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Supine versus Prone Position Percutaneous Nephrolithotomy

Amir Elmetwally Ibrahim Abd Elgawad*, Farouk Ismail Elguoshy, Yasser Ali Ahmed
Department of Urology, Faculty of Medicine, Al-Azhar University
*Corresponding author: Amir Elmetwally Ibrahim Abd Elgawad, Mobile: 01001992278,
Email: amiribrahimm@yahoo.com

ABSTRACT

Background: percutaneous nephrolihotomy (PCNL) is the first choice for treatment of single more than 2cm and multiple renal stones. The prone position is the classical position preferred by most surgeons. Then the supine position was developed for percutaneous nephrolithotomy.

Objective: to compare between supine and prone PCNL in the management of renal stones regarding number of puncture, stone free rate, operative time, intraoperative and postoperative complications.

Patients and Methods: the patients were selected, all having multiple stones, or stone size 2 cm or more. They were 30 patients divided into two groups, group (A) prone 15 patients and group (B) supine 15 patients. The study excluded patients with renal anomalies, uncontrolled coagulopathy, pregnancy, immunosuppression, and ages less than 10 years.

Results: the study demonstrated a significant difference only in operation time which was (89.00±30.37) in prone group & (64.67±24.75) in supine group with p-value (0.023) between the prone and supine position, with shorter operation time in the supine than the prone. The study has also demonstrated that there is no statistically significant difference between the two groups as regarding to stone free rates, hospital stay, intraoperative, and postoperative complications.

Conclusion: in patients with multiple renal stones, or stone size 2 cm or more, supine PCNL has proved to be superior to prone PCNL as regarding operative time. However, Urologists should be familiar with the differences in the positions and be able to use the method appropriate for each patient.

Keywords: Percutaneous nephrolithotomy, intra venous urogram, extracorporeal shockwave lithotripsy

INTRODUCTION

After many years, PCNL is the treatment of choice for large and/or complex urolithiasis. Instead of becoming obsolete over the decades, PCNL underwent considerable evolution since its introduction in 1976, progressively acquiring a new configuration to improve its efficacy and safety in expert hands [(1)].

The old static procedure become a technically updated to mini-invasive approach a continuous advances regarding imaging techniques, anesthetic skills, patient positioning, renal access puncture, retrograde and antegrade use flexible endoscopes with better technology and vision, a variety of accessories, intracorporeal lithotripsy devices, and postoperative renal drainage [(2)].

In 1976 the prone position was the one used by **Fernstrom and Johansson** [(3)] when they described the percutaneous nephrolithotomy technique. Then it became the traditional technique. The prone position provided a wide surgical field for renal puncture and easy nephroscopic manipulation, easier upper pole puncture with a lower risk of pleura, lung, and spleen/ liver injury, a good distension of the collecting system [(4)].

On the other hand, the anesthetic concerns of the prone position (especially in morbidly obese patients, those with skeletal deformities or compromised cardiopulmonary status) and the difficulty of obtaining a combined retrograde and antegrade accesses to the renal cavities, when needed are issues that have been overlooked for years [(5)].

The supine positions for PCNL are not the unique alternatives to the prone position as demonstrated by many of recent literature, proposing flank, lateral, flank prone, split-leg modified lateral, prone flexed, supine oblique, semisupine positions, and many others. The relevant aspect is that all these authors made their proposals in a common effort to improve their surgical percutaneous practice. Of course, efficacy, feasibility, and safety of PCNL performed in any alternative position have been compared to those of the prone PCNL, by now with substantially equivalent urological outcomes (in terms of operative time, stone-free rates, hospital stay, and complication rates) [(2)].

Among the advantages of PCNL performed in the supine position there are numbers of urological and anesthesiological advantages which have been widely reported. The ventilatory, cardiovascular, and pharmacokinetic problems of the prone position are overcomed in the supine positions, with better access to the airways and the cardiovascular system [(6)].

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Urological advantages include the possibility of an endovision-assisted renal puncture and tract dilation, a demonstrated decreased risk of colon injury, a great position in the combined stone manipulation, a better descending drainage and retrieval of stone fragments from lithotripsy because of the downward position of the Amplatz sheath, low intrarenal pressures so less pyelovenous back flow and less postoperative infectious risk [7].

The major disadvantage of the supine position is that the kidney is more easily pushed forward by the puncture needle and the dilators, leading to enter through a deeper channel [8].

AIM OF THE WORK

The aim of this work is to compare between supine and prone PCNL in the management of renal stones regarding number of puncture trial, stone free rate, operative time, intraoperative and postoperative complications.

PATIENTS AND METHODS

Thirty patients underwent PCNL having renal stones starting from 2016 in a prospective study. The study was carried out in Al-Hussein University hospitals in Cairo and the National Institute of Nephrology and Urology in Cairo.

Written consents were taken from the patients and the study was approved by the ethical committee of Al-Azher University.

Patients: The study included 30 patients which were selected and divided into two groups. Group A: included 15 patients subjected to PCNL in the prone position Group B: included 15 patients subjected to PCNL in the complete supine position according to **Falahatkar *et al.*** [9].

Inclusion criteria: Patient selected for PCNL operation must have: Single or multiple renal stones more than 2 cm, Stag horn stones, and Fitness for anesthesia.

Exclusion criteria

Patients were excluded from the study when they have one of the following: Renal anomalies. Ureteric stricture. Uncorrected anemia, or systemic bleeding disorders. Sever heart disease and pulmonary insufficiency. Uncontrolled diabetes or hypertension. Patient taking anticoagulants such as aspirin and warfarin requested to stop taken for 10 days preoperative. Pregrancy. Immunosuppression. Age less than 10 years old.

Study methods:

1- Preoperative evaluation:

- **History taking:** Personal history, complaint especially pain and its severity. Present history of associated urological symptoms. Past history of medication like diabetics, hypertension, cardiac or chest diseases, any anticoagulant medications. Past surgical history of previous operations open surgery and endourological surgery.

- **Examination:** All patients were examined physically, assessing their body mass index and scars of previous operations. Any spinal deformity. Chest examination and evaluation for patients with chronic chest diseases. Also cardiac evaluation for patients with chronic cardiac diseases. And then further anesthesia consultation was done especially for chest and cardiac abnormality.

- **Investigations: Laboratory tests:** Renal function in form serum creatinine, sodium, potassium and urea. Liver function tests. Complete blood picture. Coagulation profile and urine analysis was done if there is pyuria detected, urine cultures were obtained if positive, antibiotics were administered accordinaly. Radiological: Pelvi-abdominal ultrasonography was done as 1st line of imaging investigation. IVU (Intra Venous Urogram) was done. Non contrast multi-slice computed tomography (CT) scan was done if there was a radiolucent stone or contraindications to IVU. Patients with single or principle functioning kidney and patients who are chronic renal failure did renal isotope scan to assess the function of the kidney to be operated upon.

2- Operative Procedure: Patient informed about the procedures and the other options if the procedure fails like proceeding to pyelolithotomy or proceeding to extracorporeal shockwave lithotripsy (ESWL). Consenting the patient for removal of the stone by PCNL procedure and explaining all expected complications and if failed puncture in either position, according to circumstances, stented ESWL or open stone extraction will be done at the same session. If procedure aborted after reaching the collecting system (eg. Hemodynamic instability) a nephrostomy tube was left followed by 2nd look PCNL after one week. Prophylactic antibiotic given at induction of anesthesia. Cystoscopy by 22F diagnostic cystoscope was done to evaluate the urethera and the bladder, then applying the ureteric catheter of 6F and the retrograde

evaluation was done to determine the patency of the ureter and plan the appropriate calyx to puncture. In the prone position PCNL puncture site was done at the posterior axillary line and access through the posterior division of the lower or middle calyx by Amplatz dialators and sheath.

3- Postoperative evaluation:

- **Early:** Drop of hemoglobin that indicated severe blood loss required blood transfusion especially if there was severe bleeding during the operation. DJ insertion intraoperative due to aborting the procedure or suspicion of residual.

- **Late:** Urinary leakage that required the intervention by fixation of DJ. Fever for more than 3 days. Stone free rate (no stone residual or stone residual less than 4 mm in diameter) by plain x-ray if the stone were known to be radiopaque and pelvi-abdominal CT if the stone was radiolucent. The mean hospital stay. ESWL postoperative due to significant residual.

Statistical Analysis:

Data were collected, revised, coded and entered to the statistical package for social science (SPSS) version 20. Qualitative data were presented as number and percentages while quantitative data were presented as mean, standard deviations and ranges. The comparison between groups with qualitative data were done by using Chi-square test and/or Fisher exact test instead of chi-square test when the expected count found less than 5 in any cell. The comparison between two groups regarding qualitative data with parametric distribution was done by using Independent t-test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: P>0.05: non-significant. P<0.05: Significant. P< 0.01: Highly significant.

RESULTS

Table (1): Comparison between prone group and supine group regarding patients data.

Patients data		Prone group No. = 15	Supine group No. = 15	Test value	P-value	Sig.
Age	Mean±SD Range	42.87 ± 12.30 16 – 60	46.80 ± 13.84 20 – 68	-0.823	0.418	NS
Sex	Females Males	5 (33.3%) 10 (66.7%)	6 (40.0%) 9 (60.0%)	0.144	0.705	NS
Weight	Mean±SD Range	74.20 ± 8.02 53 – 90	77.20 ± 6.53 65 – 88	-1.124	0.271	NS

P > 0.05: Non significant (NS); < 0.05: Significant (S); < 0.01: Highly significant (HS)

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding patients data.

Table (2): Comparison between prone group and supine group regarding stone data

Stone data		Prone group	Supine group	Test value	P-value	Sig.
Size (cm)	Mean±SD Range	2.87 ± 0.51 2.2 – 4	2.83 ± 0.64 2.2 – 4.5	0.189	0.851	NS
Number of stones	Single Double	15 (100.0%) 0 (0.0%)	11 (73.3%) 4 (26.7%)	4.615	0.032	S
Site	Renal pelvis Lower calyx Lower calyx & pelvis Mid calyx & pelvis	10 (66.7%) 5 (33.3%) 0 (0.0%) 0 (0.0%)	6 (40.0%) 7 (46.7%) 1 (6.7%) 1 (6.7%)	3.333	0.343	NS

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding size of stone and site of stone while there was statistically significant difference found between them regarding number of stones.

Table (3): Comparison between prone group and supine group regarding surgical and medical history

Surgical and medical history		Prone group No. = 15	Supine group No. = 15	Test value	P-value	Sig.
Open	No	11 (73.3%)	14 (93.3%)	2.160	0.142	NS
	Yes	4 (26.7%)	1 (6.7%)			
Endo	No	11 (73.3%)	7 (46.7%)	2.222	0.136	NS
	Yes	4 (26.7%)	8 (53.3%)			
ESWL	No	9 (60.0%)	10 (66.7%)	0.144	0.705	NS
	Yes	6 (40.0%)	5 (33.3%)			
Medical History	No	13 (86.7%)	10 (66.7%)	4.725	0.450	NS
	DM	1 (6.7%)	0 (0.0%)			
	HTN	1 (6.7%)	2 (13.3%)			
	Chest	0 (0.0%)	1 (6.7%)			
	Cardiac stent	0 (0.0%)	1 (6.7%)			
	HTN & DM	0 (0.0%)	1 (6.7%)			

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding surgical and medical history of the studied cases.

Table (4): Comparison between prone group and supine group regarding operative time and puncture site and No. of Puncture

		Prone group No. = 15	Supine group No. = 15	Test value	P-value	Sig.
Operative time (min)	Mean±SD	89.00 ± 30.37	64.67 ± 24.75	2.406	0.023	S
	Range	45 – 140	40 – 120			
Puncture site	Lower calyex	15 (100.0%)	12 (80.0%)	3.333	0.068	NS
	Middle Calyx	0 (0.0%)	3 (20.0%)			
No. of Puncture	1	15 (100.0%)	15 (100.0%)	NA	NA	NA

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding puncture site and number while there was statistically significant difference between them regarding operative time.

Table (5): Comparison between prone group and supine group regarding stone free rate & intra-operative complications

Stone free rate and Intra-operative complications		Prone group No. = 15	Supine group No. = 15	Test value	P-value	Sig.
Stone free rate		11 (73.3%)	13 (86.7%)	0.833	0.361	NS
Residual Stone		4 (26.7%)	2 (13.3%)	0.833	0.361	NS
Mean Blood Loss (gm/dl)	Mean±SD	2.33 ± 0.69	1.95 ± 0.78	1.415	0.168	NS
	Range	1 – 3.5	0.5 – 3.4			
Failed Puncture	No	15 (100.0%)	15 (100.0%)	NA	NA	NA
	Yes	0 (0.0%)	0 (0.0%)			
Organ Injury	No	15 (100.0%)	15 (100.0%)	NA	NA	NA
	Yes	0 (0.0%)	0 (0.0%)			

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding stone free rate & intra-operative complications

Table (6): Comparison between prone group and supine group regarding postoperative complications

Post operative complications		Prone group	Supine group	Test value	P-value	Sig.
Fever	No	14 (93.3%)	14 (93.3%)	0.000	1.000	NS
	Yes	1 (6.7%)	1 (6.7%)			
Hemorrhage	No	15 (100.0%)	15 (100.0%)	NA	NA	NA
	Yes	0 (0.0%)	0 (0.0%)			
Urine Leakage	No	14 (93.3%)	15 (100.0%)	1.034	0.309	NS
	Yes	1 (6.7%)	0 (0.0%)			

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding postoperative complications

Table (7): Comparison between prone group and supine group regarding auxiliary retreatment

Auxilary retreatment		Prone group	Supine group	Test value	P-value	Sig.
2nd look	No	15 (100.0%)	15 (100.0%)	NA	NA	NA
	Yes	0 (0.0%)	0 (0.0%)			
JJ Fixation	No	13 (86.7%)	14 (93.3%)	0.370	0.543	NS
	Yes	2 (13.3%)	1 (6.7%)			
ESWL	No	11 (73.3%)	13 (86.7%)	0.833	0.361	NS
	Yes	4 (26.7%)	2 (13.3%)			

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding auxiliary retreatment

Table (8): Comparison between prone group and supine group regarding hospital stay

		Prone group	Supine group	Test value	P-value	Sig.
Hospital Stay (days)	Mean±SD	3.47 ± 1.41	3.13 ± 0.83	0.789	0.437	NS
	Range	2 – 8	2 – 6			

The previous table shows that there was no statistically significant difference found between prone group and supine group regarding hospital stay.

DISCUSSION

PCNL is widely used and has almost completely replaced open surgery for removal of large renal stones, since its first description by **Fernstrom and Johansson** [(3)].

Traditionally, PCNL has been performed in the prone position, which allows a wide field for kidney puncture, avoids abdominal visceral injuries, and makes the puncture pathway straight and short. Multiple routes of access and the interoperative use of C-arm fluoroscopy X-ray machines may contribute to the vertical positioning of the puncture [(10)].

However, prone position also has disadvantages. Classically the patient is initially placed in the lithotomy position for ureteric catheter insertion and then changed to a prone position for the rest of the procedure, then repositioning him after finish the procedure. This changing of position under anaesthesia makes unnecessary delay and also a risk of limbs, nerves, neck, ligaments, and ophthalmic injuries to the patient. Furthermore, this position is less favourable in morbidly obese patients and patients with severe cardiopulmonary diseases, Moreover diseases like severe spine disease and ankylosing spondylitis are relative contraindications for prone PCNL, and this led urologists to use alternative positions for PCNL [(11)].

The supine position for percutaneous stone surgery was first described by **Valdivia-Uria *et al.*** [(12)]. Many authors suggested this position as being more safe and easy with many advantages over the prone position in terms of reducing operation time, avoiding injuries that may occur during repositioning the patient, anaesthesia-related difficulties, as well as reducing radiation exposure to the team, and ability of the surgeon to perform the procedure whilst sitting [(13)]. Furthermore, as the abdominal wall is punctured

more laterally, away from the lumbar muscles, movements of the endoscopic instruments are less restricted. The direction of the tract preserves a low pressure in the renal pelvis, which reduces the risk of fluid absorption and allows even spontaneous washout of fragments. According to anatomical CT studies, the risk of colon perforation might even be less than in the prone position, as the bowel can float free in the uncompressed abdomen and is not pressed towards the kidney [14].

However, one of the main disadvantages of the supine position is the little enough space for more punctures when needed [15]. Until now, there has no consensus on the best position.

In our study, we prospectively compare the outcome between supine position with conventional prone position as standard control in single renal stone 2cm or more or multiple renal stones. The procedure done by the same team of urologists expertise in supine and prone PCNL and were evaluated in term of stone free rate, operative time, operative and postoperative complications, needs for auxillary treatment and the hospital stay.

In our study, stones in group (A) prone position patients range from 2.4 cm to 4 cm, all were single stones, 10 was in renal pelvis while 5 was in lower calyx. On the other side, stones of Group (B) supine position patients range from 2.2 cm to 4.5 cm, 11 were single renal stones, and 4 were multiple renal stones located in renal pelvis& lower calyx, renal pelvis& middle calyx, twice in lower calyx, twice in renal pelvis. With no statistically significant difference found regarding size and site of the stones, while there was statistically significant difference found between two groups regarding number of the stones.

Sohail and colleagues [16] demonstrated that the stone size was in range of 29 mm in prone group (101 patients) and 29.7 mm in supine group (96 patients).

Jones and colleagues [17] performed on 236 patients. The supine group patients were 160. The types of stones were multiple stones (49 patients), staghorn stones (17 patients), and stones more than 2 cm (94 patients). While the prone group patients were 76, the types of stones were multiple stones (18 patients) and staghorn stones (15 patients), stones more than 2 cm (43 patients).

Wang and colleagues [18] performed on 122 patients (62 men and 60 women; age range, 22 to 70 years), 102 with renal calculi and 20 with ureteral calculi, the prone group (52 patients with renal calculi and 10 with upper ureter calculi) and supine group (50 patients with renal calculi and 10 with upper ureter calculi) position, with renal stones more than 2 cm and upper uretral stone more than 1.5cm.

Eliwa and colleagues [19] performed on 60 patients with staghorn stones and stone more than 2 cm in size. In prone group the stone size more than 2 cm (25 patients) and 5 patients with staghorn stones and in the supine group stones more than 2 cm (28 patients) and 2 patients with staghorn stone.

In the study we choose a site of puncture which was the shortest (skin-kidney distance), easiest to deal with all the stones inside following a preplanned tract according to stone morphology. In prone group- punctures were through the lower calyx, while supine group- punctures were through middle calyx in 3 patients, the rest were through lower calyx, with no statistically significant between the two groups regarding the calyx chooses as a puncture site, there were no cases of failed puncture in our study.

In our study the operation time was shorter in the supine group than the prone group, most probably related to the time taken for repositioning of the patient. The range time for supine group was from 40 to 120 minutes, with mean time in the supine group was 65 ± 25 min and in prone group the range was from 45 to 140 minutes with mean time which was 89 ± 30 min with p value = 0.023 which is statistically siginificant difference.

Jones and colleagues [17] found a shorter operative time in the supine group compared with the prone group. Also familiarity with the procedure performed in the supine position may affect the efficiency and success of the operation. The mean time difference was in the prone group was 123±49.5 min and in the supine group was 93±45.5 min with a p value <0.01. This agrees with our study.

Sohail and colleagues [16] demonstrated a significant reduction in operation time in the supine group with P value < 0.001. The mean time for the supine group was 98 min. The mean time for the prone group was 130 min. This agrees with our study.

Wang and colleagues [18] found that the operation time was much shorter in the prone than in the supine position group. The mean time was 78 min in the prone group vs 88 min in the supine group with p value 0.03. This may be due to the steep learning curve with the supine position

which leads to a longer time in the supine group. This was in disagreement with our study.

Eliwa and colleagues [19] reported that operative time was calculated from the patients positioning for fixing ureteral catheter till the fixation of the nephrostomy. Regarding the operative time the mean operative time in both groups was 94.9 ±10.12 min.In supine group the operative time [96.2±10.85minutes] was longer than prone group 93.6±9.71min however this difference was statistically insignificant P-value=0.3, which disagree with our study.

In our study, the mean hospital stay in prone group was 3.47 ± 1.41 with a range of 2-8 days and in supine group was 3.13 ± 0.83 with a range 2-6 days. There is no statistical significant difference with p value = 0.437.

Jones and colleagues [17] stated that the supine group (2days) stayed on average a day shorter in hospital than the prone group (3 days). With highly significant difference with p value=0.005. This disagrees with our study.

Wang and colleagues [18]said that as regard hospital stay, there was no significant different between the two groups, as in prone group the range of the stay was from 6-11 days with mean stay of (8.2), and in supine group range was from 6-12 days with mean stay of (8.4), there is no statistical significant like our study.

Sohail and colleagues [16] demonstrated a significant difference regarding the hospital stay, which was shorter in the supine group 2.7 (2-5 days) versus the prone group 3.9 (2-8 days) (P < 0.001). This disagrees with our study.

Eliwa and colleagues [19] showed that the mean hospital stay was 3.4±1.2 days and 3.2±1.01 days [p=0.1] in supine and prone position respectively, which statistically insignificant and this agree with our study.

In our study there was no need for blood transfusion for any patient in both group. As the range of blood loss was 1-3.5 gm/dl with mean blood loss of 2.33±0.69 in prone group, at the same line in supine group the range was 0.5-3.4 gm/dl with mean blood of 1.95±0.78. There was no statistically significant between both groups p-value = 0.168.

With our study **Jones and colleagues** [17] reached to that blood transfusions were required for 3 patients (4%) in the prone group and 3 patients (2%) in the supine group, with postoperative anaemia not requiring transfusion occurring in both groups, with 3 patients (4%) and 1 patient (0.6%) respectively. P-value= 0.615.

Eliwa and colleagues [19] reached that the overall transfusion rate was 5% [3 patients] two in prone group one in supine group. The mean preoperative Hemoglobin in supine group was 12.10 gm/ml ±0.74 which turned to 10.75gm/ml ±1.07 postoperatively. Only one patient in this group required blood transfusion [3.3%]. The mean preoperative Hemoglobin in prone group was 12.01 gm/ml ±0.59 which turned to 10.83 gm/ml ±1.05 postoperatively. Regarding the preoperative and postoperative Hb in A and B there were no significant statistical differences between both groups [P=0.5 and P=0.7 respectively]. And this is at the same line with our study.

According to **Sohail and colleagues** [16] the percentage of blood transfusion was 2.9% only 3 patients in the prone group and no record of blood transfusion in the supine group with p value 0.09. There was no statistical significant difference and this agrees with our study.

Wang and colleagues in [18] demonstrated hemoglobin drop in the prone group 2.2% and in the supine group 2.4% with p value =0.23, with statistical insignificant difference. This is agrees with our study.

In our study residual stones more than 4mm were as follow, in prone group (4 patients) has experienced residual stones (26.7%), while in supine group only (2 patients) has residual stones (13.3%), with no statistically significant between two groups (p-value = 0.361).

Jones and colleagues [17] stated that there is a high prevelance in stone free rate for the supine position than for the prone (70% supine vs. 50% prone, p=0.005). This disagrees with our study.

Sohail and colleagues [16] demonstrated 79.2 % stone free rate in the prone group and 85 % stone free rate in the supine group with no significant difference between the two groups. This is agrees with our study.

Wang and colleagues [18] found that there is a statistical significant different between supine and prone group PCNL p-value = 0.03, with lower stone clearance for supine group (73.3%) versus (88.7%) for prone group, but they stated that because they compared only the stone size in the study not complexity of the renal stones, and that against our study.

Eliwa and colleagues [19] the stone free rate at 24-h imaging was higher in prone group than in supine group 70.0% [21 patients], and 63.3% [19 patients] respectively however this was statistically insignificant p-value =0.5, which agree with our study.

In our study as regard the need for auxiliary treatment, there was no need for Second Look PCNL for both groups of the study, 4 patients in prone group required postoperative ESWL (26.7%) for their residual stones, 2 (86.7%) of them non stented, and other two (13.3%) were stented using jj stents one of them was intraoperative stent, and the other was fixed for postoperative urinary leakage which was only one (6.7%) case of leakage in this group of patients, while only 2 patients in supine group required ESWL (13.3%) one of them was stented intra operative (6.7%) and, the other was non stented for ESWL, there was no patients has experienced intra operative organ injuries or postoperative hemorrhage, there were only one (6.7%) patients in each group who experienced postoperative fever for more than 2 days which subsides by medical treatment, those revealed there was no statistically significant different between our both groups regarding all above data.

Sohail and colleagues [16] demonstrated that in the prone group, 14 (13.9%) patients had a persistent urine leakage, 5(49%) were managed conservatively, 9 patient stented, and one patient (1%) had a fever >38ºC. Whilst, in the supine group, five (5.2%) patients had persistent urinary leakage, 3 of them managed conservatively and two patients (2.1%) had a fever of >38ºC. There were no complications, e.g. pneumothorax, arteriovenous fistula, adjacent visceral injury, or death in either group. There was no statistical significant difference and this was in agreement with our study.

Jones and colleagues [17] demonstrated that there was a significantly higher rate of overall complications seen in the prone group compared with the supine group. with 14 total complications (18%) for the prone group and 13 total (8%) for the supine group, One major complication (haemothorax) occurred in the prone group which required drainage. Sepsis occurred in 4 patients (5%) in the prone group and 6 patients (3%) in the supine group, and there was a urine leak (urinoma) requiring stenting with a DJ for 1 patient in each group. There was no statistical significant difference. This is in agreement with our study.

Wang and colleagues [18] said that None of the patients in their study experienced major complications, fever as a minor complication were 5 patient in prone group, and 6 patient in supine group, with our study that no significant.

Eliwa and colleagues [19] inform that they didn't had postoperative urinary leakage this is may be due to the constant use of post procedure JJ stent, and No cases of organ injuries were reported in their study, and about postoperative pain needing parenteral analgesic was noticed in 16 cases in the supine position and 18 patients in the prone position, also statistically with our study.

CONCLUSION

In patients with multiple renal stones, or stone size 2 cm or more, supine PCNL has proved to be superior to prone PCNL as regarding operative time, with comparable rate of hospital stay, stone free rates, intra and post complications with prone PCNL. However, Urologists who perform PCNL should be familiar with the differences in the positions and be able to use the method appropriate for every patient, more studies are needed with larger population to evaluate which position is better in PCNL.

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