

أسس العناية المركزة\الكورس الاول

MECHANICAL VENTILATION LEC.8



Sawa University

جامعة ساوة الاهلية

College of health and medical techniques

كلية التقنيات الصحية والطبية

Department of Anesthesia

قسم تقنيات التخدير

.....3..... Stage

.....المرحلة 3...

..... محاضرة رقم

نظري

Lecture No.

Theoretical

استاذ المادة : ...د ضي عبد
الكريم.....



Mechanical Ventilation

Introduction

Mechanical Ventilation:

The mechanical ventilation is the process by which gas is moved into the lungs by creating a pressure gradient artificially.

Respiratory support is needed to correct hypoxemia and hypercapnia and to reduce work of breathing.

Goals

- Treat hypoxemia.
- Treat acute respiratory acidosis.
- Relief of respiratory distress.
- Prevention or reversal of atelectasis.
- Resting of ventilatory muscles.

Indications

- Neurological impairment (drugs, poisons , snake bite, trauma) with “Glasgow Coma Scale ” (GCS) ≤ 8 .
- Respiratory Failure
 - a. Arterial PaO₂ <60 mm Hg (on supplemental Oxygen).
 - b. Arterial PaCO₂ >50 mm Hg (in the absence of chronic airway disease)

Contd

c. Evidence of elevated work of breathing:

Respiratory rate > 35 breaths/minute.

Tidal volume $< 5\text{ml/kg}$.

Vital Capacity $< 15\text{ml/kg}$.

Presence of retraction or nasal flaring.

Paradoxical or divergent chest motion.

- Cardiopulmonary arrest.
- Neuromuscular disorders.
- Lung Diseases.

Parameters	Ventilation indicated	Normal range
<u>A- Pulmonary function studies:</u> • Respiratory rate (breaths/min). • Tidal volume (ml/kg body wt) • Vital capacity (ml/kg body wt) • Maximum Inspiratory Force (cm HO₂)	> 35 < 5 < 15 <20	10-20 5-7 65-75 75-100

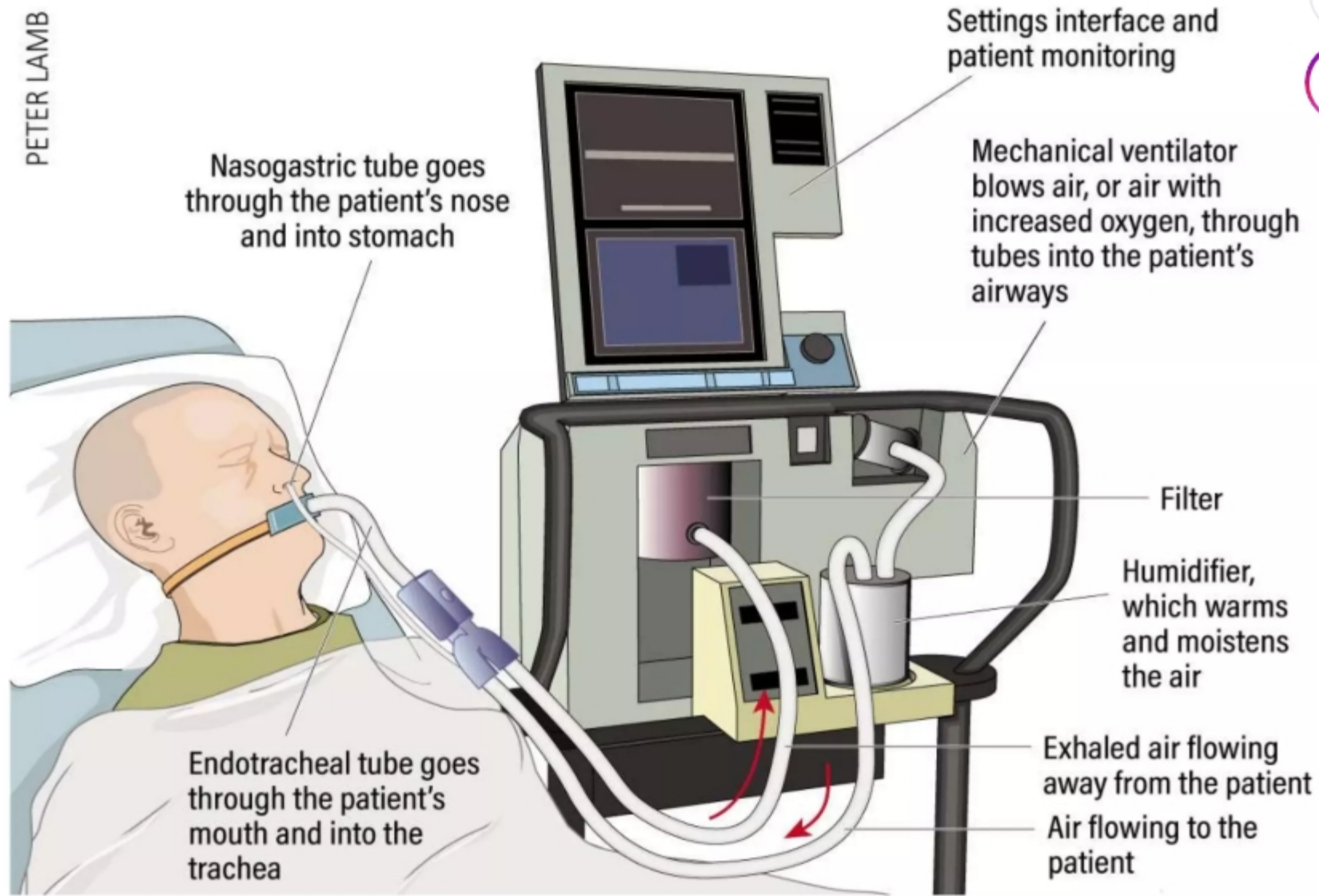
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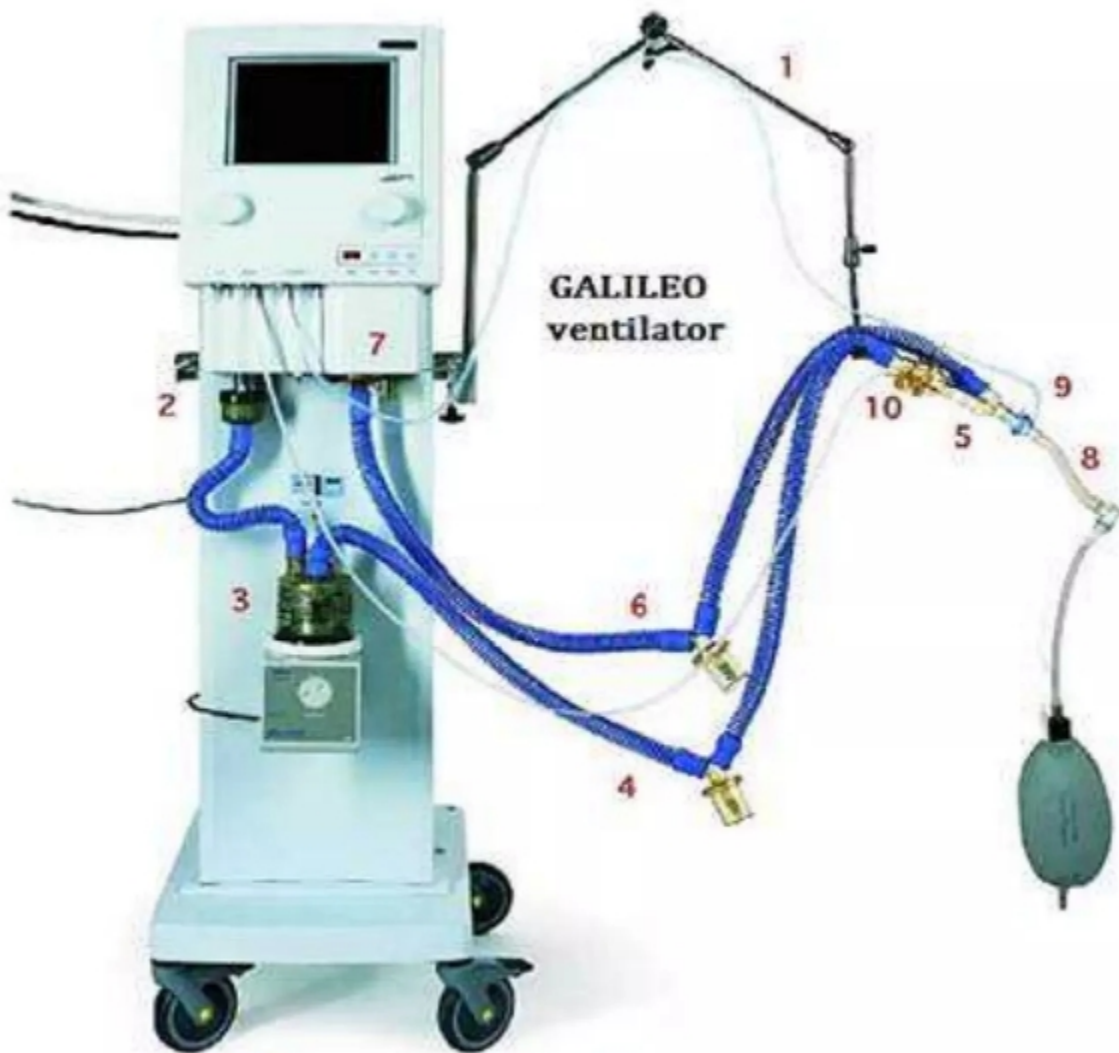
Parameters	Ventilation indicated	Normal range
<u>B- Arterial blood Gases</u>		
• PH	< 7.25	7.35-7.45
• PaO ₂ (mmHg)	< 60	75-100
• PaCO ₂ (mmHg)	> 50	35-45

Introduction

Mechanical Ventilator:

- A mechanical ventilator is a positive or negative pressure breathing device that can maintain ventilation and oxygen delivery for a prolong period.
- It is a machine that generates a controlled flow of gas into a patient's airway.





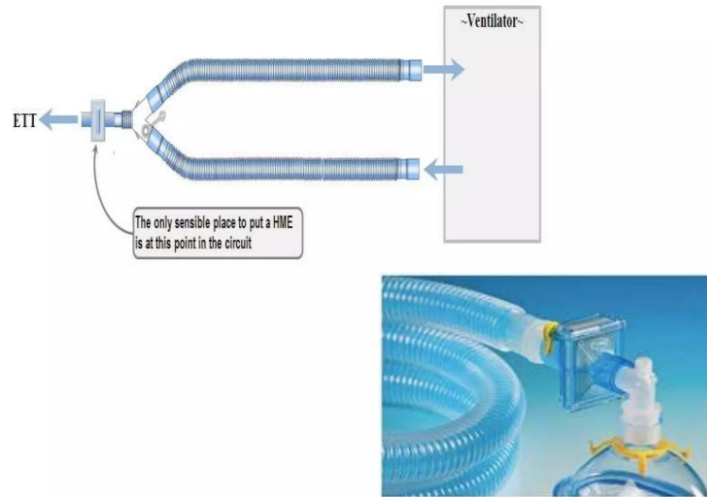
1. Support arm
2. Inspiratory port with filter
3. Active humidifier
4. Inspiratory line with watertrap
5. Y-piece
6. Expiratory line with watertrap
7. Expiratory port
8. Flexible connector
9. Proximal flow-pressure sensor
10. Nebuliser

Fig - A mechanical ventilator for intensive care, with the external circuit

PARTS OF VENTILATOR



Contd...



Y- Piece/ Connector



Heat & Moisture Exchanger (HME)
Filter



Monitor/ Screen



Catheter Mount



parameters/ controls

- Fraction of inspired oxygen (FIO_2)
- Tidal Volume (VT)
- Peak Flow/ Flow Rate
- Respiratory Rate/ Breath Rate / Frequency (F)
- I:E Ratio (Inspiration to Expiration Ratio)
- PEEP

Fraction of inspired oxygen (FIO₂)

- The percent of oxygen concentration that the patient is receiving from the ventilator. (Between 21% & 100%)
- Initially a patient is placed on a high level of FIO₂ (60% or higher).
- Subsequent changes in FIO₂ are based on ABGs and the SaO₂.
- The lowest possible fraction of inspired oxygen (FiO₂) necessary to meet oxygenation goals should be used.

Tidal Volume (VT)

- The volume of air delivered to a patient during a ventilator breath.
- The amount of air inspired and expired with each breath.
- Usual volume selected is between (5 to 15 ml/ kg body weight)
- In the volume ventilator, Tidal volumes of 10 to 15 mL/kg of body weight were traditionally used.
- The large tidal volumes may lead to (volumetrauma) aggravate the damage inflicted on the lungs.
- For this reason, lower tidal volume targets (6 to 8 mL/kg) are now recommended.

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Respiratory Rate/ Breath Rate / Frequency (F)

- The number of breaths the ventilator will deliver/minute (10-16 b/m).
- Total respiratory rate equals patient rate plus ventilator rate.
- An optimal method for setting the respiratory rate has not been established. For most patients, an initial respiratory rate between 12 and 16 breaths per minute is reasonable
- The nurse double-checks the functioning of the ventilator by observing the patient's respiratory rate.

Peak Flow/ Flow Rate

- The velocity of gas flow or volume of gas delivered by the ventilator per minute (L/min)
- The **higher the flow rate**, the faster peak airway pressure is reached and the **shorter the inspiration**;
- The lower the flow rate, the longer the inspiration.

I:E Ratio (Inspiration to Expiration Ratio)

- During spontaneous breathing, the normal I:E ratio is 1:2, indicating that for normal patients the exhalation time is about twice as long as inhalation time.
- If exhalation time is too short “breath stacking” occurs resulting in an increase in end-expiratory pressure also called auto-PEEP.

Any questions?

*Thank
You*