https://doi.org/10.36290/aim.2025.030

Donation after circulatory death in a regional hospital in Czech Republic: a case report

Kalina M.[1–3], Jobánek J.[2,3], Mareš J.[2], Pokorná E.[4]

[1]Charles University, Faculty Medicine Hradec Králové, Czech Republic
[2]Department of Anaesthesiology, Resuscitation and Intensive Care, Děčín Hospital, Czech Republic
[3]Department of Anaesthesiology, Perioperative and Intensive Care Medicine, J. E. Purkinje University in Ústí nad Labem, Masaryk Hospital in Ústí nad Labem, Czech Republic
[4]Institute for Clinical and Experimental Medicine, Prague, Czech Republic

Transplantation is a well-established therapeutic option that saves lives and improves the quality of life of patients. A shortage in organs has led to an increased use of donation after circulatory death. Donation after circulatory death is nowadays used in some way in most countries in the developed world. We present two cases of a successfully conducted donation after circulatory death in a regional hospital with the aim to demonstrate the feasibility and share a successful practice.

Key words: deceased donation, withdrawal of therapy, donation after circulatory death, transplantation, critical care, anaesthesiology.

Dárcovství orgánů po nevratné zástavě oběhu – kazuistika

Transplantace orgánů je dnes již zavedená léčba, která zachraňuje život či zlepšuje kvalitu života pacientů. Nedostatek orgánů vede transplantační komunitu ke zvýšenému využívání orgánů i od dárců po nevratné zástavě oběhu. Dárcovství po nevratné zástavě oběhu se dnes využívá ve většině zemí rozvinutého světa. Představujeme dva případy úspěšně provedeného odběru orgánů u dárců po nevratné zástavě oběhu v regionální nemocnici s cílem ukázat proveditelnost a podělit se o úspěšnou praxi.

Klíčová slova: darování orgánů od zemřelých, ukončení léčby, darování orgánů po smrti mozkové, transplantace, intenzivní péče, anesteziologie.

Introduction

Transplantation is a well-established therapeutic option that saves lives and improves the quality of life of the patients with terminal organ failure [1, 2]. Most deceased organs are derived from donors after brain death (DBD) [2, 3]. However, due to a shortage of transplant organs and improvement in post-transplant outcomes, the harvesting of organs from donors after circulatory death (DCD) is gaining more interest in the transplantation community [2]. A shift in the DCD paradigm is also visible in transplantations of the lung and heart, the two organs most missing [4]. DCD is adopted in many countries in the developed world. However, DCD is a significantly smaller pool of donors compared to DBD [5]. This is mainly because of ethical and legislative obstacles [2]. Notably, even in the countries that have adopted DCD, its practice is mainly restricted to tertiary hospital centres, including the Czech Republic. Reasons may include a lack of technical expertise and insufficient organizational capabilities in regional hospitals [5–7]. This case report aims to demonstrate the feasibility of the adoption of controlled DCD in regional hospitals and share a successful practice to facilitate the use of the DCD pool in these hospitals.

Case report 1

A 40-year-old man was admitted to the intensive care unit (ICU) of a regional hospital after successful cardiopulmonary resuscitation (CPR) following hypoxic circulatory arrest due to a suicide attempt by hanging. The patient was found by a police officer who initiated basic life support (BLS). The medical rescue service arrived 10 minutes later and continued with advanced life support (ALS) according to the current guidelines, successfully restoring spontaneous circulation (ROSC) after 31 minutes.

Upon admission to the ICU, the patient was under pharmacological sedation and on mechanical ventilation. He was

KORESPONDENČNÍ ADRESA AUTORA:
MUDr. Michal Kalina, MBA, michal.kalina@kzcr.eu

Článek přijat redakcí: 20. 2. 2025; **Článek přijat k tisku:** 23. 6. 2025
Cit. zkr: Anest intenziv Med. 2025;36(3):194-197

haemodynamically unstable with vasoactive support. He was unconscious, with a Glasgow Coma Scale (GCS) of 3, and had reactive mydriatic pupils. A plain CT scan of the brain and neck showed early signs of brain oedema, with no abnormal findings in the cervical spine. Post-resuscitation care was conducted according to the latest recommendations.

After 24 hours, all pharmacological sedation was ceased, and his circulation gradually stabilized without further need for vasoactive support. In the following days, a severe impairment of consciousness persisted, with a GCS of 3, absent corneal and pupillary reflexes, and no other brainstem reflexes. However, the patient maintained spontaneous respiratory activity. Therefore, the prognosis was assessed as very poor by consensus of the whole medical team. Taking into consideration the extent of brain damage, brain death was expected to develop. The first contact of a dedicated transplant centre was done. The treatment of the patient continued with the aim of potential organ donation according to the Czech law [8].

On the fifth day of hospitalization, the patient continued to have spontaneous respiratory activity. The medical team determined that the condition was irreversible with a very low chance of developing brain death. After consultation with the transplantation centre, donation after irreversible circulatory arrest (DCD) was proposed. No one from the medical team was against. Therefore, the family was fully informed of the patient's condition, the irreversible brain damage, and the plan to change the treatment to palliative care with a potential of organ donation. To inform the family, a structured communication approach was used. First, the information regarding poor prognosis and irreversibility of the clinical condition was addressed. Next, the transition to palliative care was communicated. Lastly, the potential of organ donation was discussed with the family highlighting that the decision is to be made by the medical team, not the relatives. The family harmonized with the idea of potential organ donation without any objections.

On the sixth day of admission, the patient was moved from the ICU to an anaesthesia preparation room for transition to palliative care. This room is situated in front of the operating theatre in a complex of central operating theatres. In the preparation room, organ support was ceased, including terminal extubation. Oxygen saturation dropped below 70% after 1 minute, and systolic blood pressure fell below 50 mmHg after 2 minutes from organ support cessation. Shortly after that, 20,000 units of heparin were administered intravenously as a preventive measure against organ thrombosis during warm ischaemia time (WIT). Circulatory arrest occurred within 7 minutes of organ support cessation. The diagnosis was based on the loss of organized electrical activity on the ECG and the absence of a pulse waveform on invasive blood pressure measurement. This was followed by a ‚no-touch' interval of 5 minutes. After this time, circulatory arrest was assessed as irreversible, and the patient was declared dead. The deceased patient was handed over to the transplantation team for organ procurement. Based on a perioperative evaluation, the liver was taken. The kidneys and lungs were not taken due to high creatinine levels and severe oxygenation dysfunction due to severe pneumonia.

Case report 2

A 65-year-old male patient was admitted to the ICU of a regional hospital after an unwitnessed cardiac arrest with successful resuscitation. ROSC was achieved after 20 minutes. The cause of cardiac arrest was determined to be hypoxic, attributed to exacerbation of chronic obstructive pulmonary disease (COPD) and bronchospasm.

Upon admission to the ICU, the pupils were mydriatic and unresponsive to light, and the corneal reflex was absent. Post-resuscitation care was initiated and conducted conventionally.

After 24 hours from admission, weaning from sedation was initiated. Severe impairment of consciousness with missing brainstem reflexes persisted. The circulation was stable with no need for vasoactive support on the seventh day from admission. The patient remained unconscious with GCS 3 with no active brainstem reflexes without sedation. Spontaneous breathing was preserved.

Given these circumstances, the medical team decided in consensus on a poor prognosis and palliative care was initiated. The family was fully informed about the irreversible condition and the change of the course of treatment to palliative care, including potential organ donation. Cessation of organ support was postponed by a day because of communication with the family and potential organ donation. The same structured communication approach was used as the one described in Case 1.

On the eighth day of admission, the patient was referred to a dedicated transplant centre, and organ support cessation and subsequent organ procurement were scheduled for the following morning. Upon arrival of the harvesting team, the patient was moved to the anaesthesia preparation room to commence palliative care. Organ support was ceased there, including terminal extubation. Oxygen saturation dropped below 70% after 4 minutes, and systolic blood pressure fell below 50 mmHg after 6 minutes from organ support cessation. In coordination with the harvesting team, 20,000 IU of heparin were administered. Cardiac arrest occurred 10 minutes after initiating palliative care. This was confirmed via electrocardiogram (ECG), the absence of a pulse wave on invasive blood pressure monitoring, and ultrasound verification using point-of-care ultrasound echocardiography displaying no mechanical activity of the heart. Then, the no-touch interval began. The patient was observed for 5 minutes. After this period, circulatory arrest was assessed as irreversible, and the patient was pronounced dead. Subsequently, the deceased patient was transferred to the operating theatre and the harvesting team assumed care.

Based on an intraoperative assessment, only one kidney was harvested and then transplanted. The liver was not considered for harvesting due to a higher donor age, prolong artificial lung ventilation, the lungs were not harvested due to COPD, and the other kidney was not harvested due to severe atherosclerosis that compromised perfusion of the organ.

Discussion

Because of shortage in organ donation, the transplantation community increasingly utilizes DCD nowadays. According to the Maastricht categories, DCD can be divided into controlled and uncontrolled groups

[1]. We present two cases of controlled DCD according to Maastricht classification type 3 (awaited cardiac arrest in controlled conditions).

In the presented cases, we report two patients after out-of-hospital cardiac arrest as protentional candidates for organ donation. The prognosis was bleak and, therefore, the option of organ donation was communicated with the family. For this purpose, we used a structured communication format, which may be beneficial [9]. In this format, the communication is divided into several steps. The first step is to inform the relatives about the poor prognosis and its irreversibility. The second step is to shift focus towards the organ donation option, highlighting that we seek the one that would best fit the patient. Lastly, the process of palliative care is explained, including the possibility of organ procurement. Crucial communication includes in-depth communication within the hospital staff.

Upon the day of organ harvesting, the patients were transported to an operating theatre anteroom. This was due to a long distance from the ICU to the operating theatres. Otherwise, this distant transport would cause prolongation of WIT. Therefore, we decided to withdraw the treatment and await circulatory death in the anteroom. If circulatory death had not occurred, palliative care would continue. Organ support was withdrawn according to the ICU conventions [10]. In our ICU, we usually perform terminal extubation as part of palliative care to avoid discomfort related to endotracheal tube placement and to support the dignity of dying [3, 9, 10].

According to ethical principles, the harvesting team should not be in the same room when the treatment is being withdrawn [9]. In our cases, the harvesting team was seated in the daily room which is part of the complex of central operating theatres. The operating theatre had been set up before arrival of the harvesting team. The harvesting team started to get ready after initiation of the no-touch interval, which is a common practice [1].

After palliative care initiation, heparin was administered pre-mortem, in coordination with the harvesting team, to prevent thrombosis during WIT. This is a common practice in many countries, including the Czech Republic [11]. However, there is a large variability in the timing and dose of pre-mortem anticoagulation therapy, which may influence the outcomes of transplanted organs [11]. It seems that pre-mortem anticoagulation therapy can lower biliary complications after liver transplantation in the recipient patient, but has limited effect on thrombosis-related complications in lung and kidney transplantations [11–13].

The accepted standard for determining circulatory death is permanent loss of circulation and respiration. This shift to the circulatory concept means that the patient can be declared dead even if there is electrical activity of the heart. But mechanical function of the heart must be missing (mechanical asystole) [1, 8]. In our cases, we used a five-lead ECG, invasive blood pressure monitoring, and echocardiography to diagnose circulatory death. At least two monitoring modalities should be used. Current evidence shows that, due to the high prevalence of electromechanical dissociation and its duration, the ECG waveform is unreliable for accurate diagnosis and may contribute to an undue prolongation of warm ischaemia time [14]. Circulatory death must be diagnosed by two fully licensed physicians [15]. In the presented cases, both physicians were fully licensed anaesthesiologists.

In the time when systolic blood pressure drops below 50 mmHg or haemoglobin oxygen saturation drops below 70%, the functional WIT starts [1, 9]. In our cases, the WIT did not exceed 15 minutes. The longest acceptable WIT is always dependent on the organ harvesting team decision [9]. In the case of a too long WIT, organ harvesting is cancelled.

After cardiac arrest of the patient, the no-touch interval is in place. The duration may differ across different countries ranging from 2 to 20 minutes [1, 9, 14]. In the Czech Republic, the common practice is 5 minutes as it was in our cases [9, 16]. After the no-touch interval, the deceased patients were transported to the operating theatre and the care handed over to the harvesting team.

We present two successful cases of controlled DCD in a regional hospital. In both cases, there were no issues with meeting the national and European recommendations regarding DCD [1, 16]. Controlled DCD can be successfully done in a regional hospital when recommendations are followed.

Conclusion

The cases presented share a successful practice and document that DCD is also feasible in regional hospitals, which can widen the pool of donors significantly.

Acknowledgement

The team of authors would like to thank Professor Vladimír Černý, the head of the Department of Anaesthesiology, Perioperative and Intensive Care Medicine, J. E. Purkinje University in Ústí nad Labem, Masaryk Hospital in Ústí nad Labem, Czech Republic, for reading the article and giving valuable opinions regarding the article.

Consent of publication

Written patient consent of publication was obtained from the legal surrogates of the patients.

PROHLÁŠENÍ AUTORŮ: **Prohlášení o použití AI:** Autoři prohlašují, že při psaní tohoto odborného článku nepoužili žádnou formu umělé inteligence. Všechny informace a analýzy jsou výsledkem jejich vlastního výzkumu, zkušeností a úsudku s důrazem na relevantní literaturu, primární zdroje a konzultace s odborníky v oboru. **Prohlášení o původnosti:** Práce je původní a nebyla publikována ani není zaslána k recenznímu řízení do jiného média. **Střet zájmů:** Autoři prohlašují, že nemají střet zájmů v souvislosti s tématem práce. **Podíl autorů:** Všichni autoři rukopis četli, souhlasí s jeho zněním a zasláním do redakce časopisu Anesteziologie a intenzivní medicína. MK se podílel na psaní článku i ideové náplni článku. JJ se podílel na psaní článku i ideové náplni článku. JM se podílel na psaní článku. EV se podílela na psaní článku, ideové náplni článku a dozorovala celý proces průběh přípravy článku. **Financování:** Žádné. **Poděkování:** Poděkování prof. Vladimíru Černému za přečtení článku, poskytnutí obohacujícího náhledu na problematiku DCD a velmi cenných komentářů k článku. **Registrace:** N/A **Projednání etickou komisí:** N/A

REFERENCES

1. Thuong M, Ruiz A, Evrard P, Kuiper M, Boffa C, Akhtar MZ, et al. New classification of donation after circulatory death donors definitions and terminology. Transpl Int. 2016 Jul;29(7):749-59. doi: 10.1111/tri.12776. Epub 2016 May 4. PMID: 26991858.
2. Miñambres E, Rubio JJ, Coll E, Domínguez-Gil B. Donation after circulatory death and its expansion in Spain. Curr Opin Organ Transplant. 2018 Feb;23(1):120-129. doi: 10.1097/MOT.0000000000000480. PMID: 29120882.
3. Manara AR, Murphy PG, O'Callaghan G. Donation after circulatory death. Br J Anaesth. 2012 Jan;108 Suppl 1:i108-21. doi: 10.1093/bja/aer357. PMID: 22194426.
4. Jawitz OK, Devore AD, Patel CB, Keenan JE, Milano CA, Schroder JN. Regional variation in donation after circulatory death heart allograft utilization. JTCVS Open. 2024 Jul 17;21:191-196. doi: 10.1016/j.xjon.2024.07.004. PMID: 39534326; PMCID: PMC11551292.
5. Lomero M, Gardiner D, Coll E, Haase-Kromwijk B, Procaccio F, Immer F, et al; European Committee on Organ Transplantation of the Council of Europe (CD-P-TO). Donation after circulatory death today: an updated overview of the European landscape. Transpl Int. 2020 Jan;33(1):76-88. doi: 10.1111/tri.13506. Epub 2019 Oct 7. PMID: 31482628.
6. Vail EA, Bakhru RN, McGinity AC, Sarge T, Heimbach JK, Tompeck AJ, et al. Best Practices for Intensivists Planning and Opening Hospital-Based Deceased Organ Donor Care Units: Part 1. CHEST Critical Care. 2025 Mar 1;3(1):100110.
7. Kizer KW, English RA, Hackmann M, editors. Realizing the Promise of Equity in the Organ Transplantation System. Washington, D.C.: National Academies Press; 2022.
8. https://www.zakonyprolidi.cz/cs/2002-285 [Internet]. 2002 [cited 2025 Jan 29]. Zákon č. 285/2002 Sb. Available from: https://www.zakonyprolidi.cz/cs/2002-285.
9. Schmidt M, Pokorná E, Duška F. Dárcovství orgánů po nevratné zástavě oběhu: Jak na to? Anest. intenziv. Med. 2020;31(3):114-118. doi: 10.36290/aim.2020.005.
10. Kompanje EJ, van der Hoven B, Bakker J. Anticipation of distress after discontinuation of mechanical ventilation in the ICU at the end of life. Intensive Care Med. 2008 Sep;34(9):1593-9. doi: 10.1007/s00134-008-1172-y. Epub 2008 May 31. PMID: 18516588; PMCID: PMC2517089.
11. Kramer AH, Holliday K, Keenan S, Isac G, Kutsogiannis DJ, Kneteman NM, et al. Premortem anticoagulation timing and dose in donation after circulatory death: multicentre study of associations with graft function. Can J Surg. 2022 Jul 28;65(4):E474-E484. doi: 10.1503/cjs.023120. PMID: 35902105; PMCID: PMC9343016.
12. Narvaez JRF, Noyes K, Nie J, Kayler LK. Outcomes of DCD kidneys recovered for transplantation with versus without pre-mortem heparin administration. Clin Transplant. 2019 Jul;33(7):e13624. doi: 10.1111/ctr.13624. Epub 2019 Jun 25. PMID: 31162721.
13. Keshava HB, Farver CF, Brown CR, Shafii AE, Murthy SC, Yun JJ, et al. Timing of heparin and thrombus formation in donor lungs after cardiac death. Thorac Cardiovasc Surg. 2013 Apr;61(3):246-50. doi: 10.1055/s-0032-1322627. Epub 2012 Dec 3. PMID: 23208845.
14. Dhanani S, Hornby L, van Beinum A, Scales NB, Hogue M, Baker A, et al; Canadian Critical Care Trials Group; Canadian Donation and Transplantation Research Program. Resumption of Cardiac Activity after Withdrawal of Life-Sustaining Measures. N Engl J Med. 2021 Jan 28;384(4):345-352. doi: 10.1056/NEJMoa2022713. PMID: 33503343.
15. Vyhláška č. 115/2013 Sb. [Internet]. 2013 [cited 2025 May 12]. Available from: https://www.zakonyprolidi.cz/cs/2013-115.
16. Cvachovec K, Černý V, Duška F, Hejna P, Pokorná E, Rusinová K, et al. Doporučený postup před odběrem orgánů od zemřelých dárcůpo nevratné zástavě oběhu. Anest. intenziv. Med. 2014;25(2):145-146.