

UK Living Kidney Donation Network Meeting
Wednesday 10th May 2023

Clinical Session: Donor Assessment
- the grey areas

- Donor BMI
- Donor GFR/Split function (pre/post cr.)
- Donor Hypertension/end organ damage

Is Size Important?

Differential Kidney Function vs Size in Prospective
Living Kidney Donors
Graham Lipkin, Birmingham

Dr J Sturman, Dr U Hayat, Dr A Fenton, Dr R Jones & Dr G Lipkin
University Hospitals Birmingham NHS Foundation Trust



Measurement of Renal Function

- *Initial evaluation of donor candidates should be using estimated glomerular filtration rate (eGFR), expressed as mL/min/1.73m² computed from a creatinine assay standardised to the International Reference Standard. (B1)*
- *GFR must subsequently be assessed by a reference measured method (mGFR) such as clearance of ⁵¹Cr-EDTA, ¹²⁵Iothalamate or Iohexol performed according to guidelines published by the British Society of Nuclear Medicine. (B1)*
- *Differential kidney function, determined by ^{99m}TcDMSA scanning is recommended where there is >10% variation in kidney size or significant renal anatomical abnormality. (C1)*

Advisory GFR Thresholds for Donation

- *Pre-donation mGFR should be such that the predicted post-donation GFR remains within the gender and age-specific normal range within the donor's lifetime. Recommended threshold levels are defined in Table 5.5.2. (B1)*
- *The risk of end-stage renal disease (ESRD) after donation is no higher than that of the general population. However, there is a very small absolute increased lifetime risk of ESRD following donation for which the potential donor must be consented. (D2)*
- *The decision to approve donor candidates whose renal function is below the advisory GFR threshold or who have additional risk factors for the development of ESRD should be individualised and based on the predicted lifetime incidence of ESRD. (D2)*

- *The renal function requirements of the intended recipient, based upon the absolute GFR of the donor, are relevant to the decision to donate (in a directed donation) and to the acceptance of a kidney offer from a non-directed donor or within the UK Living Kidney Sharing Schemes. (Not Graded)*

Background

- British Transplantation Society Guidance:

*‘Differential kidney function, determined by $^{99m}\text{TcDMSA}$ scanning is recommended where there is **>10% variation in kidney size** or significant renal anatomical abnormality.’ (Guidelines for Living Donor Kidney Transplantation, 4th Edition, 2018)*

- KDIGO Guidelines: Split renal function should be calculated if **differential kidney size >10% or >2cm**
- Both recommended on low quality evidence (Grade C)
- All imaging: DMSA, GFR lastly CTA/U/V on 1 day



Normal Kidney Function in UK Population

3000 healthy potential donors

RESEARCH ARTICLE

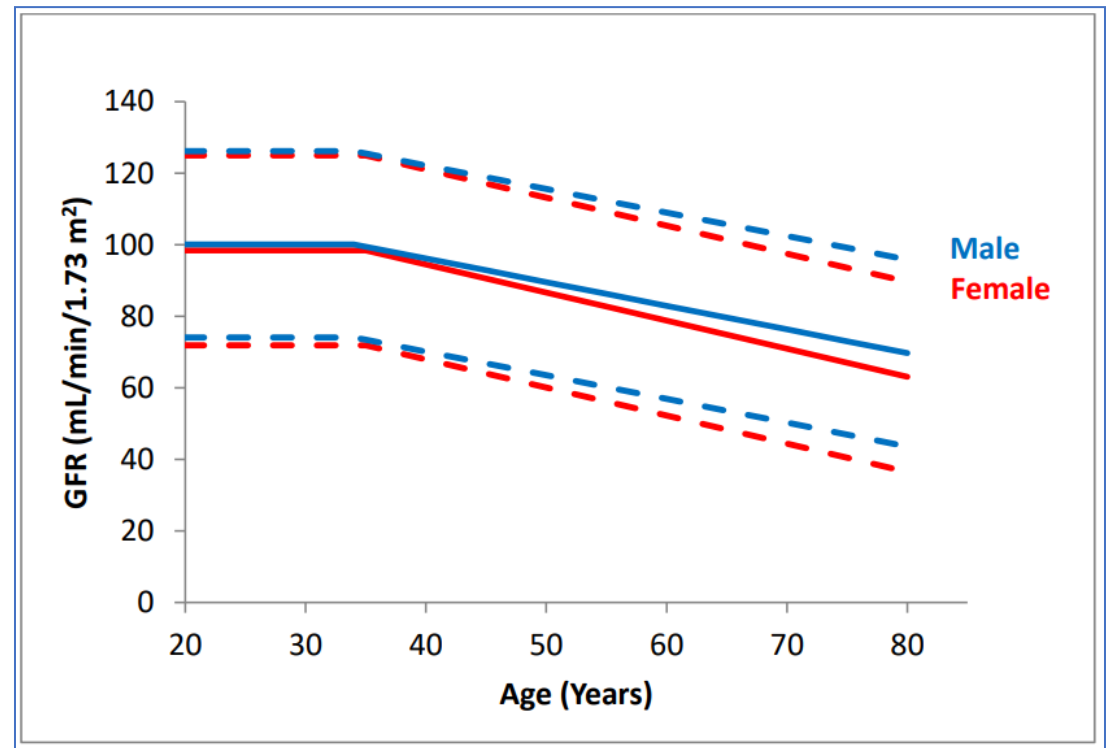
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Glomerular filtration rate: new age- and gender- specific reference ranges and thresholds for living kidney donation

Anthony Fenton¹, Emma Montgomery², Peter Nightingale³, A. Michael Peters⁴, Neil Sheerin^{2,5}, A. Caroline Wroe⁶ and Graham W. Lipkin^{1*}

Age (years)	Measured GFR (mL/min/1.73m ²)	
	Male	Female
20-29	100 (74-126)	98 (72-125)
30-34	100 (74-126)	98 (72-125)
35	99 (73-126)	98 (72-125)
40	96 (70-122)	94 (68-121)
45	93 (67-119)	91 (64-117)
50	90 (63-116)	87 (60-113)
55	86 (60-112)	83 (56-109)
60	83 (57-109)	79 (52-105)
65	80 (54-106)	75 (48-101)
70	76 (50-102)	71 (44-97)
75	73 (47-99)	67 (40-94)
80	70 (44-96)	63 (36-90)

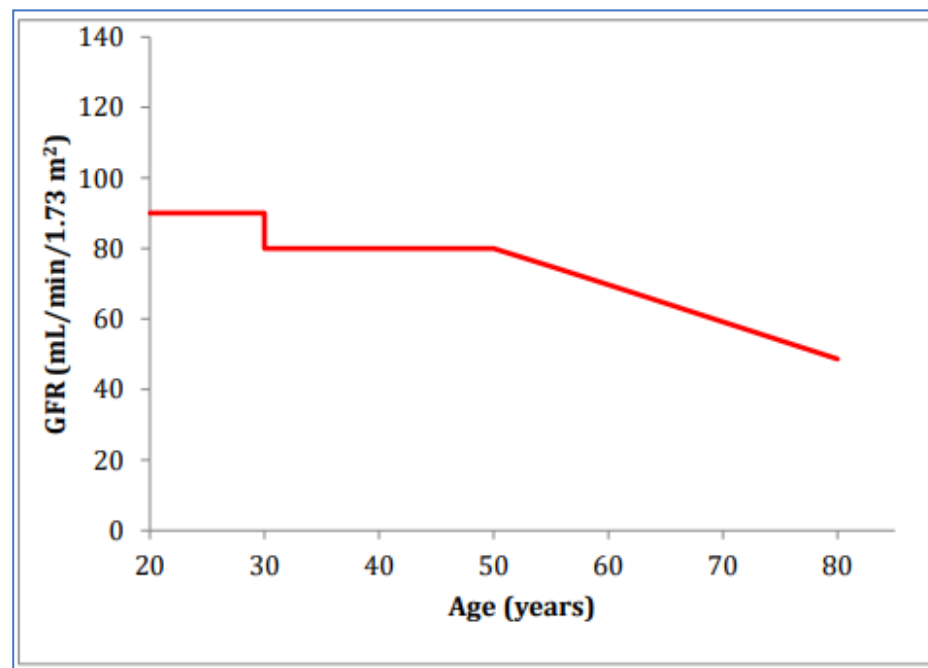
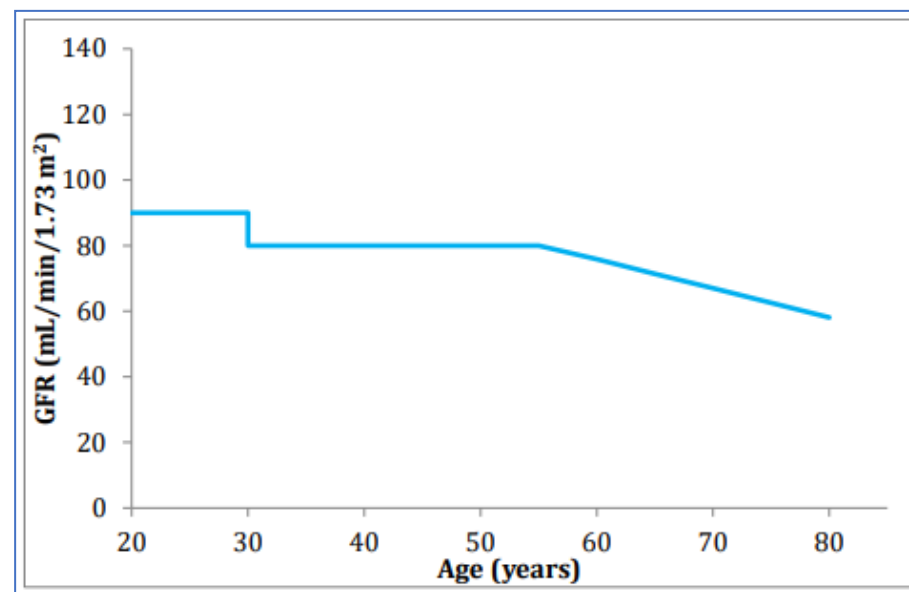




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Age (years)	Threshold GFR (mL/min/1.73m ²)	
	Male	Female
20-29	90	90
30-34	80	80
35	80	80
40	80	80
45	80	80
50	80	80
55	80	75
60	76	70
65	71	64
70	67	59
75	63	54
80	58	49

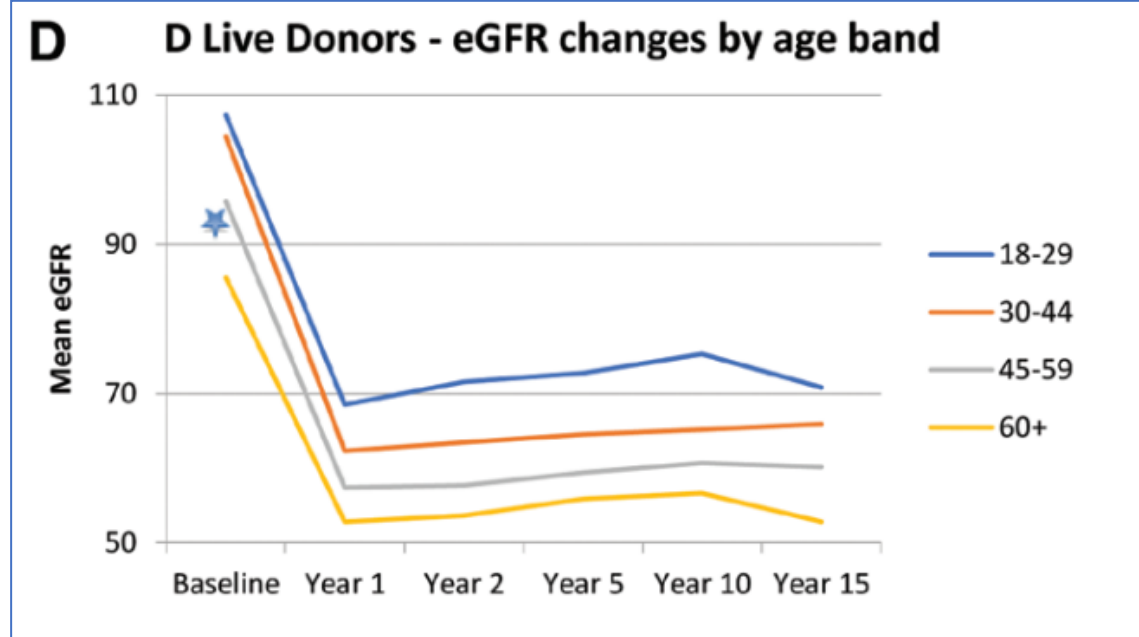
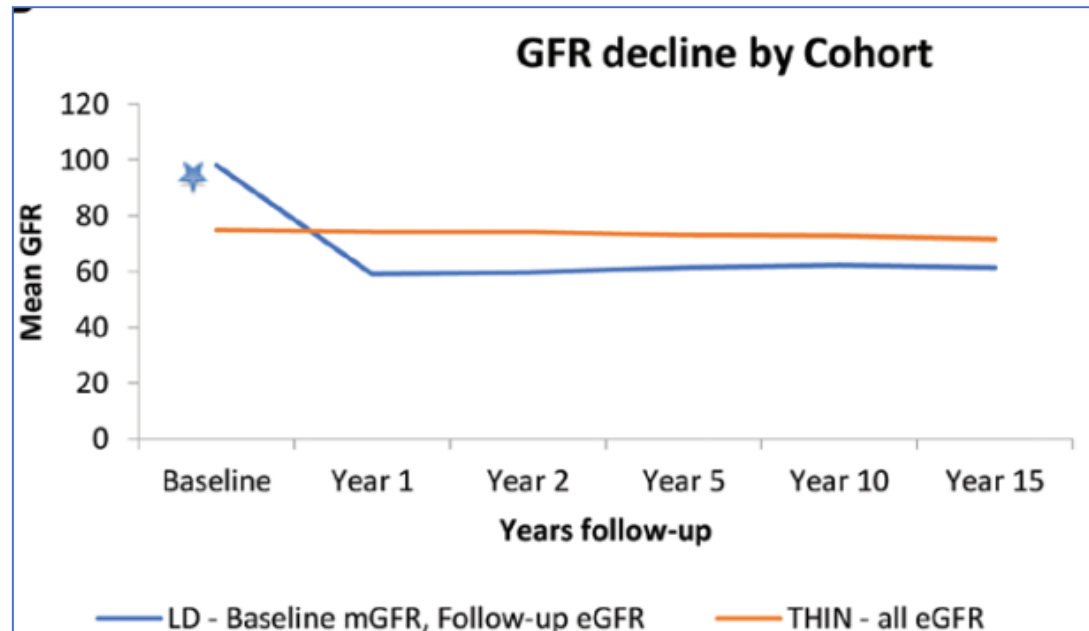




Comparison of Medium-term Outcomes of Living Kidney Donors With Longitudinal Healthy Control in the United Kingdom

9750 LD and 19071 THIN participants.

Nithya Krishnan, FRCP, MD,^{1,2} Lisa Mumford, MSc,³ Graham Lipkin, FRCP,⁴ Paramjit Gill, FRCGP,⁵ Simon Fletcher, FRCP,¹ Indranil Dasgupta, FRCP,⁶ Ronan Ryan, PhD,^{7,8} and Neil T. Raymond, MSc¹



(Transplantation 2020;104: e65–e74).

Background

- It is commonly held that kidney length correlates to renal function (Beland et al, 2010)
- Kidney length has poor specificity in predicting renal impairment. (Van Den Noorgate et al, 2003)
 - US measurement of length vs EDTA clearance measurements of GFR in 25 geriatric patients
 - Moderate correlation between length and function ($r= 0.51$, $p=0.008$) but poor specificity and poor positive predictive value for renal impairment



Materials and Methods

123 prospective living kidney donors:

- CT Kidney and Renal Tract
- DMSA Scan for GFR and split renal function

Kidney length measured using CT scans:

- Axis aligned along kidney in coronal plane
- Longest length then measured in sagittal plane

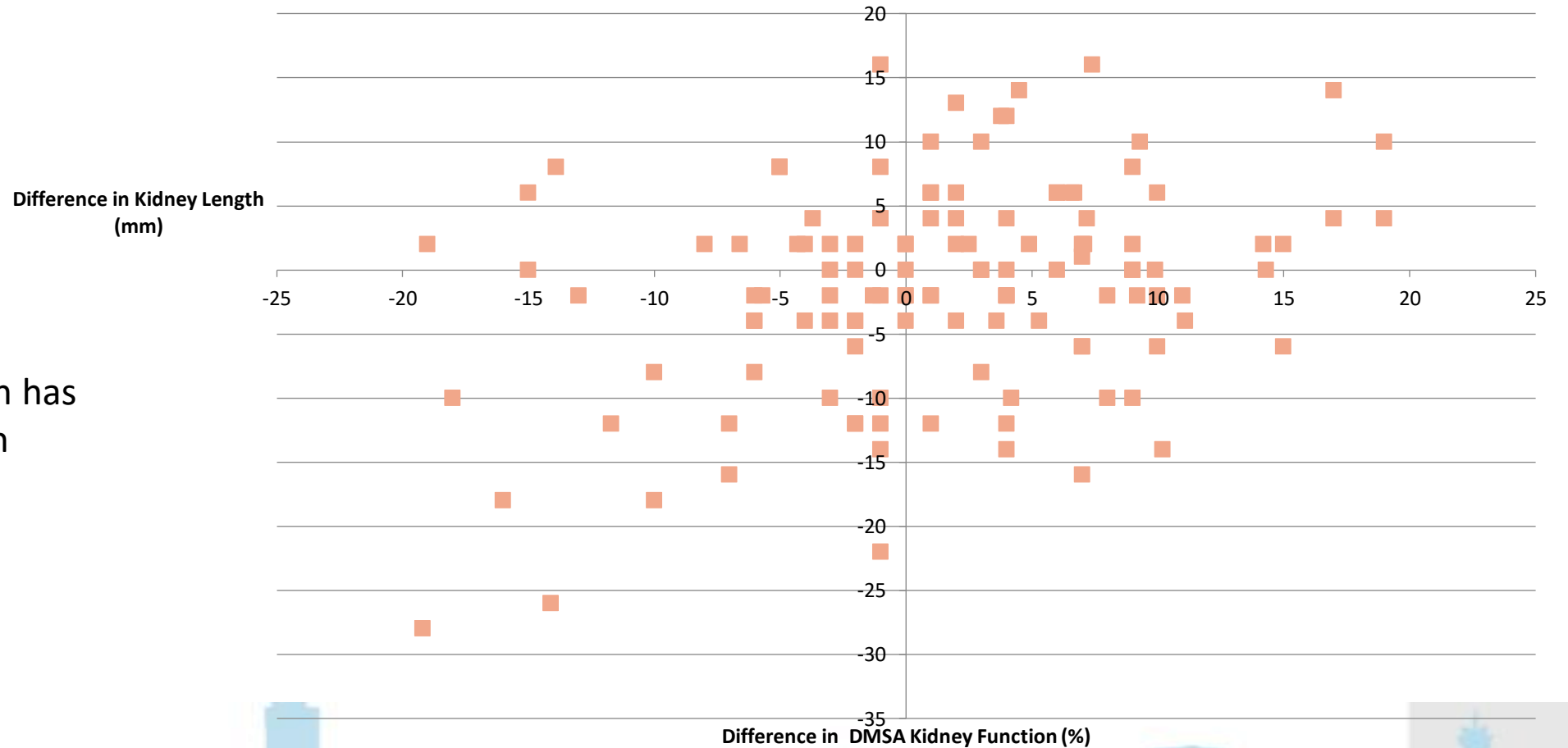
Kidney length and split renal function of each patient analysed using Pearson's Correlation Coefficient

Sensitivity and specificity calculated



Results

Scatter Graph To Show Correlation Between Difference in Kidney Length and Difference in Kidney Function



- Relative kidney length has weak correlation with DMSA function
- $R=0.378$, $p<0.0001$

Results

- No patient with abnormal split renal function had a difference in kidney size $>2\text{cm}$ (*Sensitivity 0% [0 – 14%], Specificity 100% [96 – 100%]*)
- For those with differential kidney length $>10\%$, positive predictive value is only 40%
- When using differential kidney length $>10\%$ as the test for whether DMSA is needed in prospective living kidney donors:
 - Sensitivity = 24% [7 – 41%]
 - Specificity = 87% [80 – 93%]





Are There Better Indicators of Split Renal Function?

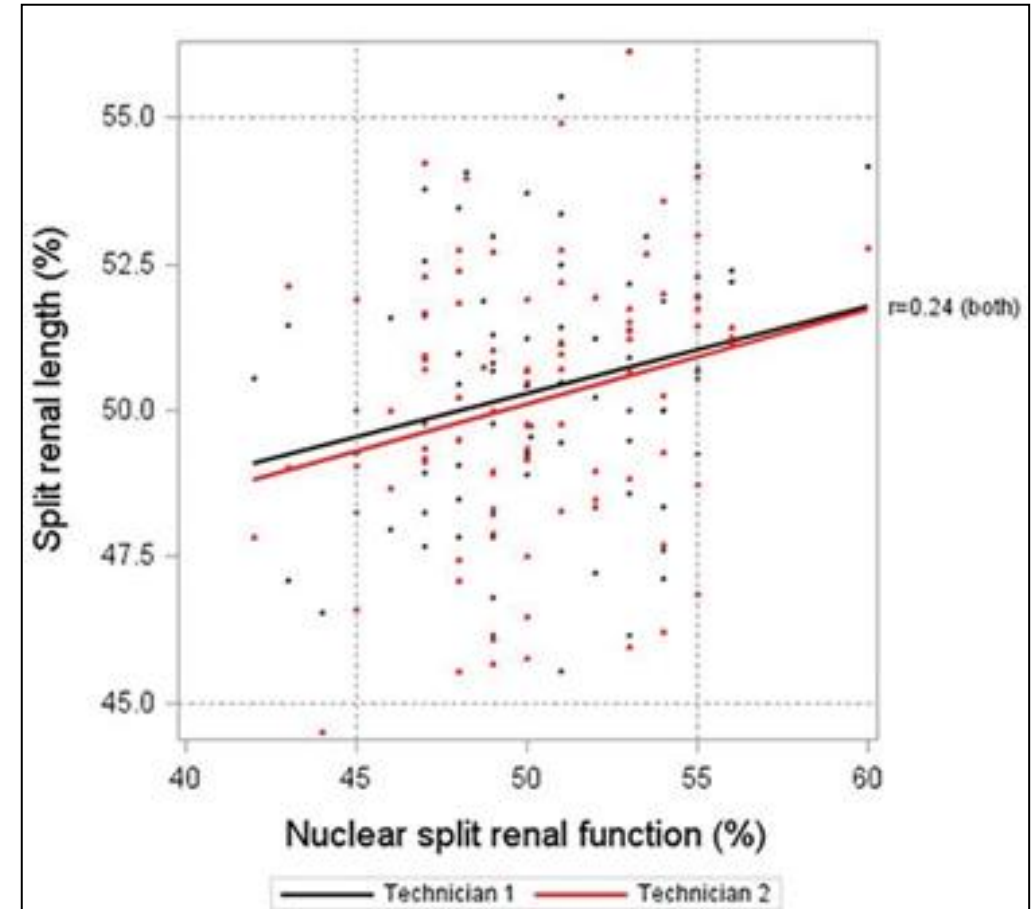
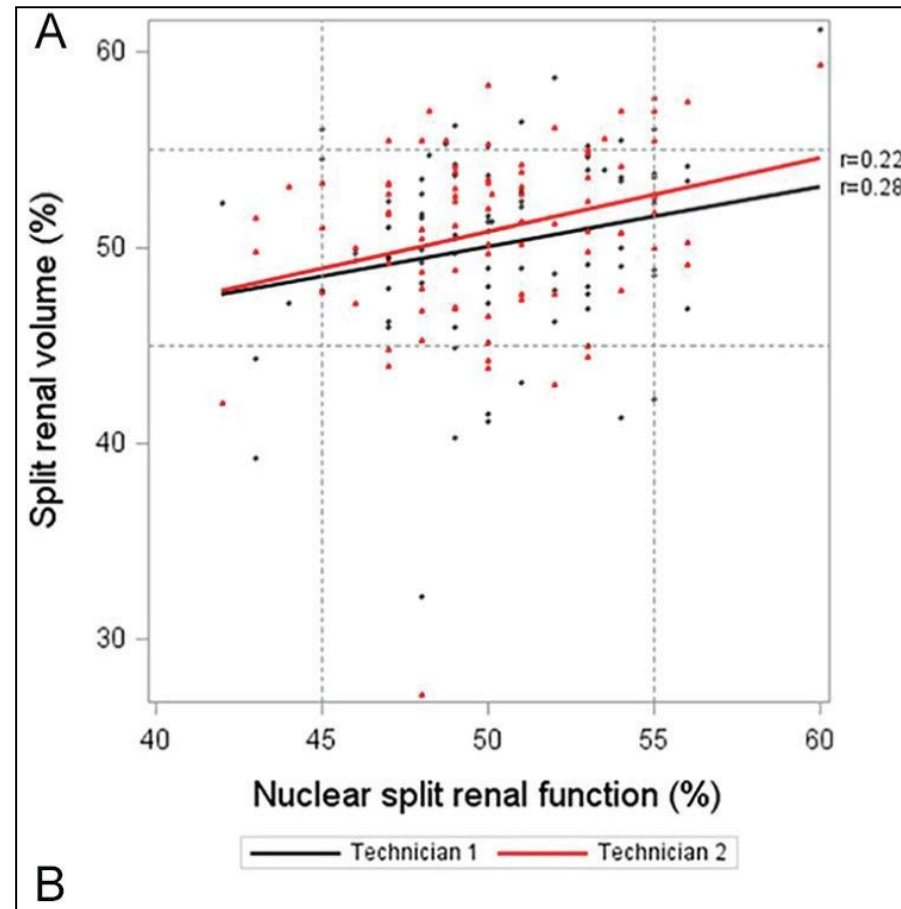
Kidney Length vs Renal Cortical Volume (U Hayat, A Fenton, R Jones, G Lipkin 2018)

	Sensitivity (95% CI)	Specificity (95% CI)
Differential Kidney Volume (optimal cut-off 6.2% difference)	68% (50 - 86)	85% (78 - 92)
Differential Cortical Volume (optimal cut off 5.2% difference)	84% (70 – 98)	72% (64 – 81)
Renal Length (difference >10mm)	24% (7 – 41)	87% (80 – 93)

Can Split Renal Volume Assessment by Computed Tomography Replace Nuclear Split Renal Function in Living Kidney Donor Evaluations? A Systematic Review and Meta-Analysis

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Discussion & Conclusion

- Differential kidney length is a poor predictor of split renal function
 - Weak correlation
 - Poor sensitivity and specificity when differential length >10% used as cut-off
- Results similar to work by Akoh et al (2010):
 - US renal lengths vs MAG3 differential kidney function
 - Correlation between length and differential renal function has mild correlation ($r=0.333$, $p=0.005$)
 - 10 patients had inverse relationship between renal length and split renal function
- **Conclusion:** All potential donors should be considered for a DMSA scan regardless of kidney size



References

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