

of the models yielded sufficient accuracy, indicating its generalizability supporting its predictive capability to unseen samples. Studying the samples, we've noticed that not alone airway pressure has influence on venous pressure levels, yet also a small increase in PEEP contributes to increase in CVP. Conclusions: Adjustments in mechanical ventilation parameters influence CVP. To support personalized approach, a data driven approximator was trained to predict CVP levels.

Rescuing the failing circulation via humoral reset: total plasma exchange in refractory post-cardiopulmonary bypass mixed shock. A case series

Tudor Florin Borjog^{1,2}, Adelina Iacob¹, Mihai Popescu^{1,2}, Mihaela Livia Agapie^{1,2}, Angelica Bratu^{1,2}, Catalin Constantin Badiu³, Carmen Orban^{1,2}

¹Clinical Department of Anesthesia and Intensive Care, University Emergency Hospital Bucharest

²Department of Anesthesia and Intensive Care, University Emergency Hospital Bucharest, „Carol Davila” University of Medicine and Pharmacy, Bucharest

³Clinical Department of Cardiovascular Surgery, University Emergency Hospital Bucharest

Background: Cardiopulmonary bypass-associated inflammation can produce mixed cardiogenic–vasodilatory shock, characterized by myocardial dysfunction and hypotension, often refractory to conventional vasoactive agents. We report successful rescue use of total plasma exchange (TPE) in three patients with this specific type of shock. Methods: The first patient underwent CABG and PFO closure, and required the institution of V–A ECMO for separation from CPB, with pharmacological requirements reaching a peak Vasoactive-Inotropic Score (VIS) of 136. The second received aortic and mitral valve replacement for severe regurgitation secondary to infectious endocarditis; discontinuation of extracorporeal circulation was only achievable through VA–ECMO support amidst a profound catecholamine requirement, peaking at a VIS of 306. The third patient underwent aortic and mitral valve replacement for combined valvular stenosis. CPB separation was achieved with vasoactive support reaching a peak VIS of 78. Adjunctive therapy including hydrocortisone hemisuccinate and hydroxocobalamin 5g were uniformly administered across the entire patient series. Results: Renal replacement therapy with an in-line hemadsorption filter was initiated upon admission of the first patient, with a suboptimal clinical response; given the persistent hemodynamic collapse, a salvage intervention with therapeutic plasma exchange was commenced. Serial IL-6 assays confirmed a marked reduction in the systemic inflammatory burden, with the expeditious down-titration of vasoactive support and the discontinuation of VA–ECMO. This prompted the early deployment of TPE in the subsequent cases, with comparable outcomes: a significant reduction in IL-6 assays and the concurrent weaning of multimodal vasoactive support to the point of sustained hemodynamic stability. Conclusion: TPE provides a potentially effective salvage therapy for refractory post-cardiopulmonary bypass mixed shock, facilitating quantifiable humoral reset and rapid

hemodynamic stabilization. Controlled studies are needed in order to formally define standardized indications, optimal timing and biomarker-guided endpoints.

Does protective mechanical ventilation protect the brain?

Ralitsa Petrova^{1,3}, Ivelin Karageorgiev^{1,3}, Sevil Ahmed-Shieva¹, Vasil Popov¹, Aneesha Bhambra², Ivaylo Minev^{2,3}

¹Technical University of Sofia, Plovdiv Branch, Bulgaria

²Medical University of Plovdiv, Bulgaria

³Center for Competence PERIMED 2, Plovdiv, Bulgaria

Background: Protective mechanical ventilation (PMV) is recommended in severe traumatic brain injury (TBI) due to increased risk of ventilator-induced lung injury and ARDS. However, low tidal volumes and higher PEEP may induce hypercapnia and impair cerebral venous drainage, potentially worsening secondary brain injury. Objective: Machine learning recognition of the interdependence between cerebral perfusion pressure and mechanical ventilation. Methods and materials: A retrospective analysis of TBI patients from the AmsterdamUMC ICU Database was conducted. Intracranial pressure (ICP) and cerebral perfusion pressure (CPP), along with mechanical ventilation parameters (PEEP, DP, Pplat, I:E ratio, RR, VT, Paw mean, FiO₂, pO₂, pCO₂, P/F ratio) and central venous pressure, were extracted. These datasets were used to determine optimal combinations of input features for identifying nonlinear patterns. To model such time series rich data, we attempt to predict CPP recordings with a TCN-Transformer hybrid approach. It is an architecture that combines one-dimensional convolutional networks (CNN) and a parallel transformer. This pipeline model can process raw sequences to extract hierarchical temporal features and conveys the data to global relational mapping, which is suitable for processing of nonlinearity in bio-signals. Results and Discussion: Analysis of the available patient datasets suggests a seasonal inversely proportional trend in airway pressure levels and the corresponding cerebral perfusion levels during mechanical ventilation. Such a time series trend could be a subject of contribution to a secondary brain injury. The evaluation benchmarks of the deep learning model yielded sufficient accuracy, indicating its generalizability, supporting its predictive capability to unseen samples. Conclusions: Adjustments in PMV parameters may influence CPP and have clinically relevant effects on brain injury. To support personalized mechanical ventilation and make it protective not only to the lungs but also to the brain, a data driven approximator was trained to predict CPP and ICP levels.

A distinct phenotype of critical illness? Clinical profile and outcomes of hematological patients admitted to the ICU

Matilde da Silva Drumond¹, Dúlio Teixeira Passos², Teresa Silva³, Mariana Silva⁴, Maria Aguiar⁵, Lisandra Gouveia⁶, Gonçalo Faro Silva⁷, Guilherme Coelho⁸, Francisco Calisto⁹