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Lung-cOnservation liquid VEntilation for the induction of ultRa-fast COOLing after cardiac arrest: the OVERCOOL study design

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The therapeutic window within which induced hypothermia may be effective after cardiac arrest is still unknown. In animal models, the favorable effect of hypothermia is independently associated with a faster cooling rate. Induction of ultra-fast cooling remains however rarely used in the human setting. Total liquid ventilation with temperature-controlled breathable liquids could provide such a rapid cooling (i.e. >15°C/h cooling rate) in small and large animals. This method was further shown to improve neurological outcome in animal models. Until recently, no reliable device was available to transfer this technology to patients. A new device, called VENT2COOL, was developed for clinical purpose to provide lung-conservative ladmissioniquid ventilation with a continuous and reliable control of pulmonary liquid volume. The non-blinded and single-arm OVERCOOL trial will evaluate the feasibility, cooling rate and safety of this technique in 24 patients resuscitated after in- or out-of-hospital cardiac arrest in Cochin (Paris, France) and Erasme (Bruxelles, Belgium) Hospitals. Inclusion criteria will include presumption to start ultra-fast cooling procedure within less than 120 min after resuscitation. The primary outcome will be the achievement of a core (i.e. vesical or blood) temperature <33.5±0.5°C, as well as successful return to conventional gas ventilation within < 60 min after procedure initiation. Secondary outcomes will include time to reach target temperature, vital status, systemic and pulmonary parameters and modified-Rankin Score. The OVERCOOL study, that will start in 2023, will represent the first in-human experience with liquid ventilation and ultra-fast cooling in critically ill patients.