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HEMOPERFUSION WITH CYTOSORB IN THE TREATMENT OF REFRACTORY CARDIOGENIC SHOCK IN A SEPTIC PEDIATRIC PATIENT: IS IT WORTH IT?

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Background: Refractory cardiogenic shock is one of the leading causes of death in pediatric patients worldwide. International guidelines underline the importance of an early diagnosis and a timely treatment, especially if a septic shock overlaps. Indeed, the cytokine storm plays a pivotal role in the myocardial dysfunction, in the multiorgan involvement and in the consequent cardiovascular collapse. Hence, to guarantee a full recovery, it is fundamental to turn off the underlying systemic hyperinflammation. In support of standard treatments, such as corticosteroids and immunoglobulin, a hemoperfusion treatment with CytoSorb could help in contrasting the cytokine storm. CytoSorb is a cartridge conceived for hemoadsorption composed of polystyrene divinylbenzene copolymer beads, aimed at removing molecules of medium molecular weight (up to 55 kDa), including several cytokines. It is safe and well-tolerated in children, according to available literature.

Methods: We report the case of a 5-year-old female admitted at our pediatric emergency room with fever, otalgia, latero-cervical swelling, hypotension, profuse weakness, and confusion. Her clinical history was characterized by an episode of acute pharyngitis with anaemia and neutropenia one year before, successfully treated with corticosteroids and antibiotic therapy, after exclusion of hematologic diseases through bone marrow aspiration. At physical examination, she was tachycardic and oliguric, while laboratory exams showed neutropenia, elevated inflammatory markers and NT-proBNP. The echocardiogram attested a severe biventricular dysfunction with a left ventricular ejection fraction (LVEF) of about 15%, with evidence of diffuse thickening of the pulmonary interstitium and bilateral pleural effusion at the thoracic XRay. A successive CT scan showed an extended tonsillar abscess and upper lobe pneumonia. Subsequently, a positivity for Streptococcus urinary antigen was detected. An invasive fulminant infection by Streptococcus dysgalactiae was diagnosed, rapidly evolving into a serious septic shock and a refractory cardiogenic shock, despite an adequate inotropic support and antibiotic therapy, with a Predicted Death Rate (PDR%) of 86.4%. While tracheal intubation and invasive mechanical ventilation were performed, a metabolic acidosis associated to hyperlactatemia occurred. Therefore, to contrast the cytokine storm, the patient underwent a continuous hemoperfusion with CytoSorb cartridge.

Results: Three columns were used, the first two changed every 6 h, while the last one after 12h. Moreover, she started immunomodulatory therapy with methylprednisolone and immunoglobulins. 12 hours later, we witnessed an important increase in LVEF to 38%, which improved further to 50% after 24 hours (Figure 1A). Lactate, C-reactive protein and NT-proBNP quickly returned to normal ranges. Also the Paediatric Logistic Organ Dysfunction 2 (PELOD-2) score drastically dropped, while the PDR% decreased below 20% (Figure 1B-C). In addition, inotropic agents were rapidly reduced, as demonstrated by the trend of the Vasoactive Inotropic Score (VIS) (Figure 1D), with suspension of adrenaline and dobutamine 3 and 6 days after hemoperfusion beginning, respectively.

Conclusion: The purpose of this case report is to strengthen the current data on the effectiveness of hemoperfusion with CytoSorb as adjuvant treatment of severe septic shock with multiorgan involvement, even in pediatric patients, especially if standard therapies fail in hyperinflammation control.

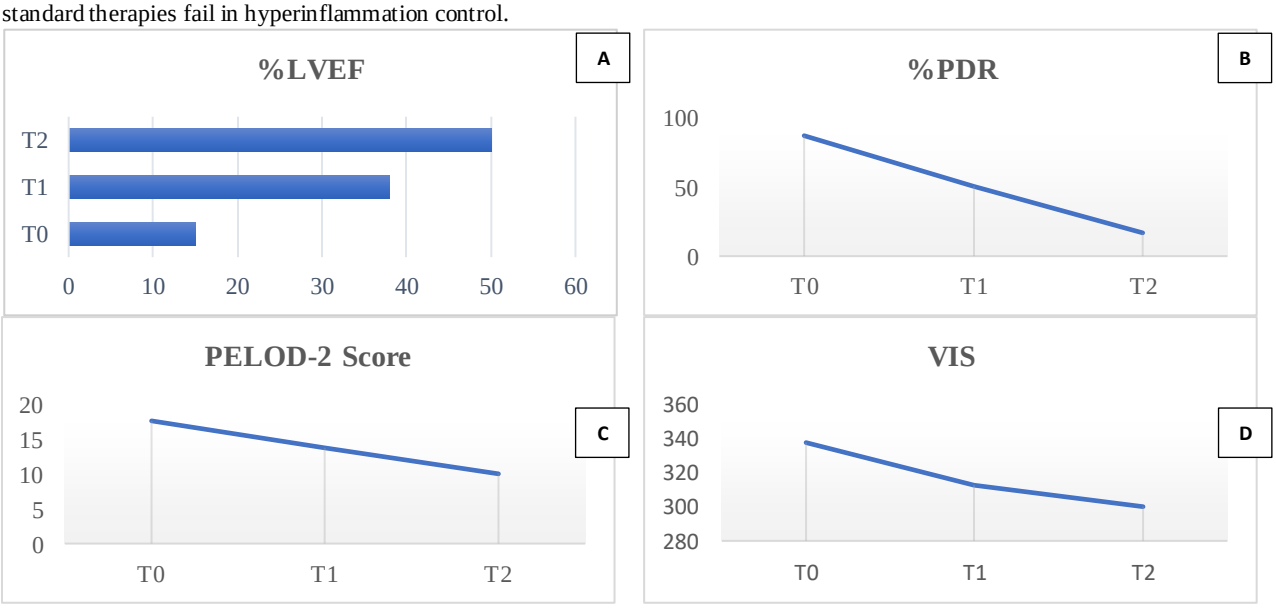

Figure 1: Trends of left ventricular ejection fraction (LVEF), Predicted Death Rate (PDR%), Paediatric Logistic Organ Dysfunction 2 (PELOD-2) Score and Vasoactive Inotropic Score (VIS) before and after the hemoperfusion with CytoSorb. T0: pre-treatment; T1:12 hours after CytoSorb; T2: 24 hours after CytoSorb