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Catheter Based Targeted Extracorporeal Membrane Oxygenator (ECMO)

Technology No. 20160146

IP Status: Issued US Patent; **Application #:** 15/066,819

Supplies oxygenated blood to brain and heart during cardiac arrest

A novel catheter system performs a targeted form of extracorporeal membrane oxygenation (ECMO) during cardiopulmonary resuscitation (CPR) to provide blood to the heart and brain during cardiac arrest or cardiogenic shock. The targeted cardio-cerebral ECMO (TC-ECMO) system is easy for average-trained, less specialized healthcare personnel to use, it provides time to transfer the patient to a higher level medical center (i.e., one with an ECMO team). The procedure supplies oxygenated blood to the portion of the aorta where the cerebral and coronary arteries originate. The system consists of an aortic catheter and a venous catheter (placed in the inferior vena cava) connected to an external, semi-automated oxygenator and pump that requires very minimal operator intervention while transporting the patient. The device is inserted via the femoral artery and vein and has two balloons that inflate; one blocks the descending aorta, and the other blocks the inferior vena cava. The device is expected to improve survival rate and neurological outcomes in cardiac arrest patients. It can also be used to support the circulation in patients undergoing high risk coronary artery interventions and in patients with cardiogenic shock.

Overcomes conventional ECMO limitations, fewer complications

Cardiopulmonary resuscitation (CPR) chest compressions is associated with poor survival outcomes and high incidence of neurological deficits, mostly because it cannot provide sufficient amount of oxygenated blood to the vital organs (i.e. heart and brain). Combining CPR with extracorporeal membrane oxygenation (ECPR) improves survival and neurological outcomes, however its use is limited to large hospitals that have specialized teams available around the clock. Another limitation is that ECMO uses very large arterial and venous cannulas that require special expertise for placement and may lead to high failure and complication rates. The TC-ECMO system overcomes many of these limitations and offers numerous

benefits including: Exclusively delivers oxygenated blood to the brain and heart Easier to place than ECMO; can be easily implemented in the emergency department, doesn’t require highly trained personnel Provides a temporizing measure to allow more cardiac arrest patients access to ECPR, hence saves more lives Smaller cannulas and fewer vascular complications Expected improvement in survival rate and neurological outcomes Delivers more blood to the brain than chest compression Portable: small external unit Requires minimal human intervention Superior to regular ECMO in bleeding patients

Phase of Development

- Proof of Concept with in vivo animal studies.

Benefits

- Buys time until further help/higher level of care is available
- May improve survival rate and neurological outcomes in cardiac arrest patients
- Easier and faster to place than ECMO
- Alternative to conventional ECMO for patients in cardiogenic shock (with beating heart); can provide adequate circulatory support that is easier to implement and with fewer vascular complications

Features

- Targeted form of ECMO during CPR (ECPR)
- Specially designed catheter and portable ECMO system
- External, semi-automated oxygenator and pump
- Provides oxygenated blood with good perfusion pressure to brain and heart during cardiac arrest
- Arterial (aortic) catheter and venous catheter (placed in inferior vena cava)

Applications

- Early cardiac arrest treatment
- Trauma patients with ongoing blood loss elsewhere in the body
- Maintaining heart and brain perfusion until trauma patients can get definitive intervention for bleeding organs
- High-risk coronary artery interventions when other measures (i.e., temporary ventricular assist devices) are unavailable or contraindicated
- Circulatory support backup in high risk coronary interventions; provides alternative to IMPELLA
- Patients in cardiogenic shock (due to weak heart function) in the intensive care unit
- Hospitals without full ECMO teams

- Battlefield hospitals: provide temporary support to vital organ circulation
- Major vascular surgical procedures
- Possible early application of hypothermia protocol

Researchers

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