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Pyonephrosis in a Non-Functioning Stone-Damaged Kidney: Beyond Renal Preservation

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Abstract **Case Report**

Pyonephrosis is a severe suppurative infection of an obstructed collecting system and represents an advanced form of infected upper urinary tract obstruction. In the setting of chronic stone disease, persistent obstruction, urinary stasis, recurrent infection, and progressive elevation of intrapelvic pressure may lead to irreversible destruction of the renal parenchyma and functional exclusion of the affected kidney. In symptomatic patients with negligible residual renal function, nephrectomy may therefore represent the most relevant definitive treatment. We report the case of a 58-year-old woman with diabetes mellitus and a history of left renal lithiasis who presented with a symptomatic pyonephrotic left kidney. Renal scintigraphy showed a split renal function of 5% on the affected side. Given the persistence of symptoms, the chronic infectious process, and the nearly absent functional value of the kidney, total nephrectomy was performed. The postoperative course was uneventful, with drain removal on postoperative day 1 and discharge on day 2. At 3-month follow-up, the patient remained asymptomatic and overall renal function was preserved. This case illustrates the pathophysiological progression from chronic lithiasic obstruction to pyonephrosis and renal parenchymal destruction, and emphasizes the clinical relevance of nephrectomy when the diseased kidney has become both symptomatic and functionally insignificant.

Keywords: Pyonephrosis; Non-functioning kidney; Nephrolithiasis; Nephrectomy; Diabetes mellitus.

INTRODUCTION

Pyonephrosis is a severe infection of an obstructed collecting system and is most often associated with urinary stone disease [1,2]. When obstruction persists, urinary stasis, increased intrapelvic pressure, and infection progressively damage the renal parenchyma through ischemia, inflammation, fibrosis, and cortical atrophy [1,2]. In advanced cases, the kidney may become chronically infected and functionally excluded.

This situation is particularly concerning in diabetic patients, who are more susceptible to severe urinary tract infections and infectious complications [3]. When pyonephrosis develops in a symptomatic kidney with negligible residual function, nephrectomy may represent the most appropriate definitive treatment. We report the case of a 58-year-old diabetic woman with chronic left stone disease complicated by pyonephrosis and 5% split renal function, in whom nephrectomy was performed.

CASE REPORT

A 58-year-old woman with diabetes mellitus and a history of left renal stone disease was evaluated for persistent symptoms related to a chronically infected left kidney. The clinical, radiological, and functional assessment supported the diagnosis of left pyonephrosis developing on a stone-damaged kidney.

Abdominopelvic computed tomography demonstrated a severely damaged left kidney with marked cortical thinning, distortion of the collecting system, and multiple intrarenal stones. The renal architecture was extensively altered, with replacement of normal parenchyma by dilated cavities containing lithiasic formations, consistent with advanced destructive stone disease complicated by pyonephrosis (figure 1). Renal scintigraphy showed only 5%

differential renal function on the affected side, confirming a practically non-functioning kidney.

Total nephrectomy was therefore indicated as definitive treatment (figure2). The postoperative course was uneventful. The drain was removed on postoperative day 1, and the patient was discharged on postoperative day 2.

At 3-month follow-up, the patient remained clinically well, with no recurrence of infection and satisfactory overall renal function.

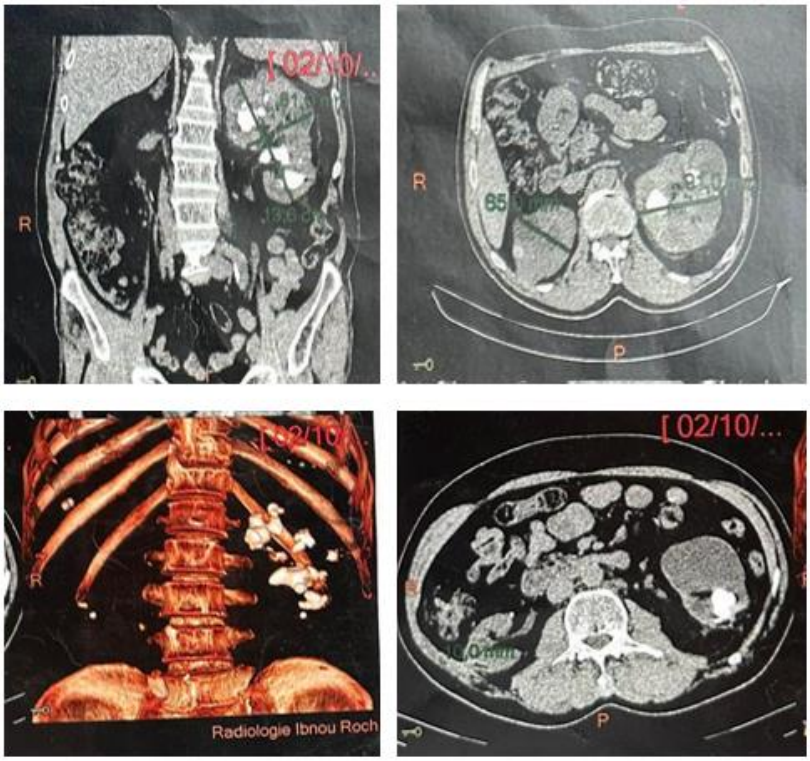

Figure 1: Computed tomography of the abdomen demonstrating a stone-damaged left kidney with severe parenchymal destruction, marked cortical thinning, and multiple intrarenal calculi, suggestive of chronic pyonephrosis in a non-functioning renal unit

Figure 2: Gross specimen showing a severely destructed kidney with marked loss of normal renal architecture and multiple extracted calculi, consistent with advanced stone-related parenchymal destruction

DISCUSSION

Pyonephrosis represents the suppurative transformation of an obstructed collecting system and should be regarded as an advanced infectious complication of urinary tract obstruction rather than a simple upper urinary tract infection [1,2]. In the setting of stone disease, obstruction initiates urinary stasis, which promotes bacterial proliferation and progressive accumulation of infected urine under pressure. This increased intrapelvic pressure is transmitted to the renal parenchyma, leading to compression of the intrarenal microvasculature, impaired perfusion, and ischemic damage [1,2]. At the same time, the persistent inflammatory response contributes to tubular injury, interstitial destruction, fibrosis, and cortical thinning. Over time, the kidney progressively loses both its structural integrity and its functional capacity, eventually becoming a chronically infected and nearly excluded renal unit [1,5].

Stone disease plays a central role in this process because it is not only the cause of obstruction but also a factor maintaining chronic inflammation and recurrent infection [2]. Repeated episodes of obstruction and infection create a self-perpetuating cycle in which urinary drainage worsens, bacterial persistence increases, and the renal parenchyma undergoes irreversible inflammatory and ischemic destruction [1,2,5]. In advanced cases, the radiological and gross pathological appearance may resemble the spectrum of destructive chronic inflammatory nephropathies, including xanthogranulomatous pyelonephritis, which is likewise strongly associated with stones, obstruction, recurrent infection, and diffuse renal destruction [5].

In our patient, computed tomography demonstrated a severely destructed stone-damaged kidney with marked parenchymal loss and intrarenal calculi, while renal scintigraphy showed a split renal function of only 5%. These findings indicate that the affected kidney had already reached the stage of functional exclusion. In such a context, preservation of the renal unit carries little physiological value. On the contrary, a symptomatic pyonephrotic kidney with negligible function remains a source of recurrent infection, persistent pain, inflammatory burden, and potential septic complications [1,2,6]. The rationale for nephrectomy is therefore not merely technical or procedural, but fundamentally pathophysiological: the organ is no longer salvageable and persists primarily as a focus of morbidity.

This interpretation is further reinforced by the diabetic background. Diabetes mellitus is a well-recognized risk factor for urinary tract infection, recurrent infection, and more severe infectious presentations [3,4]. Altered immune defenses, impaired leukocyte function, and the metabolic environment associated with diabetes all contribute to increased bacterial growth and reduced resistance to infection [3,4]. In this setting, maintaining a chronically infected and almost non-functioning kidney may expose the patient to a particularly unfavorable risk-benefit balance. Definitive removal of the diseased kidney is therefore clinically relevant, especially when the contralateral kidney is able to preserve satisfactory global renal function.

The literature supports this approach. Studies on nephrectomy for stone-related non-functioning kidneys emphasize that these rental units are frequently associated with chronic infection and intense inflammatory destruction, and that surgery is often justified when symptoms persist and residual function is minimal [6,7]. In addition, series dealing specifically with pyonephrosis caused by calculi describe the disease as a severe form of infectious hydronephrosis characterized by pyogenic destruction of the renal parenchyma, often with complete or almost complete loss of renal function [1]. Our case is consistent with this pathophysiological evolution: longstanding stone disease led to chronic obstruction, infection, renal destruction, and finally to a symptomatic non-functioning kidney for which nephrectomy constituted the most coherent definitive treatment.

CONCLUSION

Pyonephrosis complicating chronic stone disease represents the endpoint of prolonged obstruction and infection, leading to progressive ischemic and inflammatory destruction of the renal parenchyma. In a symptomatic patient with negligible split renal function, the affected kidney may no longer provide meaningful functional benefit and instead persist as a chronic infectious focus. In such circumstances, nephrectomy is pathophysiologically justified and clinically relevant, particularly in diabetic patients who are more vulnerable to severe urinary infection.

DECLARATION

Ethics approval and consent to participate: Ethical approval is not applicable. The case report does not contain any personal information.

Consent for publication: Written informed consent for publication of the clinical details and images was obtained from the patient.

Declaration of interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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