



## PLANNING FOR AN OPTIMAL ACCESS FOR PERCUTANEOUS NEPHROSTOMY; IT'S COMPLICATIONS, FOLLOW UP AND OUTCOME

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**ABSTRACT** **Aim:** To determine technical success, complication and clinical outcome of ultrasound guided percutaneous nephrostomy. **Methods:** Our study included a total of 84 patients of both the sexes between the age group ranging from 21 to 70 years. Two puncture techniques were used, Seldinger (SD) and Trocar techniques (TD). **Result:** Out of 84 patients, 44 were allocated in SD group and 40 in TD group. Out of 84 cases, 49(58.33%) were male and 35(41.67%) were female. The most common indication for PCN in our study was pyonephrosis (32.1%), followed by ureteric calculus (21.4%). Technical success rate was 85 % (34) and 95.5 % (42) in TD and SD respectively whereas failure rate was seen 15% (6) and 4.5% (2) in TD and SD respectively. Overall rate of minor complications was 12.5% in TD and 9.1% in SD respectively & rate of major complications was 5% in TD and 2.3% in SD respectively. **Conclusion:** Ultrasound-guided PCN is a safe and effective treatment method for obstructive uropathy with great clinical benefit, high technical success and low complications rates.

**KEYWORDS :** Percutaneous Nephrostomy, Seldinger technique, Trocar technique.

### INTRODUCTION:

Percutaneous nephrostomy (PCN) is a procedure in which access to the renal collecting system is achieved under radiological guidance. The indications include accessing the collecting system for diagnostic and therapeutic operations, alleviating urinary blockages and urinary diversion. Goodwin, Casey and Wolfe performed the first percutaneous kidney drainage (PCN) in 1955. Since then, this now common place procedure has made substantial advancements in both its technical and imaging aspects, with improvisation of puncture devices and techniques. (1-3)

Current methods of PCN insertion with ultrasound and fluoroscopic guidance are safe and has an advantage over surgical intervention in that it is carried out under local anaesthesia with decreased morbidity and cost reduction. (4-5)

For ultrasound guided PCN, radiologists have reported success rates of up to 95%. The therapeutic goal of urinary drainage is decompression to relieve symptoms while maintaining renal function, while minimizing hospitalization and detrimental effects on quality of life.

### AIMS AND OBJECTIVES:

1. To determine optimal access techniques for percutaneous nephrostomy.
2. To compare the accuracy of percutaneous nephrostomy and incidence of complications in patients treated with the procedure by Seldinger and Trocar methods.
3. To determine the clinical outcome in patients treated with percutaneous nephrostomy.

### SUBJECTS AND METHODS:

**Patients:** Longitudinal interventional and evaluation study was conducted in 84 patients with moderate to severe hydronephrosis/pyonephrosis at Gauhati Medical College and Hospital, Guwahati between April 2021 to July 2022. Diagnosis of hydronephrosis / pyonephrosis was made on the basis of clinical history, examination & USG / CT scan. We employed two different USG-guided techniques, Seldinger technique (SD) and Trocar technique (TD). After selection patients were randomly allocated in both the groups. [SD=44 & TD=40].

### ULTRASOUND GUIDED PERCUTANEOUS NEPHROSTOMY:

**Pre-procedure preparation:** Ultrasonography was carried out with a SAMSUNG RS80A ultrasound machine using 5 MHz curvilinear and 12 MHz linear transducers. The kidneys were scanned and we measured the kidneys' dimensions, echogenicity, and cortical thickness.

**Procedural steps:** The two main methods for catheter placement used in our study are:

- A) Seldinger Technique
  - B) Trocar Technique
- Steps in Seldinger technique (SD):

**Step 1:** The patient is draped and painted while in the prone position, following all aseptic procedures.

**Step 2:** Longitudinal USG scan of affected kidney was performed, and location of puncture site is verified.

**Step 3:** Puncture site is identified and surface area with the best sonographic visualization of the dilated pelvis and calyx is selected.

**Step 4:** Shortest skin to pelvic distance is selected, centering a puncture point there, and directing it directly into the renal pelvis.

**Step 5:** After anaesthetic infiltration by 10 ml of 2% lignocaine injection at the puncture site, the skin, fascia, and muscle are cut using a No. 11 blade.

**Step 6:** Under USG guidance, a 15 cm, diamond-tipped, 18 gauge, two-part trocar needle is introduced into the renal pelvis. Free flow of urine is observed to confirm the correctness of access.

**Step 7:** Guide wire (0.038-inch diameter) is inserted through the needle under ultrasound-guidance.

**Step 8:** Serial tract dilatation is performed over the guide wire employing fascial dilators.

**Step 9:** Nephrostomy tube is then introduced until it reaches into the renal pelvis.

**Step 10:** Position of the PCN pigtail catheter is confirmed by USG followed by firm suturing to the skin using silk 1-0 and adhesive strapping.

Steps in Trocar technique (TD):

Steps 1 to 5: Similar to Seldinger technique

Step 6: PCN tube (8-12 F) with a needle is blindly inserted for a

distance of 3–4 cm, piercing skin, fascia, muscle, and fat. This distance is based on the patient's anatomical characteristics.

Step 7: Under USG guidance, the PCN tube is then advanced until the entry of the echo tip needle into the PCS is seen. The secret to success is to visualize the dilated renal pelvis and calyx (if any) at each step.

Step 8: The inner cannula is then removed, and the free flow of urine is seen. The trocar is kept stable as the pigtail catheter is gradually advanced.

Step 9: Position of the PCN pigtail catheter is confirmed by USG, followed by firm suturing to the skin using silk 1-0 and adhesive strapping.

Post-procedure care & follow-up: The patients were monitored closely for at least 4 hours for any immediate procedure related complications. Patients were followed up for check ultrasonography at day 1 (2nd post procedural day) and then at day 7 and 14.

**DATA ANALYSIS:** In our study, technical success and complications rates were within the accepted target ranges proposed by the Society of Interventional Radiology Standards of Practice Committee (SIR). The definitions of outcome was assessed according to the Society of Interventional Radiology (SIR) standards of practice committee guideline.<sup>1</sup> The primary endpoints of the studies were technical success, which was defined as image-verified catheter placement within the renal pelvis and subsequent urine aspiration, and the rates of procedure-related complications during hospitalization and at up to 14 days of follow-up. According to the guidelines of the SIR, complications were categorized as major or minor. The secondary endpoints included the duration of the procedure (defined as the time between administration of local anaesthesia and pigtail catheter positioning within the renal pelvis) and clinical success/outcome, which was defined by gradual subsidence of signs, symptoms, and elevated renal biochemical markers. Technical failure was also considered as an outcome of the procedure, which was defined as inability to place a nephrostomy tube.

Data collected were statistically described and diagnostic performance was calculated.

#### REPRESENTATIVE IMAGE:

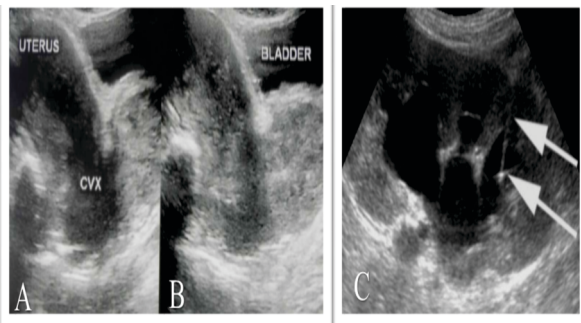


Figure: A case of carcinoma cervix with left ureteric infiltration and hydronephrosis (stage IIIC). A and B shows, heterogeneous circumferential wall thickening of cervix. C. PCN was performed, the white arrow showing course of the puncture needle into the dilated lower pole calyx.

#### RESULTS:

Patient data was collected. Out of 84 patients, the age of the patients ranged from 21 to 70 years. Majority of the patients were in the age group of 51-60 years in TD group (35%) & 41-50 years in SD group (43.2%). There was male preponderance in both SD and TD groups.

**Table 1: Distribution of different obstructive etiologies.**

Etiology	No. of Patients	Percentage (%)
Ureteric calculus	18	21.4%
VUJ calculus	6	7.1%
Ca Urinary bladder with ureteric infiltration	12	14.3%
Ca Cervix with ureteric infiltration	15	17.9%
Pyonephrosis	27	32.1%
Ureteric stricture	2	2.4%
PUJ Obstruction	4	4.8%
Total	84	100%

**Table 2: Distribution of Benign and Malignant Etiologies.**

Etiology	No. of Patients	Percentage (%)
Benign	57	67.9%
Malignant	27	32.1%
Total	84	100%

**Table 3: Distribution of demographic, procedure complication and success rate.**

	Seldinger Technique (n=44)	Trocar Technique (n=40)
Mean Age (in years)	48.79	48.52
Male	62.5% (25)	54.5% (24)
Female	37.5% (15)	45.5% (20)
Minor Complications	9.1%	12.5%
Major Complications	2.3%	5%
Mean Procedure Time (in min)	6.8 ± 0.97	3.8 ± 0.60
Technical Success	95.5%	85%

#### DISCUSSION:

In our study, the age group ranged from 22 to 70 years with a mean age of 48.5 years. Majority of patients were of the age group 41-50 years. Out of 84 cases, 49(58.33%) were male and 35(41.67%) were female, showing a male predominance.

The most common indication for PCN in our study was pyonephrosis (32.1%), followed by ureteric calculus (21.4%).

In our study, the benign causes accounted for 67.9 % of the cases and malignant causes accounted for 32.1 % of the cases respectively. Overall rate of minor complications was 12.5% and 9.1% in TD and SD respectively & rate of major complications was 5% and 2.3% in TD and SD respectively. Post procedure pain was the most common minor complication whereas a gross haematuria was the most common major complication.

Technical success rate was 85 % (34) and 95.5 % (42) in TD and SD respectively whereas failure rate was seen 15% (6) and 4.5% (2) in TD and SD respectively. The association of success / failure rate and technique is found to be statistically significant (p = 0.029) indicating that success rate is significantly higher in SD group.

Mean procedure time in patients with Trocar and Seldinger drainage were 3.87 minutes and 6.8 minutes respectively.

In our study, following PCN insertion renal biochemical parameters were assessed and compared with Pre-PCN values. There was a statistically significant decline in the mean creatinine levels from 2.15 to 1.41 mg/dl & also in the mean blood urea levels from 58.33 to 24.63 mg/dl respectively (p<0.001).

Percutaneous nephrostomy is done as an out-patient procedure, involving at least 4 hours of observation after the procedure with no hospital admission, unless there is major complication.

In our study, technical success and complications rates were within the accepted target ranges proposed by the Society of Interventional Radiology Standards of Practice Committee.

#### CONCLUSION:

In conclusion, ultrasound-guided PCN is a safe and effective treatment method for obstructive uropathy with great clinical benefit, high technical success and low complications rates. In our study, the Seldinger access technique is preferable over Trocar technique with respect to technical success and complication rate. Due to its effectiveness, simplicity of insertion, low cost, and satisfying outcome, it is an excellent technique for upper urinary obstruction. Our study's technical success and complications rates fell within the acceptable target ranges recommended by the Society of Interventional Radiology Standards of Practice Committee.

**Conflict of interest:** No conflict of interest to declare.

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