

Complications of Ultrasound Guided Percutaneous Nephrostomy in Adults: A retrospective Study

Ultrasound
Guided
Percutaneous
Nephrostomy

Akhtar Nawaz, Waqas, Zohair, Siddique Akbar and Sardar Alam

ABSTRACT

Objective: To identify the indications for percutaneous nephrostomy (PCN) placement and assess the success rate as well as the incidence of various complications associated with ultrasound-guided percutaneous nephrostomy.

Study Design: A retrospective Study

Place and Duration of Study: This study was conducted at the Institute of Kidney Diseases, Peshawar from April 2021 to April 2022.

Methods: This retrospective look at carried out at the Institute of Kidney Diseases, Peshawar, focused on patients who underwent ultrasound-guided percutaneous nephrostomy (PCN) for obstructive uropathy between April 2021 to April 2022. Data from HIS records and Urology Department registers have been analyzed. The inclusion standards encompassed patients aged >sixteen years, with exclusion standards involving incomplete documentation, pregnancy, and PCN for motives apart from obstructive uropathy. Statistical evaluation turned into achieved using IBM SPSS, calculating suggest, preferred deviation, frequency, and percentage. The take a look at layout aimed to offer complete insights into PCN-associated headaches, contributing to the development of urological care.

Results: The observe included 1702 sufferers with an average age of 38.50 ± 14 . Seventy eight years. Successful PCN placement changed into executed in ninety six.1%, with 67 patients requiring more than one try. Complications have been mentioned in 18.9%, comprising 17.6% minor and 1.3% major headaches. Macroscopic hematuria changed into the maximum not unusual (6.9%), followed by way of PCN dislodgment (1.9%) and tube occlusion (1.8%). Statistical analysis found out associations among complications and variables including gender, number of attempts, and age. The consequences contribute valuable insights into the efficacy and safety of ultrasound-guided PCN, assisting in refining procedural protocols for top-rated affected person care.

Conclusion: This study underscores the effectiveness and protection of ultrasound-guided percutaneous nephrostomy in dealing with obstructive uropathy. With urinary stones diagnosed as a important motive, the findings contribute to enhancing affected person care and procedural protocols at the Institute of Kidney Diseases, Peshawar, Pakistan.

Key Words: Obstructive Uropathy, Percutaneous Nephrostomy, Complications

Citation of article: Nawaz A, Waqas, Zohair, Akbar S, Alam S. Complications of Ultrasound Guided Percutaneous Nephrostomy in Adults: A retrospective Study. Med Forum 2024;35(1):54-57. doi:10.60110/medforum.350112.

INTRODUCTION

Obstructive uropathy, a structural hindrance to the flow of urine ⁽¹⁾ accounts for 10% of the causes of acute renal failure and 4% of chronic end stage renal failure ⁽²⁾. The common causes of obstructive uropathy in adults are urinary stones, malignancy and iatrogenic benign stricture⁽³⁾.

Department of Urology and Renal Transplant IKD Peshawar.

Correspondence: Zohair, Consultant Urology and Renal Transplant, IKD, Peshawar.

Contact No: 03332362625

Email: doctorzohair1@gmail.com

Received: July, 2023

Accepted: September, 2023

Printed: January, 2024

Percutaneous nephrostomy (PCN), a minimally invasive procedure, first documented by a urologist Dr. Willard Goodwin in 1955 is used to decompress the obstructed renal collecting system in order to preserve the renal function. This involves the insertion of a tube through the skin into the renal collecting system to drain the urine from the affected kidney⁽⁴⁾. Percutaneous Nephrostomy (PCN) can be performed under fluoroscopic and ultrasound guidance. However, ultrasound guided PCN has lower complications and is as effective as fluoroscopic guided. Hence it is the most common method used to manage obstructive uropathy⁽⁵⁾. After the placement of PCN, renal functions return to normal within 15 days in two-third of the patients with azotemia secondary to obstruction⁽⁶⁾. Apart from relieving the urinary obstruction, which accounts for 85% to 95% of the cases, it is also utilized for other purposes. These include providing access to endourologic procedures,

diagnostic testing and urinary diversion⁽³⁾. The technical success of PCN varies depending on the clinical situation⁽⁷⁾. For obstructed dilated systems, the reported success rate is 96-100%. For nondilated collecting systems it is 82-96% and for complex stone disease it is 82-85%. Although the procedure is generally safe, some minor or major complications may occur. Quality Improvement Guidelines for Percutaneous Nephrostomy reported major complications in 0.1-10% of those undergoing the procedure. Similarly, high success rates of PCN have also been reported in Pakistan; however, the rates of complications vary from 4.66% to 17.3% which include both minor and major complications⁽⁸⁻¹¹⁾. The Institute of Kidney Diseases (IKD) in Peshawar is a leading provider of care for urological patients in the region. A study done from 2011-2012 at IKD⁽¹²⁾ reported that Urinary Tract Infection (UTI) was the most frequent complication (35%) after Percutaneous Nephrostomy (PCN), followed by macroscopic haematuria (21.4%). Catheter dislodgment occurred in 17% of the patients, while sepsis affected 13% of patients. Despite this valuable data, there remains a gap in understanding the current status and trends of PCN-related complications.¹³ Our study aims to address this gap by evaluating complications related to ultrasound-guided percutaneous nephrostomy in patients with obstructive uropathy, ultimately contributing to improved patient care and outcomes.

METHODS

A retrospective study was conducted at Institute of Kidney Diseases, Peshawar, Pakistan. After approval from Institutional Ethical & Review Board, the HIS records and registers of Department of Urology were accessed for patients who underwent Ultrasound guided Percutaneous Nephrostomy (PCN) between April 2021 to April 2022. The study focused on patient demographics, indications for PCN, and procedure-related complications. The inclusion criteria included all patients aged >16 years who underwent percutaneous nephrostomy (PCN) for obstructive uropathy. The exclusion criteria were patients with incomplete documentation, pregnant women, and who had PCN for reasons other than obstructive uropathy. Data was collected using self-made proforma and analysed using IBM SPSS for Windows version 26. Mean and standard deviation were calculated for age. Frequency and percentage was calculated for gender, cause of obstruction and complications. Chi-square test was done to determine the association between complications and variables of gender, age and number of attempts. The p-value of 0.05 or less was considered statistically significant.

Data collection: Data collection involved having access to Health Information System (HIS) records and Urology Department registers at the Institute of Kidney

Diseases, Peshawar. The study duration ranged from April 2021 to April 2022. Comprehensive information on patient demographics, symptoms for PCN, and headaches become systematically retrieved for evaluation.

Statistical Analysis: Statistical evaluation turned into carried out the usage of IBM SPSS for Windows model 26. Mean, popular deviation, frequency, and percent had been calculated. The Chi-square check determined associations among complications and gender, range of tries, and age, with a importance stage set at zero.05 or less.

RESULTS

There were 1702 patients in our study with a mean age of 38.50 ± 14.78 and ranged from 16 to 83 years. 995 (58.5%) were male and 707 (41.5%) were female. 1152 (67.7%) patients were aged 16 to 45, while 550 (32.3%) were aged 46 and above. 1628 unilateral and 74 bilateral percutaneous nephrostomies were performed. The indications for PCN included Urinary Stones in 1150 (67.6%), malignancy in 407 (23.9%), Pyonephrosis in 60 (3.5%), Stricture in 54 (3.2), Iatrogenic Ureteric Injury in 16 (0.9%), Emphysematous Pyelonephritis in 10 (0.6%) and Ureteric Ligation in 05 (0.3%).

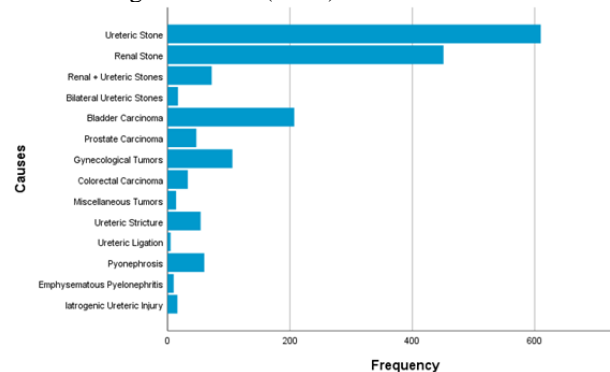


Figure No. 1: Bar chart showing causes of obstructive uropathy

Successful PCN was placed in the first attempt in 1635 (96.1%) patients and only 67 (3.6%) patients required more than single attempt. Complications were reported in 320 (18.9%) of patients. Among these 300 (17.6%) were minor complications and 22 (1.3%) were Major complications. 95.3% (286/300) of the minor complications occurred in patients who had their PCN placed in the first attempt, while 54.5% (12/22) of the major complications occurred in patients who required more than one attempt for PCN placement. Macroscopic haematuria was the most common complication which was experienced by 6.9% of the patients, while 1.9% and 1.8% of the patients experienced PCN dislodgement and occlusion, respectively. PCN tube occlusion with associated pain was reported in 1.2% of patients. Sepsis was observed

in 13 (0.8%) patients, and major haemorrhage requiring transfusion was noted in 2 (0.1%) patients. Out of the 300 minor complications, 176 (58.7%) were observed

in patients aged 16 to 45. Similarly, out of the 22 major complications, 14 (63.6%) were observed in patients aged 46 and above.

Table No. 1: Incidence of complications of Percutaneous Nephrostomy

		Urinary Stones	Malignancies	Pyonephrosis	Ureteric Stricture	Iatrogenic Ureteric Injury	Emphysematous Pyelonephritis	Ureteric Ligation	Incidence N (%)
	No Complications	964	306	43	44	11	8	4	1380 (81.1)
Minor Complications	Macroscopic Hematuria	75	29	5	6	2	0	0	117 (6.9)
	Pain, Macroscopic Hematuria	29	14	1	0	0	1	0	46 (2.2)
	PCN Tube Dislodgement	11	19	1	1	1	0	0	33 (1.9)
	PCN Tube Occlusion	15	9	2	2	1	1	1	31 (1.8)
	Pain	14	9	1	0	0	0	0	24 (1.4)
	Urine Leak	17	3	1	0	0	0	0	21 (1.2)
	Pain, PCN Tube Occlusion	11	7	2	0	1	0	0	21 (1.2)
	Infection at PCN Insertion Site	3	1	2	0	0	0	0	6 (0.4)
Major Complications	Sepsis	5	7	0	1	0	0	0	13 (0.8)
	Puncture of adjacent organ	2	1	1	0	0	0	0	4 (0.2)
	Pleural effusion	2	0	0	0	0	0	0	2 (0.1)
	Major Haemorrhage	1	1	0	0	0	0	0	2 (0.1)
	Urinoma	0	1	0	0	0	0	0	1 (0.1)
	Pneumothorax	1	0	0	0	0	0	0	1 (0.1)

Table No. 2: Association of Gender, No. of attempts and Age with Complications

		Complications			p-value
		None N (%)	Minor N (%)	Major N (%)	
Gender	Male	807 (81.1)	173 (17.4)	15 (1.5)	0.627
	Female	573 (81.0)	127 (18.0)	7 (1.0)	
Attempt	1	1298 (83.3)	252 (16.2)	9 (0.6)	<0.001
	>1	82 (57.3)	48 (33.6)	13 (9.1)	
Age	16 to 45	968 (84.0)	176 (15.3)	8 (0.7)	<0.001
	46 and over	412 (74.9)	124 (23.5)	14 (2.5)	

DISCUSSION

In discussing the findings of the study on ultrasound-guided percutaneous nephrostomy (PCN) complications at the Institute of Kidney Diseases in Peshawar,

Pakistan, it is crucial to contextualize them in the existing literature. The examine aligns with previous studies, confirming the efficacy and protection of PCN, with a fulfillment price of 96.1%, steady with pronounced quotes ranging from eighty two% to a hundred%^(14,15,7,11). This reaffirms the reliability of PCN as a treasured intervention for obstructive uropathy. The occurrence of urinary stones because the leading cause of obstructive uropathy echoes findings from earlier research (thirteen, 12). Notably, the take a look at highlights a statistically vast association between age and complications, emphasizing the importance of age as a capability chance component. This is consistent with the observations that sixty three.6% of predominant complications befell in sufferers elderly forty six and above (Table 2).The suggested principal headaches (1.3%) fall within the mounted range of 0.1% to 10% outlined in fine development tips for PCN (eight). Noteworthy is the meticulous breakdown of headaches, with macroscopic hematuria being the most commonplace, going on in 6.9% of patients. This aligns with the findings of a preceding study carried out at IKD⁽¹²⁾. Comparisons with different regional research in Pakistan, which includes the one from 2011-2012, monitor a consistency in the prevalence of headaches, with urinary tract infections (UTI) being the maximum

common (35%) (thirteen). The current observe reinforces UTI as a significant complication, taking place in 21.6% of sufferers elderly 20-50 years. However, it's miles important to well known the limitations of this look at, inclusive of its retrospective nature and the absence of an assessment of long-time period complications. Furthermore, the impact of tube length and the degree of hydronephrosis on complications was no longer assessed, representing capability areas for future studies. Our study findings make contributions valuable insights into the headaches related to ultrasound-guided PCN in adults. The alignment with existing literature reinforces the reliability of PCN as a vital intervention for obstructive uropathy. The affiliation between age and complications emphasizes the need for individualized care in precise age groups, guiding future studies and refining procedural protocols.^{16,17}

CONCLUSION

This study establishes that urinary stones are the most prevalent cause of obstructive uropathy. Percutaneous Nephrostomy (PCN) is a comparatively simple, secure, and quick technique for temporary urinary diversion in cases of obstructive uropathy. This technique has a high success rate and results in fewer minor and major complications.

Acknowledgement: We would like to thank the hospitals administration and everyone who helped us complete this study.

Author's Contribution:

Concept & Design of Study:	Akhtar Nawaz
Drafting:	Zohair
Data Analysis:	Waqas
Revisiting Critically:	Siddique Akbar
Final Approval of version:	Sardar Alam

Conflict of Interest: The study has no conflict of interest to declare by any author.

Source of Funding: None

Ethical Approval: No.122 dated 12.02.2021

REFERENCES

- Roth KS, Koo HP, Spottswood SE, Chan JC. Obstructive Uropathy: An Important Cause of Chronic Renal Failure in Children. *Clinical Pediatr* 2002;41(5):309-314.
- Siddiqui MM, McDougal WS. Urologic assessment of decreasing renal function. *Med Clin North Am* 2011;95(1):161-8.
- Dagli M, Ramchandani P. Percutaneous nephrostomy: technical aspects and indications. *Semin Intervent Radiol* 2011;28(4):424-37.
- Beiko D, Razvi H, Bhojani N, et al. Techniques – Ultrasound-guided percutaneous nephrolithotomy: How we do it. *Can Urol Assoc J* 2020;14(3):E104-E110.
- Yang YH, Wen YC, Chen KC, Chen C. Ultrasound-guided versus fluoroscopy-guided percutaneous nephrolithotomy: a systematic review and meta-analysis. *World J Urol* 2019;37(5):777-788.
- Pappas P, Stravodimos KG, Mitropoulos D, et al. Role of percutaneous urinary diversion in malignant and benign obstructive uropathy. *J Endourol* 2000;14(5):401-405.
- Pabon-Ramos WM, Dariushnia SR, Walker TG, Janne d'Othée B, Ganguli S, Midia M, et al. Quality Improvement Guidelines for percutaneous nephrostomy. *J Vascular Interventional Radiol* 2016;27(3):410-4.
- Haris MS, Hussain SA, Islam F. An evaluation of complications of ultrasound guided percutaneous nephrostomy in cases of obstructive uropathy. *Pak J Med Health Sciences* 2023;17(1):530-2.
- Ali SM, Mehmood K, Faiq SM, Ali B, Naqvi SA, Rizvi AU. Frequency of complications in image guided percutaneous nephrostomy. *J Pak Med Assoc* 2013;63(7):816-820.
- Ahmad I, Pansota MS. Comparison between double J (DJ) ureteral stenting and percutaneous nephrostomy (PCN) in obstructive uropathy. *Pak J Med Sciences* 2013;29(3). Doi:10.12669/pjms.293.3563
- Ahmad I, Pansota MS, Tariq M, et al. Complication of Percutaneous Nephrostomy (PCN) in Upper Obstructive Uropathy: Our Experience. *J Univ Med Dent Coll* 2014 Jun. 3 [cited 2023Dec.17];5(1):55-0. Available from: <https://jumdc.com/index.php/jumdc/article/view/275>
- Farooq K, Ahmad B, Shahab M. Frequency of common complications in patients after percutaneous nephrostomy for obstructive uropathy. *Khyber J Med Sciences* 2016;09(01): 72-6.
- Efesoy O, Saylam B, Bozlu M, Çayan S, Akbay E. The results of ultrasound-guided percutaneous nephrostomy tube placement for obstructive uropathy: A single-centre 10-year experience. *Turk J Urol* 2018;44(4):329-334.
- Montvilas P, Solvig J, Johansen TEB. Single-centre review of radiologically guided percutaneous nephrostomy using “mixed” technique: Success and complication rates. *Eur J Radiol* 2011;80(2):553-8.
- Naeem M, Jan MA, Ullah A, Ali L, Khan S, Haq A, et al. Percutaneous Nephrostomy for the Relief of Upper Urinary Tract Obstruction: An Experience with 200 Cases. *J Postgrad Med Inst* 2011 Oct 13 [cited 2024 Jan. 4];24(2). <https://jpmi.org.pk/index.php/jpmi/article/view/1056>
- Saeed K, Qureshi F, Hussain I, Tariq M. Frequency of complications of percutaneous nephrostomy in upper obstructive uropathy. *Sepsis* 2016;1:0-51.
- New FJ, Deverill SJ, Somani BK. Outcomes Related to Percutaneous Nephrostomies (PCN) in Malignancy-Associated Ureteric Obstruction: A Systematic Review of the Literature. *J Clin Med* 2021;10(11):2354.