

Extra Corporal Membrane Oxygenation (ECMO)

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Abstract

The Extracorporeal Membrane Oxygenation is a modified “heart-lung” machine to provide temporary cardiorespiratory support to the patients. It is an advanced form of organ support to the severe cardiovascular and respiratory failure patients. The majority of patients develop dysrhythmias, ECMO cannulation site bleeding and thrombocytopenia. ECMO is not a treatment and that does not correct the underlying pathological health issues. ECMO is a form of mechanical system, which can maintain oxygenation even without involvement of lungs and appears ideal for the patients with refractory hypoxemia.

Keywords: Extracorporeal Membrane Oxygenation; Heart-Lung Machine; Extracorporeal Life Support.

Introduction

Extracorporeal membrane oxygenation (ECMO) phenomenon was first recognized in 1944, when Kolff and Berk noted that blood became oxygenated as it passes through the thin transparent cellulose chambers of the artificial kidneys. In 1971, a trauma patient survived after being supported for 3 days with ECMO, the first patient to get benefit from this technology. A few years later, Robert Bartlett reported the first infant to benefit from ECMO support. Many medical practitioners were then enthused by the technology and offered it to their patients.

Definition

Extracorporeal membrane oxygenation (ECMO), also known as extracorporeal life support (ECLS). The extracorporeal technique of providing prolonged cardiac and respiratory support to the persons whose heart and lungs are unable pump or

to provide an adequate amount of gas exchange or perfusion to sustain life.

Types of Ecmo:

There are mainly two types of ECMO:

1. *Veno -Venous ECMO*: In Veno-venous (VV) ECMO blood is removed and returned into the venous circulation simultaneously. It is usually achieved through a single Y shaped cannula placed in the internal jugular vein in the neck. VV ECMO provides support for the lungs only.

2. *Veno-Arterial ECMO*: In veno-Arterial ECMO Blood is drawn from a venous circulation, and then the blood is returned to an artery. The carotid artery in the neck or the femoral artery in the groin is used. VA ECMO provides support to the lungs and to the patients with severe cardiac failure.

Indications:

The following list of indications for which the ECMO care can be provided.

1. Acute myocarditis
2. Cardiac arrest (in certain settings)
3. Failure to wean from cardiopulmonary bypass

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4. Cardiogenic shock
5. Hypoxic respiratory failure
6. Hypercapnic respiratory failure
7. Primary graft failure after lung transplantation.
8. pulmonary contusion
9. Pulmonary embolism
10. Local anesthetic toxicity
11. Post-cardiac arrest
12. ARDS.

Adults: In an adult, the conditions that might require ECMO include:

1. Pneumonia
2. Trauma and other emergencies
3. Heart support after cardiac failure
4. Severe infections

Children: A child might need ECMO if they experience:

1. Pneumonia
2. Severe infections
3. Congenital heart defects
4. Cardiac surgery
5. Trauma and other emergencies
6. Aspiration of toxic materials into the lungs
7. Asthma.

Infants: For infants, conditions that may require ECMO include:

1. Respiratory distress syndrome
2. Congenital diaphragmatic hernia
3. Meconium aspiration syndrome
4. Pulmonary hypertension
5. Severe pneumonia
6. Respiratory failure
7. Cardiac arrest
8. Cardiac surgery
9. Sepsis

ECMO Procedure:

ECMO requires a surgical procedure, but it is usually done in a patient's room with the help of surgical team members. ECMO patients may be given medications such as: heparin to prevent blood clots, antibiotics to prevent infections, sedatives to minimize movement and improve sleep, diuretics to help the kidneys to get rid of fluids, electrolytes to

maintain the fluid balance, blood and blood-products to replace blood loss. An x-ray is taken to ensure the tubes are in right place. The ECMO patient should put on the ventilator, which helps the lungs to heal. This patient will be monitored by specially trained health care personnel in the hospital and respiratory therapists. Due to sedation, Nasal-gastric tube is administered to provide the Nutrition to the patient.

Investigations need to be done prior to the removal of ECMO machine to confirm that the patient's heart and lungs are functioning normal. Once the cannulas are removed, the blood vessels need to be repaired by putting staple. Even though the patient is off the ECMO, he/she may still needs to be on a ventilator [4].

ECMO Team:

After determining that ECMO is necessary, doctors will prepare the equipment with their health team members. They include:

1. Physician
2. ICU registered nurses
3. Respiratory therapists
4. Perfusionists (specialists in the use of heart-lung machines)
5. Support personnel and consultants
6. 24/7 transport team
7. Rehabilitation specialists.

Mechanism and Principles

Contraindications for ECMO

- Contraindications to anticoagulation: recent surgery, uncontrolled bleeding, intracranial hemorrhage
- Irreversible condition
- Contraindications for heart/lung transplant.

Principles

- De-saturated blood is drained via a venous cannula
- CO₂ is removed, O₂ added through an "extracorporeal" device
- The blood is then returned to systemic circulation via another vein (VV ECMO) or (VA ECMO).

Caveats to ECMO: Before subjecting a patient to such a perversely unnatural therapy, one ought to satisfy oneself that every "conventional" strategy has failed. These include:

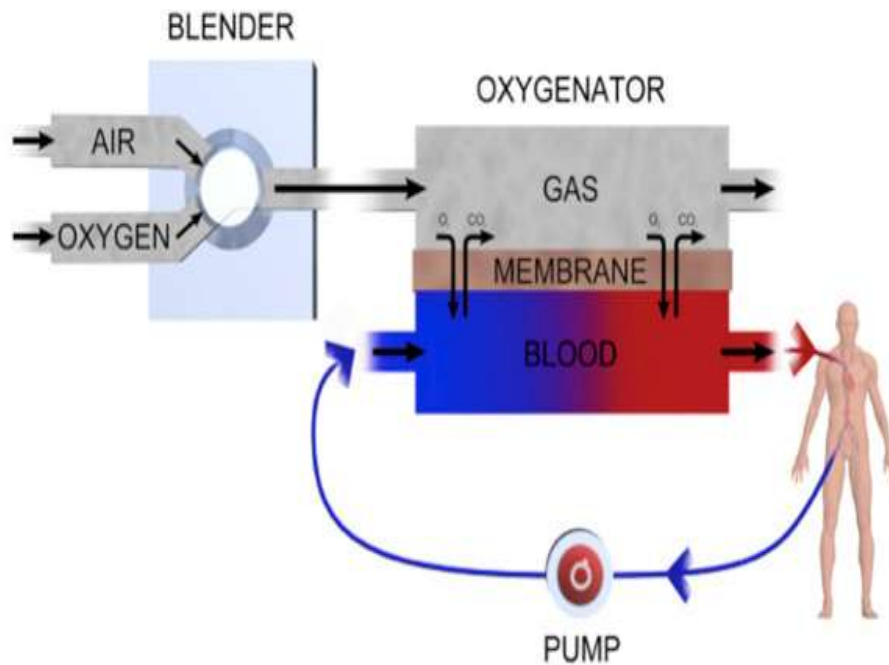


Fig. 1: An illustration of how ECMO works

1. Recruitment manoeuvres
2. Prone positioning
3. Inhaled prostacyclin
4. Dieresis
5. Fluid resuscitation and decreased PEEP to improve V/Q matching.

Basic physics of ECMO

1. Oxygenation is controlled by the blood flow rate
2. CO₂ removal is controlled by the countercurrent flow of fresh gas.

Anticoagulation during ECMO

- Heparin can increase the risk of bleeding complications during ECMO.
- ACT (Activated Clotting Time) is the chosen method for measuring the anticoagulation
- ACT target is 180-210 seconds.

Weaning off ECMO

1. VV ECMO: Gas sweep is turned off. No fresh gas passes through the oxygenator. The patient's lung function can thus be isolated, and observed. If gas passes muster, the pump is turned off and the blood returned.
2. VA ECMO: The drainage and infusion lines are temporarily clamped, to observe what the patient does with his own circulation.

Major complications of ECMO

- Subarachnoid hemorrhage
- Limb ischemia (with VA ECMO)
- LV distension and pulmonary hemorrhage (with VA ECMO)
- Cardiac chamber thrombosis (with VA ECMO)
- Bleeding complications (in as many as 30-40%)
- Heparin-induced thrombocytopenia (HIT).

Benefits Of ECMO:

1. The main advantage of ECMO is that it can maintain the supply of oxygen to the body while the lungs are in resting state. An oxygenator (or artificial lung) the ECMO circuit relies on a motor to pump the blood around. The pumping ability of the ECMO machine can also provide support for reversible heart disorders when required.
2. Traditionally patients with lung injury are treated on a ventilator. A ventilator pushes oxygen into the patient's lungs to maintain the oxygen levels in the blood.
3. High pressure and high oxygen levels in themselves can cause lung damage, so the injured lung becomes more damaged and the pressure needs to be increased further which causes yet more damage. ECMO breaks this cycle and allows the lungs to be rested while the body heals. This is similar to the way that

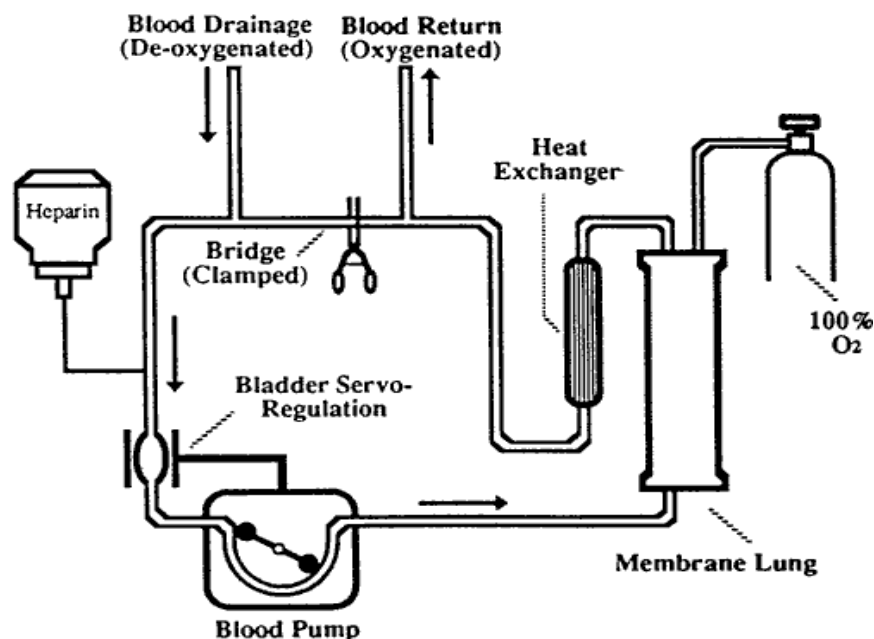


Fig. 2: Mechanism of ECMO

a plaster cast supports a broken arm whilst the bone repairs.

4. We should remember that ECMO does little to heal the underlying condition; it only provides support for healing.

Risks of ECMO

- ECMO does carry some risks which include:
- Bleeding, due to the medication that's given to prevent blood from clotting in the tubing.
- Infection at the sites where the tubes enter the body.
- Transfusion issues, since a person on ECMO is given blood products.
- Small clots or air bubbles forming in the tubing.
- Increased chance of stroke⁴.

Nursing Implications

1. The use of ECMO during CPR is a technologically advanced and complex treatment that requires extensive knowledge from every member of the health care team.
2. Nursing personnel's should be well educated about physiology as well as the mechanical aspects of the ECMO pump. Centers providing this treatment must offer educational programs to train nurses in rapid deployment of the ECMO circuit.
3. Familiarity with the circuit and experience

with the cannulation procedure will ensure a smooth transition from cardiopulmonary resuscitation to artificial circulation.

4. Once the patient is cannulated, highly skilled nurses are needed to manage daily treatment. Nursing care of ECMO patients is both physically and mentally demanding.
5. The ECMO patients require laboratory and physical assessments, as well as frequent neurological checks. Neurological injury is common in ECMO as patients owing to the acuity of their illness and the risk of cerebrovascular injury from stroke or hemorrhage.
6. Daily ultrasound imaging of the head is a routine in most cases, and continuous electroencephalographic monitoring is also implemented with concerns for subclinical seizure activity.
7. Because of the immense workload associated with ECMO patients, two nurses are generally needed to care for these acutely ill children. One nurse is tasked with the care of the patient, while the other nurse tends to the needs of the ECMO pump.
8. Most centers have implemented the use of perfusionists and specially trained respiratory therapists to manage the ECMO circuit in an effort to reduce the strain on nursing staff.
9. The bedside nurse is often depending on support from patient's family. It is quite often difficult and challenging to garner support and it requires a large amount of dedication.

10. Most intensive care nurses are well versed in end-of-life care and must continue to use this skill during ECMO trials.
11. Nurses should be aware of the resources available for patient's families, including palliative care teams, social workers, and chaplain services. These services can help by offering assistance to family members during periods of critical illness and end of life.

Conclusion:

Use of ECMO as a final therapy during CPR in the care of critically ill patients remains promising. As care providers continue to broaden the boundaries of use of ECMO, it is imperative that judicious decision making to be maintained in the clinical setting. It is essential that clinicians providing this treatment be thoroughly educated and knowledgeable about the literature, so that decisions are based on evidence. In all end-of-life care cases, it is essential that all members of the health care team be aware of parental presence and concern. Support must be provided to patient's families on a constant basis to ensure that their

needs are met. It is very easy for physicians and nurses to become overwhelmed by the technical aspects of caring for these critically ill patients and focus solely on maintaining life.

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Ginger the Natural Medicine

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Abstract

Ginger is a member of Zingiberaceae family of plants. Ginger has many important medicinal values; it is used for healing strategies in Asia, India, Europe and the Middle east for centuries. Ginger plays a significant role in the treatment of disorders such as arthritis, stomach upset, asthma, diabetes and menstrual irregularities. Ginger is one of the common ingredients in Asian and Indian food recipes. Ginger helps in relieving digestive problems such as nausea, loss of appetite, motion sickness and pain. Ginger the root or underground stem (rhizome) of the ginger plant can be consumed as fresh, powdered, dried as a spice, or as oil form or as a juice.

Summary statement

- Ginger is one the commonest and healthiest spices available on the planet which has a significant medicinal values.
- The medicinal properties of the ginger are unearthed in this article. Ginger plays a significant role to solve digestive problems such as nausea, loss of appetite, motion sickness and pain.
- Ginger helps to improve the neurological function and protects against alzheimers disease. The various extracts of ginger can be used to prevent various forms of cancer.

Keywords: Ginger; Natural Medicine; Health Benefits; Phenolic Compounds; Gingerol.

Introduction

The rhizome of ginger has been used has a spice across globe. Ginger is an underground root or rhizome of the plant with a firm striated texture. Ginger is a yellow, white or red in colour depending upon the variety. Ginger is a form of root which is a flexible ingredient and which can be consumed in drinks, especially in tea or in cooking. Gingers is also used to make food spicy or it is also used a food preservative [1].



Source: Google

Fig.1: Ginger

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Health Benefits of Ginger

1) Prevents Indigestion

Ginger has a phenolic compound which are known to help in relieving the gastrointestinal irritation, stimulates saliva and helps in bile production and suppress gastric contractions and movements of food and fluids through the gastrointestinal tract [2].

2) Prevents Nausea

Ginger can be chewed in raw form or can be taken in tea which is a common home remedy for nausea and also during cancer treatment.



Source: Google

Fig. 2: Ginger tea can help relieve nausea and aid cold recovery.

Ginger helps pregnant women who are experiencing morning sickness especially during the first trimester. Ginger helps to relieve morning sickness, nausea and vomiting. Ginger can be consumed in the form of ginger lozenges or candies.

During winter season, consumption of ginger tea is very good way to keep the body warm. Ginger is a diaphoretic, which means that it promotes sweating, and helps to keep the body warm within. A ginger is helpful in common cold and cough, ginger tea is particularly helpful to relieve cold and cough. Ginger tea can be prepared at home, by taking a slice of about 20-40 gram of fresh ginger and steep in a cup of hot water. A slice of fresh lemon or a drop of honey adds flavour and additional benefits, including vitamin C, this preparation has a lot of antibacterial properties [3].

3) Pain Reduction

Ginger is an effective and a natural anti-inflammatory agent which helps to reduce pain and inflammation. Ginger is also found to reduce the signs and symptoms of painful menstruation (dysmenorrhea). A study was conducted in which it was found that the 83% of women who

were consuming ginger capsules reported improvements in pain symptoms when compared with 47% of those who were placed on placebo therapy [3].

4) Anti Inflammatory Actions

The anti-inflammatory has been found from centuries and has significant medicinal importance. Ginger and various extracts of ginger have been used traditionally as anti-inflammatory and helps to treat inflammatory conditions. Ginger contains a chemical substance known as 6-gingerol, which is found to have protective effects against cancer and various other infections.

5) Ginger Lowers Blood Sugars And Improves Heart Disease Risk Factors

Ginger is found to be helpful in lowering the blood sugar levels and to prevent heart disease and to improve the conditions of heart patients. Ginger helps to improve the risk factors with type 2 diabetes. Ginger significantly reduces the level of LDL (low density lipoprotein) cholesterol and blood triglyceride levels.

6) Ginger Improves Brain Function

Ginger improves the memory and attention span and calms the anxious mind of the person. It helps in safeguarding the brain from the free radical damage. Ginger helps to improve the brain function against Alzheimer's disease.

7) Ginger Helps To Prevent Cancer

The extracts of ginger have been found to be an alternative for the treatment of several forms of cancer. The anticancer properties of ginger are attributed to 6-gingerol, a substance which is found in large amounts in the raw ginger. Ginger is an antioxidant and a natural cancer fighter. A study was conducted in which it was found that the ginger root supplement was administered to volunteer participants, reduced the inflammation markers in the colon within a month. Ginger has shown promise in clinical trials for treating inflammation associated with osteoarthritis [4]. Ginger is classified as carminative herb which reduces intestinal gas as well as a spasmolytic agent which soothes the intestinal tract.

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