Using Donation After Cardiac Death Donors in Liver Transplantation

There is a growing disparity between the number of patients requiring transplantation and the supply of available organs. Today there are approximately 17,000 people waiting for a liver transplant, but in 2005, there were only 6,444 liver transplants performed using livers from either deceased donors or living donors. Based on the shortage of donors and waiting list deaths, there have been attempts to expand the donor pool. One of these methods is the use of donation after cardiac death (DCD) donors.

There are two types of deceased donors: donation after brain death (DBD) donors and donation after cardiac death (DCD) donors. For DBD donors, the transplant organs are prepared for procurement while there is still cardiac activity. After the insertion of an aortic cannula for the organ preservation solution, the flush of the solution is begun and the donor then has cessation of cardiac activity. Up to the moment of flushing of this preservation solution, the donor maintains a blood pressure and pulse. The DCD donors do not meet brain death criteria; however, the decision to withdraw life-sustaining support has been made by the family in the context of imminent death. In this setting, organ donation may be considered after cessation of all cardiac activity, and the patient is declared deceased. The operation is then performed and the organs are flushed with preservation solution.

Prior to the development of brain death criteria, most liver allografts were from DCD (formerly known as non-heart-beating) donors. Since the establishment of the definition of brain death in 1968, there has been a shift in the primary source of cadaveric donor organs from DCD donors to DBD donors. However, the waiting list for organ transplantation continues to expand while the donor pool has not significantly increased in the last 5 years.

Over the last several years there has been renewed interest in DCD liver allografts in response to the Institute of Medicine report that the use of these organs is medically ethical and acceptable. The use of DCD livers has been reviewed by many different institutions. There has been concern over an increased incidence of complications in these grafts due to donor hypoperfusion until the moment of cardiac death. Several institutions have reported decreased patient and graft survival, as well as increased complications such as primary non-function (PNF) and ischemic cholangiopathy.

Our experience at the University of Washington Medical Center Liver Care & Transplantation Program with the use of DCD liver allografts began in 2003. We have experienced exceptional results in the ability to get our patients transplanted. Our transplant rate for the patients on our waiting list from 7/1/2004 to 6/30/2005 was 84%. Using national data for comparison, our expected rate would have been only 55%. This is a significantly higher rate (p<0.01) of transplanting our patients, and directly affects the mortality on the waitlist. Our waitlist mortality of 9% for 7/1/2004 until 6/30/2005 was statistically lower by 50% than the 18% that we would have been expected to have based on national statistics. The median time to transplant 50% of our list for 7/1/2000 until 12/31/2005 is 7.2 months compared to 24.2 months for the rest of the United States.

As our experience grows using DCD donors, we have found that we have maintained excellent patient and graft survival. For 7/1/2003 until 12/31/2005 our 1-year graft survival of 83.43% and patient survival of 87.2% was exactly as expected compared to national results.
We also have not had any increased risk for hepatic artery thrombosis (HAT) or PNF of the liver. However, there does appear to be an increased risk for ischemic cholangiopathy. Ischemic cholangiopathy is defined by multiple intrahepatic strictures of the donor biliary system. Knowledge has gradually increased about this phenomenon, which initially was associated with HAT. Of patients who received DBD donor livers and subsequently developed non-anastomotic or biliary tree strictures, most are found to have experienced HAT. However, it has been noted that 2-20% of patients with normal vasculature also developed pathologic ischemic-appearing changes of their bile ducts. These changes in the presence of a normal vasculature are generally referred to as ischemic biliary lesions or ischemic cholangiopathy. More recently, this pathology is becoming associated with the use of DCD donor livers secondary to their initial hypoperfusion at procurement. An initial report of liver transplantation with DCD donor livers had reported a 26.6% incidence of ischemic cholangiopathy. At the University of Washington Medical Center, we have had a 15% incidence of ischemic cholangiopathy with these livers. We have re-transplanted two patients for this condition, and both patients are alive and well.

The use of DCD organs is expanding our donor pool, allowing us to transplant our patients sooner, and decreases the number of waitlist deaths. It also represents a way for families to donate organs of loved ones who do not meet the traditional brain death criteria. We are exploring further research to determine how to decrease the risk of developing ischemic cholangiopathy with these donors.

—Edie Y. Chan, M.D.