

fectured patients. In addition, the exclusion of patients with CKD from the majority of clinical trials severely limits the breadth of the therapeutic arsenal available to these individuals, as can be seen in paediatric patients as well. In both situations (children and patients with CKD), it is a lack of conclusive study results, not issues with toxicity or efficacy, that limit the indications described on the drug technical data sheet in many cases. In two publications concerning paediatric patients (both in primary care and the hospital setting)<sup>6-7</sup> that compiled the available data from 11 studies, between 36% and 100% of patients were prescribed medications under conditions that fell outside of the recommended situations described in the drug summary of characteristics.

With this in mind, to address the question posed by Del Pozo et al<sup>1</sup> regarding whether one can say if it is illegal to employ metformin in patients with an estimated GFR < 60 ml/min/1.73 m<sup>2</sup>, we can state that the use of metformin in patients with an estimated GFR of 30-60 ml/min/1.73 m<sup>2</sup> does not fall within the legal regulations governing its use.

As such, and given the important benefits and low costs associated with this drug, we believe that the implicated scientific societies, health authorities, and pharmaceutical companies should place emphatic priority on the process of reviewing the technical data sheet for metformin in the interest of revising it. This modification should establish the indications for administering metformin in patients based on estimated GFR (ml/min/1.73 m<sup>2</sup>), which is the format recommended by current guidelines and consensus documents,<sup>8</sup> instead of using creatinine clearance values as recommended by the current drug technical data sheet. Second-

ly, the estimated range of GFR within which metformin can be used should be expanded. This modification, which has already been supported by expert consensus opinion, retrospective and observational studies, and meta-analyses,<sup>3-5</sup> should express the reasonable use of metformin, with precautionary measures taken and reduced doses, in patients with a GFR of 30-60 ml/min/1.73 m<sup>2</sup> with suspension of treatment with metformin in patients with a GFR < 45 ml/min/1.73 m<sup>2</sup> and risk factors for developing lactic acidosis (peripheral hypoperfusion, diabetic foot, heart failure, advanced liver disease, or a history of previous episodes of lactic acidosis or metabolic acidosis).

It is only a matter of time, but the wait until evidence is provided and clinical trials have been completed could involve years of delay in optimising the treatment of hyperglycaemia in patients with CKD among the millions of people afflicted with diabetes mellitus all over the globe.

1. del Pozo-Fernández C, Pardo-Ruiz C, Sánchez-Botella C, López-Menchero R. Discrepancias entre ficha técnica y recomendaciones de uso de metformina en el tratamiento de pacientes con diabetes mellitus tipo 2. *Nefrología* 2012;32(6):837-8.
2. Martínez-Castelao A, Górriz JL, Sola E, Morillas C, Jover A, Coronel F, et al. A propósito de las discrepancias entre documentos de consenso, guías de práctica clínica y normativa legal en el tratamiento de la diabetes tipo 2. *Nefrología* 2012;32(4):419-26.
3. NICE. Type 2 diabetes: the management of type 2 diabetes: NICE clinical guideline 87. London: National Institute of Health and clinical Excellence; 2009.
4. Shaw JS, Wilmoth RL, Kilpatrick ES. Establishing pragmatic estimated GFR thresholds to guide metformin prescribing. *Diabet Med* 2007;24:1160-3.

5. Lipska KJ, Bailey CJ, Inzucchi SE. Use of metformin in the setting of mild-to-moderate renal insufficiency. *Diabetes Care* 2011;34:1431-7.
6. Turner S, Longworth A, Nunn AJ, Choonara I. Unlicensed and off label drug use in paediatric wards: prospective study. *BMJ* 1998;316:343-5.
7. Schirm E, Tobi H, de Jong-van den Berg LT. Risk factors for unlicensed and off-label drug use in children outside the hospital. *Pediatrics* 2003;111:291-5.
8. Alcázar R, Egocheaga MI, Orte L, Lobos JM, González Parra E, Alvarez Guisasaola F, et al. Documento de consenso SEN-SEMFYC sobre la enfermedad renal crónica. *Nefrología* 2008;28(3):273-82.

José L. Górriz<sup>1</sup>, Alberto Martínez-Castelao<sup>2</sup>, Eva Sola<sup>3</sup>, Carlos Morillas<sup>3</sup>, Ana Jover<sup>3</sup>, Francisco Coronel<sup>4</sup>, Juan F. Navarro-González<sup>5</sup>, Fernando de Álvaro<sup>6</sup>

- <sup>1</sup> Servicio de Nefrología. Hospital Universitario Dr. Peset. GEENDIAB. REDINREN. S.E.N. Valencia.
- <sup>2</sup> Servicio de Nefrología. Hospital Universitario de Bellvitge. IDIBELL. GEENDIAB. REDINREN. S.E.N. Hospitalet de Llobregat, Barcelona. (Spain).
- <sup>3</sup> Servicio de Endocrinología. Hospital Universitario Dr. Peset. Valencia. (Spain).
- <sup>4</sup> Servicio de Nefrología. Hospital Clínico de San Carlos. Madrid. (Spain).
- <sup>5</sup> Servicio de Nefrología. Hospital Universitario Nuestra Señora de Candelaria. GEENDIAB. REDINREN. S.E.N. Santa Cruz de Tenerife. (Spain).
- <sup>6</sup> Servicio de Nefrología. Hospital Universitario Infanta Sofía. GEENDIAB. REDINREN. S.E.N. Madrid. (Spain).
- Correspondence:** José L. Górriz  
Servicio de Nefrología.  
Hospital Universitario Dr. Peset. Valencia.  
jlgorritz@senefro.org

## B) BRIEF PAPERS ON RESEARCH AND CLINICAL EXPERIMENTS

### Autosomal dominant polycystic kidney disease with contralateral renal agenesis

*Nefrología* 2012;32(6):839-42  
doi:10.3265/Nefrología.pre2012.Jul.11658

#### To the Editor:

Autosomal dominant polycystic kidney disease (ADPKD) is the most common hereditary cause of terminal chronic renal failure (CRF), with an incidence of 1 in 500-1000. This disease is produced by mutations to the genes *PKD1* (16p13.3, 85%) or *PKD2* (4q22.1, 15%). In ADPKD, the growth of renal

cysts produces a progressive increase in renal volume and destruction of the parenchyma, leading to terminal CRF at approximately 50-60 years of age (in PKD1 mutations). Although ADPKD is bilateral, renal involvement may be asynchronous and asymmetrical,<sup>2</sup> and in PKD2 mutations, terminal CRF may

be delayed by as many as 20 years with respect to PKD1. On the other hand, congenital anomalies of the kidney and urinary tract (CAKUT) are the most common cause of CRF in children, constituting half of all cases.<sup>3-6</sup> Although many cases of CAKUT are caused by unique genetic defects, mutations have been identified in only a few genes. These unique mutations can produce a wide phenotypic spectrum of CAKUT, which ranges from vesicoureteral reflux to renal agenesis.<sup>5-7</sup> Unilateral renal agenesis is a congenital anomaly that occurs in 1 in 3000 births,<sup>3</sup> for which several candidate genes exist. The coexistence of ADPKD and unilateral renal agenesis occurs in approximately 1 in 1 500 000-3 000 000 individuals. As such, the coincidence of both anomalies in a single individual is very rare, with only 7 cases reported.<sup>8-12</sup>

In a cohort of 205 patients with ADPKD, we identified a new case of ADPKD with unilateral renal agenesis, which is the 8<sup>th</sup> such case reported in the world and only the 2<sup>nd</sup> in Spain. Our patient was a 57-year old male who was diagnosed with right ADPKD and left renal agenesis by ultrasound at age 41. At this moment, the patient's serum creatinine (Cr<sub>s</sub>) value was 1.2mg/dl. The right ADPKD and left renal agenesis were confirmed by isotopic renogram and magnetic resonance angiography (MRA). The MRA revealed hepatic cysts, a large right polycystic kidney, and absent renal tissue on the left side (Figure 1 a). Sixteen years later, sCr was 5.9mg/dl and creatinine clearance was 12ml/min/1.73m<sup>2</sup>. In the last 6 years, the patient had suffered a mean annual loss in glomerular filtration rate of 7.6ml/min/1.73m<sup>2</sup>, requiring peritoneal dialysis starting at age 57. In the patient's family background, the mother, two siblings, and one child all had ADPKD (Figure 1 b). The family genetic analysis ruled out the possibility of unilateral renal agenesis in other family members.

Renal agenesis is produced by a lack of interaction between the ureteric bud and the metanephric mesenchyme,

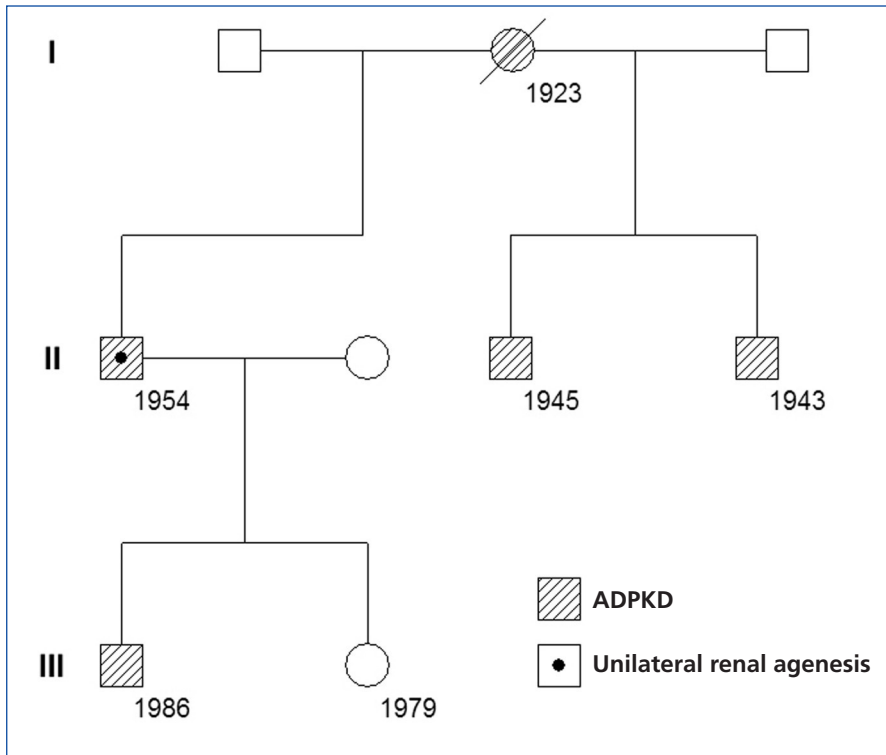
leading to the absence of ureter and kidney. Induction of the ureteric bud from the nephric duct is mediated by glia cell-derived neurotrophic factor (GDNF), which is secreted by the metanephric mesenchyme and interacts with the tyrosine kinase c-Ret receptor expressed in the ureteric bud in order to induce branching of the nephric duct.<sup>13</sup> Several candidate genes have been isolated: *BMP4*, *RET*, *GDNF*, *FREM2* (*FRAS1*-related extracellular matrix protein 2), and *FRAS1* (Fraser syndrome 1).<sup>13-16</sup> *FRAS1* and *FREM2* are responsible for maintaining the integrity of several renal epithelial structures, and are also implicated in the initiation of metanephric kidneys. The gene *FRAS1* codes for the protein *FRAS1*, which contains repeats of the primary domain of sulphate chondroitin proteoglycan, whose function is to maintain the integrity of the epithelial cells. The protein *FRAS1* was detected in several tissues under development. In the metanephros, *FRAS1* was detected in the extracellular matrix, covering the basal surface of the ureter during growth and the basal membrane of the collecting tubule. In individuals with Fraser syndrome, all *FRAS1* mutations reported were mixed heterozygotes or homozygotes, indicating a recessive genetic trait. In contrast, in non-syndromic unilateral renal agenesis, unique *FRAS1* heterozygotic mutations have



**Figure 1.** Coronal magnetic resonance image demonstrating a large right polycystic kidney and absent left kidney. The liver also has multiple cysts.

been observed.<sup>16</sup> On the other hand, unilateral renal agenesis is associated with congenital anomalies of the reproductive system and urinary tract (cysts in the seminal vesicles).<sup>17</sup> Approximately 40%-50% of children with renal agenesis also have other urogenital defects, such as vesicoureteral reflux, ectopic kidney, pelvicalyceal dilatation, ureteral duplication, neurogenic bladder, cryptorchidism, and structural defects of the vagina or uterus. In addition, 15% of these children have cardiovascular defects.<sup>18</sup>

The importance of the association between ADPKD and contralateral renal agenesis is due to the possible causal relationship between these two processes and due to the influence that a single polycystic kidney may have on the early development of CRF. Of the 8 cases of ADPKD and unilateral renal agenesis (including our case) recorded in the medical literature, only 2 underwent genetic analyses to differentiate between PKD1 and PKD2,<sup>12</sup> and each case was associated with a different mutation of the *PKD1* gene. When unilateral renal agenesis occurs as an isolated anomaly, it is asymptomatic, tends to be discovered incidentally during routine ultrasound tests, and normally produces a compensatory hypertrophy of the contralateral kidney. In the case of association with ADPKD, this compensatory hypertrophy may not occur, thus accelerating the development of CRF in the single polycystic kidney. In this manner, unilateral ADPKD would represent a model for analysing the consequences of reducing the number of available nephrons in ADPKD. The cases of ADPKD in a single kidney do not provide sufficient information regarding kidney volume or rates of progression,<sup>8-12</sup> and several already had advanced CRF (Table 1). In addition, these cases of ADPKD in a single kidney cannot be compared to those of patients with two polycystic kidneys. The 2 patients described by Poster<sup>12</sup> who had unilateral ADPKD had higher renal volumes and rates of volume increase than the mean values recorded in a control group. With the exception of the case reported by



**Figure 2.** Genealogical tree of the family with autosomal dominant polycystic kidney disease and unilateral renal agenesis. Numbers indicate date of birth. ADPKD: autosomal dominant polycystic kidney disease.

Sirvent,<sup>11</sup> which involved severe uncontrolled hypertension, the 7 cases reported of unilateral ADPKD did not experience accelerated rates of disease progression. Our patient progressed towards terminal CRF, with an annual loss

in renal function of 7.6ml/min/1.73m<sup>2</sup> during the last 6 years. As such, the available data indicate that unilateral ADPKD kidneys do not appear to retain the capacity to compensate for the reduction in the number of available

nephrons. Unilateral renal agenesis also occurs most commonly on the left side of the body,<sup>19</sup> since in 6 out of the 8 cases reported to date of ADPKD and contralateral renal agenesis, the absent kidney was the left kidney (75% of cases). No clear explanation has been put forth for this predominance, highlighting our lack of understanding of embryogenesis and nephrogenesis in particular.

To conclude, this case illustrates the coincidence of two hereditary renal diseases: one autosomal dominant, ADPKD, and the other recessive, contralateral renal agenesis. Although ADPKD and unilateral renal agenesis can be due to alterations to 2 different and independent genes, we cannot rule out the possibility of a causal relationship between these two anomalies.<sup>20</sup> More cases will need to be analysed in order to come to a conclusion in this regard.

**Acknowledgements**

This study was financed in part by the Carlos III Institute of Health, the Ministry of Science and Innovation (EC08/00236) and the programme for intensifying research activities (IdiPAZ and Agencia Lain-Entralgo/CM) to R.P.

**Conflicts of interest**

The authors state that they have no potential conflicts of interest related to the content of this article.

**Table 1.** Patients with autosomal dominant polycystic kidney disease and contralateral renal agenesis as reported in the medical literature.

Reference	Sex	Family member with ADPKD	Absent kidney	Age at diagnosis	Renal function
Bear, 1974	Male	Father	Left	48	TCKD at 58 years
Todorov, 1999	Female	Mother	Right	45	TCKD at 45 years
Jeong, 2003	Male	Unknown	Left	66	TCKD at 66 years
Sirvent, 2006	Male	Father	Left	23	TCKD at 34 years
Poster, 2009	Female	Father	Left	23	Ccr 83 ml/min/1,73 m <sup>2</sup>
Poster, 2009	Male	Father	Left	38	Ccr 77 ml/min/1,73 m <sup>2</sup>
Poster, 2009	Female	Mother	Right	40	Ccr 59 ml/min/1,73 m <sup>2</sup>
Peces, 2012	Male	Mother	Left	41	TCKD at 57 years

TCKD: terminal chronic kidney disease; ADPKD: autosomal dominant polycystic kidney disease.

- Masoumi A, Reed-Gitomer B, Kelleher C, Bekheirnia MR, Schrier RW. Developments in the management of autosomal dominant polycystic kidney disease. *Ther Clin Risk Manag* 2008;4:393-407.
- Shiroyanagi Y, Suzuki M, Matsuno D, Mochizuki K, Kitagawa N, Tanaka M, et al. Asymmetric development of tumor-like cysts in a child with autosomal dominant polycystic kidney disease. *J Pediatr Surg* 2008;43:e21-3.
- Wilson RD, Baird PA. Renal agenesis in British Columbia. *Am J Med Genet* 1985;21:153-69.
- Costantini F. Renal branching morphogenesis: concepts, questions, and recent advances. *Differentiation* 2006;74:402-21.
- Dressler GR. Advances in early kidney specification, development and patterning. *Development* 2009;136:3863-74.
- Reidy KJ, Rosenblum ND. Cell and molecular biology of kidney development. *Semin Nephrol* 2009; 29:321-37.
- Yosypiv IV. Renin-angiotensin system in ureteric bud branching morphogenesis: insights into the mechanisms. *Pediatr Nephrol* 2011;26:1499-512.
- Bear RA. Solitary kidney affected with polycystic disease: A report of 2 cases. *J Urol* 1974;111:566-7.
- Todorov VV. The diagnostic dilemma of the unilateral cystic kidney-ADPKD with aplasia of one kidney. *Nephrol Dial Transplant* 1999;14:2775.
- Jeong GH, Park BS, Jeong TK, Ma SK, Yeum CH, Kim SW, et al. Unilateral autosomal dominant polycystic kidney disease with contralateral renal agenesis: Acase report. *J Korean Med Sci* 2003; 18:284-6.
- Sirvent AE, Enríquez R, Ardoy F, Amorós F, González C, Reyes A. Autosomal dominant polycystic kidney disease with congenital absence of contralateral kidney. *Int Urol Nephrol* 2006;38:773-4.
- Poster D, Kistler AD, Krauer F. Kidney function and volume progression in unilateral autosomal dominant polycystic kidney disease with contralateral renal agenesis or hypoplasia: a case series. *Am J Kidney Dis* 2009;54:450-8.
- Song R, Yosypiv IV. Genetics of congenital anomalies of the kidney and urinary tract. *Pediatr Nephrol* 2011;26:353-64.
- Skinner MA, Safford SD, Reeves JG, Jackson ME, Freermerman AJ. Renal aplasia in humans is associated with RET mutations. *Am J Hum Genet* 2008;82:344-51.
- Rozen EJ, Schmidt H, Dolcet X, Basson MA, Jain S, Encinas M. Loss of sprout1 rescues renal agenesis caused by Ret mutation. *J Am Soc Nephrol* 2009;20:255-9.
- Saisawat P, Tasic V, Vega-Warner V, Kehinde EO, Günther B, Airik R, et al. Identification of two novel CAKUT-causing genes by massively parallel exon resequencing of candidate genes in patients with unilateral renal agenesis. *Kidney Int* 2012;81:196-200.
- Nakanishi K, Yoshikawa N. Genetic disorders of human congenital anomalies of the kidney and urinary tract (CAKUT). *Pediatr Int* 2003;45:610-6.
- Szmigielska A, Roszkowska-Blaim M, Werner B, Kamińska H, Brzewski M. Hypertension in a girl with severe coarctation of the aorta and renal agenesis. *J Pediatr* 2012;160:705-6.
- Schreuder MF. Unilateral anomalies of kidney development: why is left not right? *Kidney Int* 2011;80:740-5.
- Kerecuk L, Long DA, Ali Z, Anders C, Kolatsi-Joannou M, Scambler PJ, et al. Expression of Fraser syndrome genes in normal and polycystic murine kidneys. *Pediatr Nephrol* 2012; 27:991-8.

**Ramón Peces<sup>1</sup>, Cristina Vega<sup>1</sup>, Ana Aguilar<sup>1</sup>, Rosa Zometa<sup>1</sup>, Claudia Tapia<sup>1</sup>, Carlos Peces<sup>2</sup>, Emilio Cuesta<sup>3</sup>**

<sup>1</sup> Servicio de Nefrología. Hospital Universitario La Paz, IdiPAZ. Madrid. (Spain).

<sup>2</sup> Área de Tecnología de la Información. SESCAM. Toledo. (Spain).

<sup>3</sup> Servicio de Radiología. Hospital Universitario La Paz, IdiPAZ. Madrid. (Spain).

**Correspondence:** Ramón Peces

Servicio de Nefrología. Hospital Universitario La Paz, IdiPAZ, Madrid. (Spain).  
rpeces.hulp@salud.madrid.org

**Diabetic nephropathy confirmed by biopsy: on who and when do we have to perform a biopsy?**  
*Nefrologia* 2012;32(6):842-3  
doi:10.3265/Nefrologia.pre2012.Aug.11623

## To the Editor:

The prevalence of diabetes mellitus (DM) has increased globally, primarily type 2.<sup>1</sup> One of the main complications of this disease, diabetic nephropathy (DN), is the primary global cause of terminal chronic kidney disease (TCKD), and affects approximately one-third of all DM patients.<sup>2</sup> The diagnosis of this condition is usually established based on clinical criteria in diabetic patients with albuminuria and/or diabetic retinopathy.

However, it is also common to encounter non-diabetic kidney disease in diabetic patients, which necessitates the indication for renal biopsies in patients with DM and nephropathy, especially those with a rapid progression or atypical forms of disease.<sup>2,3</sup>

In our study, we describe the characteristics of patients with DN confirmed by renal biopsy. We analysed the motives described for indicating the renal biopsy and the moment in the evolution of disease when the biopsy was taken.

During the study period of 2004-2011, a total of 156 native renal biopsies were performed at the Hospital General de Segovia. In 17 of these (10.9%), a final diagnosis of DN was made.

Table 1 describes the socio-demographic characteristics, pathological history, treatments given, and laboratory results for all of these patients prior to the renal biopsy.

As regards the motive for indicating the renal biopsy, 82.4% of cases were due to nephrotic range proteinuria or nephrotic syndrome, 5.9% were due to acute renal failure, another 5.9% were due to persistent urinary alterations, and the final 5.9% were due to other indications. In 16 patients, the diagnosis was established based on the first renal biopsy, and the other patient required a second biopsy to confirm the diagnosis.

In two patients, the diagnosis of DN was confirmed when the patient had TCKD, while on a dialysis programme.