

LATERAL PERCUTANEOUS NEPHROLITHOTOMY: A CASE SERIES

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ABSTRACT

Objective: To report our experience on lateral PCNL in the management of complex kidney stone in patients with many morbidities. **Case(s) Presentation:** In our hospital, there were 2 cases of incomplete stone clearance after PCNL which underwent lateral PCNL. The first case was a 47 years old woman who was morbidly obese and some cardiac problems such as coronary artery disease (CAD) and arrhythmia. Her intravenous pyelography shows that she has incomplete double collecting system with kidney stone in her upper moiety. She underwent PCNL in supine position which was halted due to arrhythmia with rest stone on her upper moiety system. The second case was a 57 years old male with multiple right kidney stone with hydronephrosis in his upper calyceal system. He has some comorbidities such as obese and CAD. He had history of open kidney surgery and right PCNL. Due to incomplete stone clearance after first procedure and some morbidities of those patients, we decided to perform PCNL on lateral position of both cases. The surgery went successfully with duration of 100 minutes in average with less than 100cc of blood loss. Both of the patients were discharged on second operation day without any complication. **Discussion:** Positioning for the patient who undergo PCNL is important. The lateral position of PCNL is useful in morbid obesity and have least effect on cardiac and respiratory function. This technique proved to increase patient comfort and safety. **Conclusion:** Lateral PCNL is safe and effective procedure to treat kidney stone in patients with history of incomplete stone clearance after supine or prone PCNL. It also can be performed safely in patients with comorbidities.

Keywords: Percutaneous nephrolithotomy, flank position.

ABSTRAK

Tujuan: Melaporkan pengalaman kami dalam melakukan PCNL lateral sebagai tatalaksana batu ginjal kompleks pada pasien dengan banyak morbiditas. **Presentasi Kasus:** Di RSHS, terdapat 2 kasus rest stone pasca-PCNL yang selanjutnya dilakukan PCNL dalam posisi lateral. Kasus pertama merupakan pasien wanita berusia 47 tahun dengan obesitas dan beberapa masalah jantung, seperti penyakit jantung koroner (PJK) dan aritmia. Hasil pyelografi intravena menunjukkan adanya double collecting system inkomplit dengan batu ginjal di upper moiety. Pada pasien ini, dilakukan PCNL dengan posisi supine yang terhenti akibat aritmia sehingga terdapat rest stone di upper moiety. Kasus kedua merupakan pasien laki-laki usia 57 tahun dengan batu ginjal multipel kanan dengan hidronefrosis di kaliks superior. Pasien memiliki beberapa komorbiditas seperti obesitas dan PJK. Pasien memiliki riwayat operasi ginjal terbuka dan PCNL kanan. Akibat adanya rest stone setelah prosedur pertama dan beberapa morbiditas, kami memutuskan untuk melakukan PCNL pada posisi lateral untuk kedua kasus tersebut. Operasi berjalan dengan sukses dengan durasi rata-rata 100 menit dan kehilangan darah kurang dari 100 cc. Kedua pasien dipulangkan pada hari kedua operasi tanpa komplikasi. **Diskusi:** Pemilihan teknik posisi pada tindakan PCNL merupakan hal yang penting. Posisi lateral merupakan pilihan yang dapat dipilih pada pasien obesitas. Selain itu, posisi lateral juga memiliki efek yang minimal pada fungsi jantung, pernapasan, dan hemodinamik. Teknik ini dapat meningkatkan kenyamanan dan keamanan terutama pada pasien dengan komorbid obesitas dan gangguan hemodinamik. **Simpulan:** PCNL posisi lateral merupakan prosedur yang aman dan efektif untuk menangani batu ginjal pada pasien dengan rest stone pasca PCNL supine atau prone. Prosedur ini juga aman dilakukan pada pasien dengan komorbiditas.

Kata Kunci: Percutaneous nephrolithotomy, posisi lateral.

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INTRODUCTION

Since 1976, Fernstrom and Johansson reported on three patients who were unsuitable for open surgery and who had renal stones removed using a percutaneous technique.¹ Percutaneous nephrolithotomy (PCNL) is a preferred surgical procedure for especially >2cm stones and also would be performed for 1-2 cm stones. PCNL is also one of choice in staghorn stone removal. Percutaneous nephrolithotomy has become the treatment of choice for large kidney stones based on its high success rate.²

The prone position is the conventional method for performing PCNL for many years. This was only position in that era. In prone position, it provides a large surface area for the choice of puncture site and a wide space for instrument manipulation. But this position has its limitations due to circulatory and ventilator difficulties, especially in obese and patients with cardiovascular problems.²⁻⁴

The supine position also has limitations especially in patients with complex stones and renal anomalies, it also associated with higher bleeding incidence and lower success rate in patients with

anterior calyceal stones. In other hand, the flank position results in less restriction of the respiratory movement of the chest wall so that it facilitates anesthesiologic access to the endotracheal tube, especially in obese patients.^{2,5} One of the advantages of flank position is the increased distance between the rib cage and the kidney that facilitates the subcostal access to the upper calyces. The flank position is associated with upward displacement of chest wall; therefore there is enough space for upper pole access.⁶ In this study, we aimed to report our experience on lateral PCNL in the management of complex kidney stone in patients with many morbidities.

CASE(S) PRESENTATION

In our hospital, there were 2 cases of incomplete stone clearance after PCNL which underwent lateral PCNL. The first case was from a 45 years old woman. She had flank pain as chief complaint. The second case was a 57 years old male with multiple right kidney stone with hydronephrosis in his upper calyceal system.

Table 1. The patient characteristics.

No.	Gender	Age	History	Physical Examination	Radiology	Comorbidities
1	F	45	-Flank pain -History of PCNL for left kidney and DJ stent insertion due to incomplete staghorn -ESWL due to 8x5mm right ureterolithiasis	CVA Tenderness + (left)	IVP: incomplete double collecting system with kidney stone in her left lower moiety (22x21mm)	- Coronary artery disease - Obesity - Previous Supine PCNL was halted due to arrhythmia
2	M	57	- Flank pain -History of open kidney surgery, right PCNL, and ESWL on left kidney	CVA Tenderness + (right)	IVP: infundibular stenosis with multiple right kidney stone from his upper calyceal system (21x14mm – 5x6mm)	- Coronary artery disease - Obesity - Previous Supine PCNL with residual stone

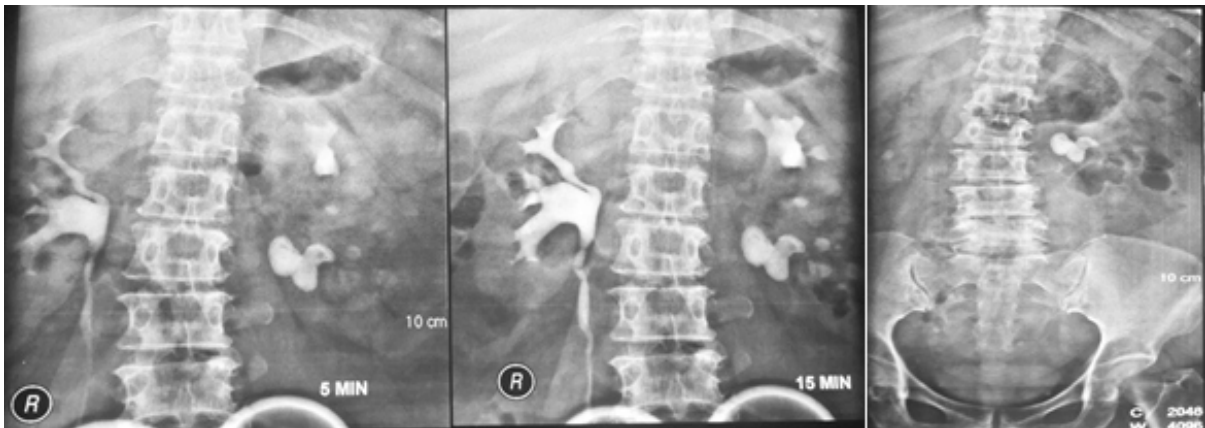


Figure 1. Pyelography of first patient. 22x21 mm stone in the left kidney.



Figure 2. Series of intravenous pyelography showed infundibular stenosis.

The surgery went successfully with duration of 100 minutes in average with less than 100cc of blood loss. From the first patient, we got a 22x21mm kidney stone in left renal pelvis. Then for the second patient, we evacuated multiple right kidney stone from his upper calyceal system varies from 21x14mm-5x6mm. Both of the patients were discharged on second operation day without any complication. During the operation, blood loss was minimal, only less than 100cc. Total surgery time 100 minutes in average. The patient was stone-free after the operation. The patient was discharged on postoperative 2nd day without any complication and was involved in routine follow-up program.

DISCUSSION

Percutaneous nephrolithotomy (PCNL) is an effective surgical treatment for especially >2cm stones.² Some individual factors affect the success

rate of this method. Those factors are stone size, stone location, Hounsfield unit, surgical volume of the operating center Surgical, and also patients' factors. Patients' factors such as age, associated deformities, and obesity are the main predicting factors of PCNL success rate.⁷

In obese patient, extracorporeal shockwave lithotripsy is not suitable due to skin-to-stone distance. Open surgery is not routinely recommended because of increased risk of complications either. Greater blood loss, greater loss of renal function, increase injury to other organs, longer time for hospitalization, and longer convalescence.³ After that, the treatment of choice is PCNL.

Positioning for patient who undergo PCNL is important. The optimal position may require a compromise between the best position for surgical access and the position that the patient can tolerate. The chosen position may result in physiological

changes and can result in soft tissue injury (e.g., nerve damage, pressure-induced injury or ulceration, or compartment syndrome).⁸ Since introduction of PCNL, prone position is the conventional one.¹ Several positions have been described for PCNL as further modification of this technique. Those positions are supine, lateral decubitus, modified lateral, reverse lithotomy, split leg, and flank position.⁹⁻¹¹ A recent survey from Endourology Society members found that 86% respondents used the prone position, 10% supine, and 4% lateral decubitus.¹²

As mentioned before, PCNL is classically performed in the prone position. Despite its efficacy and safety, it is associated with considerable cardiopulmonary strain patients. The prone position is also related to ventilator and circulation difficulties, especially for obese and patients with cardiovascular disease.³ There was decrease in mean blood pressure and an increase in heartbeat in patient who undergo PCNL in prone position.¹³ In the prone position, the operator is provided a large surface area for the choice of puncture site and a wide space for instrument manipulation. Conversely in Supine position, it has anesthetic advantages but results in poorer ergonomics and increased surgical difficulty.^{4,14}

In our patients, there were some problems such as obese and cardiovascular disease. Prone position was not possible. In the first patient, we had tried prone position but PCNL should be stopped because patient got arrhythmia during surgery. To prevent any other complication might arise, the

proper position should be prepared. One of alternative is lateral position.

In our experiences, we choose this technique because the lateral position minimize hemodynamic and respiratory risks. This technique proved to increase patient comfort and safety. We found that lateral position is much easier to patient repositioning to supine than prone position. This technique is more ergonomic than prone position and also easier to identify posterior calyces.¹⁴ Instead of the benefit, the lateral position is inconvenient for PCNL guided by a C-arm, and the working tract is nearly vertical to the operating table, which limits the evacuation of stone fragments.⁸

PCNL in lateral position may be performed under epidural or local anesthesia only and the surgeon may perform nephroscopy and ureteroscopy simultaneously. The most important, lateral position is useful in morbid obesity or severe kyphoscoliosis and have least effect on cardiac and respiratory function. It has advantage, especially for high risk patient.¹⁵⁻¹⁶ But in this patient repositioning is required and fluoroscopy is technically limited necessitating triangulation or ultrasound-guided access. An axillary roll or padded wedge with a grieve to accommodate the dependent arm must be positioned to adequately support the chest and prevent positioning-related injury. Extra padding must also be placed under the dependent knee and ankle to prevent pressure-related complication.²

Follow up will be taken twice, after surgery and 2 weeks after surgery with abdominal x-ray. Comparing the surgical outcomes in non-staghorn



Figure 3. Lateral patient position. (a and b). Lateral view. A pad was placed in between patient's leg. (c). Anterior view. Patient's arms are slightly flexed. Support was given to prevent any injury. The patient was at risk from falling, so patient was tied at operating table.



Figure 4. Puncture Site on Subcostal Region.

stone patients who underwent PCNL in the prone, supine, and lateral positions noted similar success rates 1-month post-procedure in all positions. It results 92%, 86%, and 88%, respectively. The stone-free rate for patients with staghorn stones using lateral position was varied 66.4%-78%.^{14,17} Previously, our first patient undergoes ESWL and PCNL in prone position but not stone free. In our cases, all patients were stone free after lateral position PCNL.

PCNL is generally accepted as a safe procedure. Hemorrhage is the most frequent complication of this procedure. Excessive bleeding can occur during needle passage, tract dilatation, or nephrostomy.¹⁸ In our cases, there was only minimal bleeding, approximately 100cc. It did not require any blood transfusion.

The operating time was also compared to the mean operating time of prone and supine PCNL were 99 minutes and 81 minutes.⁵ This is comparable to our case which was only 100 minutes.

From previous studies, prior open stone surgery or PCNL did not affect subsequent PCNL results and complication.¹⁸ Similar in our cases, there is no complication after latest PCNL. There is no complication in patient with a history of previous open surgery, PCNL, or ESWL. These two patients were discharged from hospital after two days of hospitalization. The limitation of this study was the lack of data. Only 2 cases were reported in this study. In the future, additional cases and data are needed to improve this technique and also to know the safety and efficacy of lateral PCNL.

CONCLUSION

As reported, obesity, cardiovascular problem, and prior history of incomplete stone clearance make percutaneous nephrolithotomy more complicated. Lateral PCNL is safe and effective procedure to treat kidney stone in patients with history of incomplete stone clearance after supine or prone PCNL. It also can be performed safely in patients with comorbidities.

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