



Renal Function Improvement Following Bilateral Percutaneous Nephrostomy

Leonardo Grevi Tamara¹, Sakti Ronggowardhana Brodjonegoro¹, Fateh Jamal Nahdi²

¹Division of Urology, Department of Surgery, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada - Dr.Sardjito Hospital, Yogyakarta, Indonesia

²Division of Urology, Cilacap Municipality General Hospital, Central Java, Indonesia

Email correspondence : sakti.brodjonegoro@gmail.com

Track Record Article	Abstract
Revised: 18 July 2025 Accepted: 25 September 2025 Published: 30 September 2025 How to cite: Tamara, L. G., Brodjonegoro, S. R., & Nahdi, F. J. (2025). Renal Function Improvement Following Bilateral Percutaneous Nephrostomy. <i>Contagion: Scientific Periodical Journal of Public Health and Coastal Health</i>, 7(2), 444–453.	<i>Urinary tract blockages caused by urolithiasis, trauma, and tumours that spread to the kidneys, bladder, cervix, uterus, or colon would harm renal function. Percutaneous nephrostomy (PCN) provides an option if immediate decompression is required. It serves as a temporary diversion before more serious treatment, to reduce symptoms and preserve renal function in unilateral. This research is a retrospective cohort study that involved patients with obstructive uropathy for about 128 samples from 2019 to 2022. This study was conducted in 2023. Renal function recovery was evaluated by comparing creatinine levels in each group of obstruction aetiology in two periods, before and after obstruction (3rd and 7th day after decompression). History of haemodialysis procedure and chronic kidney disease were excluded The results showed that there was a significant decrease in creatinine from baseline to day 7 of all samples ($p=0.001$). In the cancer group, there is a significant mean difference in baseline creatinine level and creatinine level at day 7 after the procedure ($p=0.008$; $p<0.05$). There is no significant renal function improvement in the stone group. PCN in patients with obstructive uropathy has a significant effect on improving renal function, especially in patients with cervix cancer.</i> Keyword: Obstructive Uropathy, Percutaneous Nephrostomy, Renal Function Improvement

INTRODUCTION

Acute Kidney Injury (AKI) is a condition of a rapid decline in kidney function within 48 hours and can lead to high morbidity if not adequately addressed. Postrenal AKI causes about 5% of cases and is commonly associated with obstructive problems in the urinary tract, such as external compression (prostate hypertrophy, carcinoma), intrinsic obstruction (calculi, clot, stricture, tumour), and functional decline (neurogenic bladder). Postrenal AKI, resulting from any of those urinary tract obstruction aetiology, may typically occur when a blockage affects one or both kidneys. Immediate intervention is crucial to alleviate kidney pressure if bilateral obstruction occurs, as the clinical conditions would rapidly deteriorate, leading to uremic syndrome, electrolyte imbalance, urinary tract infections, decreased consciousness, and potential mortality.

Percutaneous nephrostomy (PCN) is a significant medical procedure facilitating minimally invasive access to the renal collecting system with radiological guidance and local anaesthesia(New et al., 2021a; Reid et al., 2022). PCN involves creating percutaneous access

to the kidney through a needle inserted through the skin and directed towards the kidney using visual radiography assistance, like ultrasound or X-ray(Chávez-Iñiguez et al., 2020; Nayyar et al., 2023). PCN facilitates kidney decompression and relieves kidney obstruction, thus leading to improved kidney function, reduce unnecessary haemodialysis procedure, and potentially increase survival. Outcome of the decompression using PCN itself reported involves multiple factors such as low body mass index (BMI), presence of marked hydronephrosis and the use of ultrasound guidance when the procedure performed(Gadelkareem et al., 2022; Gebreselassie et al., 2022). PCN is commonly used when other methods, such as retrograde approaches, are challenging or unsuccessful, in addressing clinical conditions like urinary tract obstruction and providing access to other percutaneous procedures, such as kidney stone treatment(Zul Khairul Azwadi et al., 2021). One research concluded that PCN insertion in patients with bladder carcinoma with obstructive uropathy may improve kidney function test to normal levels and enable them to receive tumour-specific curative treatment(Garg et al., 2019). However, like any medical procedure, PCN comes with risks and complications that require careful evaluation and preparation(Turo et al., 2018). Risk of occlusion, malposition and hematoma might occur during nephrostomy insertion(Javanmard et al., 2017; Waqas et al., 2025). Urinary tract infection and sepsis has been consider as the effect from long term use of the PCN catheter(Mert et al., 2023). PCN method has been demonstrated for better option with regard to procedure accessibility (Koh et al., 2024; Moon et al., 2024; Yu et al., 2023).

PCN has become an integral part of medical practice, committed to enhancing kidney function effectively and safely through advanced and innovative techniques. This report aims to provide a detailed discussion on percutaneous nephrostomy, its indications and contraindications, technical steps in the procedure, associated complications, and the importance of post-procedure care to achieve optimal kidney function improvement. The primary objective of this report is to evaluate the impact of PCN on improving kidney function in patients with urinary tract obstruction, therefore unnecessary haemodialysis procedures can be reduced. The literature review in this report will extensively cover PCN procedures, indications, contraindications, and the implementation steps within the hospital practice.

METHODS

Research Design

This is a retrospective cohort study to assess post-procedural changes in kidney function following PCN in patients with urinary tract obstruction. The study was conducted in 2023 at the Division of Urology, Department of Surgery, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia.

Population and sample

This retrospective cohort study included patients diagnosed with obstructive uropathy treated at our institution between January 1, 2019 and December 31, 2022. A total of 128 eligible cases were identified and consecutively enrolled for analysis. Renal function recovery was assessed by comparing serum creatinine levels for each obstruction-etiology group at two post-decompression time points (3rd and 7th day) and the pre-decompression baseline. Patients with a prior history of chronic kidney disease or receiving maintenance hemodialysis before obstruction were excluded. Data were collected from medical records and the study was conducted in 2023.

Data Collection

This study enrolled patients experiencing post-renal acute kidney injury (AKI) with a creatinine level exceeding 5 mg/dL, attributed to diverse underlying conditions like kidney stones, trauma, or tumours involving related organs. Serum creatinine was measured using an enzymatic method via autoanalyzer (e.g., Cobas c501, Roche), calibrated according to IDMS standard. Inclusion criteria are the patient who underwent bilateral PCN and the availability of creatinine data on day 3 and day 7 post-procedure. Conversely, patients undergoing haemodialysis or lacking data were excluded.

Statistical analysis

Data collection included pre- and post-procedure creatinine levels on days 3 and 7, to evaluate kidney function improvement. Data distribution was measured for normality using Kolmogorov Smirnov. When the data is not normally distributive, we use Mann-Whitney Test and the Kruskal-Wallis Test for two independent groups.

Statistical analysis involved dependent t-tests for comparing pre- and post-procedure creatinine levels and assessing the correlation between obstruction causes and kidney function improvement. The significance level for all the methods was set at $p \leq 0.05$.

Human Subject Protection

The research adhered to medical ethics guidelines and patient safety protocols, with informed consent obtained before procedures and was approved by the Ethics Committee of Gadjah Mada University (KE/FK/1943/2023).

RESULTS

The results provide a comprehensive analysis of the study on kidney function improvement following bilateral PCN in 128 patients with urinary tract obstruction from 2019 to 2022.

Table 1. Demographic Representation

Variable	Result (n=128)	Percentage (%)
Age (Mean, years)	51.41	
Gender (n, %)		
- Male	40	31.25
- Female	88	78.75
Nephrostomy Indication (n,%)		
- Stone	9	7.03
- Cancer	117	91.4
- Others	2	1.57
Tumour Obstruction (n,%)		
- Bladder	25	21.37
- Cervix	65	55.56
- Colon	5	4.27
- Ovarium	10	8.55
- Prostate	7	5.98
- Others	5	4.27
Creatinine evaluation (mg/dl)		
- Baseline	7.06	
- Day 3	4.26	
- Day 7	2.69	

Table 1 provides a comprehensive overview of the patient population undergoing bilateral percutaneous nephrostomy, the indications for the procedure, and the changes in creatinine levels, which are useful for evaluating the effectiveness of the procedure in addressing kidney problems in various medical conditions.

The average age of the patients was 51 years, and the majority were female (68%). The most common indication for nephrostomy was cancer (n= 117; 91.4 %), followed by kidney stones (n= 9; 7.03%), and others (ureteral trauma/strictures) (n=2; 1.57%). The baseline creatinine level, which reflects the patients' initial condition before the procedure, was 7.06 mg/dl. The data on creatinine level improvement on day 3 and day 7 after the procedure is also given, with the average creatinine level being 4.26 mg/dl on day 3 and 2.69 mg/dl on day 7. The results showed that there was a significant decrease in creatinine from baseline (Cr = 7.06 mg/dL) to day 7 (Cr = 2.69 mg/dL) of all samples (p=0.001).

Table 1 shows that among patients with tumour-related obstruction requiring bilateral percutaneous nephrostomy, the most frequent cancer was uterine cervix (55.56%), followed by bladder (21.37%), colon (4.27%), ovary (8.55%), prostate (5.98%), and others (4.27%).

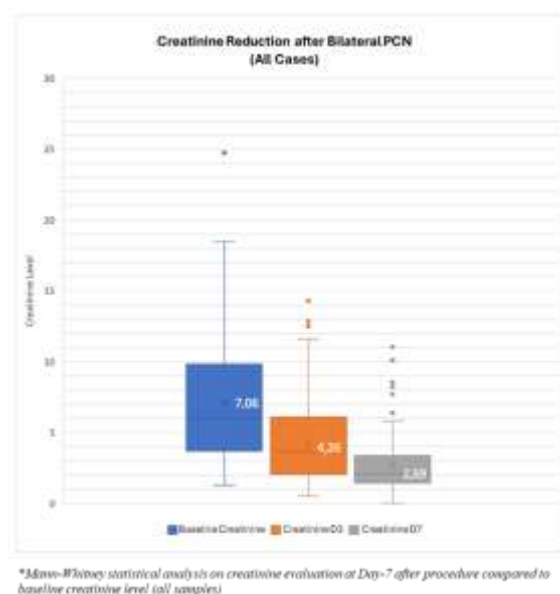


Figure 1. Creatinine Reduction Statistics after Bilateral PCN in all Patients

Figure 2 illustrates the reduction of creatinine levels on day 3 and day 7 after bilateral PCN. The Mann-Whitney test was used to compare the changes in creatinine levels from baseline to day 3, baseline to day 7, and from day 3 to day 7 in the general population (Table 2). The results showed that there was a significant decrease in creatinine from baseline to day 7 of all samples ($p=0.001$). There was no significant difference in creatinine change from baseline to day 3 ($p=0.052$) and from day 3 to day 7 ($p=0.12$).

Table 2. Creatinine Reduction After Bilateral PCN

Creatinine reduction	Baseline to day 3	Baseline to day 7	Day 3 to Day 7
mg/dl	2.8	4.37	1.57
<i>p</i>	0.052	0.001*	0.12

*Significant result on statistics analysis (Mann-Whitney Test)

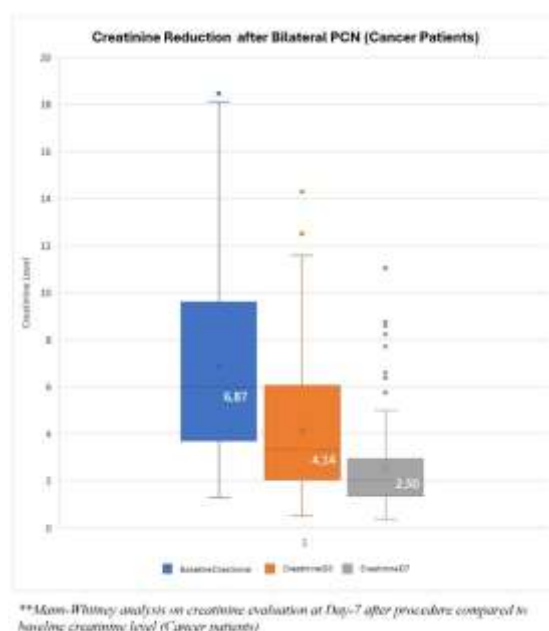


Figure 2. Creatinine Reduction Statistics in Cancer Patients after Bilateral PCN

Table 3. Kruskal-Wallis Test

Variable	Creatinine level (mg/dl)			p-value
	Baseline	Day 3	Day 7	
Cancer				
Bladder	6.02	3.59	2.61	0.891
Cervix	6.79	4.18	2.33	0.026
Colon*	8.39	4.80	3.13	
Ovarium*	8.36	5.29	4.12	
Prostate*	6.29	4.40	2.39	
Others*	6.85	2.41	0.56	
Cumulative p-value in cancer cases				0.008
Stone*	9.79	5.30	5.12	

Figure 3 demonstrates the decrease in creatinine levels in cancer patients at baseline, day 3, and day 7 after bilateral PCN. Table 3 shows the results of the Kruskal-Wallis test, which was used to compare the changes in creatinine levels after bilateral PCN in patients with different types of tumours and urinary stones. The results showed that there was a significant improvement in creatinine levels in patients with cervical cancer ($p=0.026$), but not in patients with bladder cancer ($p=0.891$). Overall, there was a significant improvement in creatinine levels in patients with all types of cancer ($p=0.008$). There was no significant improvement in creatinine levels in patients with kidney stones ($p=0.279$).

DISCUSSION

The discussion analyses the impact of bilateral PCN on the improvement of kidney function by comparing creatinine levels before and after obstruction release. The study showed

notable effectiveness of bilateral PCN in cancer cases but insignificant results in kidney stone cases. The results highlight the need for a nuanced understanding of different kidney conditions.

Furthermore, the discussion refers to other studies by Jufriady *et al.* (2019) and Sukmagara and Danarto (2015) for comparative insights. In predominantly cancer related cases, these studies explore factors influencing kidney function improvement after bilateral PCN and the association between serum creatinine reduction and various variables, including obstruction aetiology, nephrostomy side, symptom duration, comorbidities, and degree of hydronephrosis. The results contribute to a more comprehensive understanding of the factors affecting kidney function recovery after urinary tract obstruction (Ismy *et al.*, 2019; Sukmagara & Danarto, 2015). Some of the predicting factors confirmed from the other research were haemoglobin level, ages, type of renal pelvis, initial kidney function and BUN-to-Cr ratio (Wijaya *et al.*, 2022).

PCN can reduce the risk of haemodialysis, as evidenced by the increased number of patients with creatinine levels <5 mg/dl at 7 days after the PCN procedure. Therefore, definitive treatment can be exercised, and patients discharge earlier. Eighty-seven percent of cancer patients achieved creatinine <5 mg/dl within 7 days, and 86% of patients with obstructive uropathy achieved creatinine <5 mg/dl within 7 days. Khazaeli *et al.* comparing PCN and haemodialysis groups indicated that PCN resulted in a significant decrease during hospitalization compared to haemodialysis, with a better satisfaction rate for patients undergoing PCN (Khazaeli *et al.*, 2019). Additionally, PCN is an alternative, appropriate, inexpensive, and less complicated method for individuals with obstructive uropathy (Alhassoun *et al.*, 2025; New *et al.*, 2021b). This suggests that PCN may offer benefits in managing obstructive uropathy and potentially reduce the need for haemodialysis (Trifunovski *et al.*, 2024).

The discussion integrates findings from related studies, providing a broader perspective on factors influencing kidney function recovery after nephrostomy. The results contribute valuable insights to the field of urology and nephrology. This study also has limitations. Each categories which has small sample size for specific conditions such as obstruction (stone), making it difficult to be generalized. It may hard to measure post-procedure conditions of the patients, one of those is functionality due to the absence of the quality of life assessment (de Lima *et al.*, 2023). Short follow-up period may miss long-term outcomes. Prognosis of the patient should be included on the discussion section, available treatments that the patient is eligible for, as well as the patient's wishes.

CONCLUSIONS

The study underscores the importance of kidney function improvement following bilateral PCN in patients with urinary tract obstruction. Analysis results indicate that bilateral PCN significantly enhances kidney function, prevents haemodialysis, as evidenced by creatinine level reduction. The research highlights that urinary tract obstruction, attributed to urolithiasis, trauma, and tumours in organs such as the kidneys, bladder, cervix, uterus, or intestines, can lead to decreased kidney function. Therefore, bilateral PCN emerges as an effective procedure for addressing urinary tract obstruction to improve kidney function and alleviate associated symptoms. Recommendations from the study include conducting more in-depth research on specific factors influencing kidney function improvement post-bilateral PCN, comparing it with other methods, designing prospective and longitudinal studies for longer-term observations, and assessing its impact on patients' quality of life, including perceived symptoms and overall well-being.

REFERENCE

- Alhassoun, A., Alkhatib, B., Idilbi, A., Hallak, M. H., Ghanem, R., Hanouneh, T., & Jarmi, T. (2025). Percutaneous Nephrostomy in Kidney Transplant Recipients: Incidence, Risk Factors, Complications and Outcomes. *Nephrology*, 30(1), e14421. <https://doi.org/10.1111/NEP.14421>
- Chávez-Iñiguez, J. S., Navarro-Gallardo, G. J., Medina-González, R., Alcantar-Vallín, L., & García-García, G. (2020). Acute kidney injury caused by obstructive nephropathy. In *International Journal of Nephrology*. <https://doi.org/10.1155/2020/8846622>
- de Lima, D. P. A., do Nascimento Matias Teixeira, C., de Brito Abath, M., Raposo, F. A. N., & Fontan, S. B. (2023). Percutaneous nephrostomy in cervical cancer patients: a retrospective analysis. *Brazilian Journal of Oncology*. <https://doi.org/10.5935/2526-8732.20230393>
- Gadelkareem, R. A., Abdelraouf, A. M., El-Taher, A. M., & Ahmed, A. I. (2022). Acute kidney injury due to bilateral malignant ureteral obstruction: Is there an optimal mode of drainage? In *World Journal of Nephrology*. <https://doi.org/10.5527/wjn.v11.i6.146>
- Garg, G., Bansal, N., Singh, M., & Sankhwar, S. N. (2019). Role of percutaneous nephrostomy in bladder carcinoma with obstructive uropathy: A story revisited. *Indian Journal of Palliative Care*. https://doi.org/10.4103/IJPC.IJPC_102_18
- Gebreselassie, K. H., Gebrehiwot, F. G., Hailu, H. E., Beyene, A. D., Hassen, S. M., Mammed, F. O., & Issack, F. H. (2022). Emergency Decompression of Obstructive Uropathy Using Percutaneous Nephrostomy: Disease Pattern and Treatment Outcome at Two Urology Centers in Ethiopia. *Open Access Emergency Medicine*. <https://doi.org/10.2147/OAEM.S344744>
- Ismy, J., Husen, L. D. S., & Hidayat, I. (2019). Predisposing factors of kidney function recovery after postrenal obstruction. *Bali Medical Journal*. <https://doi.org/10.15562/bmj.v8i3.1616>
- Javanmard, B., Yousefi, M., Yaghoobi, M., Hadad, A. H., Amani, M., Fadavi, B., & Karkan, M. F. (2017). Ureteral reimplantation or percutaneous nephrostomy: Which one is better

- in management of complete ureteral obstruction due to advanced prostate cancer? *International Journal of Cancer Management*. <https://doi.org/10.5812/ijcm.6074>
- Khazaeli, D., Mombeini, H., Kord, S., & Hessam, S. (2019). Comparing the Percutaneous Nephrostomy and Hemodialysis in Patients with Obstructive Uropathy: A Clinical Trial Study. *Jentashapir Journal of Health Research*. <https://doi.org/10.5812/jjhr.88909>
- Koh, D. H., Yu, J. E., Kim, J. B., Kim, H. W., Kim, H. J., Joo, Y. C., Baik, J. H., Bae, S., & Chang, Y. S. (2024). Impact of the timing of percutaneous nephrostomy on the prognosis in patients with obstructive urolithiasis with sepsis. *European Urology*. [https://doi.org/10.1016/s0302-2838\(24\)01330-7](https://doi.org/10.1016/s0302-2838(24)01330-7)
- Mert, D., Iskender, G., Kolgelier, S., & Ertek, M. (2023). Evaluation of risk factors, causative pathogens, and treatment in recurrent percutaneous nephrostomy catheter-related urinary tract infections in cancer patients. *Medicine (United States)*. <https://doi.org/10.1097/MD.00000000000033002>
- Moon, Y. J., Jun, D. Y., Jeong, J. Y., Cho, S., Lee, J. Y., & Jung, H. Do. (2024). Percutaneous Nephrostomy versus Ureteral Stent for Severe Urinary Tract Infection with Obstructive Urolithiasis: A Systematic Review and Meta-Analysis. *Medicina (Lithuania)*, 60(6), 861. <https://doi.org/10.3390/MEDICINA60060861/S1>
- Nayyar, R., Sachan, A., Aggarwal, N., & Seth, A. (2023). Anatomical approach to PCNL: concept of ideal puncture zone in a 3D perspective. *Urolithiasis*. <https://doi.org/10.1007/s00240-023-01477-9>
- New, F. J., Deverill, S. J., & Somani, B. K. (2021a). Outcomes related to percutaneous nephrostomies (Pcn) in malignancy-associated ureteric obstruction: A systematic review of the literature. In *Journal of Clinical Medicine*. <https://doi.org/10.3390/jcm10112354>
- New, F. J., Deverill, S. J., & Somani, B. K. (2021b). Outcomes related to percutaneous nephrostomies (Pcn) in malignancy-associated ureteric obstruction: A systematic review of the literature. In *Journal of Clinical Medicine*. <https://doi.org/10.3390/jcm10112354>
- Reid, U. J., Maruszewski, D., Young, M., Biyani, C. S., & Khan, A. (2022). Percutaneous Nephrostomy Insertion Training: An Overview. *EMJ Radiology*. <https://doi.org/10.33590/emjradiol/21-00272>
- Sukmagara, J., & Danarto, H. R. (2015). Prognosis of obstructive nephropathy patients after percutaneous nephrostomy. *Indonesian Journal of Urology*. <https://doi.org/10.32421/juri.v22i1.88>
- Trifunovski, A., Severova, G., Atanasova, A., Janculev, J., Stankov, V., Stavridis, S., Saidi, S., Brzanov, A. G., Ambardjieva, M., & Dohchev, S. (2024). Percutaneous Nephrostomy as a Procedure in the Treatment of Urinary Tract Obstruction – Experiences in the University Clinic of Urology in Skopje. *PRILOZI*, 45(1), 31–40. <https://doi.org/10.2478/PRILOZI-2024-0004>
- Turo, R., Horsu, S., Broome, J., Das, S., Gulur, D. M., Pettersson, B., Doyle, G., & Awsare, N. (2018). Complications of percutaneous nephrostomy in a district general hospital. *Turkish Journal of Urology*. <https://doi.org/10.5152/tud.2018.37336>
- Waqas, M., Khan, A., Akbar, S., Shah, S., Ahmad, S., Hamid, M. S., Waqas, M., Sr., A. K., Akbar, S., Shah, S., Ahmad, S., & Hamid, M. S. (2025). A Study Conducted on Complications Associated With Percutaneous Nephrostomy (PCN) at a Tertiary Care Center in Peshawar, Pakistan. *Cureus*, 17(3). <https://doi.org/10.7759/CUREUS.80476>
- Wijaya, W. S., Irdam, G. A., & Rahman, F. (2022). Predicting Parameters of Renal Function Recoverability After Obstructive Uropathy Treatment in Adults. *Acta Medica Indonesiana*.
- Yu, J. E., Chan Joo, Y., Chang, Y. S., Kim, J. B., Kim, H. W., Kim, H. J., & Koh, D. H. (2023). Impact of The Timing Of Percutaneous Nephrostomy on The Prognosis in Patients With Obstructive Urolithiasis With Sepsis. *The Journal of Urology*, 209(Supplement 4), e307.

- Zul Khairul Azwadi, I., Norhayati, M. N., & Abdullah, M. S. (2021). Percutaneous nephrostomy versus retrograde ureteral stenting for acute upper obstructive uropathy: a systematic review and meta-analysis. *Scientific Reports*. <https://doi.org/10.1038/s41598-021-86136-y>