

Liver procurement from a brain-dead kidney transplant recipient — a case report

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Abstract

The shortage of organ donors has led to new strategies to increase the availability of allografts for transplantation, such as organ procurement from brain-dead organ transplant recipients.

We present the case of a 26 year-old male brain-dead liver donor who had been a kidney transplant recipient six years previously. The liver donor described in this report, as the first in Poland, has paved a new, although as yet narrow, way in the field of organ donation. This is also the first case described in the medical literature of liver recovery from a brain-dead kidney transplant recipient on an immunosuppressive regimen with three immunosuppressive agents. Although transplant recipients represent an uncommon group of deceased organ donors, it is probable that situations when they may be considered as potential organ donors will occur more often. Therefore, although specific criteria for organ donors exist, each reported potential donor should be considered individually, and brain-dead solid organ recipients should not be excluded *a priori* as organ donors; both their native and allografted organs may be recovered and successfully transplanted. In this study, we also review the current state of knowledge on the reuse of organs.

Key words: liver transplantation, brain-dead, renal transplant recipient, organ shortage

Anestezjologia Intensywna Terapia 2012, tom XLIV, nr 3, 169–172

The goal of transplantation is to provide every patient on the waiting list with an opportunity to obtain an organ transplant. According to 'Poltransplant', the Polish Transplant Coordinating Centre, there were 2,284 patients waiting for an organ in Poland on 31 July 2012 [1]. The shortage of organ donors has led to new strategies to increase the availability of allografts for transplantation, such as organ procurement from brain-dead organ transplant recipients.

According to the United Network for Organ Sharing (UNOS) data as of 8 August, 2012: between 1 January, 2000 and 31 March, 2012, 762 organs (264 kidneys, 368 livers, 79 lungs, 36 hearts, 13 pancreases and two intestines) were donated by 718 deceased donors who had been transplanted (Table 1) [2].

We present the case of a 26 year-old male brain-dead liver donor who had been a kidney transplant recipient six years previously.

CASE REPORT

A 26 year-old male was admitted to the Emergency Department with a strong headache and aphasia. Six years before, due to chronic renal failure, he had undergone renal transplantation. The postoperative period was uneventful and the patient was discharged on an immunosuppressive regimen with cyclosporin, rapamycin and prednisone. His creatinine level varied between 1.8 and 2.5 mg dL⁻¹. Over the following years, he developed arterial hypertension, for which he had received antihypertensive therapy.

Table 1. Organs recovered for transplant from previous organ recipients between 1 January, 2000 and 31 March, 2012. Based on OPTN data as of 8 August, 2012

Donation date	Donors	Kidneys recovered	Lungs recovered	Hearts recovered	Livers recovered	Pancreases recovered	Intestines recovered
2000	19	6	2	2	7	0	0
2001	41	16	4	4	17	2	0
2002	42	18	0	1	22	0	0
2003	52	14	2	3	32	2	1
2004	62	12	8	4	38	2	0
2005	67	23	4	3	36	1	0
2006	69	21	8	1	34	1	0
2007	84	39	8	3	46	2	0
2008	71	22	5	1	30	1	1
2009	71	45	10	3	34	0	0
2010	62	24	14	5	36	1	0
2011	59	18	12	4	28	1	0
2012	19	6	2	2	8	0	0
Total	718	264	79	36	368	13	2

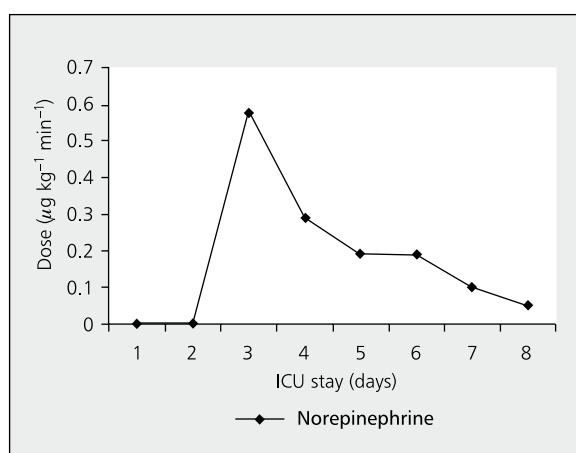
A computerised tomography study showed a subarachnoid haemorrhage, and angiography showed an anterior communicating artery (ACoA) aneurysm; therefore coil embolisation of the aneurysm was performed. In spite of aggressive treatment, the patient's intracranial pressure continued to increase and his neurological status worsened.

The patient required a catecholamine infusion (fig. 1). Echocardiographic heart examination showed a lesion typical for hypertonic cardiomyopathy. The creatinine level reached 5.4 mg dL^{-1} , and the patient needed renal replacement therapy. An additional problem was the hypernatremia that continued to increase in spite of adequate fluid therapy. The hepatic function tests were normal, with a prothrombin index of 82.4%, and liver enzymes activity was within normal values. Ultrasonographic liver examination revealed no abnormalities. *Hepatitis B virus* (HBV) and *hepatitis C virus* (HCV) infections were excluded.

On the seventh day, neurologic examination showed no brain-stem reflexes. Brain death was confirmed by cerebral angiography and two clinical examinations registered at six hour intervals according to the Polish medico-legal protocol. Non-objection to organ donation was verified by the transplant coordinator and the family was approached for acceptance for organ donation.

Because no similar case had previously been reported in Poland, and after numerous consultations with the liver transplant team, the decision was made to harvest only the liver.

The liver was transplanted to a 45 year-old male recipient, with post-HCV infection cirrhosis. The transplanted patient had been waiting for a liver transplant on the non-urgent waiting list for ten months. Despite such factors as

**Figure 1.** Norepinephrine dose on each day of hospitalisation

the use of norepinephrine, hypernatremia, an eight-day stay in the intensive care unit (ICU), and three potentially hepatotoxic (immunosuppressive) drugs regimen, the liver's function was still normal 29 months after transplantation.

This is the first case described in the medical literature of liver recovery from a brain-dead kidney transplant recipient treated with an immunosuppressive regimen with three immunosuppressive agents (cyclosporine, rapamycin and prednisone).

IMPLICATIONS FOR INTENSIVE CARE TEAMS

DISCUSSION

Solid organ transplantation is limited by constant problems regarding organ availability. Therefore, over the last

decade the criteria for accepting organ donors have been expanded.

Extended criteria donors (ECD) are donors whose organs can be used because of liberalisation of the acceptance criteria. The ECD criteria may include such factors as: age > 59 years, BMI > 39.5 kg m⁻², maximum aspartate transaminase (AST) or alanine transaminase (ALT) activity >500 U L⁻¹, maximum bilirubin level > 2 mg dL⁻¹, p_{ick} serum sodium > 170 mmol dL⁻¹, HBV/HCV/HTLV reactive, donor after circulatory cessation, cold ischaemia time > 12 hrs, ICU stay > 5 days, extensive alcohol abuse, cancer history (non skin), active meningitis/bacteriemia or significant donor liver trauma, three or more vasoactive drugs simultaneously [3] or graft macrovesicular steatosis (> 30%) [4]. Liver harvest according to ECD rules must not result in a decrease in graft or patient survival [3].

Efforts to address organ shortage have also focused on the use of donors who had previously been transplanted. Although transplant recipients represent an uncommon group of deceased organ donors, it is probable that situations where transplant recipients may be considered as potential organ donors will occur more often. Intracranial haemorrhage, the commonest reason for brain death, has been found in 7–24% of autopsied liver transplant recipients [5, 6]. Thus it is feasible to encounter such a situation in the ICU among admitted liver transplant recipients.

Although the immunosuppressive regimen remains potentially hepatotoxic, no severe complications including liver failure after kidney transplantation due to immunosuppression were observed. Hepatotoxicity from transplant immunosuppressive agents is relatively rare. Of the agents administered to this patient, cyclosporin may result in cholestasis, whereas steroids may cause steatosis. None of these were observed in this case [7].

A case of a successful liver procurement from a kidney transplant recipient 11 years after transplantation was reported in 2000 [8]; however, there were differences between these two cases regarding donor gender, age and immunosuppressive regimen, as well as numerous potentially hepatotoxic factors such as hypernatremia and norepinephrine infusion. The donor described in this report was a 61 year-old female on an immunosuppressive regimen with cyclosporine as the only immunosuppressive agent, admitted to the emergency department due to a nonoperable large cerebral haemorrhage in the left hemisphere; whereas the donor described in our case report was a 26 year-old male immunosuppressed with cyclosporin, sirolimus and prednisone, with an ACoA aneurysm and a massive subarachnoid haemorrhage leading to cerebral hypertension.

Organ procurements from transplanted, and thus immunosuppressed, donors have already been reported in the literature. The first reuse of a liver allograft from a brain-

-dead donor recipient was described in Spain in 1991 [9]. From 1991 to 2007, 22 other transplantations were reported worldwide [10]. Moreover, in 2007 Ringers *et al.* [11] described the first two cases of orthotopic reuse of hypertrophied partial liver grafts for recipients with chronic liver disease donated by surviving recipients of partial auxiliary liver transplantation because of acute liver failure whose native liver regenerated. In 1993, a report about the reuse of a transplanted kidney was published [12] as well as an extraordinary case regarding the reuse of a transplanted heart [13]. In 2004, the first case of heart and lung procurement together with the reuse of a recently transplanted liver from a brain-dead donor following liver transplantation was reported [14]. Reprocurements from brain-dead recipients were performed in the majority of cases within one week; however, in 2006 a case of successful reuse of a liver graft 13 years after initial transplantation was published [15]. It is worth noting that organ reuse is a unique situation in which one organ, including the heart, functions consecutively in three people: the donor, the recipient-donor and the recipient [13].

Although other cases concerning organ reuse have been published previously, this is the first case in the medical literature of liver recovery from a brain-dead kidney transplant recipient on an immunosuppressive regimen with three immunosuppressive agents. It is also the first documented case report concerning organ procurement from a brain-dead organ transplant recipient in Poland.

In conclusion, this report confirms that although specific criteria for organ donors exist, each reported potential donor should be considered individually, and brain dead solid organ recipients should not be excluded *a priori* as organ donors. Unfortunately, only some of the possible donors have been reported to 'Poltransplant', the Polish Transplant Coordinating Centre. This has led to a shortage of organ donors, and therefore sometimes difficult, but not risky, decisions have to be made in the field of organ recovery and transplantation.

The liver donor described in this report, as the first in Poland, has paved a new, although as yet narrow, way in the field of organ donation. To give every patient on the waiting list an opportunity to obtain an organ transplant, every possible donor ought to be considered as a potential donor, because they may finally become effective donors.

ACKNOWLEDGEMENTS

There were no funding sources supporting the work submitted, nor any commercial associations that might pose a conflict of interest in connection with the submitted manuscript.

This work was supported in part by Health Resources and Services Administration contract 234-2005-370011C.

The content is the responsibility of the authors alone, and does not necessarily reflect the views or policies of the Department of Health and Human Services, nor does any mention of trade names, commercial products or organizations imply any endorsement by the U.S. Government.

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Submitted: 20.01.2012

Accepted: 27.08.2012