Surgical Technique of Cadaver Donor Nephrectomy

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BACKGROUND

Numerous advances in surgical technique and immunosuppressive therapy have led to the current status of renal transplantation as a highly successful treatment option for patients with chronic kidney disease. Presently, more than 50,000 patients await kidney transplantation, and, despite considerable efforts to meet the increasing demand, the number of suitable cadaveric kidneys remains stable (approx 18,200 cadaveric kidney transplants in 2002). This ever-increasing disparity requires the urological surgeon to have a thorough understanding of the principles of kidney procurement for transplantation. On a broad level, the goals of cadaver donor nephrectomy are identification of suitable cadaveric kidney donors and technical performance of the operation such that the excellent organ function is achieved.

The vast majority of cadaveric donors satisfy criteria for brain death. Recent improvements in outcomes with transplantation of kidneys from donors suffering cardiac death (non-heart-beating donors) have slightly increased the pool of potential kidney donors by adding donors who may not meet strict brain death criteria. In general, cadaveric kidney donors range between the ages of 12 mo and 75 yr. The history is reviewed, and chronic conditions that affect renal function, such as hypertension or diabetes, are noted. Additionally, the hospital course both prior to and after declaration of brain death should also be reviewed. Changes in hemodynamic parameters, such as prolonged periods of hypotension, may result in acute tubular necrosis and delayed graft function posttransplantation. Furthermore, vasopressor use, particularly at high doses, may result in renal vasoconstriction and add to graft dysfunction. Normal renal function is verified by clinical assessment of the urine output during the period of hospitalization and laboratory analysis of blood urea nitrogen, serum creatinine, and urinalysis.

SURGICAL TECHNIQUE

Cadaver donor nephrectomy is most often performed in conjunction with procurement of other solid organs for transplantation. Frequently, this includes procurement of heart and lungs as well as liver and pancreas. Operative techniques of liver and pancreas procurement are not discussed in this chapter; but knowledge of the operative principles of liver and pancreas procurement are useful to the kidney procurement surgeon. The principles of abdominal organ procurement are the same regardless of the organs removed. These include wide exposure, cannulation for in situ perfusion, isolation of organs to be removed in continuity with their central vascular structures, and orderly removal of the organs under cold perfusion. In the setting of a combined thoracic and multiple abdominal organ donor, the initial dissection is performed by the thoracic and liver-procurement teams. After cross-clamping and perfusion, the organs are removed in the following order: heart, lungs, liver, pancreas, and kidneys. This chapter focuses on the operative technique of kidney procurement in kidney-only cadaveric organ donors.

Exposure and Initial Dissection

Following hemodynamic stabilization, the organ donor is brought to the operating room and placed in the supine position. A small rolled towel may be placed between the shoulder blades, and the neck can then be hyperextended to facilitate median sternotomy. A long midline incision from the suprasternal notch to the symphysis pubis is utilized to obtain exposure (see Chapter 1). A median sternotomy is not absolutely necessary in kidney-only procurement procedures, but the improved exposure afforded by this maneuver enables easier control of proximal aorta and allows for venous outflow in the chest. The sternum is retracted with a sternal retractor, and the abdomen is widely retracted with a large Balfour retractor.
Assurance of complete neuromuscular blockade is essential to maximizing exposure.

The initial steps in the abdominal dissection of all cadaveric organ donors should be directed toward exposure of the retroperitoneal structures and isolation of the distal aorta for cannulation. Performance of this step early in the operation allows for immediate cannulation should the donor become unstable. The retroperitoneum is exposed by incising the posterior peritoneum beginning near the root of the small bowel mesentery and continuing around the hepatic flexure (Fig. 8.1). Division of the inferior mesenteric vein (IMV) allows for improved exposure of the left renal vein. The viscera are then generously retracted superiorly, and the impulse of the superior mesenteric artery (SMA) should be palpable directly superior to the left renal vein. The abundant neural and lymphatic tissue around this vessel should be divided, and the SMA should be carefully encircled at this location. It is imperative to maintain the dissection on the SMA adventitia, as attempts to encircle this vessel from the incorrect dissection plane are fraught with difficulty and may result in significant bleeding. Additionally, the SMA should be isolated near its origin from the aorta, as aberrant hepatic arterial branches may hamper dissection beyond the first 1–2 cm. Although not absolutely necessary, isolation of the SMA aids in identification of aberrant hepatic arteries when the liver and pancreas are being procured and, more importantly, for the purpose of kidney-only procurement, enables the surgeon to maximize kidney perfusion (through occlusion of the SMA).