

ORIGINAL ARTICLE

A RETROSPECTIVE STUDY OF PERCUTANEOUS NEPHROLITHOTOMY PERFORMED FOR THE MANAGEMENT OF RENAL CALCULUS: FIVE YEAR EXPERIENCE OF 1000 CASES

H. L. Gupta¹, Manish Gupta², Shameer Deen³

HOW TO CITE THIS ARTICLE:

H. L. Gupta, Manish Gupta, Shameer Deen. "A Retrospective Study of Percutaneous Nephrolithotomy Performed for the Management of Renal Calculus: Five Year Experience of 1000 Cases". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 39, September 28, 2015; Page: 6406-6411, DOI: 10.18410/jebmh/2015/877

ABSTRACT: OBJECTIVES: A Retrospective study to review and provide a detailed analysis of percutaneous nephrolithotomy for management of renal calculus disease. **PLACE AND DURATION:** The retrospective study was conducted by the Dept. of Urology, Mahatma Gandhi Medical College and Hospital, Jaipur. We reviewed the medical records of 1000 patients who underwent percutaneous nephrolithotomy for renal calculus disease from March 2010 to March 2015. **METHODS:** Patients with stones of various sizes and characteristics in the kidney and upper ureter were included in the study. The duration of the procedure, Perioperative analysis and intra and postoperative complications were reviewed. Mean age of inclusion were 2 to 75 years. Size of stones varying from 9mm to 7cms. **RESULTS:** Total of 1000 cases was included in the study consisting of 657 males and 343 females. Mean age of patient was 32 years (2-75 years). Calculus was more common in the right side than the left side. Mean operating time was 75mins. Complications occurred in 446 cases, but most of them were minor. **CONCLUSION:** Percutaneous nephrolithotomy is the procedure of choice for management of renal calculus disease, although associated with a marginally higher complication rate but most of them were minor further these can be overcome by establishing a protocol under skilled surgical experience. To decrease lung and pleural injury, we recommend a subcostal approach if possible. To decrease solid organ injury, we recommend using complete prone position.

KEYWORDS: Percutaneous Nephrolithotomy, Complications, Prone.

INTRODUCTION: The treatment for nephrolithiasis has been on shift from the past few decades. The standard open procedure has been completely replaced by minimal access surgery except in very few conditions. Percutaneous nephrolithotomy is a relatively non-invasive procedure, has now established as a surgical treatment of choice for nephrolithiasis owing to advancement in the instrumentation and techniques which have improved treatment outcomes and less morbidity.⁽¹⁾ It is standard surgical treatment for staghorn calculi, large volume calculi, upper tract calculi refractory to other modality, difficult lower pole stone, calculi in anatomically abnormal kidneys.^(1,2) As with other surgical procedure, PCNL is also associated with certain complications which can occur preoperatively as well as post operatively. Complications which can occur are, mainly while accessing kidney in form of haemorrhage or collecting system injury or adjacent organ injury, extravasation and fluid absorption leading to electrolyte imbalance in post-operative period, septicaemia, renal loss and mortality.^(3,4) We hereby report our experience of 1000 PCNL and incidence of its complications.

ORIGINAL ARTICLE

MATERIAL AND METHODS: 1000 patients who underwent PCNL at Mahatma Gandhi Hospital from March 2010 to March 2014 were reviewed retrospectively. The Ethical committee of Mahatma Gandhi University of Medical Sciences and technology has approved the study. The data were collected and studied and literatures were reviewed in relation to complications associated with PCNL. Preoperative evaluation and diagnostic work up was done in every case. Routine investigations including Haemoglobin, Serum Creatinine, Bleeding and clotting time, Urine examination, Viral Serum Markers & USG KUB, X-Ray KUB, IVP or CT scan were done for stone characteristics and Renal anatomy. All procedure was done in prone position. Puncture was done under fluoroscopic guidance. Tract was dilated using Alken fascial Dilators, usually up to 24 Fr to 30 Fr. Number of tract and site depends on the size and location of the stone. Rigid Nephroscope was used. Irrigation was done using Normal saline. Stones were fragmented using Pneumatic lithotripter and removed using tri-pronged and alligator grasping forceps. Double Pigtail ureteral stent were kept at the end of procedure in selected cases. Abdominal drain was placed in the nephrostomy tract and then blocked for the purpose of tamponade and opened on 1st post-operative day. Nephrostomy tube was removed on 2nd post-operative day. Ureteral stent were kept for 3 weeks and review X-Ray KUB was done before removal of stent.

RESULTS: Total of 1000 cases was included in the study out of which 657 males and 343 female were included. Mean age of patient was 32 years (2-75 years). Right side is more common than left side. Mean Operation time was 75mins. Most common site of stone was renal pelvis and the least common site was upper calyx. Sizes of stones varied from 9mm to 7cms. Complications occurred in 446 cases.

Age	2-75
M : F	65.7 : 34.3
Laterality	Right more common
Size of stone	9mm to 7cm
Site of Stone	Renal pelvis (Most Common)
Mean Operation Time	75mins

Table 1: Patient Demographics

Type of complications which occur are intra-operative bleeding, postoperative fever with or without urosepsis, Late bleeding, Renal collecting system injury, adjacent organ injury, electrolyte imbalance, Renal vascular injury, Residual stones (15 cases), Re PCNL /ESWL (6 cases).

Complications of PCNL

Complications	Our Experience	percentage
Bleeding	200	20%
Transfusion	100	10%
Angio-embolization	4	0.4%

ORIGINAL ARTICLE

Renal collecting system Injury	20	2%
Fever without Urosepsis	100	10%
Septicaemia	12	1%
Hemodynamic Abnormality	1	0.1%
Adjacents Organ Injury	1	0.1%
Pleural Injury/ Pneumothorax	10	1%

DISCUSSION: The evolution of minimal invasive procedure in form of PCNL has revolutionized the treatment of renal calculi. As no surgical intervention is 100% safe, so is the PCNL. Complications associated with PCNL ranges from minor complications such as Post-operative pain & fever to major complications such as renal vascular injury or adjacent organ injury.

Complications rate associated with PCNL reported up to 83% out of which majority is insignificant.^(5,6) The complications of PCNL can be divided in major and minor complications.

Bleeding is one of the common complications of the PCNL but haemorrhage which requires intervention is less. It can occur at various stages of the PCNL. It can occur at the time of access which is more of venous in nature and can occur while dilating percutaneous tract or injury to capsule or parenchyma.⁽⁷⁾ Vascular injury increases when the tract passes close to the renal hilum. Incidence of vascular injury increases with number of punctures, stone size, and location of stone.^(8,9) Bleeding which occur can be managed either conservatively or in some cases require intervention. In our series 4 patient required angio-embolization and 100 patients requires transfusion.

Post-operative fever/ sepsis can occur. Transient post-operative fever is a common occurrence following PCNL which can range from 15-30%.⁽¹⁰⁾ on the contrary fever with urosepsis is a rare complication.⁽¹¹⁾ Septicaemia can be seen as a result of infection introduced via the access tract to the kidney or working with the infected stones or system. Following PCNL, fever is significantly higher and more frequent in patients with infected urinary stones than in those with sterile stones.⁽¹²⁾ and patient requiring post-operative transfusion one or more than one.⁽¹³⁾ Septicaemia is low in patients treated with appropriate pre-operative antibiotics.⁽¹⁴⁾ which can be given either as a single dose or short course prophylaxis.⁽¹⁵⁾ Prophylactic antibiotics and drainage of a pyonephrotic kidney is mandatory prior to PCNL. Time of Operation, amount of irrigation fluid, pressure in collecting system, post-operative transfusion, multiple puncture, positive pelvic urine and stone culture increases the risk of fever and sepsis.^(16,17,18,19) In our series post-operative fever develop in 100 patient and septicaemia in 12 patient.

Hormonal and hemodynamic changes can occur during and after PCNL owing to its invasive nature and continuous irrigation to vital organ. There is tendency of Hyponatremia and metabolic acidosis.⁽²⁰⁾ In our series one patient developed hyponatremia.

Adjacent Organ Injury though occur less but accounts for major morbidity associated with PCNL. Injury to pleura and subsequent pneumothorax and hydrothorax can range from 0.7% to 2.4%.^(21,22) Injury to pleura is more common with supracostal approach in comparison to infra-costal approach. In our series 10 patients developed pneumothorax which was confirmed by chest X-ray and managed by placing intercostal tube with underwater seal bag drainage. Injury to abdominal organs may occur to colon, liver, spleen, small bowel.

ORIGINAL ARTICLE

Previous gastrointestinal surgery, advanced age and anatomically abnormal kidney, low body weight, female gender, lateral puncture may increase risk of the injury.^(3,23) In our series no solid organ injury occurred may be due procedure was done in complete prone position.⁽²⁴⁾ However there is one case of gallbladder perforation which was managed conservatively with percutaneous drainage of pericholecystic collection.

CONCLUSION: History and largely the previous literature and studies have proved that percutaneous nephrolithotomy is the procedure of choice for management of renal calculus disease, although associated with a marginally higher complication rate, but most of them were minor further these can be overcome by establishing a protocol under skilled surgical experience. To decrease lung and pleural injury, we recommend a subcostal approach if possible. To decrease solid organ, we recommend using complete prone position.

REFERENCES:

1. Preminger G M, Assimos D G, Lingeman J E, et al. chapter 1: AUA guideline on management of staghorn calculi : diagnosis and treatment recommendations. J urology 2005; 173: 1991-2000.
2. Albala D M, Assimos D G, Clayman R V, et al. Lower pole: a prospective randomized trial of extracorporeal shock wave lithotripsy and percutaneous nephrostolithotomy for lower pole nephrolithiasis- initial results. J Urol. 2001; 166 (6): 2072-2080.
3. Michel M S, Trozan Lutz, Rassweiler J J. Complications in Percutaneous Nephrolithotomy. European Urol. 2007; 51: 899-906.
4. Shin T S, Cho H J, Hong S H, et al. Complications of Percutaneous Nephrolithotomy classified by the modified clavien grading system : a single centre experience over 16 years. Korean J Urol. 2011; 52: 769-75.
5. de la Rosette J, Assimos D, Desai M, et al. The clinical research office of the endourological society Percutaneous Nephrolithotomy Global study: Indications, complications, and outcomes in 5803 patients. J Endourol 2011; 25: 11-16
6. Rudnick DM, Stoller ML. Complications of Percutaneous nephrostolithotomy. Can J Urol 1999; 6: 872-75
7. Lee WJ, Smith AD, Cubelli V et al. Complications of percutaneous nephrolithotomy. ATR Am J Roentology. 1987; 148 :177-80
8. Srivastava A, Singh KJ, Suri A, et al. Vascular Complications after percutaneous nephrolithotomy: are there any predictive factors? Urology. 2005;66:38-40
9. El-Nahas AR, Shokeir AA, El-Assmy AM, et al. Post-percutaneous nephrolithotomy extensive hemorrhage: a study of risk factors. J Urol 2007; 177:576-9.
10. Charton M, Vallancien G, Veillon B, Brisset JM. Urinary tract infection in percutaneous surgery for renal calculi. J Urol 1986;135:15-7.
11. Dogan HS, Guliyev F, Cetinkaya YS, Sofikerim M, Ozden E, Sahin A. Importance of microbiological evaluation in management of infectious complications following percutaneous nephrolithotomy. Int Urol Nephrol 2007; 39:737-42.

ORIGINAL ARTICLE

12. Takeuchi H, Ueda M, Nonomura M, et al. [Fever attack in percutaneous nephrolithotomy and transurethral ureterolithotripsy]. *Hinyokika Kiyo*. 1987; 33:1357-63.
13. Eric Taylor, Joe Miller, Thomas Chi, Marshall L. Stoller. Complications associated with percutaneous nephrolithotomy. *Transl Androl Urol* 2012; 1(4).
14. Vorrakitpokatorn P, Permtongchuchai K, Raksamani EO, Phettongkam A. Perioperative complications and risk factors of percutaneous nephrolithotomy. *J Med Assoc Thai*. 2006 Jun; 89(6):826-33.
15. Moslemi MK, Movahed SM, Heidari A, Saghafi H, Abedinzadeh M. Comparative evaluation of prophylactic single-dose intravenous antibiotic with postoperative antibiotics in elective urologic surgery. *Ther Clin Risk Manag*. 2010; 6:551-6.
16. Dogan HS, Sahin A, Cetinkaya Y, Akdogan B, Ozden E, Kendi S. Antibiotic prophylaxis in percutaneous nephrolithotomy: prospective study in 81 patients. *J Endourol*. 2002; 16:649-5.
17. Korets R, Graversen JA, Kates M, et al. Post-percutaneous nephrolithotomy systemic inflammatory response: a prospective analysis of preoperative urine, renal pelvic urine and stone cultures. *J Urol* 2011; 186:1899-903.
18. Margel D, Ehrlich Y, Brown N, et al. Clinical implication of routine stone culture in percutaneous nephrolithotomy--a prospective study. *Urology* 2006; 67:26-9.
19. Gonen M, Turan H, Ozturk B, Ozkardes H. Factors affecting fever following percutaneous nephrolithotomy: A prospective clinical study. *J Endourol* 2008; 22:2135-8.
20. Atici S, Zeren S, Aribogan A. Hormonal and hemodynamic changes during percutaneous nephrolithotomy. *International Urol & Nephro*. 2001; 32:311-14
21. Mousavi-Bahar SH, Mehrabi S, Moslemi MK. Percutaneous nephrolithotomy complications in 671 consecutive patients: a single-center experience. *Urol J* 2011; 8:271-6.
22. el-Nahas AR, Eraky I, Shokeir AA, et al. Factors affecting stone-free rate and complications of percutaneous nephrolithotomy for treatment of staghorn stone. *Urology* 2012; 79:1236-41.
23. Segura JW, Patterson DE, LeRoy AJ, et al. Percutaneous removal of kidney stones: review of 1,000 cases. *J Urol* 1985; 134:1077-81.

ORIGINAL ARTICLE

AUTHORS:

1. H. L. Gupta
2. Manish Gupta
3. Shameer Deen

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Urology, Mahatma Gandhi Medical College and Hospital, Jaipur.
2. Assistant Professor, Department of Urology, Mahatma Gandhi Medical College and Hospital, Jaipur.
3. Post Graduate Resident, Department of Surgery, Mahatma Gandhi Medical College and Hospital, Jaipur.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. H. L. Gupta,
Assistant Professor,
Department of Urology,
Mahatma Gandhi Medical College and Hospital,
Jaipur.
E-mail: drhotilalgupta@yahoo.com

Date of Submission: 14/09/2015.
Date of Peer Review: 15/09/2015.
Date of Acceptance: 21/09/2015.
Date of Publishing: 25/09/2015.