STUDY OF FUNCTIONAL RENAL RESERVE IN PROSPECTIVE KIDNEY DONORS

Shilpa Mandal, Dipankar Bhowmik, Gurdeep Kaur, Madhavi Tripathi, Soumita Bagchi, Sandeep Mahajan, Raj Kanwar Yadav, Arun Kumar Subbiah

Department of Nephrology, AIIMS, New Delhi

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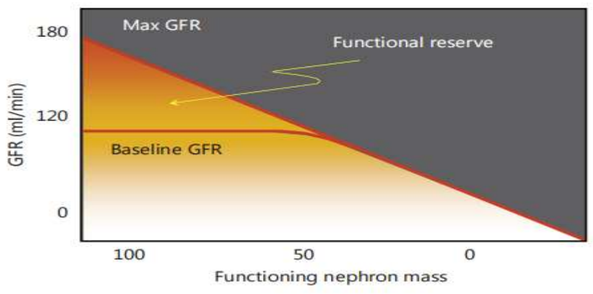
INTRODUCTION

- Functional renal reserve(FRR) refers to the kidney's ability to increase its function in response to physiological demands.



- Donors with a higher FRR are more likely to maintain adequate renal function after donation, reducing the risk of developing CKD or ESRD later in life.
- Generally it is done through protein loading using animal protein.
- For vegetarian live donors, use of animal protein for this assessment poses an ethical, religious or personal dilemma.
- This study was conducted to look for feasibility of using vegetarian protein for FRR**.**

AIM

- To study the functional renal reserve in prospective kidney donors..

OBJECTIVE

- **Primary outcome**: To study the feasibility and safety of preoperative renal stress test in the form of vegetarian protein in routine clinical practice in living kidney donor transplantation.
- **Secondary outcome**: To assess the differences in demographic and clinical profile of kidney donors with above average and below average functional renal reserve..

METHODOLOGY

- Single center prospective study
- **Data Collection**: July 2022 and July 2023
- **Center**: Department of Nephrology AIIMS, New Delhi.
- **Inclusion criteria:**
- All healthy donors (≥18 years)
- Willing to provide consent
- **Exclusion criteria**:

1. Patient with serum creatinine ≥1.2 mg/dl
2. Patients with diabetes
3. Previous history of AKI

- A detailed history and examination
- Baseline investigations(RFT, Urine R/M, Spot UPCR, HbA1C, lipid profile, GFR(Tc^{99m} DTPA scan)
- **Vegeterian protein(1gm/kg)**→20 gm Whey protein + Rest paneer
- The GFR was remeasured after 2 hours of the protein load.
- The difference in the baseline and stress test GFR was calculated to derive the FRR.
- % FRR→ **Negative 0-5 % 5.1-15% 15.1-25% >25 %**
- Poor responders →FRR**< Median**
- Good responders →FRR**≥ Median**

STATISTICAL ANALYSIS

- Statistical analysis was performed using SPSS version 25.0 version.
- Level of significance was set at a p value ≤ 0.05.
- Independent samples 't'- and chi-square tests→used to establish statistical association between FRR response and different demographic and clinical factors.
- Receiver-operator characteristic curve analysis was performed to derive the cut-off value of baseline GFR to predict good FRR response.

RESULTS

- **Baseline profile of patients**

SN	Characteristics	No.	%
1	**Mean age±SD (Range)**	44.8±8.7 (31-64)	
2	**Gender**		
	Female	37	74.0
	Male	13	26.0
3	**Hypertensives**	3	6.0
4	**HbA_{1C} 5.5-6.5%**	25	50.0
5	**Mean BMI±SD**	25.1±3.3 (20.7-34.1)	

RESULTS

Laboratory Parameters of Kidney donors (N=50)

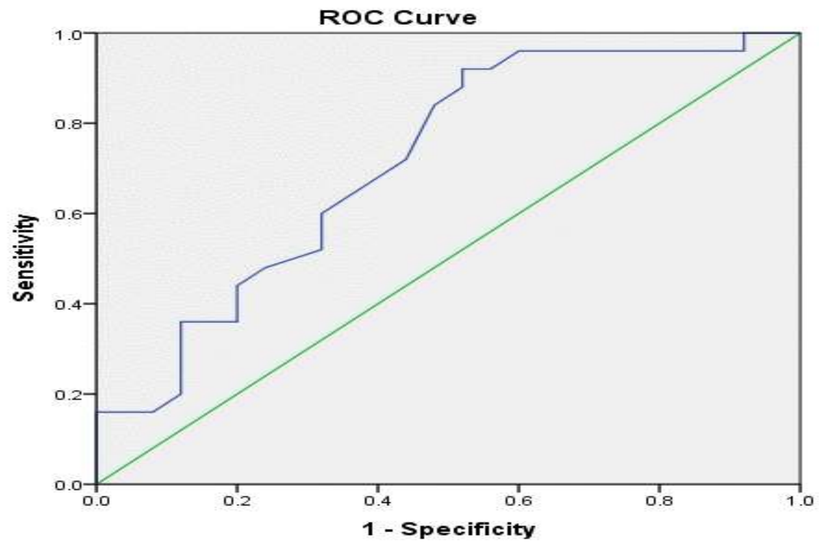
SN	Parameters	Mean±SD	Range
1-	Serum creatinine (mg/dl)	0.72±0.15	0.48-1.11
2-	Serum Urea (mg/dl)	22.85±5.49	13.80-34.00
3-	Spot UPCR (mg/gm)	88.98±50.06	29.6-388.7
5-	HbA_{1C} (%)	5.5±0.4	4.74-6.25

GFR levels at baseline and after protein load in Kidney donors (N=50)

SN	Parameters	Mean±SD	Range
1	Baseline GFR	75.54±14.44	60.0 to 111.0
2	Post protein load GFR	84.06±14.86	60.0 to 120.0
3	% FRR	12.55±12.67	-13.04 to 56.52
	Negative change	2 (4.0%)	
	0-5 %	15(30%)	
	5.1-15%	18(36%)	
	15.1-25%	8(16%)	
	>25 %	7(14%)	
4	Median % FRR	11.19	

Association of Baseline GFR level with Protein Load response

Protein Load response	N	Min	Max	Mean	SD
Poor	25	54.0	111.0	80.25	15.33
Good	25	46.0	98.0	69.24	13.99
Total	50	46.0	111.0	74.74	15.55



DISCUSSION

- Protein loading, offer a dynamic assessment of the FRR
- Van Londen *et al.* reported their study on a sample size of 937 living kidney donors in a large clinical study.
- Most studies have similar sample size to ours or even lower
- In the present study, mean pre- and post-protein load GFR was 75.54±14.44 and 84.06±14.86 mL/min/1.73m^2 respectively.
- Vegetarian protein in the present study showed a similar FRR as observed for various other methods
- Younger age of donors was associated with a lower RFR(mostly because of high baseline GFR)
- ROC analysis at a projected cut-off value ≥65.5, the sensitivity and specificity of prediction of poor response (below median RFR) was 92.0% and 48.0% .

CONCLUSION

- FRR assessment using vegetable protein load was feasible and safe, however, its clinical efficacy and accuracy needs to be validated in further prospective studies.
- Vegetable protein load driven FRR assessment was highly dependent on baseline GFR levels and was more practical to use among donors with lower baseline GFR.

REFERENCES

1. Van Londen M et al. Renal functional reserve capacity before and after living kidney donation. Am J Physiol Renal Physiol. 2018;315(6):F1550-F1554.
2. Kher A et al.The living kidney donor evaluation: focus on renal issues. Clin J Am Soc Nephrol.2012;7(2) :366-71.