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Living kidney donor transplants over a 16-year period in South Africa: A single center experience

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Abstract

Background: Kidney transplantation is the treatment of choice for end-stage renal disease (ESRD). The number of patients on the waiting list is increasing due to an imbalance between organ supply and demand. This has led to an increase in the number of living donor transplants in most parts of the world. The benefits to the recipients must, however, be weighed against the risks to the donors. Long-term follow-up of the donors is therefore imperative to ascertain the risks of living kidney donation.

Materials and Methods: We reviewed the records of 571 potential living kidney donors (PLDs) in Johannesburg hospital over a 16-year period between 1990 and 2005.

Results: There were 1030 kidney transplants during this period, with 800 cadaveric and 230 actual living donor (ALD) transplants. There were 571 PLDs; however, 341 (59.7%) withdrew or were withdrawn because of medical and non-medical reasons. Among the 230 ALDs, the mean age of the donors was 35.2 ± 8.3 years; 55% were females; 24% were Blacks. Eighty-five percent were related to the recipients while 15% were unrelated. Mean duration of follow-up was 8.6 ± 6.4 years. The pattern of post-donation follow-up was excellent in 29.7%, adequate in 34% and unacceptable/poor in 36.3%, based on the number of clinic visits post-donation. Hypertension was noted in 24% of the donors during long-term follow-up. Three of the donors also developed significant microalbuminuria.

Conclusion: There is a need to encourage living kidney donation, especially amongst the Black populations, and to emphasize the value and significance of post-donation follow-up visits to all potential donors.

Keywords: Living kidney donor, post-donation follow-up, reasons for non-donation, South Africa

Résumé

Background: Transplantation de reinest le traitement de choix pour l'insuffisance rénale terminale (IRT). Le nombre de les patients sur la liste d'attente s'accroît en raison d'un déséquilibre entre l'offre et la demande orgue. Cela a conduit à une augmentation du nombre de vie donneur transplante dans la plupart des régions du monde. Les avantages pour les destinataires doivent,Toutefois, être mis en balance avec les risques pour les donneurs. Un suivi à long terme des donateurs est donc impératif de déterminer les risques de la vie Don de rein.

Matériaux et procédés: Nous avons examiné les dossiers de 571 potentielles vivant des donateurs de rein (APL) à Johannesburg hôpital sur une période de 16 ans entre 1990 et 2005.

Résultats: Il y avait des greffes de rein 1030 durant cette période, avec 800 cadavres et 230 donneur de vie réel (ALD) greffes. Il y avait des 571 APL ; Cependant, 341 (59,7%) se retire ou ont été retirés en raison de la medical et travaille motifs. Parmi les 230 EDL, l'âge moyen des donateurs était 35,2 ± 8,3 ans ; 55% étaient des femmes. 24% étaient Noirs. Quatre-vingt-fi ve % était liées aux destinataires tandis que 15% n'étaient pas liées. Durée moyenne du suivi a été 8,6 ± 6,4 ans. Le profil de suivi reconstituante était excellent dans 29,7%, adéquat dans 34% et inacceptables / pauvres de 36,3%, selon le nombre de clinique visites post-donation. L'hypertension a été notée dans 24% des donateurs au cours de suivi à long terme. Trois des donateurs a également développèrent signifi cant microalbuminurie.

Conclusion: Il est nécessaire d'encourager la vie Don de rein, surtout parmi la population noire et à mettre l'accent

sur la valeur et signifi cance du suivi reconstituante visites à tous les donateurs potentiels.

Mots clés: Vivant donneur de rein, suivi reconstituante, motifs de non-Don, Afrique du Sud

Introduction

Kidney transplantation is the treatment of choice for end-stage renal disease (ESRD). However, the number of patients on the waiting list is ever increasing due to an imbalance between organ supply and demand. This, together with the fact that living donation provides better patient and allograft survival, has led to an increase in the number of living donor transplants in most parts of the world.[1] Various strategies were developed to increase organ availability in living donation such as ABO incompatible donors and the living donor exchange program.[2,3] The benefits to the recipients of kidney transplantation must, however, be weighed against the risks to the donors. Various international organizations including the WHO are now focusing on the care of living donors through the establishment of guidelines on preoperative assessment and post-donation follow-up.[4,5] Whilst the overall risk of donation is small, hypertension or proteinuria post-nephrectomy may identify patients at a higher risk of progressive renal dysfunction.

The aims were to study the number of potential living donors (PLDs) against the number of actual living donors (ALDs), and the reasons for non-donation, as well as assessing the demographic characteristics, family and social history of the ALDs, relationship to the recipients, pattern of follow-up visits post-donation as well as clinical and laboratory parameters including renal function before and after donation to assess long-term risks.

Materials and Methods

We retrospectively reviewed the records of 571 PLDs over a 16-year period from 1990 to 2005 in Johannesburg hospital to study the ALDs and their demographic characteristics, reasons for non-donation, pre- and post-donation clinical and laboratory parameters as well as pattern of post-donation follow-up clinic visits. This center is responsible for transplantation in the public sector in Gauteng and North West provinces, which have a population of 15 million. Donor assessment is done at a dedicated living donor clinic of the hospital by a senior nephrologist who is not involved in the care of the potential recipients, together with assessments by a psychologist and a social worker. Evaluation of the potential donor follows a standard protocol which includes clinical details, ABO blood grouping, HLA typing, and B and T lymphocyte matching with the recipients. Other laboratory investigations include serological tests for hepatitis B and C, cytomegalovirus, HIV and syphilis. Serum biochemistry for urea, creatinine, liver function tests, fasting blood sugar, lipid profile, complete blood count, urine analysis including microalbuminuria, microscopy and culture and measurement of Tc-99m diethylenetriaminepentaacetic acid (DTPA) glomerular filtration rate (GFR) are also included. Radiological investigations comprise chest radiograph, intravenous pyelogram and renal angiography. In addition, consent for transplantation from living unrelated donors is given by a Ministerial Advisory Committee. Following transplant nephrectomy, donors are expected to attend the follow-up clinic on an annual basis for clinical evaluation. Complete blood count, blood sugar, and tests for renal function, urine protein including microalbuminuria are repeated at each clinic visit; in addition, they are seen in the clinic if and when problems arise post-donation. Donors were classified in this study as having excellent follow-up when they had attended more than 75% of the expected number of visits, adequate when it was 75–50%, unacceptable when it was between 49 and 25%, and poor when it was less than 25%.

Results

There were 1030 kidney transplants during the study period, with 800 cadaveric and 230 living donor transplants. There were 571 PLDs but 341 (59.7%) either withdrew or were withdrawn because of various reasons which were medical in 184 (54%) and non-medical or miscellaneous in 46%. Renal causes were the commonest medical reasons for non-donation seen in 41 and included the presence of non-orthostatic persistent proteinuria and abnormal GFR. Urological problems were seen in 5 PLDs comprising unilateral hydronephrosis or hypoplastic kidney, 3 others had renal calculi and 2 normotensive females were found to have significant fibromuscular hyperplasia of a single renal artery on arteriography. Hypertension and obesity were the reasons for non-donation in 11 and 29, respectively. Viral infections were seen in 16 and included 13 with HIV infections, 2 with hepatitis C virus and 1 with hepatitis B virus (all in separate individuals). Other disorders included atheromatous vasculopathy, chronic rheumatic heart disease, alcoholic cirrhosis, major psychoses, diabetes mellitus, Hodgkin's lymphoma, tuberculosis, and anti-phospholipid

syndrome (asymptomatic).

There were 99 non-medical causes for non-donation; these included voluntary withdrawal, immunological and miscellaneous. The miscellaneous group comprised 18 recipients who were inadvertently called up for cadaver transplantation due to communication errors, pregnancy in 1 case and another PLD was jailed for criminal activity shortly before donation.

Figure 1 shows the number of live donor transplants in the study period. Analysis of the ALDs showed that the mean age was 35.2 ± 8.3 years, ranging between 20 and 64 years; 55% were females, while Blacks comprised 24%. Forty-four percent smoked cigarettes and 33.7% took alcohol. Ninety percent were not on any medication preoperatively and the remaining 10% were on non-specific medication including oral contraceptives, and 85% had no history of preoperative disease. There was no family history of any disease in 46%, while the remaining reported family history of diseases like hypertension (39.7%) and diabetes mellitus (23.8%). Eighty-five percent were genetically related to the recipients while 15% were emotionally related (spouses, friends). Figure 2 shows the relationship between recipients and the donors. The pattern of follow-up visits post-donation was excellent in 29.7%, adequate in 34% and either unacceptable or poor in 36.3%. There was no significant association between the pattern of post-donation follow-up visits and the sex of the donors (Chi-square 1.69, $P = 0.42$), age of the donors when grouped into those below 40 years of age and those above at the time of donation (Chi-square 0.49, P 0.78), as well as the relationship with the recipient among those who are genetically related to the recipients (Chi-square 1.88, P 0.93). However, there was significant association between the follow-up visits post-donation and the ethnicity of the donor (Chi-square 6.16, P 0.004) with less Blacks having an excellent follow-up visits post-donation. The mean follow-up period was 8.6 ± 6.4 years.

Table 1 shows the mean of clinical and laboratory parameters both pre- and post-donation. Hypertension defined as blood pressure greater than 140/90 mmHg was noted in 24% of those with excellent follow-up clinic visits; 63.6% of them had positive family history of hypertension prior to donation. Three of the donors developed significant microalbuminuria and one of them was also hypertensive. None of the donors in our

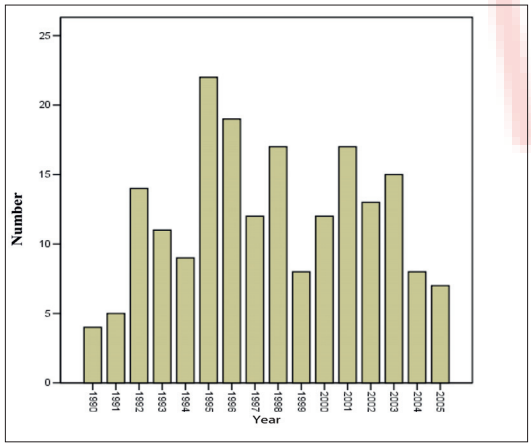

Figure 1: Distribution of living kidney donor transplants by year

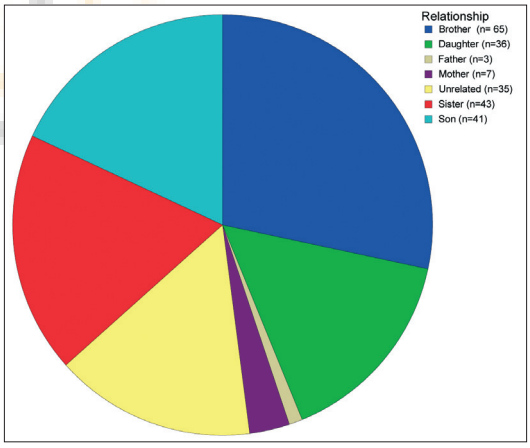

Figure 2: Relationships of the donors to the recipients

Table 1: Mean blood pressure, BMI and laboratory parameters pre-donation and at last clinic visit post-kidney donation

Parameter	Pre-donation	Post-donation	*P* value
Systolic blood pressure (mmHg)	116.25 ± 10.21	117.54 ± 15.66	0.459
Diastolic blood pressure (mmHg)	72.99 ± 8.43	70.97 ± 10.04	0.068
BMI (kg/m^2)	25.80 ± 3.80	26.17 ± 4.41	0.342
Blood urea (mmol/l)	4.41 ± 1.18	5.16 ± 1.40	0.000
Serum creatinine (µmol/l)	89.99 ± 13.29	114.83 ± 21.37	0.000
Creatinine clearance (ml/min)	103.32 ± 23.00	79.92 ± 23.42	0.000
Microalbuminuria (AER in mg/day)	7.27 ± 7.46	8.72 ± 11.92	0.289
Serum cholesterol (mmol/l)	5.23 ± 1.25	5.13 ± 0.88	0.550
Hemoglobin (g/dl)	14.65 ± 1.33	14.21 ± 1.12	0.080

BMI = Body mass index, AER = Albumin excretion rate

series had renal failure and no occurrence of any malignancy was noted among them.

Discussion

With the increase in living donor kidney transplantation worldwide, knowledge regarding long-term risks is important. Our series is among the few reports of long-term follow-up of living donors from developing countries and the largest series from sub-Saharan Africa, where kidney transplantation is largely unavailable in most countries of the region.[6,7] Volunteering as a kidney donor has been shown to offer an opportunity of discovering unreported diseases and this may be beneficial.[8] Fehrman *et al.* in a Swedish study have reported that 63% of their PLDs were unable to donate and various reasons for non-donation were stated.[9] This is similar to our findings; however, we have higher rate of infections, including HIV, as a reason for non-donation compared to the Swedish series; this may reflect the higher prevalence of infections in the general population in this part of the world. There are reports of long-term safety of living kidney donation, though reports from this part of the world are scanty. Naicker *et al.* had earlier reported their experience over a 10-year period from a single center in the KwaZulu Natal province in South Africa.[10] The mean age of the donors in their series was 34.2 years, majority were females and 24% were Blacks; these are similar to our findings. The finding of a lower percentage of donors among the Black population is surprising as the majority of the patients on the transplant waiting list are Blacks, especially in the public sector. This may be related to cultural and religious beliefs of the African community. Poor post-donation follow-up is a serious concern and this has led our clinic to be more stringent and actively contacting the donors; in some instances, we discovered that relocation of families has seriously affected their ability to attend the follow-up clinics. Majority of the donors were siblings similar to that in the series reported by Naicker *et al.*;[10] however, in a small series from India, Sahay *et al.*[11] reported that 80% of the donors were parents. We noted the occurrence of hypertension in 24% of our donors which is similar to findings by others.[12,13] Whether there is increased incidence of hypertension post kidney donation has been controversial, but most series with large number and longer follow-up duration have reported a comparable incidence of hypertension to that in the general population.[14-16] Albuminuria has been described as a suitable marker of kidney damage in the context of nephrectomy and the advantages have been stated with a recommendation that kidney donors be screened for microalbuminuria at 2–3 year intervals post kidney donation.[17] Eberhard *et al.* reported that 24% of the donors in their series developed microalbuminuria and their mean follow-up time was 11 years.[18] They suggested the possibility of subclinical hyperfiltration damage of the glomeruli as a possible cause. However, this could not be ascertained as there were no renal biopsies performed in those with the microalbuminuria, and therefore, other possible causes could not be ruled out. Saran *et al.*[19] also reported microalbuminuria in 34% of the donors in their series but mostly in those who developed hypertension.[19] One of the patients with microalbuminuria in our series was also hypertensive. It is not clear whether hypertension does contribute to the development of microalbuminuria post-nephrectomy, but its presence may necessitate certain interventional measures such as the use of angiotensin converting enzyme (ACE) inhibitors. The post-donation serum creatinine was significantly higher and creatinine clearance lower compared to pre-donation values, though they were within the normal range; this is also similar to the findings by others.[11,20] It has been reported that following donor nephrectomy, serum creatinine levels may increase by approximately 25% and creatinine clearance falls by the same percentage,[17] but it is not known whether this is associated with increased risk of progressive renal dysfunction. Reports on the incidence of renal dysfunction post-nephrectomy in sub-Saharan Africa are lacking. Gibney *et al.* reported that African Americans may have higher renal risks related to hypertension post-nephrectomy.[21] We had no patient with reported ESRD in our series though the loss to follow-up rate is high.

Conclusions

Kidney donation is safe; however, long-term evaluation of living kidney donors is important. The significance of post-donation follow-up visits needs to be emphasized to detect early changes in blood pressure, renal function and albuminuria so that appropriate measures may be instituted. There is a need to encourage kidney donation among the Black population in South Africa, with measures instituted to ensure the likelihood of good follow-up visits post-donation.

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