

# Three Liver Transplants After a Single Cadaveric Procurement: Split Liver Transplantation Plus Domino Liver Transplantation, an Infrequent but Valid Alternative for Maximizing Transplant Sharing and Applicability—Report of the First Latin American Case

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## TO THE EDITORS:

The development of liver surgery and the need to overcome the shortage of cadaveric grafts have stimulated the creativity of surgeons in describing different options for using segmental liver grafts. Reduced size liver transplantation, ex vivo and in situ split liver transplantation, and living related donor liver transplantation are options that have spread since their original descriptions.<sup>1</sup> In the setting of these accepted strategies, the option of performing sequential or domino liver transplantation with livers from patients with familial amyloidotic polyneuropathy (FAP) has become possible, and these patients have started to be used worldwide as whole living donors for patients who otherwise would not benefit from the current allocation system and cannot apply for a segmental adult living donor graft. The success of some of the aforementioned techniques can be currently followed via Web-based registries such as the Familial Amyloidotic Polyneuropathy World Transplant Registry, which includes 62 centers in 21 countries performing orthotopic liver transplantation with FAP donors.<sup>2</sup> The need to foster maximal sharing has led to surgical innovations for further splitting FAP livers or performing split liver transplants for a pediatric recipient and an adult recipient with FAP followed by sequential or domino liver transplantation; however, only a small number of cases of this kind have been described.<sup>3–5</sup> Therefore, we report here our experience with the first case of split transplantation plus

domino transplantation in Latin America at 2 Argentinean institutions.

## PATIENTS AND METHODS

The liver of a 19-year-old cadaveric donor with a donor risk index of 1.97 who died from head trauma was nationally distributed and allocated to a 13-month-old patient (12 kg) with acute liver failure of an unknown etiology. The left lateral segment was accepted, and the surgical team proposed splitting the organ and giving the right lobe plus segments I and IV to an adult recipient. In accordance with the Argentinean organ allocation policy, the right section of the liver was distributed nationally and was accepted by our program for a 41-year-old male patient (61.4 kg) with FAP and a Model for End-Stage Liver Disease score of 17; he was 30th on the national list. After the right split had been accepted, his FAP liver was offered to the same national list, and it was accepted for a second adult, a 63-year-old female (81 kg) with cryptogenic cirrhosis and encephalopathy (also from our program) who had a Model for End-Stage Liver Disease score of 20; she was 19th on the national list.

The logistics were arranged for performing an ex vivo split at the pediatric hospital while the 3 recipients were prepared for engraftment: the pediatric recipient at a public pediatric hospital and the 2 adult recipients at our private institution.

Address reprint requests to Gabriel Gondolesi, M.D., Institute of Multiorgan Transplantation, Unit of Hepatology, Hepatobiliary Surgery and Hepatic Transplantation, University Hospital, Favaloro Foundation, Avenida Belgrano 1782, 7mo piso (1093), Buenos Aires, Argentina. E-mail: ggondolesi@ffavaloro.org

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TABLE 1. Technical Aspects, Early Outcomes and Complications

	Graft	Cold Ischemia Time	Aspartate Aminotransferase (U/L)/ Alanine Aminotransferase (U/L)/ Prothrombin Time (%)			Complications	Length of Stay
			24 Hours	Day 7	Day 14		
Pediatric recipient	Left lateral segment (split)	9 hours 55 minutes	6041/1569/31	79/278/83	24/7/76	Abdominal wall closure on postoperative day 2 Cytomegalovirus pneumonia	Continuing
Adult male recipient	Right lobe + segments IV and I	10 hours 25 minutes	5767/2300/25	79/408/100	20/45/100	—	10 days
Adult female recipient	Whole FAP liver	3 hours 25 minutes	224/278/37	152/358/91	73/296/100	—	13 days

The left lateral segment was engrafted via the classic technique with triangulation of the cava anastomosis (without the need for vascular grafts) and a transient abdominal wall closure with Silastic mesh (removed 48 hours after the procedure).

For the adult recipient with FAP, we chose to dissect the diaphragm from the upper cava to gain length, and we proceeded to remove the FAP liver with the whole cava; therefore, the engraftment of the right split was performed with cava replacement followed by an end-to-end portal anastomosis. The artery was handled with a cuff from the celiac trunk at the level of the splenic artery and was anastomosed to the proper hepatic artery. Bile duct reconstruction was performed in an end-to-end fashion with a 5-Fr T-tube.

In the third recipient, the engraftment was managed with the piggyback technique with an end-to-end portal anastomosis, and the hepatic artery was anastomosed through the construction of a cuff of the hepatic artery at the level of the gastroduodenal artery. The bile duct was handled in an end-to-end fashion without a T-tube.

The adult patients were discharged. All patients were alive at 40 days of follow-up. Table 1 summarizes the technical aspects, complications, and lengths of stay. This report received review board approval.

## DISCUSSION

One child and 2 adults with end-stage liver disease shared a common need: liver transplantation. Their positions on a common national waiting list were different. They were unaware of the fact that they would be sharing not only a need but also a common dream and history.

They became the first case in Latin America of an infrequent procedure that has been proved in other continents to be the maximum example of organ sharing (a true domino effect): the combination of split liver transplantation using a cadaveric liver and sequential transplantation using a living whole liver donor.

The literature reports a small number of similar experiences in Europe and the United States;<sup>3-5</sup> however, more cases like this are needed in order to reduce mortality on the waiting list. These procedures require hard work, adequate selection, patient commitment, and enough resources for 4 surgical teams to perform the partition of the cadaveric liver and simultaneously perform 3 liver transplant operations.

The challenge of these procedures lies in knowing how many vessels need to be preserved in 1 graft or patient and how many vessels need to be shared in order to be able to safely use the 3 liver grafts.

This case exemplifies the fact that despite different institutional health systems (public and private), when medical needs are met by teams willing to face challenges, split and domino techniques will be used

more worldwide to successfully reduce the shortage of organs and increase the applicability of liver transplantation.

**Gabriel Gondolesi, M.D.<sup>1</sup>**  
**Pablo Barros Schelotto, M.D.<sup>1</sup>**  
**Esteban Halac, M.D.<sup>2</sup>**  
**Pablo Romero, M.D.<sup>1</sup>**  
**Marcelo Dip, M.D.<sup>2</sup>**  
**Guillermo Cervio, M.D.<sup>2</sup>**  
**Diego Ramisch, M.D.<sup>1</sup>**  
**Francisco Klein, M.D.<sup>1</sup>**  
**Silvia Niveyro, M.D.<sup>1</sup>**  
**Guillermo Orce, M.D.<sup>1</sup>**  
**Silvina Yantorno, M.D.<sup>1</sup>**  
**Valeria Descalzi, M.D.<sup>1</sup>**  
**Oscar Inventarza, M.D.<sup>2</sup>**

<sup>1</sup>Institute of Multiorgan Transplantation  
Unit of Hepatology  
Hepatobiliary Surgery and Hepatic Transplantation  
University Hospital  
Favaloro Foundation  
Buenos Aires, Argentina

<sup>2</sup>Department of Liver Transplantation  
Garrahan Hospital  
Buenos Aires, Argentina

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