort and also how the patient responds to the ventilator delivered breath. The interaction between patient and the ventilator is frequently suboptimal, And that patient ventilator asynchrony is a common phenomenon ***(Epstein, 2011)*** .

patient-ventilator asynchrony is one of the causes of ineffective ventilation, lung overdistention, impaired gas exchange, increased work of breathing, and patient discomfort. It also predisposes to respiratory muscles dysfunction and leads to excessive use of sedation which increases the duration of ventilatory support, and interferes with weaning trials (***Pierson,2011)*** .

Asynchrony can be categorized into four general types: flow asynchrony; trigger asynchrony; cycle asynchrony; and mode asynchrony. With flow asynchrony, the gas delivery pattern from the ventilator does not match the inspiratory pattern of the patient . Thus, when the patient's inspiratory flow exceeds the ventilator's delivered flow, patient effort and work of breathing increase stimulating an increased respiratory rate. This type of asynchrony is much more common during volume ventilation than pressure ventilation ***(Kacmarek et al.,2015)*** .

Modes that adjust the amount of assistance delivered by ventilator proportionally e.g., Neurally Adjusted Ventilatory Assist (NAVA) and Proportional Assist Ventilation (PAV) have been designed to overcome weakness of PSV modes and markedly reduce asynchrony ***(de la Oliva et al,2012).***

These modes do not control ventilatory pattern of the patient. The patient is allowed to select the pattern that his respiratory center considers appropriate. Neither pressure, volume, flow, nor time is set by the ventilator but all are controlled by the patient. So, these modes follow the lead of patient but again "do not force" a ventilatory pattern result in decreased asynchrony compared to the classic modes of ventilatory support ***(Kacmarek et al , 2011).***

The main methods that decrease asynchrony are:

(1) NAVA and PAV both can prevented hyperinflation produced by overassistance

(2) NAVA and PAV restored an equal level of breathing-pattern variability

(3) according to the level of assistance, NAVA and PAV induce a good patient-ventilator synchrony than PSV ***(Schmidt et al. ,2015).***

Aim of the work

The aim of this essay is to cast light on assisted mechanical ventilation modes and their role in reducing patient-ventilator asynchrony.

Chapter One

ANATOMY AND PHYSIOLOGY OF RESPIRATORY SYSTEM