

# Use of CytoSorb in a septic shock patient with pneumonia, gangrenous cholecystitis and suspicion of HLH

Dr. Klaus Kogelmann, Matthias Drüner, Morten Scheller

Department for Anesthesiology and Intensive Care Medicine, Hospital Emden, Germany

This case study reports the extremely complicated course of a 66-year-old patient who was initially admitted to the hospital with the suspicion of a malignant lymphoma and with extensive itching, lichenoid skin changes, weakness and chills.

## Case presentation

- Initial diagnosis and treatment on the normal ward, then deterioration of the condition with development of a septic picture and ultimately transfer to the intensive care unit with bilateral pneumonia and septic shock a few days later
- After initial non-invasive therapy, the patient quickly required invasive ventilation
- Despite differentiated, protocol-based and cardiac output-controlled sepsis therapy (volume, catecholamine and lung-protective ventilation therapy and calculated antibiotic therapy), the patient's condition worsened further
- In the next 24 hours, development of a rapidly deteriorating multiple organ failure (kidney, circulation, lung)
- Treatment of ARDS (PaO<sub>2</sub>/FiO<sub>2</sub> 91) with high frequency ventilation and initiation of continuous renal replacement therapy due to acute renal failure
- Septic shock with high norepinephrine requirements of 2.2 mg/h (MAP 60), leukocytes 12,600/μl, cardiac index 5.21 ml/min/m<sup>2</sup>, SVRI 708 dyn×sec×cm<sup>-5</sup>
- After 24 hours of maximum therapy even with adjunctive treatment (hydrocortisone) without any clear improvement, the indication for the additional treatment with CytoSorb was confirmed (despite a delay >48 hours after initial sepsis insult)

## Treatment

- Three treatments (1st + 2nd treatment run consecutively for 24 hours each, 3rd treatment for 24 hours 10 days later due to a recurring septic surge)
- Cytosorb was used in combination with CRRT (Multifiltrate, Fresenius Medical Care) run in CVVHD mode
- Blood flow: 100-150 ml/min
- Anticoagulation: citrate
- CytoSorb Adsorber position: pre-hemofilter

## Measurements

- Hemodynamics and need for catecholamines (dose of norepinephrine vs. the achieved MAP)
- Lung function PaO<sub>2</sub>/FiO<sub>2</sub>
- Lactate, thrombocyte count, leukocyte count, procalcitonin
- Bilirubin
- CRP
- SAPS 2 and SOFA

## Results

- Shock reversal was achieved within 24 hours (norepinephrine requirement reduced by ~85%), and 24 hours later there was no more need for catecholamines
- Hyperdynamic cardiac index nearly halved, peripheral resistance doubled
- Ventilation (HFOV) stable (PaO<sub>2</sub>/FiO<sub>2</sub> ratio improving)
- Constant lactate, thrombocyte count, leukocyte count, procalcitonin
- Bilirubin was reduced by 64%, CRP was significantly reduced
- SAPS 2 and also SOFA decreased by 25%

|  | Directly<br>pre –therapy 1 | After<br>1st Adsorber | After<br>2nd Adsorber | 24 hours after<br>Ende of therapy |
|--|----------------------------|-----------------------|-----------------------|-----------------------------------|
| Norepinephrine/MAP (µg/h*mmHg)           | 36.67                      | 5.71                  | 0                     | 0                                 |
| SAPS 2                                   | 58                         | 54                    | 42                    | 45                                |
| Lactate (mg/dl)                          | 9.5                        | 14.6                  | 16.2                  | 11.7                              |
| Creatinine (mg/dl)                       | 1.98                       | 3.53                  | 2.04                  | 1.84                              |
| Bilirubin (mg/dl)                        | 1.17                       | 1.16                  | -                     | 0.42                              |
| Thrombocytes /µl                         | 231                        | 310                   | 221                   | 202                               |
| PaO <sub>2</sub> /FIO <sub>2</sub> ratio | 91                         | 72                    | 40                    | 105                               |
| SOFA                                     | 16                         | 15                    | 12                    | 12                                |
| Leucocytes/µl                            | 12.6                       | 17.1                  | 9.5                   | 11                                |
| CRP (mg/L)                               | 153.3                      | 259.4                 | 145.2                 | 88.3                              |
| PCT (ng/µl)                              | 1.37                       | 4.71                  | 3.25                  | 1.87                              |
| Cardiac Index (l/min/m <sup>2</sup> )    | 5.21                       | 6.29                  | 3.99                  | 2.8                               |
| SVRI                                     | 708                        | 727                   | 1.509                 | 1.249                             |

#### Patient Follow-Up

- Initially, clinical improvement but persistent renal failure with further need for a CRRT
- Over the course of the following days, high frequency ventilation could be terminated and the weaning from the ventilator initiated
- After the next 10 days a progressive liver failure (bilirubin >11 mg/dl, Plasma Disappearance Rate of Indocyanine Green PDR-ICG 2.1%) developed with the diagnosis of a gangrenous cholecystitis followed by laparotomy and later persistence of an abdominal compartment syndrome and impaired liver function
- Re-use of CytoSorb, however only one adsorber was applied, since the treatment had no significant effect, which was possibly due to the second septic hit in the sense of a MARS (Mixed Antagonistic Response Syndrome)
- Additional initiation of an ultima ratio therapy with immunoglobulins and corticoids due to the differential diagnoses of secondary hemophagocytic lymphohistocytosis
- This resulted in a clinical improvement and subsequently in weaning from the ventilator, termination of CRRT as well as increasing alertness
- From several abdominal swabs, 4-MRGN Enterococci spp. and MRSA was confirmed, which led to a further worsening in the patient's condition with fever and increase in catecholamine demand as a result of wound dehiscence with dysplasia. Eventually definite wound closure could be achieved after an emergency laparotomy
- Transfer of the patient to the normal ward after a total intensive care stay of 71 days, with 44 days on mechanical ventilation, patient was oriented and cooperative
- Ten days later he then developed a fulminant pulmonary embolism and died

#### CONCLUSIONS

- The authors herein describe an extremely complicated course with a total of 3 phases of septic shock, long-term respiratory support, resistant microbiology, several laparatomies and possibly secondary HLH
- Initially an excellent effect from the CytoSorb therapy was observed, however in the second phase (3rd treatment) no effect was observed, which was most probably due to the second septic hit in the sense of a MARS with additional HLH
- In this phase, the additional therapy ex juvantibus of the HLH with corticoids and immunoglobulins allowed the breakthrough
- Treatment with CytoSorb was safe and without technical problems