

## Role of Nephrostomy in poorly functioning kidneys in patients with ureteropelvic junction obstruction (UPJO)

Vijayendra Kumar<sup>1</sup>, Vinit Kumar Thakur<sup>1</sup>, Ramdhani Yadav<sup>1</sup>, Zaheer Hasan<sup>1</sup>, Digamber Chaubey<sup>1</sup>, Apurva Agarwal<sup>1</sup>, Ramjee Prasad<sup>1</sup>, Sandip Kumar Rahul<sup>1\*</sup>

<sup>1</sup> Department of Paediatric Surgery, Indira Gandhi Institute of Medical Sciences, Patna-800014, Bihar, India

\*Address for Corresponder: Dr. Sandip Kumar Rahul, Department of Paediatric Surgery, Indira Gandhi Institute of Medical Sciences, Patna-800014, Bihar, India  
(e-mail: sandeep.rahul65@gmail.com)

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### Abstract

**Introduction:** Several studies have addressed the unique management challenges in poorly functioning kidneys of patients with ureteropelvic junction obstruction. Trial with percutaneous drainage of such kidneys as a guide to choose the type of surgical management would be a solution to this dilemma. We aimed to evaluate the role of percutaneous nephrostomy in treatment of poorly functioning kidneys in pediatric patients with UPJO.

**Materials and Methods:** A prospective study was performed on patients with poorly functioning kidneys (split renal function < 10% on renal dynamic scan) and unilateral ureteropelvic junction obstruction from August 2016 to January 2018. Ultrasound-guided nephrostomy was inserted for these patients. Data regarding the differential renal function and glomerular filtration rate (GFR) was collected before and after nephrostomy insertion. Decision regarding pyeloplasty or nephrectomy of the involved kidney was made based on changes seen in differential function and Glomerular filtration rate following the drainage.

**Results:** Thirty three patients with unilateral UPJO with poorly functioning kidneys were treated during this period. Thirty patients had significant increase in differential function and glomerular filtration rate. These patients underwent pyeloplasty. In 2 patients, these parameters did not increase much and they underwent nephrectomy. One patient had an infected kidney which did not improve significantly on drainage and had to be removed. Of the 30 patients who had pyeloplasty, two developed

### Keywords

- Nephrectomy
- Nephrostomy
- Pyeloplasty
- Ureteropelvic obstruction

obstruction after 3 months of removal of double-J stent and needed re-operation.

**Conclusion:** Percutaneous nephrostomy in poorly functioning kidneys with ureteropelvic junction obstruction helps to identify potentially salvageable kidneys which merit pyeloplasty. Kidneys which do not improve with nephrostomy are unlikely to improve with pyeloplasty and therefore nephrectomy is done in such cases.

## Introduction

With a reported incidence of 1:500 to 1:1250 live births, Uretero-pelvic junction obstruction (UPJO) is the most common obstructive pathology in the upper urinary tract.<sup>1,2</sup> Significantly impaired renal function or its progressive deterioration, secondary calculi and infections are the indication for surgical intervention.<sup>3</sup> Poorly functioning kidneys with UPJO [split renal function (SRF) < 10% on renal dynamic scan (RDS)] present a therapeutic dilemma wherein one has to choose between pyeloplasty and nephrectomy.<sup>4,5</sup> Performing pyeloplasty in a kidney with irreparable damage would unnecessarily add to the cost of treatment and increase the morbidity of the patient. On the other hand, doing nephrectomy in a potentially salvageable kidney would be disastrous. So, it is important to differentiate kidneys which can be saved from those which cannot be, after ensuring adequate drainage. Percutaneous drainage in such scenario helps in decision-making and guides appropriate management in this controversial group of patients. We present our experience of percutaneous nephrostomy (PCN) in poorly functioning kidneys with UPJO in pediatric patients.

## Materials and Methods

A prospective analysis of pediatric patients with unilateral UPJO and poor functioning kidney (defined as SRF <10%) was done for improvement in SRF and glomerular function rate (GFR) before and after ultrasound guided PCN drainage of the obstructed kidneys. This study was conducted

between August, 2016 and January, 2018. In all patients, RDS was done using Technetium-99m diethylenetriamine pentaacetic acid (99m Tc DTPA) using the standard institutional protocol. Parents of all such patients with sufficiently dilated pelvis on ultra sonogram were counseled regarding the nature of the pathology, its natural course, need for percutaneous drainage and method of subsequent surgery depending upon the report of RDS after 4 weeks of nephrostomy drainage. A 16 Fr. Pigtail catheter was used for nephrostomy in all patients. After obtaining consent from the parents, ultrasound-guided PCN was inserted and quality and amount of daily urinary output was noted for 4 weeks. Repeat diuretic renogram was done at this time and in patients who showed SRF and GFR more than 10%, pyeloplasty was carried out. In those with kidneys still having less 10%SRF and GFR, nephrectomy was performed. In the post-operative period, patients were periodically followed with ultra sonogram after 3 months and RDS after 6 months of surgery and annually thereafter.

Data collected was analyzed. Independent samples t-test was used to compare Pre-pigtail SRF and GFR with the outcome (pyeloplasty or nephrectomy). Similarly, this test was used to compare the Post-pigtail SRF and GFR as well as age at presentation with the outcome. SPSS statistics was used to compare and analyze the data.

## Results

Total number of UPJO patients treated during the study period was 118. Out of this, the total number

of patients who had poorly functioning kidneys and were included in this study was 33 (27.97%) with a mean age of 40.5 months. However, the age at presentation greatly varied from 2 months to 132 months. There were 28 males and 5 females. In 20 patients UPJO was on the left side, while 13 had right sided UPJO. Of these 30 patients underwent pyeloplasty and 3 patients had nephrectomy. In two of these 3 patients, even after 4 weeks of drainage with PCN, the SRF and GFR on repeat

diuretic renogram was less than 10%. In the third patient, although the SRF and GFR improved to marginally greater than 10%, the involved kidney was infected and did not respond to drainage and antibiotics therapy.

**Table 1** shows the age characteristics of the 2 groups of patients –those who had pyeloplasty versus those who had nephrectomy.

**Table 1:** age characteristics of the 2 groups

Output	N	(Age(Month		
		Mean	Std. Deviation	Std. Error Mean
Pyeloplasty	30	40.80	37.15	6.78
Nephrectomy	3	72.00	54.99	31.75

In 2 out of 30 patients who had pyeloplasty after Percutaneous nephrostomy, there were a lot of inflammatory adhesions and after three months of removal of double-J stent, these patients again developed obstruction for which surgery had to be repeated.

There was no significant association between the pre-pigtail SRF and GFR and the final outcome and surgery type (p-value > 0.05 in each case).

There was a significant association between the postpigtail SRF and GFR and the final outcome with P-values 0.015 and 0.033 respectively (P-value < 0.05 in each case).

There was no statistically significant relation between age at which the patient presented with UPJO and whether pyeloplasty or nephrectomy was done as the final outcome (p-value > 0.05). Thus irrespective of the age at presentation, a trial with PCN in poorly functioning kidneys of UPJO is worth consideration.

## Discussion

Being the most common cause of pediatric hydronephrosis, UPJO is now commonly diagnosed on antenatal ultra sonography. However, the proportion of UPJO patients turning up late with massive hydronephrosis and poorly functioning kidneys is still high in developing countries.

A large number (27.97%) of UPJO patients in our study had poorly functioning kidneys on RDS. This is comparable to that reported by other investigators.<sup>5</sup> Considering this significant fraction of patients, it is important to have as a guide some parameter which could predict whether these kidneys are salvageable.

Surgical intervention in a UPJO patient is indicated in cases where T1/2 is greater than 20 minutes, SRF is less than 40%, Parenchymal thickness progressively decreases with contralateral compensatory hypertrophy on serial ultra sonography, or when there is recurrent pain,

hypertension, haematuria, recurrent infections or secondary renal calculi.<sup>3</sup>As it is difficult to predict the ability of these obstructed kidneys to recover, periodic follow-ups and ultra sonography/RDS are important to monitor them. Also, due to this reason in cases where SRF is less than 10% and parenchymal damage is excessive, the type of surgical management of poorly functioning kidneys with UPJO is controversial.<sup>6</sup>

Several investigators have reported the benefit of PCN drainage of the obstructed kidney for a few weeks and then judging the functional status of the kidney again with RDS.<sup>5, 7, 8, 9</sup> While many of them have reported a significant improvement in the split renal function of the involved kidney<sup>5, 7, 8, 10</sup> a few others have not found significant benefits.<sup>10, 11</sup> For how long PCN drainage of obstructed kidneys should be done before repeating RDS is not standardized; but most of the studies have reported a period of 4 weeks of PCN drainage as minimum for the obstructed renal units to show any improvement in function.<sup>5</sup>

In our study, considering the two outcomes Pyeloplasty or nephrectomy with respect to the pre-pigtail SRF or GFR, there was no significant association (p-value >0.05). But, when these outcomes were seen in relation to the post-pigtail SRF or GFR, the p-value was significant (<0.05). These results imply that pre-pigtail SRF or GFR were not associated with whether the patient would finally end up with pyeloplasty or nephrectomy. But, post-pigtail SRF and GFR directly determined the choice between pyeloplasty and nephrectomy.

There were two patients who did not show significant improvement after pigtail drainage and so underwent nephrectomy. In one patient, although the SRF and GFR improved to marginally greater than 10%, the involved kidney was infected and did not respond to drainage and antibiotic therapy.

In a series of 24 patients with UPJO who had a Percutaneous nephrostomy in the preoperative period due to various reasons, Comploj et. al.

found a significantly higher percentage of chronic inflammation of the renal pelvis leading to an increased risk of reoperation. Also, they observed little or no improvement in the split renal function of the involved kidneys.<sup>11</sup> In our study, two patients had to be re-operated when obstruction reoccurred a few months after the initial surgery. We also observed increased inflammation and adhesions in kidneys which had undergone nephrostomy prior to pyeloplasty.

Several investigators have studied the importance of age at presentation and the potential of the involved kidneys to improve SRF and GFR with pigtail insertion.<sup>5</sup> Our study concluded that irrespective of the age, obstructed kidneys often show improvement in SRF and GFR and so it is immaterial to consider age before giving a trial of percutaneous drainage in poorly functioning UPJO patients.

## Conclusion

Poorly functioning kidneys with UPJO form a significant proportion of all kidneys with UPJO and pigtail drainage in such kidneys improves SRF and GFR irrespective of the age at presentation. Therefore, percutaneous drainage should be used to guide the ultimate surgical management of these patients.

## Ethics Approval

This study was approved by the Institutional Ethics Committee of Indira Gandhi institute of Medical Sciences.

## Conflict of interest

There are no conflicts of interest.

## ORCID ID

Sandip Kumar Rahul  <https://orcid.org/0000-0002-9620-9305>

Vijayendra Kumar  <https://orcid.org/0000-0002-3172-1033>

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