The Evaluation of Kidney Transplant Candidates and Potential Living Donors

Simin Goral MD

University of Pennsylvania Medical Center

Philadelphia, Pennsylvania

Case #1

- 37 yo male, ESRD due to FSGS
- Living-related kidney transplant age 17, deceased donor transplant age 22, and living-related kidney transplant age 27
- Back on dialysis in 2002, wants another transplant
- Recurrent FSGS 1st and 3rd transplants
- Is he a candidate? Living donor or DD?

Case #2

- 71 year old male, ESRD due to HTN, on dialysis since 2000
- Retired social worker, very compliant, very active person
- H/o colon cancer 7 years ago
- Routine blood work: PSA 8.1
- Is he a candidate?
- Can we transplant him now?

Case #3

- 30 year old male, ESRD due to lithium toxicity, not on dialysis yet
- H/o bipolar disorder, lives with his parents (mother 68 yo, father 72 yo)
- Psychosis if he stops lithium, has learning disabilities
- He also has severe peripheral neuropathy (Charcot-Marie-Tooth's), uses a wheel chair
- Is he a candidate?

Case #4

- 48 yo woman, ESRD due to IgA nephropathy, on dialysis
- H/o breast cancer treated with surgery and radiation 16 months ago
- Her sister wants to donate a kidney to her (6 antigen match), family wants surgery in 1 month
- Can we transplant her now?

Case #5

- 31 year old woman, ESRD due to lupus
- Started dialysis 2 years ago
- Hospital admission 2 months ago for pericardial effusion and anemia, now has weight loss
- ANA: 1:320, anti-DNA: 1:1280, C3: 10, C4: 18
- She has 3 potential living donors
- Can we transplant her now?

Recipient Evaluation

- Kidney transplantation is THE treatment of choice for patients with ESRD
- Waiting time: long, average 3 years
- Patients and their families should be well informed concerning the procedure as well as immunosuppression
- Informed decision and active participant

Recipient Evaluation

- Referral for transplant-nephrologists (majority) or self-referral (rare)
- Basic information gathering: insurance coverage, **patient's medical history**, family history (including potential living donors) and laboratory results
- Initial interview and exam

Recipient Evaluation

- Physical exam
- Chest x-ray, ECG-12 lead
- Dental evaluation*
- Pap smear, mammogram
- Labs: CMP, CBC, serologies (HIV, hepatitis B and C, CMV, and RPR), HLA typing, PRA , PSA

Recipient Evaluation

- Stress test (dobutamine echo or thallium)
- Colonoscopy
- Arterial Doppler of carotids or lower extremities
- MRI abdomen/MRA of pelvis
- Toxicology screen
- Echocardiogram
- Pulmonary function test

Physical Exam

- Dental health
- Carotid pulse/bruit
- Peripheral pulses, abdominal and femoral bruit
- Careful abdominal exam: previous surgeries/scars, organomegaly, large kidneys in patients with PKD
- Testicular exam, rectal exam
- Breast exam

Medical History

- Recent diagnosis of cancer
- Active infection (catheter-related, endocarditis, osteomyelitis, etc.)
- Recent chest pain, MI, or arrhythmias
- Foot ulcers, GI bleeding
- Malnutrition, morbid obesity

Medical History-Cancer

- Active or recent evidence of a malignancy, except for some skin cancer (basal cell): transplant is contraindicated
- Israel Penn International Transplant Tumor Registry (IPITTR)
- Waiting time: varies amongst different tumors

  *Breast Ca: at least 2 years-up to 5 years in certain tumors (regional lymph node involvement, bilateral disease, inflammatory histopathology)

Recurrence Risk of Pre-existing Breast Cancer After Solid Organ Transplantation

Wait time	<2 yrs	2-5 yrs	>5 yrs
# Patients	10	30	51
% Recurrence	20	20	9.8
Died of disease	10	17	4

	Stage I (55)	Stage II (25)	Stage III (11)
Median wait (mo)	65.3	87.2	61.5
% Recurrence	5.4	8	63.6
% Died of disease	3.6	4	45
Survival (1,3,5 yrs)	95, 87, 73%	95, 88, 88%	100, 67, 14%

- High mortality with less than 5-year waiting period
- No transplantation in stage III breast cancer patients

Buell JF et al, abstract #518, AST 2003

Risk of Post-Transplant Recurrence of Pre-Existing Malignancies

Risk group	Tumor type	Patients (n)	Patients treated >5 years prior to transplantation (%)	Overall Recurrence Risk (%)
Low	Incidental RCC[1]	72	0	1
	Uterine	26	50	4
	Testicular	43	58	5
	Cervical	93	54	6
	Thyroid	54	38	7
Moderate	Lymphoma	37	76	11
	Wilm's	78	33	13
	Prostate	33	34	18
	Colon	53	42	21
High	Breast	90	51	23
	Symptomatic RCC	222	22	27
	Bladder	55	22	29
	Sarcoma	17	24	29
	Skin	125	11	53

[1] Refers only to tumors incidentally discovered at time of bliateral nephrectomy pre- or concurrent with renal transplantation.

Feng S, et al. Am J Transplant 2003

Case #4

- 48 yo woman, ESRD due to IgA nephropathy, on dialysis
- H/o breast cancer treated with surgery and radiation 16 months ago
- Her sister is the donor (6 Ag match), family wants surgery in 1 month
- Waiting time: 5 years

Medical History-Cancer

- Prostate Ca: At least 2 years disease-free period followed by negative blind random biopsies
- Renal cell Ca: 2-year waiting time for asymptomatic >2 cm RCC, possibly shorter time <2 cm, at least 5 years for symptomatic RCC (recurrence risk is still ~26%)
- Colorectal Ca: waiting period of 5 years for all Duke's classifications

Case #2

- 71 year old male, ESRD due to HTN, on dialysis since 2000
- Retired social worker, very compliant, very active person
- H/o colon cancer 7 years ago: Waiting time at least 5 yrs, Duke A or B1 could have shorter waiting time
- Routine blood work: PSA 8.1: biopsy: not cancer; if cancer, waiting time at least 2 years

Medical History-Infection-HIV

- Undetectable plasma HIV-1 RNA levels (viral load) for at least 3 months (kidney)
- CD4+ T-cell count of more than 200 cells/microL
- No history of opportunistic infections and neoplasms
- Maintained on highly active antiretroviral therapy (HAART)
- Increased incidence of acute rejection after transplantation
- Preliminary data are encouraging

Medical History-Infection Hepatitis C

- After transplantation, liver disease is more frequent in HCV-positive patients than in HCV-negative patients
- HCV-positive patients have a higher risk for developing proteinuria, diabetes and infections after transplantation
- Long-term patient and graft survival rates are lower in HCV-positive patients than in HCV-negative graft recipients

Medical History-Infection Hepatitis C

- Mortality is higher, mainly as a result of liver disease and infections
- HCV-positive renal transplant recipients had a better survival than similar HCV-positive patients awaiting transplantation

Knoll GA et al, Am J Kidney Dis 1997

Medical History-Infection Hepatitis C

- All transplant candidates should be tested for HCV
- Serum transaminases may be normal even if the patient has advanced liver disease
- If HCV RNA is positive, proceed with liver biopsy
- Cirrhosis–consider combined liver/kidney transplant
- **HCV is not a contraindication for transplant**

Medical History-Infection Tuberculosis (TB)

- The prevalence of TB in renal transplant recipients 0.4-1.7% in the US and up to 12% in developing countries
- Aggressive disease with dissemination
- Chest x-ray, PPD, h/o therapy (how long and which medication?)
- INH prophylaxis for at least 6 months in patients with +PPD, past history of TB, in patients from high-risk populations

Medical History- Cardiovascular Risks

Mortality of transplant recipients from cardiovascular disease is 25 times higher than age/sex matched general population

Age, ESRD	Diabetes
Hypertension	Smoking
Hyperlipidemia	Obesity

Cardiovascular Disease

- Pre-transplant CVD important risk factor for post-transplant CVD
- High risk patients (diabetics, older patients, patients with 2 or more risk factors) should have a cardiac stress test/cardiac cath before transplant
- Repeat screening 1-2 years during waiting, every year for diabetics

Heart Disease-Evaluation

- 151 patients with IDDM, candidates for kidney transplantation without any chest pain, at University of Minnesota
- Routine arteriogram as part of the protocol
- 31 patients had significant stenosis
- 26/31 were randomized either to revascularization or medical treatment

Manske CL et al, Lancet 340:998-1002, 1992

Heart Disease-Evaluation

- 10/13 medically managed and 2/13 revascularized patients had a cardiovascular end-point 8.4 months (median) after arteriogram
- Revascularization decreased the frequency of cardiac events in this patient population
- **Conclusion:** Diabetic renal transplant candidates should be screened for silent CAD before transplantation

Manske CL et al, Lancet 340:998-1002, 1992

Screening Diabetic Transplant Candidates for CAD

- Coronary angiography is recommended:

  -All Caucasian type I diabetics over age 45

  -Type I diabetics younger than age 45 with EKG changes (ST-T segment), smoking history (>5 pack/year), diabetes for at least 25 years

Sensitivity: 97%, negative predictive value: 96%

Manske CL et al, Kidney Int 44:617-621, 1993

Screening Asymptomatic Diabetic Patients for CAD

- 97 asymptomatic type 1 and 2 DM kidney and kidney-pancreas transplant candidates
- 33% of type 1 and 48% of type 2 DM patients had significant stenosis (> or = 70%) in 1 or more coronary arteries
- On multivariate logistic regression analysis, BMI >25 was significantly associated with CAD (relative risk = 4.8, P = 0.002), also age of the patient, and smoking history
- Young African American DM patients with no smoking history and a BMI </=25 are at reduced risk, and invasive tests may not be necessary in this group

Ramanathan V, Goral S, Transplantation 2005

Obesity and Transplantation

- The majority (60%) of subjects at time of transplantation currently are overweight or obese
- Between 1987 and 2001, the proportion of obese transplant recipients rose by 116% (grossly similar to that in the general population)
- The likelihood of being obese increased with age, female sex, NIDDM, black race, and the more recent the transplant year

Friedman AN et al, Am J Kidney Dis 2003

Obesity and Transplantation

- 493 patients from Australia, 59 (12%) were obese (BMI 30 kg/m)
- More superficial wound breakdown (14% vs. 4%, P<0.01), complete wound dehiscence (3% vs. 0%, P<0.01), and wound infections (15% vs. 8%, P=0.11)
- Similar graft survival and patient survival

Johnson DW et al, Transplantation 2002

Obesity and Transplantation

- Analysis of paired kidneys: obesity (BMI>30) is not a risk factor for DGF, acute rejection, and 1-year graft survival, but decreased long-term graft survival

  Yamamoto S et al, Clin Transplant 2002

- Obese transplant (BMI >35) recipients have similar outcomes to nonobese patients, more posttransplant DM

  Howard RJ et al, Transplantation 2002

- Obese children (6-12 years) higher risk for death than nonobese patients due to cardiopulmonary disease (27% in obese vs 17% in nonobese). Graft loss as a result of thrombosis more common in obese as compared with nonobese (19% vs 10%)

  Hanevold CD et al, Pediatrics 2005

Obesity and Transplant Outcome

- UNOS database: 27,377 primary kidney-only transplants between 1997 and 1999
- Morbid obesity (BMI ≥ 35) was independently associated with increased risk of:
  - DGF ($p < 0.001$)
  - Prolonged hospitalization ($p<0.001$)
  - Acute rejection ($p = 0.006$)
  - Decreased overall graft survival ($p = 0.001$)

Gore JL, et al. Am J Transplant 2006

Medical History-Other Risks

- Disease activity (lupus, vasculitis)
- Urologic disease, cystic disease
- Pre-transplant native kidney nephrectomy
- GI diseases (peptic ulcer, gallstones, pancreatitis)
- Medications (interactions)
- Psychosocial issues, alcohol and substance abuse
- Recurrent diseases (FSGS, MPGN, HUS, lupus)
- Ethical issues (noncompliance with meds, multiple transplants, transplant after recurrence)

Live Donor Evaluation

Living Donors

- The annual number of available deceased donors will not resolve the ongoing shortage of organs
- The survival of a kidney transplanted from a live donor exceeds the results achieved from a deceased donor
- Success of live donor transplantation no longer necessitates the consideration of an HLA match unless there is possibility of a transplant from HLA identical sibling
- The survival rate of a kidney transplant from a genetically unrelated donor is excellent

Living Donors

- In 1954: Requiring an identical twin for success
- During the 1980's: Selection of an HLA-matched family member
- Current: any person (irrespective of the HLA match) can be a donor if they are medically and psychosocially suitable

Potential Live Donor Should Be:

- Competent, willing to donate
- Free of coercion
- Medically and psychosocially suitable
- Fully informed of the risks and benefits as a donor
- Fully informed of risks, benefits, and alternative treatment available to the recipient

Potential Advantages of Live Donation

- Better short-term and long-term results
- More consistent early function and ease of management
- Avoidance of long wait for cadaveric transplant
- Less delayed graft function
- Less aggressive immunosuppressive regimens
- Surgery can be planned ahead (medical and personal convenience)
- Emotional gain to donor
- Helps relieve stress on national cadaver donor supply

Potential Disadvantages of Live Donation

- Psychological stress to donor and family
- Inconvenience and risk of evaluation process (i.e. IV contrast)
- Operative mortality (0.03% or 1 in 2000 patients)
- Major perioperative complications (4.4%, range: 0.0 to 13.0%)
- Minor postoperative complications (up to 50%)
- Long-term morbidity
- Risk of traumatic injury to remaining kidney
- Risk for unrecognized chronic kidney disease

An International Survey

- Sent out by Donor Nephrectomy Outcome Research (DONOR) Network investigators
- 203 health practitioners from 119 cities in 35 different countries responded to the survey
- Sixty-three percent of respondents nephrologists, 27% surgeons, 4% nurse practitioners and 6% other individuals involved in discussing risks with potential donors

Housawi AA, et al. Nephrol Dial Transplant 2007

Table 2. Long-term medical risks discussed with potential living kidney donors

	Proportion of health care providers[a] who discuss risk (with 95% confidence interval)
Hypertension	92 (87–95)%
Proteinuria	83 (77–87)%
Chronic kidney disease[b]	81 (75–86)%
Kidney failure requiring dialysis	86 (81–90)%
Premature cardiovascular disease	33 (27–40)%
Premature death not related to the surgery	34 (28–41)%

[a]Survey of 203 transplant professionals (predominantly nephrologists and surgeons) who were responsible for informing potential donors of risks prior to donation.
[b]A glomerular filtration rate <60 ml/min.

	Proportion of health care providers[a] who believe the following medical risks are increased, compared to if a donor had elected not to have the nephrectomy	
	Not increased	Increased
Blood pressure		
Higher systolic blood pressure than expected for age	44%	56%
Higher diastolic blood pressure than expected for age	50%	50%
Hypertension[b]	55%	45%
Proteinuria		
Higher 24-h urine protein than expected for age	31%	69%
Higher 24 h urine albumin than expected for age	31%	69%
Microalbuminuria (30–300 mg/24 h)	27%	73%
Proteinuria (>300 mg/24 h)	44%	56%
Reduced kidney function		
GFR 60–80 ml/min	21%	79%
GFR < 60 ml/min	45%	55%
Other		
Cardiovascular disease	84%	16%
Death, not related to surgery	92%	8%

Housawi AA, et al. Nephrol Dial Transplant 2007

Long-Term Consequences of Live Kidney Donation

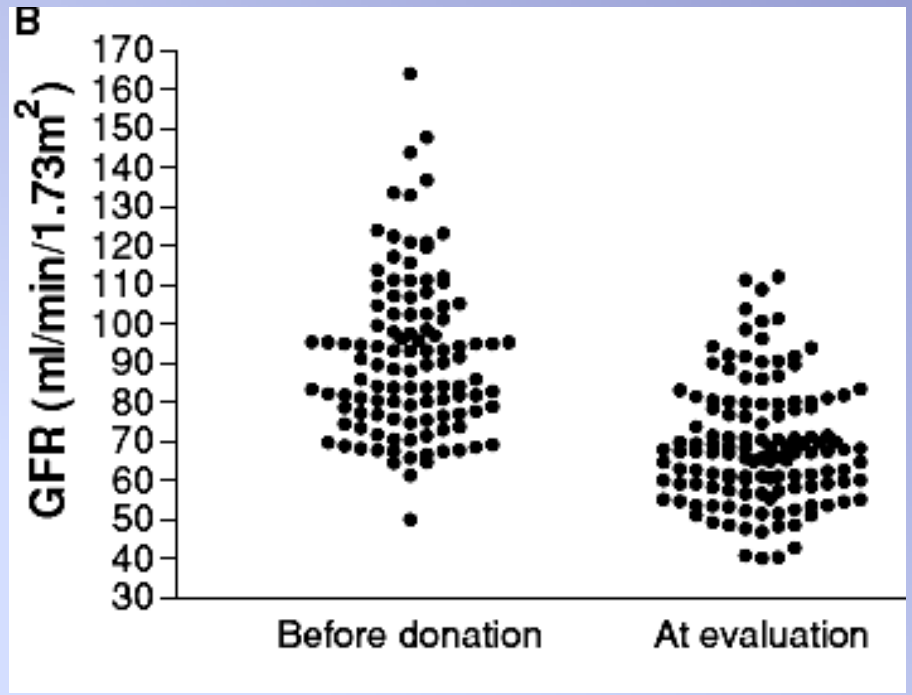
- Between 1973 and 2001, 152 living donor nephrectomies
- Seven of 152 donors had died from nonrenal diseases
- Of the remaining 145, data collection on 135 (93%) donors
- The mean time from nephrectomy to the current evaluation: 11 ± 7 (range 1–28) years

Gossman J, et al. Am J Transplant 2005

Table 3: Renal function before and after kidney donation, determined by different methods

	Before donation	At evaluation	p-value*
Plasma creatinine (μmol/L)	72.5 ± 15.0†	85.7 ± 16.8	<0.001
Cystatin C (nmol/L)		67.4 ± 13.5	
Cystatin C above normal (%)		23	
Measured creatinine clearance (mL/min/1.73 m^2)	119 ± 30	99 ± 30	<0.001
Calculated GFR (MDRD 4) (mL/min/1.73 m^2)	92 ± 20	71 ± 15	<0.001

*Wilcoxon test.
†Mean ± SD.



Gossman J, et al. Am J Transplant 2005

Table 4: Blood pressure before and after kidney donation

	Before donation	At evaluation	p-value*
Systolic blood pressure (mmHg)	125 ± 15†	134 ± 19	<0.001
Diastolic blood pressure (mmHg)	79 ± 11	81 ± 9	n.s.
Hypertensive, %	7	30	<0.001‡

Table 6: Proteinuria in kidney donors

Percentage with protein-excretion > 150 mg/day	56
Percentage with urinary albumin > 50 mg/L	10
Percentage with urinary α_1-microglobulin > 12 mg/L	7
Percentage with urinary IgG > 10 mg/L	2

Gossman J, et al. Am J Transplant 2005

Long-Term Consequences of Live Kidney Donation

- A decrease in creatinine-clearance or GFR by 20–25%, but no correlation between residual renal function and blood pressure or the amount of proteinuria in this cohort
- Blood pressure in these donors were slightly higher but it remained lower than in the normal population
- An increase in urinary protein excretion, but pathological albuminuria was rare

Gossman J, et al. Am J Transplant 2005

Long-term Morbidity

- Information on 464 live donors (60%)
- 20-37 years of follow-up
- 84 had died and 380 were alive; 3 in 84 had kidney failure; Of the 380 still alive, three had abnormal kidney function and two had undergone transplantation
- The rate of proteinuria and hypertension was similar to the age-matched general population

Ramcharan T et al, Am J Transplant 2002

Long-Term Morbidity

- 73 patients who had unilateral nephrectomy
- Normal kidney function, no proteinuria at the time of surgery
- Reasons for nephrectomy: stones in 29, renal mass in 14, hydronephrosis in 11, and renal tuberculosis in 5 patients
- Mean follow-up: 13.6± 8.6 years (18 months-35 years)
- 20 in 73 patients (27%) developed proteinuria/renal insufficiency

Praga M, et al. Kidney International 2000

Table 1. Clinical characteristics of patients at the time of unilateral nephrectomy

	Total ($N=73$)	Patients who maintained normal renal function (Group I) ($N=53$)	P value	Patients who later developed proteinuria/ renal insufficiency (Group II) ($N=20$)
Age *years*	39.7 ± 14.7 (11–66)	39 ± 14 (11–65)	NS	41 ± 14 (11–66)
Gender	35 M; 38 F	24 M; 29 F	NS	11 M; 9 F
Mean arterial pressure *mm Hg*	94 ± 12 (70–140)	93 ± 12 (70–140)	NS	98 ± 12 (80–130)
Serum creatinine *mg/dL*	1 ± 0.1 (0.7–1.4)	0.9 ± 0.1 (0.7–1.3)	NS	1 ± 0.1 (0.9–1.4)
Proteinuria *g/24 hours*	0	0	NS	0
Body weight *kg*	68 ± 12 (40–99)	63.5 ± 8.9 (40–85)	<0.001	80.1 ± 12.1 (53–99)
Body mass index kg/m^2	26.2 ± 5.3 (18–41.4)	24.3 ± 3.7 (18–34)	<0.001	31.6 ± 5.6 (22–41.4)

In 14 obese patients (BMI>30 at the time of nephrectomy), 13 (92%) developed proteinuria/renal insufficiency.

Praga M, et al. Kidney International 2000

Long-term Morbidity

- Organ Procurement and Transplantation Network (OPTN) database
- A total of 56 previous living donors in 47,996 subsequently listed for cadaveric kidney transplantation (0.04%); 43 have received transplants; 36 currently have functioning grafts; One died after transplantation; Two candidates died while waiting
- 1999 adjusted incident rate for ESRD in the general U.S. population: 315 per million population, or 0.03%

Ellison MD et al, Transplantation 2002

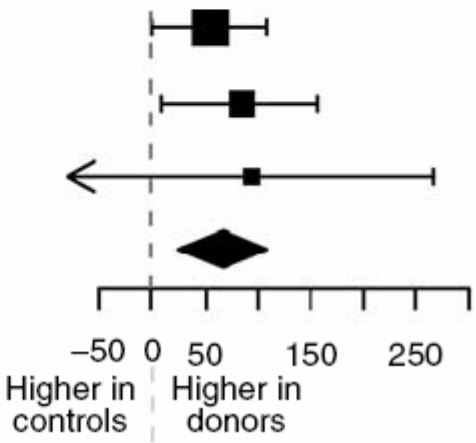
Proteinuria and Reduced Kidney Function in Living Kidney Donors- A Meta-Analysis

- Forty-eight studies from 27 countries followed a total of 5048 donors
- Follow-up: average of 7 years (median 6, range 1–25 years)
- Published from 1973 to 2005
- 21% prospectively followed donors in time
- Four studies described the characteristics of donors lost to follow-up

Garg AX, et al. Kidney Int 2006

24 h urine protein

Source*	Donors, post-donation: Years after donation, Mean (range)	Donors, post-donation: 24 h urine Protein (mg/day) *N* mean (s.d.)	Controls: 24 h urine Protein (mg/day) *N* mean (s.d.)	24 h urine protein Mean difference (mg/day) 95% CI
D'Almeida *et al.*[45]	7 (1–14)	59 151 (125)	28 96 (116)	54 (1, 108)
Williams *et al.*[58]	13 (10–18)	37 115 (135)	17 31 (125)	84 (10, 157)
Mathillas *et al.*[60]	15 (10–20)	33 306 (320)	14 212 (255)	94 (–79, 267)
Pooled estimate		129 147 (22)	59 83 (30)	66 (24, 108)



- The average 24 h urine protein was 154mg/day and the average GFR was 86 ml/min
- Kidney donation resulted in small increases in urinary albumin, which increased with the time after donation

Proteinuria and Reduced Kidney Function in Living Kidney Donors- A Meta-Analysis

- Ten years after nephrectomy, donors had a GFR that was 10 ml/min lower compared to controls
- 12% of donors developed a GFR less than 60 ml/min during follow-up
- However, after the initial decrement in GFR from the nephrectomy, there was no evidence of an accelerated loss in GFR over that anticipated with normal aging
- The pooled incidence of proteinuria: 12%

Garg AX, et al. Kidney Int 2006

Donor Evaluation

- Live kidney donor **must** receive a complete medical and psychosocial evaluation
- Blood typing: often the first test, relatively inexpensive
- Initial cross-match
- Preliminary medical evaluation

Donor Evaluation

- Complete history (*hereditary dz) and physical exam
- Labs (routine, serologies, OGTT for diabetic families)
- UA, urine culture, pregnancy test
- 24 hour urine for protein and creatinine
- GFR measurement (glofil-ideal)
- Chest x-ray, ECG, exercise stress test for patients older than 50 years of age
- CT angio or MRA of renal arteries
- Psychosocial evaluation
- Repeat crossmatch before transplantation

Hereditary Diseases

- Alport’s syndrome
- Diabetes
- Polycystic kidney disease
- FSGS
- IgA nephropathy
- Hypertension
- HUS, SLE, and cystinosis

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- A **GFR**<80 ml/min or 2 SD below normal (based on age, gender, and BSA corrected to 1.73 per m2) generally preclude donation
- Patients with a **BP**>140/90 mmHg by ABPM are generally not acceptable as donors
- Patients with a **BMI**>35 kg/m2 should be discouraged from donating
- **Dyslipidemia** alone does not exclude kidney donation (Keep an eye on “Metabolic Syndrome”)

Transplantation March 27, 2005

Amsterdam Forum Guidelines

- A 24 h urine **protein** of >300 mg is a contraindication to donation
- Individuals with a history of **diabetes** or fasting blood glucose ≥126 mg/dl (7.0 mmol/l) on at least two occasions (or 2 h glucose with OGTT≥200 mg/dl (11.1 mmol/l) should not donate

Persistent Microscopic Hematuria
Two or more positive dipstick urine tests on separate occasions over at least one-month period

	Need to undergo
Detailed family history	for TBMN, Alport's syndrome etc
Urine culture	to rule out infection
24 hour urine collection	to estimate protein, calcium, urate etc
Cytology	to look for malignancy
Cystoscopy	
Renal imaging:	
CT-Renal angiogram	to look for Nephrolithiasis, urothelial cancer
(or)	and also to assess anatomy of renal vasculature
Intravenous Pyelography	

If no urological cause found, then **Counseling** and **option for deferring donation**

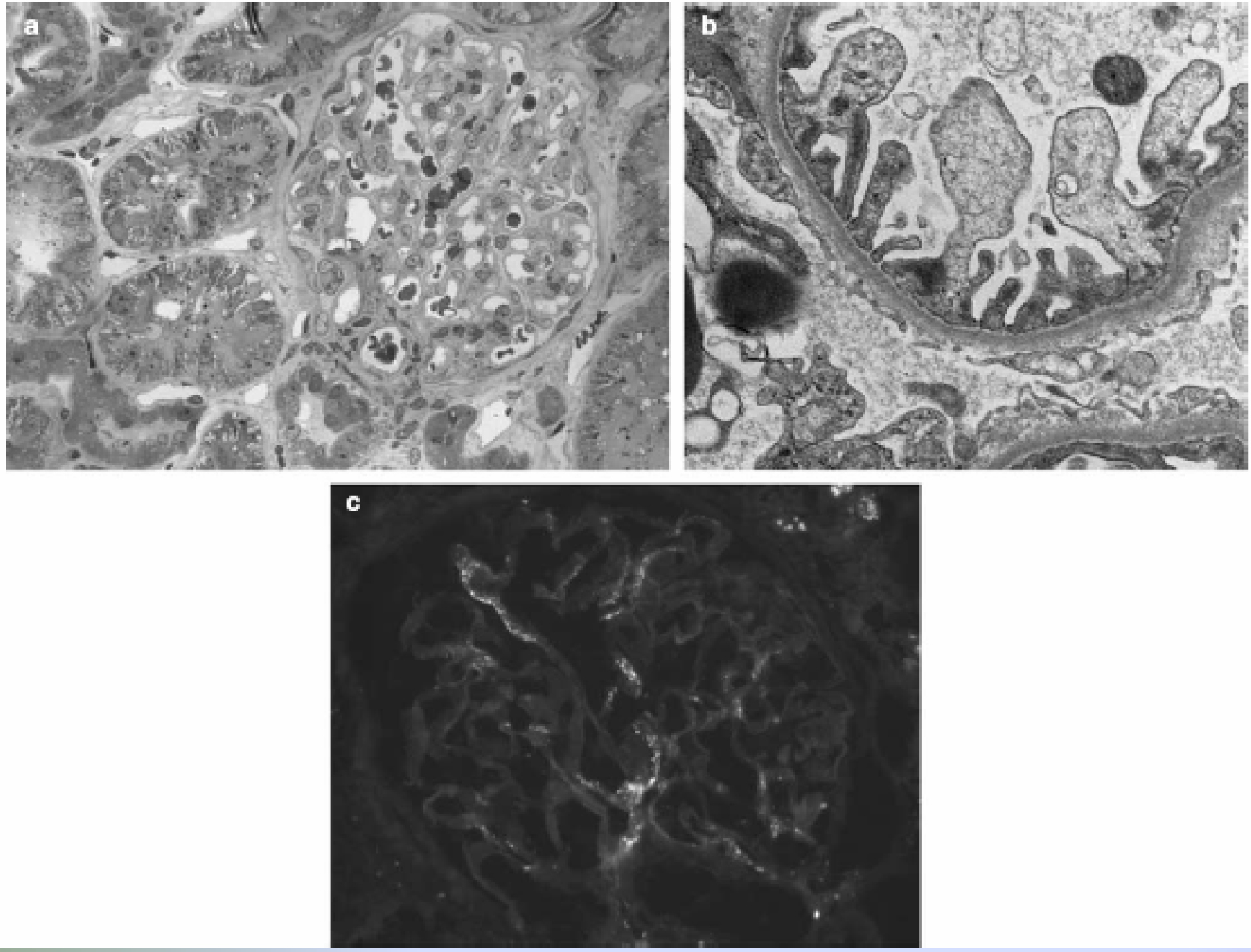
Deferred donation
Further follow-up with PCP

For those willing to undergo further evaluation
Renal Biopsy should be perfomed

Vadivel N, et al. Kidney Int 2007

Causes of Persistent Microscopic Hematuria

- **Glomerular** bleeding (common causes, not associated with proteinuria or casts)
  - Thin basement membrane nephropathy (TBMN)
  - Alport Syndrome (early stage) or carrier state
  - IgA nephropathy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Causes of Persistent Microscopic Hematuria

- **Extraglomerular** bleeding
  - Stone disease
  - Hemoglobinopathy (SS/SA hemoglobin)
  - Polycystic kidney disease
  - Benign prostatic hyperplasia (elderly donors)
  - Malignancy (bladder, kidney, prostate)
  - Arteriovenous malformations and fistulas
  - Schistosomiasis (in endemic areas)
  - Hypercalciuria, hyperuricosuria, etc.

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- Asymptomatic potential donor+history of a **single stone** may be suitable if:
  - No hypercalcuria, hyperuricemia, or metabolic acidosis
  - No cystinuria or hyperoxaluria
  - No urinary tract infection
  - No evidence of multiple stones or nephrocalcinosis on CT scan

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- **Stone** formers who should not donate are:
  - Nephrocalcinosis on X ray or bilateral stone disease
  - Stone types with high recurrence rates, and are difficult to prevent

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- A prior history of the following **malignancies** usually excludes live kidney donation:
  - Melanoma
  - Testicular cancer
  - Renal cell carcinoma
  - Choriocarcinoma
  - Hematological malignancy
  - Bronchial cancer
  - Breast cancer
  - Monoclonal gammopathy

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Cardiovascular Risk Assessment

- The clinical predictors of an **increased perioperative risk** (for non-cardiac surgery) by the American College of Cardiology /American Hospital Association standards fall into three categories: major, intermediate, and minor
- **Major predictors**: unstable coronary syndromes, decompensated heart failure, significant arrhythmias and severe valvular disease-contraindications to live kidney donation

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Cardiovascular Risk Assessment

- Most of the **intermediate predictors**: mild angina, previous myocardial infarction, compensated or prior heart failure, and diabetes mellitus-contraindications to donation
- **Minor predictors**: older age, abnormal ECG, rhythm other than sinus, low cardiac functional capacity, history of stroke, or uncontrolled hypertension-warrant individual consideration

Psychosocial Evaluation of Living Kidney donors

- Sociodemographic history and current status
- Capacity to comprehend information
- Psychological status
- Relationship with transplant candidate
- Rationale and reasons for volunteering to donate
- Knowledge, understanding, and preparing for donation
- Social supports
- Financial status and suitability

Donor Evaluation-Actual Cases

- Microscopic hematuria and renal mass (renal cell carcinoma)
- Unknown pregnancy
- Significant bilateral hydronephrosis
- Horseshoe kidney
- Unrecognized hypertension
- Slightly elevated liver enzymes, + HCV (previously unknown)
- Fibromuscular dysplasia
- EF < 20% on ECHO
- Proteinuria: kidney biopsy IgA nephropathy

The Impact of BMI on Renal Transplant Outcomes

Meier-Kriesche HU et al, Transplantation 2003

TABLE 1. Cox proportional hazard model for graft loss by categorized body mass index

BMI (kg/m^2)	RR	95% CI	*P*
<18	1.213	1.110–1.326	<0.001
18–20	1.114	1.044–1.189	0.001
20–22	1.034	0.976–1.094	0.257
22–24	0.963	0.912–1.017	0.117
24–26	1.000	-Reference-	
26–28	1.071	1.008–1.136	0.026
28–30	1.073	1.004–1.140	0.047
30–32	1.181	1.098–1.271	<0.001
32–34	1.151	1.055–1.257	0.002
34–36	1.205	1.084–1.339	0.001
>36	1.385	1.300–1.551	<0.001

Polycystic Kidney Disease

- Potential donor >30 years of age, negative ultrasound, CT or MRI: safe to donate
- Suspected PKD with ultrasound: two or more cysts in individuals 30 years or younger, or two or more cysts in each kidney in those aged 30–59 years, or four cysts in each kidney in those older than 60 years
- Suspected PKD with MRI: If all cysts are to be counted, five cysts or more for 18–29-year-olds, six cysts or more for 30–44-year-olds, six cysts or more for women 45–59 years old, and nine cysts or more for men 45–59 years old

Alessandra B et al, Radiology 2001

Long-term Morbidity

TABLE 1. Diagnosis of previous living donors at time of listing

Diagnosis	Number	Percent
Hypertensive nephrosclerosis	20	35.71
Focal glomerularsclerosis	9	16.07
Chronic glomerulonephritis unspecified	7	12.50
Unknown/not reported	5	8.93
Malignant hypertension	4	7.14
Familial nephropathy	2	3.57
Diabetes—insulin dependent	2	3.57
Blunt trauma	1	1.79
Chronic pyelonephritis/reflux nephropathy	1	1.79
Membranous glomerulonephritis	1	1.79
Nephritis	1	1.79
Renal cell carcinoma	1	1.79
Systemic lupus erythematosus	1	1.79
Vasculitis	1	1.79
Total	56	100.00