* Pathophysiology of Abnormal Breathing
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* Objectives

***At the end of the session the students should be able to:***

* Define and classify Hypoxia, List its causes and describe its associated and compensatory changes.
* Define Cyanosis and mention its types and causes
* Define Cheyne- Stokes breathing and describe its pathophysiology
* Definitions

**Hypoxia :**

Hypoxia is defined as lack of oxygen at tissue level.

**Anoxia :**

Anoxia is defined as complete absence of oxygen in the tissues

* Types of hypoxia
* Hypoxic hypoxia
* Anaemic hypoxia
* Stagnant(ischaemic) hypoxia
* Histotoxic hypoxia
* A. Hypoxic hypoxia
* It is characterized by low arterial pO2 when oxygen carrying capacity of blood and rate of blood flow to tissues are normal or elevated
* It is characterised by
* Low arterial pO2
* Low arterial O2 content
* Low arterial % O2  saturation of haemoglobin
* Low A-V pO2 difference
* Hypoxic hypoxia(contd.)

**Causes:**

* Low pO2 of inspired air
* Decreased pulmonary ventilation
* Defect in exchange of gases
* Venous arterial shunts
* B.Anaemic hypoxia

In anaemic hypoxia arterial pO2 is normal but the amount of haemoglobin available to carry oxygen is reduced.

**Causes :**

* Anemia
* Haemorrhage
* Conversion of haemoglobin to some abnormal form
* Anaemic hypoxia(contd.)
* Characterized by:
* Normal arterial pO2
* arterial O2 content moderately reduced
* A-V pO2 difference is normal
* C. Stagnant(ischemic) Hypoxia

Blood flow to the tissue is so low that adequate oxygen is not delivered to them despite normal arterial pO2 and haemoglobin concentration

**Causes** :

* Circulatory failure
* Haemorrhage via baroreceptors leading to reflex vasoconstriction
* **Stagnant hypoxia (contd.)**

Characterized by:

* Normal arterial pO2
* Normal arterial O2 content
* normal arterial % O2 saturation of haemoglobin
* A-V difference more than normal
* D.Histotoxic hypoxia
* Amount of oxygen delivered to the tissues is adequate but because of the action of toxic agents the tissues cannot make use of the oxygen supplied to them.
* **Cause :** *Cyanide poisoning* causing damage to enzyme cytochrome oxidase.
* **Characterized by:**
* Normal pO2
* No difference in O2 content of arterial and venous blood.
* A-V pO2 difference is less than normal
* **Clinical features of hypoxia**
* Hyperventilation is seen in all types of hypoxia except anemic hypoxia
* In all types of hypoxia the first symptoms are like that of alcohol overdose(drowsiness, depression/excitement, emotional outburst)

If oxygen saturation of haemoglobin falls below 60% there unconsciousness within 20 seconds, causing death in 4-5 minutes.

* Severe hypoxia( except anaemic) causes increase in heart rate and systemic blood pressure.
* Associated symptoms- nausea, vomiting and anorexia
* Treatment of hypoxia
* Treatment of the underlying cause- depending upon the type of hypoxia
* Oxygen therapy-
* Inhalation of 100% pure oxygen
* Hyperbaric oxygen therapy
* CYANOSIS

Bluish discoloration of skin and/or mucus membrane due to the presence of at least 5gm of reduced haemoglobin per 100ml of blood in capillaries.

**Sites to be examined:**

* Mucus membrane of undersurface of tongue
* Lips
* Ear lobes
* Nail beds
* Tip of nose
* **Types of cyanosis:**
* **Central cyanosis-** Due to a circulatory or ventilatory problem that leads to poor blood oxygenation in the lungs.

 It develops when arterial saturation of blood with oxygen is ≤85%. Cyanosis may not be detected until saturation is 75% in dark-skinned individuals

* **Peripheral cyanosis**-Due to inadequate circulation.

All factors contributing to central cyanosis can also cause peripheral symptoms to appear, however peripheral cyanosis can be observed without there being heart or lung failures.

* **Causes of cyanosis**
* Hypoxic hypoxia
* Stagnant hypoxia
* Polycythemia
* Exposure to mild cold( approx 200  C) produces cyanosis while exposure to severe cold (appprox. 100 C or below) does not produce cyanosis.
* Cheyne-Stokes respiration
* Cheyne-Stokes respiration is also known as periodic respiration, with cycles of respiration that are increasingly deeper then shallower with possible periods of apnoea. Typically, over a period of 1 minute, a 10-20 second episode of apnoea or hypopnoea occurs followed by respirations of increasing depth and frequency. The cycle then repeats itself.
* Causes of Cheyne-Stokes respiration
* Causes include:
* Brainstem lesions: cerebrovascular event
* Encephalitis
* Raised intracranial pressure
* Heart failure
* Chronic pulmonary oedema
* Altitude sickness
* Pathophysiology
* Instability of respiratory control underpins the development of Cheyne-Stokes respiration and results from hyperventilation, prolonged circulation time, and reduced blood gas buffering capacity

Thanks………..