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Victor Zota
Irinel Popescu
Silviu Ciurea
Elena Copaciu
Oana Predescu
Florin Costandache
Rosana Turcu
Vlad Herlea
Dan Tulbure

Successful use of the liver of a methanol-poisoned, brain-dead organ donor

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V. Zota · R. Turcu
National Transplant Coordination,
Serviciul de Ambulanta,
Bucharest, Romania

I. Popescu (✉) · S. Ciurea
Department of General Surgery and Liver Transplantation, Fundeni Clinical Institute,
Sos. Fundeni 258, Sector 2,
72435 , Bucharest, Romania
E-mail: irinel.popescu@icfundeni.ro
Tel.: +40-21-2403248

E. Copaciu · O. Predescu
F. Costandache
Department of ICU,
University Emergency Hospital,
Bucharest, Romania

V. Herlea
Department of Pathology,
Fundeni Clinical Institute,
Bucharest, Romania

D. Tulbure
Department of Anesthesiology,
Fundeni Clinical Institute,
Bucharest, Romania

Dear Editors:

Donor availability remains the limiting factor of organ transplantation. The annual rate of cadaveric donors in Europe, for example, in the year 2000 varied between 33.9 per million persons in Spain, to 17 in France and 1.9 in Greece [4]. In Romania, in the same year, the rate was 1.1 donor per million persons. If the donor pool is to be expanded, the acceptance criteria need to be continuously reassessed, and the use of marginal donors should be augmented. The increasing demand for organs to be transplanted has led to organ procurement from acutely poisoned donors. There is little literature on patients who have successfully undergone transplantation that used organs from brain-dead poisoned victims [1, 2, 3, 6, 7, 8, 9, 10]. We present a case of successful multiple organ transplantation (liver and kidney) from a methanol-poisoned victim.

The 47-year old male patient was admitted to the intensive care unit at University Hospital, Bucharest, 36 h after he had ingested an unknown amount of alcohol, presumed to be ethanol. Upon admission to the hospital, the patient was comatose (Glasgow Coma Scale = 3), with fixed dilated pupils. Bradycardia, then cardio-respiratory arrest and tonic seizures followed shortly after he was admitted. Cardio-pulmonary resuscitation was started immediately. The initial neurological assessment indicated deep coma with severe impairment of brainstem reflexes: slow pupil reactivity, no ciliary or corneal reflexes, and slight motor response of the upper limbs upon nociceptive stimuli. All the signs were consistent with the diagnosis of diffuse metabolic encephalopathy. The cerebral computerized tomography scan showed diffuse brain swelling with severe intra-cranial hypertension. Given the severe metabolic acidosis resistant to systemic alkalization, with a wide anion gap, we performed a routine toxicological screening, which indicated a methanol plasma level of 1.85 g/l.

The diagnosis of acute methanol poisoning was established. The supportive therapy included the correction of metabolic acidosis with 550 mEq of sodium bicarbonate solution infused in the next 12 h, whilst the patient was mechanically ventilated; ethanol was administered as antidotal therapy (16 ml of 96% ethanol i.v. in the emergency room, followed by a continuous infusion of approximately 66 mg/kg per h of 10% ethanol, to achieve a plasma ethanol concentration of >1 g/l). In order to promote methanol elimination and correction of the acid–base disturbances, we started hemodialysis 3 h after the patient had been admitted to hospital, with the blood methanol level decreasing to 0.15 g/l.

Despite sustained intensive care, the neurological condition of the patient deteriorated continuously, with diabetes insipidus appearing 14 h after his admission. Brainstem reflexes (including apnea test) disappeared 4 h later. Ten hours after his admission to the intensive care unit, the transplant coordination team was informed of the availability of a potentially brain-dead patient with acute methanol intoxication.

The diagnosis of brain death was established according to the accepted criteria. The first determination of brain death, including a positive apnea test, a clinical examination of the brainstem reflexes, and a flat EEG, was performed 18 h after admission of the patient to the intensive care unit. The second determination was performed 6 h later.

Family consent for organ donation was obtained. All therapeutic measures were directed towards supporting the function of the organs to be procured. The acid–base disturbances were corrected. Liver tests remained within normal range, as did the blood urea nitrogen and serum creatinine levels before the organs were removed. The donor needed inotropic support for 6 h before organ removal (dopamine 10 μg/kg per min).

Removal of the liver and kidney was performed on 16 May 2001, approximately 60 h after the donor's admission to hospital. Use of the heart was declined by the cardiac transplant team. Both kidneys were grafted.

A liver biopsy was performed. The examination showed normal features. The liver was transplanted after a 4-h cold ischemia time. The recipient was a 47-year-old woman with primary biliary cirrhosis. Grafting of the liver was performed with preservation of the recipient's inferior vena cava and a side-to-side caval anastomosis. The warm ischemia time was 45 min. The postoperative course was uneventful. During the first 24 h post-transplantation, the INR varied between 1.04 and 1.19, the successive lactate determinations were 2.8–3.4–1.8 mmol/l (n 0.7–2.1), and the AST reached 887–330 IU/l (n 14–50), with normalization at 72 h. The bilirubin and cholestasis enzymes reached normal levels during a 2-week period. The patient was discharged on the 28th postoperative day in good condition. Five months later she underwent a left nephrectomy for lithiasis, followed by an uneventful postoperative course. At present the patient is in good clinical and functional health.

Severe methanol poisoning produces CNS intoxication similar to that of ethanol, acidosis, and optic nerve toxicity, responsible for permanent visual deficiency in the patients who survive. The toxicity is related to the acidosis produced by the accumulation of formic acid and formaldehyde, the main products resulting from methanol biotransformation. Late diagnosis and delayed therapy are always associated with poor outcome. The treatment includes correction of acidosis with sodium bicarbonate, initiation of an ethanol infusion (ethanol acts as a competitive substrate for alcohol dehydrogenase, the enzyme that produces toxic metabolites from methanol) and hemodialysis to enhance methanol and formic acid elimination and normalize acid–base disturbances [10].

Despite the initial opinion that severe heart failure that develops in methanol-poisoned victims is a contra-indication to transplantation, recent literature reports positive experiences with transplanted hearts procured from acutely methanol-intoxicated donors. These hearts may require longer inotropic support postoperatively before the recipient enjoys complete recovery, but they can provide excellent long-term function and results [1, 2, 3, 10].

Double lung [5], kidney [2] and kidney–pancreas [3] transplantations with grafts from methanol-poisoned donors have also been performed with good results. The most difficult decision—whether to transplant the liver or not—depends on the supposed toxicity of various poisons. In the past decade, experiences with the grafting of livers procured from poisoned patients have been reported (vencuronium/propofol [10], nortriptylene [10], imipramine [10], trimipramine, brodifacoum [10], methaqualone [6], BZD [6], barbiturates [6], and carbon monoxide [6]). In most of these reports, the liver graft subsequently functioned well.

Although transplantation experience with livers from methanol-poisoned brain-dead donors is limited [2, 3, 7, 10], the liver graft function of all patients was very good after transplantation.

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