Department of Anesthesia Techniques
Title of the lecture:- Respiratory failure

Msc. Ali Fadhil
alifadhilz@uomus.edu.iq

Respiratory failure: defined as impairment of the respiratory function so that the arterial oxygen tension (Pao2) is below 60 mmHg or the arterial Carbone dioxide tension (Paco2) exceed 50 mmHg when the pt. is at rest, breathing air at sea level

- **Types of respiratory failure**

Type I respiratory failure

A. acute type I RF, low Pao2 with normal or low Paco2

Develop rapidly in cases like pulmonary oedema, pneumonia, ARDS

B. chronic type I RF low Pao2 with normal Paco2

- **Causes**: fibrosing alveolitis, Interstitial lung disease, chronic pulmonary oedema

Type II respiratory failure

a. Acute type II resp. failure: low pao2 and high paco2

Causes:

Upper air way obstruction, inhaled foreign body, acute epiglottitis, laryngeal oedema, bilateral vocal cord paralysis, sever acute asthma, Chest injuries (tension pneumothorax, massive haemothorax, flail chest), Brain stem and cervical cord lesions, Paralysis of the resp. muscles, Poisoning with narcotics and other drugs.

Chronic type II resp. failure:

Low Pao2 and high Paco2

Causes: e.g. chronic bronchitis and other progressive resp. disease

Type of resp. failure to be admitted to the ICU

1. Damage of resp. center in the brain e.g. (drug intoxication, status epilepticus, eclampsia, head trauma and CVA)
2. Upper motor neuron lesions e.g. High cervical spinal injury (above C4)
3. Lower motor neuron lesion e.g. Poliomyelitis
4. Peripheral nerves disease (Gillian barre syndrome, tetanus)
5. Myoneural junction diseases, (Myasthenia gravis, muscle

Department of Anesthesia Techniques
Title of the lecture:- Respiratory failure

Msc. Ali Fadhil
alifadhilz@uomus.edu.iq

relaxants)
6. Structural impairment of chest walls e.g. Flail chest
7. Upper resp. tract lesions: (Epiglottitis, bilateral vocal cord paralysis, laryngotracheobronchitis (croup)
8. Lower resp. tract diseases: (Status asthmaticus, aspiration e.g. Gastric contents, food, muconium or foreign body)
9. Alveolar diseases (parenchymal): Pulmonary constriction, pulmonary oedema, near drowing, adult or neonatal resp. distress syndrome.

The clinical diagnosis of resp. failure

It is based on 2 facts
a. The disease itself direct the attention
b. The effects of hypoxemia on CNS, CVS, AND RESP. SYSTEM
1. The effect of hypoxemia on the brain
Restlessness, anxiety, apathy, exhaustion, disorientation, finally coma
2. The effects hypoxemia on the CVS
Dusky coloration of the skin and mucous membranes, which may progress to cyanosis ,Pallor occur due to sympathetic over activity .Cold moist extremities (sweating), tachycardia, ectopic beats or dysrhythmia
3. The effect of hypoxemia on the resp. system
Tachypnea, dyspnea, shallow breaths, or irregular and grunting resp. use of accessory muscles of respiration, tracheal tug, and difficult speech .
*if 2 of the previous 3 points are present then resp. failure is surely present
* If the all 3 points are present then the patient is in extreme danger and cardiac arrest may occur if the patient is not treated.

Treatment of resp. failure

1. Supplementary oxygen e.g. By mask , nasal cannula ….etc

Department of Anesthesia Techniques
Title of the lecture:- Respiratory failure

Msc. Ali Fadhil
alifadhilz@uomus.edu.iq

2. Tracheal intubation
Indications are:
I. Loss of protective upper air way reflexes
II. Loss of effective cough
III. Coma
IV. For mechanical ventilation
Routes: I. supraglottis (nasal, oral)
II. Infraglottis: tracheotomy
* Nasal intubation
 Advantages: 1.Provide greater stability with fixation, 2. better tolerated by the pt.
 Disadvantages
Trauma, infection, ulceration of external naris, difficult in suction of secretion .

***oral intubation**
 Advantages :
 1. Permit the use of large internal diameter tubes , this facilitate suctioning and the passage of fibro optic bronchoscope
 Disadvantages :
Poorly tolerated by the patient and difficult to be fixed
 If intubation is intended to be continued more than 10 days then tracheotomy should be done, otherwise there is a high risk of upper air way complications e.g. (laryngeal stenosis, and vocal cord paralysis)
 Complication of supra or infra glottis are
Tracheal stenosis :Tracheomalacia at the site of mucosal contact with cuff of the tube
3. Mechanical support of ventilation.
Judged on clinical grounds e.g. Fatigue, and pulmonary measurement e.g.

Department of Anesthesia Techniques
Title of the lecture:- Respiratory failure

Msc. Ali Fadhil
alifadhilz@uomus.edu.iq

inadequate tidal volume or blood gas estimation

I. Clinical indices.

a) Resp. rate is more than 35 breath per minute

b) Evidence of fatigue of resp. muscles (rapid shallow respiration, deterioration of consciousness)

c) Tidal volume is less than 5 ml/Kg

d) Vital capacity is less than 15ml /Kg

e) Maximum insp. Force is less than 25 cm H2O

f) Forced expiratory volume in 1 sec. (FEV1) is less than 10 ml/Kg

g) Minute ventilation less than 3L/min or more than 20

II. Respiratory gas tension

a) Pao2 is less than 70 mmHg despite an inspired O2 that exceed 40%

b) Alveolar /arterial po2 difference is more than 450 mmHg when breathing 100% O2

c) Arterial PCO2 is more than 56 mmHg and it is increasing (in the absence of chronic hypercapnea)

d) The ratio of physiological dead space /tidal volume (VD /VT ratio) is more than 0.6

Initial ventilator setting

Using flow generator because it compensates for the change of compliance and air way resistance changes

FIO2 =50% O2

VT =10 -15 ml/Kg

Frequency 8 -12 /min

Insp./Exp. Ratio =1/2 -1/3

Insp. Pressure 20 cm H2O

Pressure support 20 cmH2O

Flow trigger 2L/min

Pressure trigger -1 to-3 cm H2O

Sighs. Nil, formerly thought to prevent atelectasis, but no longer considered effective

Subsequent adjustment of ventilator is needed according to the measurement of Pao2, Paco2, pH

Department of Anesthesia Techniques
Title of the lecture:- Respiratory failure

Msc. Ali Fadhil
alifadhilz@uomus.edu.iq

- Initial mode of ventilation is volume controlled mode
- Assisted controlled mode is used if the pt. is able to produce negative pressure of less 5 cm H2o
- PEEP, it is recommended when Pao2 is less than 60 mmHg when Fio2 is 50%. When PEEP is high (>15cm H2o) may over- distend open alveoli thereby causing compression of alveolar capillaries resulting in decrease of v/Q ratio
- Best PEEP is the one which improve pao2 without decreasing the cardiac output.

ICU
By : MSc. ALI FADHIL
3rd stage