ORIGINAL RESEARCH

Surgical outcomes of living kidney donors at a nascent transplant center in Addis Ababa, Ethiopia

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Abstract

Background
Living donors are the main source of kidney in most transplant center and the only in some. The safety of these special peoples is a high priority. This study aimed to describe socio-demographic characteristics and surgical outcomes of living kidney donors in a nascent transplant center in a sub-Saharan African country

Methods
A retrospective analysis of all living kidney donor in the first two years (September 2015 to August 2017) performed at Ethiopia's National Kidney Transplant Center was done. The center is located at St. Paul's Hospital Millennium Medical College in Addis Ababa.

Results
A total of 52 donor nephrectomies were done of which 38.5 %(20) of the cases were done in the first year. Females made 53.8 %(28) of the donors. Age of donors ranged from 21to 66 with a mean of 32.8 years. Most common donors were siblings 23(44.2%) followed by parents 7(13.5%). The most common form of surgery was Hand Assisted Laparoscopic Donor Nephrectomy (HALDN) 80.8 %(42) with a conversion rate of 6.7 %(3). All nephrectomies were left side, 48(92.3%) of the patients had only one artery. Average operation time and estimated blood loss were 159 minutes and 160ml in HALDN while that of open nephrectomy were 126 minutes and 220mls. Only 3 patients had early postoperative complications. One patient had postoperative small bowel obstruction. No donor death.

Conclusions
In initial experience, young adults and females are the main living kidney donors. Outcomes of living kidney donors are excellent and comparable to high volume centers.

Keywords: transplant, living kidney donor, outcomes

Introduction

With a growing incidence and prevalence of ESRD worldwide the need for renal replacement therapy (RRT) has increased. RRT ,dialysis and kidney transplant are not readily available and affordable for most patients in Sub-Saharan Africa (SSA)(1,2). Of the two options, kidney transplant is by far the best option in-terms of cost effectiveness and quality of life of patients, which is close to normal continual renal filtration. In Ethiopia, the first kidney transplant was done in September 2015. Preparation in designing the program , training transplant coordination nurses , lab technicians, pharmacists ,operating theater nurses, social workers , ra-

Table 1. Sociodemographic characteristics of living kidney donors, SPHMMC, Addis Ababa, Ethiopia. September 2015 to August 2017

Variable		n	%
Sex	Male	28	53.8
	Female	24	46.2
	Total	52	100
Age group, years	21-30	30	57.7
	31-40	13	25.0
	41-50	5	9.6
	51-60	2	3.8
	>60	2	3.8
	Total	52	100.0
Residence	AA	28	53.8
	Oromia	12	23.1
	Amhara	6	11.5
	SNNP	4	7.7
	Tigrai	1	1.9
	Dire Dawa	1	1.9
	Total	52	100.0
Marital status	single	25	48.1
	married	23	44.2
	divorced	4	7.7
	Total	52	100.0
Occupation	Government employee	18	34.6
	personal business	14	26.9
	House wife	7	13.5
	farmer	7	13.5
	student	6	11.5
	Total	52	100.0
Literacy status	illiterate	5	9.6
	read and write	4	7.7
	Elementary complete	12	23.1
	high school complete	15	28.8
	college graduate	16	30.8
	Total	52	100
Religion	Orthodox Christians	36	69.2
	Muslims	9	17.3
	Protestants	7	13.5
	Total	52	100

diologists ,psychiatrists , basic exposure on kidney transplant to fellows abroad, designing and renovating a hotel building to a transplant center(hospital) and preparing transplant protocols took almost three years

Organ donors (living or deceased) are the critical and limiting factor in any transplant program. Even though anyone who is willing and medically fit to donate an organ can be a potential donor there is variability in the type of donor accepted in different centers(3,4). In most developing nations living related donors are the main sources of kidney(5). In general, living related donors are accepted almost in all centers and recipients from these donors do better in-terms of graft and patient survival rate(1,5–7).

In addition to helping the loved one, organ donation gives an improved sense of well-being and a boost in self-esteem ,donors are also reported to live longer(8). However, there have been some reports of depression and disrupted family relationships after donation, even suicide after a recipient's death(9). Furthermore organ trafficking is an important issue necessitating a careful evaluation of living donors and recipients, and in some countries like Ethiopia, limiting donation only between either blood or marriage related persons(10,11).

Donor nephrectomy is a safe procedure with very low rate of morbidity and mortality(12–17). Surgical complication listed includes bleeding, hernias, hematomas, bowel obstructions etcetera …(16,18,19). Though there is a lot of data regarding living kidney donors' peri-operative and long

term outcomes worldwide, specific data in sub-Saharan Africa is scarce(12,20–27). Understanding the characteristics of donors and their outcomes can help other potential donors, referring physicians, transplant professionals, and the public in decision making. The objective of this study was to describe socio-demographic characteristics and surgical outcomes of living kidney donors at Ethiopia's National Kidney Transplant Center.

Methods

A retrospective analysis of all living kidney donor in the first two years (September 2015 to August 2017) of Ethiopia's National Kidney transplant Center was done from April to July 2018. The center is located at St. Paul's Hospital Millennium Medical College (SPHMMC) in Addis Ababa. The national Kidney transplant program is started, supported fully funded and followed very closely by the Ethiopian Federal Minister of Health and the Minster office special committee. It has also huge support from the college provosts' office and University of Michigan(UvM). A transplant surgeon from UvM with more than 25 years of experience in the business was travelling every month to the center for the last five years in preparation, training and procurement of supplies, evaluating donors and patients and performing the surgery. Similarly transplant nephrologists from UvM were also helping from the inception to date. Additional training and support was provided by surgeons and nephrologists of Hospital do Rim (HRIM) of São Paulo, Brazil The transplant surgeons from University of Michigan trained the four Ethiopian transplant fellows (01 urologist and 03 general surgeons). . Transplant nephrologists and surgeons from SPHMMC & US hospitals were involved in donor evaluation

The operation theater log book, outpatient clinic and ward registration books as well as individual patients' medical records were examined. Data was collected in a pretested data collection format by trained final year surgical residents. The data was checked for completeness, cleaned, coded, entered and analyzed with SPSS version 20. Demographic characteristics, types of donor nephrectomy, operation time, amount of bleeding, type and rate of complication and duration of hospital stay were analyzed. A written ethical clearance was obtained from SPHMMC IRB and data obtained was used only for research purpose.

Results

General

In the two years period, a total of 52 transplant pairs were completed, hence 52 donor nephrectomies. Females donors,28(53.8%), outnumbered males, with female to male ratio of 1:0.67. The age of donors ranged from 21 to 66years with a mean of 32.6 years (SD=10.5). Donors in the age group 21-30years made up 57.7% of the donors. Regarding recipients, male made 40(76.9%) of the patients making male to female ratio 3.3. Age of recipients ranged from 16 to 60 averaging at 34.5(SD= 10.4). Most of the patients were in their third decade16 (30.8%) or fourth decades of life 17(32.7%) Donors and patients came from all parts of the country but majority were from Addis Ababa [28(53.8%)] and Oromia region [12(23.1%)]. Regarding marital status single donors made 25 (48.1%) of the cases. The majority of the donors 41(88.5%) had at least completed elementary school (Table 1).

Regarding relationship of donors to ESRD patient's the majority were sibling (brother or sister), while parents and spouse being the second most common donors each accounting for 6(11.5%). Donors weight ranged from 36.2 to 77.2kg with a mean of 59kg (SD=9.0). Donor height ranged from 151 to 185cm with a mean of 165cm (SD= 7.0) making the mean BMI of donors 1.67kg/m^2.

Procedure

All the donors underwent left sided nephrectomy. The most common form of surgery was HALDN,42(80.8%). Three procedures were converted to open donor nephrectomy; two for bleeding and the third due to sever adhesions (secondary to a remote history of disseminated TB). All patients were reported to have single renal artery in CT angiography but 4(7.7%) of the donors had two arteries on exploration. The average operation time and estimated blood loss were 159 minutes and 160ml respectively in HALDN while that of open nephrectomy were 126 minutes and 220mls respective-

Table 2. Types of surgery, number of renal arteries and complications in patient who underwent donor nephrectomy. SPHMMC, Addis Ababa, Ethiopia. September 2015 to August 2017

Variable		n	%
Type of surgery	HALDN	42	80.8
	Open donor nephrectomy	8	15.4
	HALDN converted to open	2	3.8
	Total	52	100.0
Number of renal arteries	Single renal artery	48	92.3
	Two renal arteries	4	7.7
	Total	52	100
Post Op complications	Superficial SSI	1	33.3
	Atelectasis	1	33.3
	Small bowel obstruction	1	33.3
	Total	3	100

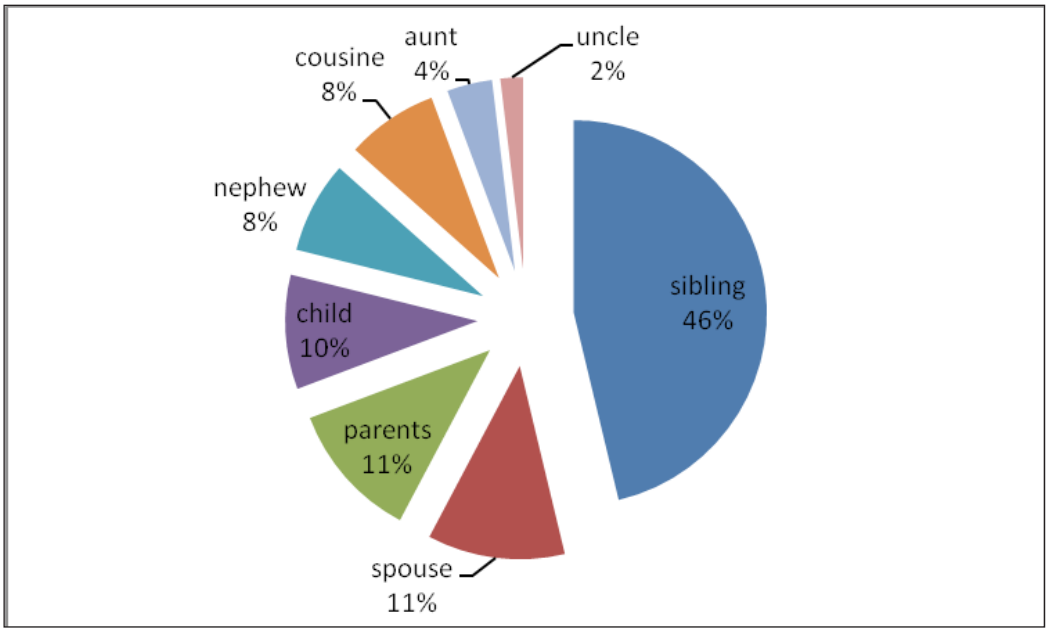

Figure 1. Relationship of donors to recipients, SPHMMC, Addis Ababa, Ethiopia. September 2015 to August 2017

ly. The mean hospital stay of patients was 4.8days (SD=1.3) but ranged from 3 to 11 days. Three (7.7%) patients had early post op complications. One patient had a postoperative small bowel obstruction on post operative day 5 after developing persistent abdominal pain, distension and vomiting of ingested matter. He was operated and found to have a distal ileal adhesion obstruction away from the operative field, which was released. Patient improved and discharged. To date there are neither donors who developed incisional hernia nor any donor deaths.

Discussion

The creation and maturation of a transplant center in a developing nation speaks to the commitment of leadership at all levels. This is understandable when one recognizes what transplant takes in terms of human resources, infrastructure and finance. In Africa, a clear reflection of this fact is, only few countries have transplant program in Africa (Northern African countries, Sudan ,Nigeria, Kenya and South Africa and now Ethiopia)(1,5). Our program wouldn't have succeeded without the full support and continued attention from the leadership to help ESRD patient and families without compromising the outcomes of the living kidney donors. Experience from Nigeria showed 143 transplant performed in a period of 11 years and among this only 30 percent happened in Public hospital. The average number of transplants performed per year was only 13 (1). In addition, the Sudanese experience showed, though first transplant was done in 1972, non-sustained support from leaders can result in interruptions of the program and low rate of transplant per year(28).

The rate of living donor kidney transplant has been shown to increase in the last decade even in countries that have a deceased donor programs(3,29). The highest rate of living donor transplant performed is performed in Saudi Arabia with 32 transplants per million population (3,5,29). The types of living organ donors accepted by transplant centers differ from region to region and often from hospital to hospital in same region(3). In the current era of transplant medicine the criteria for selection of donors has become more relaxed with experience. In US, programs accept living donors from immediate family members ,extended family members to close friends with close emotional ties to the recipient and even anonymous donors (9). As the Ethiopian law restricts donation to direct or married relationships, most of our donors were siblings, spouses or parents. Similar findings are reported in many developing and developed nations. A study from Nigeria showed 82.5% of donor to be genetically related in the form of siblings, parents or children (1,5–7).

As many donors were siblings, our donors are relatively young which is good for the recipients as kidneys from young donors perform better and have longer graft survival. This is similar to most developing nations where law frequently restrict donation to living relations with very little or no deceased donation(3,5,7,30). The average of donors in developed nation is higher but , still younger adults are the most common donors(20,31). Worldwide females are the most common living kidney donor which was also the case for our study. In one study females and those in age group 18-39 were found to be the most common donors accounting for 58.5 % and 49.2% of live kidney donors respectively(20). The mean BMI of our donors is much lower than what is reported in the literature. Outcome of donor didn't show any relation with age , Sex or BMI.

All corners and forms of Ethiopian society in terms of

literacy and occupational status were seen as donors. This diversity is likely due to the societal make up and relatively high awareness of the disease, financial and medical burden by families of ESRD patients. The fact that, donors from all parts of Ethiopia were served shows the accessibility of the service to all Ethiopians.

Donor nephrectomy can be done either purely laparoscopicaly , by hand assisted laparoscopy or by couple of open approaches .((6,13–15,17–20,32). The goal of the surgery is to obtain adequate allograft with minimum morbidity to the donor. In the current era of minimally invasive surgery the standard of care for donor nephrectomy is often either pure laparoscopy or hand assisted Laparoscopic nephrectomy in the developed nation given lower morbidity to the donor(-less pain, rapid recovery, shorter hospital stay fewer hernias, for example)(17,18,32). Though laparoscopy is at its infancy in our hospital, we adopted the protocol from University of Michigan, initially utilizing the HALDN approach for the donor. After the first mass procurement which started and sustained the HALDN for the first 44 patients we switched to an open (mini-incision) approach. This change occurred because the cost for HALDNs consumables was prohibitive and supplies were difficult to obtain from local or regional market. In addition, for the fellows (who has long experienced in open surgical skills both general and urology surgery) the learning curve was slow due to the relatively low number of donor nephrectomies (an average of four in one week every month). Though abandoned, the success rate of HALDN was comparable to literatures reports with very low conversion rates and complication. The reported rates of conversion to open nephrectomy ranges from 1.5% to 4.3% (14,15). The operation time in HALDN was long as the fellows were new to the procedure. Because the number of open donor nephrectomy were few in this study, it was difficult to compare patients' surgical outcomes with HALDN. However open nephrectomy had shorter operation time but higher estimated blood loss with no difference in duration of hospital stay. Pain differences were not assessed.

Intra-operative or early surgical complication that can happen to donors includes bleeding, gastrointestinal injury , venous thrombo-embolism, re-operation, surgical site infection , bowel obstruction etc…(29) The rate of overall surgical complications of our donor's nephrectomy was very low and is comparable to centers with long experience (14,15). The only major complication was the patient who developed small bowel obstruction while in the hospital.

Conclusions and recommendations

Main kidney donors in our center are young siblings, mainly females. The rate of surgical complications was very low and comparable to high volume centers with long years of experiences. We recommend continued monitoring of donors surgical and overall all health performance in long-term. We have successfully demonstrated that, utilizing long-term collaborations and a model of training *in situ*, excellent outcomes can be obtained in a nascent national transplant program.

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