

Management of Malignant Ureteral Obstruction in Advanced Bladder Cancer: Percutaneous Nephrostomy Versus Double-J Ureteral Stenting—An Evidence-Based Case Report

Orvael Nabeel¹, Rosadi Putra², Nicholas Tambunan^{3*}

¹Medical Study Program, Faculty of Medicine, Tarumanagara University, Jakarta, Indonesia

²Department of Urology, Dr. K.H. Idham Chalid Regional General Hospital, Ciawi, Indonesia

³Department of Urology, Faculty of Medicine, Tarumanagara University, Jakarta, Indonesia

*Corresponding Author: nicholast@fk.untar.ac.id

Abstract: Malignant ureteral obstruction (MUO) is a consequence of locally advanced bladder cancer and may cause hydronephrosis, obstructive nephropathy, progressive renal dysfunction, and renal failure. Urinary diversion using double-J (DJ) ureteral stents or percutaneous nephrostomy (PCN) is commonly performed, although the optimal decompression strategy remains debated. This evidence-based case report compared the clinical role of DJ stenting and PCN in MUO caused by advanced bladder cancer. An 85-year-old man with advanced bladder carcinoma presented with oliguria, fatigue, nausea, and worsening lower urinary tract symptoms. Computed tomography demonstrated disease progression from T3bN0Mx to T4bN2M1 with bilateral hydronephrosis. Serum creatinine was 10.21 mg/dL, indicating severe renal impairment. Because of extensive local tumor burden and suspected trigonal involvement, retrograde DJ stent placement was considered unlikely to achieve technical success. Therefore, PCN was performed for urinary diversion. Following the procedure, serum creatinine decreased to 4.48 mg/dL, indicating effective decompression and partial renal recovery. Evidence suggests that both DJ stenting and PCN can relieve MUO. Gauhar et al. reported shorter operative time and hospitalization with ureteral stenting, while renal recovery, complication rates, and survival were comparable. De Lorenzis et al. similarly found no significant differences in outcomes and described PCN as a dependable option for advanced malignant obstruction. Artiles Medina et al. reported a median survival of 6.43 months and identified advanced malignancy, bilateral hydronephrosis, and delayed diversion as poor prognostic factors. PCN is therefore a dependable option, particularly when trigonal invasion is suspected or retrograde stenting is unlikely to succeed.

Keywords: *Advanced bladder cancer; malignant ureteral obstruction; percutaneous nephrostomy; double-J ureteral stenting; urinary diversion; hydronephrosis.*

Abstrak: Obstruksi ureter maligna (malignant ureteral obstruction/MUO) merupakan komplikasi yang sering terjadi pada kanker kandung kemih stadium lanjut dan dapat menyebabkan hidronefrosis, nefropati obstruktif, gangguan fungsi ginjal progresif, hingga gagal ginjal. Diversi urin menggunakan stent ureter double-J (DJ) atau nefrostomi perkutan (percutaneous nephrostomy/PCN) sering dilakukan untuk mengatasi obstruksi, tetapi pilihan metode dekompresi yang optimal masih menjadi perdebatan. Laporan kasus berbasis bukti ini bertujuan membandingkan peran klinis pemasangan stent DJ dan PCN pada MUO akibat kanker kandung kemih stadium lanjut. Seorang laki-laki berusia 85 tahun dengan karsinoma kandung kemih stadium lanjut datang dengan oliguria, kelelahan, mual, dan perburukan gejala saluran kemih bagian bawah. Pemeriksaan computed tomography menunjukkan progresivitas penyakit dari T3bN0Mx menjadi T4bN2M1 disertai hidronefrosis bilateral. Pemeriksaan laboratorium awal menunjukkan gangguan fungsi ginjal berat dengan kadar kreatinin serum 10,21 mg/dL. Karena beban tumor lokal yang luas dan dugaan keterlibatan trigonum kandung kemih, pemasangan stent DJ secara retrograd diperkirakan memiliki keberhasilan teknis yang rendah. Oleh karena itu, dilakukan diversifikasi urin melalui PCN. Setelah tindakan, kadar kreatinin menurun menjadi 4,48 mg/dL, menunjukkan dekompresi yang efektif dan pemulihan fungsi ginjal secara parsial. Bukti menunjukkan bahwa DJ dan PCN sama-sama efektif dalam mengatasi MUO. Gauhar et al. melaporkan waktu operasi dan lama rawat yang lebih singkat pada stenting, dengan pemulihan ginjal, komplikasi, dan kelangsungan hidup yang sebanding. PCN merupakan pilihan yang andal, terutama pada dugaan invasi trigonum atau kegagalan stenting retrograd.

Kata kunci: *Kanker kandung kemih stadium lanjut; obstruksi ureter maligna; nefrostomi perkutan; stent ureter double-J; diversifikasi urin; hidronefrosis*

Introduction

Malignant ureteral obstruction (MUO) is a common complication in advanced pelvic malignancies, particularly advanced bladder cancer (Campbell et al., 2021). Tumor invasion involving the trigone, ureteral orifice, or surrounding pelvic structures may result in unilateral or bilateral hydronephrosis leading to progressive renal impairment, electrolyte imbalance, and obstructive uropathy (Purnomo, 2018). Urinary diversion therefore plays an important role in relieving obstruction, preserving renal function, and improving quality of life in patients with advanced malignancy (Ku et al., 2004). Two commonly used decompression modalities in MUO are retrograde double-J (DJ) ureteral stenting and percutaneous nephrostomy (PCN) (De Lorenzis et al., 2022; Gauhar et al., 2022). DJ stenting is generally preferred due to better patient comfort and absence of external urinary drainage; however, technical success may be limited in advanced malignancy due to tumor invasion, severe hydronephrosis, and distorted anatomy (Artiles Medina et al., 2024). In contrast, PCN provides more reliable urinary decompression in severe obstruction despite the disadvantages associated with external drainage devices (De Lorenzis et al., 2022). This case report discusses the clinical decision-making process between DJ stenting and PCN in a patient with advanced bladder cancer complicated by malignant ureteral obstruction and obstructive uropathy.

Case Report

An 85-year-old man was admitted to the emergency department with progressive generalized weakness, persistent nausea, poor oral intake, oliguria, and worsening lower urinary tract symptoms. He had been diagnosed with muscle-invasive bladder cancer; however, definitive oncological management and regular follow-up were not completed because of financial limitations. Contrast-enhanced abdominal computed tomography performed on May 6, 2024, revealed a T3bN0Mx bladder tumor associated with hydronephrosis. Repeat imaging on June 11, 2025, demonstrated disease progression to T4bN2M1, with bilateral hydronephrosis and extensive pelvic tumor extension causing malignant ureteral obstruction.

Initial laboratory evaluation showed severe renal dysfunction, with a serum creatinine level of 10.21 mg/dL, consistent with obstructive nephropathy and uremia. Owing to profound azotemia, the patient underwent an initial session of hemodialysis, resulting in a modest reduction in serum creatinine to 8.84 mg/dL. Nevertheless, definitive urinary decompression remained necessary to relieve the obstruction and preserve residual renal function.

Retrograde double-J (DJ) ureteral stenting was considered; however, extensive tumor involvement of the bladder with suspected trigonal invasion was expected to compromise retrograde access and increase the likelihood of procedural failure. Consequently, percutaneous nephrostomy (PCN) was selected as the preferred urinary diversion technique. Financial constraints

limited the initial intervention to unilateral nephrostomy.

Following PCN placement, renal function improved substantially, with serum creatinine decreasing to 4.48 mg/dL, representing a 50.68% reduction from baseline. Despite this favorable response, renal function did not fully recover, most likely because of prolonged urinary obstruction, advanced malignant disease, delayed decompression, and irreversible renal parenchymal damage.

Clinical Question

Is percutaneous nephrostomy more effective than double-J stent in malignant ureteral obstruction?

Methods

A literature search was conducted through PubMed® and Google® Search on May 8, 2026. The search strategy used a combination of the keywords "malignant," "ureteral," "obstruction," "management," "nephrostomy," and "DJ-stent." In PubMed®, the search was performed using the combination "Malignant" AND "ureteral" AND "obstruction" AND "Management" OR "Nephrostomy" OR "DJ-Stent," which identified 222 articles. Meanwhile, Google® Search was conducted using the keywords "malignant ureteral obstruction, management, nephrostomy, DJ-stent," yielding 264 results. The identified articles were initially screened based on their titles and abstracts according to predefined inclusion and exclusion criteria. Following the selection, filtering, and screening of titles and abstracts, three full-text articles met the eligibility criteria and were included for further review.

A critical appraisal of the selected articles was subsequently performed using multiple evaluation domains adapted from the Centre for Evidence-Based Medicine (CEBM), University of Oxford, for therapy studies. The assessed domains included level of evidence, study design, number of patients, randomization, similarity of treatment and control groups, blinding, comparability of treatment, intention-to-treat analysis, determinants, outcome measurement, and study results. Each article was evaluated based on the clarity of reporting and methodological quality. A positive (+) assessment indicated that the respective domain was clearly reported in the article, whereas a negative (–) assessment indicated that the domain was not reported. The overall results were categorized according to the strength of evidence and clinical applicability. Result A indicated strong and consistent evidence with direct clinical applicability, whereas Result B indicated moderately good evidence with limitations, particularly related to potential observational bias. The level of evidence was classified according to the Oxford Centre for Evidence-Based Medicine (OCEBM) 2011 framework, with Level 1A representing systematic reviews or meta-analyses of randomized or high-quality studies and Level 2B representing retrospective cohort or observational studies.

Result

Following a systematic literature search and critical appraisal, three studies comparing double-J (DJ) ureteral stenting and percutaneous nephrostomy (PCN) for the management of malignant ureteral obstruction (MUO) were included in the evidence synthesis.

De Lorenzis et al. (2022) conducted a retrospective study involving 51 patients with MUO, including 27 patients managed with ureteral stenting and 24 treated with PCN. The study primarily evaluated procedural outcomes and treatment-related complications among patients with advanced gastrointestinal malignancies. Ureteral stenting was associated with a significantly shorter operative duration and reduced length of hospitalization compared with PCN. These findings were supported by pooled data from three comparative studies comprising 145 stent procedures and 60 nephrostomies, demonstrating a significantly shorter operative time in the stent group (mean difference [MD] -10.26 minutes, 95% confidence interval [CI] -12.40 to -8.02 ; $p < 0.00001$), although substantial heterogeneity was observed ($I^2 = 97\%$).

A systematic review and meta-analysis by Gauhar et al. (2022) included ten comparative studies evaluating urinary diversion in patients with MUO caused by various advanced malignancies, including bladder, prostate, gynecological, colorectal, gastrointestinal, pancreatic, gastric, and breast cancers. The pooled analysis demonstrated that ureteral stenting significantly reduced both operative time (MD -10.26 minutes, 95% CI -12.40 to -8.02 ; $p < 0.00001$) and hospital stay (MD -1.30 days, 95% CI -1.69 to -0.92 ; $p < 0.0001$) compared with PCN. However, no significant differences were observed in renal functional recovery following decompression (MD -0.35 mg/dL, 95% CI -1.19 to 0.49 ; $p = 0.41$), overall complication rates (odds ratio [OR] 1.46 , 95% CI 0.72 – 2.95 ; $p = 0.30$), or overall survival between the two procedures. Notably, accidental tube dislodgement occurred significantly less frequently following ureteral stenting (OR 0.25 , 95% CI 0.13 – 0.48 ; $p < 0.0001$). Based on these findings, Gauhar et al. (2022) recommended ureteral stenting as the preferred initial urinary diversion whenever retrograde access is technically feasible, whereas PCN remains an appropriate alternative for patients with severe obstruction, trigonal invasion, or failed retrograde stenting.

Artiles Medina et al. (2024) retrospectively analyzed 188 patients with CT-confirmed MUO who underwent urinary diversion using either ureteral stenting or PCN. The median overall survival was 6.43 months (interquartile range [IQR] 1.91–14.81 months), emphasizing the poor prognosis associated with MUO despite successful urinary decompression. The authors further summarized outcomes from several large cohort studies. Heo et al. reported a median overall survival of 5 months among 778 patients treated with either ureteral stenting or PCN, identifying low hemoglobin, hypoalbuminemia, reduced estimated glomerular filtration rate, multiple metastatic sites, and the absence of subsequent oncologic therapy as independent predictors of poor survival. Among patients managed with ureteral stenting, Matsuura et al. observed a median survival of 266 days, with poor performance status and lack of post-procedural oncological treatment

significantly associated with adverse outcomes. Comparable results were reported in PCN cohorts, where Perri et al. demonstrated a median survival of 11.13 months, whereas Alawneh et al. reported a median survival of 5.05 months. Across these studies, bilateral hydronephrosis, hypoalbuminemia, disseminated malignancy, and poor performance status consistently emerged as predictors of unfavorable prognosis following urinary diversion.

Overall, the available evidence indicates that both ureteral stenting and PCN provide effective urinary decompression and comparable renal functional recovery in patients with MUO. Although ureteral stenting offers the advantages of shorter operative time, reduced hospitalization, and improved patient comfort when technically feasible, PCN remains the more reliable option in patients with advanced pelvic malignancy, severe ureteral obstruction, trigonal involvement, or unsuccessful retrograde access. Importantly, long-term survival is determined predominantly by the underlying malignancy rather than the method of urinary diversion, with prognosis strongly influenced by disease burden, renal impairment, nutritional status, bilateral hydronephrosis, and the opportunity to receive further oncological treatment.

Discussion

Malignant ureteral obstruction (MUO) is a frequent complication of advanced pelvic malignancies and is generally associated with an unfavorable prognosis. In patients with advanced bladder cancer, direct tumor invasion involving the bladder trigone or ureteral orifices may obstruct urinary outflow, resulting in hydronephrosis, obstructive nephropathy, and progressive deterioration of renal function. Consequently, timely urinary diversion is essential to preserve renal function, relieve symptoms, and maintain eligibility for subsequent oncological treatment (Artiles Medina et al., 2024).

The optimal method of urinary diversion for MUO remains a subject of ongoing debate. Systematic reviews and meta-analyses conducted by Gauhar et al. (2022) and De Lorenzis et al. (2022) demonstrated that ureteral stenting was associated with significantly shorter operative time and reduced length of hospital stay compared with percutaneous nephrostomy (PCN). In addition, ureteral stenting was associated with a lower incidence of accidental tube dislodgement, potentially improving patient comfort and simplifying long-term management. Despite these procedural advantages, both studies consistently reported no significant differences between ureteral stenting and PCN regarding renal functional recovery, overall complication rates, or survival outcomes. These findings suggest that both techniques are effective for relieving malignant ureteral obstruction, and that the choice of urinary diversion should primarily be guided by anatomical feasibility and individual patient characteristics.

Although ureteral stenting is generally considered the preferred initial approach when technically feasible, successful retrograde placement may be challenging in patients with advanced

bladder cancer. Extensive tumor infiltration involving the bladder neck, trigone, or ureteral orifices can distort normal anatomy, compromise ureteral access, and increase the likelihood of stent failure. Under these circumstances, PCN offers a more dependable method of urinary decompression by directly accessing the renal collecting system and bypassing the obstructed distal urinary tract. Therefore, PCN remains the preferred alternative in patients with severe obstruction, trigonal involvement, or unsuccessful retrograde access (Gauhar et al., 2022; De Lorenzis et al., 2022).

The present case exemplifies this clinical scenario. The patient presented with advanced bladder cancer complicated by bilateral hydronephrosis and severe renal dysfunction, with an initial serum creatinine level of 10.21 mg/dL. Radiological findings suggested extensive local tumor extension with probable trigonal invasion, rendering retrograde double-J (DJ) ureteral stenting technically unfavorable. Accordingly, PCN was selected as the initial urinary diversion procedure. Following nephrostomy insertion, serum creatinine declined to 4.48 mg/dL, indicating successful decompression and partial restoration of renal function. Furthermore, in patients with urothelial bladder cancer, PCN may offer an additional theoretical advantage by avoiding ureteral instrumentation, given emerging evidence suggesting a possible association between ureteral stenting and the subsequent development of metachronous upper tract urothelial carcinoma (UTUC) (Wu et al., 2025; Sountoulides et al., 2021).

Despite successful decompression, complete recovery of renal function was not achieved. This observation is consistent with the findings reported by Artiles Medina et al. (2024), who demonstrated that patients with MUO generally experience poor clinical outcomes despite urinary diversion, with a median overall survival of 6.43 months. The study identified advanced malignancy, bilateral hydronephrosis, impaired renal function, and delayed urinary decompression as important predictors of poor prognosis. Similar clinical characteristics were present in our patient and likely contributed to the incomplete renal recovery observed after PCN.

Beyond procedural success and short-term renal outcomes, the potential oncological consequences of urinary diversion should also be considered when selecting the most appropriate treatment strategy for patients with bladder cancer. Wu et al. (2025) conducted a retrospective cohort study involving 570 patients who underwent transurethral resection of bladder tumor (TURBT) and reported that 3.33% developed metachronous UTUC during follow-up. Notably, the incidence of metachronous UTUC was substantially higher among patients who received double-J ureteral stents than among those who did not undergo stenting (15.22% vs. 2.29%). Multivariable analysis further identified ureteral stent placement as an independent predictor of metachronous UTUC. The authors hypothesized that disruption of the physiological anti-reflux mechanism at the ureterovesical junction by the indwelling stent may facilitate vesicoureteral reflux, thereby

promoting retrograde dissemination of urothelial tumor cells into the upper urinary tract (Wu et al., 2025).

These findings are further supported by the systematic review and meta-analysis by Sountoulides et al. (2021), which demonstrated that bladder cancer patients undergoing ureteral stenting had more than a threefold higher risk of developing metachronous UTUC than those managed without ureteral stents (OR 3.49, 95% CI 1.43–8.48). Collectively, the available evidence suggests that although ureteral stenting offers procedural advantages, including shorter operative time, reduced hospitalization, and improved patient convenience, its potential long-term oncological implications should also be considered, particularly in patients with urothelial carcinoma.

In the present case, advanced bladder cancer with bilateral hydronephrosis, severe renal impairment, and suspected trigonal invasion significantly reduced the likelihood of successful retrograde stent placement while increasing the risk of stent failure. Consequently, PCN represented the most appropriate urinary diversion strategy because it provided effective urinary decompression without traversing the tumor-involved ureterovesical junction. In addition to reducing the serum creatinine level from 10.21 mg/dL to 4.48 mg/dL, PCN may theoretically minimize the risk of retrograde tumor cell dissemination associated with ureteral stenting. Therefore, in patients with advanced bladder cancer complicated by trigonal involvement, the selection of urinary diversion should be based not only on technical feasibility and expected renal recovery but also on the potential long-term oncological consequences associated with each intervention.

Conclusion

Urinary diversion is a crucial component in the management of malignant ureteral obstruction secondary to advanced bladder cancer, aiming to preserve renal function and facilitate subsequent oncological treatment. Although both double-J (DJ) ureteral stenting and percutaneous nephrostomy (PCN) provide effective urinary decompression, the choice of intervention should be individualized according to anatomical characteristics, technical feasibility, and disease extent. In patients with extensive local tumor involvement, suspected trigonal invasion, or anticipated failure of retrograde access, PCN represents a reliable and effective alternative that achieves adequate decompression while avoiding manipulation of the tumor-involved ureterovesical junction. Furthermore, emerging evidence suggests a possible association between ureteral stenting and an increased risk of metachronous upper tract urothelial carcinoma, highlighting the importance of considering not only procedural outcomes but also potential long-term oncological implications when selecting the optimal urinary diversion strategy.

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