Cleveland Clinic Innovations

PRODUCT
Cannula Design for Improved Proximal Venous Drainage and Distal Arterial Perfusion

INDICATION
Surgery, ECMO, Cardiac insufficiency, Respiratory insufficiency

VALUE PROPOSITION
- Will allow drainage of venous blood from the extremity into the cannula and hence into the ECMO circuit
- Addresses problem of inadequate venous drainage at site of venous cannulation
- Lower thrombosis and edema in the extremity

DEVELOPMENT STAGE
Design Development

INTELLECTUAL PROPERTY
US: 10,328,196

PARTNERING OPPORTUNITY
Development and commercialization partnership

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Novel Cannula for ECMO Procedures

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UNMET NEED

Patients with respiratory insufficiency not amenable to ventilatory support require veno-venous extra-corporeal membrane oxygenation (VV-ECMO) and patients with cardiac insufficiency require veno-arterial extra-corporeal membrane oxygenation (VA-ECMO). In the case of VV-ECMO, placement of either two large cannulae in two separate extremity veins or a single dual lumen cannula in one extremity vein is required. These cannulae take blood out of central circulation and return oxygenated blood to the right atrium. Due to the large size of these cannulae, the venous drainage in the extremity or head and neck region where the cannula is placed is significantly impaired. A significant proportion of patients develop venous stasis, thrombosis, and edema in the extremity. Intracranial Venous Hypertension has been observed in the case of internal jugular vein cannulation, especially in children. On the arterial side, if a femoral artery is cannulated, the blood is returned into the abdominal aorta and there is no perfusion to the leg on the side of cannulation. This can lead to drastic ischemic complications. Currently, if arterial cannulation is required for more than a few hours, a second smaller cannula is placed in the femoral artery for antegrade perfusion. An improved cannula design to aid venous drainage and reduce complications is needed.

SOLUTION

To overcome these issues, this novel cannula design has a series of channels on its back wall that are occluded by a movable cover slip. The cover slip can be retracted to open any number of channels to the lumen of the vessel, on the side that is being blocked by the cannula itself. Since the depth of insertion of the cannula is different for every patient, this design allows the operator to retract the cover slip to the level of insertion such that the channels inside the vessel are open while those outside the vessel stay occluded. In the case of venous cannula, venous blood can be drained from the extremity, into the cannula, and hence into the ECMO circuit. In the case of arterial cannula, the artery and extremity distal to the cannulation can be perfused.