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# Donor Selection and Surgical Technique for en Bloc Liver–Small Bowel Graft Procurement

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COMBINED liver–small bowel retrieval has been successfully performed in 12 cadaveric donors over a 19-month period. Eight allografts were implanted en bloc, while the remainder were separated after retrieval and implanted independently.

This report details the important aspects of donor selection and procurement that ensure the yield of quality organs and facilitate later implantation.

## METHODS

Three adults (mean age, 34.7 years; range, 21 to 47 years) and nine children (mean age, 2.9 years; range, 8 days to 16 years) with a broad range of causes of death were selected as cadaveric donors (Table 1). Two other candidates were accepted and explored but rejected after peritonitis (one case) and mesenteric lymphadenopathy (the second case) were encountered.

Initially, our preference was for infant and juvenile donors with stable hemodynamic parameters.[1] However, the age range was expanded, provided the patients exhibited hemodynamic stability on minimal vasopressor support ($\leq 10$ $\mu$g/kg/min of dopamine). Size considerations were given special attention (Table 1). In elective circumstances we chose donors who were 15% to 40% smaller than the designated liver–small bowel recipient. Superimposed liver failure in one case forced the urgent assignment of a larger donor.

Preoperative liver function was evaluated with the standard criteria for liver donor selection. Because of time constraints, no functional assessment of the small bowel could be performed. It can only be inferred that young hemodynamically stable patients with acceptable liver function tests will have normal intestinal function and anatomy. Decontamination of the donor small bowel, using a combination of oral nonabsorbable and intravenous antibiotics, was accomplished.

**Table 1. Donor Data: Causes of Death and Donor–Recipient Size Matches**

| Case | Cause of Death | Donor/Recipient Weight (lb) |
|---|---|---|
| F, 36 y | Intracranial bleeding | 119/141* |
| F, 2.7 y | Bacterial meningitis | 26.4/27.3† |
| M, 16 y | Closed head injury | 100/117† |
| F, 1.2 y | Drowning | 20/44† |
| M, 1.8 y | Smoke inhalation | 28.6/30.8† |
| M, 8 d | Intracranial bleeding | 7.5/15† |
| F, 0.5 y | Closed head injury | 13.8/21.3† |
| F, 0.9 y | Drowning | 18/24.2† |
| M, 21 y | Closed head injury | 198/154† |
| M, 2 y | Closed head injury | 28.6/31* |
| M, 1.8 y | Drowning | 26.4/18* |
| F, 47 y | Intracranial bleeding | 137/98* |

*Isolated small bowel transplant.
†Liver–small bowel transplant.

The essence of the retrieval technique entails a hepatic hilar dissection followed by an ascending and transverse colon mobilization and division of the proximal and distal small bowel. Next, a duodenopancreatectomy strips away unnecessary tissues and prepares the target organs for selective cooling. We limit the cold perfusion of the composite graft to avoid small bowel edema. Additional cold flushing of the liver alone is performed as necessary. The composite graft is removed after the thoracic organs and packed in University of Wisconsin solution for transport. Kidneys, and in some cases the pancreas for islets, are subsequently removed.

Eight of 12 composite organs have been procured and transplanted en bloc, whereas the remaining four allografts were procured en bloc and separated at the back table for independent allocation.

## RESULTS

Assurance of gross anatomic integrity of the grafts was provided by the intraoperative appearance in both the donor and the recipient, and by postoperative stomal characteristics and serous effluent. Seven of the eight patients who received a combined intestine and liver graft remain alive from 164 to 557 days posttransplant (mean, 338 days). One patient died 23 days after transplantation from graft-vs-host disease. All of the isolated small bowel grafts ($n = 4$) functioned with minimal ischemic injury. Patient follow-up is 35 to 642 days (mean, 202 days).

Of the four liver allografts, two failed and required early retransplantation, one from unsuspected hemochromatosis, and the other from hepatic artery thrombosis.

## DISCUSSION

Donor age, hemodynamic stability, and donor–recipient size match should be primary donor considerations for liver–small bowel retrieval.

Selecting a stable donor increases the likelihood of obtaining quality organs and permits a meticulous dissection that often takes 2.5 hours by an experienced transplant surgeon. This in vivo dissection allows complete hemostasis of smaller vessels that can lead to meddlesome bleeding or lymphorrhea after engraftment, and permits

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visualization of critical anatomic structures that might be easily injured when dissecting ex vivo.

Judgment about the donor–recipient size match is important. The majority of recipients have had extensive visceral resections, leading to progressive volume reduction of the abdominal cavity. Therefore, the selected donors were generally of lesser size and weight. Problems with the use of smaller donors and consequent discrepancy of the great veins can be obviated by engrafting the liver with the "piggyback" technique.[2] When the donor is of nearly equal size or larger than the recipient, staged abdominal wall closure may be necessary, as in one case at our center.

We have demonstrated a successful approach to donor selection and liver–small bowel retrieval. The procedure has yielded quality organs without major anatomic or microscopic preservation injury.

## REFERENCES

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