

Case Report

Bridging Two Worlds: The First Hybrid Dual-Graft Liver Transplantation Combining Whole Deceased and Living Donor Grafts

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Abstract

The persistent mismatch between organ availability and demand continues to drive innovation in liver transplantation. Dual-graft transplantation represents a novel solution to overcome graft-size limitations while minimizing donor risk. We report the first successful hybrid dual-graft liver transplantation combining a deceased donor whole graft with a living donor partial graft. The case involved a 35-year-old woman with Wilson's disease and recurrent hepatocellular carcinoma who received a full deceased donor liver graft complemented by a robotic left lateral segment graft from an altruistic living donor. This strategy fulfilled the graft-recipient weight ratio target while preserving donor safety. The recipient's postoperative course was uneventful, with early graft function and excellent recovery. This case illustrates the feasibility and clinical promise of combining deceased and living donor grafts to maximize the donor pool and optimize outcomes in settings where deceased donation remains scarce.

Keywords: Transplantation; Hepatocellular; Feasibility

Introduction

The global shortage of donor organs remains one of the most pressing challenges in liver transplantation. Dual-graft transplantation implanting two partial or whole grafts into a single recipient has emerged as a sophisticated strategy to expand the donor pool while ensuring donor safety through reduced resection volumes. In regions such as the Kingdom of Saudi Arabia, where cultural and logistical constraints limit the availability of Deceased Donor Liver Transplantation (DDLT), maximizing the use of every viable organ is essential. Living Donor Liver Transplantation (LDLT) continues to serve as the backbone of most national programs, yet it carries inherent risks to healthy donors [1-3]. The introduction of robotic donor hepatectomy has markedly enhanced donor safety and acceptance by reducing operative trauma and recovery time [4]. This report presents the first documented case of a hybrid dual-graft liver transplantation that integrates both a deceased donor whole liver and a robotic living donor left lateral segment. This innovative approach aims to address graft-volume inadequacy while maintaining donor well-being.

Case Presentation

A 10-month-old infant (8.5 kg, blood group AB) was declared

brain-dead following a cardiac arrest. The family consented to multi-organ donation. No pediatric recipients matched the donor's blood group, but an adult recipient (35 years old, 49 kg, Wilson's disease with treated HCC recurrence) was identified. Given the donor-recipient mismatch and risk of small-for-size syndrome, the team proposed a hybrid dual-graft transplant using the infant's whole liver and a supplemental left lateral segment from an altruistic living donor. The living donor was recruited from the hospital's anonymous altruistic donor registry and underwent robotic left lateral segmentectomy Figure 1.

Donor and graft details

- Deceased donor: full-organ graft, 312 g, cold ischemia time 487 min.
- Living donor: robotic left lateral segmentectomy, graft 181 g, warm ischemia 8 min, blood loss 50 ml.
- Total graft weight: 493 g, achieving GRWR = 1.0

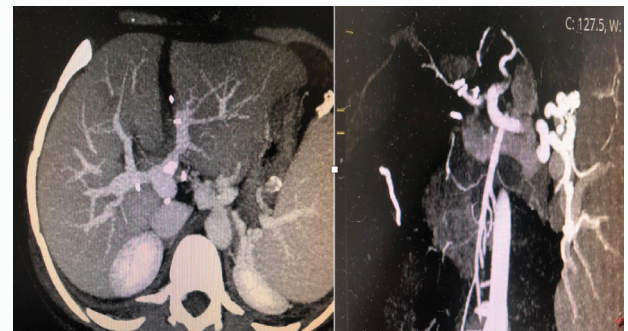


Figure 1: CT 1 month after transplant showing patent portal veins and hepatic arteries of both liver grafts.

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Operative Technique

Recipient hepatectomy was performed using the piggyback technique. A replaced left hepatic artery from the left gastric artery was noted.

Right-side graft (deceased donor whole liver)

- IVC–RHV side-to-side anastomosis.
- Main portal vein–right portal vein anastomosis.
- Common hepatic artery anastomosis.
- Duct-to-duct biliary reconstruction.

Left-side graft (living donor LLS)

- Left hepatic vein–recipient LHV anastomosis.
- Left portal vein–recipient LPV anastomosis.
- Left hepatic artery anastomosed to the replaced artery from the left gastric artery.
- Two separate hepatico-jejunostomies for dual bile ducts.

Operative time was 350 min; blood loss was 1.5 L. The patient recovered uneventfully and was discharged on postoperative day 12. Follow-up imaging confirmed excellent perfusion of both grafts and patent vascular anastomoses.

Discussion

While LDLT remains the mainstay of transplantation in many Middle Eastern programs, it poses unique challenges: limited donor pool and potential donor morbidity. Deceased donor offers, when available, must be used optimally to avoid wastage [1-3]. The hybrid dual-graft approach combines the volumetric adequacy of DDLT with the safety of a minimal-volume LDLT [5]. This model capitalizes on robotic donor surgery's advantages less pain, quicker recovery, and improved willingness among altruistic donors [6,7]. The literature predominantly describes dual living donor grafts, yet this case establishes proof of concept for combining deceased and living grafts to achieve metabolic adequacy when neither alone is sufficient. It provides a viable path for adult recipients with no suitable living donor and for whom small pediatric grafts alone would be inadequate Table 1. This concept broadens transplant strategies in regions dependent on LDLT and could redefine allocation algorithms for partial deceased grafts.

Table 1: showing demographic and operative data of both donors and the recipient.

Donor 1 Operative data	Donor 2 operative data
Deceased donor full graft OR time 245 min CIT 487 min Full graft with standard anatomy Graft weight 312 gm.	Robotic LLS OR time 310 min WIT 8 min Blood loss 50 ml LLS (1 HV, 1 PV, 1 HA, 2 BD) Graft Weight 181 gm.
Recipient Operative data	
Full graft on the Right side and LLS on the Left side. OR time 350 min. Blood loss 1.5 L Total liver weight 493 gm (GRWR 1).	
First Graft	Second Graft
IVC of the graft To RHV with IVC extension of the patient side to side.	LHV of the graft to LHV of the patient.
MPV of the graft to RPV of the patient.	LPV of the graft to LPV of the patient.
CHA of the graft to CHA of the patient.	LHA of the graft to replaced LHA from LGA of the patient.
CBD of the graft to CBD of the patient.	2 BD of the graft to the jej. As 2 separate anastomoses.

Conclusion

Hybrid dual-graft liver transplantation integrating a deceased donor full graft with a robotic living donor partial graft offers a safe and effective method to expand the donor pool. This approach merges the strengths of both modalities maximizing deceased graft utility and ensuring donor safety. It represents a forward-looking strategy for transplant centers operating in regions with limited deceased donation infrastructure and a potential paradigm for future policy development.

References

1. Yang CH, Chen CL, Wang CC, Concejero AM, Wang SH, Liu YW, et al. Dual grafts in adult-to-adult living donor liver transplantation: a single center experience in Taiwan. *Surgery*. 2009;145(2):212-18.
2. Zidan A, Sturdevant M, Alkhail FA, Alabbad S, Boehnert MU, Broering D. The first two cases of living donor liver transplantation using dual grafts in Saudi Arabia. *Ann Saudi Med*. 2019;39(2):118-123.
3. Moon D, Lee S, Hwang S, Kim K, Ahn C, Park K, et al. Resolution of severe graft steatosis following dual-graft living donor liver transplantation. *Liver Transpl*. 2006;12(7):1156-60.
4. Cho HD, Samstein B, Chaundry S, Kim KH. Minimally invasive donor hepatectomy: systematic review. *Int J Surg*. 2020;82:187-191.
5. Otte JB. Donor complications and outcomes in live-liver transplantation. *Transplantation*. 2003;75(10):1625-26.
6. Broering DC, Elsheikh Y, Alnemy Y, Zidan A, Elsarawy A, Saleh Y, et al. Robotic Versus Open Right Lobe Donor Hepatectomy for Adult Living Donor Liver Transplantation: A Propensity Score-Matched Analysis. *Liver Transpl*. 2020;26(11):1455-64.
7. Broering D, Sturdevant ML, Zidan A. Robotic donor hepatectomy: A major breakthrough in living donor liver transplantation. *Am J Transplant*. 2022;22(1):14-23.