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Management of renal fungus balls in premature infants

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Özet

Prematürelerde renal mantar toplarına yaklaşım

Prematürelerin yoğun bakım standartlarındaki artış, pelvikalisiyel mantar toplarının oluşumuna neden olabilen renal kandida enfeksiyonlarının sıklığında da artışa yol açmıştır. Çalışmamızda renal mantar topları nedeniyle izlenen 3 hasta geriye dönük olarak değerlendirilmiştir. Üç olguda da, öykü, ultrason bulguları, idrar ve kan kültürleri ana tanısal kriterler olmuştur. Parenteral amfoterisin B, nefrostomi ile dekompresyon ve ağır parankim hasarında nefrektomi olguların özelliklerine göre tedavi seçenekleri olarak uygulanmıştır.

Anahtar kelimeler: *Renal kandidiyaz, mantar topu*

Summary

The improved intensive care standards for premature infants have increased the incidence of renal candidiasis which may cause pyelocaliceal fungal balls. In this study, a retrospective documentation of 3 patients with renal fungal balls was performed. In all three cases, the history, ultrasound findings, urine and blood cultures were the main diagnostic criteria. Parenteral amphotericin B therapy, nephrostomy decompression and nephrectomy in severe parenchymal destruction were performed as therapeutic modalities according to the presentation.

Key words: *Renal, candidiasis, fungus ball*

Introduction

The superficial skin and mucosal infections of candida are common in the infancy period, but serious candida infections are encountered much less frequently. The improved survival of premature infants, the widespread use of broad-spectrum antibiotics, total parenteral nutrition (TPN) and intravascular catheters have increased the incidence of systemic and renal candidiasis [1,8].

Involvement of the kidney is usually secondary to generalized systemic disease, but on occasion the kidney may be solely affected [9]. Disseminated and renal candidiasis both present a major challenge to the clinician, since neither diagnostic nor therapeutic measures are entirely satisfactory.

Renal candidial infection mostly appears as a formation of mycelia in the collecting tubules and subsequently pyelocaliceal fungal balls (FB), leading to obstruction and hydronephrosis [5]. We report three cases with pyelocaliceal FB.

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Materials and Methods

The records of three patients with renal FB were reviewed retrospectively. Patients were evaluated according to the clinical and laboratory findings, diagnostic imaging studies, clinical management and outcome. Ultrasonographic (USG) examination was the main criterion for diagnosis and follow up.

Results

Case 1: A female baby was born at a gestational age of 34 weeks (2300 g). In the first three days she required mechanical ventilation. TPN and broad-spectrum antibiotic therapy for culture proven sepsis. On the tenth day of life the blood culture yielded Candida albicans (CA) and she was treated with flucanozol for three weeks, and discharged from the hospital. She did well until the last admission. Results of laboratory investigations on admission are outlined in Table I. Persistence of anuric state with

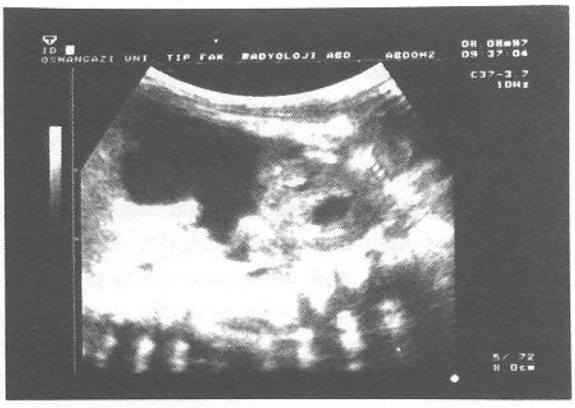

Figure 1. USG appearance of fungal balls in the right kidney (case 1).

increasing levels of serum creatinine and potassium, and signs of cardiac decompensation necessitated peritoneal dialysis.

The results of USG and 99m Tc renal scan (SC) evaluation are shown in Table II. The right kidney was affected more severely than the left, with a large echogenic mass compatible with fungal bezoars (Figure 1). CA was isolated in the cultures of blood and urine. Parenteral amphotericin B, 1 mg/kg/day was started and a nephrostomy tube was placed to the right kidney. CA was also isolated in the urine obtained via the nephrostomy tube and amphotericin B irrigation was initiated.

Follow up USG revealed marked improvement in the left hydronephrosis. However, despite amphotericin B therapy parenterally and via nephrostomy tube; in the right kidney an echodense material in the pelvis formed a cast, obstructed urine flow and dilated the pelvicalyceal system, and necessitated surgical intervention. A right nephrectomy was performed due to multiple cortical abscesses and parenchymal destruction. The excised kidney weighed 95 g and was 95x50x35 mm in size.

Table I. Results of laboratory investigations

Case	WBC count (mm^3)	BUN (mg/dl)	Creatinine (mg/dl)	K^+ (meq/L)	Urinalysis
1	13300	98	6.4	6.5	2+proteinuria and pyuria
2	15100	37	3.1	8.4	4+proteinuria
3	12000	10	0.5	5.2	1+proteinuria

WBC: white blood cell, BUN: blood urea nitrogen, K^+: potassium.

A cross section revealed a chronic inflammatory process with multiple cortical abscesses. The microscopic diagnosis was active chronic pyelonephritis and perinephritis. Antifungal therapy was continued for 2 months and no significant side effect of amphotericin B has been observed. She was discharged from hospital at 7 moths of age. Hematological and biochemical profile, urinalysis and radiological evaluation of the patient did not show any significant change during the follow up period up to 16 months of age.

Case 2: A female baby was born 1620 grams with a gestational age of 32 weeks and referred for hypoactivity and poor feeding to our neonatology department in the first day of life. She received teophylline and nasal CPAP for apnea, exchange transfusion for high bilirubine levels, TPN for 15 days and broad-spectrum antibiotics for Klebsiella sepsis and triflucanazol for two weeks due to CA that was isolated from the abscess material on the foot.

She was discharged from the hospital at 25 days of age and readmitted at 2 months of age. Results of laboratory investigations on admission are outlined in Table I. CA was isolated in the cultures of urine. The results of USG and SC evaluation are shown in Table II. Peritoneal dialysis was started for anuria, hyperkalemia and acidosis, and continued for 4 days. Amphotericin B, 1 mg/kg/day was started and

Table II. Diagnostic imaging studies and therapeutic approach

Case	USG findings	Renal SC findings	Amphotericin B therapy	Nephrostomy	Nephrectomy
1	Bilateral PCD + FB	Bilateral reduction in all functions	11 weeks	Right kidney for 3 weeks	Right
2	Bilateral PCD + FB	Scarring on the left kidney	12 weeks	-	-
3	Left PCD + FB	Reduction in all functions of the left kidney	12 weeks	Left kidney for 2 weeks	-

PCD: pyelocaliceal dilatation, FB:fungal ball

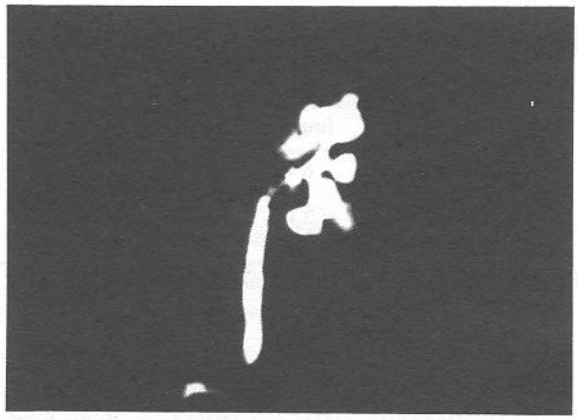

Figure 2. Intrapelvic fungal balls in the antegrade pyelogram of the left kidney (case 3).

continued for three months with USG follow up, and no significant side effects of the treatment has been observed. She was discharged from hospital with normal biochemical values and USG findings at 5 months of age, and did well up to 11 months of age during the follow up.

Case 3: A male baby was born 1470 grams at gestational age of 34 weeks. He received teophylline and nasal CPAP for apnea, TPN and broad-spectrum antibiotic therapy for culture proven sepsis for three weeks, and he was discharged from the hospital at 32 days of age. Results of laboratory investigations on the last admission are outlined in Table I. CA was isolated in the urine culture.

The results of USG and SC evaluation are shown in Table II. A nephrostomy tube was placed to the left kidney and the antegrade pyelogram has demonstrated the intrapelvic FB (Figure 2). CA was also isolated in the urine obtained via the nephrostomy tube and amphotericin B irrigation was initiated.

Parenteral amphotericin B, 1 mg/kg/day was started. Antifungal therapy continued for 3 months with no significant side effects, and he was discharged from hospital at 5 months of age with normal biochemical values and USG findings. Monthly examination of the patient up to 3 months of age has not shown any significant pathological change.

Discussion

Predisposing factors of serious candidial infection include antibiotic therapy (57 %), prematurity (29 %), intravenous or umbilical arterial catheterization (24 %) and parenteral alimentation (18 %) [7]. Renal involvement in systemic candidiasis frequently occurs as a part of multisystem infection. Primary renal candidiasis is another form and mostly follows a less serious clinical picture [8]. Hurley and Winner demonstrated that, large doses of candida given intravenously to mice produced systemic candidiasis, whereas smaller doses caused isolated renal disease [5].

In our cases; prematurity, antibiotic suppression of normal flora, infusion of hyperalimentation fluids were contributing factors. Although antifungal therapy in first two cases was introduced in the neonatal period, these two infants presented with renal candidiasis after months. In the first case, renal involvement associated with candidemia suggested the systemic disease while in the second and third cases, the kidneys were involved as a solitary focus.

Renal candidiasis may show a silent clinical picture or present as acute renal failure, systemic hypertension or flank mass [9]. Anuria may result from a combination of acute pyelonephritis, papillary necrosis and/or obstructing fungal bezoars [6]. In a review of the literature of neonatal renal candidiasis by Pappu et al [9], at least 12 of the 16 reported cases presented with anuria. In our cases 1 and 2, anuria was present and required peritoneal dialysis. Cases of renal failure in young infants caused by obstructing fungal bezoars in the renal pelvis have increased since the first reports in the 1970's [4].

Once in the kidney the fungus theoretically evades host defences, when within the renal tubules where the fungus proliferates, causing cortical and medullary abscesses and papillary necrosis. Breakthrough into or proliferation within the calices and renal pelvis allows mycelial clump development [3].

In case 1, radiological evaluation, following the parenteral administration and nephrostomy irrigation of amphotericin B, did not show any significant improvement in the right kidney comparing to the left one. The right kidney was explored surgically and nephrectomy was performed because of the multiple cortical abscesses and parenchymal destruction.

Examination of the urinary sediment revealing yeasts as well as candida may be an indication for aggressive antifungal therapy. However, despite the severity of renal involvement, only 37 percent of the infants in one study had positive urine culture [7]. This emphasizes the importance of direct renal access for culture in suspected cases. Simplest method of obtaining it is by percutaneous puncture.

Early diagnosis made from the history, the USG appearance and the microscopic finding of mycelium in the urine and appropriate cultures results in increased survival rates. USG has been the most useful imaging modality in the early diagnosis of renal candidiasis. Fungus balls can be identified sonographically as echogenic masses within the renal collecting system without demonstrable acoustic shadowing and, hydronephrosis is a relative late finding [6].

Nuclear medicine studies demonstrate variable decreases in function of the involved kidneys. In our cases, one of the main criteria for decision making in diagnosis, therapy and follow up of renal candidiasis was USG appearance of FB. Renal USG did not only confirm the diagnosis, but also was used for guidance in placing the percutaneous nephrostomy catheter, and for following the progress in resolution of pathology to decide for discontinuation of the therapy, or for surgery to remove the resistant FB.

The treatment of renal candidiasis as outlined by Pappu et al. includes instillation of amphotericin B through nephrostomy catheter directly into the renal pelvis, parenteral and/or oral administration of antifungal drugs, and surgical removal of the obstructing fungal bezoars [9].

The duration of medical treatment is usually six weeks, but no objective data exists regarding the appropriate length of therapy [10]. Continuation of parenteral amphotericin B therapy up to 11 weeks in case 1, and 12 weeks in case 2 and 3 was decided according to the biochemical values, urine cultures, USG and SC.

Nephrostomy decompression and amphotericin B irrigation were performed in cases 1 and 3. The contribution of nephrostomy to the treatment in case 1 was not as good as it was mentioned in the literature [2,10]. It may be due to the delayed diagnosis and the severe renal pelviceal cast formation associated with parenchymal destruction.

Disappearance of CA from the urine, and complete resolution of any filling defect with hydronephrosis are two main criteria that should be met before discontinuation of therapy [9]. Continued surveillance with USG and repeated cultures for several months is also suggested.

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