Impact of Body Mass Index On the Outcome of Percutaneous Nephrolithotomy For Renal Stone

Khuda Bux,[1] Muhammad Mansoor,[1] Naresh Kumar, [1] Shahzad Ali, [1]
Saeed Ahmed Khan, [1*] Shahid Hussain [1]

ABSTRACT

Objective — *To determine the outcome of percutaneous nephrolithotomy (PNL) in patients of renal stones with varied body mass index (BMI).*

Study design — *Cross sectional study.*

Place & Duration of study — *Department of Urology and transplantation, Jinnah Postgraduate Medical Center (JPMC), Karachi, from February 2019 to April 2020.*

Methodology — *Patients of renal stones were divided into four groups according to the BMI; underweight, normal weight, overweight and obese subjects. CT KUB was done in all patients to determine the size and site of the stone in renal unit. All patients underwent PNL. All had urine C/S to document infection in perioperative period. Postoperative complications were also noted. Patients were followed for six weeks with x-ray KUB to detect the presence of radio opaque stone or ultrasound demonstration of radiolucent stone to estimate frequency of stone free rate. Data were entered and analyzed by SPSS 21.0 version. A p value of less than 0.05 was considered as significant after applying Chi square test.*

Results — *A total of 133 patients were included in the study. Mean age of the patients was 51.9±8.2 year and mean body mass index 28.9±5.5 kg/m^2. There were 76 (57.1%) male and 57 (42.9%) female patients. Mean size of the stone was 2.4±0.4 cm, mean operative time was 67.3±22.5 minutes and mean fluoroscopy time was 55.2±11.4 seconds. Two (1.5%) patients were under weight, 6 (4.5%) of normal weight, 34 (25.6%) overweight and 91 (68.4%) were obese. Stone clearance was noted in 77 (57.9%) patients while stone clearance with respect to BMI was insignificant (p=0.592). Fever was documented in 22 (16.5%) patients and hematuria in 34 (25.6%) patients.*

Conclusion — *Stone clearance after PNL did not depend upon BMI of the patients. PNL is safe and effective treatment modality in obese patients with acceptable postoperative complication rate.*

Key words — *Renal Stone, BMI, PNL, Stone clearance.*

[1] Department of Urology & Transplantation JPMC, Karachi.

Correspondence:
Dr. Saeed Ahmed Khan [1*]
Department of Urology and Transplantation
Jinnah Postgraduate Medical Center
Karachi
Email: narejo.saeed@gmail.com

INTRODUCTION:

Obesity is a common condition that affects over 300 million people worldwide in industrialized as well as developing countries.[1,2] Obesity is one of the major global health issues.[2] In recent years obese patients with renal stones are seen frequently and most of them need intervention. Obesity has previously been demonstrated as an independent risk factor for urolithiasis because of the insulin resistance, dietary

factors and lithogenic urine profile (increased excretion of calcium, oxalate, sodium, and uric acid in the urine).[3-6]

Renal stone can be treated by different ways, like extracorporeal shock wave lithotripsy, retrograde intra-renal surgery and percutaneous nephrolithotomy. Treatment of renal stone in obese patient is a big challenge as obesity itself is a risk factor for failure of shock wave lithoripsy (SWL) for small stone due to increase skin to stone distance and even in open surgical procedure it affects postoperative recovery.[7] Since the advent of PNL for the management of renal stones, it is now being practiced as the gold standard technique with acceptable complication rate.[8] It has been seen that outcome of PNL has been compromised in obese patients. This may be due to failure to puncture the desired calyx because of short length of the instruments and increased stone to skin distance. In data by Clinical Research Office of the Endourological Society (CORES), it is evident that stone clearance was less in obese patients with prolonged operative time.[9]

Reported stone free rate in different studies varies from as high to 90 % to as low as 32 % in obese patients after PNL with number of postoperative complications.[4,9] However, PNL in obese patients is found to be safe approach with higher rate of re-intervention.[10] Obesity is also associated with an increased perioperative complication rate. The impact of body mass index on the outcome of PNL is still inconsistent. Few studies addressed the outcome of PNL in obese patients at national level. The aim of this study was to determine the outcome of PNL in relation to body mass index which may help the urologists for adopting surgical strategies in obese patients.

METHODOLOGY:

This was a cross sectional study conducted in the Department of Urology and Transplantation at Jinnah Postgraduate Medical Center Karachi, from February 2019 to April 2020. Approval was taken from the institutional ethical board. Patients of either gender between 18 years to 70 years of age with upper and middle calcyeal and pelvic stones of greater than 2.0 cm, lower calyceal stone of > 1.5 cm, and stone refractory to ESWL, were included in this study. Patients with chronic liver disease, bleeding disorder, positive urinary tract infection, and pregnant ladies were excluded from the study.

Demographic variables like age, sex, height (cm) weight (Kg) and body mass index were recorded in the pre designed form. CT KUB was done in all patients to assess the exact size and location of the stone. Operative and fluoroscopic time were noted. After six weeks of the procedure x-ray KUB was done to find out residual stones in case of radi opaque and ultrasound KUB for radiolucent stones at follow up. Perioperative and post-PNL complications like hematuria, fever and stone clearance were also recorded.

Data were entered and analyzed by using SPSS 23.0 version. Effect modifiers were controlled through stratification of age, gender, stone size and BMI levels (underweight, normal, over weight and obese) to see the impact of these on the outcome by Chi-Square test and considered two-sided p = 0.05 as statistical criteria of significance.

RESULTS:

Total of 133 patients were included in this study. There were 76 (57.1%) male and 57 (42.9%) female patients. Mean age of the patients was 51.9 + 8.2 year and mean BMI of 28.9 + 5.5 kg/m^2. Mean size of the stone was 2.4±0.4 cm, mean operative time was 67.3±22.5 minutes and mean fluoroscopy time 55.2±11.4 seconds. BMI of 2 (1.5%) patients was in underweight category, 6 (4.5%) had normal weight, 34 (25.6%) overweight and 91 (68.4%) patients were obese. Stone clearance rate was 57.9% (n=77). With respect to BMI this was found statistically insignificant (p=0.592). Fever was documented in 22 (16.5%) patients and hematuria in 34 (25.6%) patients. Table I shows the stratification with respect to BMI, age group, gender and stone size and outcome of percutaneous nephrolithotomy. Only gender and stone size were found significant.

DISCUSSION:

Obesity is a common health related problem world over due to sedentary life style and eating habits.[2] The incidence of different metabolic syndromes, cardiovascular diseases, and renal calculi is also increased with increasing obesity.[11] Pakistan is located in the stone belt of Afro-Asian region with stone prevalence of 12-15%. In urology OPD 50% of the adult and 60% of the children present with urolithiasis.[12,13] Prevalence of obesity is also increasing in Pakistan due to adaptation of different life style.[14]

PNL is a widely used method in renal stone treatment in both obese and non-obese patients for all type of stones. Reaching a pelvi-calyceal system (PCS) and stone during PNL with Amplatz sheath in obese patient may be little difficult due to huge

Table I: Study Parameters of Patients

1.1 Stone clearance with respect to BMI			
	Yes	No	p value
Underweight	01 (0.8%)	01 (0.8%)	
Normal weight	02 (1.55)	04 (3.0%)	0.592**
Overweight	17 (12.78)	17 (12.78%)	
Obese	57 (42.9%)	34(25.55%0	
1.2 Stone clearance with respect to gender			
Male	52 (39.1%)	25 (18.8%)	0.05*
Female	24 (18.04%)	32 (34.1%)	
1.3 Stone clearance with respect to age group			
18-45 years	34 (25.55%)	20 (15.0%)	0.328**
46-70 years	43 (32.3%)	36 (27.1%)	
1.4 Stone clearance with respect to size			
1.5-2.0 cm	45 (33.8%)	45 (33.8%)	0.008*
>2.0 cm	32 (24.1%)	11 (8.3%)	

*significant ** insignificant Chi-Square Test.

subcutaneous thick adipose tissue resulting in increased stone to skin distance. To overcome this access issue, Curtis et al used an incision in the skin and adipose tissue retracted to shorten the distance.[15] CORES study group published prospective data of 3709 patients who underwent PNL and found that stone clearance was affected with increase in BMI and required additional auxiliary procedures as well .[3]

In our study the mean age and gender were comparable with the other studies.[10,16,17] In current study the mean stone size was 2.4±0.4 cm. Nakamon T et al[16] noted stone size of 3.94±.78 cm and Reddy SV et al as 2.84±1.07 cm. [18] In our study the mean operative time was 67.3±22.5 minutes. The operative time was 72.4 minutes in Isoglu CS et al study.[10] However, it was 52.62±20.68 minutes in another study suggesting that duration of procedure varies.[18]

In present study, the mean fluoroscopy time was 55.2±11.4 sec. Isoglu CS et al noted fluoroscopy time as 144.4 sec which was much higher than our study.[10] Our study reported stone clearance rate as 57.9% which was lower than 70.49% by Nakamon T, et al. Reddy SV et al and Al Towa RR et al reported stone clearance rate of above 90%.[16,18,19] In present study fever was documented in 22 (16.5%) patients. The study of Darabi MR et al had similar results.[17] No fever was noted in underweight patients. On the other hand hematuria was documented in 15% in obese patients, 7.5% and 2.3% in overweight and normal BMI patients respectively. Stone clearance was observed in 42.9% of obese patients, 12.8% in overweight, 1.5% and 0.8 in normal BMI and obese patients respectively which was not significant.

CONCLUSION:

Stone clearance after PNL did not depend upon the BMI. PNL was safe and effective treatment modality in obese patients with acceptable postoperative complications.

REFERENCES:

1. Aboumarzouk OM, Somani B, Monga M. Safety and efficacy of ureteroscopic lithotripsy for stone disease in obese patients: a systematic review of the literature. BJU Int. 2012;110:374-80.

2. Türk C, Knoll T, Petrik A, Sarica K, Skolarikos A, Straub M, et al. Guidelines on urolithiasis. Eur Urol. 2015;40:362-71.

3. Fuller A, Razvi H, Denstedt JD, Nott L, Pearle M, Cauda F, et al. The CROES percutaneous nephrolithotomy global study: the influence of body mass index on outcome. J Urol. 2012;188:138-44.

4. Alyami FA, Skinner TA, Norman RW. Impact of body mass index on clinical outcomes associated with percutaneous nephrolithotomy. Can Urol Assoc J. 2013;7:197-201.

5. Semins MJ, Shore AD, Makary MA, Magnuson T, Johns R, Matlaga BR. The association of increasing body mass index and kidney stone disease. J Urol. 2010;183:571-5.

6. Mazzucchi E, Vicentini FC, Marchini GS, Danilovic A, Brito AH, Srougi M. Percutaneous nephrolithotomy in obese patients: comparison between the prone and total supine position. J Endourol. 2012;26:1437-42.

7. Flegal KM, Kit BK, Orpana H, Graubard BI. Association of all-cause mortality with overweight and obesity using standard body mass index categories: a systematic review and meta-analysis. JAMA. 2013;309:71-82.

8. Altunrende F, Tefekli A, Stein RJ, Autorino R, Yuruk E, Laydner H, et al. Clinically insignificant residual fragments after percutaneous nephrolithotomy: medium-term followup. J Endourol. 2011;25:941-5.

9. Chen TF, Chen CH, Lee YJ. The role of body mass index predicting outcome of percutaneous nephrolithotomy. Urol Sci. 2018;29:252-6.

10. Isoglu CS, Suelozgen T, Boyacioglu H, Koc G. Effects of body mass index on the outcomes of percutaneous nephrolithotomy. International Braz J Urol. 2017;43:698-703.

11. WHO Global Infobase. Data for Saving Lives. January 2011. Available at https://library.mcmaster.ca/data/who-global-infobase-data-saving-lives

12. Rizvi SA, Naqvi SA, Hussain Z, Hashmi A, Hussain M, Zafar MN, et al. The management of stone disease. BJU Int 2002;89:S62-8.

13. Sultan S. Evolution of pediatric urology at Sindh institute of urology and transplantation. Front Pediatr 2014;2:1-5.

14. Tanzil S, Jamali T. Obesity, an emerging epidemic in Pakistan-a review of evidence. J Ayub Med Coll Abbottabad. 2016;28:597-600.

15. Curtis R, Thorpe AC, Marsh R. Modification of the technique of percutaneous nephrolithotomy in the morbidly obese patient. Br J Urol. 1997;79:138-40.

16. Nakamon T, Kitirattrakarn P, Lojanapiwat B. Outcomes of percutaneous nephrolithotomy: comparison of elderly and younger patients. Int Braz J Urol. 2013;39:692-701.

17. Darabi MR, Soltani S, Rezayat AA, Yousefi M, Kashefi M, Tavakkoli M, et al. Clinicaloutcomes of the simultaneous bilateral percutaneous nephrolithotomy (PCNL) in patients with kidney stones: a prospective cohort study. Electronic Physician. 2018;10:6377-82.

18. Reddy SV, Shaik AB. Outcome and complications of percutaneous nephrolithotomy as primary versus secondary procedure for renal calculi. Int Braz J Urol. 2016;42:262-9.

19. Al-Toma RR. Safety and efficacy of percutaneous nephrolithotomy in patients with a single functioning kidney compared to patients with bilateral functioning kidneys. F1000Research. 2019;8(742):742. https://doi.org/10.12688/f1000research.19259.1.

Received for publication: 03-07-2021

Accepted after revision: 30-09-2021

Author's Contributions:
Saeed Ahmed Khan: Concept of study manuscript writing.
Muhammad Mansoor. Concept of study manuscript writing.
Shahzad Ali: Data analysis, final proof reading.
Naresh Kumar: Data analysis, final proof reading.
Khuda Bux: Data collection.
Shahid Hussain: Data collection.
All authors approved the final manuscript.

Ethical statement: Institution review board permission obtained prior to study and informad consent was taken.

Competing Interest:

The authors declare that they have no competing interest.

Source of Funding: None

How to cite this article:
Bux K, Mansoor M, Kumar N, Ali S, Khan SA, Hussain S. Impact of body mass index on the outcome of percutaneous nephrolithotomy for renal stone. J Surg Pakistan. 2021;26 (4):126-30. Doi:10.21699/jsp.26.4.2.