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Prognoses of Multicystic Dysplastic Kidney Patients: A Single Center Experience

Multikistik Displastik Böbrek Hastalarının Prognozları: Tek Merkez Deneyimi

İsa YILMAZ [1*], **Harun PERU** [1]

[1] Department of Pediatric Nephrology, Faculty of Medicine, Selçuk University, Konya, Türkiye

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Abstract

Objective: In this study, it was aimed to evaluate the demographic characteristics and follow-up results of patients with multicystic dysplastic kidney (MCDK) in our pediatric nephrology clinic, based on the existing medical literature.

Materials and Methods: A retrospective analysis was conducted on the medical records of patients who presented to the Pediatric Nephrology Clinic at Selçuk University Faculty of Medicine between January 2011 and January 2022. The data of 21 patients diagnosed with MCDK were recorded and analyzed.

Results: Out of the total patients, 12 (57%) had left-sided MCDK, while 10 (43%) had right-sided MCDK. Three patients experienced urinary tract infections (UTIs). Among the patients with right-sided MCDK, one had a concurrent right ureterocele, and five showed hydronephrosis in the contralateral kidney. No urinary anomalies except MCDK were observed in the remaining patients. None of the patients exhibited proteinuria nor hypertension. Vesicoureteral reflux (VUR) was not detected in the five patients who underwent voiding cystourethrography. In the follow-up of the patients, MCDK was involuted in a mean of 16.2 ± 30.07 (1-107) months.

Conclusion: Multicystic dysplastic kidney in children has a good prognosis with conservative management. Periodic follow-up is important to prevent the potential development of hypertension or hyperfiltration injury.

Keywords: Multicystic Dysplastic Kidney, Survival, Childhood.

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Öz

Amaç: Bu çalışmada çocuk nefroloji kliniğimizde multikistik displastik böbrek (MKDB) saptanan hastaların demografik özellikleri ve takip sonuçlarının literatür bilgileri eşliğinde değerlendirilmesi amaçlandı.

Gereç ve Yöntemler: Ocak 2011- Ocak 2022 yılları arasında Selçuk Üniversitesi Tıp Fakültesi Çocuk Nefrolojisi kliniğine başvuran hastaların dosyaları retrospektif olarak incelendi. Multikistik displastik böbrek (MKDB) tanısı alan 21 hastanın bilgileri kaydedildi ve analiz edildi.

Bulgular: Hastaların 12'sinde (%57) sol taraflı, 9'unda (%43) sağ taraflı MKDB mevcuttu. Üriner sistem enfeksiyonu (ÜSE) üç hastada görüldü. Sağ taraflı MKDB'si olan hastaların 1'inde sağ üreterosel, 5'inde karşı böbrekte hidronefroz mevcuttu. Diğer hastalarda MKDB dışında üriner anomali izlenmedi. Hastalarda proteinüri ve hipertansiyon tespit edilmedi. İşeme sistoüretrografi çekilen 5 hastada da vezikoüreteral reflü (VUR) tespit edilmedi. Hastaların izleminde MKDB ortalama 16,2 ± 30,07 (1-107) ayda involüsyona uğradı.

Sonuç: Çocuklarda MKDB konservatif yönetim ile iyi prognoza sahiptir. Hipertansiyon veya hiperfiltrasyon hasarının potansiyel gelişimini önlemek için periyodik takip yapılması önemlidir.

Anahtar Kelimeler: Multikistik Displastik Böbrek, Sağkalım, Çocukluk Çağı.

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[*]**Sorumlu Yazar (Corresponding Author):** İsa Yılmaz, **e-mail**: drisayilmaz@hotmail.com

Introduction

Multicystic dysplastic kidney (MCDK) is characterized as a non-hereditary manifestation of renal dysplasia, which frequently leads to organ dysfunction as a result of aberrant kidney development. It represents the most severe form of cystic renal dysplasia. Multicystic dysplastic kidney disease is one of the most common kidney abnormalities that can be identified during fetal ultrasound evaluation. It occurs in approximately one in 4300 live births (1). Typically, it presents unilaterally, with a predilection for the left side, and carries a favorable prognosis (2). However, the prognosis can substantially worsen in cases of bilateral involvement or conjunction with concurrent anomalies (3).

Although the underlying mechanisms governing the pathogenesis of these kidneys remain incompletely elucidated, they often exhibit spontaneous involution over time. Evidence from case series suggests that complete regression occurs in 60% of cases during the first five years of life (4, 5). In the absence of hypertension or neoplastic transformations, surgical intervention is generally not favored, and conservative surveillance proves sufficient (6).

The objective of this study is to determine the demographic characteristics and longitudinal outcomes of patients with MCDK who were followed up in our pediatric nephrology clinic in the last 10 years.

Materials and Methods

In this study, we conducted a retrospective analysis of the medical records of 21 patients who presented to the Pediatric Nephrology clinic at Selçuk University Faculty of Medicine between January 2011 and January 2022. The study was approved by the Selcuk University Local Ethics Committee (date: 01.03.2022 and approval number: 2022/120). The age and gender information of the patients were extracted from their respective medical files. Laboratory findings, including fully automated urinalysis, urine culture, and proteinuria levels, and results of antibiogram analyses were recorded. The presence of leukocyturia and significant bacteriuria (≥100,000 cfu/ml) observed in urine microscopy were utilized as diagnostic criteria for urinary tract infection. Proteinuria in the urine was deemed clinically significant if the spot urine protein/creatinine ratio exceeded 0.2 or if the 24-hour urine collection yielded protein levels above 4 mg/m2/hour. The diagnosis of the MCDK was based on urinary system ultrasonography (US) findings characterized by the presence of multiple cysts of varying sizes and the absence of normal renal parenchyma. Patients who presented with urinary tract infections and abnormal US findings underwent further investigation using Voiding cystourethrography (VCUG). Nuclear imaging results, encompassing Technetium-99m (Tc-99m) dimercaptosuccinic acid (DMSA) renal scintigraphy, diethylenetriaminepentaacetic acid (99mTc DTPA) renal scintigraphy, and mercaptoacetyltriglycine (MAG 3) renal scintigraphy, were meticulously documented. Blood pressure measurements were obtained using an oscillometric device. Measurements were taken on the right upper arm with a suitable cuff, in a sitting position (supine position in newborns) after resting for at least 5 minutes. Additionally, 24-hour continuous blood pressure monitoring data, obtained once a year, were recorded for comprehensive evaluation. The 24-hour, daytime, and nighttime mean systolic and diastolic BP readings, 24-hour mean arterial BP reading, systolic and diastolic BP loads in wake and sleep periods, the extent of dipping, and heart rate were analyzed. Blood pressure load is found by the ratio of systolic blood pressure and/or diastolic blood pressure measured by ABPM to the total number of measurements of those who are above 95p according to their age, gender, and height. Those with a blood pressure load of 25% or more were considered as hypertension.

Results

The files of patients with MCDK who applied to Selcuk University Faculty of Medicine between January 2011 and January 2022 were evaluated. Nine (43%) of the patients were female and 12 (57%) were male. Sixteen of the patients (76.2%) were diagnosed in the prenatal period. The mean age of the patients diagnosed in the postnatal period was 31.5 ± 36.5 months (2-81) and their complaints were vomiting and abdominal pain at the time of admission to the hospital. The patients were followed up for an average of 61,8±35.77 months (13-126). Twelve (57%) of the patients had left-sided, and 9 (43%) had right-sided MCDK. Urinary system infection (UTI) was seen in three patients. Right-sided MCDK was accompanied by a right-sided ureterocele in one patient, and hydronephrosis in the contralateral kidney in 5 patients. No urinary anomaly was observed in

other patients. Proteinuria and hypertension were not detected in the patients. Vesicoureteral reflux (VUR) was not detected in 5 patients who underwent voiding cystourography. Other patients did not undergo VCUG. In the follow-up of the all patients, MCDK was involuted in a mean of 16.2 ± 30.07 (1-107) months (Table 1).

Table 1

Demographic and clinical characteristics of patients diagnosed with unilateral MCDK

	Count	%
Sex		
Female	9	43
Male	12	57
Side		
Right	9	43
Left	12	57
Prenatal diagnosis		
Yes	16	76,2
No	5	23,8
UTI		
Yes	3	14,3
No	18	85,7
There is a urinary system anomaly	6	28,6
Ureterocele	1	4,8
Hydronephrosis	5	23,8
No urinary system anomaly	15	71,4
Involution Rate	21	100

Statistical analyses were performed using IBM SPSS statistical software version 22.0. The results were expressed as mean ± standard deviation (SD) (minimum-maximum) and percentages, ensuring a comprehensive and robust analysis of the data.

Discussion

Multicystic dysplastic kidney (MCDK) arises from aberrant metanephrosis differentiation, wherein the normal kidney tissue undergoes replacement by numerous cysts, undifferentiated epithelium, and primitive channels encapsulated by fibromuscular connective tissue (7). Although an underlying cause cannot be determined in most cases, 7-14% of patients have genetic disorders (1). They are known to be associated with the SALL1, HNF 1B, ROBO2, and CHD 1L gene mutations (8). Genetic or chromosomal abnormalities tend to elevate the likelihood of concurrent extrarenal abnormalities. Nevertheless, there exist case reports suggesting that MCDK may manifest due to intrauterine infections caused by agents such as adenovirus, cytomegalovirus, enterovirus, or as a consequence of the teratogenic effects exerted by antiepileptic medications like carbamazepine and phenobarbital (9, 10). In our study, genetic testing was regrettably omitted, however, there was no history of congenital infection or use of teratogenic drugs. Antenatal diagnosis holds paramount significance in safeguarding the contralateral kidney and enabling timely intervention in the presence of potentially associated urological anomalies. Moralıoğlu et al. reported the antenatal diagnosis rate as 94% in their study and as 50% by Kara et al. (11, 12). This rate was 76.2% in our study. This finding underscores the efficacy of perinatological follow-up in our institution.

Multicystic dysplastic kidney disease exhibits a higher prevalence in boys compared to girls, as supported by existing literature (12, 13, 14). Consistently, our study found a male-to-female ratio of 1.3/1, aligning with the literature. Similarly, MCDK was left-sided in 57% of patients in our study, in line with literature findings indicating a higher occurrence of MCDK on the left side (2, 15, 16). The prognosis is primarily influenced by the presence of additional anomalies and bilaterality, rather than the affected side, as bilateral involvement is often incompatible with life (3). Compensatory growth of the contralateral kidney begins during intrauterine life, but this growth is not observed in cases of contralateral kidney abnormalities, including rotational or positional anomalies, hypoplasia, areas of dysplasia, vesicoureteral reflux (VUR), ureterocele, ureteropelvic (UP) junctional stenosis, ureterovesical (UV) junctional stenosis, or genital abnormalities (5, 17). Studies indicate that 70-75% of MCDK cases are isolated and unilateral, while 25-30% are accompanied by genitourinary anomalies and a single functional kidney (1). Common urological anomalies in these cases involve VUR and urinary system obstructions (2, 18). The incidence of VUR in the contralateral kidney ranges from 5-26%, primarily consisting of low-grade (grades 1-2) VUR (5, 19). In our study, VUR was not detected in patients who underwent voiding cystourethrography (VCUG). However, in some cases, VCUG was not performed. The necessity of routine VCUG for all MCDK patients remains controversial. In the literature, VCUG is not recommended when two consecutive normal ultrasound examinations of the contralateral kidney are obtained, as the likelihood of detecting clinically significant VUR is low in such cases. Low-grade reflux associated with VUR is known to improve during the early stages of life (6, 20). However, some studies recommend VCUG only in patients with ureteral or pelvic dilatation, abnormal appearance of the contralateral kidney, or a history of symptomatic UTI (21, 22). The prevalence of UP junctional stenosis in the contralateral kidney varies between 1.1% and 13% in the literature, while ureterovesical junctional stenosis is reported to be present in 1-6% of cases (11, 19, 20). In our study, neither UP nor UV junctional stenosis was detected in patients, including those with hydronephrosis. Multicystic dysplastic kidney typically remains asymptomatic, with abdominal or flank pain and respiratory distress being rare symptoms resulting from the pressure effect of the abnormal kidney (15). Consistent with the literature, we found that only two of our patients presented with symptoms, one experiencing vomiting due to UTI and the other presenting with abdominal pain. Possible complications in patients with MCDK include UTIs, the development of malignancy, hypertension, and proteinuria. The incidence of UTIs in these patients has been reported to range from 2.5% to 34.7% (11, 23). This is particularly important in terms of the potential to cause damage to the contralateral kidney. Antibiotic prophylaxis is indicated, especially in cases accompanied by VUR in the contralateral kidney (12). In our study, the UTI rate was 14.3%, consistent with the literature (11, 12). Although mild hydronephrosis was present in the contralateral kidney of five patients, prophylaxis was not administered to any patient, as UTIs were not recurrent. While hypertension may not be observed in all MCDK patients, studies report a potential risk of hypertension in 17.7% of patients (5, 12). None of our patients exhibited hypertension. Blood pressure measurement, urinalysis to detect proteinuria, and kidney function tests including measurement of blood urea nitrogen and serum creatinine are recommended in the routine follow-up of patients, especially in children with anomalies in the contralateral kidney who are at risk of developing chronic kidney disease (5,24). Whittam et al. retrospectively reviewed a cohort of 84 patients, all of whom had Tc-99 m MAG3 or DMSA screening as a follow-up, and concluded that serial US has a high predictive value in diagnosis and that nuclear kidney scans do not provide additional benefit (25). The most recent recommendation in the literature is to follow-up patients with serial US rather than routine nuclear scanning, and nuclear scans should be used in the presence of indistinguishable US findings (26). In this study, we observed that nuclear imaging was frequently used in addition to serial US in the follow-up of the patients. In previous years, priority was given to nuclear imaging. This approach has declined in recent years. Resection of the multicystic dysplastic kidney is not recommended due to the lack of evidence supporting an increased risk of malignancy, particularly Wilms tumor, in MCDK. This assertion is supported by a systematic literature review encompassing 26 studies, which revealed no cases of Wilms tumor among 1041 children with unilateral MCDK (18). Furthermore, it is widely recognized that a majority of MCDK cases undergo spontaneous regression within the first year of life (4). Thus, surgical intervention was not pursued in any of our patients, as we observed involution in accordance with the existing literature, within an average time frame of 16.2 months.

Naturally, our study is subject to certain limitations, namely its retrospective design and the relatively small number of patients involved, which restricts the generalizability of our findings.

Conclusion

In conclusion, conservative management of MCDK in pediatric cases is associated with a favorable prognosis. Routine VCUG or prophylactic antibiotic administration is unnecessary. The incidence of UTIs in MCDK patients is not higher than that observed in the normal pediatric population. Serial ultrasound examinations typically suffice for monitoring purposes. Consequently, we propose a periodic follow-up schedule of every 6 months initially, transitioning to annual assessments for patients diagnosed with uncomplicated MCDK, aiming to detect and prevent potential complications such as hypertension or hyperfiltration-related renal damage.

Ethics Committee Approval: The study was approved by the Selcuk University Local Ethics Committee (date: 01.03.2022 and approval number: 2022/120).

Informed Consent: Consent was not obtained as it was a retrospective study.

Conflict of Interest: Authors declared no conflict of interest.

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