



Harvesting the Liver From a Donor With a Biventricular Assist Device (BiVAD)—An Unexpectedly Challenging Procedure: A Case Report

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ABSTRACT

Background. Organ procurement from deceased donors is usually a standard procedure. Nevertheless, the performing surgeon is often confronted with demanding situations, such as atherosclerotic or aneurysmatic aortic disease or even other pathologies, which may alter the surgical steps. We report on an interesting case of solid organ harvesting from a donor with a biventricular assist device (BiVAD) due to global heart failure.

Case Report. A 42-year-old male donor with a BiVAD, enlisted for heart transplantation, died of intracerebral hemorrhage. Dressing the surgical field was challenging because the extracorporeal portions of all 4 tubes and the pump device rested on the donor's body, covering his whole abdomen. To ensure enough space, the pump and tubes had been covered with sterile swabs and drapes. The second surgical assistant was tasked with holding the device slightly deviated to the left and the ankle elevated at 45°, to avoid any tube kinking. The dissection of the main vessels distally was performed using the standard technique. No encirclement of the proximal aorta beneath the diaphragm was necessary, as the cardiac output could be arrested by clamping the left ventricle's outflow tube. Once the perfusion was completed, the procedure continued in the standard fashion.

Conclusion. So far, the literature has no data on organ harvesting from deceased donors with BiVAD. Although such a retrieval is quite challenging and requires an experienced team, the transplantation of the corresponding organs can be performed without any further special technical problems.

ORGAN procurement from deceased donors is usually a standard procedure. Nevertheless, the performing surgeon is often confronted with demanding situations, such as atherosclerotic or aneurysmatic aortic disease or even other pathologies, which may alter the surgical steps. We report on an interesting case of solid-organ harvesting from a donor with a biventricular assist device (BiVAD) due to global heart failure.

CASE REPORT

A 42-year-old male donor with a BiVAD who was listed for heart transplantation died of an intracerebral hemorrhage. The patient had fairly good function of the abdominal organs, so his liver and both kidneys were considered suitable for transplantation. Due to the heart failure and episodes of pneumonia, the thoracic organs were excluded from harvesting. Dressing the surgical field was

challenging because the extracorporeal portions of all 4 tubes and the BiVAD pump rested on the donor's body, covering his whole abdomen (Fig 1A). To ensure there was enough space to perform the laparotomy, the pump and tubes were covered with sterile swabs and drapes (Fig 1B). The second assistant was tasked with holding the device slightly deviated to the left and the ankle elevated at 45° angle, to avoid any tube kinking. A thoracotomy, although routinely performed during our standard retrieval procedure, was omitted in this case because of the presence of the device's tubes exiting from both sides of the lower sternum. The distal dissection of the main vessels was performed using the standard technique (Fig 1C). No

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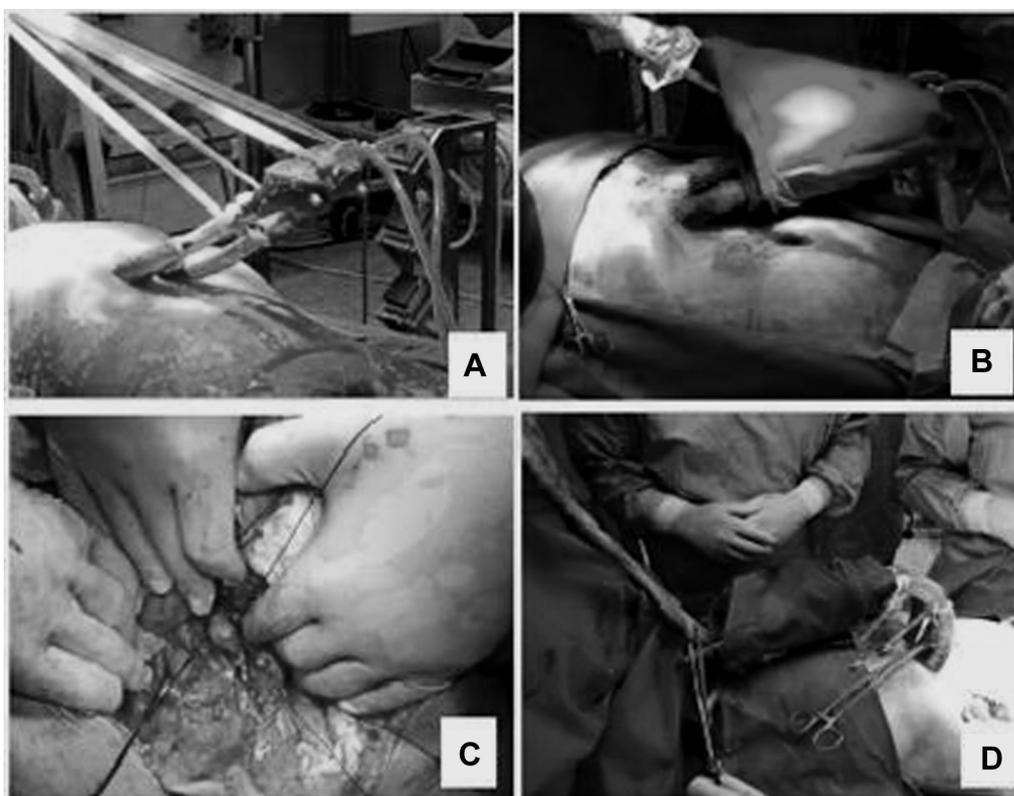


Fig 1. (A) Extracorporeal portions of BiVAD lying on donor's body; (B) Dressing of operation's field; (C) Dissection of the main vessels; (D) Cardiac output arrest by clamping the left ventricle's outflow tube.

encirclement of the proximal aorta beneath the diaphragm was necessary, as the cardiac output could be arrested by clamping the left ventricle's outflow tube (Fig 1D). We do not routinely perform an additional portal perfusion in situ, leaving this step for the back-table preparation of the liver transplant. Once systemic perfusion was completed, the procedure continued in the standard fashion. Complete liver mobilization was possible only after lysis of partially strong adhesions between liver and diaphragm, due to a prior cardiac operation, retrosternal lying tubes, and cardiac ascites. Liver anatomy was determined to be simple, without aberrant or replaced arteries. The dissection of the subdiaphragmatic aorta was performed during the vessel dissection, beginning from the branch of gastroduodenal artery. An aortic ring, incorporating the orifice of the celiac artery, was also obtained. The retrieval of kidneys, which also had a simple 1 vessel/ureter anatomy, completed the operation. Although the explanted liver was eventually rejected due to excessive fibrosis, both kidneys were successfully transplanted in 2 recipients and showed moderate primary function.

DISCUSSION

Despite the concerning lack of offered organs in Greece, the number of patients awaiting transplant organs continues to rise, which means that every effort should be made to use organs from every potential donor. To meet this need, organs previously deemed unsuitable for transplantation are

increasingly used, a practice that generates more technical and ethical challenges.

The organ harvesting procedure may be quite demanding for the surgeon, due to various donor-associated factors. More specifically, organ retrieval may be challenging in cases of aortic grafts, severe atherosclerosis, reoperations with strong adhesions, or even in cases of vascular variability, such as the presence of aberrant or replaced left or right hepatic arteries. When confronting such special conditions, the surgeon should deviate from standard procedural thinking and introduce or establish a new approach or a technique modification. In fact, all these technical challenges are better faced by experienced surgical teams. For example, Molmenti et al suggested 2 alternative techniques of organ perfusion to be used in donors with infrarenal aortic pathologies, in an effort to avoid a retrograde embolization during organ procurement [1]. We have practised both of these novel techniques in further cases of deceased donors with abdominal aortic grafts (including 3 endovascular) that were not known/diagnosed before the harvesting procedure, with excellent results. We describe here a further interesting case from a donor with a BiVAD whose liver and kidneys could be retrieved using a slightly altered procedure. Much attention was paid to the dressing

of the surgical field and sterile coverage of the extracorporeal parts of the pump device, to avoid disrupting its function while not significantly compromising the free space for the laparotomy.

As previously mentioned, we abandoned our common practice of performing a thoracotomy during the retrieval, making the whole procedure even more demanding. In general, the maneuver of opening the thoracic cavity gives the surgeon more space and makes the subdiaphragmatic mobilization of the liver much easier. Furthermore, the length of the dissected suprahepatic vena cava inferior is maximized if the surgeon just cuts through the left atrium. This approach is only feasible in cases where no heart harvesting is intended. A further difficulty was the unavoidable lysis of partial severe adhesions, which were generated as a consequence of the patient's surgical history. A small advantage of this special condition was the avoidance of the primary encirclement of the proximal aorta, as the cardiac output could be easily detained by clamping the appropriate left ventricle's outflow tube. The remaining surgical steps were performed according to the standard technique. To best of our knowledge, this is the first report

of organ harvesting from a donor with BiVAD. The whole attempt proved to be feasible and successful thanks to the optimal cooperation of both the experienced surgical and anesthesia teams.

CONCLUSION

To date there is no data in the literature on organ harvesting from deceased donors with BiVAD. Although such a procedure is quite challenging and requires an experienced team, transplantation of the corresponding organs can be performed without any further special technical problems. The successful use of such organs could expand the pool of potential donors, representing an additional source with which to reduce the existing organ shortage.

REFERENCE

- [1] Molmenti EP, Molmenti H, Marubashi S, Sanchez EQ, Gogel BM, Goldstein RM, et al. Cannulation of the aorta in organ donors with infrarenal aortic pathologies. *Dig Dis Sci* 2001;46: 2457-9.