

## *EDITORIAL*

### **Selection and Complications of Donor Nephrectomy in Gezira Hospital for Renal Diseases and Surgery**

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#### **Abstract:**

**Background:** Though various renal replacement therapies are endorsed for the long treatment of ESRD yet the transplantation remains the gold standard.

**Objectives:** generally to assist in auditing of the programme of renal transplantation in Sudan and specifically to determine the degree of matching between donors and recipients ,to determine the effect of age, sex, relation, occupation and education in donor nephrectomy and to estimate the incidence of complications in donor nephrectomy.

**Methods:** In this study we reviewed open donor nephrectomy performed in GHRD and S from January 2005 to December 2011 in a descriptive retrospective and prospective study. Around 90 living kidney donors were enrolled in this study, followed for one year. Data concerning the work up, clinical strata, the thematic operative conditions and postoperative follow up sheets were recorded in the platform of the patient sheets and retrieved completely through the master sheet of the study and evaluated via SPSS package version 11.5, every complication was dealt with according to EUA guidelines, the mortality recorded was one patient in this study.

**Results:** of these donors 41 were males (46%) and (49) were females (54%) the minimum age was 18 years and maximum 57 and mean age 30,3years.

We noted that donors were found satisfying the EAU criteria of donor's selection. The complications recorded were anesthetic problems in 2.2%, vascular complications in 2.2%, wound infection in 6.6%, pneumonia in 4.4% and the mortality in the study was 1.1%.

**Conclusion:** 1-selection for living donor nephrectomy is consistent with the international criteria and. 2- The incidence of complications in donors in GHRD and S was found to be comparable to the literature with slight inclination to upper limit.

**Key words:** Gezira hospital, donor nephrectomy, selection, complications.

#### **Introduction:**

Recent years have witnessed increasing number of patients suffering end stage renal disease ESRD as well as centers providing therapeutic modalities such as hemodialysis, peritoneal dialysis and renal transplantation<sup>(1)</sup>.

Renal transplantation is the kidney transplant into a patient with end-stage renal disease. Kidney transplantation is typically classified as deceased-donor (formerly known as cadaveric) or living-donor transplantation depending on the source of the donor organ. Living-donor renal transplants are further characterized as genetically related (living-related) or non-related (living-unrelated) transplants, depending on whether a biological relationship exists between the donor and recipient<sup>(2)</sup>. As a result of economic consideration, quality of life, and outcomes renal transplantation has emerged as the preferred treatment modality for most patients with ESRD<sup>(1,3)</sup>. However the number of transplants performed has not kept pace with the ESRD growth<sup>(4)</sup>. The shortage of organs has led to a more expansive use of live donors in kidney transplantation beyond biologic relatives and

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spouses <sup>(5)</sup>. Regarding selection for donor nephrectomy a traditional policy has been to accept individuals in excellent health only as donors, aged 18 to 60 years. Although acceptable donor age limits are now becoming extended, it remains important to avoid excessive risk <sup>(6)</sup>.

A systematic review of the literature shows that short and long-term risks of morbidity and mortality of the donor are reasonably low <sup>(7)</sup>.

Although living donor nephrectomy (LDN) was in healthy and young persons it is like any type of major surgery under general anesthesia the living kidney donors (LKD) may experience the same anesthetics complications <sup>(8)</sup>.

During donor nephrectomy pleura may be injured and lead to pneumothorax, peritoneum may be injured and often intraperitoneal organs such as spleen in most series show very different rates in donor nephrectomy-associated splenectomy, liver and bowel may be injured <sup>(9,10)</sup>.

Injury to the gonadal artery, adrenal artery, inferior phrenic artery and inferior vena cava (IVC) because they lie in close proximity to the areas of dissection, these vessels are vulnerable to injury resulting in hemorrhage which may require blood transfusion <sup>(11)</sup>. Reactionary hemorrhage may occur due to slipped ligature and donor can develop retroperitoneal hematoma <sup>(12)</sup>.

Femoral nerve compression with resulting weakness, wound hematoma or seroma and surgical site infections. a retained sponge that required reexploration, corneal abrasions and sub acute epididimitis has been reported <sup>(13)</sup>.

Phlebotic intravenous sites, urethral trauma and ascending urinary tract infections as complications of catheterization has been seen <sup>(14)</sup>.

Inadequate analgesia postoperatively precludes chest movement so leads to atelectasis and pneumonia (all of which resolve quickly with antibiotics alone), some experiences nausea and vomiting that may require readmission. Clostridium difficile colitis as a result of used antibiotic which causes diarrhea leads to fluids and electrolytes can be treated simply by fluids and elimination of the used antibiotic reported by Signori et al <sup>(15)</sup>.

Deep venous thrombosis, pulmonary embolism, myocardial infarctions and rhabdomyolysis occur in less than 5% of donors, chronic pain syndromes at the incision site due to nerve entrapment can occur. Testicular pain, incisional hernia, mild hypertension (27%) and proteinuria has been described (19%) <sup>(12)</sup>. Ascites due to affection of lymphatics (3.5%) acute renal failure <sup>(14)</sup>. Overall mortality for living kidney donation is 0.03 % <sup>(14)</sup>.

The objectives of this work. To determine the degree of matching between donors and recipients. 2. To determine the effect of age, sex, relation, occupation and education in donor nephrectomy. 3. To estimate the incidence of intraoperative, early and late postoperative complications in donor nephrectomy. 4. To determine the overall conformity of donors' selection to the EAU guidelines adopted in GHRD and S.

### **Living kidney donors and methods:**

In this descriptive, retrospective and prospective study a total of 90 patients underwent open donor nephrectomy in GHRD and S between 2005-2011, so any

Patient who underwent nephrectomy for other causes than donation or patients underwent hand

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assisted or laparoscopic donor nephrectomy were excluded. All these living kidney donors were selected according to the European guidelines.

Data of all strata of patients' records are kept in either soft or hard copies with peculiar secret number for the filing system.

Patients record from archive including, history, examination and patients' operative sheet. In this study we used to follow the donors after 2 weeks, 3 months and one year postoperatively. Data were coded and fed in a computer to handle statistical and mathematical procedure, to display the analyzed data and present them graphically using SPSS software (statistical package for social sciences).

### **Results:**

A 90 living kidney donors were included in this study in GHRD&S 45.6% males and 54.4% were females. The mean age was 30.26 years+ 9.98 SD. 63.3% of them were single, 30 of them were married 33.3% and 3 of them were divorced 3.3%. (Figure1).

In this study 5 of them were illiterate (5.6%), 14 educated to the level of primary school (15.6%), 40 secondary school (44.4%) and 31 were educated to university level (34.4%) figure 2. In this study group 60% from Gezira state and 40% from other Sudan states. The occupations of the LKDs in this study were found as followed, 31 of them were students (34.4%), 26 housewives (28.9%), 21 workers (23.3%) and 12 were employees (13.3%). (Figure3).

In this study we found 87 of LKDs 96.7% were blood related to the recipients either parents, siblings, sisters, brothers, or related couples. 3 of LKDs were not blood related to the recipients 3.3%.

The number of living kidney donation was fluctuating maximum in 2007(21) and minimum in 2008 (6) in spite of steady increment in the number of patients with ESRD waiting for renal transplantation (Figure 4).

The abdominal ultrasonography of 89 (98.9%) of LKDs in the study had normal anatomical findings and only one donor 1.1% had duplex of the collecting system on the left kidney.

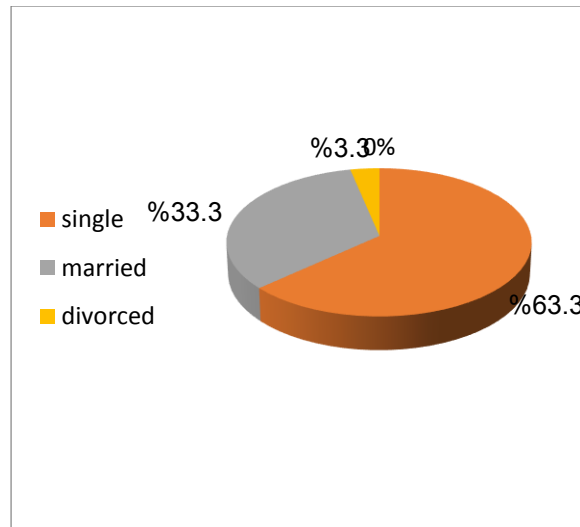
In this study the CT angiogram of the renal vasculature of the LKDs we found 82 (91.1%) of them have single renal artery, 6 (6.6%) with polar renal artery and 2 (2.2%) with double renal arteries and were not typical with the intraoperative findings (Figure 5).

In this study we found 86 (95.6%) of LKDs underwent left side nephrectomy and 4 (4.4%) of them underwent right side nephrectomy.

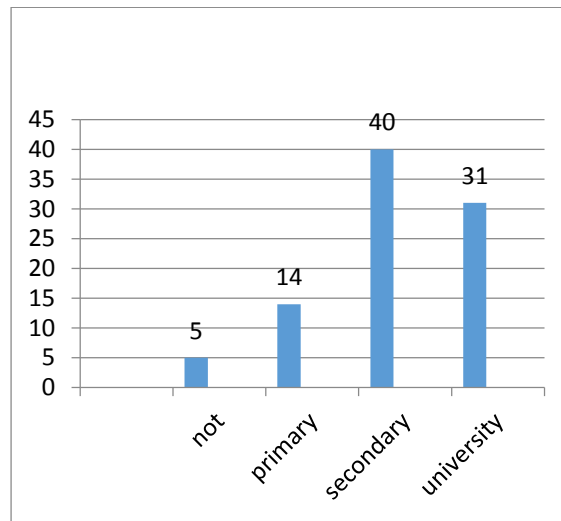
The approach for nephrectomy in this study 38 (42.2%) of LKDs underwent nephrectomy through supra 12th rib, 21 (23.3%) through transthoracic rib and 31(34.4%) through lumbar incision.

In this study 2(2.2%) LKDs had anesthetic problems (one with difficult intubation and one with delayed recovery), intraoperatively 3(3.3%) had hemorrhage, 7(7.8%) with pleural injury, 4(4.4%) had peritoneal injury and 2 (2.2%) had vascular injury (one IVC and one left ovarian vein).

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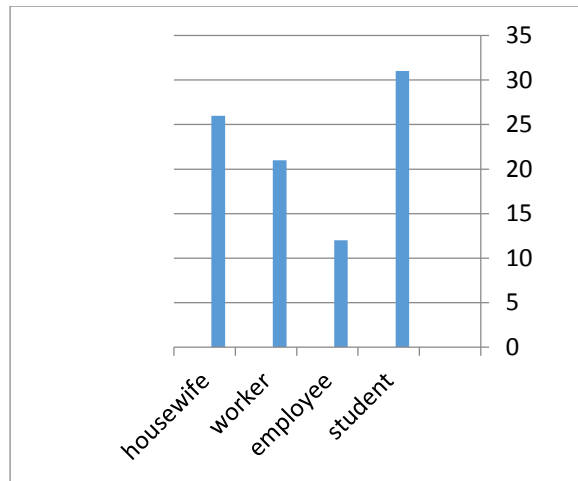


**Figure 1: Marital status of LKDs in GHRD and S in 2005-2011.**

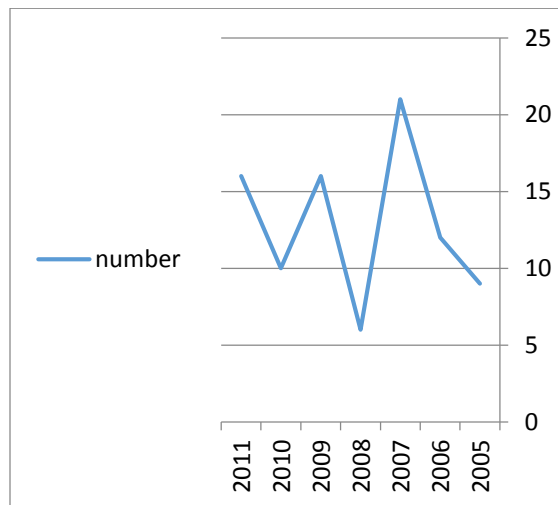


**Figure 2: Level of education of LKDs in GHRD and S in 2005-2011**

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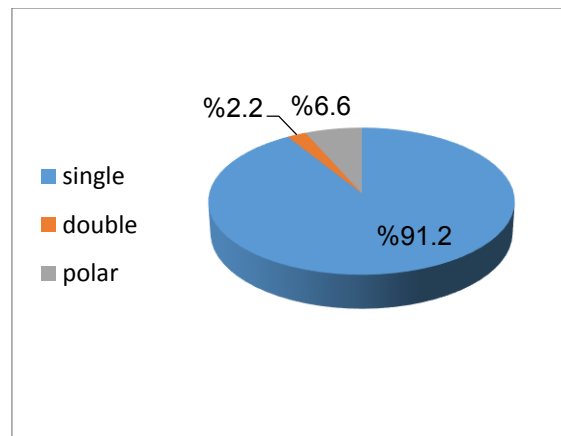


**Figure 3: Occupations of LKDs in GHRD and S in 2005-2011**



**Figure 4: Number of LKDs per year in GHRD and S in 2005-2011.**

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**Figure 5: CT angiography of LKDs in GHRD and S in 2005-2011.**

In the early postoperative period (less than 3 weeks) in this study 4 LKDs developed pneumonia 4.4%, 2 of them developed diarrhea 2.2% which was treated successfully with fluid replacement, 6 donors developed surgical site infections 6.7% (2 deep and 4 superficial) and one of them developed seroma 1.1%. (Table 2).

In this study one LKD presented late (after 3 weeks) with deep wound infection had been readmitted, the wound culture revealed fungal growth, during her admission she developed pancytopenia, renal and hepatic failure and died after 6 weeks as a result of septic shock, so the mortality in this study was 1.1%.

In this study the mean time of ischemia was  $47.7 \pm 9.27$  STD, the minimum hospital stay was 3 days, maximum hospital stay was 40 days and means  $4 \pm 4.04$  STD.

In this study we found the minimum time of return to normal activity was 29 days, maximum was 40 days, mean  $29.7 \pm 4.137$  STD and median 30.

In this study 84 of recipients have normal renal function 93.3%, 3 developed acute rejection 3.3% and 3 of them chronic rejection and returned again to hemodialysis 3.3%. (Table 3).

Maximum age of the graft in this study was 91 months, mean  $50.7 \pm 23.81$  STD months, median 53.5 and mode 45.

**Table 1: Intraoperative complications of LKDs.**

Complication	Frequency	Percentage %
anaesthetic	2	2.2
Haemorrhage	3	3.3
Pleural injury	7	7.8

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Peritoneal injury	4	4.4
Vascular injury	2	2.2
No complication	72	80

**Table 2: Early postoperative complications of LKDs**

Complication	Frequency	Percentage %
Pneumonia	4	4.4
diarrhoea	2	2.2
Wound infection	6	6.7
State of graft	Frequency	Percentage %
Normal graft	86	93.7
Acute rejection	3	3.3
Chronic rejection	3	3.3

**Table 3: the renal recipients** **State of graft in**

**Discussion:**

The number of living donor nephrectomies in this study was 90 in the period from Jan 2005 to December 2011. This number represents LDN whom had been done in GHRDS. In comparison to 82 recipients conducted in GHRD and S from 2001 to 2008 <sup>(1)</sup>. This number would have never bridge the gap between the increasing incidence of ESRDs doomed renal replacement therapy in Sudan.

The gender distribution of living kidney donors in this study 54% were females and 46% were males in comparison to that in United States is more frequently female, constituting 60% of the live-donor population <sup>(16)</sup>. It was very clear that the compassionate of female and their peculiar conscious is over shown by their vigilance to donate but we could never role out the trend of our community to spare male gender for what is believed the hard time in procurement of life requires. The mean age of donation in the study was 30.26 years compared to 33.94 in Hong Kong <sup>(17)</sup>. Although this age might be not statistically advert because practitioner used to choose the best candidate in term of health over the variable of age but still active age groups really surmounted the donors' crews.

The study showed that 54 donors from Gezira 60% and 36 donors 40% from other state being the only center outside the capital GHRDS receives patients from other states (Senar, Kassala, Gedarif, White and Blue Nile, Portsudan and this study included donors even from Khartoum state).

In the study 57 were single (63.3%), 30 of them are married (33.3%) and 3 of them are divorced (3.3%) in comparison to 82% married in other series <sup>(18)</sup>. There is no definite statistical differences

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between this study and what had been mentioned in the literature.

In the study 96.7% were related and 3.3% were not related in comparison to 90.6% related and 9.4% not related in University of Wisconsin Medical School study <sup>(19)</sup> and this attributed to good family links.

in the study 5 of the group were not educated (5.6%), 14 educated to the level of primary school (15.6%), 40 to secondary school (44.4%) and 31 were educated to university level (34.4%) in comparison to that in Iran 2.7%, 90.8%, and 6.5% were illiterate, school graduates, and university graduates, respectively <sup>(20)</sup> so the education has a role in living kidney donation.

in the study we found 31 LKDs were students 34.4%, 26 housewives 28.9%, 21 workers 23.3% and 12 were employees 13.3%. This indicates that the students are aware about the benefits to the donors and feeling of no harm to their lives.

Only one LKD in the study had medical problem (bronchial asthma) and all of them had normal renal function and their urine analysis and virology screening for (hepatitis B and C and HIV) was negative. Also tissue matching between LKD and recipients showed no HLA antibodies in the recipients' sera and this is consistent with European guidelines for transplantation <sup>(21)</sup>. In the study 89 of them had normal findings 99% anatomy and only one donor had duplex of the collecting system on the left kidney 1%.

In the study we found 82 (91.1%) with single renal artery, 6 (6.6%) with polar renal artery and 2 (2.2%) with double renal arteries in comparison to helical CT study polar arteries 10% and multiple renal arteries 12% and 78% were single arteries. <sup>(22)</sup>

In the study 86 (95.6%) underwent left nephrectomy and 4 (4.4%) right nephrectomy because one LKD had sonographic duplex features in the left kidney and 2 LKDs had double renal arteries and the fourth because of intravenous pyelography in comparison to 70 consecutive left sided LDN performed between October 1998 and March 2001 in Indiana –USA. <sup>(23)</sup>

38 of LKD underwent nephrectomy through supra 12th rib 42.2%, 21 through trans 12th rib 23.3% and 31 through lumbar incision 34.4%. Kumar et al showed sub costal approach decrease the requirement for analgesia and hospital stay. <sup>(24)</sup>

Intraoperative complications in the study 2 LKD had anesthetic problems 2.2% (one with difficult intubation and one with delayed recovery), 3 had hemorrhage 3.3%, 7 with pleural injury 7.8%, 4 had peritoneal injury 4.4% and 2 vascular injury 2.2% (one IVC and one left ovarian vein) in comparison to Davis CL study. <sup>(25)</sup>

early postoperative complications 4 LKD developed pneumonia 4.4%, 2 of them developed diarrhea 2.2% which was treated successfully with fluid replacement, 6 donors developed surgical site infections 6.7% (2 deep and 4 superficial) compared to 3.7% in Norway and one seroma 1.1% <sup>(26)</sup>. In the study 2 LKD had 2.2% vascular complications in compare to 0.2% in Davis CL study. <sup>(25)</sup>

Late postoperative complications one LKD readmitted 1.1% because of deep wound fungal infection and then died after 6 weeks as a result of septic shock, so the mortality in the study is 1.1%.

Collectively the morbidity in the study it was 35.5% in comparison to 14% in the laparoscopic

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group and 35% in the open group Maryland school <sup>(27)</sup>. Li-Ming Suet al reported donor complications following laparoscopic live donor nephrectomy are listed in total complication rate was 16.5 %, so the complications in this study is comparable to the open era and more than the complications in laparoscopic era. <sup>(27)</sup>

In the study the mortality rate is 1.1% due to deep surgical site infection ended by septic shock in comparison to 0.3% in the international literature. <sup>(28)</sup>

In the study 3 acute rejections (3.3%) compared to 8 (9.8%) reported by a previous study in our hospital by Elfatih et al <sup>(1)</sup> and 3 chronic rejection in comparison to Lee et al who studied 29 cases of chronic rejection out of 139 transplanted patients 21% . <sup>(28)</sup>

The mean hospital stay in the study was 4 days compared to 3.8 days in open donor nephrectomy in Turkey <sup>(29)</sup> and  $3.3 \pm 4.5$  days in laparoscopic donor nephrectomy in hospitals of Johns Hopkins Medical Institutions. <sup>(30)</sup>

The mean time of return to normal life in the study was 29.7 (29 -40) days, in comparison to 42 (14-84) in laparoscopic donor nephrectomy and 66.5 (14-112) days in open donor nephrectomy according to Leicester General Hospital-UK. In this study the return to normal life is less an that may be due the emotional and social support by our community and the LKDs considered as heroes. <sup>(31)</sup>

In our study maximum age of the graft was 91 months and mean 50.7 months in comparison to Philosophie, Benjamin et al two-year graft survival for LDN and ODN was 98% and 96%, respectively <sup>(32)</sup> and 60 month 97.1% in African- Americans. <sup>(33)</sup>

### **Conclusion:**

The selection criteria of GHRD and S for living donor nephrectomy are consistent with the international selection criteria, The complications of open living donor nephrectomy in GHRD and S it seems to be acceptable in term of incidence and management, The mortality in the study due to sepsis can be prevented, The hospital stay and return to normal activities in the study is reasonable and comparable to era of laparoscopic nephrectomy, The one year graft survival was found to be 96% and the donor survival was 98.9% which is comparable to the international studies.

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### **References:**

1. Mohamed Elfatih M. El Hag, Mohamed El Imam, Omran, Idris M Elsheikh A. Elsabig M., Elhadi Miskeen. Renal Transplantation GEZIRA Hospital FOR Renal Disease and Surgery. Sudanese journal of public health. April 2009.
2. R. Von Versen. WHO Guiding Principles on human cell, tissue and organ transplantation. Cell and tissue banking. Journal no 10561. 2008.
3. Evans RW. Need, demand and supply in kidney transplantation: a review of the data, an examination of the issues and projections through The year 2000: Semin Nephrology, 1992.
4. T. Kälble, A. Alcaraz, K. Budde, U. Humke, G. Karam, M. Lucan, G. Nicita, C. Süsal. Guidelines on Renal Transplantation. European Association of Urology 2009.
5. Panduranga S. Rao, and Akinlolu Ojo. Clinical journal of the American Society of Nephrology. Sep 2009.
6. Kerr SR, Gillingham KJ, Johnson EM, Matas AJ. Living donors > 55 years: to use or not to use? Transplantation 1999; 67(7) 999-1004.
7. Oppenheimer Salinas F. Nefrologia. 2010, 2:100-5.
8. Feltracco P, Ori C. Anesthetic management of living transplantation. Minerva Anestesiologica. 2010 Jul; 76(7):525-33.
9. Cassar K, Munro A. Iatrogenic splenic injury. J R Coll Surg Edinb 2002; 47(6):731-741.
10. Cooper CS, Cohen MB, Donovan Jr JF: Splenectomy complicating left nephrectomy. J Urol 1996; 155(1):30-36.
11. Satyapal KS, Haffjee AA, Singh B, et al: Additional renal arteries: incidence and morphometry. Surg Radiol Anat 2001; 23(1):33-38.
12. Ratner LE, Ciseck LJ, Moore RG, Cigarroa FG, Kaufman HS, Kavoussi LR. Laparoscopic live donor nephrectomy. Transplantation 1995; 60: 1047-1049.
13. Perry KT, Freedland SJ, Hu JC, Phelan MW, Kristo B, Gritsch AH, Rajfer J, Schulam PG. Quality of life, pain and return to normal activities following laparoscopic donor nephrectomy versus open mini-incision donor nephrectomy. J Urol. 2003.
14. Johnson EM, Remucal MJ, Gillingham KJ, Dahms RA, Najarian JS, Matas AJ. Transplantation. 1997 Oct 27; 64(8):1124-
15. Signori S, Boggi U, Vistoli F, Del Chiaro M, Pietrabissa A, Costa A, Vanadia Bartolo T, Coletti L, Gremmo F, Croce C, Morelli L, Mosca F. Regional procurement team for abdominal organs. Transplant Proc 2004; 36(3):435-6.
16. Kayler LK, Rasmussen CS, Dykstra DM, Ojo AO, Port FK, Wolkfe RA, Merion RM. Gender imbalance and outcomes in living donor renal transplantation in the United States. Am J Transplant 3: 452-458, 2003.
17. Chu KH, Poon CK, Lam CM, Cheuk A, Yim KF, Lee W, Tang HL, Chan HW, Fung KS, Tong KL. Nephrology (Carlton). 2012 Jan; 17(1):85-8.
18. Hoda MR, Hamza A, Wagner S, Greco F, Fornara P. Impact of hand-assisted laparoscopic living donor nephrectomy on donor's quality of life, emotional, and social state. Transplant Proc. 2010 Jun.
19. Srivastava A, Tripathi DM, Zaman W, Kumar A. Subcostal versus transcostal mini donor nephrectomy: is rib resection responsible. J urol. 2003 Sep; 170.3.738-40.
20. T. Malakoutian, M.S. Hakemi, A.A. Nassiri, M. Rambod, A.N. Haghghi, B. Broumand, I. Fazel. Socioeconomic Status of Iranian Living Unrelated Kidney Donors: A Multicenter Study. Transplantation Proceedings. May 2007, 824-825.
21. A Report of the Amsterdam Forum On the Care of the Live Kidney Donor: Data and Medical Guidelines. 2004 April.

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22. Andrew Holden, Andrew Smith, Paul Dukes, Helen Pilmore, Motohiko Yasutomi. Assessment of 100 Live Potential Renal Donors for Laparoscopic Nephrectomy with Multi-Detector Row Helical CT. *Radiology* 2005; 237:973–980.
23. Tibero M, Siquira JR, Ryan F. Paterson, Ramsay I, Kuo et al. Comparison of laparoscopic live donor nephrectomy versus traditional open technique. *International Braz J Urol*. September - October, 2002. (5): 394-402,
24. J L Flowers, S Jacobs, E Cho, A Morton, W F Rosenberger, D Evans, A L Imbembo, and S T Bartlett. Comparison of open and laparoscopic live donor nephrectomy. *Ann Surg*. 1997 October; 226(4): 483–490.
25. Davis CL. Evaluation of the living kidney donor: current perspectives. *Am J Kidney Dis* 2004; 43:508.
26. Mjoen G, Oyen O, Holdaas H, Midtvedt K, Line PD. Morbidity and mortality in 1022 consecutive living donor nephrectomies: benefits of a living donor registry. *Transplantation*. 2009 Dec 15;88(11):1273-9.
27. Li-Ming Su, Lloyd E. Ratner, Robert A. Montgomery, et al. Laparoscopic Live Donor Nephrectomy. *Ann Surg*. 2004 August; 240(2): 358–363.
28. Lentine KL, Patel A. *Adv Chronic Kidney Dis*. Risks and outcomes of living donation. 2012 Jul;19(4):220-8. doi:10.1053/j.ackd.2011.09.005.
29. Lee, Po-Chang, Terasaki, Paul I, Takemoto, Steven K et al. All chronic rejection failures of kidney transplants were preceded by the development of HLA antibodies. *Transplantation*: 27 October 2002 - Volume 74 - Issue 8 - pp 1192-1194.
30. Altinel M, Akinci S, Gunes ZE, Olcucuoglu E, Gonenc F, Yazicioglu AH. Open versus laparoscopic donor nephrectomy: perioperative parameters and graft functions. *Transplant Proc*. 2011 Apr;43(3):781-6.
31. Nicholson ML, Kaushik M, Lewis GR, Brook NR, Bagul A, Kay MD, Harper SJ, Elwell R, Veitch PS. Randomized clinical trial of laparoscopic versus open donor nephrectomy. *Br J Surg*. 2010 Jan;97(1):21-8.
32. Philosophe, Benjamin, Kuo, Paul C, Schweitzer, Eugene J et al. Laparoscopic versus open donor nephrectomy: Comparing Ureteral Complications in the Recipients and Improving the Laparoscopic Technique. *Transplantation*: August 1999 - Volume 68 - Issue 4 - pp 497-502.
33. Foster CE, Philosophe B, Schweitzer EJ, Colonna JO, Farney AC, Jarrell B, Anderson L, Bartlett ST. A decade of experience with renal transplantation in African-Americans. *Ann Surg*. 2002 Dec; 236(6):794-804; discussion 804-805.