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ACUTE HYPERCAPNIC DYSPNEA AND SARS-COV2 INFECTIONS IN HEMODIALYSIS PATIENTS TREATED WITH AFB.

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BACKGROUND

Dialysis treatment in chronic obstructive pulmonary disease (COPD) patients is a challenging setting: COPD frequently develop hypercapnia due to presence of CO_2 that originates from the reaction between acetic/citric acid with bicarbonate, needed to prevent the precipitation of salts inside. Carbon dioxide passes through the dialysis membrane by diffusion, because of the significant difference in partial pressure between the dialysate compartment (80-100 mmHg) and the blood compartment (35-45 mmHg) thus determining CO_2 overload. A COPD patient, on the other hand, may not be able to implement effective respiratory compensation mechanisms with the consequent onset of hypercapnia.

METHODS

A 79-year-old ESRD patient was admitted because of SARS-CoV2 infection. His medical history was notable for emphysematous COPD with predominantly severe obstructive disorder on chronic oxygen therapy.

The patient present acute hypercapnic dyspnea during the first dialysis session in COVID19 setting with severe desaturation episode associated with mixed acidosis (pH 7.13, pCO_2 83 mmHg, HCO_3^- 22.7 mmol/l). The raise of pCO_2 was remarkable, in fact partial pressure of CO_2 (pCO_2) was 61 mmHg before dialysis versus pCO_2 83 mmHg after dialysis treatment (Fig.1). The patient appeared comatose and poorly responsive to stimuli. CPAP cycle was set up and he was placed in semi-orthopneic decubitus did not improve the clinical conditions.

To prevent the hypercapnia condition Acetate Free Biofiltration (AFB) technique with profiled potassium (K^+ 3.5 mmol/L) was prescribed. The vital parameters during this hemodialysis session remained stationary and the pCO_2 values at the end of dialysis were comparable to those at the beginning of dialysis (pCO_2 65 mmHg versus a.d. pCO_2 63 mmHg) (Fig. 1). The following treatment were well tolerated with progressive improvement of respiratory parameters.

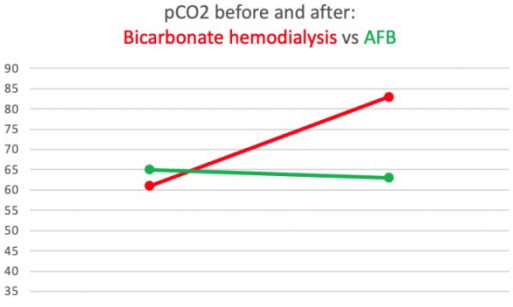

Fig. 1 – Intradialytic variation of pCO2: a comparison between bicarbonate hemodialysis and AFB.

RESULTS

The AFB technique is characterized by a dialysate without buffers which do not react and do not produce carbon dioxide. The correction of the acid-base balance takes place with the post-dilution infusion of a sterile solution of sodium bicarbonate ($NaHCO_3$). Furthermore, the absence of acetic acid avoids the stimulation of interleukin 1β (IL-1β) and of the Tumor Necrosis Factor α (TNFα) which in turn would have activated the enzyme Nitric Oxide Synthetase (iNOS) thus causing an increased production of Nitric Oxide (NO) and a consequent greater hemodynamic instability. AFB is therefore a more tolerated technique from a hemodynamic point of view.

CONCLUSIONS

This case report has shown that AFB is an effective hemodialysis technique in preventing a condition of hypercapnia in patients suffering from respiratory diseases (Fig.2). The patient also experienced hemodynamic stability from the AFB with no longer presenting significant hypotensive episodes.

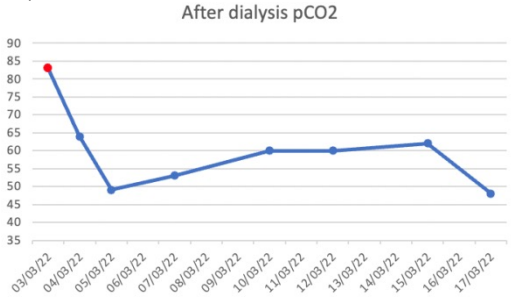

Fig. 2 - pCO2 values at the end of dialysis during AFB treatment

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