*Indian Journal of Medical Case Reports ISSN: 2319–3832*
*Online, International Journal, Available at http://www.cibtech.org/jcr.htm*
*2022 Vol.11, pp. 38-42/Swamini et al.*
***Case Report (Open Access)***

# A CASE OF ARPKD WITH COEXISTENT HYPERHOMOCYSTEINEMIA

**Swamini Panandiker, *Visar Linyu, Yasmin Fernandes and Neha Da Rocha**
*Department of Radiology, Goa Medical College and Hospital,*
*Bambolim, Goa, India*
**Author for Correspondence: visarlinyu566@gmail.com*

## ABSTRACT
Autosomal recessive polycystic kidney disease (ARPKD) is one of the most common inherited disease manifesting in infancy and childhood. It is characterized by bilateral enlargement of the kidneys secondary to diffuse dilatation of the collecting tubules. Congenital hepatic fibrosis is invariably associated with ARPKD. Hyperhomocysteinemia refers to an elevated circulating level of the sulfur-containing amino acid homocysteine and is associated with vascular and ocular disease. In this case report, we discuss a 5-year old patient who presented with redness in the right eye, headache and vomiting. On evaluation, the patient was found to have anterior dislocation of the lens in the right eye and hypertension. Further workup of the patient for hypertension by USG and MRI abdomen revealed features of ARPKD, which includes bilaterally enlarged and echogenic kidneys with multiple tubular cystic spaces as well as renal medullary calcifications. The patient's serum Homocysteine level was found to be elevated with MRI of the brain revealing thrombosis of the superior sagittal sinus.

***Keywords:*** *Autosomal Recessive Polycystic Kidney Disease (ARPKD), Hyperhomocysteinemia*



## INTRODUCTION
ARPKD is a common inherited disease of infancy and childhood. It can be divided into four groups—perinatal, neonatal, infantile, and juvenile based on the age of presentation, renal size, clinical course, and severity of collecting duct dilatation. Ultrasound and MRI abdomen are the imaging modalities of choice for the detection of ARPKD and can distinguish it from other cystic renal diseases. Hyperhomocysteinemia has varied genetic and non-genetic causes and is associated with various systemic disorders, in which imaging plays an important role for diagnosis and monitoring of therapy.

## CASE
A 5-year-old male child presented with history of redness in the right eye, headache and vomiting for 2 days. There was no history of pain, photophobia, diplopia or discharge. On examination, the right eye showed congestion of the sclera and anterior dislocation of the lens into the anterior chamber. The anterior chamber was shallow and the intraocular pressure was raised. The left eye appeared normal. The child's CNS and respiratory findings were within normal limits, however, his blood pressure was found to be elevated (160/90 mm Hg). A provisional clinical diagnosis of right acute angle closure glaucoma with hypertension was arrived at. Laboratory findings revealed normal renal and liver function tests, however, the patient's serum Homocysteine was elevated measuring 343 μmol/L. Other radiological investigations including Ultrasound abdomen, Renal doppler, CT brain and MRI brain was advised by the clinician. In

the meantime, the patient was started on antihypertensive and antibiotics. Small incision cataract surgery (SICS) and lens extraction was done in the right eye.

Plain CT brain with orbits did not reveal any neuroparenchymal abnormality. However, there was anterior dislocation of the lens with a shallow anterior chamber on the right side.
On abdominal USG performed, the right kidney measured 8.9 x 4.2 cm and left kidney measured 8.6 x 4.3 cm in size. Both the kidneys were enlarged in size for age. The renal cortices showed uniform thick rim of echogenicity. Rest of the bilateral renal parenchyma was echogenic with tubular cystic spaces noted. Multiple discrete tiny echogenic foci were seen throughout the medullary portions of the kidneys suggestive of calcifications. No hydronephrosis was seen on either side. Liver measured 11.5 cm in size with mild enlargement of the left lobe and showed a homogeneous echotexture. There was no dilatation or ectasia of the biliary tree. Portal vein measured 8.4 mm in diameter and splenic vein measured 3.7 mm in diameter. Splenic size was 6.7 cm. There was no ascites. Rest of the abdominal USG findings were within normal limits.
Shear-wave elastography of liver revealed elasticity value of 4.16 kPa which was within normal limits.
On renal doppler performed, PSV and RI values in the right main renal artery were 36, 0.71 and on the left side 37, 0.70. Intrarenal PSV and RI values on the right side were 60,0.70 and on the left side 36, 0.61. There was no evidence of renal artery stenosis.

On MRI abdomen performed using coronal T2 and heavily weighted T2 sequences, both the kidneys were enlarged and markedly hyperintense on T2W images. Dilated tubules appearing hyperintense on T2W images were seen in both kidneys.
Based on the above ultrasound and MRI abdomen findings, a diagnosis of Autosomal recessive polycystic kidney disease (ARPKD) with medullary nephrocalcinosis in bilateral kidneys was arrived at. Mild hepatomegaly with mild enlargement of the left lobe was also noted with no evident features of portal hypertension.
MRI brain did not reveal any neuroparenchymal abnormality, however, there was loss of normal flow void in the superior sagittal sinus on T2W images suggestive of thrombosis. MR venography revealed a filling defect in the superior sagittal sinus confirming cerebral venous thrombosis.

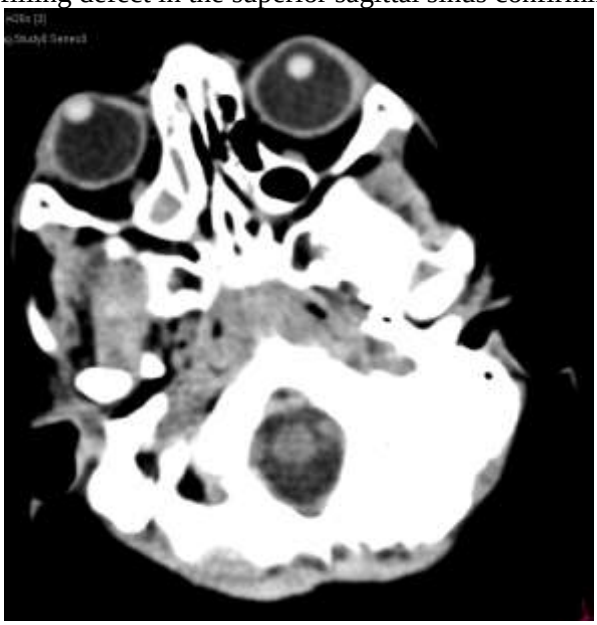

**Figure 1a: Plain CT brain revealed anterior dislocation of the right lens and a shallow anterior chamber.**

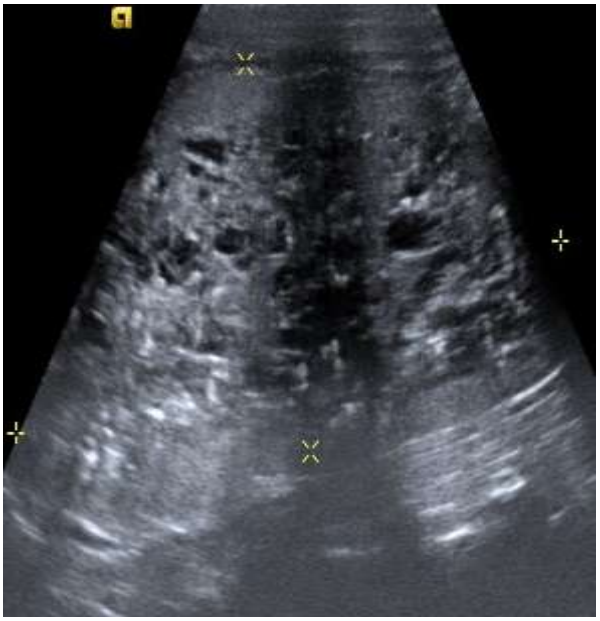

**Figure 1b: Scanning with high frequency USG transducer shows echogenic renal parenchyma with tubular cystic spaces.**

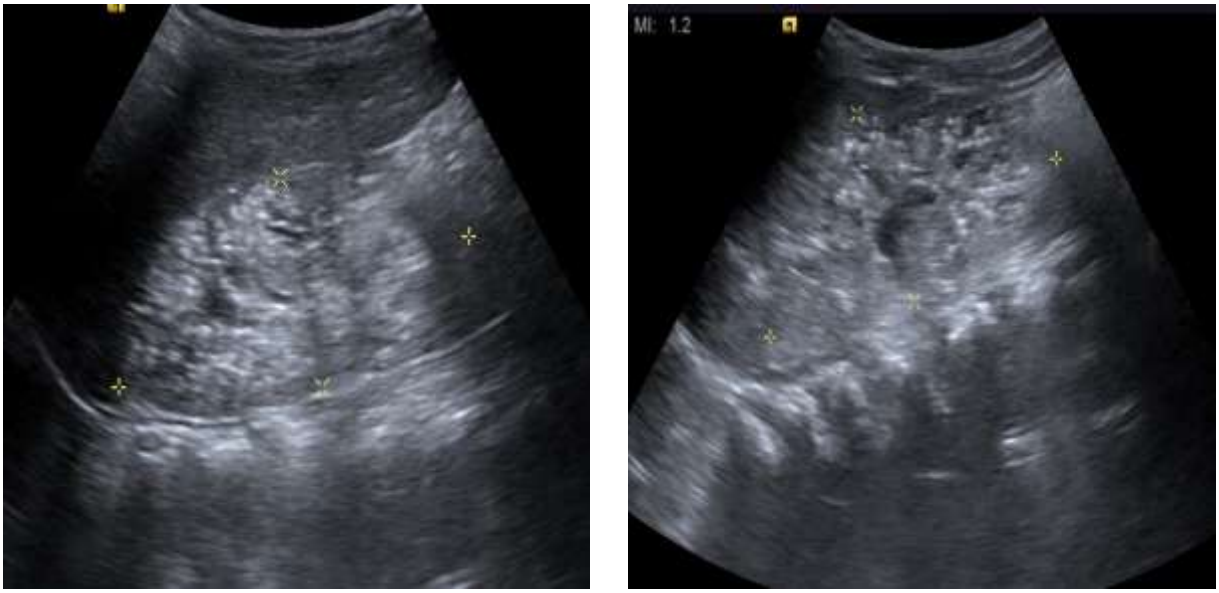


**Figure 2: Ultrasound images showing bilateral echogenic kidneys with multiple tiny discrete calcifications.**

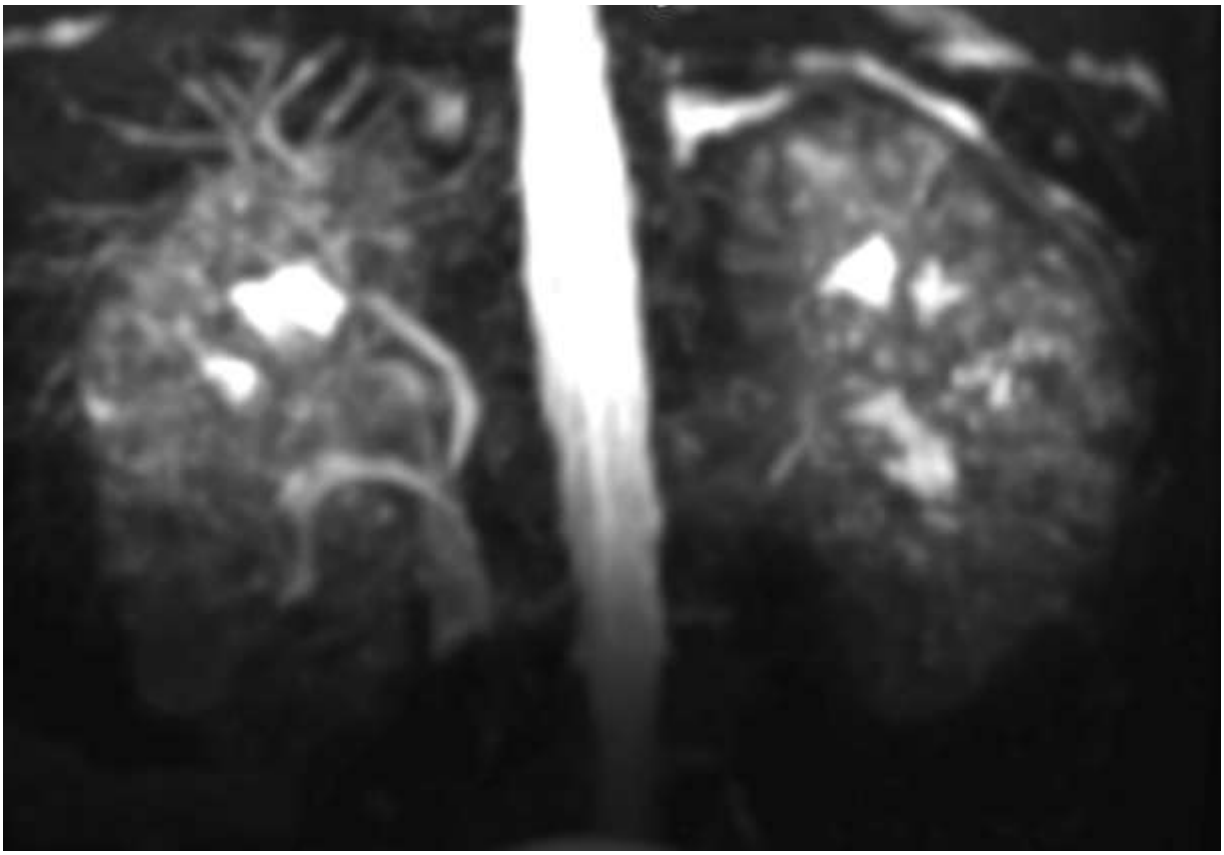

**Figure 3: T2 weighted coronal MRI image of the kidneys shows bilaterally enlarged kidneys with multiple hyperintense dilated tubules.**

**4a** **4b**

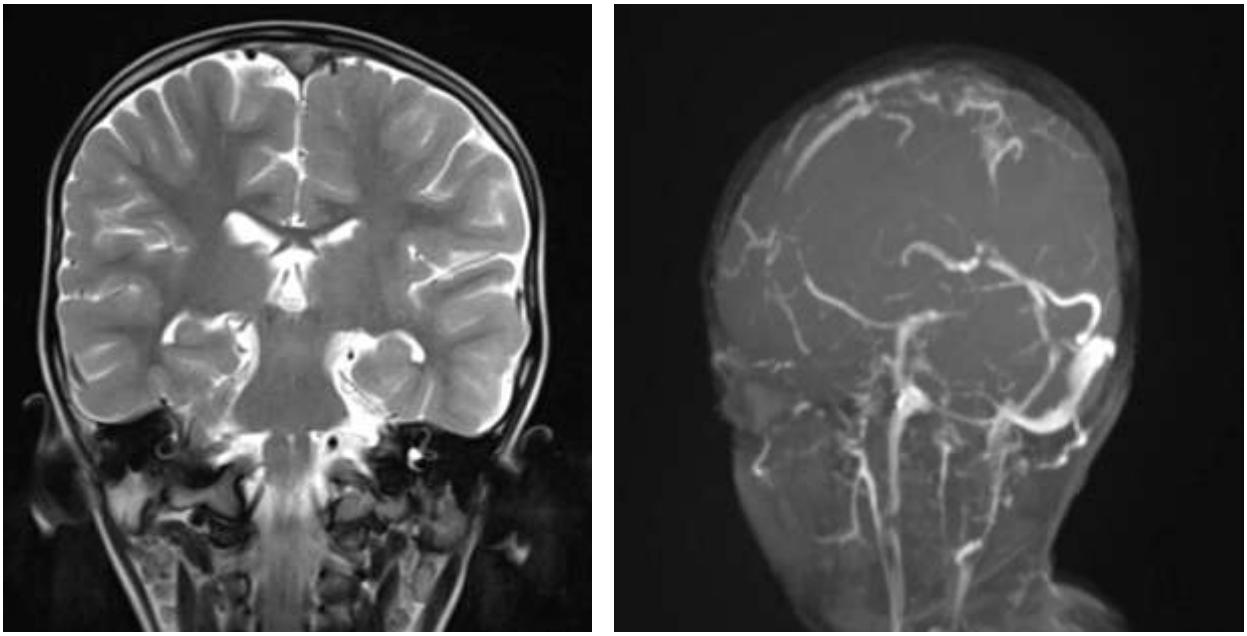

**Figure 4a: T2 weighted coronal MR image of the brain shows loss of normal flow void in the superior sagittal sinus. Figure 4b: MR venography revealed a filling defect in the superior sagittal sinus.**

## DISCUSSION

Autosomal recessive polycystic kidney disease (ARPKD) is one of the most common inheritable disease manifesting in infancy and childhood with a frequency of 1:6,000 to 1: 55,000 births. It is characterized by bilateral, smooth, reniform enlargement of the kidneys secondary to diffuse dilatation of the collecting tubules. Congenital hepatic fibrosis is invariably associated with ARPKD. The disease is caused by a mutation in the PKHD1 (polycystic kidney and hepatic disease) gene location on chromosome 6p. This results in bilateral symmetric microcystic disease occurring in the distal convoluted tubules and collecting ducts. There is non-obstructive collecting duct ectasia with renal interstitial fibrosis which can lead to end-stage renal disease (Rajanna *et al*., 2013).

Patients with ARPKD may also have hepatic involvement in which there is expansion of portal tracts due to ductal plate malformation with an increased number of dilated bile ductules in an expanded fibrous connective tissue resulting in congenital hepatic fibrosis (CHF). ARPKD can be divided into four groups—perinatal, neonatal, infantile and juvenile based on the age of presentation, renal size, clinical course, and severity of collecting duct dilatation. The most severe is the perinatal type with nearly 90% ductal involvement and mostly fatal by 1 week of age. With milder renal disease, renal function impairment is less severe and the patients may present with progressive hepatic fibrosis and the development of portal hypertension at a later age as in the juvenile type of ARPKD (Kumar *et al*., 2015).

The imaging modalities of choice in ARPKD are ultrasound and MRI. High-resolution USG can resolve the tiny dilated tubular cysts that distinguish ARPKD from other cystic renal diseases and can demonstrate segmental involvement. MRI with cholangiography allows depiction of the biliary system as well as the extent of kidney involvement (Chung *et al*., 2014).

USG imaging in neonates reveals massively enlarged, smooth, hyperechogenic kidneys with loss of corticomedullary differentiation. This hyperechogenicity is caused by the multiple interfaces of the walls of the dilated collecting ducts reflecting sound back to the transducer. The tubular dilated ducts arranged in a fan-shaped pattern can be seen on high-frequency transducers (Chung *et al*., 2014).

Renal USG in patients presenting in childhood may demonstrate relatively normal-sized kidneys with less severe tubular cystic dilatations. There may be numerous non-shadowing echogenic foci in the pyramids. One or more macrocysts may be seen superimposed on the diffuse hyperechogenicity. MRI can show enlarged kidneys that are darker on T1-weighted images and bright on T2-weighted images due to the large amount of urine in the dilated ducts. Multiple rounded tubular cystic foci as well as large macrocysts may be seen on MRI (Chung *et al*., 2014).

Liver involvement in ARPKD includes intrahepatic biliary dilatation or cysts in continuity with biliary ducts, disproportionate enlargement of the left hepatic lobe, splenomegaly and ascites.

The imaging differentials of ARPKD includes Atypical ADPKD, Medullary sponge kidney and other cystic renal diseases. Although these abnormalities may be detected on USG and MRI, the specific diagnosis is determined by family history and genetic testing,

In our case the patient presented with visual symptoms, hypertension and headache. These symptoms can be attributed to the subsequently detected elevated serum homocysteine level. The major clinical features of elevated homocysteine levels include lens dislocation, myopia, glaucoma, arterial and venous thromboembolism. There is an increased risk of coronary artery disease, atherosclerotic events as well as hip fractures in hyperhomocysteinemia. The causes of Homocysteinemia is varied and includes genetic disorders (the most common being impaired activity of cystathionine beta-synthase enzyme) as well as nongenetic disorders including renal insufficiency. Early case detection, along with introduction of a low methionine diet and pyridoxine supplements is associated with a better prognosis (Garland *et al*., 1999. Son *et al*., 2022)

## CONCLUSION

ARPKD is an inherited disorder which can present during perinatal period, infancy or early childhood, affecting the renal and hepatobiliary systems. Imaging plays an important role in the detection of the disease and in distinguishing ARPKD from other cystic renal diseases. Imaging also allows assessment of the hepatobiliary system especially in the extent of hepatic fibrosis. The treatment of ARPKD depends on the extent of organ-specific involvement with prognosis depending on the age and severity of disease at presentation. In our case, diagnosis of concurrent hyperhomocysteinemia explained the presenting symptoms and was also seen as the cause of dural venous sinus thrombosis. Imaging plays a crucial role in the detection of complications such as atherosclerotic disease and venous thromboembolism as well as monitoring of the disease for appropriate intervention.

## ACKNOWLEDGEMENT

We are grateful to the Departments of Radiology and Paediatrics, Goa Medical College and Hospital, Bambolim, Goa, India for their valuable collaboration.

## REFERENCES

**Chung *et al.* (2014).** Paediatric polycystic kidney disease and other ciliopathies: Radiologic-Pathologic correlation. *RadioGraphics* **34**(1) 155-178.

**Garland J, A Prasad, C Vardy, C Prasad (1999).** Homocystinuria: Challenges in diagnosis and management. *Pediatrics and Child Health* **4**(8) 557-562.

**Kumar M, Agarwal Y, Thukral BB (2015).** Imaging features in neonatal autosomal recessive polycystic kidney disease. *Astrocyte* **2** 36-7.

**Rajanna DK, Reddy A, Srinivas NS, Aneja A (2013)**. Autosomal recessive polycystic kidney disease. Antenatal diagnosis and histopathological correlation. *Journal of Clinical Imaging Science* **3** (1) 1-6.

**Son P, Lewis L (2022)**. Hyperhomocysteinemia. *StatPearls [Internet]* 2022 Jan.