ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

EFFECTIVE METHODS OF OXYGEN THERAPY IN RESUSCITATION

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Abstract: This article discusses the primary goals of oxygen therapy in resuscitation, the methods used, and new approaches aimed at improving its effectiveness. The significance of oxygen therapy in cases of oxygen deficiency is highlighted, with detailed information provided on various methods, including nasal catheters, oxygen masks, and mechanical ventilation. Additionally, potential complications during therapy and ways to prevent them are discussed.

Keywords: Resuscitation, oxygen therapy, nasal catheter, oxygen mask, mechanical ventilation, hypoxia, emergency assistance.

Purpose and importance of oxygen therapy . Oxygen therapy is used to eliminate hypoxia (oxygen deficiency in tissues) and restore the normal function of vital organs. Hypoxia negatively affects not only the respiratory system but also the cardiovascular system. If oxygen deficiency persists:Disruption of heart function: Lack of oxygen supply to the brain, potentially leading to coma or death. Dysfunction of other vital organs. The primary goal of oxygen therapy is to maintain the oxygen pressure in arterial blood gases (PaO2) within normal limits (80-100 mmHg).[6]Indications for oxygen therapy:Oxygen therapy is required in the following situations: Respiratory failure: When the patient experiences difficulty with deep or shallow breathing (e.g., pulmonary embolism, asthma attacks). Cardiovascular diseases: In cases of shock or acute heart failure, where oxygen delivery is impaired due to circulatory disturbances. Infectious diseases: Difficulty in breathing caused by COVID-19 pneumonia or other infectious processes. Postoperative recovery: A higher risk of hypoxia exists due to anesthesia and other factors after major surgeries.[1]

The risk of hypoxia after major surgical procedures is high due to factors related to anesthesia, the condition of the airways, and the patient's overall health. Below are the main causes and mechanisms of this condition:Effects of anesthesia:
1. Suppression of the central respiratory system: General anesthetics used during surgery (e.g., propofol, isoflurane) and opioids (e.g., morphine) can suppress the respiratory centers, reducing the depth and rate of breathing.2. Weakening of respiratory muscles: Anesthetic drugs temporarily weaken the diaphragm and other respiratory muscles, reducing the efficiency of gas exchange.3. Accumulation of carbon dioxide:During surgery, hypoventilation (insufficient air exchange) may occur in the patient, leading to an increase in carbon dioxide levels and a decrease in oxygen levels.[7]
Factors affecting lung function:
1. Lung collapse (atelectasis): Prolonged immobility and anesthesia can cause some parts of the lung to collapse, limiting oxygen exchange.

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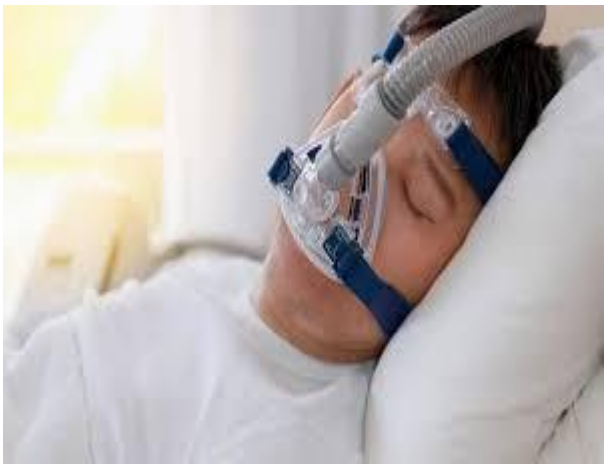
2. Accumulation of secretions: Mucus or other secretions in the airways can accumulate and partially or completely obstruct the airways.
3. Vasodilation: Anesthesia causes the dilation of blood vessels, redirecting blood flow to poorly ventilated areas of the lungs. This leads to a "ventilation-perfusion mismatch," reducing oxygenation.



Emergency situations: Cardiac arrest, shock, or pulmonary edema.[6]

Methods of oxygen delivery

A. Nasal Catheter: Used for mild hypoxia conditions. Oxygen flow is between 1-6 l/min, and oxygen concentration is 24-40%. This method is less invasive and more convenient, making it widely used in daily resuscitation.

B. Oxygen mask:Used for patients with moderate breathing difficulty.Oxygen flow is between 5-10 l/min, with a concentration of 40-60%. Provides short-term delivery of high levels of oxygen to the patient.

C. Reservoir Mask:Used in severe hypoxia conditions. Oxygen concentration is 90-100%. These masks are used in emergency care and for trauma patients.

D. Mechanical ventilation: Applied when the patient loses the ability to breathe or has very low breathing capacity. Oxygen is delivered to the airways through artificial ventilation devices. It is carried out through intubation and requires special monitoring.[1]

Risks and complications of oxygen therapy Pulmonary barotrauma: High pressure oxygen delivery may cause lung damage.
Oxygen toxicity: Prolonged use of high concentrations of oxygen can lead to alveolar damage.[3]
Excessive dryness: Oxygen flow can dry out the mucous membranes, causing discomfort during breathing.

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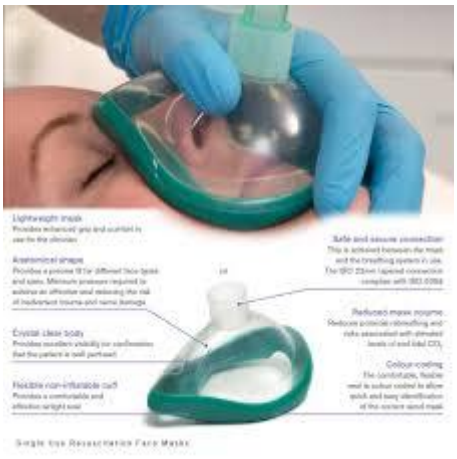

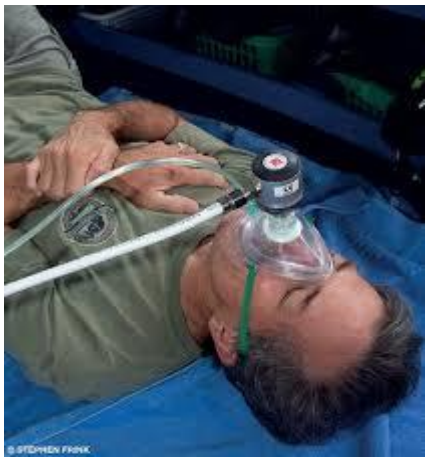

Hypo- or hypercapnia: The balance between oxygen and carbon dioxide levels may be disrupted. To minimize complications, oxygen concentration and treatment duration must be strictly monitored.[5]
Hypercapnia (or hypercarbia) is a condition characterized by an increased level of carbon dioxide (CO_2) in the blood plasma, primarily resulting from respiratory process disruptions. Hypercapnia can develop alongside or independently of hypoxia (oxygen deficiency). This condition arises due to impairments in respiratory centers, pulmonary ventilation, or gas exchange.[1]
Causes. 1. Respiratory system failure: Chronic obstructive pulmonary disease (COPD). Asthma, Pulmonary edema or chronic bronchitis, Interstitial lung fibrosis.
2. Central nervous system disorders: Damage to the respiratory centers controlling pulmonary ventilation (e.g., due to trauma, drugs, or diseases).Use of opioids or sedative medications. Hypoxic or toxic brain injury.
3. Musculoskeletal system disorders: Weakness of the diaphragm and respiratory muscles (e.g., myasthenia gravis or amyotrophic lateral sclerosis (ALS)). Chest wall deformities (e.g., kyphoscoliosis or outcomes of thoracoplasty).[4]
4. Problems related to mechanical ventilation: Improperly adjusted mechanical ventilators. Accumulation of carbon dioxide due to low ventilation settings.
Recommendations for improving effectiveness: Use of monitoring tools: Pulse oximeters help monitor the patient's SpO2 levels. The optimal oxygen saturation should be 94-98%. Adjusting the optimal flow: Oxygen flow should be adjusted based on the patient's condition, either increasing or decreasing.
Humidification: Pass dry oxygen flow through humidifying devices to prevent drying out of the mucous membranes.
Trained personnel: resuscitation specialists and nurses should use the equipment properly.[5]

Conclusion

Oxygen therapy in resuscitation is an integral part of saving a patient's life and is recognized as the most effective method in combating hypoxia. For the adequate supply of oxygen to tissues and ensuring the stability of the cardiovascular and respiratory systems, oxygen therapy must be applied accurately and in a timely manner. The methods of oxygen delivery—nasal catheter, oxygen mask, reservoir mask, and mechanical ventilation—are selected based on the patient's clinical condition. Each method has its own advantages and indications for use. For example, nasal catheters are effective for mild hypoxia, while mechanical ventilation is used in severe respiratory failure cases. However, improper

ISSN: 2692-5206
AMERICAN ACADEMIC PUBLISHER
INTERNATIONAL JOURNAL OF MEDICAL SCIENCES

management of oxygen therapy or its prolonged use without control can lead to several risks and complications, such as oxygen toxicity, pulmonary barotrauma, or hypercapnia. To prevent such adverse effects, it is crucial to properly regulate the oxygen flow and concentration, continuously monitor the patient's condition, and limit the duration of treatment. Moreover, to enhance the effectiveness of oxygen therapy, modern medical equipment should be utilized, humidification devices should be used during the therapy process, and the patient's clinical indicators should be continuously monitored. Resuscitators must regularly improve their skills and stay updated with new technologies and scientific approaches to effectively apply this treatment. Accurate and prompt decision-making by physicians, along with precise monitoring methods, plays a critical role in ensuring the success of oxygen therapy.
In general, oxygen therapy remains one of the primary methods for restoring respiratory and cardiovascular system functions, not only in resuscitation but also in other medical fields. With correct and systematic approaches, this therapy will continue to save millions of lives.

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