

# Use of CytoSorb in a young patient with post-partal fulminant liver failure

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This case study reports on a 34-year-old female patient, who presented at a peripheral hospital with painless icterus (jaundice) for almost four weeks after having given birth to a healthy boy. To determine the initially unknown cause of liver injury, the patient had a transjugular liver biopsy and was then transferred to our center because of further deterioration in the liver function and for evaluation of high-urgency liver transplantation.

## Case presentation

- The patient had had a comparable episode of liver injury seven years previously with elevated transaminases and cholestasis parameters. This former episode had healed spontaneously. While no clear underlying trigger could be found, there was a supposed association with low dose paracetamol treatment. The patient was on low doses of paracetamol at the time of the first episode and was also receiving 3-4 g of paracetamol a day after the cesarean section. Therefore, the patient received treatment with N-acetyl-cysteine according to current guidelines, even though the ingested paracetamol doses were low and the timeframe association not characteristic.
- From the histology of the transjugular liver biopsy, the pattern was most probably associated with drug induced liver injury, but as 50 % of the liver tissue was necrotic and no portal tracts were obtained, the ultimate cause could not be determined
- On admission, the patient showed the following laboratory parameters: INR 3.4, antithrombin III activity 31 %, factor V activity 38 %, total bilirubin 19.8 mg/dl, GOT 2.746 U/l, GPT 3.147 U/l, LDH 717 U/l, lactate 5.6 mmol/l, ammonia 78.4 µmol/l
- Clinically, the patient was - apart from the pronounced icterus - almost asymptomatic without any signs of overt hepatic encephalopathy
- However, over time her lab parameters and mental status worsened rapidly and she had to be transferred to the ICU two and a half days after her initial presentation due to a significant and rapid rise in ammonia levels (121 µmol/l) and confusion (hepatic encephalopathy grade III)
- At that time the patient was listed for high-urgency liver transplantation
- On the third day of her intensive care stay the patient also developed an anuric renal failure (creatinine clearance 19.12 ml/min, creatinine 1.11 mg/dl, urea 3.4 mg/dl) despite adequate crystalloid fluid therapy
- In order to keep the ammonia level stable, to reduce bilirubin levels and to prevent the development of cerebral edema, continuous veno-venous hemodiafiltration was started and a CytoSorb adsorber was added into the circuit

## Treatment

- Five CytoSorb treatments for 12 hours each with a total treatment time of 60 hours (including a break of 24 hours) were performed prior to liver transplantation (on day 6)
- CytoSorb was used in conjunction with continuous veno-venous hemodialysis (multiFiltrate, Fresenius Medical Care) with citrate anticoagulation in the beginning and had to be switched to continuous hemodiafiltration with supplementation of antithrombin III after citrate accumulation.
- Blood flow rate: 100-150 ml/min
- CytoSorb adsorber position: pre-hemofilter

## Measurements

- Markers for liver injury/dysfunction (bilirubin, transaminases, lactate dehydrogenase, ammonia, coagulation parameters)
- Inflammatory parameters (procalcitonin, CRP, IL-6)
- Continuous invasive blood pressure measurement

### Results

- Significant decrease in bilirubin levels from 20.0 mg/dL to 5.7 mg/dl during the course of treatment
- After an initial decrease in ammonia levels to 88  $\mu\text{mol/L}$  after 4 hours of CytoSorb treatment, ammonia varied between 98 and 153  $\mu\text{mol/L}$  with a one-time peak of 211  $\mu\text{mol/L}$  during a period of severe hemodynamic instability. Thereafter, the ammonia levels of the patient continued to decrease rapidly to 125  $\mu\text{mol/L}$ . Finally, the patient underwent transplantation when the ammonia was at a level of 149.3  $\mu\text{mol/L}$
- On admission to the ICU transaminases and LDH were significantly increased (GOT 1240 U/l, GPT 2126 U/l, LDH 478 U/l). While the transaminases showed a progressively rapid decrease (at the time of transplantation: GOT 214 U/l, GPT 164 U/l), an initial increase of LDH was noted followed by a decrease to 297 U/l
- She had already exhibited acutely deranged coagulation parameters during transfer from the other hospital, (INR 3.4, AT III activity 31%, factor V activity 31%). Complete coagulation failure (INR >7.5, AT III activity <10%, aPTT > 180 sec) followed. Fibrinogen was replaced due to clinically significant hypofibrinogenemia
- Initially, IL-6 increased to 583.7 pg/mL and decreased to 200.3 pg/mL just before liver transplantation. CRP and procalcitonin levels were within the normal ranges during the whole treatment period
- On the second day of her intensive care stay, the patient had to be intubated in the context of fading protective reflexes and hepatic encephalopathy grade IV and required considerable catecholamine support of up to 0.9  $\mu\text{g/kg/min}$  with norepinephrine for hemodynamic stabilization. However, the hemodynamic situation could be stabilized using extended crystalloid and colloidal volume substitution (human albumin)

### Patient Follow-Up

- As the patient's hemodynamic and mental status deteriorated rapidly and she developed acute renal failure, a donor liver of minor quality was accepted due to lack of time
- Unfortunately, the pre-existing hematomas of the donor organ increased post-transplantation and the patient had to undergo another high-urgency liver transplantation

## CONCLUSIONS

- Treatment was associated with a reduction in markers of liver dysfunction/failure and inflammation
- Successful bridging to liver transplant on day 6 after transfer to our center
- By applying hemoadsorption with CytoSorb, the reaction (i.e. SIRS) could be reduced in the context of the acute liver failure
- Hemoadsorption using CytoSorb might therefore represent a promising approach to bridge patients with acute liver failure to liver transplantation. The development of a clinically significant cerebral edema could be successfully prevented
- Patients with acute liver failure should be transferred as early as possible to a center able to perform liver transplantations, and should be short-term evaluated or listed for a high-urgency liver transplantation according to the King's College criteria
- Treatment with CytoSorb, especially with the need for hemodialysis, was simple and did not present any additional risk to the patient