

# OUTCOME OF ULTRASOUND GUIDED PCNL IN THE TREATMENT OF RENAL STONES

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## ABSTRACT

**Objectives:** To evaluate the outcome of ultrasound guided percutaneous nephrolithotomy for the treatment of renal stones.

**Patients And Methods:** This descriptive study was conducted in institute of kidney diseases Hayat Abad medical complex Peshawar from January 2011 to January 2012 over 83 patients. A 6 Fr ureteral catheter was inserted into the target ureter in supine position. In prone position the desired calyx is punctured with 18 gauge needle. Its presence in calyceal system is confirmed by suctioning it through 10 cc disposable syringes. The tract was dilated with serial and metallic telescopic dilators. The leakage of fluid around metallic dilators indicated the right tract.

**Results:** Mean age was 31.6(range 14 to 63 years). Most of the patients 46(55.42%) were having right kidney stones. The targeted calyces were upper, middle and lower calyces in 17(20.48%), 12(14.57%) and 51(61.44%) patients. More than one calyx was targeted in 3 (3.61%) patients. Stone-free rate was (75) 90.3%. Four patients (4.81%) have 10 to 13 mm residual stones, which were cleared in 8 weeks through ESWL. In one patient 9 mm stone passed to the ureter during PCNL, which was cleared with URS. Three patients (3.61%) had clinically insignificant residual stones which cleared spontaneously in 4 week time. Postoperative bleeding was observed in 4(4.81%) patients. Three patients were managed by blood transfusion and one by selective angioembolization.

**Conclusion:** PCNL using sonography is a good alternative to the fluoroscopic method. It is performed without radiation exposure to the surgeon and patient; however, more experience is needed.

**Keywords:** Percutaneous Nephrolithotomy (PCNL), ultrasound guidance, renal stones

## INTRODUCTION

Percutaneous nephrolithotomy (PCNL) was first developed by Fernstrom and Johansson in 1976,<sup>1,2</sup> as a therapeutic extension to the established percutaneous nephrostomy tube insertion which was previously reserved for decompressive purposes.<sup>3</sup> It is now accepted as the procedure of choice for those patients who have large renal stones (>2 cm in diameter), infected stones, lower calyceal stones and for those patients in whom prior extracorporeal shock wave lithotripsy (ESWL) has failed.<sup>4</sup> Making a puncture is the first step in PCNL and can be described as key step.<sup>5</sup> Reflecting development of the PCNL technique, which was conceived employing fluoroscopy<sup>6</sup> access to the pyelocalyceal system has been performed routinely using fluoroscopic guidance. Other guidance modalities for calyceal access are computed tomography (CT)<sup>7</sup>, especially if there is abnormal calyceal anatomy, and ultrasonography<sup>8</sup>. The main disadvantage of fluoroscopy is radiation exposure to the patient and medical personnel. The ultrasound (US) has been proven to be a good alternative, as it is

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radiation-free and easy to use.

## PATIENTS AND METHODS

This study was conducted in institute of kidney diseases Hayat Abad medical complex Peshawar from January 2011 to January 2012 over 83 patients. Patients were first placed in supine position, and a 6 Fr ureteral catheter was inserted into the target ureter under direct ureteroscopic vision. The patient was then turned into prone position with a pack under the abdomen. After puncturing the desired calyx with 18 gauge needles, its presence in calyceal system is confirmed by suctioning it through 10 cc disposable syringes. Water is instilled continuously through ureteric catheter to create hydro-nephrosis. The tract was dilated with serial and metallic telescopic dilators. The leakage of fluid around metallic dilators indicated the right tract.

## RESULTS

Mean age was 31.6(range 14 to 63 years). A total of 83 patients among which 59 were male and 24 were female, included in the study. Most of the patients 46(55.42%) were having right kidney stones. 26 patients have prior renal stone surgery such as PCNL 1(1.20%), Pyelolithotomy 9(10.84%), ESWL 13(15.66%) and URS 3(3.61). Approach below 12th rib was made in 67(80.72%) and above it in 16(19.28%) of patients. Tract was lost in two patients (2.40%) due to guide wire dislodgment. The targeted calyces were upper,

middle and lower calyces in 17(20.48%), 12(14.57%) and 51(61.44%) patients. More than one calyx was targeted in 3 (3.61%) patients. The overall stone-free rate was (75) 90.3%. Four patients (4.81%) have 10 to 13 mm residual stones, which were cleared in 8 weeks through (extracorporeal shockwave lithotripsy) ESWL. In one patient 9 mm stone passed to the ureter during PCNL, which was cleared with URS. Three patients (3.61%) had clinically insignificant residual stones which cleared spontaneously in 4 week time. Postoperative bleeding was observed in 4(4.81%) patients. Three patients were managed by blood transfusion and one by selective angioembolization.

## DISCUSSION

PCNL has replaced all surgical modalities for the treatment of most renal stones. Fluoroscopy guided percutaneous access was generally the preferred method of access guidance. When PCNL is routine in the practice and work load is high, the surgeons and OT staff are at increased risk of radiation exposure.<sup>6</sup> in addition to taking some general precautions, many instruments were developed to decrease radiation. Using C-arm fluoroscopies in which radiation producing tube is located under the bed, leads to the reduction of received radiation by 40 times for physician and by 150 times for patient.<sup>9</sup>

Ultrasound has been shown to have the following advantages: lack of ionizing radiation, shorter procedure time, decreased number of punctures, and avoidance of contrast agent administration.<sup>10</sup> However, the operating surgeon must have enough training to use ultrasound-guided access.<sup>6</sup> In Pakistan every stone center is using C arm fluoroscopy as guidance to access renal tract. We have searched Pubmed, Pakmedinet and science direct using words such as PCNL and ultrasound but we find no publications from any center in Pakistan using ultrasound as guidance to access renal tract. In our institute we are using ultrasound as guidance to make a PCNL tract.

We included 83 patients in our study. 26 patients have prior renal stone surgery such as PCNL 1(1.20%), Pyelolithotomy 9(10.84%), ESWL 13(15.66%) and URS 3(3.61). We successfully access the pelvicalyceal system in all patients. Etemadian M et al.<sup>10</sup> also reported 100% access to pelvicalyceal system under ultrasound guidance. We noted loss of tract in two patients during its dilatation due to guide wire dislodgement. In these patients tracts were regained by reinsertion of needle under ultrasound guidance. Subcostal lower pole punctures has fewer complications, easy to perform<sup>11</sup>, mobility of the instrument is greater and access to the lower, upper pole, renal pelvises is easy. Approach to the calyces of the kidney below 12th rib was made in 67(80.72%) and above it in 16(19.28%) patients. The targeted calyces were upper, middle and lower calyces in 17(20.48%), 12(14.57%) and 51(61.44%) patients.

More than one calyx was targeted in 3 (3.61%) patients.

In our study the overall stone-free rate was (75) 90%. This rate is slightly lower than 93.61% reported by Mohammad Mehdi Hosseini et al.<sup>12</sup> His study size was 47 patients. All stones were located in the renal pelvis with mild to moderate hydronephrosis seen on intravenous urography. In contrast the success rate of Basiri A and Necmettin Penbegül<sup>13</sup> and ETEMADIAN M<sup>10</sup> were 79.0%, 82.35% and 72.72% which were lower than our results. Basiri A<sup>8</sup> conducted a comparative study on sonography-guided supine percutaneous nephrolithotomy (PCNL) versus prone standard technique (fluoroscopic guidance). Although in his study the success rate of sonography-guided PCNL was higher than fluoroscopic guided (65.2%) but it is lower than our results. Similarly Necmettin Penbegül<sup>13</sup> conducted a study on Ultrasound-guided PCNL for the treatment of Urinary Stone Disease in Children. He retrospectively reviewed and analyzed 17 patients aged  $\leq 16$  years who had undergone ultrasound-guided percutaneous nephrolithotomy from 2008 to 2010. His success rate was also lower than our result. Etemadian M included 12 patients in his study. The stone was removed by just one session of PCNL in 8 patients. Postoperative bleeding was observed in 4(4.81%) patients. Three patients were managed by blood transfusion and one by selective angioembolization.

In our study four patients have 10 to 13 mm residual stones, which were cleared in 8 weeks through ESWL. In one patient 9 mm stone passed to the ureter during PCNL, which was cleared with URS. Three patients had clinically insignificant residual stones which cleared in 4 week time. This observation was similar to the study of Mohammad Mehdi Hosseini et al.<sup>12</sup>. He observed that five patients had multiple fragments which passed in 4 weeks. In his study two patients who had residual fragments that measured 10 and 12 mm underwent shockwave lithotripsy. In one patient; a fragment that measured 7 to 8 mm migrated into the ureter which was removed with ureteroscope. Etemadian M<sup>10</sup> noted residue of less than 1 cm was present in 3 patients which were removed by repeated PCNL using the same tract in one case and by ESWL in 2 patients.

## CONCLUSION

PCNL using sonography is a good alternative to the fluoroscopic method. It is performed without radiation exposure to the surgeon and patient; however, more experience is needed.

## REFERENCES

1. Yates DR, Safdar RK, Spencer PA, Parys BT. Nephrostomy-free' percutaneous. nephrolithotomy: experience in a UK district general hospital. *Ann R Coll Surg Engl.* 2009;91:570-77
2. Huang Z, Fu F, Zhong Z, Zhang L, Xu R, Zhao. Chinese Minimally Invasive Percutaneous Nephro-

- lithotomy for Intrarenal Stones in Patients with Solitary Kidney: A Single-Center Experience... PLOS. 2012;7(7):1-7
3. Rais-Bahrami S, Friedlander JI, Duty BD, Zeph-Okeke, Smith AD. Difficulties with access in percutaneous renal surgery. *Ther Adv Urol.* 2011;3(2): 59-68
  4. Cho CO, JiHyeong Yu, Sung LH, Chung JY, Noh CH. Comparison of Percutaneous Nephrolithotomy Using Pneumatic Lithotripsy (Lithoclast®) Alone or in Combination with Ultrasonic Lithotripsy. *Korean J Urol.* 2010;51:783-7
  5. Abdallah MM, Salem SM, Badreldin MR, Gamaleldin AA. The use of a biological model for comparing two techniques of fluoroscopy-guided percutaneous puncture: A randomised cross-over study. *Arab J Urol.* 2013;11(1):79-84
  6. Andonian S, Scoffone CM, Louie MK, Gross A, Grabe M, Daels FPJ, et al. Does Imaging Modality Used for Percutaneous Renal Access Make a Difference? A Matched Case Analysis. *J Endourol* 2013;27 (1):24-28
  7. Roy OP, Angle JF, Jenkins AD. Cone beam CT for percutaneous nephrolithotomy: Initial evaluation of a new technology. *J Endourol.* 2012;26: 814-18.
  8. Basiri A, Ziaee AM, Kianian HR. Ultrasonographic versus fluoroscopic access for percutaneous nephrolithotomy: A randomized clinical trial. *J Endourol.* 2008 ; 22:281-4.
  9. Basiri A, Ziaee SA, Nasseh H. Totally ultrasonography guided percutaneous nephrolithotomy in the flank position. *J Endourol.* 2008; 22:1453-7.
  10. Etemadian M, Amjadi M, Simforoosh N. Transcutaneous Ultrasound Guided Nephrolithotomy: The First Report from Iran. 2004; 2:19-21.
  11. Aron M, Goel R, Kesarwani PK, Seth A, Gupta NP. Upper pole access for complex lower pole renal calculi. *BJU Int.* 2004;94(6):849-52.
  12. Hosseini MM, Hassanpour A, Farzan R, Yousefi A, Afrasiabi MA. *J Endourol.* 2009 April; 23(4): 603-7.
  13. Penbegül N, Tepeler A, Sancaktutar AA, Bozkurt Y, Atar M, Yıldırım K, Söylemez H. Safety and Efficacy of Ultrasound-guided Percutaneous Nephrolithotomy for Treatment of Urinary Stone Disease in Children Original Research Article. *Urol.* 2012 May; 79(5):1015-9.

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