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بسم الله الرحمن الرحيم

COMPLICATIONS ENCOUNTERED IN MECHANICALLY VENTILATED PATIENTS IN CRITICAL CARE UNIT - 1

Thesis

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Haytham

Chapter I

INTRODUCTION

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The hallmark of care of critically ill patients is minute attention to details. Most of this care is based on what is seen, what is heared and what is felt. By early recognition of the subtle changes that may occur with various types of illness, treatment can be begun early and serious difficulties can be thwarted in many instances. [1]

The principle purpose of the critical care unit is the care of the seriously ill patients who require extra-ordinary care on a concentrated and continous bases. [2] In the last years, considerable advances in the intensive care of those critically ill patients have been made. [3]

Mechanical ventilation has become one of the major artificial life support techniques used in critical care medicine and became an integral part of intensive care therapeutics. [4]

I - Mechanical Ventilation

Mechanical ventilation was originally introduced to mechanically support breathing in patients with normal lungs who were unable to maintain spontaneous ventilation due to an abnormal respiratory drive or a defective chest bellows mechanism. Mechanical ventilation is now used more for patients with respiratory failure caused by pulmonary parenchymal disease. [5]

Indications of mechanical ventilation :

- **Respiratory failure :**

The primary indication for mechanical ventilation is acute respiratory failure, which can be divided into two categories as defined by alterations in arterial blood gases : (I) Hypoxemic respiratory failure and (II) hypoventilatory repiratory failure. [Table (I) outlines causes of acute respiratory failure].

The decision to initiate mechanical ventilation is usually based on clinical judgment in conjunction with analysis of serial arterial blood gases. These measures vary from simple bedside observations to complex determinations requiring research equipment. [Table (II) provides a summary of these indicators].

Table I : Causes of acute respiratory failure. [7]

1. The brain	**5. Upper airway**
cerebrovascular accident	Obstructive sleep apnea
Bulbar poliomyelitis	Vocal cord paralysis
Drug overdose (narcotic, sedative, etc.)	Tracheal obstruction
Central alveolar hypoventilation syndrom	Epiglottitis, laryngotracheitis
Post-operative anesthetic depression	Pastintubation laryngeal edema
Trauma	Large tonsils and adenoids
Myxedema	**6. Cardiovascular**
2.The spinal cord	Cardiogenic pulmonary edema
Guillam-Barre syndrom	Pulmonary embolism
Spinal cord trauma	Fat embolism
Poliomyelitis	Snake bite
Amyotrophic lateral sclerosis	Uremia
3.Neuromuscular system	**7.Lower airway and alveoli**
Myasthenia gravis	Aspiration (acid-bile)
Tetanus	Smoke inhalation
Curariform drugs	Sepsis
Neuromuscular blocking antibiotics (streptomycin, kanamycin, polymyxin)	Bronchiolitis
	Asthma
	Chronic obstructive pulmonary disease. (chronic bronchitis and emphysema)
Botulism	Cystic fibrosis
Organophosphate insecticides	Adult respiratory distress syndrom
Peripheral neuritis	Interstitial lung disease
Multiple sclerosis	Massive bilateral pneumonia
Hypokalemic paralysis	Atelectasis
Hypophosphophatemia, hypomagnesemia	Bronchiectasis
Myxedema	Near drowning
4.Thorax and pleura	Pulmonary contusion
Muscular dystrophy	Radiation
Massive obesity	Pancreatitis
Kyphoscoliosis	Circulating agents (fatty acids, lecithinases, clotting factors)
Trauma and flail chest	
Rheumatoid spondylities	
Pneumothorax	
Pleural effusion	

Table II : Some measurments used in determining the need for mechanical ventilation. [8]

Measurments	Values	
	Normal	**Mechanical ventilation indicated**
A. Spirometric data and pulmonary mechanics :		
* Tidal volume (VT) (ml/kg)	5 – 8	< 5
* Vital capacity (VC) (ml/kg)	65 – 75	< 10; <15
* Forced expiratory volume in the first second (FEV_1) (ml/kg)	50 – 60	< 10
* Functional residual capacity (FRC) (% of predicted value)	80 – 100	< 50
* Respiratory rate (f) (breath/min)	12 – 20	> 35
* Maximum negative inspiratory pressure (Cm H_2O)	80 – 100	< 20, <25; < 30
B. Ventilation :		
* Minute ventilation (VE) (L/min)	5 – 6	> 10
* Maximum voulntary ventilation (MVV) (L/min)	120 – 180	< 20; < (2XVE)
* Dead space fraction (VD/VT) (%)	25 – 40	> 60
* $PaCO_2$ (mmHg)	35 – 40	> 50; > 55
C. Oxygenation :		
* PaO_2 (mmHg)	75 – 100 (breathing air)	< 50 (air) < 70 (O_2 mask)
*Alveolar-to-arterial PO_2 gradient $[P(A-a)O_2]$ (mmHg)	25 – 65 (breathing air)	> 350; > 450
* Arterial/alveolar PO_2 ratio (PaO_2/PAO_2)	0.75	< 0.15
* PaO_2/inspired O_2 fraction (FIO_2)ratio	350 – 450	< 200
* Intrapulmonary right-to-left shunt fraction (%)	< 5	> 20; > 25; > 30