Surgical Stapler for Right Renal Vein Elongation Using the Inferior Vena Cava in Kidney Transplant

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Abstract

Elongation of the right renal vein with the inferior vena cava (caval patch) using a vascular stapler offers a safe means of extending the deceased-donor right renal vein, while minimizing the ischemic time of the kidney during preparatory dissection. The aortic patch of the right renal artery also can be preserved, which minimize the danger of arterial stenosis, kinking, and dissection.

Key words: Caval patch, Deceased donor, Ischemic time

Introduction

A major challenge in transplanting the right kidney involves the presence of a short renal vein.1,2 Technical problems associated with the venous anastomosis have been reported in 1% to 18% of all renal transplants2-4 and are related mainly to damage sustained during the retrieval or transplant and to anatomic variations (ie, multiple vessels).3,4

According to Bakir and associates,5 transplanting the right kidney is a significant independent risk factor for graft thrombosis. Reported anatomic risk factors are the disparate length between artery and vein (which may cause arterial kinking when the graft is placed in situ; the removal of the aortic patch to shorten the renal artery), with an increased risk of arterial complications (ie, dissection, stenosis).

To reduce this risk, many authors have described different methods to elongate the right renal vein. We report elongation of the renal with the vascular stapler ETS-FLEX-35 (Endoscopic articulator linear cutter, Ethicon Endo Surgery, LLC; Ethicon Inc., West Somerville, NJ, USA) using the inferior vena cava as a conduit.

Surgical technique of elongating the right renal vein

After an en bloc resection of the kidneys from the donor, and subsequent separation of the organs, the left renal vein was taken approximately 3 to 4 mm away from the vena cava. The right kidney usually was retrieved along with the inferior vena cava. A conduit of the inferior vena cava was easily constructed by stapling proximally and distally across the vena cava to the right renal vein with the use of the vascular stapler (Figure 1).

After the venous anastomosis, the elongated vein was checked (Figure 2); eventual bleeding points along the staple lines can be fixed easily with Prolene stitches before reperfusion of the graft. We performed 49 kidney transplants, which necessitated elongation of the right renal vein; 15 of which had 2 or more arteries, and 34 had a single artery. In 40 cases, we

Figure 1. Renal Vein Elongation by Stapling Proximally and Distally Across the Vena Cava to the Right Renal Vein With the Use of the Vascular Stapler (Arrow)
preserved the aortic patch. In all cases, we performed an end-to-side anastomosis between the renal vein and the external iliac vein. The arterial anastomoses were performed on the external iliac artery. In all cases, the venous anastomoses were successfully performed. No cases of venous thrombosis or bleeding from the vein elongation during the early postoperative phase were reported to date.

**Discussion**

In renal transplant, the equal length between artery and vein facilitates the vascular anastomosis and the placement of the graft in the iliac fossa after reperfusion. This goal is difficult to achieve with the right kidney, which often presents disparity in length between artery and vein. In a recent analysis of 119 right kidneys, Janschek and associates found that the average length of the right renal vein to be almost one-half of the artery’s length (A/V mean ratio, 1.8).

Attempts to join a renal vein of inadequate length to the iliac vein are likely to result in an anastomosis that is angulated or under tension and consequent increased risk of renal vein thrombosis. This risk is minimized by elongating the right renal vein. Benedetti and associates, in their study, showed that the use of a vein extension had an effect on the outcome. Three hundred five deceased-daughter transplant recipients received a right kidney. Of these, 76 received a graft with vein extension. None experienced technical vascular complications; however, 5 of the 229 (2.2%) without vein extension did. There was no difference regarding graft survival at 2 years’ follow-up.

Right renal vein elongation with the inferior vena cava seems to be a better approach than other techniques described for elongation of renal vein, namely *venous saphenous autograft, spiral gonadal vein, iliac and femoral cryopreserved grafts, bovine arterial heterograft* and a *vascular prosthesis*. In addition, the donor team routinely provides the right kidney with the vena cava attached, as it does not interfere with the multiorgan procurement.

Use of the vascular stapler to create a conduit with a caval patch offers an expeditious means of extending the right renal vein, while greatly minimizing the ischemic time of the kidney during the back table dissection. This technique eliminates extensive mobilization of the external iliac vein to gain additional length, and likelihood of lymphoceles, haemorrhage, or thrombosis. Similarly, dissection of the hilum of the donor kidney to lengthen the right renal vein is not needed (nor is it recommended) owing to the risk of parenchymal/hilar hemorrhages (difficult to control after reperfusion), and injury of the blood supply of the pelvis and ureter, which can cause necrosis or late ureteral stenosis (owing to ureteral ischemia and delayed ureteral fibrosis).

The kidney can be placed above the iliac vessels even in case of anatomic variations of the graft (multiple vessels) or the recipient (large abdomen and/or deep pelvis). The aortic patch can be preserved, thereby reducing the risk of arterial graft kinking, renal transplant artery stenosis, and thrombosis. In addition, short vessels can significantly prolong the operative times and extend the length of the warm ischemia during the vascular anastomoses.

In conclusion, elongation of the renal vein with the contiguous inferior vena cava using the vascular stapler is a safe way to overcome technical problems faced in transplanting the right kidney.

**References**