

## The Prevalence and Natural history of Pancreatic cysts in Autosomal Dominant Polycystic Kidney Disease

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**Target audience:** Radiologists, Nephrologists, Gastroenterologists and other physicians/scientists interested in MRI findings of pancreatic cysts in autosomal dominant polycystic kidney disease.

**Purpose:** To evaluate the prevalence and natural history of pancreatic cysts in ADPKD subjects using MRI.

**Methods:** ADPKD patients enrolled in the Rogosin Institute ADPKD Data Repository (n=178; male 46%), who underwent MRI scans between 2002 and 2013 (age 18 to 84 years; mean = 47.5 years) were evaluated for pancreatic cysts on axial and coronal single-shot fast spin-echo (SSFSE) images obtained at 1.5T (TE=183, matrix = 256-512x256, slice thickness =8.0). Pancreatic cyst diameters were measured with electronic calipers counting all cysts measuring  $\geq 2$  mm. Changes in cyst number and size were recorded for 28 subjects with repeat scans separated by more than 1 year (Fig 1). Estimated GFR (eGFR; median=64 ml/min/1.73m<sup>2</sup>), using 4-variable MDRD formula, was determined at time of baseline MRI. Controls included 155 patients without ADPKD or pancreatic disease matched for age, gender, eGFR and date of MRI. 106 control patients were matched for race, age, gender, eGFR and date of MRI. The volume of both kidneys in ADPKD patients and controls was calculated using 3D workstation.

**Results:** At least one pancreatic cyst was found in 58/178 (33%) ADPKD patients (male 44%, median eGFR=62 ml/min/1.73m<sup>2</sup>). One pancreatic cyst, 2-10 cysts, and  $>10$  cysts were found in 14%, 17%, and 2% patients, respectively. Cyst size ranged from 2 mm to 46 mm (median= 3 mm). Of the 28 ADPKD patients with follow-up MRI, 39% showed changes during the follow-up period: cyst number increased in 18%, cyst size increased in 32%. Two patients underwent fine-needle aspiration, but none of patients with pancreatic cysts required surgical removal. Of 155 ADPKD cases, 33% had pancreatic cysts compared to 21% controls (p= 0.01) (Table 2). Mean number of cysts in ADPKD cases was 1.06 compared to 0.65 in controls (p<0.01). Mean size of pancreatic cysts was bigger in controls (Table 3).

**Conclusion:** Pancreatic cysts were more prevalent in ADPKD patients compared to non-PKD controls. Although increases in pancreatic cyst number and size occur commonly in ADPKD, pancreatic cysts in the ADPKD may have low clinical significance, and there should be a high threshold for investigating pancreatic cysts in ADPKD.

Table 1.

Variable	Multivariate OR	95% CI	P-value
Age	1.01	0.98-1.04	0.96
Gender (F vs. M)	0.76	0.38-1.52	0.68
Race			
Black vs. White	0.22	0.02-2.09	0.99
Asian vs. White	0.59	0.06-6.12	0.97
Multiple vs. White	0.97	0.15-6.13	0.97
Total Kidney Volume	1	1.00-1.01	0.20
eGFR	0.99	0.98-1.01	0.50

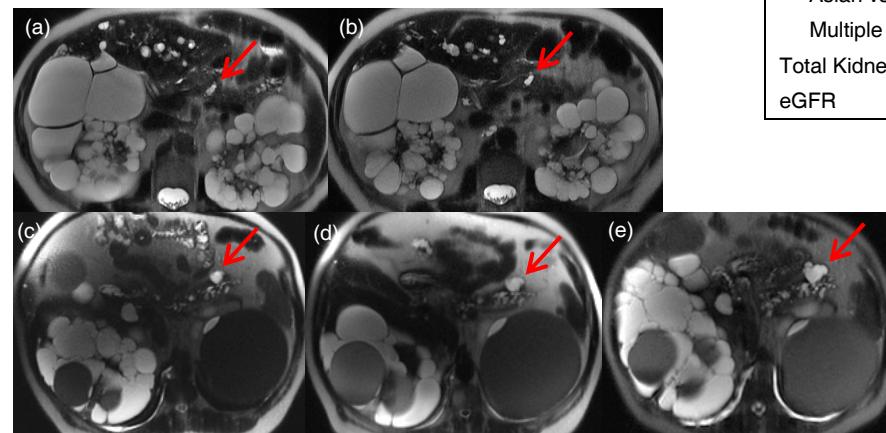


Fig 1: Axial SSFSE images of two ADPKD patients arranged in chronological order from left to right. (a, b) An 11-mm pancreatic cyst in a patient showing no change; (c-e) numerous pancreatic cysts with a dominant clustered cyst (arrow) in another patient. The number and size of all cysts increased over 3 years on yearly follow-up MRIs. The size of the clustered cyst was measured 20, 26 and 35 mm, respectively.

Table 2.

Number of cysts	Number of Case	
Categorized	ADPKD	Control
0	67.1%	79.5%
1	12.9%	12.3%
$\geq 2$	20.0%	8.4%
Chi-Square	Prob	0.0112

Table 3.

Size of Pancreatic cysts (in mm)				
Case	Mean	Median	Std Dev	Range
ADPKD	3.7	3	1.97	2-11
Control	4.48	4	2.11	2-10
Wilcoxon Two-Sample Test, Two-Sided Pr >  Z			0.04	

**References:** 1) Torra R., et al. *Clin Nephrol.* 1997 Jan;47(1):19-22. 2) Sato Y., et al. *Pathol Int.* 2009 Mar;59(3):201-4. 3) Wu G., et al. *Nat Genet.* 2000 Jan;24(1):75-8.