

# [Percutaneous nephrolithotomy in supine position health and social care essay](https://assignbuster.com/percutaneous-nephrolithotomy-in-supine-position-health-and-social-care-essay/)

Ultrasound-Guided Renal Access

## ABSTRACT

Aim: To evaluate PCNL in supine position under ultrasound guided puncture regarding its technical aspects, successrate and complications. Patients and Methods: The study included 47 patients. All patients with renal and or upper ureteral stones wereincluded in this study while patients with uncorrectable coagulopathy, congenital anomalies in the kidney wereexcluded. PCNL in supine position was done under US guided puncture while dilatation was done under fluoroscopy. Results: 20 cases (42. 5%) had pelvic stone, 18 cases (38. 3%) had calyceal stone, 5 cases (10. 6%) had multiple stones, 1 case (2. 1%) had upper ureteic stone and 3 cases (6. 4%) had stagehorn stones. 25 cases (53. 2%) were right sidedand 22 cases (46. 8%) were left sided. Stone size was 2. 9 ±1. 029. 42 cases had radiopaque (89. 4%), while 5 cases hadradiolucent stone (10. 6%). Upper calyceal puncture was done in 2 cases, middle calyceal puncture in 6 cases, lowercalyceal puncture in 32 cases (68. 1%), and multiple punctures in 9 cases. Stone desintigration using pneumaticlithoclast was done in 31 cases (66%), and intoto stone extraction was done in 16 cases (34%). Mean operative timewas 70 minutes (60-120 minutes). The intraoperative complications were dilatation difficulties in 5 cases (10. 6%), bleeding requiring transfusion in 2 cases (4. 2%). Stone free rate was achieved in 44 cases (93. 6%) and residual stonemore than 4 mm was detected in 3 cases (6. 4%). Mean hospital stay was 3. 2 days (2-5 days), fever in 4 cases (8. 5%), urinary leakage in 3 cases (6. 4, %). Conclusion: PCNL in supine position under ultrasound guided puncture is feasible, safe, and successful with minimalcomplications. KEYWORDS: Supine position; PCNL; StonesCORRESPONDENCE: Hammouda Sherif, MD, Benha University, BenhaElgdeeda, Benha, 11513, Egypt (hammoda\_elsherif@yahoo. com). CITATION: UroToday Int J. 2012 Feb; 5(1): art 89. http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07

## Abbreviations and Acronyms

CT: Computed tomographyDJ: Double JESWL: Electrohydrolic lithotripsyIVU: Intravenous urographyPCS: Pelvicaliceal systemPCNL: Percutaneous nephrolithotomyURS: UreteroscopyUS: UltrasonographyUroToday International Journal® UIJ©2012 Digital Science Press, Inc. UIJ / Vol 5 / Iss 1 / February / http://dx. doi. org/ 10. 3834/uij. 1944-5784. 2012. 02. 07http://www. urotodayinternationaljournal. comISSN 1944-5792 (print), ISSN 1944-5784 (online)UroToday International Journal®

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## Introduction

Despite newer advances in stone surgery, includingextracorporeal shockwave lithotripsy (ESWL) and flexibleureteroscopy (URS) with laser lithotripsy, the percutaneousapproach is still the optimal method for minimally invasive, upper tract stone surgery [1]. Percutaneous nephrolithotomy(PCNL) in the prone position is accepted globally for itsfamiliarity, excellent understanding of the anatomy in thisposition, and a reduced risk of visceral complications. However, there are various concerns regarding PCNL in the proneposition, especially in the morbidly obese and patients withcompromised cardiopulmonary status and stature deformitywho are not suitable for treatment in the prone position [2]. Moreover, the conventional setting of the prone position, thehands of the urologists are in the field of the fluoroscopy, thusincreasing the radiological hazards to medical personnel [3]. Valdivia and associates [4] first described the supine positionfor percutaneous stone surgery. They suggested that the colonfloats away from the kidney when the patient is in a supineposition, which makes the colon less likely to be injured bya puncture made in the posterior axillary line. Hopper andcolleagues [5] found that in a series of 90 prone and 500 supineabdominal CT scans, the bowel was posterior to the kidneysin 10 and 1. 9% of cases, respectively. They suggested that thebowel might be more often encountered in the posterior of thekidney in the prone position compared to the supine position. Therefore, performing PCNL in the prone position may increasethe risk of colon injury. PCNL in the supine position has several advantages. First, itdoes not disturb blood circulation and respiration the way theprone position does. Second, the risk of iatrogenic colon injuryis lower in the supine position. Third, this position is convenientfor the anesthetist to observe the patient and switch to generalanesthesia with endotracheal intubation, if necessary. Fourth, the angle between the horizontal plane and working tract issmall, so it is easier to wash out stone fragments through theworking sheath. In addition, urologists are made comfortableby sitting while performing the operation [6]. Ultrasonography (US) has made a significant impact in thefield of urinary interventions. US guidance makes proceduressafer, limiting the number of needle punctures and decreasingradiation exposure. In most cases, it is complementary tofluoroscopy, providing image guidance for different urinaryprocedures [7]. In addition to avoidance of contrast materialadministration, identification of all the tissue between theskin and kidney, and the energy expenditure of the surgeonand other staff of the operating room, decreases as it is notnecessary to wear a lead shield [8]. In this study, we evaluated PCNL in the supine position under anultrasound-guided puncture in regards to its technical aspects, success rate, and complications.

## Patients and methods

This study included 47 patients (30 males and 17 females)admitted to the urology department of Benha UniversityHospital between January 2010 and December 2010. Allpatients with renal and or upper ureteral stones were includedin this study, while patients with uncorrectable coagulopathy, congenital anomalies in the kidney, such as a horseshoe kidney, and ectopic pelvic kidney were excluded. Informed writtenconsent was taken from all participants after the study protocolwas approved by the Research Ethical Committee, Faculty ofMedicine, Benha University. All patients where investigated preoperatively via routinelaboratory tests, pelviabdominal US, KUB, IVP, and spiral CT, when indicated. PCNL in the supine position was done under high spinalanesthesia, with the patient placed in the supine positionwith the side harboring the stone close to the operating table(Figure 1). Figure 1. Position of the patient. http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07f1UIJUroToday International Journal®

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Percutaneous Nephrolithotomy in Supine Position with Ultrasound-Guided Renal Access©2012 Digital Science Press, Inc. UIJ / Vol 5 / Iss 1 / February / http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07http://www. urotodayinternationaljournal. comISSN 1944-5792 (print), ISSN 1944-5784 (online)The ipsilateral flank was elevated with a water bag, and theipsilateral arm was laid on the thorax. Intravenous accesswas established in the contralateral arm after a standardcystourethroscopy and 6 Fr, open tip, ureteral catheter wasinserted into the ipsilateral ureteral orifice. A kidney puncture was done under real-time US (Toshiba), afterdistending the pelvicalyceal system with saline from the uretericcatheter for better US imaging and puncture. The puncturesite and path was chosen in the mid axillary line, and then an18-gauge puncture needle was advanced into the appropriatecalyx using a needle-guiding system fixed to the US probe. A US-guided puncture through the cup of the desired calyx wasestablished. A 0. 38, floppy-tip guide wire was advanced into thechosen calyx. Tract dilatation was performed after opacificationof the PCS, with a contrast medium in a retrograde fashion, under fluoroscopic guidance using Alken dilators up to 27 Fr, except in 5 cases where hypermobile kidney balloon dilatationwas used. A 30 Fr Amplatz sheath was used, and then a standard26 Fr, rigid nephroscope was used for stone retrieval (Figure 2). A 26 Fr nephrostomy tube was fixed at the end of procedure. Patient demographics, body mass index (BMI), stonecharacteristics, operative time, intra- and postoperativecomplications, stone clearance, and the total number of sessionsof the PCNL required were collected, tabulated, and analyzedusing the Statistical Package of Social Science (SPSS), version11, software. Suitable statistical techniques were computed(frequencies, mean, standard deviation, and range).

## Results

Patient demographics and stone features were summarized inTables 1 and 2. Intraoperative data of the study group weredemonstrated in Table 3. Multiple punctures were done in 7cases: lower and middle calices in 5 cases, lower and uppercalices in 2 cases. The intraoperative complications, including dilatationdifficulties, were found in 5 cases (10. 6%), and bleedingrequiring transfusion was found in 2 cases (4. 2%). Visceralinjury did not occur in any of the studied cases. The stone-free rate was achieved in 44 cases (93. 6%). Residualstones more than 4 mm were detected in 3 cases (6. 4%). Stonefree was considered if there were no residual stones or stonesless than 4 mm. Subsequent auxiliary procedures were usedas DJ insertion and ESWL in 2 cases (4. 2%), while in the thirdcase of residual stones with prolonged leakage there was aFigure 2. PCNL in the supine position. http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07f2`6 mm stone that passed spontaneously after 5 days withoutintervention. the mean hospital stay was 3. 2 days (range 2 to5 days). Postoperative complications in the form of fever occured in4 cases (8. 5%), and urinary leakage in 3 cases (6. 4%). Therewas insignificant difference (p = 0. 018) between pre- andpostoperative hemoglobin (11. 3 ± 0. 95, 10. 8 ±1. 3, respectively), as well as pre- and postoperative hematocrite value (32. 7 ± 1. 9, 31. 2 ± 3. 25, respectively; p = 0. 003).

## Discussion

The prone position has been the most commonly used positionfor PCNL, because this was the way the technique was invented; however, the main reason for perseverance with this positionmust be the apprehension of colonic and vascular injury [9]. Various modifications in patient positioning for PCNL emergedas urologists understood more of the surface anatomy ofthe kidney and related viscera. When patients were placedin the supine position for percutaneous nephrolithotomy, the ipsilateral flank was elevated with a 1L or 3L water bag, depending on a patient’s body mass [9]. Falahatkar andcolleagues [8] performed complete supine PCNL without arolled towel under the flank, and no change in leg position. Weconsidered that there was no essential difference in the basicUIJUroToday International Journal®

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Percutaneous Nephrolithotomy in Supine Position with Ultrasound-Guided Renal Access©2012 Digital Science Press, Inc. UIJ / Vol 5 / Iss 1 / February / http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07http://www. urotodayinternationaljournal. comISSN 1944-5792 (print), ISSN 1944-5784 (online)to 120 minutes). The mean operative time in studies by Manoharet al. [2], Valdivia et al. [4], and Rana et al. [9] was 85, 74, and 65minutes, respectively, which are comparable to this study. DeSio et al. [11] reported a much shorter mean operative time (43minutes), while others reported a much longer mean operativetime, such as Zhou et al. [6] , Neto et al. [13], and Basiri et al.[14], who reported 162 , 120, and 111 minutes, respectively. Intraoperative ComplicationsIn the current study, intraoperative complications includeddilatation difficulties (10. 6%), which were due to anteromedialdisplacement of the kidney during dilatation of the tract whenthe dilators met the resistance of the renal capsule. The tractbecame longer and more perpendicular rather than parallel tothe fluoroscopy table. This issue was solved by extra abdominalcompression during dilatation to minimize renal movement, the use of super-stiff guide wire, and 1-step ballon dilatation. Dilatation difficulties were reported by others (11 to 12%)principles and surgical techniques between 2 supine positions. The mean age in this study was 46. 12 ± 10. 75 (range 24 to 65years). A patient’s number was 47, which was comparable tostudies done by Shoma et al. [10], Ng et al. [3], Manohar et al.[2], and De Sio et al. [11], who studied 53, 62, 62, and 39 cases, respectively. Larger studies were done by Valdivia et al. [4], Steele and Marshall [1], and Rana et al. [9], who studied 520, 322, and 184 cases, respectively. In this study, the mean BMI in kg/sqm (± SD) was 23. 6 ± 5. 92(4 patients, 8% were morbidly obese), which is comparable to astudy done by Manohar et al. [2], who did supine PCNL in obesepatients, and the mean BMI was 24. While Hoznek et al. reported26. 1 ± 5 [12]. Others used body weight instead of BMI [1, 4, 9, 10]. In this study, the mean operative time was 70 minutes (range 60Data Number PercentTotal number of cases 47Age (mean + SD) 46. 12 + 10. 75BMI in kg/sqm (mean + SD) 23. 6 + 5. 92 (8% weremorbid)GenderMale 30 63. 8Female 17 36. 2ComorbidityDM 4 8. 5COPD 6 12. 7Hypertension 6 12. 7IHD 3 6. 4Liver disease 1 2. 1Multiple comorbidities\* 4 8. 5Previous renal stone surgery(total)6 12. 7Open 4 8. 5PCNL 2 4. 2\*Multiple comorbidities in 4 cases (2 cases had DM andhypertension; 1 case had COPD and IHD; 1 case had livercirrhosis, DM). Table1. Patient demographic data. http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07t1Data Number PercentStone sitePelvic stone 20 42. 5Calyceal stone (total) 18 38. 3Upper calyceal 2 4. 2Middle calyceal 5 10. 6Lower calyceal 11 23. 4Staghorn 3 6. 4Upper ureteric stone 1 2. 1Multiple stones\* 5 10. 6Stone sideRight 25 53. 2Left 22 46. 8Stone size mean (+ SD cm) 2. 9 + 1. 029Stone radiopacityOpaque 42 89. 4Lucent 5 10. 6\*Regarding multiple stones, 2 cases had stones in upper andlower calices, while the other 3 cases had stones in the middleand lower calices. Table 2. Stone characteristics. http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07t2UIJUroToday International Journal®

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Percutaneous Nephrolithotomy in Supine Position with Ultrasound-Guided Renal Access©2012 Digital Science Press, Inc. UIJ / Vol 5 / Iss 1 / February / http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07http://www. urotodayinternationaljournal. comISSN 1944-5792 (print), ISSN 1944-5784 (online)[9, 10]. Bleeding requiring transfusion occurred in 2 cases (4. 2%), whichwas directly related to stone size, procedure duration, and thecreation of multiple tracts. One of them had a 2 cm stone inthe middle anterior calyx and underwent direct puncture onthe stone (single stage, 1 tract). Another, with a 4 cm staghornstone calculus without hydronephrosis, underwent lower andmiddle-caliceal puncture (single stage, 2 tracts) for completestone clearance. Both of these patients were diabetic andhypertensive. This was comparable with other series (3. 2 to5. 2%) [1, 2, 3, 8, 14]. Fewer incidences were reported in somecases (0 to 1. 4%) [4, 11], while a higher incidence was reportedin others (9. 4 to 11%) [6, 10], and this was attributed to theirlearning curve. Visceral injury did not occur in any of thestudied cases. Stone clearance rate in this study was 93. 6%, which iscomparable to other studies (70. 5 to 95%) [2, 3, 9, 10, 11, 13, 14]. Residual stones more than 4 mm occurred in 3 cases (6. 4%). Postoperative ComplicationsIn this study, fever did not exceed 38. 5 and responded wellto cold fomentation and antipyretic drugs, while De Sio et al.[11] reported 1 case suffering from fever > 38. 8 for 2 days, andtheir PUT showed a steinstrasse in the distal part of the ureter, managed by a DJ stent. Hoznek et al. [12] reported that 1 case, out of 47 patients, had a fever. In our study, urinary leakage occurred in 3 cases after theremoval of the nephrostomy tube (after 48 hour). One casewas managed conservatively, while DJ stents were inserted oneweek postoperatively in the other 2 cases. Steele and Marshall[1] reported urine leaks in 3 out of 322 patients, who thenunderwent supine PCNL. De Sio et al. [11] reported a prolongedleak from the percutaneous access in 4 out of 39 patients, managed by stenting. Hoznek et al. [12] reported 2 cases ofurinary fistulas out of 47 patients. In this study, the mean hospital stay was 3. 2 days (76. 8 hours), Hoznek et al [12] reported 3. 4 ± 1. 9 days, while Ng et al. [3]reported a mean hospital stay of 209 hours in supine PCNLcases. Steele and Marshall [1] reported the range of hospitalstay as 72 to 144 hours, De Sio et al. [11] reported the meanhospital stay as 103 hours, and Neto et al. [13] reported themean hospital stay as 129. 6 hours. Ultrasound before performing PCNL helps to plan the procedureand access site. The depth of the target and angulations ofthe needle and access can be planned, keeping in mind theavascular Brodel’s line . Usually, the posterior calyx is selectedand the ultrasound can provide radiation-free, real-timeimaging guidance for the needle puncture. [7]. Basiri et al. [15]compared fluoroscopy and ultrasonography in a clinical trial andconcluded that access for PCNL using ultrasound guidance is anacceptable alternative to fluoroscopy. They found less radiationexposure with ultrasonography, and success and complicationrates comparable with those of fluoroscopy. Hosseini et al. [16]started prone PCNL with ultrasound guidance in 39 cases. Theyshowed that ultrasound-guided PCNL can be a feasible, reliable, safe, and effective alternative to fluoroscopy in experiencedhands. Falahatkar and Allahkhah [17] noticed ultrasound-guidedcsPCNL without fluoroscopy has some disadvantages. Oneproblem is the use of lubricant gel on the sonography probeat the time of dilatation. A second problem is that urologistsare unfamiliar with sonographic images of the kidney. Becausethe Amplatz dilatator and Amplatz sheath echo do not havegood imaging quality, the experience of the surgeon plays alarge role in finding the best access. Recently, Hoznek et al. [12]proceeded to puncture the kidney under combined ultrasoundand fluoroscopic control, as in our study. Published studies from different centers have shown thatData Number PercentCalyx PunctureUpper calyceal 2 4. 2Middle calyceal 6 12. 7Lower calyceal 32 68. 1Multiple punctures 7 15Track dilationAlken 42 89. 4Balloon 5 10. 6Stone disintigrationLithoclast 31 66In toto extraction 16 34Nephrostomy drainage 47 100Mean operative time (mins) 47 100Table 3. Intraoperative data. http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07t3UIJUroToday International Journal®

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Percutaneous Nephrolithotomy in Supine Position with Ultrasound-Guided Renal Access©2012 Digital Science Press, Inc. UIJ / Vol 5 / Iss 1 / February / http://dx. doi. org/10. 3834/uij. 1944-5784. 2012. 02. 07http://www. urotodayinternationaljournal. comISSN 1944-5792 (print), ISSN 1944-5784 (online)supine PCNL is safe, and it has several benefits for the patientand several technical advantages for the surgeon [9, 10, 11, 18]. Patient positioning is less demanding and time-consumingbecause a change is not required from the lithotomy to theprone position during the procedure [19]. The supine position also allows greater versatility during stonemanagement since ureteroscopy can be performed if there iscontralateral ureteral stones, or simultaneous procedures forrenal, ureteral, and bladder stones in the same single supinelithotomy position. A final advantage of the supine PCNLposition is that urologists are more comfortable adopting asitting posture during stone management. Although supinepercutaneous nephrolithotomy is routine in some surgicalcenters throughout the world, its popularity in the fieldof urology, due to a deficiency in its training in educationalcenters, as a whole, is still minimal [20]. Lastly, systematic literature review was performed by Wu andhis colleagues [21] who concluded, for general patients withkidney calculi, PCNL in the supine position has similar, stonefreerates compared with the prone position. Supine PCNLdoes not increase related complications. The operative timessignificantly decrease in the supine position. However, there isstill no consensus on the optimal position for PCNL.

## Conclusion

PCNL in the supine position, under ultrasound-guided puncture, is feasible, safe, and successful, with minimal complications.

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