Laparoscopic en bloc kidney transplantation

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ABSTRACT

Laparoscopic donor nephrectomy is well established procedure and having advantages over open donor nephrectomy in terms of having less pain, early ambulation and rapid post operative recovery. To extend the advantages of laparoscopic surgery to the recipient, recently we have performed laparoscopic kidney transplantations when kidney was procured from deceased donors. As a further extension of the procedure, here we present a case of laparoscopic en bloc kidney transplantation in obese diabetic recipient who received kidneys from 70 year old non-heart beating donor.

Key words: Expanded criteria donor, en bloc, kidney transplantation, laparoscopy

INTRODUCTION

Laparoscopic surgery has distinct advantages over open surgery in terms of less pain, early ambulation, rapid convalescence and better cosmesis. These advantages are present both for upper abdominal surgery like donor nephrectomy and also for lower abdominal surgery like hernia repair.[1-5] In the scenario of kidney transplantation, the recipient operation is performed by open surgery. Recently, we have described the feasibility and safety of laparoscopic kidney transplantation when graft was obtained from deceased donor.[6] In this series of four patients, in comparison to open surgical approach, the incision size was much smaller and overall outcome in terms of creatinine clearance was the same as open kidney transplantation procedure performed from the same deceased donor.

Due to scarcity of the organs available for kidney transplantation many centers have started accepting kidney from expanded criteria brain dead deceased donors and donation after cardiac death (DCD). Transplantation of two kidneys in one recipient from expanded criteria deceased donor has a better outcome compared to when kidney was transplanted individually in two different recipients.[7-9] Both kidneys are transplanted in either monolateral or bilateral iliac fossa.[10,11] A single large incision or two different incisions in the lower abdomen are usually required for performing such an operation. Incision-related morbidity, especially in the setup of transplantation is well known. To avoid such morbidity we report a case of laparoscopic en bloc transplantation from a non-heart-beating deceased donor.

MATERIALS AND METHODS

An en bloc kidney graft was obtained from a 70-year-old non-hypertensive, non-diabetic female donor after her cardiac death (Maastricht Category III). Her terminal serum creatinine value was 1.5 mg/dl. Rapid procurement technique was used and in situ perfusion carried out with Histidine-tryptophane-ketoglucarate fluid. Kidneys were removed en bloc; both kidneys had small multiple cysts. There was no extensive atherosclerosis in the aorta and renal vessels. On bench, the suprarenal aorta and vena cava were closed by polypropylene suture material and openings of lumbar vessels were closed. The cold ischemia time was 11 h. The recipient was a 55-year-old female with diabetic nephropathy and on thrice a week maintenance hemodialysis for one and a half years. Her body mass index was 30.1 kg/m². She had two abdominal scars; one paramedian 20-cm long scar for emergency appendicectomy
performed 35 years back and, another midline vertical scar from symphysis pubis to umbilicus for purpose of cesarean section performed 27 years back. Gray scale ultrasound and color Doppler study of external iliac vessels showed normal flow pattern and no calcification in the arterial wall.

**Operative procedure**

Patient was placed in supine position and with right arm extended and left arm placed to the side of the patient. General anesthesia with endotracheal intubation was performed and radial artery on right side was cannulated for blood pressure measurement and for blood gas analysis during operative procedure. Four ports were placed as described previously. Division of a few intra-abdominal adhesions was carried out. In 20-degree Trendelenberg position, bowel loops were retracted upwards and iliac vessels dissected. A midline suprapubic 5-cm incision was placed and en bloc kidney allograft was placed into the peritoneal cavity. Wound was closed and pneumoperitoneum was reestablished. End to side anastomosis between the infrarenal vena cava and external iliac vein and aorta and external iliac artery was carried out using 5/0 polypropylene suture material [Figures 1-4]. Both ureters were reimplanted separately by the Lich-Gregoir method in bladder without stents [Figure 5]. One kidney was placed over the psoas muscle and was retroperitonealized while the other was placed in the peritoneal cavity and its capsule was sutured to the posterior peritoneum.

Drain tube was placed through lower 5-mm port site and port site wounds were closed.

Patient received rabbit-antithymocyte globulin as induction immunosuppressant and subsequently, tacrolimus, mycophenolic acid and prednisolone-based therapy was given.

**RESULTS**

Vascular anastomosis time was 50 min and there was no significant leak. Both kidneys became pink; turgidity was assessed by pressing kidneys with suction cannula and was found to be satisfactory. Urine output was present from both kidneys. Estimated blood loss was 100 ml and operative time was 3 h and 40 min.

Postoperatively, patient had right-side pneumonia and required intensive care unit admission for five days. There was no analgesic drug required and her visual analogue score remained between 0-1 for the first 72 h. She had delayed graft function for eight days and required hemodialysis four times. At the end of one month her serum creatinine value was 1.38 mg/dL and Diethyl Trimethyl Penta Acetic Acid renal scan showed 39.25 ml/min/1.73 m² glomerular filtration rate [Figure 6]. At six months of follow-up serum creatinine value is 1.39 mg/dL and color Doppler study shows normal perfusion of both kidneys.

**DISCUSSION**

Laparoscopic surgery has its established role for living donor nephrectomy in the scenario of kidney transplantation. Several prospective randomized trials have proved that patients undergoing laparoscopic donor nephrectomy have less pain, early ambulation, rapid convalescence and better cosmesis compared to open-donor nephrectomy.

Open kidney transplantation procedure is a well-established procedure and usually performed in one of the iliac fossa. Various incisions are described to have optimum exposure of the iliac vessels and urinary bladder for technically successful transplantation. The risk factors related to wound complications are well described in general surgery; transplant recipients have additional risk factors in terms of immunosuppressants.

Dual kidney transplantation requires either a single large incision when both kidneys are transplanted in the ipsilateral iliac fossa or two incisions in the right and left iliac fossa. A single large incision or multiple incisions give more pain and other wound-related morbidity. This is especially true for obese recipients who have further risk of wound infection. To minimize wound-related complications reduction in size of incision is successfully carried out. However, in obese recipients, small incision for transplantation may lead to excessive traction of the wound and subsequently hematoma of the muscle and more pain. Further, in obese recipients, access to the pelvic vessels and bladder for vascular anastomosis and ureteral reimplantation respectively is challenging through a small incision. Our patient was obese and had previous history of multiple abdominal operations.

Recently, we and others have described the feasibility of laparoscopic kidney transplantation (LKT) or robotic kidney transplantation. As a further extension of the procedure of LKT we have performed en bloc kidney transplantation from DCD donor. A large arteriotomy and venotomy is required to anastomose the aorta and inferior vena cava to the external iliac vessels. Compared to two separate transplantations, en bloc transplantation reduces the number and total time of vascular anastomosis. En bloc kidney transplantation is preferred for pediatric renal allograft. In the absence of significant atherosclerosis of the aorta and renal arteries, en bloc transplantation of kidneys is not a major problem. We do not recommend such transplantation in the presence of severe atherosclerosis. A theoretical risk of ischemia to the ipsilateral lower limb due to “vascular steal” may arise. However, “stealing” of blood supply could also occur in monolateral dual kidney transplantation. We did not find such complications in our previous experience of open dual kidney transplantation.

To avoid torsion of the one or both kidneys, one of the
Figure 1: Dissected external iliac artery and vein laparoscopically. Both kidneys are lying in the peritoneal cavity.

Figure 2: Infra-renal vena cava anastomoses to the external iliac vein. Posterior wall anastomosis is completed and anterior wall anastomosis is in progress. Vessel loop and hem o lok clips controlling the distal part of the external iliac vein are seen.

Figure 3: External iliac arteriotomy length extended to the diameter of the infra-renal aorta.

Figure 4: Completed anastomosis between the inferior vena cava and external iliac vein and, aorta and external iliac artery in end to side fashion.

Figure 5: Both ureters reimplanted into bladder separately.

Figure 6: DTPA renal scan is showing perfusion of both kidneys.

Kidneys was retroperitonealized and the other was fixed to the posterior peritoneum by taking few tugging sutures through its capsule.

Ureteroneocystostomy is used either by joining both ureters on the bench and making a single lumen to implant into the bladder, or both ureters are implanted separately. We
prefer to implant both ureters separately to provide adequate submucosal tunnel and anti-reflux mechanism.\(^\text{16}\)

Transplantation from expanded criteria deceased donor as defined by the United Network of Organ Sharing (UNOS) is a well-accepted modality of treatment to reduce the discrepancy between demand and supply of the organs for transplantation.\(^\text{17}\) Currently, there are no clear indications for dual kidney transplantation when the kidney is procured from DCD donors. We applied the same criteria laid down by the UNOS for dual kidney transplantation from brain dead patient and accepted graft as DCD–expanded criteria donor.

In conclusion, this is the first case report of laparoscopic en bloc kidney transplantation performed successfully.

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