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Longitudinal change patterns in estimated glomerular filtration rate in a European population of living kidney donors

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DISCLOSURES

The authors have no conflicts of interest to disclose

LONGITUDINAL CHANGE PATTERNS IN ESTIMATED GLOMERULAR FILTRATION RATE IN A EUROPEAN POPULATION OF LIVING KIDNEY DONORS

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Introduction

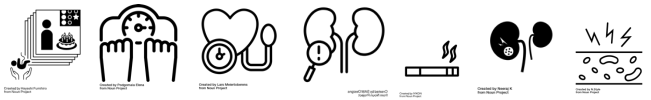
- ✓ Living donor (LD) kidney transplantation is the best treatment for end-stage renal disease
- ✓ Living kidney donors (LKD) are at increased risk of ESRD compared to matched, healthy controls.

- ✓ We sought to evaluate the longitudinal changes in the estimated glomerular filtration rate (eGFR) in our cohort of LD

- ✓ We explored several subgroups in search of distinct signatures of eGFR change according to LD characteristics at the time of donation.

Methods

- ✓ Retrospective, single-center analysis of the LKD at our Unit from 1998 to 2019
- ✓ The primary outcome was the change in eGFR until 15- years(Y) post-donation
- ✓ Factors pre-donation



- ✓ And the kidney function reduction rate (%KFRR) post-donation [-(eGFR6months(M)post-D– eGFRpre-D)/eGFRpre-D*100]
- ✓ Donor eGFR change between 6 months- to 15-years post-donation was assessed by univariate and multivariable linear mixed regression model,
- ✓ Distinct temporal trends of eGFR change were sought by imputing time as a linear spline with knots at 2, 5, 10-years.

RESULTS

Table 1: Baseline characteristics of the study cohort

	n=320**
Age (years), Mean±SD	47.3±10.5
Age (years), n (%)	
< 40	81 (25)
40-55	154 (48)
>= 55	85 (27)
Sex F:M, n (%)	227 (71):93(29)
BMI kg/m^2, Mean±SD	25.3±3.3
BMI kg/m^2, n (%)	
<25	155 (48)
25-30	132 (41)
>=30	33 (10)
Smoking habits, n (%)	48 (15)
Hypertension, n (%)	51 (16)
Dyslipidemia, n (%)	44 (14)
ProtU 0.15-0.5 g/g, n (%)	96 (30)
Pre-donation SCr mg/dL, Mean ± SD	0.75±0.16
Pre- donation eGFR mL/min/1.73m^2, Mean ± SD	100.4±14.6
Pre- donation eGFR mL/min/1.73m^2, n (%)	
<80	29 (9)
80-90	48 (15)
>=90	243 (76)
Number of SCr measurements, Median (IQR) [min.max.]	7 (5-11) [3.16.]
% kidney function reduction rate (FKRR) post-donation*, Median (IQR)	31.9 (22.6-38.1)
% KFRR post-donation, n (%)	
<26.2	106 (33)
26.2-36.1	107 (33)
>36.1	107 (33)

*KFRR post-donation =

[-(eGFR6M-eGFRpre-donation)/eGFRpre-donation*100]

**Inclusion criteria were serum creatinine (Scr) evaluation at 6 months and at least 3 Scr evaluations at follow-up

RESULTS

Table 2: Change in eGFR (mL/min/1.73 m^2/year) in 320 donors from 6 months onward

	Mean (95% CI)
Overall	+0.35 (+0.20, +0.50)
Linear spline model	
6M-2y	+0.85 (+0.10, +1.61)
2y-5y	+0.45 (+0.04, +0.86)
5y-10y	+0.24 (-0.08, +0.55)
10y-15y	-0.24 (-0.75, +0.28)

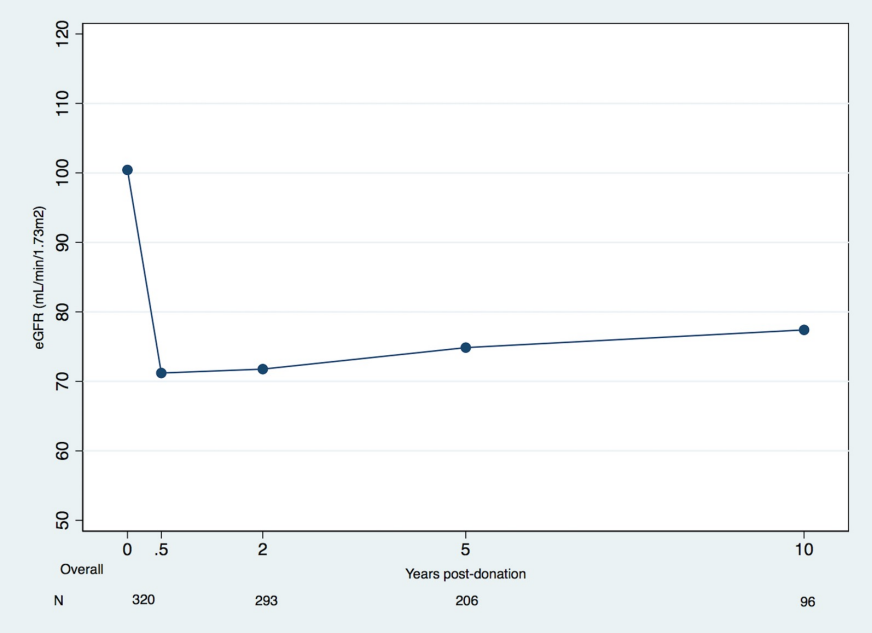


Figure 1. Mean eGFR (mL/min per 1.73 m2) in LDs pre-donation and during post-donation follow-up

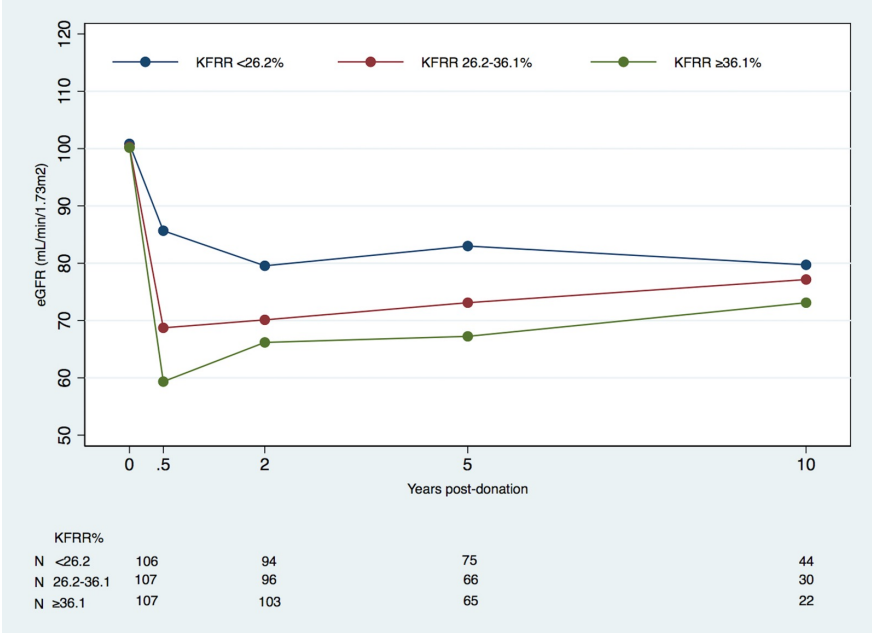


Figure 2. Mean eGFR (mL/min/1.73 m2) in living kidney donors by KFRR percentage subgroups at 6 months, starting at pre-donation and during post-donation follow-up

RESULTS

Table 2: Changes in eGFR (mL/min/1.73 m^2/year) in living kidney donors (n=320) by subgroup over different periods during follow-up from 6 months onward (multivariable analysis)

		Linear spline model			
	Overall	6mo-2y	2y-5y	5y-10y	10-15y
Age* (years)					
< 40	+0.36 (+0.07, +0.65)[A]	+0.66 (-0.94, 2.26)[A]	+0.69 (-0.18, +1.56)[A]	+0.05 (-0.61, +0.71)[A]	+0.08 (-1.03, +1.18)
40-55	+0.41 (+0.21, +0.62)[A]	+1.18 (+0.08, +2.27)[A]	+0.42 (-0.17, +1.01)[A]	+0.36 (+0.08, +0.81)[A]	-0.47 (-1.31, +0.38)
>= 55	+0.44 (+0.12, +0.75)[A]	+0.96 (-0.59, +2.51)[A]	+0.45 (-0.39, +1.30)[A]	+0.40 (-0.34, +1.14)[A]	+0.07 (-1.51, +1.36)
p	*0.932*	*0.87*	*0.879*	*0.706*	*0.727*
Sex					
Male	+0.61 (+0.31, +0.91)	+0.57 (-0.91, +2.05)	+0.60 (-0.23, +1.43)	+0.68 (-0.01, +1.37)	+0.53 (-0.93, +2.00
Female	+0.33 (+0.16, +0.50)	+1.15 (+0.24, +2.06)	+0.46 (-0.03, +0.95)	+0.15 (-0.25, +0.55)	-0.52 (-1.24, +0.21)
p	*0.128*	*0.522*	*0.787*	*0.222*	*0.242*
BMI* (kg/m^2)					
<25	+0.59 (+0.37, +0.80)[B]	+0.67 (-0.44, +1.77)[AB]	+0.97 (+0.36, +1.57)[B]	+0.32 (-0.17, +0.81)[A]	-0.11 (-1.14, +0.91)
25-30	+0.35 (-0.14, +0.56)[AB]	+2.17 (+0.98, +3.36)[B]	-0.17 (-0.81, +0.46)[A]	+0.49 (+0.02, +0.95)[A]	-0.26 (-1.01, +0.48)
>=30	-0.18 (-0.68, +0.31)[A]	-2.47 (-4.92, -0.03)[A]	+1.18 (-0.17, +2.53)[AB]	-0.64 (-1.82, +0.54)[A]	-0.62 (-2.39, +1.16)
p	***0.02***	***0.002***	***0.021***	*0.214*	*0.897*
Hypertension					
No	+0.37 (+0.21, +0.53)	+1.07 (+0.23, +1.90)	+0.34 (-0.11, +0.80)	+0.37 (+0.01, +0.73)	-0.22 (-0.88, +0.44)
Yes	+0.60 (+0.19, +1.01)	+0.58 (-1.48, +2.64)	+1.36 (+0.23, +2.48)	-0.12 (-1.08, +0.83)	-0.29 (-2.17, +1.59)
p	*0.313*	*0.672*	*0.11*	*0.361*	*0.946*
Smoking					
No	+0.41 (+0.25, +0.56)	+1.31 (+0.48, +2.14)	+0.30 (-0.15, +0.75)	+0.40 (+0.04, +0.75)	-0.30 (-1.01, +0.42)
Yes	+0.40 (-0.01, +0.82)	-0.86 (-2.93, +1.20)	+1.66 (+0.48, +2.83)	-0.31 (-1.32, +0.70)	+0.16 (-1.47, +1.78
p	*0.985*	*0.059*	***0.039***	*0.211*	*0.648*
Dyslipidemia					
No	+0.37 (+0.22, +0.53)	+0.92 (+0.10, +1.75)	+0.51 (+0.06, +0.95)	+0.27 (-0.08, +0.62)	-0.30 (-0.96, +0.36)
Yes	+0.61 (+0.19, +1.04)	+1.45 (-0.72, +3.62)	+0.43 (-0.78, +1.64)	+0.46 (-0.52, +1.43)	+0.24 (-1.54, +2.03
p	*0.311*	*0.661*	*0.904*	*0.725*	*0.585*
ProtU 0.15-0.5 g/g					
No	+0.39 (+0.23, +0.55)	+1.28 (+0.38, +2.20)	+0.32 (-0.16, +0.81)	+0.37 (+0.01, +0.72)	-0.24 (-0.88, +0.41)
Yes	+0.46 (+0.16, 0.76)	+0.19 (-1.19, +1.56)	+0.99 (+0.22, +1.75)	+0.08 (-0.65, +0.82)	-0.21 (-1.61, +1.18)
p	*0.674*	*0.193*	*0.152*	*0.504*	*0.975*
Predonation eGFR *(mL/min/1.73m^2)					
<80	-0.09 (-0.63, +0.44)[A]	+2.85 (+0.24, +5.46)[A]	+0.14 (-1.41, +1.69)[A]	-1.16 (-2.39, +0.06)[B]	-0.44 (-2.03, +1.15)
80-90	+0.52 (+0.16, +0.88)[A]	+2.32 (+0.34, +4.29)[A]	-0.33 (-1.41, +0.75)[A]	+0.51 (-0.31, +1.32)[A]	+1.62 (+0.23, +3.01)
>=90	+0.43 (+0.27, +0.60)[A]	+0.54 (-0.34, +1.41)[A]	+0.70 (+0.23, +1.17)[A]	+0.40 (+0.04, +0.77)[A]	-0.58 (-1.33, +0.18)
p	*0.141*	*0.105*	*0.217*	***0.049***	***0.028***

** In variables with 3 or more groups, each box will present letters A to C (superscript). It should be concluded that subgroups that share the same letters in the same box are non-significantly different.

Table 3:Changes in eGFR (mL/min/1.73 m^2/year) in living kidney donors (n=320) by % of KFRR post-donation donor group over different periods during follow-up from 6 months onward (multivariable analysis), adjusted to pre-donation variables

		Linear spline model			
	Overall	6M-2y	2y-5y	5y-10y	10-15y
%KFRR post-donation*,**					
<26.2	-0.21 (-0.42, +0.01)[B]	-2.71 (-4.04, -1.39)[A]	+0.35 (-0.34, +1.03)[A]	+0.03 (-0.47, +0.53)[A]	-0.36 (-1.14, +0.42)
26.2-36.1	+0.53 (+0.28, +0.78)[A]	+1.50 (+0.20, +2.80)[B]	+0.79 (+0.08, +1.51)[A]	+0.09 (-0.48, +0.66)[A]	-0.49 (-1.77, +0.80)
>36.1	+0.65 (+0.39, +0.92)[A]	+3.66 (+2.38, +4.94)[C]	+0.04 (-0.67, +0.76)[A]	+0.43 (-0.19, +1.05)[A]	-0.61 (-1.84, +0.61)
p	***<0.001***	***<0.001***	*0.339*	*0.595*	*0.941*

RESULTS

Table 5. eGFR (ml/mi/1.73 m²) category for donors based on the last available SCr measurement, using the CKD-EPI equation

eGFR (ml/min/1.73 m²)	n=320 n (%)
<15	0
15-30	2 (1)
30-45	4 (1)
45-60	55 (17)
60-90	205 (64)
>=90	54 (17)

Table 6. Prevalence of low eGFR (ml/min/1.73 m2) using the CKD-EPI equation, in living kidney donors during follow-up n (%)

	Predonation	6 M	2y	5y	10y
N	320	320	293	206	96
<60	0	79 (25)	68 (23)	38 (18)	12 (13)
<55	0	44 (14)	31 (11)	16 (8)	5 (5)
<50	0	26 (8)	13 (4)	10 (5)	2 (2)
<45	0	8 (3)	3 (1)	4 (2)	2(2)
<40	0	3 (1)	2 (1)	2 (1)	1 (1)
<35	0	0	2 (1)	0	0
<30	0	0	0	0	0

Table 7. Prevalence of proteinuria in LDs pre-donation and over different periods during follow-up

	Pre-donation	6M	2y	5y	10y
n	302	283	251	172	78
Median (IQR)	0.11 (0.07-0.16)	0.08 (0.06-0.11)	0.07 (0.06-0.10)	0.08 (0.06-0.11)	0.07 (0.06-0.10)
≥0.15g/g n (%)	96 (30)	30 (11)	19 (8)	18 (10)	6 (8)

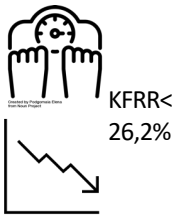
Table 8. Prevalence of eGFR<50 ml/min/ 1.73 m2, in LDs by subgroup over different time periods during FU from 6 months onward n (%), using the CKD-EPI equation

	Predonation	6M	2y	5y	10y
n	320	320	293	206	96
Overall	0	26 (8)	13 (4)	10 (5)	2 (2)
Age (years)	-				
< 40		1 (4)	1 (4)	0	0
40-55		14 (9)	4 (3)	3 (3)	1 (2)
>= 55		11 (13)	8 (10)	7 (13)	1 (5)
p		***0.009***	***0.025***	***0.005***	*0.446*
Sex	-				
Male		9 (10)	6 (7)	3 (5)	2 (8)
Female		17 (7)	7 (3)	7 (5)	0
p		*0.515*	*0.127*	*0.729*	*0.061*
BMI (kg/m²)	-				
<25		12 (8)	8 (6)	4 (4)	1 (3)
25-30		11 (8)	2 (2)	5 (6)	0
>=30		3 (9)	3 (10)	1 (5)	1 (14)
P		*0.956*	*0.063*	*0.894*	*0.064*
Hypertension	-				
No		18 (7)	9 (4)	6 (3)	1 (1)
Yes		8 (16)	4 (9)	4 (12)	1 (9)
p		***0.031***	*0.138*	*0.057*	*0.217*
Smoking	-				
No		24 (9)	13 (5)	10 (6)	2 (2)
Yes		2 (4)	0	0	0
p		*0.394*	*0.227*	*0.364*	*1*
Dyslipidemia	-				
No		17 (6)	7 (3)	6 (3)	1 (1)
Yes		9 (20)	6 (14)	4 (15)	1 (9)
p		***0.001***	***0.001***	***0.025***	*0.217*
ProtU 0.15-0.5 g/g	-				
No		19 (8)	9 (4)	9 (6)	2 (2)
Yes		7 (7)	4 (4)	1 (2)	0
p		*0.721*	*1*	*0.287*	*1*
Pre-donation eGFR (mL/min/1.73m²)	-				
<80		14 (48)	8 (31)	5 (36)	1 (14)
80-90		9 (19)	3 (7)	3 (10)	1 (7)
>=90		3 (1)	2 (1)	2 (1)	0
p		***<0.001***	***<0.001***	***<0.001***	*0.051*
%KFRR post-donation	-				
<26.2		0	2 (2)	2 (3)	1 (2)
26.2-36.1		6 (6)	3 (3)	3 (5)	0
>36.1		20 (19)	8 (8)	5 (8)	1 (5)
p		***<0.001***	*0.162*	*0.395*	*0.711*

DISCUSSION

Our data shows that eGFR recovery after donation is significant and may last until 10 years after the donation.

These observations confirm that significant kidney function loss or accelerated decline is exceptional in a carefully selected cohort of donors.



However, some subgroups of donors presented a more ominous kidney function trajectory pattern, pointing to the necessity of tailored follow-up.