UroToday International Journal®

www.urotodayinternationaljournal.com
Volume 1 - December 2008

Early and Late Complications in Living Donor Nephrectomies

Ahmed Shelbaia, Mostafa Abd El Mohsen, Ali Hussein
Department of Urology, Cairo University Hospitals, Cairo, Egypt
Submitted on 24 July 2008 - Accepted for Publication on 6 October 2008

ABSTRACT

Between May 2000 and May 2003, 300 living donor nephrectomies were performed through an extraperitoneal flank approach. The majority of complications were minor, easily diagnosed, and managed during hospital stay. Early postoperative complications were reported in 22 (7.33%) cases. Of these, wound complications were the most common, accounting for 10 (3.33%) complications, followed by 8 (2.67%) pulmonary complications. The most serious postoperative complication was frank wound bleeding necessitating wound exploration in 2 (0.67%) patients. Postoperative urinary retention was reported in 3 (1%) patients, and deep venous thrombosis was reported in 1 (0.33%). Urinary tract infections were diagnosed in 15 (5%) patients, and there was a stricture of the urethra in 1 (0.33%) patient. All cases were diagnosed and managed carefully. Follow-up lasted for 18-36 months. Late postoperative complications were reported in 28 (9.33%) patients, and urinary calculi were found in 12 (4%) donors.

We proved that retroperitoneal flank nephrectomy is a safe approach for the donor, with acceptable early and late surgical complications. It provides optimal allografts for transplantation, and there were no complications related to non-drain fixation.

KEYWORDS: Living donors, Nephrectomy, Surgical complications

CORRESPONDENCE: Ahmed Shelbaia, Department of Urology, Cairo University, Borg El Atbaa, Faisal Street, Giza, Egypt, ahmedshelbaia@yahoo.com

INTRODUCTION

Renal transplantation is now considered as the treatment of choice for end stage renal failure [1]. End stage renal disease represents a medical problem all over the world. The increased experience in immune modulation and refinement in surgical technique has made renal transplantation the optimal therapy for most patients with this disease. Due to the shortage of suitable cadaver kidneys and the low morbidity and mortality associated with living donor nephrectomies, renal transplantation is best achieved with living, related donors [2,3].

There are many approaches to living donor nephrectomies, including the thoraco-abdominal approach and through flank or anterior sub-costal incisions [4,5]. The main difference in surgical technique and morbidity is related to whether the procedure is performed transperitoneally or extraperitoneally. While fewer complications have been associated with the extraperitoneal approach, many centers continue to use the transperitoneal approach because it allows better exposure of the main renal vessels. This decreases the risk of vascular injury, including renal arterial spasm or injury to the uretral blood supply [4,5].

In this study, we evaluated the efficacy of live donor nephrectomies performed through a standard extraperitoneal flank approach, reporting the early and late surgical complications.

doi:10.3834/uij.1939-4810.2008.11.05

ISSN 1944-5792 (print), ISSN1944-5784 (online)

UroToday International Journal®
original study
Early and Late Complications in Living Donor Nephrectomies

PATIENTS AND METHODS

Between May 2000 and May 2003, 300 living donor nephrectomies were done at Cairo University Hospitals and New Kasr Elaini Teaching Hospital. 210 donors were males and 90 were females. Their ages ranged from 25 to 41 years.

Preoperative evaluation

Donors were identified on the bases of ABO compatibility, HLA tissue typing, and preliminary cross matching. Kidney evaluations were performed with excretory urographies (IVUs) and renal angiographies. Recently, three-dimensional multi-slice CT angiographies are replacing the conventional IVUs, and renal angiographies are becoming less invasive and more accurate. When single arteries and ureters were noted bilaterally, the left kidney was generally chosen for donation, since the longer renal vein facilitates transplantation.

When a duplex collecting system of multiple arteries was noted in one kidney, the contralateral one was taken. If there were other minor abnormalities, such as a discrepancy in renal size or simple renal cysts, the affected side always was taken, leaving the donor with the better kidney. The decision whether to use the right or left kidney was also guided by using radioisotope split renal function. Renal function was assessed by serum creatinine, creatinine clearance, and isotopic renal scanning. The kidney with the lower function was chosen irrespective of anatomical finding.

Preoperative preparation

It is very important to prepare the donor and minimize ischemic injury to the donor kidney. On the evening prior to the planned nephrectomy, a peripheral IV line was started, and the donor was hydrated at physiological rates. The rate was increased to give the patient one liter of fluids in the morning before induction of aesthesia together with 12.5 grams of mannitol. Under general anesthesia, intravenous fluids were continued at approximately 10-15 ml/kg/hour guided with urine output monitoring. During dissection of the renal pedicle, an additional 12.5 grams of mannitol were administered just before the renal artery was clamped. When the kidney was removed, it was flushed immediately first with warmed and then with cold Ringer's solution containing verapamil (Isoptin) and heparin. The kidney was implanted immediately in an adjacent room where the recipient's iliac fossa had been simultaneously prepared.

Operative techniques

The surgical principles used to provide the recipient with a healthy kidney were:

1. Surgical exposure should be wide to avoid any traction on the renal pedicle during dissection.
2. The main renal vessels must be dissected outside Gerota's fascia rather than in the true renal hilum to minimize the risk of vasospasm or injury to small arterial branches.
3. Fulguration around the main renal vessels must be avoided to protect against vasospasm.
4. Intrahilar dissection must be avoided to reduce the risk of injury to the ureteral blood supply from the renal artery.
5. A large amount of periureteral tissue must be included with the ureteral dissection to minimize the risk of ureteral necrosis and fistula formation.

The retroperitoneum was normally entered through a flank incision in the 11th intercostal space and through the 10th intercostal space in cases of high-lying kidney. Anteriorly, the incision was carried down medially to the lateral border of the rectus fascia. The kidney was mobilized completely and dissected from its Gerota's fascia. At the superior medial border of the kidney, the space between the adrenal gland and the kidney was dissected, leaving the adrenal gland in situ. The lower pole was dissected until the ureter was visualized though the perinephric fat, keeping the medial triangle of perinephric fat between the lower pole of the kidney and the ureter intact. The peritoneum was reflected medially, and the ureter and gonadal vein were identified in the retroperitoneum. The ureter was isolated and dissected distally with a large amount of periureteral tissue to the level of iliac vessels. The gonadal vein was identified and divided flush with the renal vein. This allowed identification of the main renal vein outside Gerota's fascia. The plane between Gerota's fascia and the peritoneum was developed further. Exposure of the anterior surface of the renal vein was continued medially until the adrenal vein was identified and divided. The kidney then was reflected medially for identification and dissection of the renal artery, which was dissected outside the renal hilum up to its aortic origin. Any lumbar vein draining posteriorly in the renal vein was identified and divided.

For right nephrectomy, the procedure was accomplished similarly to the left nephrectomy with two exceptions. First, the gonadal vein entered the vena cava rather than the renal vein. Second, to improve the shorter length of the right renal vein, the junction of the right renal vein and vena cava was cleared completely. A Satinsky clamp was then placed around the perirenal vena cava to occlude the vena cava partially. A cuff of the vena cava was then taken with the renal vein.

http://www.urotodayinternationaljournal.com
doi:10.3834/uij.1939-4810.2008.11.05
ISSN 1944-5792 (print), ISSN1944-5784 (online)

The kidney was not taken out except after adequate diuresis from the dissected ureter. Closure of the incision was done in a standard fashion.

Postoperative care
Chest x-rays were done routinely in the recovery room to exclude pneumothorax if pleural injury occurred. The urethral catheter was removed the next morning. Easy ambulation was encouraged. Intravenous fluids were continued until oral alimentation was established. In most patients, the incision was closed without drain. If the drain was fixed, it was removed after 72 hours. Our donors were followed up for 4 years to assess late surgical complications.

Follow-up included clinical examination, urine analysis, serum creatinine, KUB, renal ultrasonography, and IVP when there was indication of stone disease.

RESULTS

The left kidney was removed in 197 donors, and the right kidney was removed in the remaining 103. Two or more renal arteries were present in 40 kidneys, and single renal arteries were present in the remaining 260 kidneys. A major venous anomaly in the form of a retroaortic renal vein was found in the left side of one patient. We used 3D multislice CT angiographs in the last 70 cases for diagnosis of multiple renal vessels, as it is safer than invasive angiography and more accurate than IVU. Renal function was assessed by serum creatinine and creatinine clearance in most donors. Their mean values showed statistically significant changes compared with their preoperative values. Preoperative serum creatinine was 0.79 ± 0.13 (mean = 0.7) and creatinine clearance was 116 ± 17 (mean = 119), compared to 1.07 ± 0.23 (mean = 1) and 87 ± 20 (mean = 89) post-nephrectomy. Overall, creatinine increased by 29%, and creatinine clearance decreased to 73% of the pre-nephrectomy levels.

Preoperative complications
Out of the 300 patients, 5 (1.67%) had allergic reactions during IVU and were treated by anti-allergic drugs. During conventional angiography, 7 (2.33%) patients had complications: 3 (1%) had pain and 4 (1.33%) suffered from extravasations.

Early postoperative complications
Early postoperative complications were reported in 22 (7.33%) donors. The majority were minor and easily managed during hospital stay. Wound problems were the most common, accounting for 10 (3.33%) complications. Pulmonary complications were second with 8 (2.67%) cases. Six (2%) donors had chest infections treated by antibiotics and expectorants, and 2 (0.67%) had postoperative pneumothorax and needed chest tubes. Pleural injuries occured in 7 (2.33%) patients and were intraoperatively repaired by 3-zero vicryl sutures. Reactionary hemorrhaging developed in 2 (0.67%) donors and required immediate re-exploration to control bleeding, as they suffered from deterioration of blood pressure and increased pulse 5 hours postoperatively. The source of bleeding could not be identified, and only evacuation of hematoma was done. Deep wound collections associated with low-grade fevers were diagnosed in 3 (0.33%) donors. They were likely related to concealed bleeders and lymphatics and were treated conservatively.

Superficial wound infections developed in 5 (1.67%) patients. Deep venous thrombosis developed in 1 (0.33%) donor and was treated by intramuscular 40 mg Clexane twice daily for 2 weeks and followed up by duplex. After removal of urethral catheter, 3 (1%) donors developed urinary retention. Spontaneous micturition was reinitiated after 3-5 days of urethral drainage.

Late complications
Late complications were reported in 28 (9.33%) donors.

Medical complications: Three (1%) patients developed hypertension 2 years postoperatively and were treated by antihypertensive drugs. Four (1.33%) patients had significant albuminuria, having severe UTI, and were treated by antibiotics. Significant bacteriuria was diagnosed in 15 (5%) donors. Women were infected more than men, and the most common organisms were E. coli and Klebsiella. All were treated by antibiotics according to urine culture and sensitivity.

Surgical complications: Urinary stones were reported in 12 (4%) donors 6-36 months (mean = 20.3) after donation. Of the 12, 8 (2.67%) presented with calcular anuria due to uretral stones and were managed by ureteroscopy and basket extraction. The other 4 (1.33%) donors presented with symptomatic renal stones and were managed with ESWL after insertion of ureteric double J stent. One (0.33%) donor developed stricture urethra 2 years after donation, which was managed by visual internal urethrotomy.

DISCUSSION

Living kidney donor transplants account for about 20% of all renal transplants around the world [6]. The use of living

doi:10.3834/uij.1939-4810.2008.11.05
ISSN 1944-5792 (print), ISSN1944-5784 (online)

related donors is justified by the chronic shortage of available cadaver kidneys and the higher graft- and patient-survival rate [6,7]. Complication rates from different studies are difficult to compare because the rate varies greatly depending on how strictly the criteria for complications are defined [7]. The multiple surgical approaches to live donor nephrectomies all use variations of a flank, thoracoabdominal, or anterior abdominal incisions [2,3]. The main difference in surgical morbidities is related to whether the procedure is performed transperitoneally or extraperitoneally. In earlier studies, major complications reported with the extraperitoneal flank approach vary from 1.4% to 8% [2,8]. In more recent reports using the same approach, none of the donors suffered from serious complications [9].

Our results support the concept that extraperitoneal flank nephrectomy can be performed with negligible morbidity. Our overall early postoperative complication rate was 7.33%, which is comparable to other reports [10-13]. Major early postoperative complications included bleeding necessitating re-exploration and were found in 2 (0.67%) donors. This rate is comparable to other reports using the same approach [11]. In contrast, transperitoneal donor nephrectomies are associated with higher early and late complication rates [4]. Although the complication rate for an extraperitoneal flank approach is generally lower than the transperitoneal approach, transperitoneal nephrectomies are justified because it allows a safer and more accurate dissection of the renal vessels with less manipulation of the kidney. It has been suggested that major venous anomalies or multiple arteries are managed better in that way [3,4].

The most stressing late surgical complication reported in 12 donors (4%) was urinary stones. The prevalence of urinary stones among the general population varies from 0.5 – 1% in low-prevalence areas up to 10 – 15% in high-incidence regions [14,15]. Significant urinary tract infection was reported in 15 donors (5%), which is comparable to other reports [15,16]. In our series, renal function remained stable in most of the followed up donors. Overall, creatinine increased by 29% and creatinine clearance decreased to 73% of the prenephrectomy levels. This is very close to other studies reviewed by Goldfarb *et al*.; they found a decrease in creatinine clearance to 72% of predonation value 20 years or more after donor nephrectomy [17].

In this study, we used 3D multislice CT angiography in 23.33% of cases in preoperative renal evaluation and diagnosis of multiple renal vessels. We found it very accurate, safe and able to replace IVU and conventional angiography [18]. We proved that retroperitoneal flank nephrectomy is the safer approach with acceptable early and late surgical complications for the donor and provides an optimal allograft for transplantation. There were no complications related to non-drain fixation.

REFERENCES

[1] Sutherland DE. Living related donors should be used whenever possible. Transplant Proc. 1995 Feb;27(1):102.

[2] Bennett AH, Harrison JH. Experience with living familial renal donors. Surg Gynecol Obstet. 1974 Dec;139(6):894-8.

[3] Ruiz R, Novick AC, Braun WE, Montague DK, Stewart BH. Transperitoneal live donor nephrectomy. J Urol. 1980 Jun;123(6):819-21.

[4] Dunn JF, Nylander WA Jr, Richie RE, Johnson HK, MacDonell RC Jr, Sawyers JL. Living related kidney donors. A 14-year experience. Ann Surg. 1986 Jun;203(6):637-43.

[5] Keown PA, Stiller CR. Kidney transplantation-surg clin. NAM. 1986;66:517.

[6] Sobh MA, Moustafa FE, Hamed SM, Ghoneim MA. Infectious glomerulopathy induced by a defined agent (Schistosoma mansoni): progression despite early elimination of the causal agent. Exp Nephrol. 1993 Jul-Aug;1(4):261-4.

[7] Jacobs SC, McLaughlin AP 3rd, Halasz NH, Gittes RF. Live donor nephrectomy. Urology. 1975 Feb;5(2):175-7.

[8] Ringdén O, Friman L, Lundgren G, Magnusson G. Living related kidney donors: complications and long-term renal function. Transplantation. 1978 Apr;25(4):221-23.

[9] DeMarco T, Amin M, Harty JI. Living donor nephrectomy: factors influencing morbidity. J Urol. 1982 Jun;127(6):1082-3.

http://www.urotodayinternationaljournal.com
doi:10.3834/uij.1939-4810.2008.11.05
ISSN 1944-5792 (print), ISSN1944-5784 (online)

[10] Streem SB, Novick AC, Steinmuller DR, Bretan PN Jr, Graneto D. Results of living-donor nephrectomy: considerations for the donor and recipient. Transplant Proc. 1989 Feb;21(1 Pt 2):1951-2.

[11] Blohmé I, Fehrman I, Nordén G. Living donor nephrectomy. Complication rates in 490 consecutive cases. Scand J Urol Nephrol. 1992;26(2):149-53.

[12] Jones KW, Peters TG, Charlton RK, Lenz BJ, Walker GW, Repper S, Crews MJ, Antonucci LE, Peters EJ. Current issues in living donor nephrectomy. Clin Transplant. 1997 Oct;11(5 Pt 2):505-10.

[13] Johnson EM, Remucal MJ, Gillingham KJ, Dahms RA, Najarian JS, Matas AJ. Complications and risks of living donor nephrectomy. Transplantation. 1997 Oct 27;64(8):1124-8.

[14] Robertson WG, Peacock M, Baker M et al., (1984). Prevalence of urinary stone disease. Epidemiological study. Edited by: Rouee RL, Brock is JG, Marshal VR, and Finlayson B, Melbourne: Churchill living stone, chapter – 21 pp. 6 – 10.

[15] Wieland D, Chavers B, Simons RL et al. Information on 628 living related kidney donors at a single institution with long term follow up in 472 cases. Transplant Proc. 1984;16:5.

[16] Rollin HA, Mastroianni B, Schreiber MJ et al. Renal outcome, 25 years after donor nephrectomy. JU 2004;16:739-41.

[17] Goldfarb D, Novic A, Braun W et al. Renal outcome twenty or more years after donor nephrectomy. 1996. (personal communication).

[18] Rajamahanty S, Simon R, Edye M, Butt K, Eshghi M. Accuracy of three-dimensional CT angiography for preoperative vascular evaluation of laparoscopic living renal donors. J Endourol. 2005 Apr;19(3):339-41.

TO CITE THIS ARTICLE: Shelbaia A, El Mohsen MA, Hussein A. Early Results and Complications in Living Donor Nephrectomies. UIJ. 2008 Dec;1(5). doi:10.3834/uij.1939-4810.2008.11.05