USAGE OF SUPPORTING PAD FOR SUPINE PCNL: A SINGLE CENTER EXPERIENCE

[1]Rizky Lukman Hakim, [1]Ponco Birowo.

[1] Department of Urology, Faculty of Medicine/Universitas Indonesia, Cipto Mangunkusumo General Hospital, Jakarta.

ABSTRACT

Objective: *This study aims to compare the safety, efficacy, and other surgical outcomes of supine PCNLs performed with and without the use of supporting pad.* ***Material & Methods:*** *We enrolled 27 patients who undergone PCNL procedure with supine position for renal stones with all sizes between January - December 2019. Divided into two groups, operated with and without supporting pad, with 13 and 14 patients respectively. Inclusion criteria are patients with renal stones, including staghorn, multiple calyx, and proximal ureteral stones. Meanwhile, pediatric patients under 12 years old, uncorrectable bleeding disorders, active urinary infection, and pregnancy are excluded.* ***Results:*** *Our observation showed no statistically significant difference between the two groups, although blood loss and length of stay in supporting pad showed better results. A statistically significant difference was found in stone-free-rate (P = 0.006) favoring in supine PCNL with supporting pad.* ***Conclusion:*** *Supine PCNL with support padding may be a safe and more effective choice to treat renal stones. Nevertheless, the patient's anatomic variations may influence this. Thus, a prospective study with a larger population is needed to verify our outcomes.*

Keywords: *Supine PCNL, PCNL, supporting pad.*

ABSTRAK

Tujuan: *Penelitian ini bertujuan untuk membandingkan keamanan, efikasi, dan luaran surgikal lainnya dari PCNL posisi supine dengan dan tanpa bantalan penopang.* ***Bahan & Cara:*** *Sebanyak 27 pasien menjalani prosedur PCNL posisi supine untuk tatalaksana batu ginjal dengan berbagai ukuran pada Januari-desember 2019. Pasien tersebut dibagi menjadi dua kelompok, yaitu kelompok yang dioperasi menggunakan bantalan penopang dan kelompok tanpa bantalan penopang, masing-masing berjumlah 13 dan 14 pasien. Kriteria inklusi adalah pasien dengan batu ginjal termasuk batu staghorn, kaliks multipel, dan ureter proksimal. Pasien berusia dibawah 12 tahun, memiliki gangguan pembekuan darah, infeksi saluran kemih, dan hamil merupakan kriteria eksklusi.* ***Hasil:*** *Tidak terdapat perbedaan signifikan antara kedua kelompok dari hasil observasi, meskipun perdarahan dan lama rawatan lebih baik pada kelompok dengan bantalan penopang. Perbedaan yang signifikan secara statistik terlihat pada angka bebas batu yang lebih baik pada kelompok dengan bantalan penopang (P = 0.006).* ***Simpulan:*** *PCNL posisi supine dengan bantalan penopang merupakan pilihan yang aman dan lebih efektif dalam mengatasi batu ginjal. Meskipun demikian, variasi anatomi pasien dapat mempengaruhi hal ini. Dibutuhkan penelitian prospektif dengan populasi yang lebih besar untuk verifikasi hasil penelitian kami.*

Kata Kunci: *Supine PCNL, PCNL, bantalan pendukung.*

Correspondence: Ponco Birowo; c/o: Department of Urology, Faculty of Medicine/Universitas Indonesia, Cipto Mangunkusumo General Hospital, Jalan Diponegoro No. 71, Senen, Jakarta Pusat, DKI Jakarta10430, Indonesia. Telephone: +6221-3923631. Email: ponco.birowo@gmail.com.

INTRODUCTION

Percutaneous nephrolithotripsy (PCNL) is now the first-line therapy in renal and upper ureteral stones (size more than 20 mm), multiple stones, resistant stones to shockwave lithotripsy and Staghorn stones.[1-3] The access was originally obtained with patients set in a prone position. The possibility of a supine position was first reported by Valdivia Uria et al. in 1998, to allow easier management of the airways from the anesthesiologic side.[2,4] Moreover, this position allows the surgeon to perform combined access to the upper urinary tract in an anterograde-retrograde fashion.[5]

Despite increased experience acquired through its many years of use, PCNL morbidity remains highest amongst stone treatment procedures. The pursuit of minimizing complication

rates, many urologists embarked on a mission of improving this old procedure. Many wonder if the position of the patient during operation plays an important factor in the complications of PCNL procedure.

PCNL in supine position is believed to provide more limited space for percutaneous access than those in prone position.[4,6] This disadvantage is usually fixed by modifying the supine position with supporting pad.[7]

OBJECTIVE

This study aims to compare the safety, efficacy, and other surgical outcomes of supine PCNLs performed with supporting pad with those performed without supporting pad at our department.

MATERIAL & METHODS

We perform a retrospective study conducted in Cipto Mangunkusumo National Referral Hospital, Jakarta. We enrolled 27 patients who had undergone PCNL procedure with supine position for renal stones with all sizes between January until December 2019. Thirteen PCNL procedures was performed in the supine position with supporting pad while 14 patients were operated without supporting pad. The inclusion criteria are patients with renal stones, including staghorn calculi, multiple calyx renal stones, and proximal ureteral stones. Meanwhile, the exclusion criteria were pediatric patients under 12 years old, uncorrectable bleeding disorders, active urinary infection, and pregnancy.

The pad is made of solid foam which is coated outside with waterproof material. It has a trapezoidal shape with a length of 30 cm, width 20 cm, height 10 cm, and a 15 degrees tilt angle. On the lateral part, there is a semicircular concave side as the location of the supine PCNL puncture.

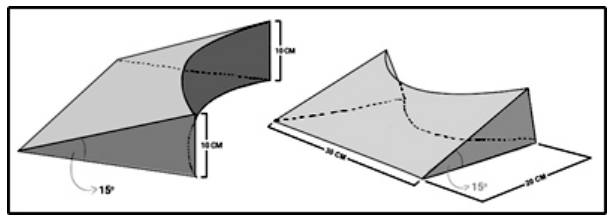

Figure 1. Pad design for supine PCNL.

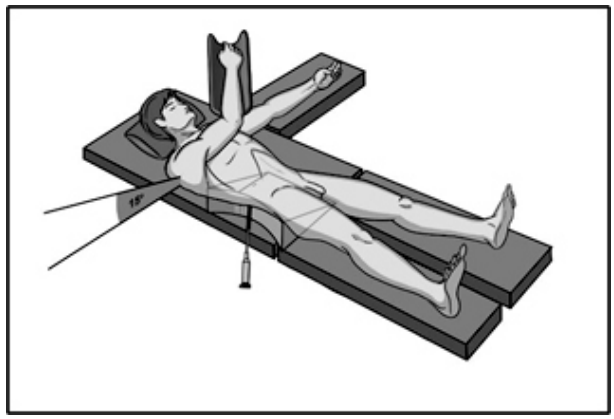

Figure 2. Patient position in supine PCNL with supporting pad.

All these PCNL procedures were performed under spinal anesthesia. The patient was placed in the lithotomy position, the rigid 22 French cystoscopes was inserted to evaluate the bladder, then the 5 French ureteral catheter was inserted. The patient was in supine position with a 15-degree tilt of the ipsilateral flank made by using pad. The percutaneous puncture was done for access into the

Figure 3. Operating sets for PCNL with Supporting pad.

pelvicalyceal system. Then the access tract was dilated using metal dilator, then inner sheath and amplatz sheath was positioned to allow the introduction of nephroscope. Stones identification and position was done then the stones were fragmented using lithotriptor. The stone fragments were then removed using stone forceps. Any visible laceration and active bleeding were also evaluated using nephroscope at the end of procedures. Any residual stones, visible lacerations, or active bleeding would influence the surgeon decision whether to place both of nephrostomy and DJ stent, either nephrostomy or DJ stent alone, or no placement of any of these tubes. Then the surgical wound was stitched.

We measured not only intraoperative outcomes such as stone-free rate (SFR), operative time, and intra operative blood loss but also some postoperative outcomes such as hospital length of stay (LOS), the necessity of postoperative ureteral catheter, DJ stent, nephrostomy, and spooling. Operative time was measured from the insertion of the cystoscope sheath for bladder evaluation up to the completion of wound stitching. Length of stay was defined as the number of days since the surgery was performed until the day of patient discharge. Patients with no residual stone with > 0.4 mm diameter was were considered stone-free.

All of the obtained data is evaluated using the SPSS software version. 24.0. The analysis was done using Chi-square and Mann-Whitney test. Any P value of less than 0.05 was considered statistically significant.

RESULTS

There were 27 patients were undergoing supine PCNL in Cipto Mangunkusumo National General Hospital Indonesia in 2019 that included in this study. The first group included 13 patients who were operated in supine position without supporting pad. The second group consisted of 14 patients were using padding support. The characteristics of all these subjects are shown in Table 1.

The duration of operation, blood loss, length of stay, and Amplatz size of the two groups were analyzed using Mann-Whitney. Stone-free-rate, postoperative ureteral catheter, post-operative Double-J stent, post-operative nephrostomy, and spooling variables were analyzed using Chi-Square. All of the observed variables are shown in table 2 and table 3

Table 1. Characteristics of Patient Supine PCNL with and without Padding Support.

Variables		Value		P-value
		With pad (n=13)	Without pad (n = 14)	
Sex, n (%)	Male	5 (38.5)	6 (42.9)	0.1
	Female	8 (61.5)	8 (57.1)	
Side, n (%)	Right	7 (53.8)	4 (28.6)	0.061
	Left	6 (46.2)	10 (71.4)	
Stone location, n (%)	Staghorn	6 (46.2)	4 (28.6)	0.587
	Renal pelvis	4 (30.8)	6 (42.9)	
	Individual calyx	3 (23.0)	4 (28.6)	
Max stone diameter (mm)	Mean ± SD	32 ± 17.2	30 ± 10.8	0.344
	Median (range)	27.5 (20-56)	30 (5–65)	
Stone, n (%)	Single	9 (69.2)	9 (64.3)	0.627
	Multiple	4 (30.8)	5 (55.7)	

Table 2. Intraoperative and Post-operative Parameters were Analyzed Using Mann-Whitney.

Variables	Without pad	With pad	P-value
Operation duration (minute)	110.77 ± 29.13	111.79 ± 25.05	0.954
Amplatz size (French)	28.23 ± 1.44	28.86 ± 0.59	0.378
Intraoperative Blood Loss (ml)	225.77 ± 133.78	160.36 ± 157.63	0.502
Length of Stay (day)	6.231 ± 1.442	5.500 ± 0.954	0.361

Table 3. Intraoperative and Post-operative Parameters were Analyzed Using Chi-square.

Variables	Without padding	With padding	P-value
Puncture locations			
- Inferior Posterior	12	8	0.078
- Media Posterior	0	4	
- Superior posterior	1	2	
Spooling			
- No	13	12	0.481
- Yes	0	2	
Postoperative DJ Stent			
- No	6	5	0.704
- Yes	7	9	
Postoperative Nephrostomy			
- No	9	6	0.252
- Yes	4	8	
Postoperative ureteral catheter			
- No	11	10	0.648
- Yes	2	4	
Stone free			
- No	11	4	0.006
- Yes	2	10	

All of the observed variables above were no statistically significant different between two groups. Blood loss and length of stay in group with padding support showed better result but not statistically significant.

Statistically significant difference was found in stone-free-rate variable (P = 0.006) in favor of the supine PCNL with supporting pad.

DISCUSSION

PCNL is currently a standard of care for treating kidney stones. It is safe and feasible by various techniques. Although PCNL is considered the gold standard treatment modality for large renal stones, this procedure is not lacking of side effects. In particular, damage to the large blood vessel and late hemorrhage are rare (less than 1%) but serious and potentially life-threatening complications of PCNL. Many studies which compared stone-free rate had the same preoperative patient demographic data in supine and prone positions. A study in favor of prone PCNL by Valdivia and colleagues reported a critical demographic difference at the start of the study that could significantly change its outcome. Another study by Zhan et al. which was done by a minimally invasive technique showed that stone composition can affect the result of stone-free rate. However, we found no other study in this regard. Stone-free rate definition and its technique and assessment time vary in different studies.

Prospective study by Desoky et al regarding stone-free rates showed that the stone-free rates achieved after one session of PCNL with padding was 90.0%.14 in this study, stone-free rates in padding group was 71.4%. The difference between the padding group and without padding group was statistically significant (p = 0.006)

Duration of operation in patients operated without padding support (110.77 ± 29.13) was shorter than the group using padding support (111.79 ± 25.05). The duration difference in both groups were not significant (p = 0.954). Abdel-mohsen et al in 2012 explained that the padding used under the flank makes it difficult to access posterior calyx.[8]

Next, the Amplatz size used in without padding group and with the padding group was 28.23± 1.44 and 28.86 ± 0.59, respectively. Amplatz size differences in both groups were not statistically significant (p = 0.378). We did not find other study comparing amplatz size in patients undergoing PCNL with padding and without padding.

In regards to the blood loss commonly occurring during PCNL procedures, a study reported its transfusion rate is 3%-23%.[9-11] In some cases, a hemostasis required interventional procedure.[9,12] In this study intraoperative blood loss in first group (225.77 ± 133.78) was higher than in second group (160.36 ± 157.63). The difference between two groups is not statistically significant (p

= 0.502). Elhamsyari et al. reported that there were 10% of patients in modified supine position and 15% in standard supine position had blood loss requiring blood transfusion.[13]

As for the hospitalization periods of patient it was found that patients in group without pad have longer hospitalization period compared to patients in group with pad, but the difference is not statistically significant (p = 0.361). Length of stay in the first group was 6.231 ± 1.442 and in the second group was 5.500 ± 0.954. A shorter hospital stay (4.4 ± 0.9) was reported by Desoky et al in patients operated using padding in flank free modified position.[14]

As for the postoperative ureteral catheter, it was found higher in the padding group (28.6%) than in without padding group (15.4%). The difference in both groups were not statistically significant (p = 0.648). DJ stent insertion was higher in the pad group (64.3%) than in without pad group (53.8%). DJ stents in both groups were not statistically significantly different (p = 0.704). There were 57.1% of patients in padding group had postoperative nephrostomy and 30.7% of patients in without padding group had nephrostomy. According to these data, the difference is not statistically significant (p = 0.252). There was no spooling in without padding group and 2 spooling in the padding group. Spooling differences in both groups are not significant (p = 481).

The limited number of references comparing the standard supine position with a modified supine position was being one of the limitation of this article. Furthermore, the authors are hoping to have more samples included in this study. The author wished that the results of this study could be useful for further studies.

CONCLUSION

In conclusion, PCNL in supine position with supporting pad may be a safe and more effective choice to treat renal stones in terms of stone-free rate. Nevertheless, the patient's anatomic variations may influence the stone-free rate. Thus, a prospective study with a larger population is needed to verify our outcomes.

REFERENCES

1. Kontos S, Papatsoris A, Nalagatla SK. Supine PCNL: An alternative to prone PCNL. Initial experience. Hellenic Urology. 2015; 27(1): 24-29.
2. Quaresima L, Conti A, Vici A, Tiroli M, Cantoro D, Rreshketa A, et al. Safety and efficacy of percutaneous nephrolithotomy in the Galdakao-Modified Supine Valdivia position: A prospective analysis. Archivio Italiano di Urologia e Andrologia. 2016; 88(2): 93-96.
3. Sofer M, Tavdi E, Levi O, Mintz I, Bar-Yosef Y, Sidi A, et al. Implementation of supine percutaneous nephrolithotomy: a novel position for an old operation. Central European Journal of Urology. 2017; 70(1): 60.
4. Gamal W, Moursy E, Hussein M, Mmdouh A, Hammady A, Aldahshoury Ml. Supine pediatric percutaneous nephrolithotomy (PCNL). Journal of Pediatric Urology. 2015; 11(2): 78-e1.
5. El Hamshary SA,El Barky EM, Mostafa MM, Abd AM, Hassanine MA. Flank suspended supine position versus standard supine and prone position in percutaneous nephrolithotomy. Benha Medical Journal. 2017; 34(2): 93.
6. Batagello CA, Barone HDS, Nguyen AH, Alshara L, Li J, Marchini GS, et al. Endoscopic guided PCNL in the prone split-leg position versus supine PCNL: a comparative analysis stratified by Guy's stone score. The Canadian journal of urology. 2019; 26(1): 9664-9674.
7. Sofer M. PCNL: understanding the beauty of the supine position. Central European Journal of Urology. 2017;70(1):68.
8. Xia Q, Zhao Z, Li C, Hao X, Dun W. Application of a Self-Made Equipment for Patient Positioning during Percutaneous Nephroscopy in the Oblique-Supine Position. Urologia Internationalis. 2019; 103(1): 89-94.
9. Pathirana H, Nandamuni Y, Manikkage Y, Hingalagoda C, Seneviratne LN. Supine percutaneous nephrolithotomy (s-PCNL) as an alternative to conventional prone approach. Proceedings of Annual Scientific Sessions of Faculty of Medical Sciences. 2016.
10. Torricelli FCM, Ogawa GK, Vicentini FC, Marchini GS, Danilovic A, Srougi M, et al. Supine percutaneous nephrolitotripsy in septuagenarian and octogenarian patients: outcomes of a case-control study. The Canadian Journal of Urology. 2018; 25(2): 9245-9249.
11. Gupta S, Maurya AK, Pal DK. Observational prospective study for surgical outcome and anesthetic feasibility of tubeless and totally tubeless supine PCNL: A single centre initial experience. Turkish Journal of Urology. 2019; 45(2): 146.
12. Mak DKC, Smith Y, Buchholz N, El-Husseiny T. What is better in percutaneous nephrolithotomy–Prone or supine? A systematic review. Arab Journal of Urology. 2016; 14(2): 101-107.
13. Srinivas SU, Gall Z, Lynch N, Pollard A, Counsell A, Brown S, et al. A retrospective, observational study of supine percutaneous nephrolithotomy. Journal of Clinical Urology. 2018; 11(4): 285-292.
14. Xia, Qiang, et al. Application of a Self-Made Equipment for Patient Positioning during Percutaneous Nephroscopy in the Oblique-Supine Position. Urologia internationalis (2019): 1-6.