Renal Blood Flow Changes in Autosomal-Dominant Polycystic Kidney Disease

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Purpose: To assess how renal blood flow changes in autosomal-dominant polycystic kidney disease (ADPKD) and its correlation with renal parenchymal volume and function.

Methods: Patients participating in our ADPKD registry were invited to undergo MRA of the renal arteries using 2D cine Phase Contrast to measure blood flow besides routine abdominal MRI since May, 2008. 41(M: F=18:21, 19-79 years old, median age= 40.4 years) of 169 patients underwent 2D cine PC flow measurements at 1.5T (GE Signa EXCITE 14.0, Milwaukee, WI) using the following parameters: TR/TE/flip=9.5/5/30 °, FOV=26cm, matrix = 256×128, slice thickness = 5mm, venc=80cm/s. Patients on dialysis (n=1), post renal transplant (n=2) or with uninterpretable data (n=5) were excluded, leaving 33 for analysis of flow. Phase contrast data were analyzed using Medis CV Flow Analysis software running on a Computer Workstation (GE advantage Windows 4.1) using background subtraction to correct for phase drift. Flow Measurements were correlated with glomerular filtration rate(GFR) estimated from serum creatinine using the MDRD equation as well as bilateral renal volume, bilateral renal parenchymal volume, solitary renal cyst fraction, age and gender.

Results: In 33 PKD patients, cystic renal replacement ranged from 34.7 % to 99.4% of renal parenchyma with GFR ranging from 27 to 91 ml/min/1.73m^2. GFR to both kidneys correlated directly with total blood flow (r=0.56) as shown in Figure 1. And GFR also correlated weakly with total parenchymal volume (r=0.18, Figure 2)but not total volume reflecting the absence of renal blood flow to the cysts (Figure 2).

Discussion and Conclusion: MRI is ideally suited to imaging the cystic changes on T2 weighted sequences. However, characterizing the deterioration of renal function in ADPKD has been difficult because renal function does not correlate well with renal size or cyst fraction. It is hypothesized that renal blood flow scales with renal function before this research. And the data acquired from 33 patients support this hypothesis and suggest that measuring total flow to bilateral kidneys may represent an effective way to monitor renal function in ADPKD patients.

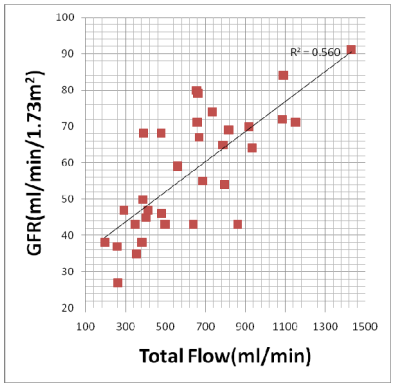

Figure 1

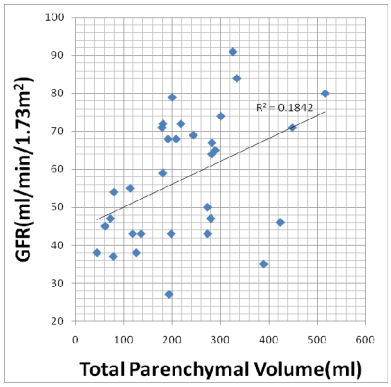

Figure 2

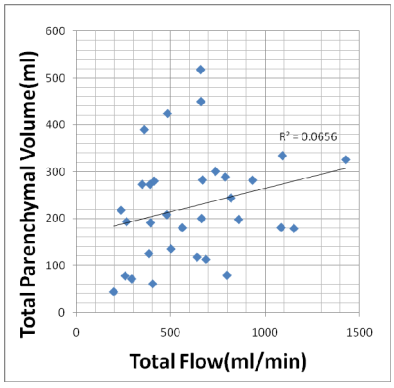

Figure 3

References:

1. Rule AD, Torres VE, Chapman AB, Grantham JJ, et al. Comparison of methods for determining renal function decline in early autosomal dominant polycystic kidney disease: the consortium of radiologic imaging studies of polycystic kidney disease cohort.Rule AD et al. J Am Soc Nephrol. 2006; 17(3):854-62.

2. King BF, Torres VE, Brummer ME, et al. Magnetic resonance measurements of renal blood flow as a marker of disease severity in autosomal-dominant polycystic kidney disease. Kidney Int. 2003 Dec;64(6):2214-21.