

# ORGAN DONATION FROM A PATIENT WITH BACTERIAL MENINGOENCEPHALITIS – THE FIRST CASE IN CROATIA

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**SUMMARY** – The growing number of patients with terminal organ failure waiting for transplantation and the limited number of available organs demand that explantation teams see brain-dead patients with infectious diseases such as bacterial meningoencephalitis as potential donors, although until recently organ explantation from such donors has been contraindicated. This paper presents the first case of successful organ explantation from a donor with confirmed bacterial meningoencephalitis in our country. In this previously healthy patient (only with mild arterial hypertension in personal history), bacterial meningoencephalitis caused fulminant worsening and he deteriorated from mild disorder of consciousness (GCS 12) to brain death within only 24 hours. After the transplantation of organs was performed (heart, kidneys, liver and corneas were explanted), antibiotic therapy was continued in all organ recipients and two days after the transplantation none of the recipients showed any signs of infectious complications. This paper proves that this type of patients should also be treated as potential donors, under condition of appropriate microbiological diagnosis, antibiotic therapy and sustained hemodynamic stability, which should enlarge the number of organs available for transplantation.

**Key words:** *Brain death; Meningoencephalitis; Organ transplantation; Case report*

## Introduction

The growing number of patients with terminal organ failure waiting for transplantation and the limited number of available cadaveric organs demand that explantation teams see even those patients as potential donors whose organ explantation has until recently been contraindicated, mostly those with infectious diseases such as bacterial meningoencephalitis<sup>1</sup>. This paper presents the first case of successful organ explantation from a donor with confirmed bacterial meningoencephalitis in our country.

## Case Report

A 46-year-old patient, only with arterial hypertension in personal history, was admitted to a regional hospital due to severe headache that had begun the day before, located in the neck and spreading into the occipital area of the head, accompanied by vomiting and dizziness. At the time of admission, the patient was Glasgow Coma Scale (GCS) 15, with neck stiffness, Hunt-Hess 2-3, discrete left arm oscillations, gradual sinking of both legs and atypical plantar response bilaterally. Urgent head multislice computed tomography (MSCT) showed fresh blood in the ventricular system (in moderately distended lateral and third brain chamber, and distended fourth chamber), mild supratentorial edema, pronounced infratentorial edema with reduced peripontine cisterns, with incipient transtentorial herniation. Intravenous therapy with 250 mL of 10% mannitol and 4 mg of dexame-

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thasone was administered and the patient was referred to neurology department of our hospital on the same day. Magnetic resonance (MR) of the brain done on the same day showed intraventricular hemorrhage and tamponade in the fourth chamber, with blood present in the third and both lateral chambers, and subarachnoid hemorrhage in cisterns at the base of the skull. MSCT angiography of the brain showed an excess of contrast in the projection of the fourth chamber, which had no communication with cerebellar branches and could be understood as a venous angioma. The patient also received nimodipine *per os* for prevention of vasospasm.

Two days after admission, the patient became somnolent, with no verbal contact, unresponsive to verbal commands, GCS 11, and urgent head CT showed obstructive hydrocephalus (markedly distended temporal horns of lateral chambers, up to 16 mm, and distension of the lateral chamber up to 17 mm). An urgent surgery was performed on the same day and the external drainage system was inserted, with a drain inserted into the anterior horn of the lateral chamber. The patient was postoperatively admitted to the intensive care unit (ICU), GCS 15, with no neurologic deficits, and on the first postoperative day he was transferred to the postintensive care unit.

Control head CT was performed two days later and showed normal width of the ventricular system, with less blood in the fourth chamber compared to previous CT finding. On postoperative day 5, lumbar puncture was performed because of persistent fever up to 39.5 °C. Biochemical findings of the spinal fluid (cells 261/3, proteins 0.93 g/L, glucose 3.2 mmol/L, lactate 2.67 mmol/L) and the parameters of possible inflammation (leukocytes 8.1x10<sup>9</sup>/L, C-reactive protein 4.6 mg/L) were not suggestive of meningitis. Therefore, the microbiological finding of the coagulase-negative staphylococcus isolated from the same spinal fluid sample was understood as contamination of the sample. A sample of cerebrospinal fluid was also taken from the external drainage system, and the results were not typical of meningitis, the same as lumbar puncture samples. Throughout that time, the patient was conscious, with occasional episodes of confusion and disorientation, GCS 13-15, and the external drainage was removed on postoperative day 7.

On postoperative day 9, the patient was transferred back to the ICU due to worsening of his neurologic status (poor contact, responsive only to pain stimuli), increased inflammation parameters (leukocytes 22.6x10<sup>9</sup>/L, C-reactive protein 231.6 mg/L) and spinal fluid finding suggestive of meningitis (cells 33300/3, proteins 25 g/L, glucose 0.6 mmol/L, lactate 19.6 mmol/L). Therapy with meropenem was started empirically (3x2 g intravenously), which was confirmed by the microbiological finding of the spinal fluid (which was taken the day before), where *Acinetobacter* sp. reactive to meropenem was isolated. Blood cultures were taken on the same day from the central venous catheter and from peripheral vein, and *Acinetobacter baumannii* reactive to meropenem was isolated from both samples, which was understood as sepsis.

Within 10 hours from admission to the ICU, the patient's state of consciousness progressively worsened, GCS 6, with no lateralization, pupils isochoric, reactive to light bilaterally, with spontaneous breathing. The patient was intubated, mechanically ventilated (SIMV ventilation mode) and sedated with continuous midazolam infusion for better tolerance of mechanical ventilation.

On the second day of his ICU stay, the right pupil became midriatic from around 6 a.m., with slow reaction to light and 100 mL of 20% mannitol was administered to reduce cerebral edema. Urgent head CT was performed to show cerebral edema and reduced width of the basal cisterns. At 6 p.m. on the same day, clinical signs of foraminal brain herniation occurred; the patient became hypotensive and bradycardic, with dilatation of both pupils and no reaction to light bilaterally.

Clinical tests for the confirmation of brain death were performed twice afterwards, according to our usual protocol (three hours between the first and the second performance of clinical tests), which were positive both times. As a confirmation test, we performed transcranial color Doppler, which showed the absence of flow in both ACI and brain death was proclaimed.

Blood cultures taken on the same day as from the central venous catheter, peripheral vein and previously cannulated radial artery were all sterile, and so was urine culture taken on the same day; so, after obtaining consent from the family, we started the explanation process. The organs explanted were the heart,

kidneys, liver and corneas, while the lungs were not offered due to the finding of atelectasis and pleural effusion. The donor had received meropenem intravenously throughout the ICU stay (4 days) and was hemodynamically stable with low-dose norepinephrine due to mild hypotension (0.05 µg/kg/min), which is the usual dose for brain-dead donors and corticosteroid therapy (hydrocortisone 100 mg i.v. three times daily).

Autopsy was performed after the explantation and showed turbid, yellow meninges with deposits of pus and fibrin. The purulent exudate was also found in the subarachnoid space, which covered the sulci of the brain hemispheres and filled the basal cisterns.

After transplantation of the organs, all organ recipients had antibiotic therapy continued and two days after the transplantation none of the recipients showed any signs of infectious complications.

## Discussion

This paper reports on the first organ explantation performed in Croatia from a donor whose brain death was the consequence of bacterial meningoen- cephalitis, in this case of fulminant course. In this previously healthy patient (only with mild arterial hypertension in personal history), meningoen- cephalitis caused ful- minant worsening and rapid deterioration from mild disorder of consciousness (GCS 12) to brain death within only 24 hours. It was an extensive cytotoxic brain edema, which caused herniation, as confirmed by CT finding.

The brain death is caused by bacterial meningoen- cephalitis in about 4%-8% of all donors<sup>1</sup>, which means that it is a rare cause of brain death. Some contro- versies exist when it comes to explantation of organs from such donors, so such procedures were not read- ily performed earlier. However, taking into account the low incidence of infectious complications in organ recipients, as well as the growing number of patients with terminal organ failure and limited number of cadaveric organ donors, a conclusion was made lately that organs could be explanted from donors with bac- terial meningoen- cephalitis, even in cases with positive blood cultures, provided that both the donor and the recipient are administered appropriate antibiotic ther- apy<sup>2-5</sup>. The only exclusions are infections with highly

virulent and intracellular organisms (such as group B streptococcus and *Listeria* species), which have a higher percentage of relapse after antibiotic therapy<sup>6</sup>.

According to experiences from available literature, and despite the finding of *Acinetobacter baumannii* in spinal fluid and first set of blood culture samples, we decided to explant organs from this donor after all three samples of the second blood culture were sterile and because the donor was pronouncedly hemo- dynamically stable all the time. Therapy with mero- penem, which was started empirically and afterwards confirmed by the antibiotic report finding, was ad- ministered throughout the patient's ICU stay up to the explantation, and the same therapy was recom- mended to all organ recipients for up to 7-10 days of organ transplantation.

Although the number of potential organ donors with bacterial meningoen- cephalitis is low, taking into account the total percentage of this diagnosis as the cause of brain death, the case presented proves that this type of patients should also be treated as potential donors, with appropriate microbiological diagnosis and antibiotic therapy, and sustained hemodynamic stability. It is especially important to emphasize that, in order to improve explantation and transplantation program in our country and to augment the number of transplanted organs, departments and divisions for infectious diseases at our hospitals can present a source of potential organ donors.

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### Sažetak

## DONACIJA ORGANA BOLESNIKA S BAKTERIJSKIM MENINGOENCEFALITISOM – PRVI SLUČAJ U HRVATSKOJ

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Sve veći broj bolesnika s terminalnim zatajenjem organa koji čekaju na presađivanje organa i ograničeni broj dostupnih organa nalažu da timovi za eksplantaciju razmatraju moždano mrtve bolesnike infektivnim bolestima kao što je bakterijski meningoenkephalitis kao potencijalne donore organa, iako je eksplantacija organa kod takvih donora donedavno bila kontraindicirana. Ovdje se prikazuje prvi slučaj uspješne eksplantacije organa kod donora s potvrđenim bakterijskim meningoenkephalitisom u našoj zemlji. Bolesnik je prethodno bio zdrav (samo s blagom arterijskom hipertenzijom u anamnezi), ali je meningoenkephalitis uzrokovao veoma naglo pogoršanje koje je od blažeg poremećaja svijesti (Glasgowska ljestvica za komu, GCS 12) dovelo do moždane smrti u samo 24 sata. Nakon transplantacije organa (eksplantirani su srce, bubrezi, jetra i rožnice) nastavilo se s antibiotskom terapijom kod svih primatelja organa i dva dana nakon presađivanja nijedan od primatelja organa nije imao nikakvih znakova infektivnih komplikacija. Ovaj rad pokazuje kako se ove bolesnike treba isto tako smatrati potencijalnim donorima, uz primjerenu mikrobiološku dijagnostiku, antibiotsku terapiju i održavanje hemodinamske stabilnosti, čime bi se povećao broj organa dostupnih za presađivanje.

*Ključne riječi: Moždana smrt; Meningoenkephalitis; Transplantacija organa; Prikaz slučaja*