

## Alcohol-Induced Coma, Hypothermia and Hypotension

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### Abstract

**Objectives:** Coma, hypothermia and hypotension caused by alcohol and benzodiazepine intoxication can be successfully treated with the use of continuous veno-venous hemodialysis (CVVHD). It eliminates small molecules, corrects pathological laboratory parameters and gradually heats the blood.

**Methods:** We present a case report of a female patient suffering from depression who attempted suicide with benzodiazepine, karbamazepine and alcohol ingestion. She was brought into the intensive care unit in a comatous state (GCS score=3), with an arterial blood pressure of approximately 40 mmHg, body temperature less than 30°C, blood alcohol concentration of 550 mg/dL, and positive assessments for benzodiazepines and karbamazepine. The nephrologist indicates that CVVHD is necessary.

**Results:** Alcohol blood levels fell to 170 mg/dL after 10 hours of CVVHD, while blood pressure and body temperature rose. After CVVHD, alcohol blood levels dropped to 0.002 mg/dL, body temperature measured 35.5°C, and blood pressure, diuresis and electrolyte status were of normal levels.

**Conclusion:** CVVHD (along with measures of intensive treatment) had a positive outcome on a patient that was vitally endangered by suicide attempt. This is based on the fact that CVVHD gives adequate clearance of alcohol and benzodiazepines, corrects electrolyte status, and gradually raises body temperature by extracorporeal circulation.

**Keywords:** Alcoholic coma; Hypothermia; Hypotension; Hemodialysis

### Introduction

Alcohol-induced coma, hypothermia and hypotension are a result of a chain of events, including vasodilatation of central origin, and hypoglycemia due to a decrease in muscle glycogen stores. Hypothermia carries a high risk of mortality, most commonly associated with cardiac arrhythmia, and one of the most successful ways of treating hypothermia in vital indications is hemodialysis. In addition, hemodialysis can be an option in treatment of accidental poisoning or attempted suicide using alcohol, especially if the intoxication is combined with other vitally endangering conditions, such as coma, osmolality imbalance, hypothermia, acidosis, etc.

### Case Report

A 65 year old woman in a coma was accepted at the emergency ward. Upon admission, the patient was unconscious, cyanotic, with occasional shallow respiration and without palpable arterial pulsations. Her pupils were dilated with no pupillary light reflex, as well as being in total areflexia. Her blood pressure was undetectable, as well as the rectal temperature. The ECG registered sinus bradycardia with a frequency of 40 bpm.

She was immediately intubated and connected to a respirator for mechanical ventilation, and she was given electrolyte and coloid solutions, after which her blood pressure was still unmeasurable. Because of this, invasive arterial blood pressure measuring was indicated, which measured roughly 40 mmHg, as well as a central venous catheter. Body temperature was less than 30°C, and diuresis was 0 mL/h.

Blood samples were drawn for laboratory measurements. A cerebral CT-scan was done as well. The scan showed cerebral parenchyma of normal attenuation, without visible focal lesions, and of symmetrical central structures.

### Laboratory measurements

Osmolality – 272 mOsm; pH – 7.2; pCO<sub>2</sub> – 3.70 mmHg; HCO<sub>3</sub><sup>-</sup> – 13.0 mmol/L; BE – 11 mmol/L; Na – 135 mmol/L; K – 3.8 mmol/L; Cl – 103 mmol/L; Ca – 1.52 mmol/L; Glucose – 4.1 mmol/L; E – 3.73×10<sup>12</sup>/L; Hb – 108 g/L; L – 4.97×10<sup>9</sup>/L; creatinine – 87 μmol/L; urea – 3.6 mmol/L; AST – 129 U/L; ALT – 37 U/L; Troponin – 0.0 g/L; bilirubin – 4.4 μmol/L; coagulogram was normal.

Toxicology measurements attain a serum alcohol concentration of 550 mg/dL, 363.8 ng/mL of benzodiazepines in the urine, as well as 35.7 μg/mL of karbamazepines in the urine. Parallel with this, measures of warming and vasoactive support are carried out, as well as gastric lavage and usage of activated charcoal.

### Neurological assessment

Patient in comatous state, with dilated pupils, negative pupil light reflex, without nuchal rigidity, absence of reflexes of the limbs. Passive elevation of upper and lower extremities result in flaccid collapsing of the same.

A nephrologist was consulted in regards to the high blood alcohol concentration, who indicated hemodialysis because of the high serum concentration of alcohol, hypothermia and acidosis. The continuous method was selected, with a high-flux filter (membrane polysulfone,

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surface area: 1.5 m<sup>2</sup>), the dialysate flow being 500-1200 mL/h, whilst blood flow was 100-120 mL/min, with dialysate temperature gradually increasing to physiological values. The ultrafiltration ratio was zero. Antithrombotic therapy was given as well: low molecular weight heparin (nandroparine-calcium) in a dose of 3800 anti-Xa IU. The total duration of the procedure was 18 hours. The concentration of alcohol in the serum after 10 hours of hemodialysis equalled 170 mg/dL, which urged prolonging of the process up to 18 hours. The concentration of alcohol in the dialysate was 20.8 mg/dL. hemodialysis is also indicated for carbamazepine intoxication, as stated recently by the Extracorporeal Treatments in Poisoning working group (Table 1 and Figure 1).

On the second day upon admission, rehydration was proceeded with control of the central venous pressure (CVP), as well as administration of adequate doses of dopamin upon which diuresis is established. Blood pressure and body temperature significantly improve.

### Neurological reassessment

The patient does not open her eyes upon verbal order, reacts to painful stimuli by moving of the extremities in a symmetrically identical fashion. Isocoric pupils, with normal pupil light reflex, absence of nuchal rigidity, other cranial nerve functioning is normal.

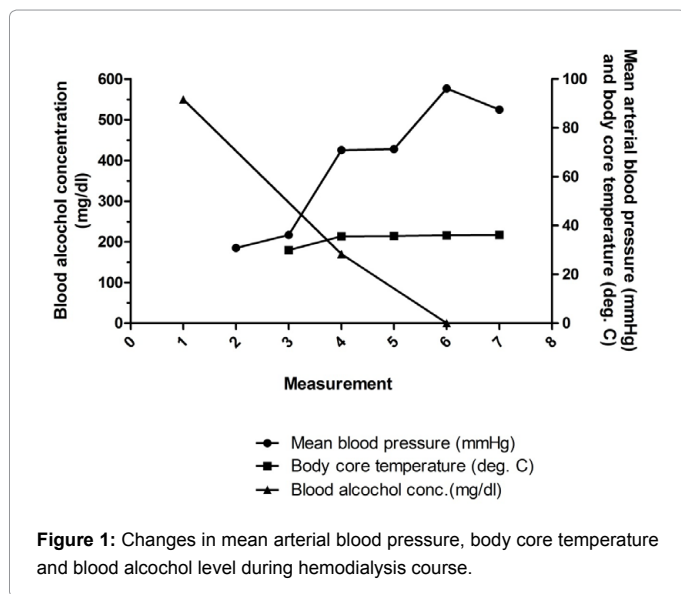


Figure 1: Changes in mean arterial blood pressure, body core temperature and blood alcohol level during hemodialysis course.

Stretch reflexes are symmetrical and normal. Bilateral impure plantar response. The EEG is diffusely slowed and changed in an encephalopathic pattern with epileptogenic graphoelements located in the left frontotemporal region.

### Control chest radiogram

Inhomogenous infiltrate located parahilar left. Fracture of the 5th and 6th rib with minor shift of fragments.

As the radiogram results are accompanied by the rise in non-segmented leukocytes, amoxicillin + clavulonic acid is added to the overall therapy.

The patient started gaining consciousness, and in the evening is fully conscious, after which she is detached from the respirator and is extubated. Vasoactive support is cancelled, her vital signs and parameters were in normal range, and enteral feeding was reestablished, as well. She was often given Dolantin for analgesia of back pain, and high dosage of Dormicum because of anxiety.

### First psychiatric assessment

During the interview, the patient is calm. However, she states that she is not doing well mentally, she is always tense and anxious. She has been consuming anxiolytics for some time now, and she started consuming alcohol as well. She is of depressed affect and had attempted suicide. Sleeping disorders are also present.

Th: Dormicum ex. Helex 3x0.5 mg, Zoloft 50 mg, Prazine 50 mg+50 mg+100 mg.

### Discussion

Maximum concentrations of alcohol in the serum are attained 6 hours after ingestion. Ethanol intoxication can lead to morbidity or death in various ways. The main effect ethanol has on the central nervous system is depressor. On the cellular level, ethanol increases gamma-amino butyric acid (GABA) activity, acting on the GABA-A receptors as do benzodiazepines [1,2], having an additive effect when taken together. Ethanol also multiplies the depressor effect, sometimes having dangerous consequences, of many medicaments that effect the central nervous system, such as antidepressives, antipsychotics and opiates [1,3].

The mentioned alcohol concentrations can be fatal, which call for urgent intervention. Hypotension and hypothermia are direct outcomes of alcoholic intoxication. In this case, considering the

Time (hours)	CVP	BP/C	Pulse	Temp. (°C)	O <sub>2</sub> sat. (%)	Diuresis (mL/h)	BAC (mg/dL)	Interventions		Urine toxicology
Start	+8	0	40	0	64	0	550	Intubation Respirator	Chest X-ray MSCT, EEG	Benzodiazepines 363.8 ng/ml
21-22	+8	0	45	0	68	0		ABS line Dialysis		Carbamazepine 35.7 µg/ml
23-24	+8	47-23	54	T/C	96	0				
24-07		49-30	56	↓30	95	0				
07-12	+17	97-59	82	35.6	97	100	170	EEG	Chest X-ray pneumoniae	
12-16	+12	100-58	96	35.7	94	15-50		Stop dialysis		
16-21	+12	130-80	104	36	95	60-100	0.02			
21	+12	124-70	107	36.1	95	60-100		Extubation		

CVP – central venous pressure mmH<sub>2</sub>O  
 BP/C – blood pressure central measurement  
 T/C – temperature central measurement  
 BAC – blood alcohol concentration

Table 1: Interventions and findings.

psychiatrist's assessment, the patient was a 'tolerant' alcoholic, who frequently abused alcohol and benzodiazepines. The excess of the abusives led to coma, respiratory insufficiency and circulatory collapse. We chose to prolong the dialysis treatment considering the patient's state of hypothermia and the need for gradual body temperature elevation, with expected slower ethanol clearance rate. Hemodialysis, as well as peritoneal dialysis, is a fast and efficient approach to internal warming, whereas external warming can theoretically cause cooling of body temperature and other complications [4-6].

Hemodialysis can recuperate body temperature faster by directly warming blood via extracorporeal heater. Hemodialysis is also a faster and more efficient variant of alcohol elimination than gastric lavage. Because hemodialysis is a relatively simple therapeutic method available in the majority of hospitals, it should be preferred to other methods where intoxication is accompanied with hypothermia, acidosis and electrolyte imbalance. However, frequent complications in the respiratory tract are bronchoaspiration and bronchopneumonia [7-9].

### Psychiatrist's Opinion

The patient is a long term benzodiazepine addict, consuming diazepam. Over time, she started abusing diazepam more frequently, which she combined with alcohol. She had suffered from depression for a long time without seeking medical attention. She was functioning normally at work, but not socially and at home. She attempted suicide because of extreme inner tension, anxiety, lack of hope and perspective.

Even though the outcome of the acute intoxication came out to be successful, psychiatric therapy is required because of the structure of the patient's personality (having elements of narcissism), depression and addiction. Her depression wasn't treated correctly since she hadn't sought for the help of a psychiatrist.

### Conclusion

Hypothermia in acute alcohol intoxication is caused by vasodilation and the depressory effect of alcohol. The progress of hypothermia is provoked by low energy intake, hypoglycaemia and low glycogen reserves [2].

The purpose of this work was to enlighten the importance of CVVHD in acute intoxication of the mentioned substances accompanied by deep coma (GCS score=3) and hypothermia.

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