Applied Cardiopulmonary Pathophysiology 15: 181-182, 2011

Standardized terminology of mechanical heart, lung and circulatory assist devices: A recommendation of the Section „Heart and Circulation“ of the German Interdisciplinary Association of Critical Care Medicine

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Introduction of the heart-lung machine (HLM) in the 1950s which allowed to establish an extracorporeal circulation (ECC) facilitated routine implementation of open-heart surgery. Due to modern monitoring technology and specific cannulation methods technical complications are now very rare. This high standard in performing ECC is guaranteed by especially qualified staff and by most advanced technology of all HLM components.

Due to miniaturisation and additional technical progress, conventional hear-lung machines have also turned into mobile mechanical heart and circulatory assist systems. Principally, these systems allow to provide mechanical support to patients suffering from advanced cardiopulmonary failure, prolonged states of shock, or refractory pulmonary failure. Application of ECC outside of heart surgery operating rooms requires special arrangements in order to guarantee patient safety. Hence, it seems imperative to define a mandatory structuring regarding equipment and qualification of the team in order to guarantee safety and enable high quality implementation of those improvements into clinical routine for the benefit of the patient. The first step towards structuring is a standardized terminology.

Non standardized and sometimes confusing terminology can be noticed in clinical practice, contributions at congresses and in published papers – in German language as well as in English language. Frequently, in this context the term „ECMO“ is used for temporary, extracorporeal lung and/or circulatory assist systems. However, the combinations of components (blood pumps, cannulation sites and oxygenators) allow variably configured systems with the goal of either a primary respiratory or circulatory support which are not sufficiently defined by the term „ECMO“. Furthermore, a precise documentation is also a prerequisite for coding and thus for successful reimbursement of these cost-intensive systems. For this reason the Section „Heart and Circulation“ of the German Interdisciplinary Association of Critical Care Medicine has worked out the following terminology for extracorporeal lung and/or circulatory assist systems.

1. Lung support

1.1 Pumpless Extracorporeal Lung Assist (PECLA)

Arterio-venous cannulation to support pulmonary function in combination with oxygenator without perfusion pump.

1.2 Extracorporeal Membrane Oxygenation (ECMO)

Veno-venous cannulation to support or replace pulmonary function in combination with oxygenator and perfusion pump.

Exemplary indications: *acute refractory pulmonary failure, e.g. ARDS, severe pneumonia, etc.*

Note: In extremely hypoxic newborns, initial veno-arterial cannulation (see below) may also be indicated for pulmonary support. In general, after stabilization re-cannulation to veno-venous access will be performed.

2. Heart-lung support

– Extracorporeal Life Support (ECLS):
Veno-arterial cannulation in combination with pump system and oxygenator

Exemplary indications: Primary cardiac pump failure with imminent or manifest cardiogenic shock, e.g. during cardiopulmonary resuscitation, fulminant pulmonary artery embolism. Standby during cardiac catheterization procedures or during catheter-assisted aortic valve implantations. Controlled whole-body perfusion (e.g. after resuscitation or re-warming after accidential hypothermia). Intoxications. Transport of patients with above mentioned conditions. Thoracic surgery with heart-lung machine (e.g. for lung transplantation)

3. Cardiac and circulatory support without oxygenator

3.1 Mechanical circulatory support systems with pump

3.1.1 Ventricular assist devices (VAD)

a) LVAD (left ventricular)
b) RVAD (right ventricular)
c) BVAD (bi-ventricular)

3.1.2 Percutaneous/intracardiac pumps without oxygenator

Exemplary indications: end-stage cardiac insufficiency, myocarditis, cardiogenic shock, status post heart surgery.

3.2 Mechanical circulatory support systems without pump

– Intraaortic balloon pump (IABP)

Exemplary indications: cardiogenic shock (especially after myocardial infarction or post cardiosurgical interventions), induction of pulsatile flow during extracorporeal circulation.

A comparable recommendation has recently been published by the European Association for Cardiothoracic Surgery (Beckmann et al. European Journal of Cardio-thoracic Surgery 40 (2011) 676-681). Standardization of the terminology on a European level will thus be possible in a timely manner. Further steps requiring consented definition are e.g. standards regarding staff-related and structural prerequisites, management of ECLS (anticoagulation, flow, pressure, monitoring, etc.). A relevant basis for discussions is currently underway and will be published soon.

Conflict of interest:
The authors declare that there are no conflicts of interest.

Accompanying publications: A German version of this article will be published in the DIVI, the official journal of the German Association of Critical Care Medicine.