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Outcome of Bladder Tumors with Obstructive Acute Kidney Injury: A Retrospective Study of 44 Cases

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Abstract **Case Series**

Introduction: Obstructive acute kidney injury (AKI) is a serious complication of bladder tumors, often indicating advanced disease and poor prognosis. ***Methods:*** We conducted a retrospective study in the urology department of Ibn Rochd University Hospital (Casablanca) between January 2021 and December 2023, including 44 patients admitted for obstructive AKI secondary to bladder tumors. ***Results:*** The mean age was 67 years with a strong male predominance (93%). Hematuria (68%), flank pain (59%), and lower urinary tract symptoms (52%) were the most frequent presenting signs. The prevalence of obstructive AKI among patients with bladder tumors was 33%. Management was based on emergency urinary drainage and etiological treatment. ***Conclusion:*** Obstructive AKI is a marker of poor prognosis in bladder cancer. Early and multidisciplinary management improves patient outcomes.

Keywords: Bladder tumor, acute kidney injury, obstruction, hydronephrosis.

INTRODUCTION

Acute kidney injury (AKI) is a potentially severe complication in patients with bladder tumors, most commonly resulting from ureteral obstruction caused by tumor invasion or

Obstructive AKI represents a urological emergency and is often associated with invasive disease and poor prognosis.

Clinical presentation varies and may include flank pain, decreased urine output, hematuria, or metabolic complications of renal failure. Diagnosis relies on clinical, biological, and imaging findings.

Management requires a multidisciplinary approach involving urologists, nephrologists, and intensivists, with urgent decompression of the urinary tract and correction of metabolic disorders.

The aim of this study is to describe the epidemiological, clinical, therapeutic, and outcome characteristics of patients with bladder tumors complicated by obstructive AKI.

RESLULTS

This was a retrospective study conducted in the Urology Department (Wing 5) of Ibn Rochd University Hospital Center in Casablanca, between January 2021 and December 2023, including 44 patients admitted on an emergency basis for acute kidney injury secondary to bladder tumor.

The prevalence of obstructive acute renal failure (OARF) among patients admitted for bladder tumors was 33%.

The mean age of our patients was 67 years, ranging from 30 to 88 years. The 50–80 age group was the most represented (82%). Four patients were younger than 50 years. There was a marked male predominance (93%).

Twenty-seven patients were chronic smokers (61.3%). Bladder stones were observed in 2 patients. Hypertension was the most common medical history (11.3%), followed by ischemic heart disease and stroke.

Regarding urological history, 23 patients had a prior history of resected bladder tumor (TURBT), with some requiring multiple re-resections. Two patients had

previously undergone transurethral resection of the prostate, and only one patient had received intravesical BCG instillation.

Hematuria was the most frequently reported symptom (30 patients). Lower back pain was also a major manifestation (26 patients). Irritative urinary symptoms (dysuria, urgency) were present in 23 patients, while obstructive symptoms were reported in 19 cases. The bladder tumor was incidentally discovered in one case. Oligo-anuria was reported in 3 cases. Pale conjunctivae were found in 27 patients. Lower limb edema was present in 3 patients, and one patient was dehydrated. General examination was normal in 15 patients.

Lumbar fossa tenderness was noted in 25 patients. A pelvic mass was palpable in one patient. On digital rectal examination, 10 patients had infiltration of the bladder base, while findings were normal in the remaining 25 patients.

All patients had elevated urea levels ranging from 0.65 g/L to 4.53 g/L. According to the KDIGO classification, stage 3 predominated (84%, n=37), followed by stage 2 (5 patients) and stage 1 (2 patients), indicating a high prevalence of severe forms of acute kidney injury.

Hyperkalemia was observed in 15 patients (34%), with levels reaching up to 9.3 mmol/L, requiring resuscitation measures and hemodialysis. Complete blood count revealed anemia in 39 patients, thrombocytosis in 16 cases, and leukocytosis in 38 patients.

Urine culture was performed in all patients : it was sterile in 17 cases and showed urinary tract infection in 11 cases. The most frequently isolated organism was Escherichia coli (6 patients). Renal ultrasound was systematically performed and served two main purposes:

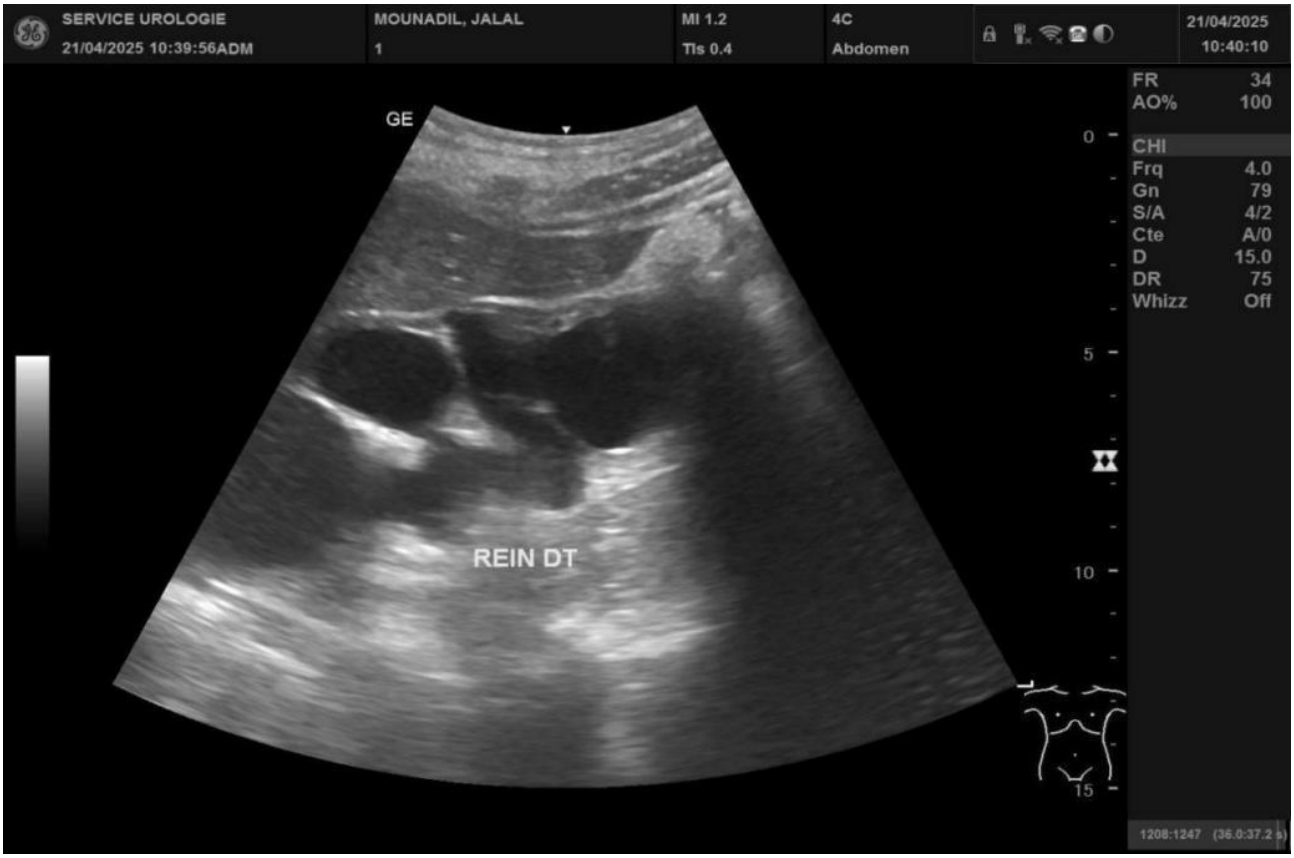

Figure 1: Ultrasound showing a dilated kidney with severe hydronephrosis

Confirming the obstructive nature of acute renal failure by demonstrating ureterohydronephrosis (UHN) in all patients:

- Unilateral in 8 cases
- Bilateral in 36 cases
- Identifying the obstructive cause, either as a tumor mass or bladder wall thickening.

However, ultrasound did not allow precise localization of the tumor on the bladder wall due to oligo-anuria.

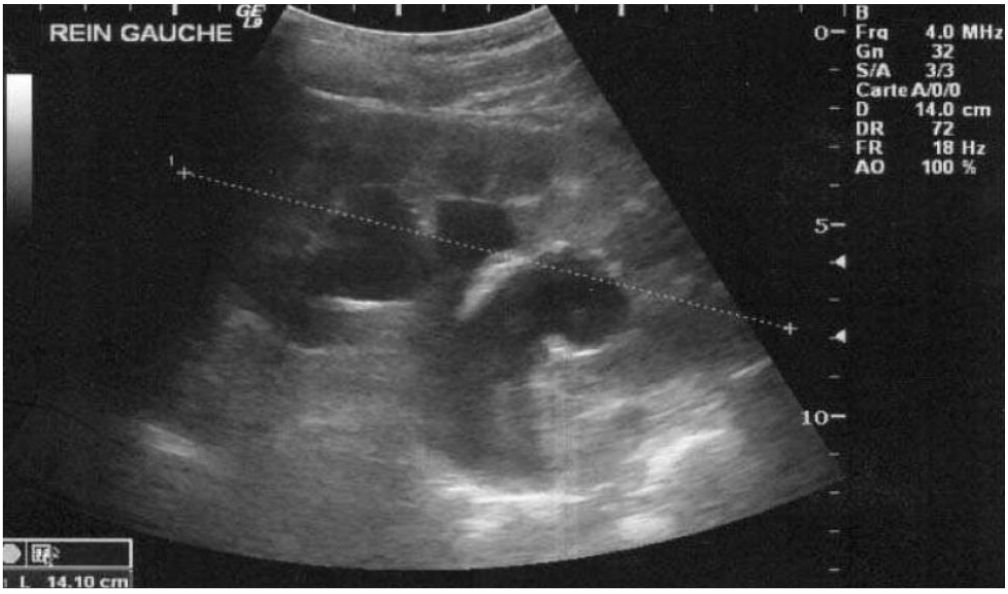

Figure 2: Ultrasound showing dilation of the renal collecting system

Figure 3: Échographie montrant une masse vésicale évoquant une tumeur de vessie

Cystoscopy was performed in all patients and showed involvement of the ureteral orifices in all cases. Multiple tumors were found in 27 patients (84.3%), while 5 patients had a single but large tumor (15.6%). The most frequent locations were the lateral walls, posterior wall, and trigone. Tumor size was not specified due to its large volume.

Histopathological analysis was available for 22 patients. Among them, 21 had urothelial carcinoma, including 14 cases staged as pT2 and 7 as pT1 (within biopsy limits). All tumors were high grade. One patient had adenocarcinoma. These findings highlight the high prevalence of high-grade urothelial carcinoma, predominantly diagnosed at pT1 and pT2 stages.

Thoraco-abdomino-pelvic CT scan (CT-TAP) was performed in 17 patients. It allowed visualization of the tumor, assessment of upper urinary tract involvement in all cases, and staging of the disease. It also identified 2 cases of urinary stones (one renal, one bladder) and one renal cyst.

Emergency treatment focused on relieving the urinary obstruction to restore renal function, including percutaneous nephrostomy or placement of a double-J ureteral stent. Management also included correction of

complications such as hyperkalemia and metabolic acidosis, adequate hydration, and temporary dialysis when necessary.

Metabolic disturbances were corrected, and prevention of post-obstructive diuresis syndrome was ensured through intravenous and oral rehydration.

All patients with hyperkalemia received appropriate potassium-lowering measures. Seven patients (16%) required renal replacement therapy due to potassium levels above 6.5 mEq/L or ECG/clinical abnormalities.

Blood transfusion was required in 10 patients due to anemia.

Urinary drainage was achieved in 39 patients via unilateral or bilateral percutaneous nephrostomy, associated with bladder catheterization in 4 cases. Three patients underwent double-J stent placement, while two refused urinary diversion.

No early hemorrhagic or infectious complications were observed. Late complications mainly included accidental nephrostomy tube dislodgement in 4 patients, requiring replacement at varying intervals (16 days, 2 months, 4 months, and 6 months).

Etiological treatment consisted of transurethral resection of the bladder tumor (TURBT), which is the key diagnostic and initial therapeutic procedure. It was performed under sterile conditions, outside hematuria episodes, and after ensuring normal hemostasis. A systematic endoscopic exploration was conducted, allowing assessment of tumor characteristics (appearance, number, location, and size).

Complete endoscopic resection was achieved in 18 patients and was incomplete in 8 cases.

After improvement or normalization of renal function, etiological treatment was initiated following multidisciplinary discussion.

Cystectomy was indicated in 3 patients but was refused by two (one initially and one after chemotherapy, who subsequently received concurrent radiotherapy). One patient underwent palliative cystoprostatectomy with bilateral cutaneous ureterostomy.

Three patients received concurrent chemoradiotherapy as an alternative to cystectomy. Neoadjuvant chemotherapy was indicated in 2 patients, while 4 patients (9.1%) refused any treatment.

Outcome was favorable in 12 patients (27%) following nephrostomy. However, long-term renal function data were not available. Persistent renal insufficiency was observed in 32 patients (73%).

Follow-up was available for 10 patients. Therapeutic decisions varied depending on tumor stage, general condition, and patient preferences.

Among all patients, 26 underwent TURBT, complete in 18 cases.

Other treatments included:

- One patient underwent cystoprostatectomy with cutaneous ureterostomy and lymph node dissection, followed by postoperative radiotherapy.
- One patient refused cystectomy.
- One patient received initial chemotherapy but refused planned cystectomy and underwent concurrent radiotherapy.
- One patient received gemcitabine-cisplatin chemotherapy followed by palliative care.
- One patient received neoadjuvant MVAC chemotherapy but was lost to follow-up.
- One patient died before initiation of planned palliative chemotherapy.
- Four patients received exclusively palliative care (two with chemotherapy, two with supportive care only).
- Three patients died: one from cardiac arrest, and two during disease progression without curative treatment.

DISCUSSION

Obstructive acute kidney injury (AKI) refers to renal failure resulting from an acute obstruction of the urinary tract above the bladder, occurring either bilaterally or in a solitary functional or anatomical kidney. This type of AKI is classified as “postrenal” because its cause is located downstream from the kidneys.

It accounts for approximately 2 to 10% of all causes of AKI. Its diagnosis requires urgent medical and surgical management. Early relief of the obstruction is crucial, as it determines the reversibility of renal impairment [1].

Bladder cancer is a common disease, predominantly affecting men and typically occurring after the age of 60. It is mainly represented by urothelial carcinoma.

Urothelial tumors can be multifocal and may involve the upper urinary tract, the bladder, or the urethra. These tumors are strongly associated with exposure to urothelial carcinogens, particularly tobacco, and cessation of exposure is essential. Urothelial evaluation and follow-up rely on urinary cytology, urethrocystoscopy, and CT urography [2].

The management of bladder tumors depends on the presence or absence of muscle invasion, as determined by histological analysis of specimens

obtained during transurethral resection of the bladder tumor (TURBT).

Bladder cancer affects approximately 2.7 million people worldwide each year. Its incidence is increasing by about 1% annually, with a higher growth rate observed in women compared to men [3].

Diagnosis is almost always based on clinical presentation, while incidental discovery through imaging (ultrasound, CT scan, or MRI) is rare [4].

Two main symptoms are suggestive:

- Macroscopic hematuria, the most frequent presenting sign (about 80%)
- Irritative urinary symptoms (frequency, urgency, dysuria), less common (about 20%)

Diagnostic Tools

Suprapubic bladder ultrasound [5] This examination can reveal intraluminal vegetations, specifying their location, size, and number. It also assesses tumor extension beyond the bladder wall, the impact on the upper urinary tract, and adjacent or abdominal lesions. It is performed with a full bladder and is highly effective in detecting exophytic tumor growths.

Urinary cytology [5] This test is based on the analysis of cancer cells spontaneously shed in urine and stained using the Papanicolaou technique. It is highly specific and particularly sensitive in high-grade carcinoma and carcinoma in situ (CIS).

Cystoscopy [5] Cystoscopy is the gold standard examination, allowing direct visualization of the tumor and enabling biopsies of suspicious lesions. It is performed after confirming sterile urine (urine culture). It provides information about the number, size, location (especially relative to the prostatic urethra and ureteral orifices), and appearance (papillary or solid) of the tumor, as well as the condition of the bladder mucosa.

Histopathological examination [5] This is the key diagnostic tool for confirming bladder cancer. It provides information about the histological type and nature of the tumor.

Bladder tumors are classified as :

Non–muscle-invasive bladder cancer (NMIBC)
Muscle-invasive bladder cancer (MIBC)

Non–Muscle-Invasive Bladder Tumors (NMIBC)

These are superficial tumors (pTa, pTis, or pT1) arising from the bladder mucosa. They represent 75–85% of bladder tumors and are limited to the urothelium without muscle involvement.

Approximately:

70% are pTa
20% are pT1
10% are carcinoma in situ (pTis)

They have a high recurrence rate (>50%) but progress to muscle-invasive disease (≥ pT2) in less than 20% of cases[6].

Staging Workup

NMIBC: No extensive staging is required for the bladder tumor itself. However, CT urography is recommended to detect synchronous tumors in the upper urinary tract [4].

MIBC: A thoraco-abdomino-pelvic CT scan with contrast, including delayed excretory phase imaging, is essential for staging [4].

In our study, obstructive acute kidney injury (AKI) was particularly frequent in elderly patients, reflecting the high incidence of bladder cancer in this age group [8].

The mean age of patients in our study was 67 years, which is very similar to that reported by Ghanbouri [7] (66 years). However, it is significantly higher than that observed in an Egyptian series of 61 patients, where the mean age was only 41 years [9].

Our findings are also comparable to those reported by Es-Salmy [10], who studied 100 patients at the Hassan II University Hospital in Fez with a mean age of 56 years, and by Abbar [11], where the mean age was 57 ± 8 years.

Another series of 28 patients conducted at Ibn Rochd University Hospital in Casablanca by Benghanem [14] reported a mean age of 51.9 ± 17 years.

In Western series, the peak incidence is typically observed in the seventh decade of life, reflecting an older population [12,13].

Most authors report a strong male predominance [15,16], which is consistent with our findings.

The two main well-established risk factors in bladder carcinogenesis are tobacco use and exposure to industrial carcinogens.

In our study, hematuria was present in 30 patients (68%). It was isolated in 15 cases (34%) and associated with flank pain in 14 patients (32%).

The frequency of isolated hematuria was 9.52% in the series by Rakototiana [18], 20% in Abbar's series [11], and 30% in Ghanbouri's series [7].

The clinical presentation of obstructive AKI varies depending on patient characteristics, the site of obstruction, the speed of onset, and whether the obstruction is complete or partial [1].

Pain, typically presenting as flank pain or renal colic, may be unilateral or bilateral. It results from acute

distension of the urinary tract upstream of the obstruction, regardless of its cause [17].

Oligo-anuria is defined as a complete cessation of urine output or a urine volume of less than 200–400 mL per 24 hours [6].

In our study, oligo-anuria was observed in 7% of cases, following flank pain, hematuria, and urinary symptoms in frequency.

This finding differs from other series [11,14,18], where oligo-anuria was the leading presenting complaint.

Biological Findings

Obstructive AKI is a pathological condition characterized by a reduction in glomerular filtration rate, leading to retention of endogenous metabolites such as urea, creatinine, potassium, and phosphates, which are normally excreted by the kidneys [38].

In our study, the mean serum creatinine level was 80.5 mg/L, compared to 88 mg/L in the Es-Salmy series [10], 85.14 mg/L in Ghanbouri's series [7], and 77.4 mg/L in Abbar's series [11].

The mean urea level in our study was 1.83 g/L, which is higher than that reported in Ghanbouri's series (1.6 g/L), Es-Salmy's series (0.76 g/L), and Abbar's series (0.83 g/L).

Hyperkalemia was observed in 15 patients (34%), with values reaching up to 9.3 mmol/L. This result is comparable to that reported by Ghanbouri (30%) [7], but higher than that found in Abbar's series (15%) [11].

Imaging Findings

Imaging plays a key role in obstructive AKI by confirming its obstructive origin, ruling out other causes of AKI, identifying the underlying tumor, and detecting potential complications [19-21].

In our study, ultrasound was used as the first-line imaging modality, as was the case in the studies by Abbar [11] and Ghanbouri [7].

Ultrasound confirmed the obstructive nature of AKI in all patients by demonstrating dilation of the urinary tract. Similar findings were reported in the series by Abbar [11], Rakototiana [18], and Ghanbouri [7].

Computed tomography (CT) does not play a primary role in the emergency diagnosis of obstructive AKI.

Once the diagnosis of obstructive AKI is established, the priority is to relieve the obstruction, which is the only treatment capable of rapidly and sustainably correcting the clinical and biological abnormalities associated with renal failure [1].

Different techniques of urinary diversion can be used, either internal or external, depending on the anatomical location of the obstruction. These include simple ureteral catheters, mono-J or double-J stents, and external diversion such as percutaneous nephrostomy.

Percutaneous nephrostomy allows drainage of urine directly from the kidney when an obstruction affects the upper urinary tract [22].

In our series, percutaneous nephrostomy was the preferred method for urinary drainage in 89% of patients, mainly due to its availability. This rate is significantly higher than those reported by Rakototiana (9.5%), Abbar (35%), and Es-Salmy (44%), and slightly lower than that reported by Ghanbouri (100%), while still remaining high overall.

A double-J ureteral stent (also known as a ureteral endoprosthesis) is a 2–3 mm diameter tube inserted into the ureter from the bladder. Its curled ends ensure fixation between the kidney and the bladder, allowing continuous urine drainage. It is referred to as "double-J" due to the shape of its two curved ends [23].

In our study, only 3 patients (7%) underwent urinary drainage using a double-J stent. This contrasts with other series, where its main indication was lithiasis, such as in Es-Salmy's study, which reported 46 cases (46%) [10].

In Abbar's series [11], 65% of patients underwent drainage using a double-J stent, whereas in Rakototiana's series [18], this technique was rarely used (4.76% of cases).

Regardless of the type of urinary diversion, careful patient monitoring is essential to prevent complications.

The standard treatment for muscle-invasive bladder cancer (MIBC) at stage cT2–T4a N0 M0 is radical cystectomy, ideally preceded by cisplatin-based neoadjuvant chemotherapy when feasible.

A more conservative approach, combining transurethral resection of the bladder tumor (TURBT), radiotherapy, and concurrent chemotherapy, may be considered in carefully selected patients who are eligible for such a protocol [25].

In our series, cystoprostatectomy was performed in only one patient, with bilateral cutaneous ureterostomy and lymph node dissection. This rate is significantly lower than that reported by Kbirou [24], who documented 22 cystoprostatectomies (21% of cases) in a retrospective study conducted between 2017 and 2019 on 106 patients with obstructive AKI secondary to bladder tumors.

Regarding outcomes, in our study, 12 patients (27%) recovered normal renal function after initial

management, whereas 32 patients (73%) showed improvement without full normalization. However, long-term renal outcomes were not available.

In Es-Salmy's series [10], 40% of patients recovered normal renal function after initial management, while the remaining patients showed partial improvement, with no available long-term follow-up data.

In other studies, the rate of renal function recovery was lower in neoplastic conditions, with reported rates of 50% in Abbar's study [11] and 37% in Benghanem's study [14].

CONCLUSION

Obstructive acute kidney injury is a serious complication of bladder tumors, often reflecting advanced disease and associated with significant morbidity. It mainly affects elderly male patients with well-established risk factors, particularly smoking.

Early diagnosis remains challenging, as clinical presentation is often nonspecific, although hematuria remains the most common warning sign. Imaging, particularly ultrasound, plays a key role in confirming the obstructive origin of renal failure and assessing urinary tract dilation.

Urgent urinary decompression is the cornerstone of management, with percutaneous nephrostomy representing the most frequently used drainage technique in our series due to its availability and effectiveness. Definitive treatment depends on tumor staging and patient condition.

Renal function recovery after decompression remains variable. In our study, only 27% of patients achieved complete normalization of renal function, while the majority showed only partial improvement, highlighting the severity of renal impairment at presentation and the importance of early intervention.

Obstructive acute kidney injury secondary to bladder tumors therefore remains both a diagnostic and therapeutic emergency requiring rapid multidisciplinary management to improve renal and oncological outcomes. Further prospective studies with long-term follow-up are needed to better assess functional and survival outcomes in this population.

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