Objectives: Multiple renal arteries in donor kidneys are not a rare entity. Whenever encountered, they pose a surgical challenge in renal transplant because they require a more complicated back table vascular reconstruction and implant technique. We developed a unique step-by-step in vivo illustration of the application of shortening a Carrel (aortic) patch to address multiple arteries in deceased-donor renal transplant.

Materials and Methods: Case report.

Results: We present the case of a 63-year-old man who received a left kidney from a deceased donor with 2 arteries on a Carrel patch that were anastomosed in a neopatch model.

Conclusions: A donor kidney with multiple arteries is a challenge before arterial anastomosis. Various anastomotic patterns have been described for this situation. Treatment of multiple arteries depends mainly on the donor source (living or deceased), the characteristics of multiple arteries, and the transplant surgeon’s preference. When the length of the aortic patch of a deceased donor is > 2.5 cm, the surgeon may shorten it and form a neopatch to facilitate a single arterial anastomosis to the recipient.

Key words: Aortic patch, Renal transplant, Surgery, Technique

Introduction

The most common anatomic variant observed in donor kidneys for renal transplant is multiple renal arteries (18%-30%). In this situation, technical complications with an increased incidence of arterial stenosis and thrombosis are more likely to occur. In living-donor renal transplant, multiple arteries demand more complicated back table reconstruction (cold ischemia time), prolong the implant time (warm ischemia time), and prolong the total ischemia time. The incidence of delayed graft function may be higher. In deceased-donor renal transplant, the presence of the aortic patch is a great advantage, because 2 or more arteries can be transplanted in 1 anastomosis to the recipient iliac artery. To our knowledge, this is the first case with a step-by-step illustration of the technique of shortening a Carrel patch to address multiple arteries in renal transplant.

Case Report

A 63-year-old man, who had end-stage renal disease for 5 years because of hypertension, received a left renal graft from a 46-year-old male deceased donor (1/1/0 HLA mismatch), with 2 arteries on a Carrel patch, a single vein, and a single ureter. Dissection of the external iliac artery revealed a mildly atheromatous artery. The renal vein was anastomosed to the external iliac vein in the conventional end-to-side fashion. The distance between the main renal artery and the inferior pole renal artery was > 2.5 cm; therefore, we decided to shorten the patch instead of proceeding with 2 separate arterial anastomoses (Figure 1). The aortic patch was anastomosed to the external iliac artery in the conventional end-to-side fashion (Figure 1). When the clamp was released, there was good hemostasis and graft perfusion. The ureter was implanted to the bladder with an onlay extravesical ureteroneocystostomy using a double J stent. Immediate postoperative duplex ultrasonography of the graft (according to our clinic protocol) showed good perfusion throughout the kidney, with good flow through the external iliac artery. The anastomosis time was 38 minutes, total
ischemia time was 11 hours, and total operative time was 180 minutes. The graft responded gradually, with a decrease in creatinine level from 813 μmol/L (9.2 mg/dL) preoperatively to 126 μmol/L (1.43 mg/dL) (estimated glomerular filtration rate > 60 mL/min/1.73m²) on postoperative day 12. The patient was discharged uneventfully on postoperative day 14.

Discussion

Donor kidneys with multiple arteries pose technical challenges to the transplant surgeon. There are various anastomotic patterns for this situation. Treatment of multiple arteries depends on the type of donor (living or deceased), the characteristics of multiple arteries, and the transplant surgeon’s preference.

The most common surgical technique to anastomose multiple arteries of deceased-donor kidneys uses a single Carrel patch containing all the arterial orifices that is anastomosed in an end-to-side manner to the external iliac artery. Anastomosis of 2 arteries close together on an aortic patch of a left-sided deceased-donor kidney is comparatively straightforward, whereas dual arteries in a right-sided kidney often make positioning of the kidney difficult without kinking 1 or the other artery; sometimes the arteries must be shortened to fulfill 2 separate anastomoses, and shortening the patch is contraindicated. If they are > 2 to 2.5 cm apart, consideration could be given to perform 2 separate anastomoses or to shorten the patch to facilitate the anastomosis and ensure adequate and smooth perfusion of the graft. More specifically, the second option is to excise a segment of aorta and reshape the Carrel patch to achieve a single anastomosis to the recipient iliac vessel and keep the secondary warm ischemia time short; however, this is done in a manner that does not stretch the arteries and lead to narrowing of the lumen, which may increase the risk of dissection of the endothelium and subsequent arterial and graft thrombosis in the recipient.

The creation of this neopatch could be an interesting surgical proposal, especially in cases where the initial full-length patch does not have extreme atheromatosis. Atheromatosis may risk failure to create the neopatch due to the possibility of arterial wall dissection, blood leak, or rupture at the fine single suture (6-0 continuous polypropylene) of the neoaortic anastomotic line after the release of clamps and revascularization of the graft.

Very small accessory renal arteries, particularly at the upper pole, can be ligated (superior pole arteries with diameter < 1 mm and ischemic surface < 1 cm²). However, for arteries with a diameter...
similar to the common renal artery, anastomosis should be performed. As far as the inferior pole artery is concerned, it is more difficult to sacrifice the inferior pole artery because of its potential blood supply to the ureter and risk for ureterovesical anastomosis leakage, ureteral necrosis, and urinary fistula. The inferior pole artery should be anastomosed end-to-side to the renal artery. In cases where the iliac artery is extremely atherosclerotic, the graft should be anastomosed to the internal iliac artery or inferior epigastric artery in an end-to-end fashion.6-8

Meticulous judgment of the quality of the aortic patch and length of the arteries will contribute to the successful outcome of the reconstruction. Remodeling a long patch of a graft with short arteries may lead to stretching and narrowing of the lumen and extreme tension on the patch, with catastrophic consequences. When appropriate technique is used, the vascular complication rate of multiple renal artery transplant is similar to that of single renal artery transplant.1 To our knowledge, this is a unique case with an intraoperative step-by-step illustration of the shortening of a Carrel patch to address multiple arteries in renal transplant, and this may be a valuable adjunct to the transplant surgeon’s armamentarium.

References