

## Extra-corporeal Membrane Oxygenation (ECMO)



**Figure. A patient on ECMO**

### *What is this procedure?*

Extracorporeal Membrane Oxygenation (ECMO) is the use of artificial machine to support patient's heart and/or lung function. It is used in some of the sickest of intensive care patients when the heart and/or lungs are failing to respond to standard treatments. This therapy supports the patient while allowing time for the lungs and heart to recover or await definitive treatment for his/her condition. (e.g. transplantation).

### *What is this procedure?*

#### **VV (Veno-venous) ECMO**

- Only for support of lung function.
- Blood is drained from a central vein and returned to the venous system after oxygenation.

#### **VA (Veno-arterial) ECMO**

- For support of both heart and lung function.
- Blood is drained from a central vein and returned to the arterial system after oxygenation.

### *Why there is a need to do it?*

Reversible conditions causing heart and/or lung failure when the patient is unresponsive to conventional treatment.

### *How is it done?*

#### **Before the Procedure:**

- The procedure will be fully explained to the family and the patient if condition allows and consent will be obtained.

#### **Initiation of ECMO support:**

- A doctor inserts large catheters (cannulae) into great vessels (veins and/or arteries) over groin and/or neck under sterile technique to connect the patient to the ECMO machine. X-ray and/or ultrasound may be used to guide the process of cannula insertion.
- The ECMO machine continuously pumps blood from the patient through a membrane oxygenator that adds oxygen and removes carbon dioxide. Oxygenated blood is then returned to the patient.

#### **Maintenance of ECMO support:**

- Blood-thinners i.e. anticoagulant is required to maintain the ECMO system free from formation of blood clots.
- Patient's movement is highly restricted while on ECMO support.
- Patient and the relatives have to be aware of the above limitation and be careful with the extracorporeal system and not to disconnect or pull out any tubing.
- Close monitoring of body vital signs and regular blood test are required throughout the procedure to evaluate the treatment effects.

### *When to stop?*

The duration of ECMO therapy depends on the recovery of the heart & lung functions. The treatment may also be terminated if the patient's condition is unsalvageable or complications have arisen making it unsuitable to continue ECMO.

### *Risks and complications*

#### **During ECMO cannula insertion/initiation of ECMO support:**

1. Cannulation related complications: it includes vessel perforation with hemorrhage, arterial dissection, distal ischemia, and incorrect location (e.g., venous cannula within the artery), development of pseudoaneurysm at the site of insertion or injury of adjacent structures or organs e.g. large vessels, heart, lung and liver. These complications are uncommon (<5%).
2. Failure to insert cannulae into the great vessels.
3. Low blood pressure and/or unstable heart rhythm.

#### **During maintenance phase of ECMO support:**

1. Bleeding complication is very common (~30-50%) and happens in any part of body, e.g. bleeding from guts, into brain or lung, from cannula insertion sites or any wound. Use of blood thinner is one the bleeding causes. Surgical exploration and/or other interventions are necessary to stop bleeding.
2. Massive bleeding due to unintended dislodgement of ECMO cannulae or tubings.
3. Damage to red blood cells and hemolysis.
4. Blood clot formation is very common within the circuit and inside the patient's vessels (~20%).
5. Air entering into patient's circulation.
6. Low body temperature.
7. Infection originating from cannula site with possibility of systemic spread.
8. Impaired limb circulation (~10% in peripheral VA-ECMO) is common with risk of tissue damage; and possible need of the surgical intervention (such as fasciotomy) and limb amputation.
9. Neurologic injury including ischemic stroke, intracerebral hemorrhage and hypoxic ischemic encephalopathy is very common (~10-50%).
10. Risk of catheter fracture or rupture: Catheter fracture or adhesion along the catheter course under the skin may cause retained fragment in the body.
11. Machine malfunction. In extreme situation may require resuscitation.

\*\* Any complications aforementioned, whenever occur, can further increase the mortality since patients supported with ECMO are already at extreme risk of death.

### ***Other treatment options***

If the patient chooses not to perform this procedure, it may affect their overall condition. A variety of clinical factors can impact the degree of change, including the individual patient's physical condition before the onset of illness, the type of disease, the response to treatment and the progress, etc. Your doctor will explain other suitable options to you.

### ***Disclaimer***

The information provided in this booklet is for general reference only. The risks and complications listed above are not exhaustive. Please consult your attending doctor for details.