International Urology and Nephrology (2022) 54:1457–1458
https://doi.org/10.1007/s11255-021-03022-2

NEPHROLOGY - LETTER TO THE EDITOR

High-volume hemofiltration and COVID-19: "don't forget the old"

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Received: 14 July 2021 / Accepted: 5 October 2021 / Published online: 16 October 2021

Keywords COVID-19 · Cytokine storm · High-volume hemofiltration · Acute kidney injury

Abbreviations

AKI	Acute kidney injury
CRP	C-reactive protein
CRS	Cytokine release syndrome
HVHF	High-volume hemofiltration.

Editor,

Evidence has shown a relationship between plasma cytokine levels and COVID-19 disease severity, with increased mortality observed when there is a "cytokine storm"[1].

Different pharmacological treatments for modulating the inflammatory response have been proposed to treat this disease. However, there is a lack of evidence on the short- and long-term safety of their clinical and experimental use in COVID-19. The selective inhibition of IL-6, for example, is insufficient for stopping inflammatory response and as a consequence, inflammatory markers continue to increase despite this inhibition [2]. When faced with rising inflammatory markers, called cytokine release syndrome (CRS), there is a pathophysiological rationale for extracorporeal therapies such as high-volume hemofiltration (HVHF). These therapies are aimed at restoring immune homeostasis [3] through the removal of cytokines and they affect leukocyte traffic [4], allowing them to be used as an option for severe CRS in COVID-19, for which pharmacological therapies are still very limited.

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In our setting, 13 adult patients with COVID-19 were admitted to the critical care unit at Carlos Van Buren Hospital in Valparaíso, Chile, due to acute respiratory failure. They required mechanical ventilation and received two cycles of HVHF during May and June of 2020. Their median age was 58 years. Of the 13, 46.2% presented with severe acute respiratory distress syndrome, 30.8% suffered from circulatory shock and required noradrenaline ≥ 0.3 mcg/kg/min, and 76.9% had acute kidney injury (AKI) (80% KDIGO 3). All received combined antimicrobial therapy (ceftriaxone–azithromycin), seven (53.8%) received methylprednisolone, and two (15.4%) received tocilizumab. No other immunomodulating or antiviral therapies were used. All patient characteristics are shown in Table 1.

Two pulses of HVHF were given along with continuous renal replacement therapy (Prismaflex; Baxter). The first pulse lasted eight hours and the second lasted six, with 24 h between the pulses. The dose was 70 ml/kg/h with prefilter replacement fluid and a 2000 IU bolus of unfractionated heparin. The indications for HVHF were hyperinflammation; elevated ferritin and C-reactive protein (CRP) levels; lymphopenia; fever of ≥ 39.5° for more than 8 h; and circulatory shock. No adverse effects secondary to the procedure were reported.

There was a significant early [day 1–2] reduction in the Sequential Organ Failure Assessment (SOFA) score (− 2.5 points, $p = 0.041$) and the inflammatory marker CRP (− 58.7%, $p = 0.04136$) and a late [day 1–7] reduction in CRP (− 76.5%, $p = 0.00672$) and ferritin (− 42.4%, $p = 0.00652$). A late decrease in lactate dehydrogenase was also observed (− 18.2% $p = 0.05118$). Norepinephrine was able to be suspended in 12 patients. Three patients died (23.1%); the death of one of the patients was attributed to septic shock of bacterial origin.

SOFA has been validated as a predictor of COVID-19 mortality. In light of this, it is notable that the mortality rate in this group is lower than what would be predicted

Table 1 Baseline characteristics of the study participants

	Survivor	Non survivor	Total
Age (IQR)—years	58 [54–65.3]	55 [47.5–63.5]	58 [53–67]
Gender—no %	Men 90%	Women 66.7%	Men 76.9%
HTA—no %	6 (60%)	1 (33.3%)	7 (53.8%)
DM2—no %	4 (40%)	2 (66.7%)	6 (46.2%)
SOFA (IQR)—pts	8.5 [7.3–11]	10 [9.5–12]	9 [8–11]
CRP (IQR)—mg/l	257.5 [227.4–313.5]	223 [113.9–301]	242 [223–318]
Severe ARDS no %	5 (50%)	1 (33.3%)	6 (46.2%)
Lymphocyte (IQR)—x10^9per L	790 [600.8–947.5]	1140 [818–1250]	800 [561–1140]
Troponins (IQR)—pg/ml	31.5 [3.4–178.8]	351 [185–454]	35 [4.0–251.0]
GPT (IQR)- U/l	57.5 [44.5–140]	47 [36–50]	53 [42–89]
D-dimer (IQR)—mg/L	2.0 [1.3–3.9]	1.8 [1.5–2.2]	1.8 [1.2–3.5]
Creatinine (IQR)—mg/dl	1.1 [0.8–1.4]	3.5 [2.8–4.6]	1.3 [0.9–3.3]
Chloride (IQR)—meq/l	107 [105–109.8]	119 [113–120]	109 [105–112]
Cumulative fluid balance (IQR)—ml	1889.5 [114–6657.8]	4220 [3752–8338.5]	3285 [1546–6861]

IQR interquartile range, *SOFA* sequential organ failure assessment, *CRP* C-reactive protein

according to other COVID-19 studies [5]. Therefore, extracorporeal therapies for the management of CRS are safe and should be considered for changing the course of critical COVID-19.

Acknowledgements The authors wish to thank the ICU staff at Carlos Van Buren Hospital.

Author contributions GRG, RBH, VTC, and FVC designed the work; GRG collected and analyzed the data; GRG and RBH interpreted the data; GRG, RBH, VTC, FVC, SRD, and OGC drafted the work or substantively revised it; and all authors read and approved the final manuscript.

Funding There was no funding for the study.

Availability of data and material All data generated or analyzed during this study are included in this published article.

Declarations

Conflict of interest The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

Ethics approval and consent to participate Biochemical and clinical parameters were collected following approval from the scientific ethics committee of the Valparaíso—San Antonio health service.

Consent for publication Not applicable.

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