**Nephroquiz for the Beginner**  
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**Acute renal failure after bacteraemia and endocarditis**

**Case**

A 68-year-old woman, with a history of arterial hypertension, atrial fibrillation, and chronic liver disease due to HCV was hospitalized for bacteraemia and mechanical prosthetic mitral valve endocarditis associated with methicillin-sensitive *Staphylococcus aureus*. She received antimicrobial therapy (cloxacillin, 6 g/day and rifampicin 300 mg/day for 6 weeks; gentamicin, 1 mg/kg/day for 2 weeks).

Subsequently, the patient developed oligoanuric acute renal failure (ARF) (creatinine 4.2 mg/dl; proteinuria < 1 g/day and microscopic haematuria), associated with reduced C3 and C4 plasma levels (C3, 35.5 mg/dl; C4, 15 mg/dl). After 7 days of continuous venovenous haemofiltration therapy and intermittent haemodialysis for an additional 20 days, renal function returned almost to the previous baseline (creatinine 1.3 mg/dl; Ccr 30 ml/min); in addition, plasma C3 and C4 levels were normal (C3, 99.5 mg/dl; C4, 31.5 mg/dl).

Abdominal ultrasound revealed a normal right kidney (12 cm) with good corticomedullar differentiation and no sign of any obstructive process; the left kidney (7–8 cm) showed many cortical scars. Haemocultures were sterile and there were no echocardiographic signs of endocarditis.

After admission, the use of a urinary catheter was necessary for diuresis measurement, and persistent candiduria was noted (urine culture was positive for *Candida albicans*).

After 2 weeks, a rapid rise in serum creatinine (3 mg/dl) together with a fall in diuresis volume, fever, and flank pain were evaluated by unenhanced computerized tomography of the abdomen. Dilatation of the right collecting system and poor visualization of the left kidney were noted. In this setting, a right percutaneous nephrostomy was performed and a purulent fluid was drained. *Candida albicans* and *Candida glabrata* were found in fungal cultures of this renal pelvic urine. An anterograde pyelogram demonstrated a radiolucent filling defect in the right renal pelvis (Figure 1).

**Questions**

What is the nature of this obstructive process?  
Is there any connection with the first episode of acute renal failure?

![Fig. 1. Right antegrade nephrostogram shows dilated renal collecting system and filling defects.](image-url)
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ARF resulting from obstruction in our patient implied unilateral ureteric obstruction with one functioning kidney. Urinalysis revealing urinary fungal infection and the non-opaque filling defect in the renal pelvis led to an initial diagnosis of fungus ball. Renal candidiasis or candiduria with a fungus ball formation is uncommon and is associated with significant morbidity and mortality [1]. In the majority of cases previously reported, Candida albicans has been the causative organism; Candida tropicalis has rarely been identified. In our review of the literature we found no cases of fungus ball due to Candida glabrata [2].

Renal invasion by fungal organisms occurs by two mechanisms: haematogenous dissemination or the ascent of infection from perineal or bladder colonization. Once the collecting system has been invaded, candida species have the ability to proliferate in spite of the acidity, and can form masses of pseudohyphal elements mixed with mucoid debris and sloughed papillary epithelia (fungus ball) [3]. In this case, ascent of the urinary infection, associated to multiple risk conditions facilitated the fungus ball formation. Previous use of antibiotics, central and urinary catheters, chronic debilitating illnesses, previous surgery or trauma (all of them identified in this case), corticosteroid therapy, immunosuppressive drugs, diabetes mellitus, etc. have been reported to predispose patients to urinary fungal infection [4,5].

A percutaneous nephrostomy was performed because of the persistent obstructive process, to identify the nature of the lesion.

This case demonstrates the value of this procedure, which combines diagnostic and therapeutic modalities in the management of a renal pelvis fungus ball. The treatment is based on the continuous irrigation of the upper urinary tract with antifungal agents by nephrostomy catheter (amphotericin B, 5 mg/dl of sterile water), after percutaneous extraction of all or part of the fungal mass. The previous irrigation with amphotericin reduced the possibility of ureteral obstruction by fungal debris. In addition, systemic amphotericin B was administered in this case because of the high risk of candidaemia [6]. Nonetheless, the consequences of this process can be catastrophic, as it was in our patient with one functioning kidney or with underlying chronic renal insufficiency. In this regard we should remember that this woman was admitted because of bacteremia and endocarditis, after which she developed an ARF associated with transient reduced plasma C3 and C4 levels, proteinuria, and haematuria; that is, a possible post-endocarditis acute glomerulonephritis.

Between these two scenarios, prolonged antibiotic therapy for an underlying renal insufficiency could be considered the link to the obstructive ARF.

References

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