A247 - Low flow CO2 removal in combination with renal replacement therapy effectively reduces ventilation requirements in hypercapnic patients – results of a pilot study

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Introduction:
Lung protective ventilation is the mainstay of mechanical ventilation in critically ill patients [1]. Extracorporeal CO2 removal (ECCO2R) can enhance such strategies [2] and has been shown to be effective in low flow circuits based on renal replacement platforms [3, 4, 5]. We show the results of a pilot study using a membrane lung in combination with a hemofilter based on a conventional renal replacement platform (Prismalung™) in mechanically ventilated hypercapnic patients requiring renal replacement therapy (NCT02590575).

Methods:
The system incorporates a membrane lung (0.32 m²) in a conventional renal replacement circuit downstream of the hemofilter. 26 mechanically ventilated patients requiring renal replacement therapy were included in the study. Patients had to be hypercapnic at inclusion under protective ventilation. Changes in blood gases were recorded after implementation of the extracorporeal circuit. Thereafter ventilation was intended to be decreased per protocol until baseline PaCO2 was reestablished and changes in VT and Pplat were recorded. Data from 20 patients were included in the final analysis.

Results:
The system achieved an average CO2 removal rate of 43.4±14.1 ml/min which corresponded to a PaCO2 decrease from 68.3±11.8 to 61.8±11.5 mmHg (p<0.05) and a pH increase from 7.18±0.09 to 7.22±0.08 (p<0.05) [Fig 1]. After adaption of ventilator settings we recorded a decrease in VT from 6.2±0.9 to 5.4±1.1 ml/kg (p<0.05) and a reduction of Pplat from 30.6±4.6 to 27.7±4.1 cmH2O (p<0.05). These effects were even more pronounced in the “per protocol” analysis [Fig 2].

Conclusion:
Low flow ECCO2R in combination with renal replacement therapy provides partial CO2 removal at a rate of over 40 ml/min can significantly reduce invasiveness of mechanical ventilation in hypercapnic patients.

References:
[1] ARDSNet 2000,

Image 1:
30 minutes after implementation of the combined renal replacement and ECCO2R circuit a moderate decrease in PaCO2 (-6.5 mmHg) corresponding to a slightly higher pH (0.04) was observed.

Image 2:

Reestablishment of initial PaCO2 resulted in a significant decrease in tidal volume (-0.8 ml/kg, p<0.05) and plateau pressure (-2.9 cmH2O, p<0.05).