Original article

Time to serum creatinine recovery after percutaneous nephrostomy in advanced cervical cancer

Tiempo a la recuperación de la creatinina sérica tras nefrostomía percutánea en cáncer cervicouterino avanzado

Andrea Paola González-Rodríguez,[1*] Jorge Guerrero-Ixtláhuac,[1] Santiago Ramírez-Guerrero,[1] Simmons David Gough-Coto.[1]

Abstract

Objective: to estimate the mean time to serum creatinine normalization after percutaneous nephrostomy in patients with advanced cervical cancer and obstructive uropathy.

Methods: a retrospective observational study conducted over a two-year period at a tertiary cancer center. Women undergoing percutaneous nephrostomy between July 2023 and June 2025 were included. The primary outcome was the time to achieve serum creatinine < 1.3 mg/dL.

Results: a total of 408 nephrostomies were recorded, of which 298 (73.0%) were performed in patients with cervical cancer. After applying selection criteria, 142 patients had complete follow-up, and 103 (72.5%) achieved serum creatinine normalization. Mean time to normalization was 7.4 ± 5.8 days, with a median of 6.0 days (interquartile range 3.0–9.5). Higher baseline serum creatinine was associated with slower renal recovery. No significant differences were observed between unilateral and bilateral nephrostomies.

Limitations: the retrospective design limits control over clinical variables that may influence renal recovery.

Originality: this study provides quantitative data on renal recovery time following percutaneous nephrostomy in an oncologic population with obstructive uropathy, an aspect that remains insufficiently documented in urologic literature.

Conclusions: serum creatinine typically normalizes during the first week after percutaneous nephrostomy. Baseline renal function influences the rate of recovery and may help guide subsequent oncologic and urologic management.

Keywords: Percutaneous nephrostomy, Cervical cancer, Obstructive uropathy, Serum creatinine, Renal function

Corresponding author:
*Andrea Paola González Rodríguez. Address: San Fernando 22, Sección XVI, Tlalpan, 14080, Ciudad de México, México. Email: andy04_10@hotmail.com

Citated: González-Rodríguez A. P., Guerrero-Ixtláhuac J., Ramírez-Guerrero S., Gough-Coto S. D. *Time to serum creatinine recovery after percutaneous nephrostomy in advanced cervical cancer. Rev Mex Urol. 2026;86(4):*1-13.

[1.] Secretaría de Salud, Instituto Nacional de Cancerología, Ciudad de México, México.

Recived: December 24, 2026
Accepted: June 15, 2026

Resumen

Objetivo: estimar el tiempo medio de normalización de la creatinina sérica tras nefrostomía percutánea en pacientes con cáncer cervicouterino avanzado y uropatía obstructiva.

Métodos: estudio observacional retrospectivo realizado durante un periodo de dos años en un centro oncológico de referencia. Se incluyeron mujeres sometidas a nefrostomía percutánea entre julio de 2023 y junio de 2025. El desenlace primario fue el tiempo hasta alcanzar creatinina sérica < 1.3 mg/dL.

Resultados: se registraron 408 nefrostomías, de las cuales 298 (73.0 %) correspondieron a cáncer cervicouterino. Tras aplicar los criterios de selección, 142 pacientes contaron con seguimiento completo, y 103 (72.5 %) alcanzaron la normalización de la creatinina sérica. El tiempo a la normalización presentó una media de 7.4 ± 5.8 días y una mediana de 6.0 días (rango intercuartil 3.0–9.5). Una mayor creatinina basal se asoció con una recuperación renal más lenta. No se identificaron diferencias significativas entre nefrostomía unilateral y bilateral.

Limitaciones: el diseño retrospectivo limita el control de variables clínicas potencialmente influyentes en la recuperación renal.

Originalidad: este estudio aporta información cuantitativa sobre el tiempo de recuperación renal tras nefrostomía percutánea en una población oncológica con uropatía obstructiva, un aspecto escasamente documentado en urología.

Conclusiones: la creatinina sérica suele normalizarse aproximadamente durante la primera semana posterior a la nefrostomía percutánea. La función renal basal condiciona el ritmo de recuperación y puede orientar la planeación del manejo oncológico y urológico subsecuente.

Palabras clave:
Nefrostomía percutánea, Cáncer cervicouterino, Uropatía obstructiva, Creatinina sérica, Función renal

Introduction

Advanced cervical cancer remains a major cause of gynecologic morbidity and mortality worldwide, particularly in low- and middle-income countries.[1,2] In clinical stages III and IV, invasion of adjacent structures such as the ureters and bladder is common, leading to obstructive uropathy, hydronephrosis, and acute kidney injury,[3,4] which not only compromises renal function but also limits the administration of platinum-based chemotherapy, radiotherapy, and contrast-enhanced imaging studies.

In this setting, percutaneous nephrostomy represents an essential tool for urinary tract decompression in patients with malignant ureteral obstruction,[4–7] allowing preservation or recovery of renal function and maintaining eligibility for oncologic treatment.[8–10] Alternatively, retrograde double-J ureteral stents may be used; however, recent meta-analyses have not demonstrated clear superiority of one technique over the other. Percutaneous nephrostomy is often preferred in advanced

disease, failed retrograde approaches, or unfavorable anatomy.[11–13]

Several series have reported high technical success rates,[4,5,14] along with significant improvement in renal function following urinary decompression.[8,10,15] Nevertheless, overall survival in advanced malignant ureteral obstruction remains limited, with high early mortality, underscoring the importance of appropriate patient selection and optimal timing for resumption of oncologic therapy.[9,16–18]

Serum creatinine is the most widely used marker to assess renal function and monitor response after decompression.[10,15] From a pathophysiological standpoint, ureteral obstruction increases intraluminal pressure and reduces glomerular filtration, leading to progressive renal damage; therefore, international guidelines recommend timely decompression in the presence of renal deterioration or associated infection.[16] Studies on malignant ureteral obstruction suggest that renal recovery—including nadir or normalization of serum creatinine—typically occurs within the first two to three weeks after drainage, with median times around 15 days and wide interindividual variability.[10,15]

Evidence in Latin American populations remains limited,[6,9] despite the clinical relevance of this condition. In high-volume oncologic centers, accurately defining the time to renal recovery after percutaneous nephrostomy is crucial to avoid unnecessary delays in chemoradiotherapy or contrast-enhanced imaging. The aim of this study was to determine the mean time to serum creatinine normalization in patients with advanced cervical cancer and obstructive uropathy, as well as to describe the evolution of renal function after urinary decompression.

Materials and methods

A retrospective observational study was conducted at a tertiary oncologic referral center, including women with advanced cervical cancer who underwent percutaneous nephrostomy between July 2023 and June 2025.

Clinical information was reviewed at the *Instituto Nacional de Cancerología*, using the electronic medical records and the Interventional Radiology Service registry. Inclusion criteria were histopathologically confirmed cervical cancer FIGO stage III–IV, imaging evidence of unilateral or bilateral hydronephrosis, serum creatinine > 1.3 mg/dL within 72 hours prior to the procedure, and at least one serum creatinine measurement within the first 72 hours after nephrostomy.

Patients with known chronic kidney disease, nephrostomy performed for indications other than cervical cancer, simultaneous placement of a double-J ureteral stent, or incomplete clinical data precluding evaluation of renal function recovery were excluded.

All percutaneous nephrostomies were performed by the Interventional Radiology Service under combined ultrasound and fluoroscopic guidance, using an 8.5-Fr nephrostomy catheter. Procedures were performed as single-session urinary diversion procedures. Unilateral or bilateral drainage was determined according to hydronephrosis laterality and severity, baseline renal function, and specific clinical indications. Bilateral nephrostomy was favored in bilateral obstruction, significant renal dysfunction, or urinary fistula requiring diversion, including vesicovaginal or rectovaginal fistula. Post-procedure care followed institutional protocols, with monitoring of clinical status, urine output, catheter patency, and early complications.

Serum creatinine was assessed within 72 hours before and after nephrostomy, with follow-up measurements reviewed for up to 30 days.

The primary outcome was time (in days) to serum creatinine normalization, defined as the first value < 1.3 mg/dL after percutaneous nephrostomy. Demographic, clinical, and procedural variables were recorded.

Statistical analysis included descriptive measures (mean, median, standard deviation, and interquartile ranges). Mean and standard deviation were reported to address the primary objective of estimating the mean time to serum creatinine normalization; median and interquartile range were also reported because time-to-normalization data showed a non-normal distribution. The Kaplan–Meier method was used to estimate time to serum creatinine normalization. A Cox proportional hazards regression model was used to evaluate independent predictors of time to serum creatinine normalization. The model included age, baseline serum creatinine, nephrostomy laterality, and FIGO stage. Hazard ratios (HRs) with 95% confidence intervals (CIs) were reported. Comorbidities were not included in the model because they were not systematically available in the retrospective database. Correlation between baseline serum creatinine and time to normalization was assessed using Spearman's correlation coefficient. Comparisons between unilateral and bilateral nephrostomy were performed using the Mann–Whitney U test. A p-value < 0.05 was considered statistically significant.

The manuscript was prepared in accordance with the STROBE guidelines for reporting observational studies.

The study was approved by the Comité de Ética en Investigación del Instituto Nacional de Cancerología under protocol number No. 2025/090. Due to the retrospective design, the requirement for informed consent was waived.

Results

During the study period, 408 percutaneous nephrostomy procedures were performed in women, of which 298 (73.0%) were indicated for advanced cervical cancer. Oncologic diagnoses associated with nephrostomy placement are detailed in Table 1, with cervical cancer being the predominant indication.

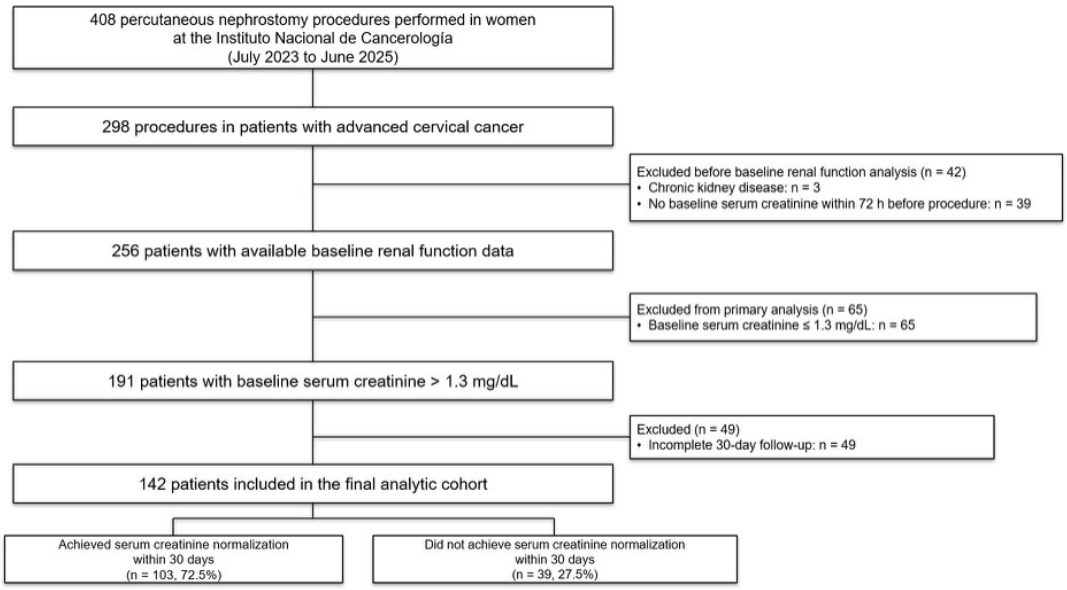
Table 1. Oncologic diagnoses associated with percutaneous nephrostomy

Diagnosis	Procedures (n)	Percentage (%)
Cervical cancer	298	73.0
Ovarian cancer	25	6.1
Endometrial cancer	22	5.4
Bladder cancer	15	3.7
Sarcomas	12	2.9
Colorectal cancer	10	2.5
Lymphoma	6	1.5
Breast cancer	5	1.2
Gastric cancer	2	0.5
Other	13	3.2
Total	408	100

Among the 298 procedures performed in patients with advanced cervical cancer, three were excluded because of preexisting chronic kidney disease and 39 because no baseline serum creatinine measurement was available within 72 hours before the procedure. Therefore, 256 patients had available baseline renal

function data. Of these, 191 patients (74.6%) had baseline serum creatinine >1.3 mg/dL, whereas 65 patients (25.4%) had baseline serum creatinine ≤1.3 mg/dL and were not eligible for the primary time-to-normalization analysis (Figure 1).

Figure 1. Flow diagram of cohort selection



The final analytic cohort consisted of 142 patients with advanced cervical cancer, obstructive uropathy, baseline serum creatinine >1.3 mg/dL, and complete 30-day follow-up after percutaneous nephrostomy. Baseline clinical and procedural characteristics of this cohort are summarized in Table 2.

Table 2. Baseline clinical and procedural characteristics of the final analytic cohort (n = 142)

Characteristic	Value
Demographic characteristics	
Age, years, median (IQR)	47.0 (38.0–55.0)
Age range, years	26–81
Tumor characteristics	
Diagnosis	Cervical cancer, 142 (100.0)
FIGO substage, n (%)	
IIIB	33 (23.2)
IIIC1	31 (21.8)
IIIC2	31 (21.8)
IVA	12 (8.5)

IVB	35 (24.6)
Baseline serum creatinine, mg/dL, mean ± SD	6.03 ± 5.21
Baseline serum creatinine, mg/dL, median (IQR)	3.84 (1.96–8.71)
Baseline serum creatinine range, mg/dL	1.32–26.34
Laterality, n (%)	
Bilateral nephrostomy	91 (64.1)
Unilateral nephrostomy	51 (35.9)
Side among unilateral nephrostomies, n (%)	
Right	21/51 (41.2)
Left	30/51 (58.8)
Procedural details	
Imaging guidance	Ultrasound and fluoroscopy, 142 (100.0)
Nephrostomy catheter caliber	8.5 Fr, 142 (100.0)
Serum creatinine normalization <1.3 mg/dL	103 (72.5)
Unresolved renal dysfunction	39 (27.5)

Among the final analytic cohort, 103 patients (72.5%) achieved serum creatinine normalization (<1.3 mg/dL) within 30 days after percutaneous nephrostomy. The remaining 39 patients (27.5%) did not achieve this endpoint and were considered to have unresolved renal dysfunction. The clinical characteristics of this non-recovery subgroup are presented in Table 3.

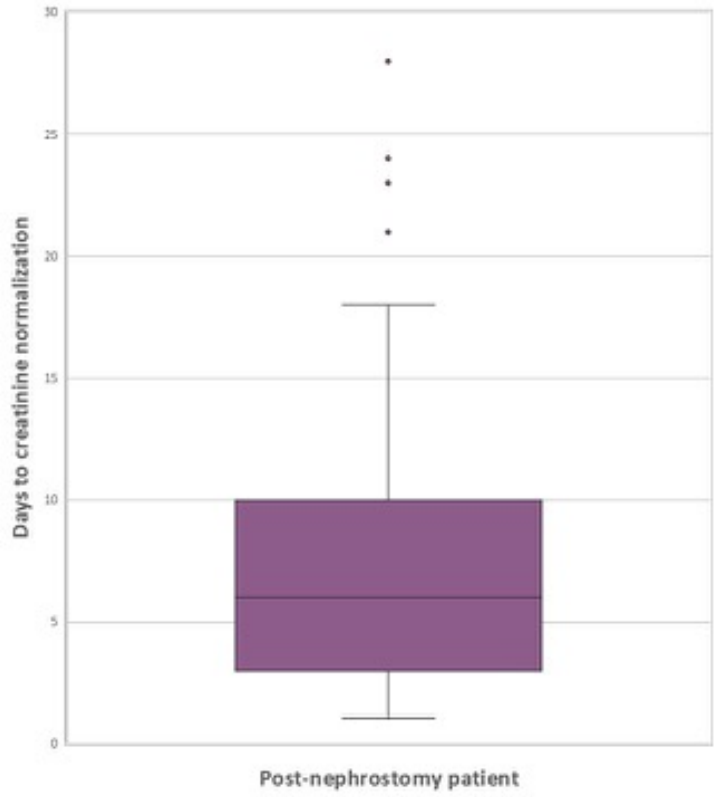
Table 3. Characteristics of patients without serum creatinine normalization within 30 days (n = 39)

Characteristic	Value
Patients without serum creatinine normalization within 30 days	39/142 (27.5%)
Age, years, median (IQR; range)	51.0 (39.0–56.5; 33–81)
Baseline serum creatinine, mg/dL, median (IQR; range)	5.65 (3.54–9.42; 2.02–26.34)
Nephrostomy laterality	
Bilateral	24 (61.5%)
Unilateral	15 (38.5%)
Side among unilateral nephrostomies	
Right	9/15 (60.0%)
Left	6/15 (40.0%)
FIGO stage	
IIIB	11 (28.2%)
IIIC1	7 (17.9%)
IIIC2	9 (23.1%)
IVA	4 (10.3%)
IVB	8 (20.5%)

Death before renal outcome assessment was documented in 8 patients, corresponding to 2.7% of the 298 cervical cancer procedures. These patients had a median age of 49.0 years (IQR, 39.8–58.0) and a median baseline serum creatinine of 4.57 mg/dL (IQR, 2.76–11.59). Because renal function recovery could not be assessed, they were excluded from the final analytic cohort. Most cases occurred in patients with FIGO stage IVB disease (6, 75.0%).

Among patients who achieved normalization (n = 103), mean time to normalization was 7.4 ± 5.8 days, with a median of 6.0 days and an interquartile range of 3.0–9.5 days (Figure 2).

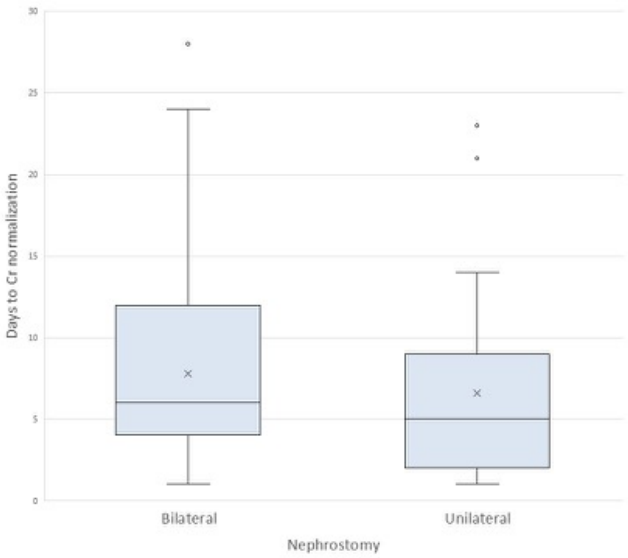
Figure 2. Distribution of time to serum creatinine normalization after percutaneous nephrostomy



Box-and-whisker plot showing the distribution of days required to achieve serum creatinine normalization (<1.3 mg/dL). Median, interquartile range, overall range, and outliers are displayed.

In this subgroup, bilateral nephrostomy (n = 67) and unilateral nephrostomy (n = 36) showed median times to normalization of 6.0 days (IQR, 4.0–11.5) and 5.0 days (IQR, 2.0–9.0), respectively. The Mann–Whitney U test demonstrated no statistically significant difference (U = 1063.5; p = 0.324) (Figure 3).

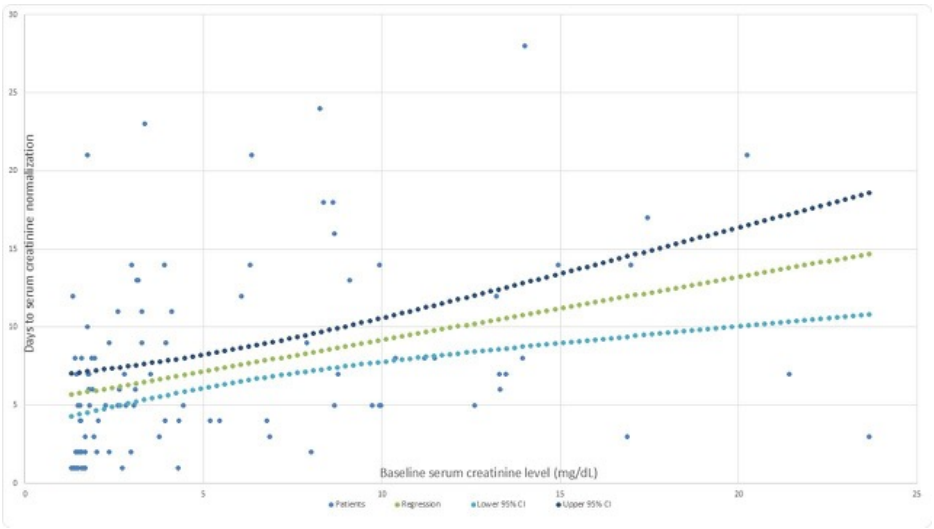
Figure 3. Time to serum creatinine normalization according to nephrostomy laterality



Comparison of time required to achieve serum creatinine normalization between patients undergoing unilateral and bilateral percutaneous nephrostomy. Boxes represent the median and interquartile range, and whiskers indicate data range.

Spearman's correlation between baseline serum creatinine and time to normalization was $\rho = 0.492$ ($p < 0.001$), indicating a moderate positive association: higher baseline creatinine levels were associated with longer time to normalization (Figure 4).

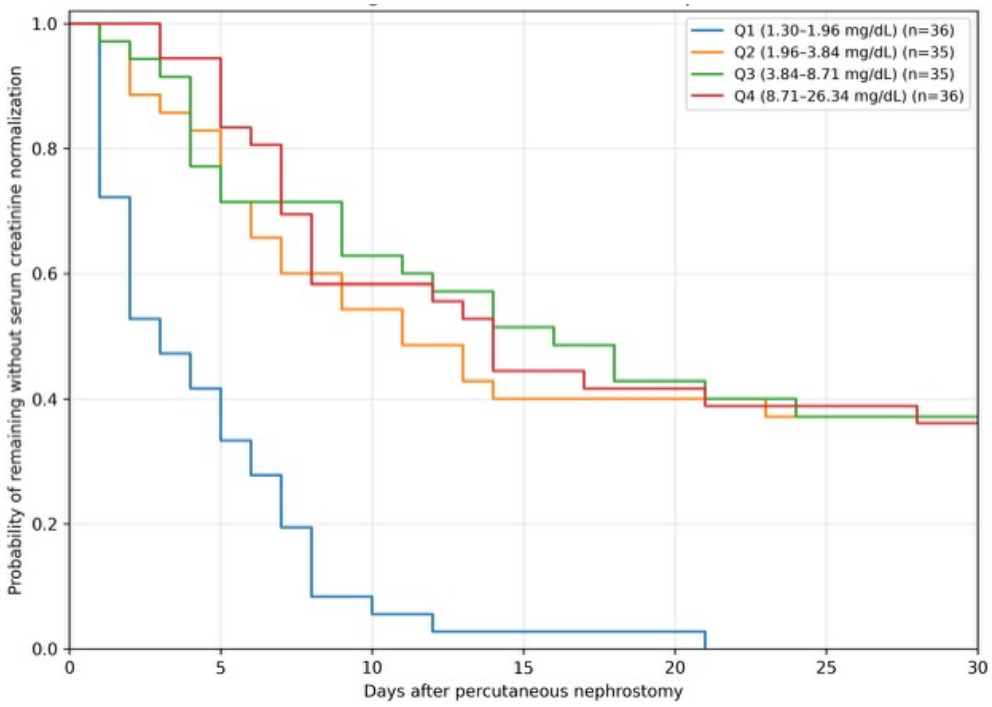
Figure 4. Relationship between baseline serum creatinine and time to normalization



Scatter plot illustrating the association between baseline serum creatinine values and the number of days required to achieve normalization. A regression line with a 95% confidence interval is included.

To further explore the effect of baseline renal function on recovery time, Kaplan–Meier curves were constructed according to baseline serum creatinine quartiles (Figure 5).

Figure 5. Kaplan–Meier curves for time to serum creatinine normalization according to baseline serum creatinine quartiles



Kaplan–Meier curves showing time to serum creatinine normalization after percutaneous nephrostomy, stratified by baseline serum creatinine quartiles (Q1: 1.30–1.96 mg/dL; Q2: 1.96–3.84 mg/dL; Q3: 3.84–8.71 mg/dL; Q4: 8.71–26.34 mg/dL). Higher baseline serum creatinine was associated with slower normalization.

Patients in the higher baseline creatinine quartiles showed a lower probability of earlier serum creatinine normalization after percutaneous nephrostomy, indicating slower renal recovery. This pattern was consistent with the positive correlation observed between baseline serum creatinine and time to normalization.

A Cox proportional hazards regression model was performed to evaluate independent predictors of time to serum creatinine normalization, with censoring at 30 days for patients who did not achieve normalization. The model was adjusted for age, baseline serum creatinine, nephrostomy laterality, and FIGO stage. Older age and higher baseline serum creatinine were independently associated with a lower probability of earlier normalization, indicating slower renal recovery. Nephrostomy laterality and FIGO stage were not independently associated with time to normalization. Hazard ratios with 95% confidence intervals are presented in Table 4.

Table 4. Cox proportional hazards regression for predictors of serum creatinine normalization

Variable	HR	95% CI	p-value
Age, per year	0.98	0.96–1.00	0.016
Baseline serum creatinine, per mg/dL	0.92	0.88–0.97	<0.001
Bilateral vs unilateral nephrostomy	1.26	0.83–1.91	0.287
FIGO stage IV vs stage III	1.17	0.78–1.76	0.458

CI, confidence interval; FIGO, International Federation of Gynecology and Obstetrics; HR, hazard ratio.
Note: Serum creatinine normalization was the event of interest. Patients without normalization within 30 days were censored at day 30. HR values <1 indicate a lower likelihood of earlier normalization.

Discussion

In this cohort of women with advanced cervical cancer and obstructive uropathy, serum creatinine normalization after percutaneous nephrostomy occurred at a mean of 7.4 days, with recovery predominantly within the first week. This interval is shorter than that reported in previous series, where median recovery or creatinine nadir has been described at approximately 15 days, with ranges extending up to three weeks after drainage.[10,15]

Baseline serum creatinine emerged as a key predictor of recovery time, consistent with studies showing that greater initial renal dysfunction is associated with slower recovery.[10,15] This finding aligns with pathophysiological principles described in international guidelines for urinary tract obstruction, which emphasize the impact of intraluminal pressure and duration of obstruction on progressive renal damage.[19] Recent systematic reviews also highlight the heterogeneity of renal recovery and the importance of appropriate patient selection in malignant urinary obstruction.[20]

The present results have practical implications for oncologic treatment planning. Because serum creatinine normalization occurred predominantly during the first week after percutaneous nephrostomy, renal function reassessment within this period may be useful to determine eligibility for chemotherapy, radiotherapy planning, or contrast-enhanced imaging. Patients with markedly elevated baseline serum creatinine may require closer biochemical monitoring after nephrostomy, as renal recovery tends to occur more slowly in this subgroup. In these cases, chemotherapy with potential nephrotoxicity or contrast-enhanced imaging should be scheduled after reassessment of renal function whenever clinically feasible. In patients without an early decline in serum creatinine, nephrostomy function should be promptly reassessed, including catheter patency, urine output, and overall clinical status. At the institutional level, the expected recovery window described in this study may assist in coordinating laboratory monitoring, imaging scheduling, catheter care, and timely multidisciplinary decision-making.

Laterality of obstruction was not significantly associated with time to creatinine normalization. This suggests that renal recovery following decompression depends more on the degree of preexisting functional impairment—largely determined by obstruction duration and severity—than on whether obstruction is unilateral or bilateral. Although bilateral obstruction is often associated with greater renal dysfunction at diagnosis and poorer overall prognosis, its effect on recovery rate after drainage has not been consistently demonstrated.[10,15,21]

This study represents one of the largest series in a Latin American population with advanced cervical cancer and malignant ureteral obstruction, contributing to a more precise characterization of renal recovery after percutaneous nephrostomy.[8,9] Major strengths include cohort size and the availability of early post-procedure biochemical follow-up. Limitations include the retrospective design, which precludes standardization of potentially influential clinical variables. Prospective studies with multivariable analyses are warranted to validate these findings and identify additional predictors of renal recovery.

Conclusions

In this cohort of patients with advanced cervical cancer and obstructive uropathy, percutaneous nephrostomy enabled renal function recovery in the majority of cases. Serum creatinine normalization occurred within the first week in most patients, with a mean time of 7.4 days and a median time of 6.0 days. Higher baseline serum creatinine was independently associated with slower recovery, whereas unilateral or bilateral nephrostomy did not significantly impact recovery time.

These findings provide clinically useful evidence to support therapeutic planning, facilitate timely continuation of oncologic treatment, and guide multidisciplinary decision-making in this patient population.

CRediT taxonomy

- Andrea Paola González Rodríguez: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing – original draft.
- Jorge Guerrero Ixtláhuac: Methodology, Investigation, Supervision, Writing – review & editing.
- Santiago Ramírez Guerrero: Investigation, Data curation, Writing – review & editing.
- Simmons David Gough Coto: Investigation, Formal analysis, Visualization, Writing – review & editing.

Funding

This study did not receive any external funding.

Conflict of interest

The authors declare no conflicts of interest related to this study.

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