

How did an oxygen exchanger through the outer membrane save lives of Covid-19 patients?

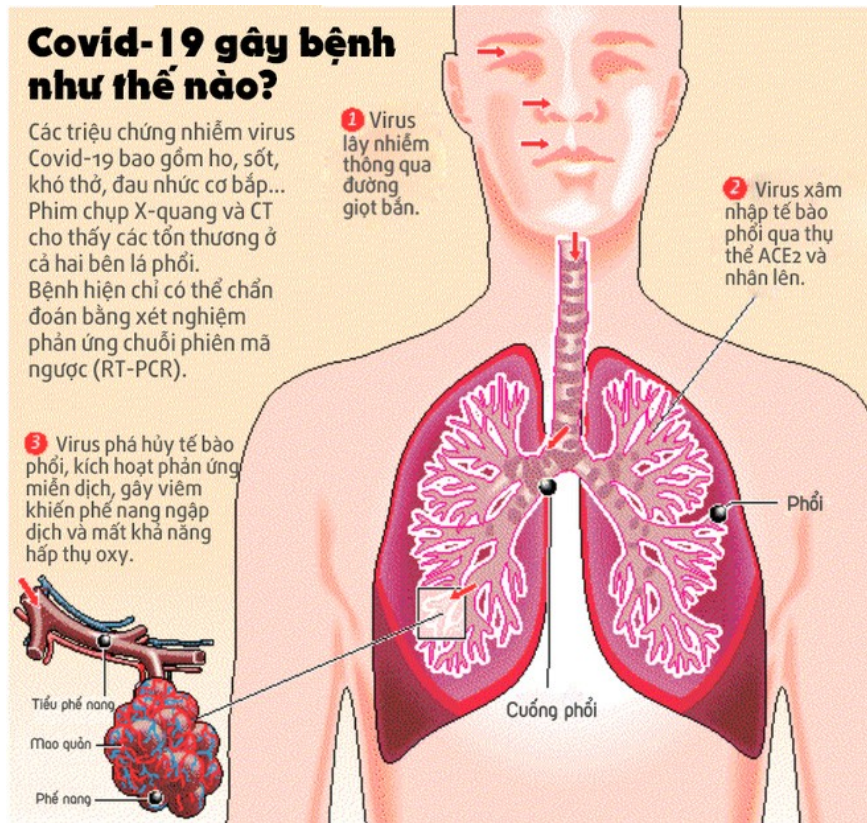
The blood flowing into ECMO is taken to an artificial lung, where it is removed from carbon dioxide and replenished with oxygen. The artificial lung itself in the ECMO machine is also a very sophisticated system. From the outside, it looks like a red water filter, but the inside is actually a sheet

As you probably know, Covid-19 is a disease that causes acute respiratory failure in humans. The corona virus strain that causes it to attack the lung cells directly, devastating them and can lead to a cytokine storm - occurs when immune cells overreact to the pathogen and will kill them all. Lung cells are still healthy.

Cytokine reactions are particularly likely in older people, people with weakened immune systems and underlying medical conditions such as diabetes, blood pressure, heart disease and cancer. The lung swept by a cytokine storm will suffer double damage, from the virus itself and then to the patient's immune cells.

Patients' lungs will be effusive, restricting their ability to absorb oxygen. And when lesions in the lungs are scarred, the lungs harden and cannot breathe anymore.





If the Covid-19 patient continues to fail to respond to conventional respiratory support methods such as the use of oxygen masks (Oxygen therapy), high-flow oxygen therapy (HFNO), non-invasive ventilation (NIV), With endotracheal intubation and mechanical ventilation, they will face the risk of death from severe respiratory failure.

That's when the doctors stood before their final choice, connecting the patient's body to a machine called ECMO (short for Extracorporeal membrane oxygenation or "Oxygen exchange through the outer membrane of the body").

ECMO: The heart and the lungs

ECMO is an extremely sophisticated life support technique developed in the second half of the 20th century. Its idea is to help circulate and breathe for patients with heart, lung or even both heart failure. This vital organ.

When a person has heart failure, the heart of the patient will not be able to support the circulation in the lungs, where blood draws oxygen and releases carbon dioxide, and can no longer pump blood throughout the body. Similarly, with respiratory failure, the patient's lungs are no longer able to exchange oxygen and carbon dioxide, resulting in their bloodstream being contaminated with high CO2 and severely depleted.

Both situations quickly put them at risk of death. ECMO is now the last method to help them sustain life. The device is connected to the patient's body through catheters into a vein and a large artery in the patient's body, usually the large vessels in the neck, groin or chest.

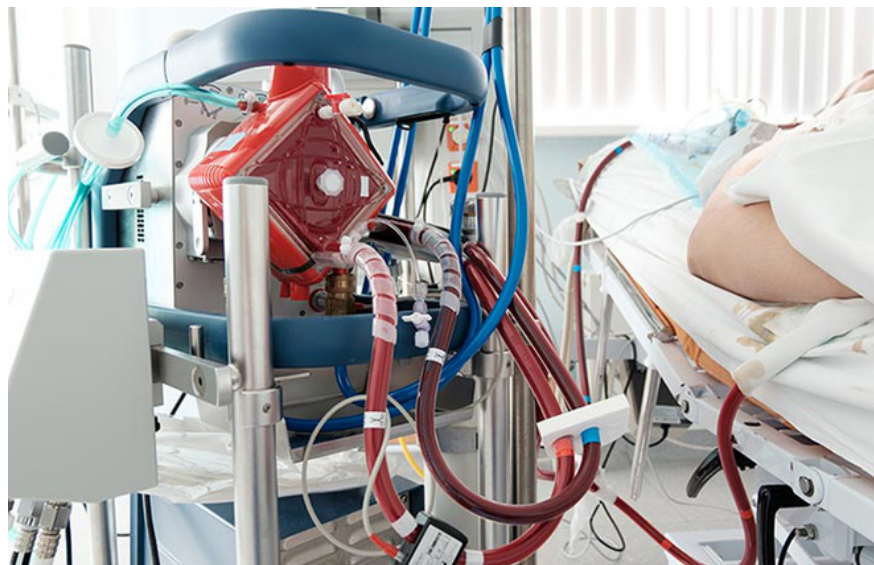
ECMO: Machine exchanges oxygen through outer body membrane

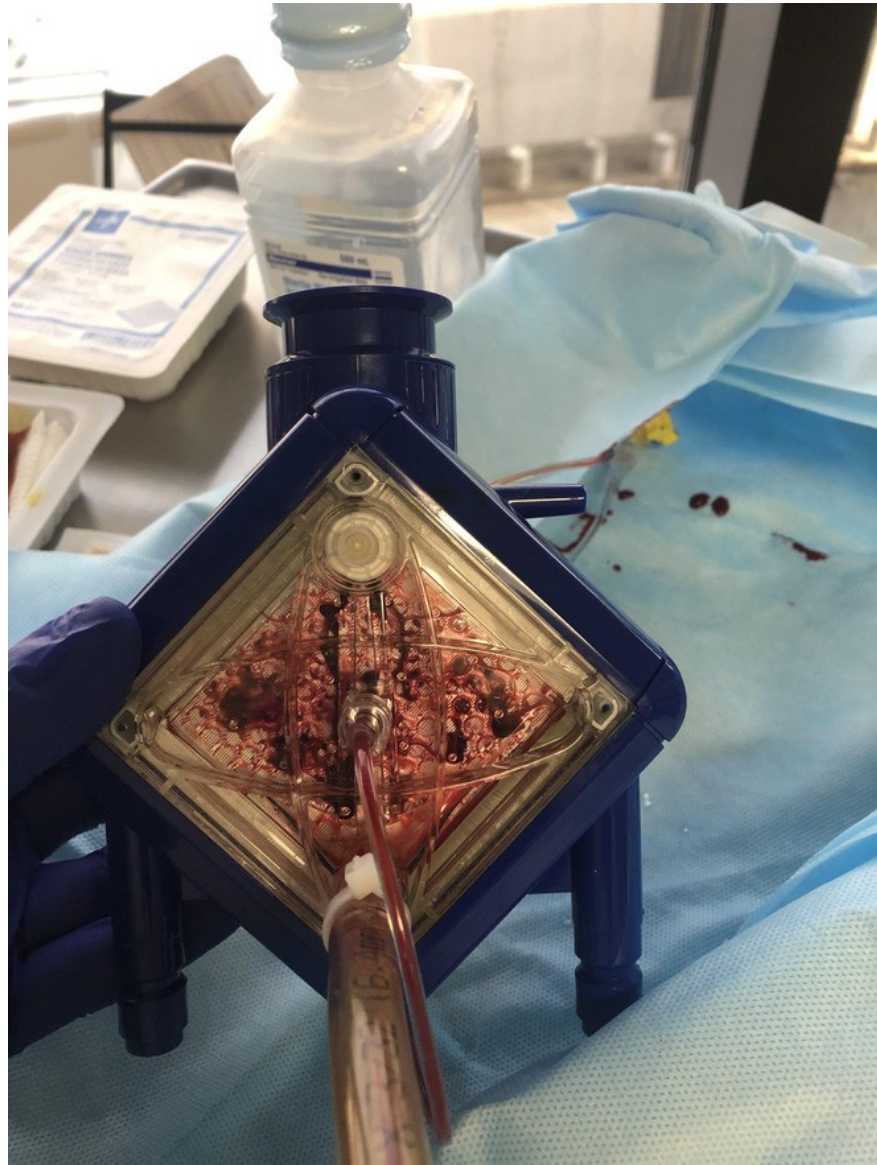


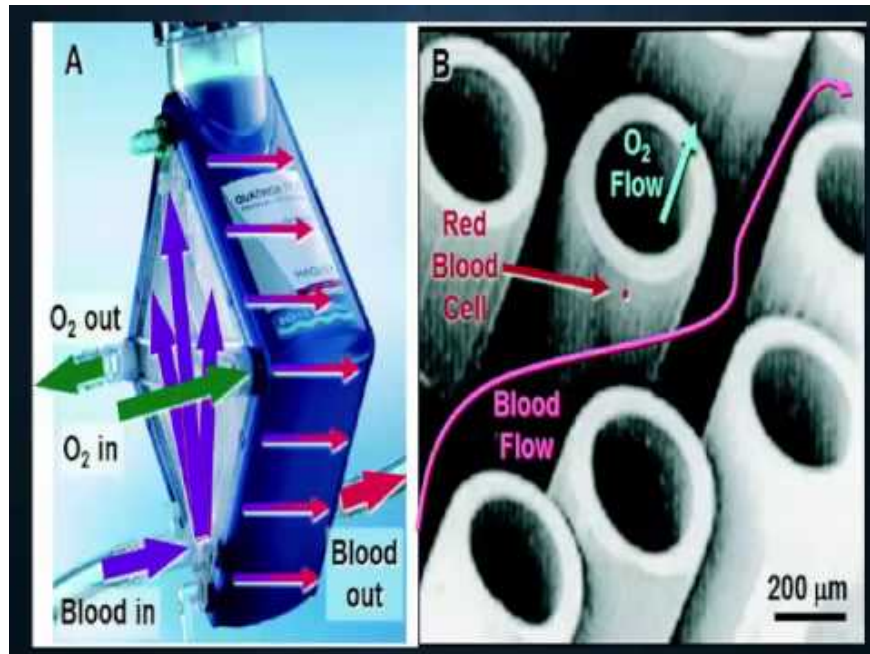
The blood flowing into ECMO is taken to an artificial lung, where it is removed from carbon dioxide and replenished with oxygen. The artificial lung itself in the ECMO machine is also a very sophisticated system. From the outside, it looks like a red water purifier.

But inside the filter is essentially an air-permeable but blood-absorbing membrane of 2 to 4 square meters. This membrane is designed in the form of hollow fibers, allowing blood to flow outside the fibers, while oxygen flows in the opposite direction to the inside.

When blood and gas flow in opposite directions on such a large area, they exchange oxygen and carbon dioxide effectively with each other. Oxygen diffuses from the gas stream into the bloodstream, whereas carbon dioxide is drawn out. The operation of the artificial lung will help normalize the patient's blood flow.







After the successful exchange of oxygen and carbon dioxide in the artificial lungs, the ECMO pump system will act as a substitute for the heart of the patient. It pushes blood flow to support the body's resurrection through a catheter into a blood vessel.

In order to support this smooth process, patients using ECMO are often given blood thinners, so that their blood does not clot and interfere with the system outside the body.

Buy more time and life for patients

The miracle but also the weakness of ECMO, it is that in essence this machine does not directly help save lives. It is only working instead of hearts and lungs to help them sustain life.

In cases of Covid-9 patients with severe respiratory distress, physicians can connect their bodies to an ECMO machine, but other therapies such as immunosuppressant therapy must be performed at the same time. Extinguish cyclone cytokine, viral suppression drugs are being tested and antibiotics to treat opportunistic infections.

Sometimes, work stops at helping patients stay alive and wait for their bodies to heal themselves.

A 2015 statistics showed that 52% of patients with respiratory failure using ECMO was saved. The percentage of health facilities with experience using this machine is even higher, up to 60-70%.

During the Covid-19 epidemic, ECMO machines were used in China to treat the most severe patients. ECMO is also recommended by the World Health Organization (WHO) as a recommended regimen, for the treatment of patients with severe respiratory failure when infected with Covid-19.

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