

ORIGINAL ARTICLE

Complications Rate of Conventional Percutaneous Nephrolithotomy (PCNL) in a tertiary care center

MUHAMMAD ASIF¹, KHALID FAROOQ², MARYAM IKRAM ULLAH³, AKBAR AZAM⁴, ROMANA BIBI⁵^{1,2}Assistant Professor Urology, Lady Reading Hospital, Peshawar³M.Phil scholar Khyber Medical University, Peshawar^{4,5}Postgraduate Resident Urology, Lady Reading Hospital, Peshawar⁵Postgraduate Resident Gynecology and Obstetrics, Khyber Teaching Hospital, Peshawar

Correspondence to Dr. Khalid Farooq, Email l'd: drkhalid846@gmail.com

ABSTRACT

Aim: To observe the complication rate of conventional percutaneous nephrolithotomy (PCNL) in a tertiary care Hospital.**Methods:** This Retrospective study conducted from January 2016 to January 2020 in the Department of Urology at Lady Reading Hospital in Peshawar, Pakistan. The research included a total of 449 patients who underwent conventional PCNL. Non-contrast CT KUB was performed on all patients before surgery. After passing 6fr Ureteric catheter through a cystoscope in lithotomy position patient was then shifted into prone position. Under the guidance of fluoroscopy, all procedures were carried out while the patient was lying flat and conventional 30FR amplatz sheath was used as working channel.**Results:** Complications were reported in 46.9% of cases. The majority of the complications occurred in patients with Clavien grades I and II, with 120(27%) and 54(12%) patients, respectively. In Grade I complication transient fever occurred in 67(15%) patients treated with antipyretics while 53(12%) patients had nephrostomy site leakage managed with simple pressure dressing at bed site. In grade II complication 45(10%) patients had bleeding which required transfusion and 9(2%) patients developed sepsis treated with parenteral antibiotics. 10(2%) patients developed grade IIIa complication such as persistent bleeding in 4(0.8%) patients managed with percutaneous angioembolization and 6(1.2%) patients required percutaneous drainage of perinephric collection. 25(5.5%) patients had grade IIIb complications, in 24(5.3%) patients DJ stenting was done for PCS injury or persistent leakage from nephrostomy site while 1(0.2%) patient needed colostomy for colonic injury.**Conclusion:** The chance of serious complications during percutaneous nephrolithotomy is very minimal. It is also safe, cost effective and well-tolerated. Transient fever or nephrostomy site leakage are the most frequently occurring minor complications often subside spontaneously.**Keywords:** Nephrostomy, percutaneous nephrolithotomy

INTRODUCTION

Modified Clavien classification system:

Grade	Definition	Example
I	Any deviation from normal course after surgery with no the need for pharmacological, surgical, endoscopic, and radiological interventions. Allowed therapeutic regimens include: antiemetics, antipyretics, analgesia, diuretics, electrolytes, physiotherapy.	Examples include ileus. This grade also includes wound infections opened at the bedside.
II	Requiring pharmacological treatment with drugs other than allowed for grade I complications.	UTI, DVT. Total parenteral nutrition and blood transfusion also included.
III	Requiring surgical, endoscopic or radiological intervention. IIIa Intervention not under general anesthesia. IIIb Intervention under general anesthesia.	Radiologically guided aspiration of fluid Return to theatre due to control bleeding or other complications.
IV	Life-threatening complication requiring intensive care management. IVa Single organ dysfunction (including dialysis). IVb Multi-organ dysfunction.	
V	Death of the patient	
Suffix 'd'	If the patient suffers from a complication at the time of discharge, the suffix 'd' is added to the respective grade of complication. This suffix indicates the need for follow-up to fully evaluate the complication.	

PCNL was first introduced in 1970s and since then, for the large renal stone, it is the first-choice procedure^{1,2}. Urolithiasis is a prevalent problem in our part of the world with a prevalence rate of 2-3% in general population with 12% lifetime risk of developing

kidney stone³. PCNL is usually associated with less morbidity and mortality but there are few complications which may occur perioperatively^{4,5}. Over all complications rate is 20.5% and most of the complications are of minor type^{6,7}. Modified Clavien classification system is used to grade these complications⁸. Although this grading system has its own limitations but still it is well validated and standardized. We are now routinely using this system to grade our complications.

Complications according to Modified Clavien Grading System:

Clavien grade	n	Comments
I	120(27%)	Transient fever in 67(15%) treated with antipyretics Nephrostomy site leakage in 53(12%) treated with simple pressure dressing at bed site
II	54(12%)	Blood transfusion in 45(10%) and sepsis treated with parenteral antibiotics 9(2%)
III	IIIa- 10(2%) IIIb- 25(5.5%)	Percutaneous angioembolization in 4(0.8%) and per cutaneous drainage of perinephric collection in 6(1.2%) DJ stenting for PCS injury or nephrostomy site leakage in 24(5.3%), colonic injury requiring colostomy in one (0.2%)
IV	0	
V	2(0.4%)	Deaths

METHODOLOGY

This Retrospective study conducted from January 2016 to January 2020 in the Department of Urology at Lady Reading Hospital in Peshawar, Pakistan. This study included 449 patients who received conventional PCNL. Preoperatively, all patients were assessed using ultrasonography KUB, X-ray KUB, and non-contrast CT KUB. The patient were shifted into prone position after inserting a 6fr Ureteric catheter through a cystoscope in lithotomy position. Fluoroscopy was used to guide all operations, and the standard 30FR amplatz sheath was used as the operating channel. Stone fragmentation were employed pneumatic lithoclast. In each case, a

Received on 14-10-2022

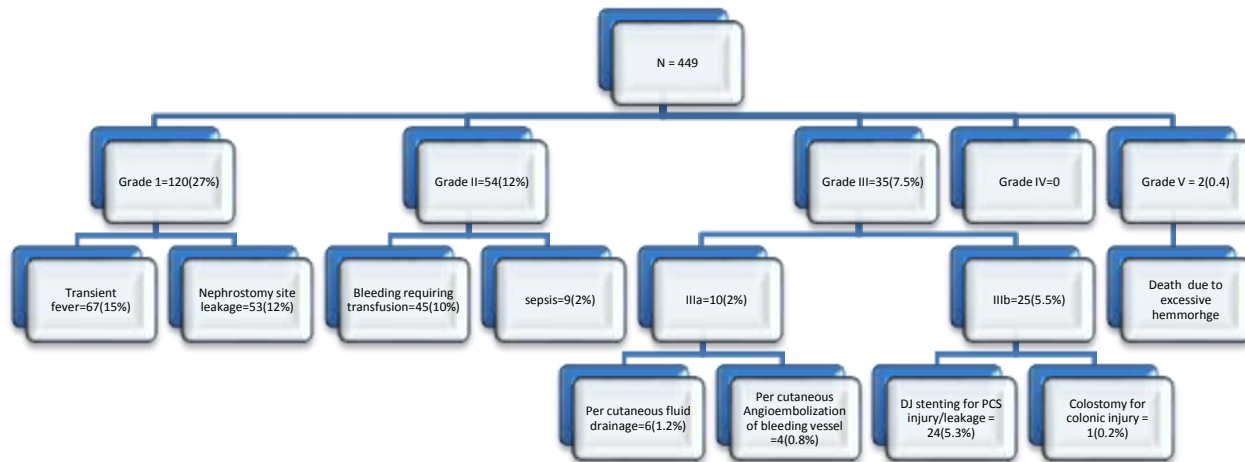
Accepted on 22-03-2023

16 Frfoley's catheter was used as a nephrostomy tube. These operations were carried out by six surgeons with a minimum of four years of PCNL expertise. According to the modified Clavien scoring scheme, postoperative complications were evaluated.

RESULTS

Complications were reported in 46.9% of cases. The majority of the complications occurred in patients with Clavien grades I and II, with 120 (27%) and 54 (12%) patients, respectively. In Grade I complication transient fever occurred in 67(15%) patients treated with antipyretics while 53(12%) patients had nephrostomy site leakage managed with simple pressure dressing at bed site. In

grade II complication 45(10%) patients had bleeding which required transfusion and 9(2%) patients developed sepsis treated with parenteral antibiotics. 10(2%) patients developed grade IIIa complication such as persistent bleeding in 4(0.8%) patients managed with percutaneous angioembolization and 6(1.2%) patients required percutaneous drainage of perinephric collection. 25(5.5%) patients had grade IIIb complications, in 24(5.3%) patients DJ stenting was done for PCS injury or persistent leakage from nephrostomy site while 1(0.2%) patient needed colostomy for colonic injury. No grade IV complication was observed. Mortality (grade V) was 0.4% due to excessive hemorrhage.



DISCUSSION

The overall complication rate of PCNL ranges from 20-83%^{9,10}. In our study overall complications rate is 46.9% compare to Tefekli et al 29.2%, De la Rosette et al 43.8% and Guy's Hospital 50.5%.

Among 5,803 individuals analysed across multiple centres, complications occurred in 21.5% of cases. Transient temperature (10–30%) and nephrostomy tube leakage (15–20%) were the most frequent side effects^{10,11,12}.

Tefekli et al¹³, the Clavien A total of 811 percutaneous nephrolithotomies were performed using this technique (PCNL), with a 29.2% complication rate on average. Grade II complications were common 16.3%. 10.9% cases required blood transfusion and in 4.6% cases DJ stenting was done for urine leakage. In 9.4% of cases a grade III complications were noted that required surgery or radiological intervention. In a sample of 244 PCNL individuals, De la Rosette et al^{9,14}, the overall complication incidence was 43.8%.

Guy's Hospital 2008 data revealed an Overall complication rate of 43(50.5%). Clavien grade I was the most frequently occurring complication with 27(32%). The Clavien grade III complication noted in 8(9%) of the individuals required surgery or radiological intervention. There were no complications of grade IV or V found^{14,15}.

Pleural violation occurs at a rate ranging from 0.3% to 1% during percutaneous access for PNL^{16,17,18}. No such complication was observed in our study because majority of our cases are of lower calyceal access.

3,878 patients undergoing PNL were retrospectively reviewed for bleeding and only 1% rate of severe bleeding was recorded with a transfusion rate of 5.5%¹⁹. In our study the transfusion rate is 10% which is a bit high may be due to prolonged operative time and large volume stones (stag horn).

Srivastava and colleagues reported 1.4% cases of persistent 1,854 individuals receiving percutaneous renal access and PNL had bleeding that required angioembolization^{20,21}. In our study bleeding requiring angioembolization is 0.8%.

30% of patients develop transient fever in the immediate post PCNL period while the Sepsis rates range from 0% to 3%²²⁻²⁸. We experienced transient fever in 15% patients while 2% developed sepsis.

Injury to the PCS during PCNL is reported in 8% patients. PCS damage can result in electrolyte imbalances, change in mental state, or intravascular volume overload^{22,23}. In our study 5.3% cases had PCS injury or leakage from nephrostomy site needed DJ stenting, this rate is low may be due to the fact that all punctures were done under fluoroscopy guidance.

Out of 5,803 patients from various locations around the globe, 0.03% of cases of Clavien grade V complications (death) were recorded¹⁰. We had 0.4% mortality. One patient died of excessive hemorrhage and other due to multiple comorbidities.

In terms of stone clearance and morbidity, PCNL is an overall safe and efficient treatment. There is less post-operative discomfort, and the patient is able to return to work sooner. Low risk of complications is attributed to the small incision and

minimally invasive access to the kidney. An evolution in the stone breaking modalities and miniaturization of PCNL has further and remarkably reduced the complication rate.

CONCLUSION

The chance of serious complications during percutaneous nephrolithotomy is very minimal. It is also safe, cost effective and well-tolerated. Transient fever or nephrostomy tube leakage are the most frequently occurring minor complications often subside spontaneously. With the miniaturization from conventional to mini, ultra mini and micro PCNL the complication rate is now negligible.

Recommendation: Looking into the safety and effectiveness of percutaneous nephrolithotomy, we believe it should be the first-line treatment for renal stones larger than 2cm and we further recommend that open renal stone surgery should be discouraged at all level and where the PCNL facility is not available patients should be referred to tertiary care hospital and specialized center where PCNL facility is available.

Conflicts of interest: The authors declared no conflict of interest

Funding: Nil

Ethical Approval: Copy Attached

REFERENCES

- Ogg CS, Saxton HM, Cameron JS. Percutaneous needle nephrostomy. *Br Med J*. 1969 Dec 13;4(5684):657-60. DOI: 10.1136/bmj.4.5684.657
- Badlani G, Eshghi M, Smith AD. Percutaneous surgery for ureteropelvic junction obstruction (endopyelotomy): technique and early results. *J Urol*. 1986;135(1):26-8. DOI: 10.1016/s0022-5347(17)45503-0
- Johnson CM, Wilson DM, O'Fallon WM, Malek RS, Kurland LT. Renal stone epidemiology: a 25-year study in Rochester, Minnesota. *Kidney Int*. 1979;16(5):624-631. DOI: 10.1038/ki.1979.173
- Preminger GM, Assimos DG, Lingeman JE, Nakada SY, Pearle MS, Wolf JS. Chapter 1: AUA guideline on management of staghorn calculi: diagnosis and treatment recommendations. *J Urol*. 2005;173(6):1991-2000. DOI: 10.1097/01.ju.0000161171.67806.2a
- Rudnick DM, Stoller ML. Complications of percutaneous nephrostolithotomy. *The Canad J Urol*. 1999;6(5):872-5.
- Rosette JD, Assimos D, Desai M, Gutierrez J, Lingeman J, Scarpa R, Tefekli A. The clinical research office of the endourological society percutaneous nephrolithotomy global study: indications, complications, and outcomes in 5803 patients. *Jendourol*. 2011;25(1):11-7. DOI: 10.1089/end.2010.0424
- Labate G, Modi P, Timoney A, Cormio L, Zhang X, Louie M, Grabe M, de la Rosette, on behalf of the CROES PCNL Study Group J. The percutaneous nephrolithotomy global study: classification of complications. *J endourol*. 2011;25(8):1275-80. DOI: 10.1089/end.2011.0067
- Morgan M, Smith N, Thomas K, Murphy D. Is Clavien the new standard for reporting urological complications? *Bju Inter*. 2009;104(4):434. DOI: 10.1111/j.1464-410X.2009.08516.x
- Rudnick DM, Stoller ML. Complications of percutaneous nephrostolithotomy. *The Canad J Urol*. 1999 Oct;6(5):872-5.
- Rosette JD, Assimos D, Desai M, Gutierrez J, Lingeman J, Scarpa R, Tefekli A. The clinical research office of the endourological society percutaneous nephrolithotomy global study: indications, complications, and outcomes in 5803 patients. *J endourol*. 2011;25(1):11-7. DOI: 10.1089/end.2010.0424
- Shin TS, Cho HJ, Hong SH, Lee JY, Kim SW, Hwang TK. Complications of percutaneous nephrolithotomy classified by the modified Clavien grading system: a single center's experience over 16 years. *KorJ Urol*. 2011;52(11):769-75. DOI:10.4111/kju.2011.52.11.769
- Skolarikos A, de la Rosette J. Prevention and treatment of complications following percutaneous nephrolithotomy. *Curropin Urol*. 2008;18(2):229-34. DOI:10.1097/MOU.0b013e3282f46afc
- Clavien PA, Barkun J, De Oliveira ML, Vauthey JN, Dindo D, Schulick RD, De Santibañes E, Pekolj J, Slankamenac K, Bassi C, Graf R. The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg*. 2009;250(2):187-96. DOI: 10.1097/SLA.0b013e3281b13ca2
- De la Rosette JJ, Zuazu JR, Tsakiris P, Elsacka AM, Zudaire JJ, Laguna MP, de Reijke TM. Prognostic factors and percutaneous nephrolithotomy morbidity: a multivariate analysis of a contemporary series using the Clavien classification. *J Urol*. 2008;180(6):2489-93. DOI: 10.1016/j.juro.2008.08.025
- Mousavi-Bahar SH, Mehrabi S, Moslemi MK. Percutaneous Nephrolithotomy Complications in 671 Consecutive Patients: A Single-Center Experience. *J Urol*. 2011;8(4):271-6. doi.org/10.22037/uj.v8i4.1233
- Shin TS, Cho HJ, Hong SH, Lee JY, Kim SW, Hwang TK. Complications of percutaneous nephrolithotomy classified by the modified Clavien grading system: a single center's experience over 16 years. *Korean journal of urology*. 2011 Nov 1;52(11):769-75. DOI:10.4111/kju.2011.52.11.769
- Bjurlin MA, O'Grady T, Kim R, Jordan MD, Goble SM, Hollowell CM. Is routine postoperative chest radiography needed after percutaneous nephrolithotomy? *Urology*. 2012 Apr 1;79(4):791-5. DOI:10.1016/j.urology.2011.08.053
- El-Nahas AR, Shokeir AA, El-Assmy AM, Mohsen T, Shoma AM, Eraky I, El-Kenawy MR, El-Kappany HA. Post-percutaneous nephrolithotomy extensive hemorrhage: a study of risk factors. *The Journal of urology*. 2007 Feb;177(2):576-9. doi: 10.1016/j.juro.2006.09.048
- Srivastava A, Singh KJ, Suri A, Dubey D, Kumar A, Kapoor R, Mandhani A, Jain S. Vascular complications after percutaneous nephrolithotomy: are there any predictive factors? *Urology*. 2005 Jul 1;66(1):38-40. doi: 10.1016/j.urology.2005.02.010
- Kukreja R, Desai M, Patel S, Bapat S, Desai M. First prize: factors affecting blood loss during percutaneous nephrolithotomy: Prospective Study. *Journal of endourology*. 2004 Oct 1;18(8):715-22. doi: 10.1089/end.2004.18.715
- Mousavi-Bahar SH, Mehrabi S, Moslemi MK. Percutaneous Nephrolithotomy Complications in 671 Consecutive Patients: A Single-Center Experience. *Urology journal*. 2011 Nov 16;8(4):271-6. https://doi.org/10.22037/uj.v8i4.1233
- El-Nahas AR, Eraky I, Shokeir AA, Shoma AM, El-Assmy AM, El-Tahar NA, Soliman S, Elshal AM, El-Kappany HA, El-Kenawy MR. Factors affecting stone-free rate and complications of percutaneous nephrolithotomy for treatment of staghorn stone. *Urology*. 2012 Jun 1;79(6):1236-41. doi: 10.1016/j.urology.2012.01.026
- Shin TS, Cho HJ, Hong SH, Lee JY, Kim SW, Hwang TK. Complications of percutaneous nephrolithotomy classified by the modified Clavien grading system: a single center's experience over 16 years. *Korean journal of urology*. 2011 Nov 1;52(11):769-75. doi: 10.4111/kju.2011.52.11.769
- Osman M, Wendt- Nordahl G, Heger K, Michel MS, Alken P, Knoll T. Percutaneous nephrolithotomy with ultrasonography-guided renal access: experience from over 300 cases. *BJU international*. 2005 Oct;96(6):875-8. doi: 10.1111/j.1464-410X.2005.05749.x
- Wang Y, Jiang F, Wang Y, Hou Y, Zhang H, Chen Q, Xu N, Lu Z, Hu J, Lu J, Wang X. Post-percutaneous nephrolithotomy septic shock and severe hemorrhage: a study of risk factors. *Urological International*. 2012;88(3):307-10. doi: 10.1159/000336164
- Armitage JN, Irving SO, Burgess NA, British Association of Urological Surgeons Section of Endourology. Percutaneous nephrolithotomy in the United Kingdom: results of a prospective data registry. *European urology*. 2012 Jun 1;61(6):1188-93. doi: 10.1016/j.eururo.2012.01.003
- Korets R, Graversen JA, Kates M, Mues AC, Gupta M. Post-percutaneous nephrolithotomy systemic inflammatory response: a prospective analysis of preoperative urine, renal pelvic urine and stone cultures. *The Journal of urology*. 2011 Nov;186(5):1899-903. doi: 10.1016/j.juro.2011.06.064
- Okeke Z, Smith AD, Labate G, D'Addressi A, Venkatesh R, Assimos D, Strijbos WE, de la Rosette, on behalf of the CROES PCNL Study Group JJ. Prospective comparison of outcomes of percutaneous nephrolithotomy in elderly patients versus younger patients. *Journal of endourology*. 2012 Aug 1;26(8):996-1001. doi: 10.1089/end.2012.0046