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Outcomes of nephrostomy and double J stent in malignant ureteral obstruction in the Palestinian practice

Elisa Ghannam[1], Helen Musleh[1], Tamara Ahmad[1], Mahmoud Mustafa[1,2*], Razan Odeh[1,2] and Ramzi Shawahna[3,4*]

Abstract

Background Malignant ureteral obstruction (MUO) is a serious health condition in which a malignant tumor compresses the ureter. The optimal decompressive intervention in MUO remains unclear. This study was conducted to assess and compare renal function, the occurrence of ureterohydronephrosis (UHN), intraoperative, and postoperative complications among patients with MUO who underwent double J stenting (DJS) and percutaneous nephrostomy (PCN) in the Palestinian practice.

Methods This study was conducted in retrospective design in one of the main tertiary care hospitals in the West Bank of Palestine. The data were collected from the electronic health information system of the hospital for the patients with MUO who received either DJS or PCN as a decompressive intervention from January 2018 to January 2024.

Results In this retrospective analysis, 62 patients who had stage 2 to stage 4 cancer and suffered MUO were included. The mean age of the patients was 60.8 ± 13.6 years. Of the patients, 40 (64.5%) were male and 22 (35.5%) were female. Of the patients, 26 (41.9%) had urinary bladder cancer. Of the patients, 23 (37.1%) had flank pain and 16 (25.8%) had lower urinary tract symptoms. Of the patients, 34 (54.8%) experienced bilateral UHN and 28 (45.2%) experienced unilateral UHN. In this study, 43 patients (69.4%) received PCN, and 19 (30.6%) received DJS as a decompressive intervention. Of the patients, 36 (58.1%) suffered postoperative complications. Stent migration/slip, UTIs, and urosepsis were the most commonly reported postoperative complications. There were no statistically significant differences in the occurrence of intraoperative complications, postoperative complications, time elapsed from receiving the decompression intervention to the diagnosis of complications, ICU admission, prognosis of UHN, serum creatinine, and serum BUN between both decompressive interventions.

Conclusion Despite improvements in renal functions, creatinine and BUN levels remained abnormal even after receiving a decompressive intervention. Postoperative complications were frequently reported among patients who received DJS or PCN as decompressive interventions. Larger prospective studies are still needed to determine the optimal interventions to improve outcomes, quality of life, and survival rates of patients with DJS or PCN.

*Correspondence:
Mahmoud Mustafa
dr_mahmoud681@yahoo.com
Ramzi Shawahna
ramzi_shawahna@hotmail.com; ramzi.shawahna@najah.edu

Full list of author information is available at the end of the article

Keywords JJ stenting, Malignant ureteral obstruction, Oncology, Percutaneous nephrostomy, Ureterohydronephrosis, Urology

Background

Malignant ureteral obstruction (MUO) is a serious health condition in which a malignant tumor compresses the ureter [1]. MUO can be caused by malignancy in the urothelium of the ureter or metastasis from other pelvic malignancies. Moreover, compression can be caused by retroperitoneal/pelvic lymphadenopathy or retroperitoneal fibrosis induced by either surgery, chemotherapy, radiotherapy, or a combination of these treatment modalities [2–4]. Patients with MUO often spend a prolonged time in the hospital and have a median survival period between 3 and 7 months following diagnosis [3]. Management of MUO is challenging and unclear [2, 3].

Patients with MUO often present with flank pain, hematuria, dysuria, oliguria, anuria, acute renal insufficiency, and/or urosepsis [5]. As the spectrum of clinical presentation may vary by the nature and duration of obstruction, MUO may manifest asymptomatically and may only be detected incidentally through imaging procedures conducted during staging or follow-up assessment of the patients [6–8].

For patients with MUO, decompression is necessary to minimize obstructive symptoms by ensuring proper drainage of the upper urinary tract while preserving renal function [9]. In addition, decompression facilitates the commencement of systemic therapy while reducing the need for additional urological interventions, and hospitalizations, improves quality of life, and prolongs the life expectancy of the patients even in advanced stages of the disease [8, 10, 11]. Decompression can be achieved retrogradely by JJ stenting (DJS) or antegradely by inserting a percutaneous nephrostomy (PCN) [3].

In clinical practice, decisions on the appropriate decompression and management approach for patients with MUO are often made using multidisciplinary approaches with the involvement of oncologists, urologists, palliative care physicians, interventional radiologists, patients, and their families. Decisions on the optimal decompression and management interventions are often made after considering the etiology of MUO, prognosis, health status, and quality of life of the individual patient [2, 7, 10–15]. Studies have documented a considerable ineffectiveness of DJS when encountering extrinsic obstruction, resulting in high failure rates. On the other hand, PCN serves as an initial decompressive intervention or in instances of DJS procedure failure. Nevertheless, PCN is characterized by increased invasiveness and carries a higher risk of accidental tube displacement, potentially compromising the patient's quality of life. Furthermore, patient acceptance of PCN may be limited due to the requirement for an external collecting device [16].

So far, there is no specific decompressive intervention proven to be superior to other interventions in the management of patients with MUO in the Palestinian practice. In addition, little is known about the outcomes of PCN and DJS used as decompressive interventions for patients with MUO in the Palestinian practice. Moreover, renal function, occurrence of complications, and survival of patients with MUO who underwent DJS and PCN in the Palestinian practice were not compared before. Therefore, this study was conducted to assess and compare renal function, occurrence of ureterohydronephrosis (UHN), intraoperative, and postoperative complications among patients with MUO who underwent DJS and PCN in the Palestinian practice.

The findings of this study might help urologists to make decisions on the most effective decompressive interventions for patients with MUO that would improve renal functions, minimize the occurrence of complications, and quality of life and life expectancy of the patients. Moreover, the findings of this study might also help oncologists to make decisions on the most effective treatment approach as most of the chemotherapeutic agents are excreted by the renal system [2].

Methods

Study design and setting

This study was conducted in retrospective design to assess and compare the outcomes of DJS and PCN as decompressive interventions in MUO. The study was conducted in one of the main tertiary care hospitals in the West Bank of Palestine. The data were collected from the electronic health information system of the hospital for the patients with MUO who received either DJS or PCN as a decompressive intervention in the period between January 2018 to January 2024.

Study population, inclusion, and exclusion criteria

The study population was all patients with MUO who underwent either DJS or PCN as a decompressive intervention at the study hospital. The diagnosis was confirmed either by a computerized tomography (CT) scan or histopathology reports.

All patients with malignancy (colon, osteosarcoma, uterine, breast, ovarian, prostate, urinary bladder, or lymphoma malignancy) and diagnosed with MUO as confirmed by computerized tomography (CT) scan, ultrasound (US), and/or histopathology reports were screened for inclusion.

Patients with an iatrogenic ureteral injury, a ureteral obstruction due to benign disease (e.g., ureteral stones), submitted to urinary diversion for a non-obstructive cause (e.g., fistula, congenital), had comorbidities that prevented intervention such as sepsis or any bleeding tendency, those who rejected operative treatment options, and those who had missing data were excluded.

Decompressive interventions

In DJS, a flexible stent is placed within the ureter to alleviate obstruction and facilitate urine flow from the kidney to the bladder [4, 13]. The technique often involves a cystoscopic insertion, where a guidewire is navigated through the urethra into the bladder and then up into the ureter [17]. The stent is advanced over the guidewire, ensuring proper placement in the renal pelvis and bladder, all while the patient is under general anesthesia and in the lithotomy position. In some patients, fluoroscopic-guided stenting was used instead of cystoscopy. This technique uses real-time X-ray guidance to position the DJS accurately within the ureter. After placing a guidewire through the urethra into the bladder, the stent is advanced over the guidewire under fluoroscopic visualization to confirm proper positioning. In case ultrasound placement is unsuccessful, the patients undergo PCN via ultrasound-guided puncture with an 18-fr needle, followed by the insertion of a guidewire [18, 19]. A catheter is then placed directly into the renal pelvis through the skin. When the PCN was the primary decompressive intervention, it was performed under local anesthesia and the placement was confirmed by a final pyelography using iodine contrast medium.

Data collection and study variables

The data were collected using a data collection form that was developed for this study. The data collection form collected categorical and continuous variables of the patients from the electronic health information system of the study hospital. The categorical variables were gender, cancer type, presence of other comorbidities, management of cancer, side of UHN, anatomical laterality, ureteral intraluminal lesion, type of decompressive intervention, type of anesthesia, radiological guidance, intraoperative and postoperative complication, need for intensive care unit (ICU), cancer stage, degree of UHN, level of ureteral obstruction, UHN prognosis, serum creatinine prognosis, and serum blood urea nitrogen (BUN) prognosis. The continuous variables included age, time from diagnosis with cancer to occurrence of UHN, time from diagnosis of UHN to receiving surgical management, preoperative serum creatinine level, preoperative BUN level, postoperative serum creatinine level, postoperative BUN level, duration of interventional procedure, and duration of interventional procedure patency. The duration of the interventional procedure referred to the time from when the patient entered the operating room until they left the recovery room and the duration of interventional procedure patency referred to the length of time a decompressive intervention remained effective or functional.

The dependent variable in this study was the type of decompressive intervention used (DJS or PCN). It was hypothesized that the choice of intervention would significantly influence the different independent variables, including the occurrence of intraoperative and postoperative complications, the necessity for ICU admission, duration of interventional procedure, duration of interventional procedure patency, UHN prognosis, and renal function prognosis, and serum creatinine and BUN prognosis.

Statistical analysis

Statistical Package for the Social Sciences version 21 (SPSS-21) was utilized for data entry and analysis. Descriptive statistics like frequencies (n) and percentages (%) were calculated. The continuous data were expressed as mean ± standard deviation (SD) and median with the interquartile range (IQR). The distributions of the variables of the patients who received either DJS or PCN were compared using Chi-square or Fisher's exact tests, as appropriate. Continuous variables were compared using the Mann-Whitney U test. A p-value < 0.05 indicated statistical significance.

Ethical consideration and confidentiality

This study was conducted in adherence to the international and local ethical principles including those in the Declaration of Helsinki. Our study was reviewed and approved by the Institutional Review Board (IRB) of An-Najah National University (reference: Med. Oct.2023/60). Because no direct contact was made with the patients, the IRB of An-Najah National University waived the need to obtain written informed consent from the patients. To safeguard patient privacy, a sophisticated code system was employed to anonymize patients, prioritizing privacy and confidentiality throughout the data collection process.

Results

Demographic and health characteristics of the patients

In this retrospective analysis, 62 patients who had stage 2 to stage 4 cancer and suffered MUO were included. The mean age of the patients was 60.8 ± 13.6 years (the median was 62.5 [IQR = 53.8, 69.0] years). Of the patients, 40 (64.5%) were male and 22 (35.5%) were female. Of the patients, 26 (41.9%) had urinary bladder cancer, 8 (12.9%) had uterine cancer, and 5 (8.1%) had prostate cancer. Of the patients, 14 (22.6%) received medical and 11 (17.7%)

Table 1 Demographic and health characteristics of the patients

	Procedure			
	DJS	PCN	Total	
Variable	**n (%)**	**n (%)**	**N (%)**	**p-value**
Age (years)				
< 60	11 (17.7)	15 (24.2)	26 (41.9)	0.104
≥ 60	8 (12.9)	28 (45.2)	36 (58.1)	
Sex				
Female	11 (17.7)	11 (17.7)	22 (35.5)	**0.021**
Male	8 (12.9)	32 (51.6)	40 (64.5)	
Cancer type				
Urinary bladder cancer	4 (6.5)	22 (35.5)	26 (41.9)	**0.015**
Colon cancer	7 (11.3)	10 (16.1)	17 (27.4)	
Uterine cancer	4 (6.5)	4 (6.5)	8 (12.9)	
Prostate cancer	0 (0.0)	5 (8.1)	5 (8.1)	
Breast cancer	1 (1.6)	1 (1.6)	2 (3.2)	
Lymphoma	2 (3.2)	0 (0.0)	2 (3.2)	
Osteosarcoma	0 (0.0)	1 (1.6)	1 (1.6)	
Ovarian cancer	1 (1.6)	0 (0.0)	1 (1.6)	
Cancer stage				
2	2 (3.2)	7 (11.3)	9 (14.5)	**0.026**
3	1 (1.6)	13 (21.0)	14 (22.6)	
4	15 (24.2)	19 (30.6)	34 (54.8)	
Management of cancer				
Surgical	1 (1.6)	10 (16.1)	11 (17.7)	0.125
Medical	3 (4.8)	11 (17.7)	14 (22.6)	
Presence of other comorbidities				
No	6 (9.7)	17 (27.4)	23 (37.1)	0.550
Yes	13 (21.0)	26 (41.9)	39 (62.9)	

Table 2 The detailed presenting symptoms of the patients with MUO

Symptoms	***n* (%)***
Urinary tract	
Lower urinary tract symptoms	16 (25.8)
Hematuria	6 (9.7)
Urinary tract infection	4 (6.5)
Acute kidney injury	2 (3.2)
Abdominal and pelvic	
Flank pain	23 (37.1)
Abdominal pain	12 (19.4)
Vomiting	4 (6.5)
Swelling	2 (3.2)
Iliac fossa pain	1 (1.6)
Others	
General weakness	2 (3.2)
Sepsis	1 (1.6)

*Each symptom was presented independently. Considering that some patients presented with multiple complaints, this resulted in a cumulative percentage that exceeded 100%

received surgical management of cancer. Details of the cancer management approaches are shown in Supplementary Table S1. More than half (62.9%) of the patients included in this analysis had other comorbid health conditions. Details of the comorbid conditions are shown in Supplementary Table S2. The detailed demographic and health characteristics of the patients are shown in Table 1. The patients who received either DJS or PCN did not significantly differ in terms of age, cancer management approach, and presence of other comorbid health conditions. On the other hand, male patients were more likely to receive PCN compared to female patients. Furthermore, the patients who had urinary bladder cancer, colon cancer, and prostate cancer were more likely to receive PCN compared to the patients who had other types of cancer. In addition, the cancer stage also affected the choice of the decompressive method.

Presenting symptoms in patients with malignant ureteral obstruction (MUO)

Table 2 shows the spectrum of the presenting symptoms among the patients with MUO at the time of diagnosis. Of the patients, 23 (37.1%) had flank pain, 16 (25.8%) had lower urinary tract symptoms, 12 (19.4%) had abdominal pain, and 6 (9.7%) had hematuria.

Occurrence of ureterohydronephrosis (UHN)

Of the patients, 34 (54.8%) experienced bilateral UHN and 28 (45.2%) experienced unilateral UHN. The majority of the patients 36 (58.1%) had severe UHN and the remaining 26 (41.9%) had moderate UHN. None of the patients experienced mild UHN. Of the patients, 47 (75.8%), 8 (12.9%) and 7 (11.3%) had lower, middle and upper ureteral obstruction, respectively. The type of decompressive intervention was significantly associated with the anatomical laterality, degree, and level of UHN. In this study, the patients who had bilateral and severe UHN and those who had lower MUO were more likely to receive PCN. On the other hand, there was no statistically significant association between the type of decompressive intervention with the presence or absence of ureteral intraluminal lesions and the time elapsed since diagnosis with cancer to the occurrence of UHN. These details are shown in Table 3.

Decompressive interventions

In this study, 43 patients (69.4%) received PCN, and 19 (30.6%) received DJS as a decompressive intervention. Of all patients, 44 (71%) received a decompressive intervention within 7 days of UHN diagnosis. There were no statistically significant differences in the time elapsed from the diagnosis of UHN to receiving the decompressive intervention, duration of the decompressive interventional procedure, and time to first procedure patency. The median duration of the interventional procedure for DJS was 42.5 [30.0, 50.0] min, and for PCN was 40.0 [27.5, 52.5] min. The median duration of the decompressive intervention patency for DJS was 75.0 [14.0, 157.0]

Table 3 Occurrence of UHN

	Procedure			
	DJS	PCN	Total	
Variable	***n* (%)**	***n* (%)**	***N* (%)**	***p*-value**
Anatomical laterality of UHN				
Bilateral UHN	5 (8.1%)	29 (46.8%)	34 (54.8%)	**0.005**
Unilateral UHN	14 (22.6%)	14 (22.6%)	28 (45.2%)	
Degree of UHN				
Moderate	12 (19.4%)	14 (22.6%)	26 (41.9%)	**0.030**
Severe	7 (11.3%)	29 (46.8%)	36 (58.1%)	
Level of ureteral obstruction				
Lower	9 (14.5%)	38 (61.3%)	47(75.8%)	**0.002**
Middle	5 (8.1%)	3 (4.8%)	8 (12.9%)	
Upper	5 (8.1%)	2 (3.2%)	7 (11.3%)	
Ureteral intraluminal lesion				
Absent	16 (25.8%)	33 (53.2%)	49 (79.0%)	0.737
Present	3 (4.8%)	10 (16.1%)	13 (21.0%)	
Time from diagnosis with cancer to occurrence of UHN (years)				
< 1	9 (14.5%)	25 (40.3%)	34 (54.8%)	0.581
≥ 1	10 (16.1%)	18 (29.0%)	28 (45.2%)	

Table 4 Decompressive interventions

	Procedure			
	DJS	PCN	Total	
Variable	***n* (%)**	***n* (%)**	***n* (%)**	***p*-value**
Time from diagnosis of UHN to receiving the decompressive intervention (days)				
< 7	14 (22.6)	30 (48.4)	44 (71.0)	0.943
≥ 7	5 (8.1)	13 (21.0)	18 (29.0)	
Type of anesthesia				
General	12 (19.4)	2 (3.2)	14 (22.6)	**< 0.001**
Local	6 (9.7)	41 (66.1)	47 (75.8)	
Guidance technique				
Cystoscopy	12 (19.4)	1 (1.6)	13 (21.0)	**< 0.001**
Fluoroscopy	6 (9.7)	0 (0.0)	6 (9.7)	
Ultrasound-guided	0 (0.0)	41 (66.1)	41 (66.1)	
CT-guided	0 (0.0)	1 (1.6)	1 (1.6)	
Duration of interventional procedure (min)*				
< 40	7 (11.3)	24 (38.7)	31 (50.0)	0.326
≥ 40	12 (19.4)	19.4 (30.6)	31 (50.0)	
Duration of interventional procedure patency (days)**				
< 50	3 (4.8)	15 (24.2)	18 (29.0)	0.286
≥ 50	10 (16.1)	8 (12.9)	18 (29.0)	

*Duration of the interventional procedure refers to the time from when the patient enters the operating room until they leave the recovery room

**The duration of interventional procedure patency refers to the length of time a decompressive intervention remains effective or functional

days, and for PCN was 33.0 [17.5, 63.5]. Mann-Whitney U test showed that there were no statistically significant differences in the duration of the interventional procedure and the duration of the decompressive intervention patency for both decompressive interventions. On the other hand, PCN interventions were more likely to be conducted as ultra-sound guided and under local anesthesia. These details are shown in Table 4.

Complications and outcomes of the decompressive interventions

In the study, the preoperative baseline creatinine and BUN levels were abnormal in the majority of the patients. In some patients, BUN and creatinine levels remained abnormal even after receiving a decompressive intervention. However, the postoperative creatinine and BUN levels were lower than those of the baseline levels. In this study, the occurrence of intraoperative complications was notably low as 2 (3.2%) suffered intraoperative complications. On the other hand, 36 (58.1%) patients suffered postoperative complications. Stent migration/slip, UTIs, and urosepsis were the most commonly reported postoperative complications. Postoperative complications occurred in half of the patients within 30 days of receiving the decompressive intervention and 3 (4.8%) patients needed admission to the ICU. In this study, improvements in the UHN, serum creatinine, and serum BUN levels were documented in 25 (40.3%), 28 (45.2%), and 31 (50.0%), respectively.

There were no statistically significant differences in the occurrence of intraoperative complications, postoperative complications, time elapsed from receiving the decompression intervention to the diagnosis of complications, ICU admission, prognosis of UHN, serum creatinine, and serum BUN between both decompressive interventions. Details of the complications and outcomes of the decompressive interventions are shown in Table 5.

Discussion

MUO results from advanced malignancies of various origins, such as abdominal, pelvic, or other malignancies [3, 9]. If not decompressed, MUO continues to present a challenging clinical issue among a subset of patients characterized by a notably high mortality rate and a life

Table 5 Complications and outcomes of the decompressive interventions

	Procedure			
	DJS	PCN	Total	
Variable	***n* (%)**	***n* (%)**	***N* (%)**	***p*-value**
Preoperative serum creatinine level				
Normal	12 (19.4)	8 (12.9)	20 (32.3)	**0.001**
Abnormal	7 (11.3)	35 (56.5)	42 (67.7)	
Preoperative serum BUN level				
Normal	12 (19.4)	11 (17.7)	23 (37.1)	**0.009**
Abnormal	7 (11.3)	32 (51.6)	39 (62.9)	
Postoperative serum creatinine level (report 1)				
Normal	10 (16.1)	9 (14.5)	19 (30.6)	**0.012**
Abnormal	7 (11.3)	32 (51.6)	39 (62.9)	
Postoperative serum creatinine level (report 2)				
Normal	10 (16.1)	7(11.3)	17 (27.4)	**0.004**
Abnormal	5 (8.1)	26 (41.9)	31 (50.0)	
Postoperative BUN level (report 1)				
Normal	11 (17.7)	8 (12.9)	19 (30.6)	**0.006**
Abnormal	6 (9.7)	26 (41.9)	32 (51.6)	
Postoperative BUN level (report 2)				
Normal	10 (16.1)	9 (14.5)	19 (30.6)	**0.027**
Abnormal	5 (8.1)	21 (33.9)	26 (41.9)	
Postoperative BUN level (report 3)				
Normal	9 (14.5)	7 (11.3)	16 (25.8)	**0.043**
Abnormal	4 (6.5)	15 (24.2&)	19 (30.6)	
Intraoperative complications				
No	18 (29.0)	42 (67.7)	60 (96.8)	0.522
Yes	1 1.6)	1 (1.6)	2 (3.2)	
Postoperative complications				
No	9 (14.5)	17 (27.4)	26 (41.9)	0.589
Yes	10 (16.1)	26 (41.9)	36 (58.1)	
Type of postoperative complication				
Stent migration/slip	4 (6.5)	17(27.4)	21 (33.9)	0.387
UTI and urosepsis	3 (4.8)	4 (6.5	7 (11.3)	
Stent obstruction	0 (0.0)	2 (3.2)	2 (3.2)	
Stent discomfort	1 (1.6)	1 (1.6)	2 (3.2)	
Failure	1 (1.6)	1 (1.6)	2 (3.2)	
UTI, urosepsis, and stent migration/slip	1 (1.6)	0 (0.0)	1 (1.6)	
Obstruction and UTI	0 (0.0)	1 (1.6)	1 (1.6)	
Time from receiving the decompression intervention to the diagnosis of complications (days)				
< 30	6 (9.7)	12 (19.4)	18 (29.0)	0.388
≥ 30	4 (6.5)	14 (22.6)	18 (29.0)	
ICU admission				
No	19 (30.6)	40 (64.5)	59 (95.2)	0.326
Yes	0 (0.0)	3 (4.8)	3 (4.8)	
Prognosis of UHN				
Deteriorated	0 (0.0)	4 (0.0)	4 (6.5)	0.429
No change	3 (4.8)	5 (4.8)	8 (12.9)	
Improved	10 (16.1)	15 (16.1)	25 (40.3)	
Serum creatinine prognosis				
Deteriorated	6 (9.7)	7 (11.3)	13 (21.0)	0.142
No change	6 (9.7)	11 (17.7)	17 (27.4)	
Improved	5 (8.1)	23 (37.1)	28 (45.2)	
Serum BUN prognosis				

Table 5 (continued)

	Procedure			
	DJS	PCN	Total	
Variable	***n*** **(%)**	***n*** **(%)**	***N*** **(%)**	***p*****-value**
Deteriorated	7 (11.3)	6 (9.7)	13 (21.0)	0.063
No change	4 (6.5)	7 (11.3)	11 (17.7)	
Improved	6 (9.7)	25 (40.3)	31 (50.0)	

expectancy measured in months [9–11]. In the past, patients with MUO were relieved through conventional open surgical interventions, the use of instrumentations, or drug therapy [7, 10]. However, due to feasibility constraints associated with open surgery, alternative decompressive interventions such as PCN or DJS have emerged as viable options for alleviating MUO. A previous study in the United Sates advocated that PCN is the preferred supravesical diversion because of its minimal morbidity and mortality [7]. However, limited data exist to help decide whether DJS or PCN tube drainage should be used for temporary drainage needs, although opting for ureteral stenting seems to be the least invasive approach for addressing ureteral obstructions [16]. This was, to our knowledge, the first study in Palestine that was conducted to assess and compare the outcomes of PCN and DJS in patients with MUO.

The findings of this study showed that patients with MOU commonly presented with abdominal and pelvic symptoms (67.7%). In addition, patients also presented with urinary tract symptoms (45.2%), predominantly lower urinary tract symptoms such as dysuria, oliguria, anuria, retention, and incontinence (25.8%), along with UTIs (6.5%). These presentations closely resembled findings from previous systematic reviews and meta-analyses of comparative studies, indicating that patients were typically referred when there was an indication of ureteral obstruction, often evidenced by urinary stasis and declining kidney function, as identified through clinical or radiological assessments [3, 9]. Furthermore, nearly all the patients underwent confirmation of MUO and UHN through imaging modalities such as CT scan and/or US. Together, these findings could inform urologists, oncologists, and other healthcare providers on the appropriate history-taking, diagnostic assessments, and referral practices when encountering patients with presenting symptoms indicative of MUO. The patients included in this analysis had MUO originating from different types of malignancies, including pelvic malignancies (such as prostate cancer, urinary bladder cancer, uterine cancer, and ovarian cancer) as well as gastrointestinal malignancies like colon cancer, and other origins such as breast cancer. In this study, there was a statistically significant difference ($p=0.015$) between the tumor types causing MUO and the type of procedure performed. However, a previous study in the UK reported no statistically significant difference in the prevalence of tumor types causing the MUO [2]. The differences in our study may be interpreted by the high tendency of the pelvic malignancies to directly invade the trigone, causing intrinsic and/or extrinsic blockage [4, 20, 21]. In addition, the patients who had urinary bladder cancer, colon cancer, or prostate cancer were more likely to receive PCN. Probably, invasion of the trigone and causing intrinsic and extrinsic blockage can make DJS unfeasible via cystoscope. The interpretation of these findings implies that the origin and stage of the malignancy causing MUO can influence the decision-making process regarding the choice of procedure for decompression. This suggests the importance of considering the specific characteristics of the malignancy when planning the course of treatment for patients with MUO, tailoring the procedure to the individual patient's condition for optimal outcomes. Therefore, effective management of patients with MUO requires a multidisciplinary approach involving oncologists, urologists, palliative care physicians, interventional radiologists, as well as the patients, and their families/caregivers [2, 3, 6, 10, 11]. A similar study reported cases of bilateral MUO, where drainage was preferred for symptomatic kidneys or asymptomatic kidneys with superior function [3]. Similarly, a study was conducted in Italy and included 51 patients with MUO of gastrointestinal origin, which noted that the recommendations of the European Association of Urology guidelines suggested initiating active treatment for symptomatic hydronephrosis and recommending drainage for only one kidney in asymptomatic patients [6, 22]. In our study, we observed a preference for performing PCN when the patient presented with bilateral UHN. Additionally, understanding the distribution of medical and surgical management depending on cancer type among the patients can aid in assessing the comprehensiveness and diversity of treatment approaches in malignant ureteral obstruction.

In our study, the low occurrence of intraoperative complications indicated a high level of procedural safety. On the other hand, postoperative complications were observed in 36 patients (58.1%). The prevalence of overall complications was 16.1% and 41.9% for the DJS and PCN groups, respectively. Among these, the most prevalent complication in PCN patients and DJS patients was stent migration or slippage, accounting for 27.4% and 6.5%, respectively. Stent migration/slippage was significantly

higher among patients who received PCN. This can be attributed to the nature of PCN, which involves attaching an external drainage tube and urine bags to the external skin, thereby increasing the likelihood of accidental removal when the patients move or change their clothes. A meta-analysis of 8 studies revealed that the accidental tube removal rates in PCN patients were significantly higher than the removal rates of DJS tubes [3]. In addition, patients undergoing PCN may experience more discomfort and stigma compared to those who receive DJS. A previous study in the UK reported higher discomfort and stigma among patients who received PCN compared to those who received DJS [10]. Additionally, UTI and/or urosepsis emerged as the second most common postoperative complication. Our findings were consistent with previous studies that reported a prevalence of UTIs in the range of 14–26% among patients who received PCN [2].

In our analysis, the initial creatinine and BUN levels in the majority of the patients who received PCN and DJS interventions were abnormal. Following decompression, some patients continued to experience elevated creatinine and BUN levels, although there was a subsequent decrease and improvement from their baseline measurements. A previous study in the UK reported a statistically significance reduction in creatinine levels, however, there was no evidence of any association between the reduction in serum creatinine levels and survival rates [2]. Furthermore, the study also reported a high 3-year mortality rate (75.3%) after receiving either DJS or PCN [2]. These findings indicated that patients who develop MUO still have a limited life expectancy even after DJS or PCN as a decompressive intervention. The high mortality rates and short life expectancy span can be explained by the cancer-related mortality that occurs at advanced stages of cancer [2]. Together, these findings indicate that despite improvements in renal functions, normal creatinine and BUN levels are not frequently attained and mortality rates remain high despite decompressive interventions. These findings might stimulate further research on how oncological and other multidisciplinary approaches to therapy might help improve renal functions and survival among patients with MUO [2, 9, 23].

Limitations of the study

The findings of this study should be interpreted after considering the following limitations. First, the study was conducted in a retrospective design. Retrospective approaches are often limited by missing data and incomplete patient records. Second, this was a single-center study. Compared to multicenter studies, this single-center study might have provided a narrow view of the outcomes of patients managed for MUO in the Palestinian practice. Third, the number of patients included in this analysis was relatively small. The inclusion of a large number of patients could have provided more reliable and robust findings. Fourth, due to the retrospective nature of this study, we could not assess changes in the quality of life of the patients as a result of the decompressive interventions performed. The medical records of the patients lacked systematic pain, satisfaction, quality of life assessments, and other patient-reported outcome measures. Finally, we did not analyze the outcomes of both interventions over a specific timeline of follow-ups. Given the importance of the length of follow-up period, it would be interesting to analyze and compare the outcomes of both interventions over a specific timeline of follow-ups.

Conclusion

The findings of this study indicated that the majority of patients with MUO can be safely decompressed using DJS or PCN. Despite improvements in renal functions, creatinine and BUN levels remained abnormal even after receiving a decompressive intervention. Postoperative complications were frequently reported among patients who received DJS or PCN as decompressive interventions. DJS and PCN did not differ in the occurrence of intraoperative complications, postoperative complications, time elapsed from receiving the decompression intervention to the diagnosis of complications, ICU admission, prognosis of UHN, serum creatinine, and serum BUN. Larger prospective studies are still needed to determine the optimal interventions to improve outcomes, quality of life, and survival rates of patients with DJS or PCN. Future research is still needed on how oncological and other multidisciplinary approaches to therapy might help improve renal functions and survival among patients with MUO.

Supplementary Information

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Supplementary Material 1

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Author contributions

Mahmoud Mustafa, Razan Odeh, and Ramzi Shawahna were involved in the conception and design of the work, analysis and interpretation of data, and drafting and final approval of the manuscript. Elisa Ghannam, Helen Musleh, and Tamara Ahmad were involved in the data acquisition, analysis, drafting of the work and final approval of the version to be published. All authors approved the final manuscript.

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Data availability
All data analyzed in this study were included in the manuscript or as supplementary materials. The datasets used in the analysis or entered into statistical software can be obtained from the corresponding author upon making a reasonable request.

Declarations

Ethics approval and consent to participate
This study was conducted in adherence to the international and local ethical principles including those in the Declaration of Helsinki. Our study was reviewed and approved by the Institutional Review Board (IRB) of An-Najah National University (reference: Med. Oct.2023/60). Because no direct contact was made with the patients, the IRB of An-Najah National University waived the need to obtain written informed consent from the patients. To safeguard patient privacy, a sophisticated code system was employed to anonymize patients, prioritizing privacy and confidentiality throughout the data collection process.

Consent to publish
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]Department of Medicine, Faculty of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine
[2]An-Najah National University Hospital, Nablus, Palestine
[3]Department of Physiology, Pharmacology, and Toxicology, Faculty of Medicine and Health Sciences, An-Najah National University, Nablus, Palestine
[4]Clinical Research Center, An-Najah National University Hospital, Nablus, Palestine

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