Original Article

Audit of percutaneous nephrostomy in Rabat Urological Centre

Abdelazim Hussein, Amer Abbo, and Tarig Hassan

Abstract

Objectives: To audit and compare the different techniques for percutaneous nephrostomy (PCN) and assess the indication of each.

Methods: Between March 2009 and November 2009, the records of 27 patients who underwent percutaneous nephrostomy were retrospectively reviewed. PCN procedures were performed under ultrasonography (US), computed tomography (CT) guidance or blindly according to the grade of hydronephrosis.

Results: US guided PCN were done for 15, CT guided PCN for 10 and blindly PCN for two patients. Overall success rate was 25 (92.6%). US guided PCN had success rate of 13 (86.6%), CT guided PCN eight (80%) while blindly PCN 2(100%). The overall complications were minimal.

Conclusions: The success of PCN procedures depend mainly on the degree of hydronephrosis and selection of the appropriate image guidance.

Key Words: Blind PCN, CT guided PCN, Ultrasound guided PCN, Hydronephrosis.

Percutaneous nephrostomy (PCN) catheter placement was first described by Goodwin in 1955[1]. It is now considered an essential component in the treatment of upper urinary tract obstruction when a retrograde route proves anatomically or technically difficult[2,3]. Its main indication is drainage of the obstructed collecting system[4]. Traditionally, PCN is being performed under the fluoroscopic and US guidance, but CT guided PCN and blind access is not well studied, hence, the indication of each technique should be established.

Patients and methods

Between March 2009 and November 2009, the records of 27 patients who underwent percutaneous nephrostomy were reviewed. In the US group, the patients were placed in the prone position with a pillow beneath the affected side. Ultrasound scan was done to plan the procedure by locating the lower pole calyx from the posterolateral abdominal wall, choosing the closest approach from the skin and avoiding any viscera.

1.Ribat Urological Centre (RUC) –Ribat University Hospital

Under local anesthesia, initial renal puncture was made with 18G needles (Amecath - company Egypt) under real time US guidance with the free hand and *Seldinger technique*. After successful puncture of calyx, 0.38G guide wire was placed. Then dilatation and insertion of nephrostomy tube was carried out**.** In the CT group, the patients were placed in CT tray and cross-sectional imaging was provided (without contrast), the angle of entry in work station of the CT was planned. Firstly, the cephalocuadal angle was determined by infrared light marker, so the mediolateral angle was estimated from the axial cross-section. After the first needle insertion, another axial CT was obtained to determine the site of the needle. Then we re-adjust the needle to be in the hydronephrotic pelvis.

Results

Total patients number was 27. They were six females and 21 males with median age 23 (range 9-64) years. Only unilateral procedure was done for these patients. The causes of obstruction are stone, malignancy, or ureteropelvic junction obstruction as shown in Table (1)

Table (1) : Indications of PCN in this series

Causes of obstruction	No (percent)
Calculi	19 (70.37%)
Malignancy	6 (22.2)
PUJ*	2 (7.4%)
Total	27(100)

*PUJ = Pelvi-ureteric junction obstruction

The grade of hydronephrosis was classified as is shown in Table (2)[5, 6]. Of the 27 patients, 5 were grade-I, 19 were grade-II and 3 were grade -III hydronephrotic.

Table (2): Grade of hydronephrosis

Grade	Hydronephrosis	No of patients
1	Mild PCS dilatation	5
II	Moderate PCS dilatation and normal parenchyma	19
III	Severe PCS dilatation with parenchymal thinning	3

The techniques for percutaneous nephrostomy in relation to grade of hydronephrosis is Shown in Table (3)

Table (3): PCN Techniques and grade of hydronephrosis

PCN Techniques	Grade of hydronephrosis
US	1(I), 13(II), 1(III)
CT	4(I), 6(II),
Blind	2 (III)

US-guided PCN was done for 15 patients, CT guided PCN (10) while blind PCN for two. Overall success rate was 25 (92.6%) patients. US guided PCN had success rate of 13 (86.6%), the procedures was repeated in two patients because of non-functioning nephrostomy tube. The range of the procedure time was 15-47 minutes. One procedure, showed over advancement of the dilator that resulted in kinking of the guide wire with subsequent displacement of the catheter before the kinked guide wire was pulled out. CT guided PCN had success rate of 8(80%), the range of the procedure time was 26-94 minutes while blind PCN had success rate of 2(100%), the procedure time was less than 10 minutes. There were no complications**.** Most of the time was spent on preparation of the procedure.

Discussion

PCN is a safe, easy procedure that improves the quality of life before a final treatment is implemented. Although US is a popular tool for PCN due to accessibility, portability, real-time imaging and no radiation risk, fluoroscopy is recommended for tract dilation and catheter placement after initial successful puncture of calyx by US[7]. PCN with fluoroscopy exposes the patient to radiation risk[8].

Free hand technique allowed direct needle visualization when the position of the needle is confined to the slice view of the transducer, jerky (vibratory) movement of the needle further aid needle visualization, displacement of the kidney while being pricked, all these factors in addition to the feeling of give off (release) improve the success rate of US guided PCN. Hold of breath before the renal puncture was unnecessary, but after successful puncture, the needle is supported loosely. When difficulties encountered during dilatation this mean either a rib is faced or the wire was displaced.

In this small series, the success rate for US was (86.6%), this correlates well with the results reported by Gupta et al who reported success rate of % 91.1 for 273 PCN with US guidance but they did not determine hydronephrosis grades in their study. In our study, US was applied for different grades of hydronephrosis (1 grades I, 13 grades II, 1 grade III). The procedure was repeated in two patients due to non-functioning nephrostomy tube (one patient grade I and another grade II). Grades-I hydronephrosis took longer time i.e. 47 minutes.

CT provides detailed information on the anatomy of the kidney that may impact

selection of an appropriate calyx for safe puncture[10, 11]. CT is particularly useful in cases of congenital renal anomalies, transplant kidney, morbid obesity, and spinal cord deformities to allow evaluation of adjacent visceral structures.

Preoperative CT imaging is essential in PCN planning and determination of entry angle, this makes the procedure financially consuming and takes longer in duration than US guided procedure, the procedure average time was 60 (range 26-94) minutes. Yet, it had success rate in 8(80%) patients. This reflect the less experience in CT guided procedure than US guided procedure, so CT imaging was preserved only for grade I hydronephrosis.

Conclusions:

Despite the small number of patients in this study we may conclude that the success of PCN procedures depends mainly on the degree of hydronephrosis and selection of the appropriate image guidance.

References:

1-Goodwin WE, Casey WC, Woolf W. Percutaneous trocar (needle) nephrostomy in hydronephrosis. JAMA 1955; 157: 891-4.

2-Mahaffey KG, Bolton DM, Stoller ML. Urologist-directed percutaneous nephrostomy tube placement. J Urol 1994; 152: 1973-6.

3 -Clayman RV, Mc Doughall EM, Nakada SY. Endourology of the upper urinary tract: percutaneous renal and ureteral procedures. In: Walsh PC, Retik AB, Vaughan ED, Wein AJ, (edi). Campbell's urology. Philadelphia: WB Saunders 1998; 2791-800.

4-Kaskarelis IS, Papadaki MG, Malliarki NE, et al. Complications of percutaneous nephrostomy, Percutaneous insertion of ureteral endoprosthesis and replacement procedures. Cardiovasc İntervent Radiol 2001; 24: 224-28.

5-Judith AW Webb. The renal collecting system. In: Cosgrove D, Meire H, Dewburry K, eds. Abdominal and General Ultrasound, 1993; 2: 471.

6- Fernbach SK, Maiselz M, Conway JJ. Ultrasound grading of hydronephrosis: introduction to the system used by the society for fetal urology. Pediatr Radiol 1993; 23: 478 – 480.

7- Zegel HG, Pollack HM, Banner MP, et al. Percutaneous nephrostomy. Comparison of sonographic and fluoroscopic guidance. AJR 1981; 137: 925-7.

8- Bush WH, Brannen GE, Gibbons RP, et al. Radiation exposure to patients and urologists during percutaneous nephrostolithotomy. J Urol 1984; 132: 1148 – 52.

9-Gupta S, Gulati M, Shankar K, et al. Percutaneous nephrostomy with real – time sonographic guidance. Acta Radiologica 1997; 38: 454 – 457.

10-Ghani KR, Rintoul M, Patel U, et al. Three-dimensional planning of percutaneous renal stone surgery in a horseshoe kidney using 16-slice CT and volume rendered movies. J Endourol 2005;19:461.

11- Skoog SJ, Reed MD, Gaudier FA Jr, et al. The posterolateral and the retrorenal colon: implication in percutaneous stone extraction. J Urol 1985; 134:110.

12 . Miller NL, Matlaga BR, Kim SC et al. Access techniques for percutaneous renal surgery. In: Recent Advances in Endourology Vol. 8 Interventional Management of Urological Diseases.Ed: S. Baba, Y. Ono. Tokyo, Japan: Springer-Verlag, p 1-23, 2006.