

Difference Between Cyanosis and Hypoxia

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Key Difference – Cyanosis vs Hypoxia

Cyanosis and hypoxia are two conditions that require prompt medical attention. Cyanosis is characterized by the bluish discoloration of peripheries or the tongue when the **deoxygenated hemoglobin** content in the blood rises more than 5g per 100 ml of blood. The diminished availability of oxygen to the body **tissues** is known as hypoxia. The key difference between cyanosis and hypoxia is the **appearance of bluish discoloration in the mucous membrane, which is the hall mark feature of cyanosis.**

What is Hypoxia?

The diminished availability of oxygen to the body tissues is known as hypoxia.

Causes

- Extrinsic causes that impair the oxygenation of blood
 1. Deficiency of oxygen in the atmosphere as in high altitudes
 2. Hypoventilation due to neuromuscular disorders
- Diseases of the Lungs
 1. An increase in the airway resistance or a decrease in the compliance of pulmonary **parenchyma** that leads to hypoventilation
 2. Diseases that impair the diffusion of oxygen through the respiratory membrane
 3. Development of a pulmonary dead space or a physiological shunt that decrease the ventilation perfusion ratio
- Venous to Arterial Shunts
- Any hematological condition that reduces the perfusion of oxygen to the peripheral tissues
 1. **Anemia**
 2. Abnormal hemoglobin
 3. Hypovolemic conditions
 4. Any obstruction in the blood vessels that compromises the blood supply to a certain region
 5. Tissue **edema**

- Inability of the tissues to consume oxygen
- 1. Alteration of structure of the oxidation enzymes
- 2. Deficiency of vitamins that act as cofactors for the enzymes

A classic example of this kind of a situation is cyanide poisoning. Cyanide acts as an irreversible inhibitor of the enzyme cytochrome oxidase. Thus oxidative phosphorylation does not take place. In Beri Beri, the lack of Vitamin B affects oxidative respiration.

Effect of Hypoxia on the Body

- Death
- Depressed mental activity
- Coma
- Decreased work capacity of the muscles
- Fatigue

Oxygen Therapy

Depending on the underlying cause, administration of oxygen can be effective in the management of hypoxia. Oxygen can be administered in main three ways

- Placing the patient's head in a tent that contains air with fortified oxygen
- Allowing the patient to breathe pure oxygen or high concentration of oxygen from a mask
- Administration of oxygen through an intranasal tube

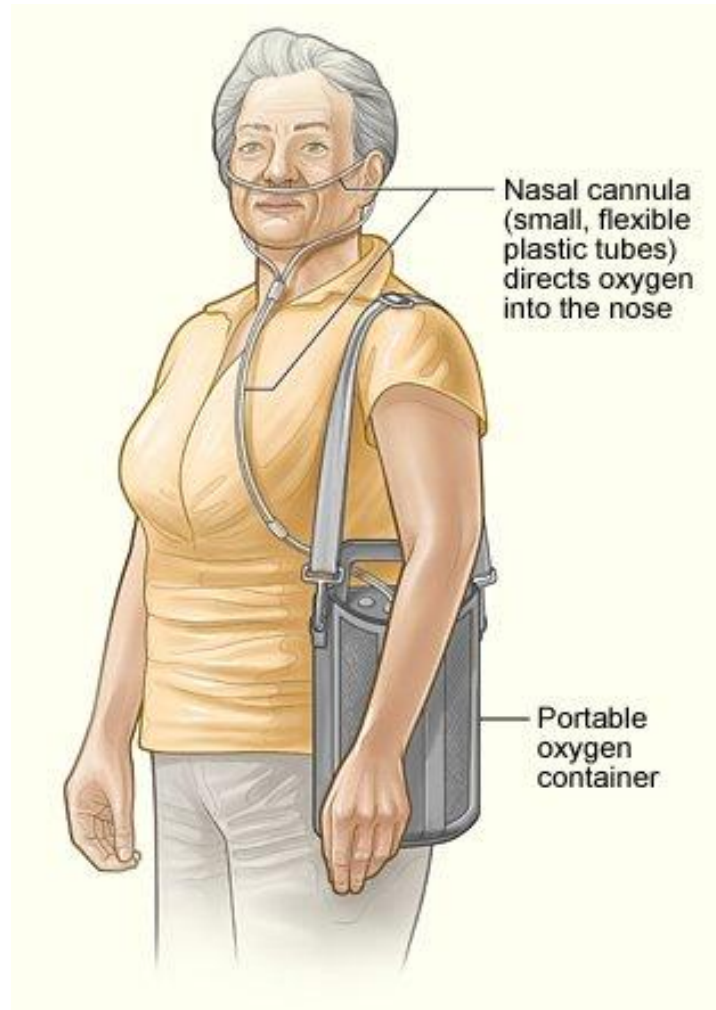


Figure 01: Oxygen Therapy

Oxygen therapy is extremely effective in the treatment of hypoxia which is caused by the lack of oxygen in the atmosphere. Administration of oxygen can also be helpful in the management of hypoxia due to hypoventilation. But since hypoventilation results in the accumulation of carbon dioxide in the circulatory system, oxygen therapy alone will not improve the symptoms.

When the cause of hypoxia is a condition affecting the respiratory membrane through which the diffusion of gases happens, administration of oxygen from outside will increase the partial pressure of oxygen inside the alveoli. Consequently, the diffusion gradient also increases, expediting the movement of oxygen molecules into the blood. Therefore oxygen therapy is an effective mode of treatment in the management of hypoxia due to respiratory membrane pathologies.

In case of hypoxia due to hematological abnormalities, there is nothing wrong with the mechanism by which the alveoli receive oxygen. Therefore oxygen therapy has no place in the management of hypoxia due to such reasons since it is not the oxygen supply that is impaired, but the carrier system which is responsible for the perfusion of oxygen from lungs to the peripheral tissues. Similarly, if the pathology lies in the tissues, making them incapable of consuming the oxygen delivered to them by blood, oxygen therapy will not be useful in ameliorating the patient's condition.

What is Cyanosis?

The bluish discoloration of the mucous membranes due to the excessive amounts of deoxygenated hemoglobin in capillary blood is known as cyanosis. Any concentration of deoxygenated hemoglobin that is more than 5g per 100 ml of arterial blood is adequate to give rise to this clinical sign.

An interesting fact is, anemic patients never become hypoxic because their hemoglobin concentration is way below the required deoxygenated hemoglobin concentration to result in cyanosis. On the other hand, polycythemic patients have a higher tendency to develop cyanosis even under the normal conditions because of the excessive amount of hemoglobin in the blood.

Depending on the location of the bluish discoloration, cyanosis has been divided into categories as

Central Cyanosis

The cause of central cyanosis is the shunting of venous blood into the systemic circulation as in the right-left cardiac shunts. Central cyanosis appears on the tongue.

Peripheral Cyanosis

Peripheral cyanosis is seen in the hands and feet. It is caused by any condition that leads to stasis of the blood in the peripheries. [Vasoconstriction](#) of the regional vessels, [congestive cardiac failure](#), [Raynaud's disease](#) and exposure to cold temperature are the common causes of peripheral cyanosis.



What are the similarities between Cyanosis and Hypoxia?

- Both conditions are the results of alterations in the concentration of the respiratory gases.

What is the difference Between Cyanosis and Hypoxia?

Cyanosis vs Hypoxia

Cyanosis is the bluish discoloration of the mucous membrane due to the excessive amounts of deoxygenated hemoglobin in the capillary blood.

Hypoxia is the deficiency in the amount of oxygen reaching the tissues.

Color Change

A bluish discoloration appears either in the peripheries

There is no externally visible

or in the tongue.

color change.

Summary – Cyanosis vs Hypoxia

Hypoxia and cyanosis can be regarded as two clinical features which arise due to the faulty circulation of blood to different regions of the body. Hypoxia which is the limited availability of oxygen to the body tissues totally blunts the oxidative respiration. Cyanosis is due to the increase in the concentration of deoxygenated hemoglobin in the blood. This is the difference between cyanosis and hypoxia.

References:

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