WEANING FROM MECHANICAL VENTILATION

Essay

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Intensive Care

By

Imane Ali Dawoud Khalil

M.B., B.CH
Faculty of Medicine, Cairo University

Under Supervision Of

Prof. Dr. Bahaa El-Din Ewais Hassan
Professor of Anesthesiology and Intensive Care
Faculty of Medicine, Ain Shams University

Dr. Amal Hamed Rabie
Lecturer of Anesthesiology and Intensive Care
Faculty of Medicine, Ain Shams University

Dr. Ayman Ahmed Kasem
Lecturer of Anesthesiology and Intensive Care
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
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بسم الله الرحمن الرحيم

**(رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي
أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ وَأَنْ أَعْمَلَ
صَالِحًا تَرْضَاهُ وَأَصْلِحْ لِي فِي ذُرِّيَّتِي
إِنِّي تُبْتُ إِلَيْكَ وَإِنِّي مِنَ الْمُسْلِمِينَ)**

صدق الله العظيم

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Imane Ali Dawoud

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LIST OF ABBREVIATIONS

Abbrev.	Meaning
ABG	Arterial blood gases
A/C	Assisted control ventilation
ALI	Acute lung injury
APRV	Airway pressure release ventilation
APV	Adaptive pressure ventilation
ARDS	Acute respiratory distress syndrome
ARF	Acute respiratory failure
ASV	Adaptive Support Ventilation
ATC	Automated tube compensation
BIPAP	Biphasic intermittent positive airway pressure
BP	Blood pressure
BNP	Brain natruiretic peptide
bpm	Breath per minute
C_{DYN}	Dynamic compliance
CINMA	Critical illness neuromuscular abnormalities
CMV	Controlled mechanical ventilation
CNS	Central nervous system
COPD	Chronic obstructive pulmonary disease
CPAP	Continuous positive airway pressure
C_{TL}	Total lung compliance
C_{ST}	Static compliance
FIO_2	Fraction of inspired oxygen
FRC	Functional residual capacity
Hgb	Hemoglobin
HFFI	High Frequency Flow Interruption
HFJV	High Frequency Jet Ventilation
HFOV	High Frequency Oscillatory Ventilation
HFPPV	High Frequency Positive Pressure Ventilation
HFV	High Frequency Ventilation
Hz	Hertz
ICU	Intensive care unit
I:E	Inspiratory expiratory ratio

LIST OF ABBREVIATIONS (Cont...)

Abbrev.	Meaning
MV	Mechanical ventilation
NIMV	Non invasive mechanical ventilation
PA	Pressure augmentation
PAC	Pulmonary artery catheterization
P-A/C	Pressure assisted control ventilation
PAV	Proportional assisted ventilation
PaO_2	Arterial blood oxygen tension
PaCO2	Arterial blood carbon dioxide tension
$P_{ET}CO_2$	End tidal carbon dioxide
PC-IRV	Pressure control with inverse ratio ventilation
PCV	Pressure control ventilation
PEEP	Positive end expiratory pressure
P_{HIGH}	Pressure high
P_{LOW}	Pressure low
PIP	Peak inspiratory pressure
Pi max	Maximum inspiratory pressure
PRVC	Pressure regulated volume control
PS	Pressure support
P-SIMV	Pressure Synchronized intermittent mandatory ventilation
PSV	Pressure support ventilation
Raw	Airway resistance
RR	Respiratory rate
SBT	Spontaneous breathing trial
SaO_2	Arterial oxygen saturation
SVO_2	Mixed venous oxygen saturation
T_{HIGH}	Time high
T_{LOW}	Time low
TOE	Trial of extubation
TPN	Total parentral nutrition
VA/Q	Ventilation perfusion ratio
VALI	Ventilator Associated Lung Injury
VAP	Ventilator associated pneumonia

LIST OF ABBREVIATIONS (Cont...)

Abbrev.	Meaning
VAPS	Volume assured pressure support
VC+	Volume control plus
V_E	Minute ventilation
V/Q	Ventilation perfusion ratio
VPC	Variable pressure control
VPS	Variable pressure support
VS	Volume support
V-SIMV	Volume Synchronized intermittent mandatory ventilation
V_T	Tidal volume
VTE	Venous thromboembolism
WOB	Work of breathing

INTRODUCTION

Mechanical ventilation is one of the life support procedures closely associated with the development of modern intensive care medicine.The primary goal of ventilator support is the maintenance of adequate gas exchange which must be achieved with minimal lung injury and the lowest possible degree of hemodynamic impairment ***(Koh, 2007).***

Although mechanical ventilation is a life-saving intervention for patients suffering from acute respiratory failure, it is associated with numerous grave complications and should be discontinued at the earliest possible time. On the other hand, premature extubation followed by reintubation is associated with increased morbidity and mortality. Choosing the right time for a successful discontinuation of mechanical ventilation, in the light of available physiologic and laboratory factors, remains a challenge ***(Eskandar, 2007).***

Weaning indices are objective criteria that are used as predictors of weaning outcome that could guide clinicians in determining the optimal time to discontinue mechanical ventilation. The actual process of weaning a patient from mechanical ventilation is carried out by allowing spontaneous breathing attempts or by gradually reducing mechanical assistance through the use of a ventilation mode, which supports spontaneous breathing ***(Kogler, 2009).***

About 25% of mechanically ventilated patients will fail their first attempt at weaning. Greater understanding of the pathophysiology of weaning failure has led to new approaches to the optimal timing and the techniques used for weaning, making weaning one of the most challenging problems in intensive care, and accounting for a considerable proportion of the workload of staff in an intensive care unit ***(Tobin, 2006).***

AIM OF THE WORK

The aim of this study is to highlight the process of weaning from mechanical ventilation as regards the best timing, the best technique and the management of difficult weaning to avoid prolonged mechanical ventilation with its complications.

ANATOMY AND PHYSIOLOGY OF THE RESPIRATORY SYSTEM

Anatomy of the Respiratory System:

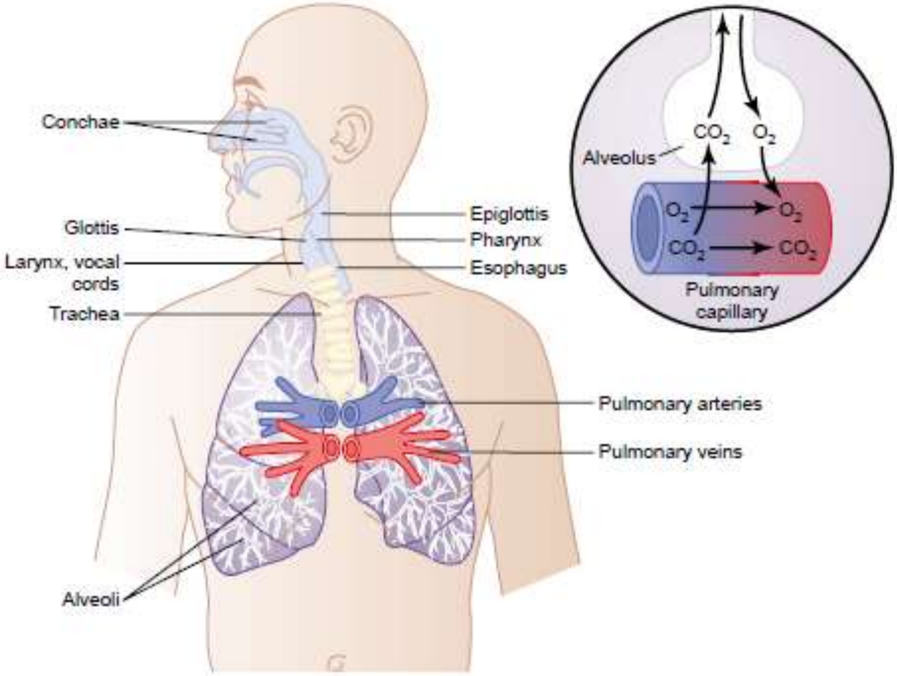

Figure (1): Respiratory passages *(Gyton and Hall, 2006).*

I. Upper airway:

Air travels from the nasal passages to the pharynx, and then into the larynx. The larynx lies at the level of upper cervical vertebrae, C4-6, and its main structural components are the thyroid, cricoid and arytenoid cartilages. The thyroid and cricoid cartilages are linked anteriorly by the cricothyroid