## INTRODUCTION

- Significant number of renal transplant patients experience at least one episode of parenchymal allograft dysfunction.
- Definitive diagnosis is made by percutaneous biopsy, which is invasive, prone to sampling error and inter-observer variability.
- Phase-contrast MRI is a promising method for flow quantification of renal transplant vessels, as it does not employ gadolinium-based contrast agents.
- Very few studies in renal transplant.

### Objectives:

2. Determine the test-retest repeatability of flow quantification in renal allograft vessels.
3. Correlate flow parameters with serum eGFR and DCE-MRI.

## METHODS

**4D flow MRI in renal transplant: preliminary results.**

### References


### RESULTS

- Excellent agreement between test-retest sessions in segmenting the vessels (Cohen’s kappa=1).
- Significantly decreased RA flow (p=0.039) in patients with allograft dysfunction (Fig. 2).
- Significantly decreased RV flow (p=0.019) in patients with allograft dysfunction (Fig. 3).
- RA flow had a moderate negative correlation with the Banff fibrosis score (Fig. 4).
- RA flow (Spearman’s r=0.50, p=0.016), RV flow (r=0.56, p=0.007) and velocity (r=0.46, p=0.034) were moderately correlated with serum eGFR.
- RA flow was negatively correlated with mean transit time from DCE-MRI in the allograft (r=-0.76, p=0.016) and loop of Henle (r=-0.77, p=0.014) obtained from a three-compartment model.

### Figures

**Figure 1.** RA flow processing in a patient (male, 42 years) with right sided renal allograft with severe fibrosis iIFTA 3, ci 3, ct 2. Vessel ROIs with flow vectors in the RA, ILA (measured with VENC=120 cm/s) and RV (measured at 45 cm/s).

**Figure 2.** RA flow distinguishes dysfunctional from functional allografts with sensitivity 0.87, specificity 0.9 at a threshold of 6.5 ml/sec.

**Figure 3.** RV flow distinguishes dysfunctional from functional allografts with sensitivity 0.83, specificity 0.8 at a threshold of 4.3 ml/sec.

**Figure 4.** RA flow showed a moderate negative association to fibrosis Banff score ci, in 10 patients with no history of allograft RAS.

**Figure 5.** RA area and flow shows strong correlations to allograft DCE-MRI parameters obtained in functional allografts from a three-compartment model.

## CONCLUSION

- Factors that restrict RA flow, such as renal artery stenosis (RAS), may affect renal function and blood pressure regulation after transplantation.
- The development of fibrosis with decreased RA flow has been shown in animal models of RAS.
- No patients in our cohort had a history of RAS, so the association of RA flow and fibrosis will be confirmed in a longitudinal study.
- Our study shows that 4D flow can potentially be used as a non-contrast method to diagnose renal dysfunction.