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Araştırma

Long-Term follow-up of multicystic dysplastic kidneys: A single center experience

Multikistik displastik böbreklerin uzun dönem izlemi: Tek merkez deneyimi

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ABSTRACT

Objective: Multicystic dysplastic kidney (MCDK) is one of the most common developmental anomalies of the kidney with an incidence of approximately 1 in 4300 live births. The goal of our study was to review our follow-up procedure of children with MCDK through this study via comparison of outcomes with the literature.
Methods: Follow-up outcomes of 36 pediatric patients with antenatally detected unilateral MCDK were assessed.
Results: The compensatory renal hypertrophy of the contralateral kidney was seen in 94.4% of the patients and mean complete involution time was 22.97±32.63 months. Four patients underwent nephrectomy because of hypertension resistant to medication in 2 patients and parental concern in 2 patients. Vesicoureteral reflux (VUR) was the most frequent anomaly detected in 5 (13.8%) patients. VUR were low grade in all patients and any scar was not detected on DMSA.
Conclusion: The results of our study showed that MCDK is usually a benign disease. Ultrasound is a noninvasive and cost- effective method of choice in follow-up. A VCUG may not be routinely required in MCDK patients unless renal US reveals signs of suspect VUR or renal parenchymal defects.

Keywords: Multicystic dysplastic kidney, nephrectomy, hypertension, complete involution, urological anomalies

ÖZ

Amaç: Multikistik displastik böbrek (MKDB), böbreğin en sık görülen gelişimsel anomalilerinden birisidir. Yaklaşık olarak 4300 canlı doğumda bir görülmektedir. Çalışmamızın amacı, MKDB'li çocukların takip prosedürünün mevcut sonuçlarımızı literatür ile karşılaştırılması yoluyla gözden geçirmektir.
Yöntem: Antenatal tanılı MKDB'li 36 çocuk hastanın izlem sonuçları değerlendirildi.
Bulgular: Hastaların %94,4'ünde karşı taraf böbrekte kompanzatris hipertrofi görüldü. Tam involüsyon süresi ortalama 22,97±32,63 ay idi. İkisi ilaç tedavisine dirençli hipertansiyon ve 2'si ebeveyn endişesi nedeniyle olmak üzere 4 hastaya nefrektomi yapıldı. Vezikoüreteral reflü (VUR) en sık görülen anomali olarak saptandı. Beş (%13,8) hastada VUR saptandı. Saptanan VUR tüm olgularda düşük dereceliydi ve DMSA'da skar saptanmadı.
Sonuç: Çalışmamızın sonuçlarına göre MKDB genellikle iyi huylu bir hastalıktır. Ultrasonografi hastaların izleminde yeğlenebilecek girişimsel olmayan ve maliyet etkin bir yöntemdir. Ultrasonografi bulguları renal parenkimal defekt ve şüpheli VUR bulguları göstermedikçe rutin VCUG yapılması gerekmeyebilir.

Anahtar kelimeler: Multikistik displastik böbrek, nefrektomi, hipertansiyon, tam involüsyon, ürolojik anomali

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INTRODUCTION

Multicystic dysplastic kidney (MCDK) is one of the most common developmental anomalies of the kidney and it has an incidence of approximately 1 in 4300 live births. It is characterized by multiple non-communicating cysts of varying sizes on ultrasonography (US) and non-functioning dysplastic parenchyma on dimercaptosuccinic acid (DMSA) radionuclide scan [1]. MCDK is either an isolated situation or associated with urological anomalies mainly vesicoureteral reflux (VUR) and ureteropelvic junction obstruction (UPJO) [2-4]. Although hypertension and malign transformation are potential risks of MCDK, it has been reported that the majority of the affected kidneys are very likely to undergo partial or complete involution within the first five years of life [1-3]. In the past, the general approach was surgical removal of the dysplastic kidney due to the risks of hypertension and malign transformation. However, in recent studies routine nephrectomy is not recommended unless there is a clinical indication [1,2,5]. Nevertheless, the long-term management of patients with MCDK is not well defined. The aim of the present study was to evaluate the long term outcomes of our patients with MCDK and review our approach of follow-up and treatment.

MATERIAL and METHODS

The study group consisted of 36 pediatric patients with antenatally detected unilateral MCDK who were followed-up in our unit between November 1997 and May 2010. Data were collected prospectively and analyzed retrospectively. The diagnosis of MCDK was based on US findings characterized by varying sized multiple non-communicating renal cysts and/or absence of functioning renal tissue in the abdomen or pelvis on DMSA scan.

According to our antenatal hydronephrosis follow-up procedure, ultrasound scan was performed on days 2-3 (or when the patient was first seen), days 7-10 and the first month of life. Patients were evaluated based on physical examination findings, blood pressure measurements, results of urinalysis and urine culture monthly in the first six months of life, once every 3 months in the second six months, twice yearly between the ages 1 and 3 and then annually [6]. Hypertension was defined as systolic and diastolic blood pressure >95th percentile for gender, age and height measured on three occasions. Ultrasonography was performed every 6 months after the diagnosis. Additionally, a voiding cystourethrogram (VCUG) was performed for all patients to verify associated pathologies. All patients underwent DMSA scintigraphy to confirm the loss of renal function of the affected kidney. Complete or partial involution of the dysplastic kidney and compensatory hypertrophy of the contralateral kidney was monitored by US. Compensatory hypertrophy of the contralateral kidney defined as kidney size >2 standard deviation (SD) larger than the age-adjusted normal sized kidney. Complete involution was defined as disappearance of the dysplastic kidney and partial involution was defined as reduction in the size of dysplastic kidney on US. Data were analyzed using SPSS 13.0 statistical software and chi-square and t-tests were used to compare independent samples. A p value of <0.05 was considered statistically significant. Involution time was evaluated by using Kaplan-Meier survival analysis.

Compliance with Ethical standarts

The study which involves human participants was approved by the local ethics committee. Informed consent was not obtained from participants due to retrospective nature of the study. The authors declare no conflict of interest.

RESULTS

A total of 36 patients [26 (72.2%) girls and 10 (27.8%) boys] were included in the study. All the patients were diagnosed with antenatal MCDK. Associated urological anomalies of the contralateral kidneys and compensatory hypertrophy were detec-

ted in 8 (22.2%), 34 (94.4%) patients, respectively. Hypertension was found in 6 (16.6%) patients whereas 4 (11.1%) patients underwent nephrectomy. Complete involution and partial involution were observed in 23 (63.8%) and in 2 (5.5%) patients, respectively (Table 1).

The mean follow-up time was 55.97±46.37 months (median 43.5 months, minimum 6 months, maximum 170 months) and the mean complete involution time of the kidneys was 22.97±32.63 months (median, 12 months; range, 6-170 months). Of these patients, complete involution was observed at 12 months in 55% and at 24 months in 75% of the patients (Figure 1). Median complete involution time was 13.8 months boys and 11 months in girls (P=0.21). Patients with or without associated urological anomalies showed complete renal involution at 21 months and 11.65 months, respectively (p=0.17). Patients with right- or left sided MCDK showed complete renal involution at 10.67, and 15.75 months, respectively (P=0.106). The mean frequency of urinary tract infection was found to be 0.71±1.55 infection/year (Table 2).

Associated urological abnormalities were seen in 8 (22.2%) patients. Vesicoureteral reflux was the most frequent anomaly detected in 5 (13.8%) patients and the grade of VUR was of low grade in all patients and no scar was detected on DMSA. VUR and ectopic kidneys were seen in 2. UPJO and ectopic kidneys in 1 patient and hypospadias in 2 patients (Table 3).

Table 1. Characteristics of patients.

Parameter	n	%
Gender (Boys/Girls)	10/26	27.8/72.2
MCDK (Left/Right)	22/14	61.1/38.9
Compensatory hypertrophy* (Yes/No)	34/2	94.4/5.6
Urological anomalies (Yes/No)	8/28	22.2/77.7
Hypertension (Yes/No)	6/30	16.6/83.3
Treatment (Nephrectomy/Follow-up)	4/32	11.1/88.9
Nephrectomy/Complete Involution/Partial involution	4/23/2	11.1/63.8/5.5

**The length of contralateral kidney > 2 SD*

Table 2. Characteristics of follow-up.

Follow-up (months)	
Mean±SD	55.97±46.37
Median	43.5
Minimum/Maximum	6/170
Complete involution time (months)	
Mean	22.97±32.63
Median	12
Minimum/Maximum	6/170
Frequency of UTI	
Patients with UTI (n)	20
Number of UTI (n)	80
Frequency (Infection/12 months) (Mean±SD)	0.71±1.55

Table 3. Additional urological anomalies.

	n (%)
VUR	3 (8.3%)
VUR and Ectopy	2 (5.5%)
UPJO and Ectopy	1 (2.7%)
Ectopy	1 (2.7%)
Hypospadias	2 (5.5%)
Total	8 (22.2%)

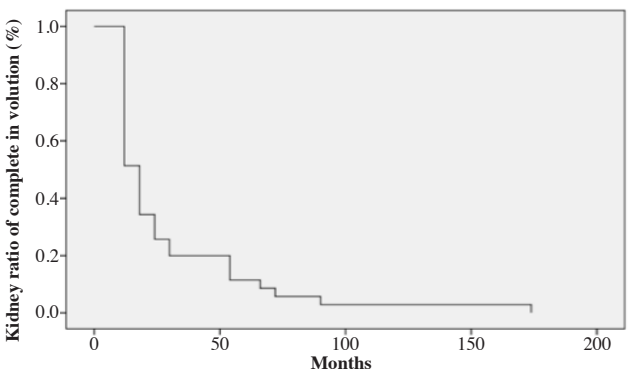

Figure 1. The curve of complete involution time of MCDKs. Kaplan-Meier analysis (Complete involution was observed at 12 months in 55% and at 24 months in 75% of patients).

DISCUSSION

We provided an overview for our follow-up procedure of children with MCDK via comparison of outcomes with those of the literature. Our study shows that it is important to monitor these patients for a long time.

As the renal function depends on the contralateral functioning kidney, its anomalies need to be detected early and managed appropriately. In a meta-analysis of 67 studies, MCDK was reported to be significantly more frequently on the left side (53.1%) with the male predominance (59.2%) [4]. As indicated in this meta-analysis, MCDK was left-sided in 22 patients (61.1%) in our study. However, contrary to this meta-

analysis, our study group showed a female predominance (Table 1).

In most cases of MCDK, the natural history without intervention is characterized by involution of the affected kidney. Analysis of 105 reports of MCDK demonstrated involution or regression of 60 % of MCDKs within the first three years of life [7]. In a prospective study from a regional registry of 323 patients with MCDK, 10% of antenatally detected MCDK had involuted by the time of the first postnatal US. Another study showed that long-term follow-up demonstrated complete involution of 35, 47 and 62 percent of MCDKs at 2, 5, 10 years follow-up, respectively [8]. In our study, complete involution of the affected kidney occurred in 55%, 75% and 80% of the group within 12, 24 and 86 months, respectively. We showed that the median complete involution time was 22.97 months (Figure 1).

If the contralateral kidney is normal, then it usually undergoes compensatory hypertrophy, which starts in utero, resulting in a kidney size that is greater than two standart deviations relative to mean length of normal kidney. The absence of compensatory hypertrophy suggests presence of abnormalities affecting the contralateral kidney [3,9]. In our study group, the compensatory renal hypertrophy of the contralateral kidney was seen in 94.4% of the patients. The contralateral urinary tract may be associated with a variety of other defects including rotational or positional anomalies, hypoplasia, areas of dysplasia, VUR and UPJO [3,9]. VUR is the most common renal abnormality in patients with MCDK, occuring in up to 25% of contralateral kidneys of the affected patients. In our series, associated urological abnormalities were seen in 8 (22.2%) patients and the total number of urological anomalies were 12 (Table 3). Vesicoureteral reflux was the most frequent anomaly detected in 5 (13.8%) patients. VUR were of low grade in all patients and no scar was detected on DMSA. The necessity of performing a VCUG in patients with MCDK has been increasingly questioned [10,11]. Although VUR has been reported to occur in 4 to 14 percent of contralateral kidneys [7,8,11], it is usually of low grade and generally resolves in early life [9]. As mentioned before, in our study, VUR was present in 5 (13.8%) patients and all of these patients showed low grade VUR while no scar was detected on DMSA scan. As a result, we could suggest that performing a VCUG is unnecessary in MCDK patients with normal renal US because children with normal US and DMSA scans rarely have high-grade VUR. However, if there is significant contralateral hydronephrosis or a history of UTI, then a VCUG should be performed.

During follow-up, proteinuria and hematuria should also be closely monitored in MCDK patients. Mansoor et al. [2] reported the incidence of proteinuria as 9.8%. On the other hand, Aslam et al. [9] have reported that none of their patients developed proteinuria. In our study, during the follow-up period, none of the patients exhibited hematuria or proteinuria.

Hypertension is a rare but recognised complication of MCDK. Compared to the general population there is no clinically significant increased risk of hypertension. The incidence of hypertension has been reported to be 0.5% to 14.4% in the MCDK population [12-15]. In our study population, the rate of hypertension (16.6%) was found to be higher than the expected rates (Table 1). However, this high rate of hypertension in our study group can not be solely attributed to the MCDK. One patient was on steroid treatment for allergic asthma and the hypertension resolved after withdrawal of steroid treatment. Three patients were moderately obese and their hypertension resolved by changing the dietary behaviors and living habits. Two patients who developed hypertension at infancy period which was resistant to antihypertensive drugs underwent nephrectomy. After nephrectomy the hypertension continued and these two patients are still under follow-up with antihypertensive medication.

In the past, routine nephrectomy of the affected kidney has been recommended due to the risks of malignancy and hypertension. Nowadays, however, there are no data to confirm the increased risks of malignancies and hypertension compared with the

general population. Therefore, routine nephrectomy is no longer recommended in MCDK patients. On the other hand, persistent hypertension, mass effect, pain, recurrent infections or anxiety of parents are controversial indications of nephrectomy in MCDK patients [1,2,5]. In our study 4 patients underwent nephrectomy because of hypertension resistant to medication in two patients and parental concern in another 2 patients.

In conclusion, the result of our study showed that MCDK is a usually benign disease. Hence, MCDK patients should be followed-up closely for UTI, hypertension, proteinuria, hematuria, malignancy and associated urological anomalies. US is a noninvasive and cost- effective method of choice for the follow–up of MCDK patients. A VCUG is not routinely required in MCDK patients unless, history of UTI and the renal US reveals evidence suggestive of VUR or renal parenchymal defects on DMSA scan.

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