



Follow-up results of patients diagnosed with multicystic dysplastic kidney disease

Prognosis in patients with multicystic dysplastic kidney disease

Ümmühan Çay¹, Nilgün Çakar²

¹Department of Pediatric Infection, Çukurova University Faculty of Medicine, Adana, Türkiye.

²Department of Pediatric Nephrology, Ankara University Faculty of Medicine, Ankara, Türkiye.

Abstract

Aim: Multicystic dysplastic kidney disease MCDKD is the second most common urinary system anomaly detected by prenatal USG and is probably one of the leading causes of having a single kidney in adults. When congenital kidney and urinary system anomalies are diagnosed in the intrauterine period and followed up and treated early in the postnatal period, the morbidity and mortality rates of the patients decrease and their quality of life increases. In this study, we aimed to evaluate the follow-up results of patients who were followed up with the diagnosis of MCDKD with prenatal and postnatal diagnosis, and to determine possible complications and their relationship with the prognosis.

Methods: In this study, 31 patients with MCDKD were examined. Nineteen patients were male (61.2%), 25 (77.4%) patients were diagnosed in the prenatal period. The cases, which were diagnosed in the prenatal or postnatal period but were included in the study according to the hospital file and outpatient card information, were evaluated retrospectively.

Results: MCDKD was detected on the left side in 18 patients (58.05%) and bilateral in one patient (3.2%). The follow-up period ranged from 7 days to 9 years. When the contralateral kidneys of the patients were examined, stage II hydronephrosis was found in two (6.6%), compensatory hypertrophy in 24 (80%) and the contralateral kidneys in 6 (20%) patients were found to be normal. It was found that hypertension developed in three (9.6%) patients and 15 (48%) patients had recurrent urinary tract infections during follow-up. Renal failure was detected in only one patient with bilateral MCDKD, and the patient died.

Conclusion: In conclusion, patients with MCDKD should be monitored with blood pressure, kidney function tests, urine analysis and USG at regular intervals. Early detection of complications such as hypertension, UTI, kidney failure, malignancy and appropriate treatment are important for the prognosis of the patients.

Keywords

multicystic dysplastic kidney disease, child, follow-up, result

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Corresponding Author: Ümmühan Çay, Department of Pediatric Infection, Çukurova University Faculty of Medicine, Adana, Türkiye.

P: +90 5054940831 - **E-Mail:** ucay-1205@hotmail.com - **Corresponding Author ORCID ID:** <https://orcid.org/0000-0001-5803-878X1>

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Introduction

When congenital kidney and urinary system anomalies are diagnosed in the intrauterine period and followed up and treated early in the postnatal period, the morbidity and mortality rates of the patients decrease and their quality of life increases. Early diagnosis is difficult due to the asymptomatic course of many congenital anomalies of the kidney and urinary system. Today, with the introduction of advanced diagnostic methods, it has become possible to detect congenital anomalies before birth. The MKDKD incidence is approximately 1/2000. It is generally unilateral.¹ Left kidney involvement is more frequent and is more common in males.^{2,3} Kidney function is provided by the contralateral, often compensatory, hypertrophied kidney. Bilaterals are incompatible with life. The cause of MKDKD is unclear. There may be an underlying genetic predisposition.^{4,5} It is a non-genetic condition that occurs sporadically.¹ The incidence of genitourinary system anomalies has been reported to be high in patients with multicystic dysplastic kidneys.⁶⁻⁸ The syndromes can be seen together with urinary system malformations and non-urinary system malformations. The most common anomaly among these is vesicourethral reflux (VUR) with a rate of 18-43%.⁹⁻¹⁰ Generally, most of them are detected incidentally during prenatal ultrasonography (USG). The diagnosis is made by USG. Renal scintigraphy and voiding cystourethrography (VCUG) are routinely recommended to determine the renal function and the presence of VUR.¹¹ Complications of multicystic dysplastic kidney disease are hypertension (HT), malignancy, kidney failure, and urinary tract infections (UTI).¹ After diagnosis, patients should undergo renal USG at regular intervals to follow up urinalysis, kidney functions, blood pressure measurement and the development of hydronephrosis, tumor, compensatory hypertrophy in the contralateral kidney. In this study, it was aimed to evaluate the follow-up results of patients who were followed up with the diagnosis of MCDKD with prenatal and postnatal diagnosis, and to determine possible complications and their relationship with the prognosis. Early detection of complications such as hypertension, UTI, kidney failure, malignancy and appropriate treatment are important for the prognosis of the patients.

Materials and Methods

In our study, we examined 31 patients with multicystic dysplastic kidneys aged between 1 day and 14 years, who were diagnosed and followed up at any stage of the prenatal period or childhood for nine years at the Pediatric Nephrology Outpatient Clinic. The cases, which were diagnosed in the prenatal or postnatal period, but were included in the study according to the hospital file and outpatient card information, were evaluated retrospectively. No limit was determined for the follow-up period of the patients included in the study. Patients' gender, age, age of diagnosis, duration of follow-up, week of gestation when prenatal MCDKD was detected, if diagnosed in the postnatal period, the reason for admission, accompanying anomaly, consanguinity of parents, family history, nephrectomy, number of UTIs, UTI prophylaxis and duration, hypertension, and kidney impairment were evaluated in terms of failure, tumor and family kidney disease. Urinalysis, kidney function tests, which side had the MCDKD, an anomaly in the opposite kidney, VCUG, MAG-3 and DMSA findings were investigated. USG was performed to show the presence of many unrelated cysts of different sizes in the normal anatomical location, rarely in the ectopic location, and without normal parenchyma. In the advanced period, it was performed in the atrophic kidneys. After catheterization of the bladder for VCUG, it was filled with a contrast agent diluted with saline from a height of 80 cm with free flow. Anteroposterior, right-left radiographs were obtained under fluoroscopy during voiding. DMSA and MAG-3 renal scintigraphy was performed to show the nonfunctioning kidney on the

side of the disease. The Toshiba Xario brand USG device was used in the ultrasonographic examinations performed in our hospital in the postnatal period. DMSA and MAG-3 renal scintigraphy was performed with Siemens Optilux and GE brand devices.

Results

In our study, 31 patients with multicystic dysplastic kidneys aged 1 day to 14 years (mean age 5.4) who were incidentally diagnosed and monitored between 2000-2009 were included. Nineteen patients were male (61.2%), 12 were female (38.7%), and the male/female ratio was 1.58. Twenty-five (77.4%) patients were diagnosed in the prenatal period and 6 (22.52%) in the postnatal period. It was determined that one of the patients diagnosed in the postnatal period was diagnosed during UTI and 5 during abdominal USG performed for various reasons. The age of diagnosis in 6 patients diagnosed in the postnatal period ranged from 3 months to 11 years. MCDKD was detected on the left side in 18 patients (58.05%), on the right side in 12 patients (38.74%), and bilateral in one patient (3.2%). The follow-up period ranged from 7 days to 9 years (mean 4.8 years) (Table 1). When the contralateral kidneys of the patients were examined by USG, 2 (6.6%) were detected to have stage II hydronephrosis, 24 (80%) compensatory hypertrophy and 6 (20%) had normal contralateral kidneys. It was observed that hydronephrosis spontaneously recovered during follow-up (Table 2). VCUG results of 20 patients were obtained, and it was learned that none of them had VUR. VCUG was planned for the remaining 11 patients but could not be performed because consent from the families could not be acquired. MAG-3 scintigraphy was performed in 20 patients, and dysfunctional kidneys were detected on the side with MCDKD in all patients. In DMSA applied to five patients, the kidney on the side with MCDKD could not be scanned. In the IVP performed on one patient, no function was detected on the side with MCDKD. During the follow-up, hypertension developed in three (9.6%) patients. When there was no response to antihypertensive treatment, nephrectomy was performed. The blood pressure of the patients returned to normal after nephrectomy. Fifteen

Table 1. Demographic Characteristics of Patients

	Number of patients	%
Total number of patients	n: 31	
Female	12	38.7
Male	19	61.2
Male / Female	1.58	
Location		
Left	18	58.05
Right	12	38.74
Bilateral	1	3.2
Diagnosis		
Prenatal	25	77.41
Postnatal	6	22.55

n: Total number of patients

Table 2. Urological anomalies accompanying MCDKD

	Number of patients n: 31	%
Additional urological anomaly	2	6.6
Ipsilateral urological anomaly	0	0
Contralateral urological anomaly	2	6.6
Compensatory hypertrophy	24	80

n: Total number of patients

patients were found to have urinary tract infection during follow-up. It was determined that the infection recurred on average 1.6 times a year, and the patients received antibiotic prophylaxis for 1-2 years. Kidney function tests in 30 patients were normal. Only 1 patient with bilateral MCDKD had renal failure and this patient died on the 7th day of his life. During the followup period, no malignancy developed in any of the patients (Table 3). There was a second-degree consanguinity between the parents of two patients, and a third-degree consanguinity in two patients. Parents and siblings of 19 patients were screened for MCDKD by USG. MKDBH was not detected in any patient. Polycystic kidney disease was detected in one patient's mother, sibling and maternal uncle. The grandfather of two patients and the cousin of one patient had a history of CRF, and the etiology was not available. It was found that MCDKD accompanied asthma and obesity in one patient, growth retardation in two, mental motor retardation and VSD in one, PDA, ASD and cryptorchidism in one, and ASD, VSD and hydrocephalus in one.

Table 3. Complications in MCDKD patients

	Number of patients n: 31	%
Urinary tract infection	15	48.3
Hypertension	3	9.6
Renal failure	1	3.2
Tumor	0	0

n: Total number of patients

Discussion

When patients with congenital kidney and urinary system anomalies are diagnosed in the intrauterine period and followed up and treated early in the postnatal period, their morbidity and mortality rates decrease and their quality of life increases. In connection with the increase of pregnancy follow-up in recent years, congenital anomalies of kidney and urinary system are more frequently diagnosed in the intrauterine period. MCDKD is one of them. MCDKD is the second most common urinary system anomaly detected by prenatal USG, and is probably one of the leading causes for the presence of a single kidney in adults.¹¹ Patients are more often diagnosed prenatally, and less frequently incidentally by USG, which is performed for various reasons. In the study conducted by Onal et al., it was reported that 80% of 61 patients who were followed up with MCDKD, were diagnosed in the prenatal period and 20% in the postnatal period.^{10,12} In our study, 77.4% of our patients were diagnosed in the prenatal period, and 22.52% in the postnatal period with UTIs and USG performed for various reasons. The incidence of MCDKD is 1/2000, and it is usually unilateral.¹ Left side involvement is more frequent and more common in males. The male/female ratio is 1.48.¹³ In our study, 61.2% of our patients were male, 38.7% were female, and the male/female ratio was 1.58. MCDKD was left-sided in 58% of the patients. In a study by Ismaili et al., 58% of the patients were male and 46% of the patients had right-sided MCDKD.¹⁴ In a study by Miller et al., 59% of the patients were male, 64% of the patients had right-sided MCDKD.¹⁵ and in the study by Onal et al., 70% of the patients were male and 54% of the patients were right-sided.¹² While it is more common in the male gender, it is seen that the location varies in different studies. Urinary malformations accompanied by MCDKD include VUR, ureteropelvic stenosis, renal agenesis, renal hypoplasia, renal dysplasia, horseshoe kidney, ureterocele, ectopic kidney, bladder diverticulum, urethral valve, fibromuscular dysplasia, and seminal vesicle abnormalities.¹³ The most common anomaly among these is VUR with a rate of 18-43%. In patients with unilateral MCDKD, it is recommended to examine the contralateral kidneys in terms of VUR, UPJ and UVB stenosis, size and function of the contralateral kidney.¹⁰

It was observed that the hydronephrosis, detected in 2 of our patients, regressed spontaneously in the follow-up, and VUR was not detected in both patients. There was no urinary system anomaly in addition to MCDKD in these patients. Hypertension is an important complication of MCDKD. Studies conducted in recent years show that the risk of HT in MCDKD is lower than what is known.^{12,14-16} In a meta-analysis evaluating 29 studies, the rate of hypertension in MCDKD was reported as 5.4 per 1000.¹⁶ Although there are publications reporting that hypertension can be treated with nephrectomy, there are also publications showing that hypertension may continue despite nephrectomy. Snodgrass performed nephrectomy in 4 patients with MCDKD and hypertension and reported that 2 patients had improved hypertension and the other 2 patients still had elevated blood pressure.¹⁷ In our study, hypertension was detected in 3 (10%) of our 30 unilateral MCDKD patients and nephrectomy was performed in all three of them because they did not benefit from antihypertensive treatment. Blood pressure returned to normal after nephrectomy. In our patient group, hypertension was found at a higher rate than expected. Even though it is rare, there still is a risk of malignancy in MCDKD. These are mostly Wilms tumors and renal cell carcinoma.¹¹

Cystic kidney diseases such as acquired cystic kidney disease, tuberous sclerosis and von Hippel-Lindau are highly preneoplastic, and the rate of kidney tumor development is high in these cases. Neoplasia was not encountered in our study, either. Due to the low risk of tumor development, nephrectomy is not recommended in MCDKD, and it is thought that follow-up with USG is sufficient. Another important complication of MCDKD is UTI. The frequency of UTI is reported to be 3.6-19%.¹⁸ MCDKD can be diagnosed incidentally with USG performed during UTI. Urinary system infection was detected in 48% of our patients. Bilateral MCDKD is very rare but incompatible with life. Infants are usually stillborn or lost in the first few hours of life.¹ Our patient with bilateral MCDKD lived for 7 days. There is no definite data on the necessity of nephrectomy in MCDKD. In addition to complications such as hypertension and malignancy, there are authors who recommend nephrectomy to reduce longterm follow-up costs. However, due to the rarity of complications, it has been reported that follow-up with close blood pressure and USG is sufficient. The American Academy of Pediatric Urology also recommends nephrectomy for cases with MCDKD in cases such as abdominal pain, UTI, hypertension, and renal malignancy.¹⁶ MCDKD can be seen together with syndromes (VACTERL, Branchio-Auto-Renal (BOR) syndrome, Williams syndrome, Beckwith-Wiedemann syndrome, Trisomy 18/49 syndrome).¹³

No syndromes were found in our patients. Malformations outside of the urinary system may also accompany MCDKD. These include the gastrointestinal system (esophageal atresia tracheoesophageal fistula, duodenal atresia, imperforate anus, omphalocele, inguinal hernia and Hirschsprung's disease), cardiovascular system (VSD, PDA, AS, PS and aortic coarctation), neurological system (anencephaly, microcephaly, microcephaly) anomalies of the musculoskeletal system (syndactyly, congenital hip dislocation and pes equinovarus) and micrognathia, cleft palate, hyphenal atresia, and uterine anomalies.¹³ In our study, it was found that MCDKD accompanied asthma and obesity in one patient, growth retardation in two, mental motor retardation and VSD in one, PDA, ASD and cryptorchidism in one, and ASD, VSD and hydrocephalus in one. MCDKD undergoes involution over time, and the contralateral, often compensatory, hypertrophied kidney takes over the functions of both kidneys. Compensatory hypertrophy has been reported with a rate of 43-100%.^{19,20} Compensatory hypertrophy was found in 80% of our patients. It is a sporadic and non-genetic condition.¹

However, familial cases have also been reported. It is considered that it may be based on genetic attachment.^{4,5} There are publications indicating

different members of a family having MCDKD. This information may support the role of genetic factors in the formation of familial MCDKD. In a study by Sekine et al., it was reported that the father of a patient with unilateral MCDKD also had unilateral MCDKD, the mother had a previous miscarriage, and bilateral MCDKD was detected in the autopsy of the fetus. The presence of MCDKD in 3 people in a family suggests the presence of hereditary factors.²¹

MCDKD was not found in the family history of our patients and in renal USGs performed on parents and siblings. Autosomal dominant polycystic kidney disease was found in the mother, maternal uncle and brother of one of our patients. In conclusion, the widespread use of antenatal USG enables early diagnosis and treatment of urinary system pathologies and reduces mortality-morbidity rates. Whether diagnosed incidentally in the prenatal or postnatal period, patients with MCDKD should be monitored with blood pressure, kidney function tests, urine analysis and USG at regular intervals. Early detection of complications such as hypertension, UTI, renal failure, malignancy and appropriate treatment are important for the prognosis of the patients.

Declarations

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Data Availability

The datasets used and/or analyzed during the current study are not publicly available due to patient privacy reasons but are available from the corresponding author on reasonable request.

Conflict of Interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

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