

DIAGNOSIS OF RESPIRATORY FAILURE

Definitions:

Respiratory failure

- Failure of the respiratory system to maintain adequate gas exchange with $\text{PaO}_2 < 8 \text{ kPa}$ (60 mmHg) and/or $\text{PaCO}_2 > 6.6 \text{ kPa}$ (50 mmHg).

Type I respiratory failure (Hypoxaemic respiratory failure)

- Failure of the respiratory system to maintain adequate gas exchange with $\text{PaO}_2 < 8 \text{ kPa}$ (60 mmHg) and/or $\text{PaCO}_2 < 6.6 \text{ kPa}$ (50 mmHg).

Type II respiratory failure (Hypercapnic respiratory failure)

- Failure of the respiratory system to maintain adequate gas exchange with $\text{PaO}_2 < 8 \text{ kPa}$ (60 mmHg) and $\text{PaCO}_2 > 6.6 \text{ kPa}$ (50 mmHg).

Type I respiratory failure

- Oxygenation failure
- $\uparrow\text{pH} \downarrow\text{pO}_2 \downarrow\text{pCO}_2$

Causes

1. Conducting airway problems (eg. severe asthma)
2. Alveolar problems (eg. pneumonia, pulmonary edema, ARDS, atelectasis)
3. Pulmonary vasculature (eg. pulmonary thromboembolism, fat embolism)

Mechanisms:

1. Reduced FiO_2
2. Ventilation perfusion mismatch
3. Right-to-left shunt
4. Diffusion abnormalities

Type II respiratory failure

- Pump failure
- $\downarrow\text{pH} \uparrow\text{pCO}_2 \downarrow\text{pO}_2$

Mechanisms:

1. Low minute ventilation
2. High dead space ventilation

Causes:

1. Respiratory centre problems (eg. brainstem stroke, opioid-induced)

respiratory suppression)

2. Cervical cord lesion
3. Motor neuron problems (eg motor neuron disease)
4. Neuropathy (eg. Guillain-Barre syndrome)
5. Neuromuscular junction problems (eg. myasthenia gravis)
6. Muscle problems (eg. muscular dystrophy)
7. Ribcage problems (eg. severe kyphoscoliosis)
8. Upper airway obstruction (eg. epiglottitis)
9. Extrapulmonary problems with diaphragmatic splinting (eg. severe ascites, intestinal obstruction)

Clinical manifestations of acute respiratory failure

- Altered mental state – agitation or drowsiness
- Evidence of labourious breathing – nasal flaring, use of accessory muscles, retraction of supraclavicular fossa or intercostal spaces, tachypnoea, paradoxical breathing pattern
- Diaphoresis, tachycardia and hypertension
- Central cyanosis

Investigations

- 1) Arterial blood gas analysis
- 2) Chest radiograph
- 3) Electrocardiogram
- 4) Electrolytes
- 5) Complete blood picture
- 6) Urine for toxicology screening
- 7) Computed tomography of chest in selected cases (eg. spiral CT for suspected acute pulmonary embolism, high resolution CT for suspected interstitial lung diseases)