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## COMMENTARY

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# Lung transplant donation following circulatory death

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conduct more research on initiatives to reduce the warm ischemia time and employ uncontrolled DCD.

### ABSTRACT

**Key Words:** *Cardiac death*

Lung transplantation (LTx) has been seriously hampered by the lack of donor organs. One of the many donor pools used to address the issue of a lack of Donation after Brain Death (DBD) donors is Donation after Circulatory Death (DCD) donors. Given that LTx from DCD donors has outcomes comparable to LTx from DBD donors, the active use of DCD donors is anticipated to considerably lower mortality on the waiting list for LTx. It is necessary to

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The lack of donor's lungs is the biggest barrier to lung transplants. This problem still exists despite recent advancements in the identification of potential donors and donor management. To address the donor shortage issue, studies on the use of lungs that don't match normal donor requirements in LTx and other alternatives are now being done. Among these options, DCD donors have attracted the attention of some institutions. Hardy et al. performed the first lung transplant with a DCD donor in 1963, making it the first LTx in recorded history. The results of all organ transplants were subpar before 1980. Due to the numerous ethical concerns surrounding the use of organs from beating-heart donors, DCD donors were frequently utilized. Since then, improvements in transplant results, immunosuppressive drug research, and preservation techniques have allowed for the use of brain-dead donors with beating hearts. Brain-dead donors alone couldn't cover all recipients as the number of transplants grew, though, thus DCD donors were once more considered as a substitute. The use of DCD donors has been claimed to enhance the current donor pool by up to 50%, and LTx employing DCD lungs is currently being extensively deployed in Europe and North America. In medicine, brain death and circulatory death are the two main categories of death. Organ donation following cardio-respiratory arrest was first referred to as occurring after a "non-heart-beating donor." This phrase was chosen for the Maastricht categorization during the inaugural International Workshop on Non-Heart-Beating Donors. Since that time, "heart-beating" has come to mean cases of brain death, while "non-heart-beating" and "cardiac death" has come to mean cases of circulatory death. However, referring to particular organs as "dead," such as the brain or heart, could cause people to believe that only that organ has stopped functioning and not the entire human body.

Thus, the classification was changed from "neurologic death" to "circulatory death," and donors whose circulatory death had already occurred started to be referred to as "donation after circulatory death" donors. Some suggested that "Donation after Circulatory Determination of Death" (DCDD) would be a more appropriate phrase, but DCD remained the favored name over DCDD because DCDD was already widely used. The lung may transport oxygen by passive diffusion via the alveolar wall, unlike other organs that get oxygenated blood directly from blood arteries. Therefore, a certain amount of cell viability can be maintained by mechanical ventilation without blood flow. Although studies have demonstrated that the lung can withstand warm ischemia for 60 minutes to 90 minutes, these studies lack the agonal phase, which makes the settings unrepresentative of real-world clinical scenarios. In other words, the agonal phase typically does not exist in tests because the main causes of mortality are ventricular fibrillation or hemorrhage. However, in the clinical environment, pulmonary edema predominantly results from hypoxic hypotension that happens in the agonal phase, and pulmonary edema is made worse by sympathetic activation that also happens in the agonal phase. As a result, there is a general rule that the agonal phase should last no longer than an hour in clinical settings. There have been numerous studies comparing the benefits of DCD lungs against lungs Donated after Brain Death (DBD). During brain death in DBD donors, catecholamine surges cause neurogenic pulmonary edema. Additionally, compared to DCD lungs, tissue levels of pro-inflammatory cytokines, which trigger inflammatory pathways, are higher in DBD lungs. From the selection of DCD patients through the procurement of lungs, clinical courses and procedures change based on institutional settings and national laws. Normally, after the medical team has secured consent through family interviews and institutional approval, recipient matching is carried out when a potential candidate DCD donor is revealed.

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The LTx doctor assesses the lung condition to see if it meets the standards for acceptance. Mechanical ventilation is stopped when everything is prepared, and extubating is performed. After a cardiac arrest, if the patient doesn't regain consciousness within 5 minutes, they deem them dead. The patient has moved right away to the operation room for mechanical breathing and reintubation while being careful to avoid aspiration. Heparin is then given, and then cardiac compression is used to move the heparin through the pulmonary arteries. To check for aspirations, bronchoscopy is utilized, and the bronchus' secretions are fully evacuated. The procurement procedure that comes next is the same as with DBD lungs. Every donor has a unique warm ischemia time, hence the examination of DCD lungs must be quite thorough. Similar to DBD, cDCD cases can undergo bronchoscopy, chest radiography, and arteri-

-al blood gas analysis before cardiac arrest, allowing for a precise assessment of the lung condition, which is not achievable in the majority of uDCD cases. Following the Perfadex infusion, some facilities inject 300 mL of donor blood into the PA to perform an arterial blood gas examination on the blood leaving the left atrium. Recently, ex vivo lung perfusion has also been carried out to assess lung health. Lungs from DCD patients are useful resources for addressing the present lung donor scarcity. The active use of cDCD is anticipated to considerably lower waiting list mortality in particular because the LTx results of cDCD are comparable to those of DBD donor lungs. However, there are still moral and legal questions that surround DCD, and fixing these difficulties is essential for the revival of DCD. Additionally, there is a need for active study on uDCD, particularly category II and euthanasia donors.