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Multicystic Dysplastic Kidney: Four-Year Evaluation

Multikistik Displastik Böbrek: Dört Yıllık İnceleme

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ABSTRACT

Objective: Multicystic dysplastic kidney is a relatively common developmental abnormality in infants and children. Additional abnormalities like vesicoureteral reflux, ureteropelvic junction obstruction, and ureterovesical junction obstruction may accompany multicystic dysplastic kidney. In this article, we reviewed the pathogenesis, diagnosis, associated urinary tract anomalies and results of management of multicystic dysplastic kidney in the light of the literature.

Material and Method: We retrospectively assessed 20 children with unilateral multicystic dysplastic kidney between January 2005 and December 2009. Mean duration of follow-up was 35 ± 8.7 months. All children with multicystic dysplastic kidney underwent nephrectomy. Patient characteristics, the pathology findings, associated urinary tract anomalies and results of management were reviewed.

Results: Abdominal ultrasound, voiding cystourethrography and renal scintigraphy revealed vesicoureteral reflux in 3 (15%) children, ureteropelvic junction obstruction in 3 (15%) children, and a duplex system in the contralateral kidney in 1 (5%) child. Blood pressure values, serum urea, creatinine and urinalysis were within normal range in all children during follow-up.

Conclusion: A conservative approach to children with multicystic dysplastic kidney has been advocated, but surgical removal is also another management modality on the basis of risk of hypertension, mass effect, potential for malignant change, and cost of repeated ultrasound examination.

Key Words: Multicystic dysplastic kidney, Multicystic renal dysplasia

ÖZ

Amaç: Multikistik displastik böbrek yenidoğan ve çocuklarda sık olarak görülen bir gelişim anomalisidir. Vezikoüreteral reflü, üreteropelvik ve üreterovezikal bileşke obstrüksiyonu gibi diğer anomaliler multikistik displastik böbreğe eşlik edebilir. Bu makalede amacımız multikistik displastik böbrekli hastaların patogenezini, tanısını, ilişkili olduğu üriner sistem anomalilerini ve klinik sonuçlarını literatür bilgileri ışığında tekrar gözden geçirmektir.

Gereç ve Yöntem: Ocak 2005- Aralık 2009 tarihleri arasında, geriye dönük olarak tek taraflı multikistik displastik böbreğe sahip 20 çocuk değerlendirildi. Ortalama takip süreleri 35 ± 8,7 aydı. Multikistik displastik böbrekli tüm çocuklara nefrektomi yapılmıştı. Hastaların özellikleri, patolojik bulguları, eşlik eden üriner sistem anomalileri ve klinik sonuçları gözden geçirildi.

Bulgular: Abdominal ultrasonografi, voiding sistoüretrografi ve renal sintigrafi yoluyla diğer böbrekte, 3 çocukta (%15) vezikoüreteral reflü, 3 çocukta (%15) üreteropelvik bileşke obstrüksiyonu ve 1 çocukta (%5) çift sistem saptandı. Takipler sırasında tüm çocuklarda kan basıncı, serum üre, kreatinin değerleri ve idrar analizi normal sınırlarda bulundu.

Sonuç: Multikistik displastik böbrekli çocuklarda konservatif tedavi yaklaşımı savunulmaktadır. Ancak hipertansiyon riski, kitle etkisi, malign değişim potansiyeli ve tekrarlanan ultrasonografi maliyeti göz önüne alındığında cerrahi tedavi diğer bir tedavi seçeneği de olabilir.

Anahtar Sözcükler: Multikistik displastik böbrek, Multikistik renal displazi

INTRODUCTION

Multicystic dysplastic kidney (MCDK), a variant of renal dysplasia, is one of the most frequently identified congenital urinary tract abnormalities. The incidence varies, depending on the study and country, but ranges from 1 in 3,640 to 4,300 live births (1-4). MCDK can be familial disease but most often occurs as a sporadic finding (5). Prenatal ultrasound (US) scans detect 77–88% of MCDK cases (6). They are more commonly diagnosed in boys and usually found on the left side but may also be bilateral (7,8). Most commonly found additional abnormalities in patients with MCDK include vesicoureteral reflux (VUR), ureteropelvic junction (UPJ) obstruction, and ureterovesical junction obstruction (6,8,9). In this article we reviewed the pathogenesis, diagnosis, associated urinary tract anomalies and results of management of MCDK in light of the literature.

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MATERIAL and METHODS

We retrospectively assessed 20 children (2 girls and 18 boys) with unilateral MCDK between January 2005 and December 2009. The age of children admitted to our center ranged from 12 to 108 months (mean 59±9.1 months). Mean duration of follow-up was 35±8.7 months (range 12-60 months). The first complaint of patients at admission was abdominal mass. Urinary tract malformation was suspected in prenatal ultrasound tests in 4 (20%) children. US performed after birth revealed MCDK in 20 children. Indications for US included urinary tract infection and incidental study. US examinations were repeated every 6 months after the diagnosis. All patients underwent voiding cystourethrography (VCUG). Renal scintigraphy was performed with technetium-99m, dimercaptosuccinic acid (99mTc-DMSA) to confirm MCDK and evaluate renal scarring in the contralateral kidney. Blood pressure was measured in all children; additionally serum urea and creatinine measurements, as well as urinalysis and urine culture were performed at baseline and periodically repeated thereafter. The presence of urological anomalies in children with MCDK was an indication for antimicrobial prophylaxis (with nitrofurantoin or trimethoprim). For histopathological evaluation, whole-mount sections of one side of the kidneys were examined. Tissue samples were processed routinely and fixed in 10% formalin solution and embedded in paraffin. Tissue sections of 3 μm were obtained and stained with hematoxylin and eosin (H&E). Histopathological examinations were performed under the light microscope.

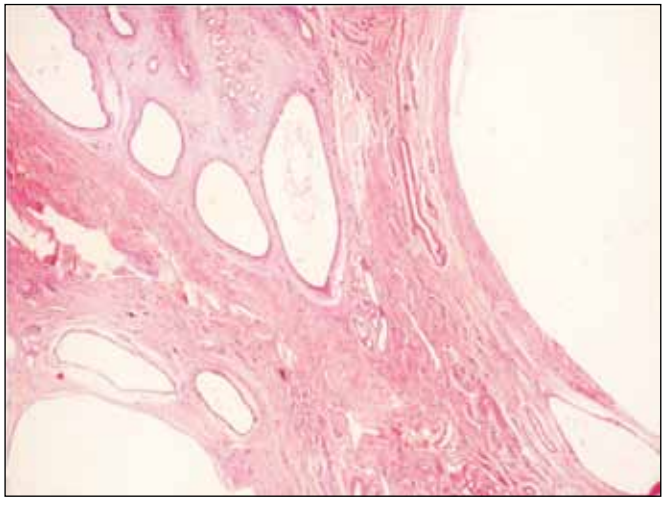

Figure 1: Dysplastic kidney containing multiple cysts (H&E; x100).

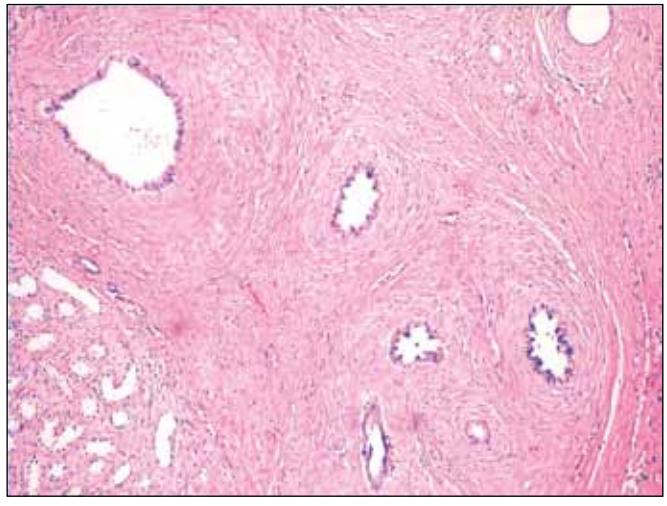

Figure 3: Primitive-appearing tubules surrounded by condensed mesenchymal cells (H&E; x100).

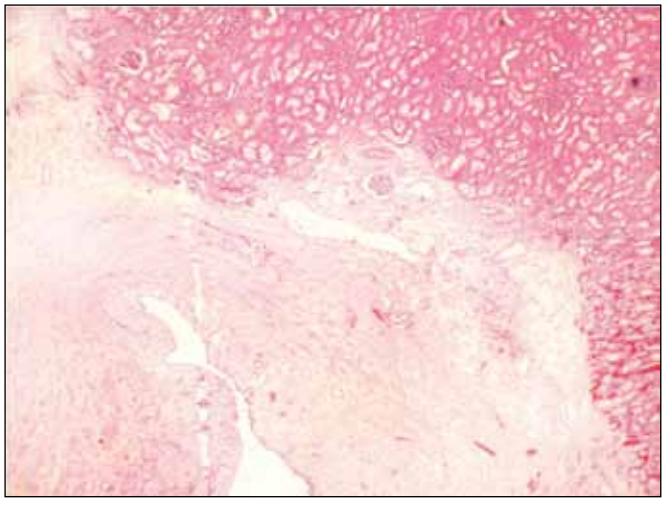

Figure 2: Aberrantly formed glomeruli (H&E; x40).

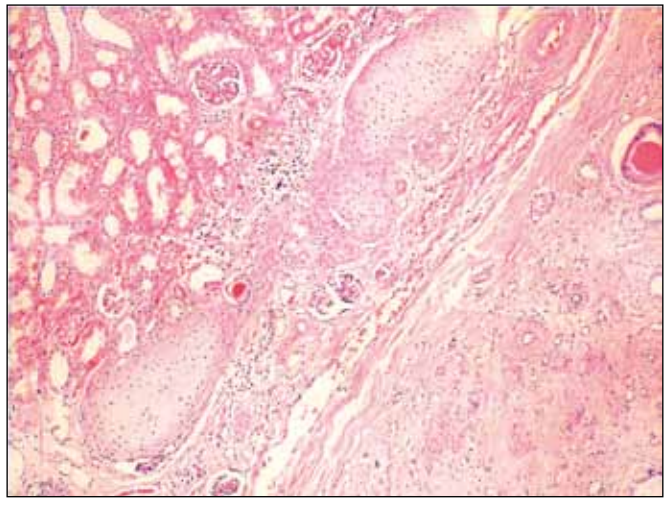

Figure 4: Cartilage within dysplastic kidney (H&E; x100).

RESULTS

MCDK was diagnosed in the left side in 12 (60%) and the right side in 8 (40%) children. Abdominal US, VCUG and renal scintigraphy revealed VUR in 3 (15%) children, UPJ stenosis in 3 (15%) children and a duplex system in the contralateral kidney in 1 (5%) child. Antimicrobial prophylaxis was applied in ten children. Indication for antimicrobial prophylaxis included VUR in 3 children, UPJ stenosis in 3 (15%) children, urinary tract infection in 3 (15%) children and a duplex system in 1 (5%) child. Among the 7 (35%) children with urological anomalies accompanying MCDK, 1 (5%) child underwent dismembered pyeloplasty. The remaining 6 (30%) children were treated conservatively.

All children with MCDK underwent nephrectomy in this series. The indication for nephrectomy was hypertension in 4 patients, abdominal mass in 6 patients, and recurrent urinary infection in other patients. The diagnosis of MCDK was confirmed by histopathology in all children who underwent nephrectomy. Histopathologically, variably sized cysts replaced the renal parenchyma in the sections. Characteristically, large cysts were lined by flattened cuboidal epithelium (Figure 1) and an intervening parenchyma that was fibrotic with islands of cartilage and rare glomeruli. Frequently glomeruli appeared immature and aberrantly formed (Figure 2). Primitive or dysplastic ducts were lined with columnar epithelium and surrounded by collars of spindle cells (Figure 3). Immature cartilage was seen (Figure 4). Blood pressure values, serum urea, creatinine and urinalysis were within normal range in all children.

DISCUSSION

Multicystic dysplastic kidney (MCDK) is characterized by replacement of normal kidney tissue with numerous cysts, undifferentiated epithelium and primitive ducts surrounded by fibromuscular connective tissue (2,10,11). This malformation results from abnormal metanephros differentiation, probably due to disturbed connection of ureteric bud with renal blastema and abnormal division at the stage of metanephros (2,10,12,13).

Various etiological factors have been held responsible for MCDK. Teratogens, such as in utero viral infections and medications, have also been implicated. In one study, 1–3% of children with congenital kidney malformations had amniotic fluid that produced cultures positive for enterovirus, cytomegalovirus or adenovirus (14). A series of four infants with MCDK and epileptic mothers treated during pregnancy with antiepileptic drugs raises the possibility that medications may be a contributing factor (15).

Many concurrent urinary tract abnormalities have been described in patients with MCDK. The most common and potentially significant urologic defect seen is VUR to the contralateral kidney. The largest study, with 143 patients that underwent a VCUG, describes a VUR incidence of 19% to the contralateral kidney and 16% to the MCDK (1). Contralateral VUR was seen in 15% of the children in our series. Other urinary tract abnormalities, such as contralateral UPJ obstruction are often seen in patients with MCDK. In our series, contralateral UPJ obstruction was seen in 15% of the children. According to the literature it has been described in 7–15% of individuals with MCDK (16).

The natural history is unclear and many studies have shown that MCDK tends to involute. Complete involution rates vary from 19–74% over 9 months to 10 years. This involution may be so severe that the affected kidney disappears in subsequent sonograms (1,17). In patients with complete MCDK involution, 92% had compensatory hypertrophy of the contralateral kidney (18). In one long-term, prospective study of 33 children with a MCDK, 24% had compensatory hypertrophy at birth, and 52% demonstrated compensatory hypertrophy in later childhood, with a mean follow-up duration of 4.9 years (19).

Another management question in MCDK disease is frequency of hypertension and has been provided as a reason for nephrectomy of the affected kidney (20,21). Furthermore, case reports have described how MCDK patients with hypertension were cured by nephrectomy of the involved kidney (22). In a study of 887 patients with MCDK, only 6 (0.7%) had hypertension (23). In another series of 20 patients older than 11 years who had MCDK, only 2 had hypertension and the blood pressure was not controlled by nephrectomy in these patients (22).

Of greater concern is the potential for malignant degeneration in a MCDK. Most case reports have been of Wilms tumor, renal cell carcinoma and urothelial carcinomas that developed in a MCDK (25,26). The incidence of Wilms tumor developing in MCDK is greater than fourfold, citing an incidence of 1 in 8000 general population and 1 in 2000 in the MCDK population. This fourfold increase does not make a case for prophylactic nephrectomy (27). In our series there were no patients with malignant degeneration. Flank pain as an adult is another risk of MCDK that is left in situ, and in such cases the pain usually responds to nephrectomy (23). This was the main indication for nephrectomy in our series.

Identification of MCDK in newborns has dramatically increased with the use of fetal ultrasound (28). If MCDK is suspected on prenatal ultrasound, a postnatal ultrasound will confirm the diagnosis and screen for other urinary tract abnormalities (29). Recent improvements regarding the natural history of MCDK, especially with regard to prenatal diagnosis and conservative management, have changed the approach to this anomaly. Until the mid-1980s, the management of MCDK patients often consisted of nephrectomy. Since then, with the improvements in fetal US, such management has been replaced by clinical and sonographic follow-up of the patients. Some studies have shown that conservative management seems to be a safe option; the prevalence of complications is negligible and most of the affected units have partial or complete involution on US. Recently, a comparative study between surgical and conservative treatments has not revealed any significant difference in the frequency of complications for the patients (30).

A conservative approach to children with MCDK has been advocated, but others have suggested surgical removal on the basis of risk of hypertension, mass effect, potential for malignant change, and cost of repeated US examination. According to our experience, the conservative approach is a reliable method for patients who can attend regular follow-up. Nephrectomy can be undertaken if any complication occurs. Children with MCDK therefore need a protocol of initial investigation and regular follow-up, even if the MCDK is removed, to determine the growth and function of the contralateral kidney.

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