

## Research Article

## Comparison between Double 'J' Ureteral Stenting versus Percutaneous Nephrostomy in Obstructive Uropathy in Sudan, 2015

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**Abstract:** Obstructive uropathy is the structural impedance to the flow of urine and can occur at any level from urethral meatus to the calyceal infundibula. This study compared the ultrasound guided percutaneous nephrostomy (PCN) versus the double J (JJ) ureteral stenting in the management of Obstructive Uropathy, Nephropathy and Hydronephrosis. To compare the success rates of JJ stent versus PCN. To assess the conversion rates of JJ versus PCN. To compare recent complications of JJ versus PCN. To compare late complications and failure of JJ versus PCN. To compare Quality of Life (QOL) of patients underwent JJ versus PCN. A prospective analytical (comparative) study done in Ibn-Sina Specialized hospital, Sudan, From December 2014 to September 2015. All patients with a clinical problem of obstructive kidney disease have been involved. Data collected via a designed questionnaire that has been filled in an interview style. The data have been fed to Statistical Package for Social Sciences (SPSS) Inc., Chicago, IL, USA; version 19.0.  $P = 0.05$  with 95% confidence interval. 83 patients have been included in this study, JJ stent was decided for 67 (80.7%) (Group A), where PCN was decided for 16 (19.3%) of patients (Group B). The mean age was 36.1 years in group A, and 39.2 years in group B. Urolithiasis accounts for 71 (85.5%) of the diagnosis, Malignancy 8.4% and benign strictures 6%. Restoration of daily life activities was far better in patients underwent JJ than those underwent PCN by 38.8% to 18.8% respectively. PCN is a safe procedure and has higher success rate than JJ stent to relieve sepsis and decompress the kidney, but it has a higher complication rates on the long run. Moreover, it was found effective in patients with malignant ureteric obstruction. JJ stent needs better setup and more assisting personnel than JJ stent. Patient quality of life is better than those with PCN regarding restoration of their daily life activities and return back to school or work.

**Keywords:** Percutaneous Nephrostomy PCN, JJ (DJ) stent, Obstructive Uropathy, Sudan

### INTRODUCTION

Obstructive uropathy is the structural impedance to the flow of urine and can occur at any level from urethral meatus to the calyceal infundibula. It refers to the pathophysiological effects secondary to this obstruction leading to renal dysfunction [1]. The obstruction may be due to intraluminal, intramural or extramural causes. In young and middle age patients' renal calculi are the main etiological factors of obstruction [2]. In female, Gynaecological tract obstruction and obstetrical trauma while in old people, malignancy contributes to upper obstructive uropathy [2, 3].

It is a potentially life threatening condition and if the obstruction is present bilaterally, then immediate measures are required to decompress the kidney, otherwise the patient's clinical conditions will deteriorate at a fast pace [4] through uremia, water-electrolyte abnormalities and urinary infections with a

consequent reduction of alertness and subsequent death [3,5]. Urinary diversion is one of the ways to manage ureteral obstructions and is commonly performed in our daily practice when the underlying pathology of ureteral obstruction cannot be eliminated in a short period. The various methods of urinary diversions are retrograde double J ureteral stenting, percutaneous nephrostomy and open drainage of kidney [2, 6].

Three terms are used to describe a disease as a consequence of urinary tract obstruction:

- Obstructive uropathy,
- Obstructive nephropathy, and
- Hydronephrosis.

But each in different connotation. If ureteral dilatation due to impaired flow of urine is associated with renal parenchymal damage, it is described as obstructive uropathy [6]. It is a potentially life threatening condition and sometimes it is desirable to

provide immediate temporary relief of the obstruction, until definitive treatment can be undertaken. Cystoscopy with retrograde catheterization (Double J Stenting) and percutaneous nephrostomy (PCN) are two main options for temporary urinary diversion with their own merits and demerits [7].

Clear guidelines regarding optimal urinary diversions have not been established. Most authors agreed that decisions should be individualized [8]. Currently, retrograde double-J ureteral stenting and ultrasound guided percutaneous nephrostomy tube insertion are the most widely used techniques for relieving obstruction of the urinary tract [6, 8]. Both are associated with: variable technical success, complication rates, availability and quality of life issues.

Retrograde implantation of ureteral stents is associated with septicemia, irritative bladder symptoms, forgotten stents and high failure rate which ultimately require percutaneous nephrostomy tube insertion to drain the affected kidney [9]. On the other hand, Percutaneous nephrostomy is associated with complications like bleeding, septicemia, tube blockage and accidentally tube dislodgement [2,5,8,10]. Moreover, PCN also requires an extra care of external urine-collecting bag.

Our study compared the ultrasound guided percutaneous nephrostomy (PCN) versus the double J (DJ) ureteral stenting in the management of Obstructive Uropathy, Nephropathy and Hydronephrosis. Taking into consideration the decision (way of draining, Methodology), number of trials (accessibility), conversion rate, complications (immediate and late), advantages and disadvantages and Quality of Life.

#### OBJECTIVES

- To compare between Double 'J' Ureteral Stenting versus Percutaneous Nephrostomy in Obstructive Kidney Disease in
- To compare the success rates of JJ stent versus PCN.
- To assess the conversion rates.
- To compare recent complications of JJ versus PCN.
- To compare late complications and failure of JJ versus PCN.
- To compare Quality of Life (QOL) of patients underwent JJ versus PCN.

#### PATIENTS AND METHODS

##### Setup

Ibn-Sina Specialized Hospital is one of the main five urology centers in the Sudan. In most

hospitals outside the capital Khartoum the acute urological as well as the simple pathologies are carried out by non-specialized general surgeons.

The Urology unit occupies more than 40 beds, with a high turnover of patients.

#### Procedural description

##### JJ insertion

An informed consent is taken from the patient.

The operation is carried under general anaesthesia (sedation) or spinal anaesthesia, in a lithotomy position under strict aseptic condition. Cystoscopic identification of the ureteric orifice into the bladder. First the tip of a ureteric catheter is inserted at the ureteric orifice, then a dye is injected to have a retrograde study to map the ureter, pelvis and the calyces. To identify if there is a lesion type (Narrowing, Filling defect, etc...) and the location. Accordingly a guide introduced and an image intensifier is used to confirm location of the guide wire. The JJ stent then introduced through the guide wire, another screen shot is needed to confirm reaching the pelvis. Finally the guide wire is extracted.

Patient stay 24 hours after the procedure and an X-ray KUB is done before discharge to document and confirm placement.

##### PCN

An informed consent is taken from the patient.

The patient is placed prone. Almost all procedure are done under local anesthesia.

PCN is carried under strict aseptic precautions. The urologist uses the ultrasound to decide on the point for inserting the PCN catheter usually in the patients back.

Then the skin will be anesthetized with local anesthesia at the site of insertion, and a fine needle inserted into the kidney. A guide wire is then placed into the kidney through the needle. The tract is dilated & PCN placed over the wire into the pelvi-calyceal system.

This catheter is then fixed to the skin and attached to a drainage bag. Most of patients can go home immediately after successful operation.

Risk to the patient is more clarified in table1.

**Table-1: shows the comparison between procedural risk to the patient between JJ and PCN**

<b>RISK \ Method</b>	<b>JJ</b>	<b>PCN</b>
<b>Anatomy</b>	Restore continuity of urine flow	
	Protection of renal parenchyma	Pass through the renal parenchyma
	Mal-position +++ (Kink, Low lying)	Mal-position +
<b>Booking</b>	Waiting minimum 1-4 days	Waiting 0 day
<b>Procedure</b>	Risk of anaesthesia (General)	Local anaesthesia
	Risk of radiation	
	Internal drainage of pus (sepsis)	External drainage
	Bleeding, Perforation, Stricture	Bleeding
<b>Removal</b>	Re-instrumentation risk	
	Re-anaesthetic risk	
	Time bound according to the tube material (Risk of negligence)	Permanent drainage for permanent distal obstruction
	Failure rate (conversion or postpone)	Failure rate (conversion or postpone)

**Consent**

Verbal consent was taken from the patient before filling the questionnaire.

**Ethical clearance**

Obtained from the Ministry of Health, Directorate of Human Subject Research. A formal permission letter was provided to Ibsina Hospital Administration.

**Study Design**

A prospective analytical (comparative) study.

**Study area**

Urology Unit, Ibn-Sina Specialized Hospital, Khartoum

**Study duration**

From February 2014 to October 2015.

**Study population**

All patients with a clinical problem of obstructive Uropathy have been involved (benign and malignant), with all the age groups and genders. No specific inclusion criteria.

**Data collection**

The questionnaire has been tested before starting the collection (piloting) to check the integrity of the questions and necessity to change, add or remove items.

Designed questionnaire is filled in an interview style. Contain the socio-demographic data, the clinical

information (Diagnosis, important points in the history, important investigations findings, decision, success and number of trials, immediate complications).

An interval 1-6 weeks after the procedure was designed for follow-up of the complications as well, the quality of life. It has been conducted mainly through a phone call interview.

**Data analysis**

The data have been fed to Statistical Package for Social Sciences (SPSS) Inc., Chicago, IL, USA; version 19.0. Frequencies, means, standard deviations, and correlation were tested. Chi-square test was used to determine the significance of correlation between categorical and numerical variables and *t*-test was used for correlation between categorical variables. Significance level has been taken for values at *P* = 0.05 with 95% confidence interval.

**RESULTS**

Eighty three patients have been included in this study, JJ stent was decided for 67 (80.7%) (Group A), where PCN was decided for 16 (19.3%) of patients (Group B). The mean age was 36.1 years ± 21SD range 78.5 for group A, and 39.2 years ± 24.3 rang 74 for group B. Male: female ratio was 1.6:1 for both groups. In general urolithiasis accounts for 71 (85.5%) of the diagnosis, Malignancy 8.4% and benign strictures 6%. It is obvious that the success rate was more in PCN than JJ (93.8% vs. 80.6%) but that was statistically insignificant (see table 2).

**Table-2: shows the success rate of JJ and PCN and the rate of conversion in each**

Procedure		Decision		Total	
		PCN	JJ		
	Successful	Frequency	15	54	69
		Percentage%	93.8%	80.6%	83.1%
	Unsuccessful Converted	Frequency	1	11	12
		Percentage%	6.3%	16.4%	14.5%
	Unsuccessful Postponed	Frequency	0	2	2
		Percentage%	.0%	3.0%	2.4%
Total		Frequency	16	67	83
		Percentage%	100.0%	100.0%	100.0%

At the end, total number of JJ stent was done for 55 patients, one of them converted from a failed PCN (1.8%), and PCN was done for 21 patients, and six of them were converted from JJ (28.5%).

JJ stent for malignancy was used in 5 patients, 3 which were failed and converted to PCN then succeeded, where the other 2 were successful. 50% of PCN converted from JJ were due to malignancy and the other half were due to stone disease. (See table 3) P value 0.0001.

**Table-3: shows the success of PCN in relation to diagnosis**

Diagnosis		Procedure		Total	
		Successful	Unsuccessful JJ Converted to PCN		
Urolithiasis	Frequency	12	3	15	
		Percentage %	80.0%	50.0%	68.2%
	Benign Stricture	Frequency	1	0	1
		Percentage %	6.7%	.0%	4.5%
	Malignancy	Frequency	2	3	5
		Percentage %	13.3%	50.0%	22.7%
Total		Frequency	15	6	22
		Percentage %	100.0%	100.0%	100.0%

Number of trials were traced in more than two third of the procedures, ranged from 1- 4, with a mean of  $1.3 \pm 0.6$  SD in both JJ and PCN, means =  $1.2 \pm 0.4$  to  $1.7 \pm 1.1$  respectively. Two third of them were successful with single and double trials. Cross tabulation between number of trials and the procedure identified JJ to have a significant fewer trials (1-2) to succeed by 100% than PCN that third of them were succeeded with more trials (3-4). P value 0.001.

There were no immediate complications followed both procedures like bleeding, sepsis, shock or pain. Late complications were more with JJ stent, two (3.6%) patients out of 55 developed haematuria, and one (1.8%) developed pain. Of those underwent PCN two (9.5%) have developed surgical site pain as a late complication. Rate of complications between JJ: PCN = 5.4: 9.5%. That was statistically insignificant. (See table 4)

**Table-4: Relation of Late complication with the procedure done (JJ, PCN)**

Late.Complications		Decision					
		PCN	JJ	Surgery	Total		
	Frequency	2	3	0	6		
		Percentage %	9.5%	5.5%	.0%	7.2%	
	No	Frequency	17	49	5	72	
		Percentage %	81.0%	89.1%	100.0%	86.7%	
	Bleeding	Frequency	0	2	0	2	
		Percentage %	.0%	3.6%	.0%	2.4%	
	Pain	Frequency	2	1	0	3	
		Percentage %	9.5%	1.8%	.0%	3.6%	
	Total		Frequency	21	55	5	83
			Percentage %	100.0%	100.0%	100.0%	100.0%

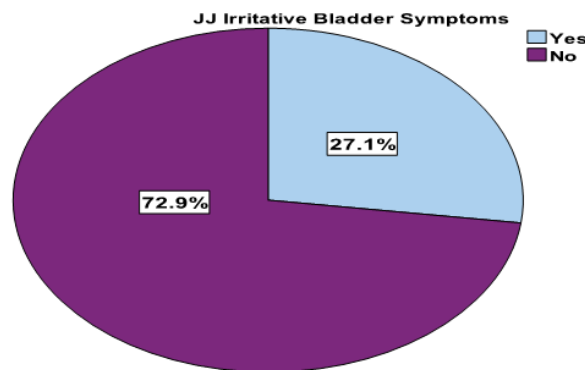
P.s. Complications related to surgery was not traced, but included in the table to maintain calculation

Of those underwent JJ stent insertion successfully, 2 (3.5%, 2.4% of the total) had a low lying

JJ not reaching the renal pelvis and one has slipped JJ. In contrast, patients underwent successful PCN, 4

(21.1%) of them had a blocked or non functioning PCN, and third of them (6 patients) have been slipped. Irritative bladder symptoms were sought in 59 (88%) of

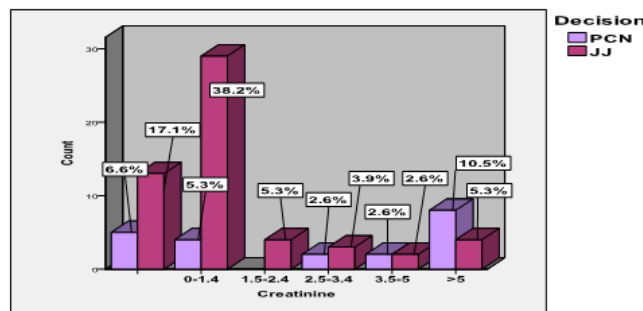
the patients underwent JJ stent insertion; less than the third has developed such a complain, as shown in figure 1.



**Fig-1: Pie chart shows incidence of irritative bladder symptoms in percentages among JJ stent patients**

Mean of serum creatinine on presentation was  $3.1 \pm 3.4$  SD range = 11.7 mg/dl. Figure 2 shows correlation between serum creatinine in mg/dl in both JJ and PCN patients. It is clear that normal range values

(<1.4mg/dl) in 38.2% of the JJ patients and only 5.3% in the PCN patients. In contrast higher values of serum creatinine (>5mg/dl) was found in 10% of the PCN patients and only 5.3% of JJ patients. P value 0.003.



**Fig-2: Bar chart shows percentages of categorized creatinine in relation to the procedure**

Quality of life of the patients have been demonstrated by three direct questions-

- Patient satisfaction (relief of complains). Satisfaction of JJ patients is more than those of the PCN by 44.8% to 37.5% respectively, and the same for the unsatisfied 37.3% vs. 56.3%. And that was statistically insignificant
- Return back to work or school was more obvious in patients with JJ than those

underwent PCN, ascending toward not getting back to work with PCN, and the reverse with those underwent JJ stent (see figure .3).

- Restoration of daily life activities was far better in patients underwent JJ than those underwent PCN by 38.8% to 18.8% respectively. Even though two third of JJ respondents maintained their daily life activities. P value 0.034.

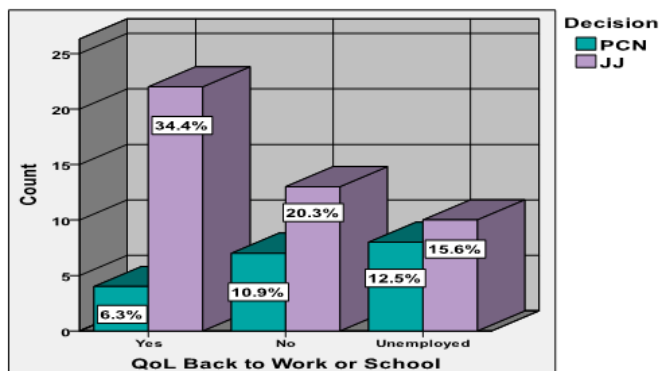


Fig-3: Bar chart showing percentages of both groups of patients who returned back to school or work

### DISCUSSION

Three terms are used to describe a disease as a consequence of urinary tract obstruction: obstructive uropathy, obstructive nephropathy and hydronephrosis, but each in different connotation. If ureteral dilatation due to impaired flow of urine is associated with renal parenchymal damage, it is described as obstructive uropathy [6]. It is a potentially life threatening condition and sometimes it is desirable to provide immediate temporary relief of the obstruction, until definitive treatment can be undertaken. Cystoscopy with retrograde catheterization (Double J Stenting) and percutaneous nephrostomy (PCN), are two main options for temporary urinary diversion with their own merits and demerits [7]. In our study wide range of patients' age was included (range 1-80 mean  $36.1 \pm 21$ ) years, but that was not the case in the studies done by Ahmed I *et al.* [12] and Chang *et al.* [13] (Range 20-80 mean 43) years and (range 19-89 mean 63.6 years) respectively. It is clear that the department is dealing with paediatrics patients.

In our study, the commonest cause of obstructive uropathy observed was stone disease (renal or ureteric) as was also found by Richter S *et al.* [8] and Naeem M *et al.* [2] The male patients were 61.4% and female were 38.6% with ratio of 1.6:1 in this study which is very much comparable to studies of Naeem M *et al.*[2], Karim R *et al.* [7] and Memon NA *et al.* [11] who had also found predominance of male patients with obstructive uropathy.

Ureteral obstruction was highly amenable to endoscopic ureteral stents in cases of benign intrinsic obstruction, but the incidence of stent failure was significantly higher in cases of extrinsic compression, as was seen with most malignant diseases. It was also observed in this study that in cases of urinary bladder, prostate carcinoma, Cervical and colonic cancers, percutaneous nephrostomy is preferable option with a better success rates and less trials to intubation, as retrograde stenting could not be possible due to involvement of ureteric orifices by tumour. Ahmed I

[12], Ku JH *et al.* [10] and Chang HC *et al.* [13] had also found percutaneous nephrostomy as a better option for temporary urinary diversion in obstructive uropathy of advanced malignancies.

Double J stenting was successfully done in 80.6% of patients in our study while Memon NA *et al.* [11] reported as 94.2% and Ahmed I *et al.* reported as 96% [12]. Those patients in which stent could not be passed, were considered as unsuccessful cases and in these cases, percutaneous nephrostomy tube insertion was done to achieve urinary diversion in 7.2% and prompt surgical intervention in stone diseases in 6% who were having a mild hydronephrosis on radiological tests. On the other hand, percutaneous nephrostomy (PCN) was successfully done in 93.8% of patients in our study while Ahmed I *et al.* [12] and Naeem M *et al.* [2] came across 97.5% and 96.05% respectively. The success rate is lower in patients with non-dilated collecting system, stag horn calculi or where patient was not cooperative. Numbers of trials in both procedures were traced. All (100%) of successful stents were done after single or double trails, while in PCN the case was in only two thirds, and the rest were placed after three to four trials.

Complications associated with the use of ureteral stents are basically mechanical in nature and are related to stent material. The most common complication was painful trigone irritation which occurred in 27.1%. The result is consistent with that of Arshad M *et al.* [14] 27.7% but, Ahmed *et al.* [12] and Memon NA *et al.* [11] had found lower rates of 12.0% and 10.0% respectively. The most common complication of percutaneous nephrostomy (PCN) was pain account for 9.5% that was not reported by the above researchers but bleeding that have never happened in our study and reported by Ahmed I *et al.* [12] in 4.5%, Naeem M *et al.* [2] in 4% but, Olivera ST *et al.* [6] reported a much higher rate of bleeding i.e. 21.5%. Post DJ stenting hematuria observed in different studies range from 2-21% [6, 8, 11]. In our study it was

found in 3.6% of patients which was settled by giving I.V. fluids within 24 hours.

There was no incidence of post JJ stenting or PCN septicaemia in our study, while Arshad M *et al.* [14] reported 10.2%, but Richter S *et al.* [8] reported much higher incidence of septicaemia i.e. 19.0% post JJ stent. On the other hand Naeem M *et al.* [2] reported 2.0% incidence of post PCN septicaemia.

Post PCN blockage or dislodgment of the nephrostomy tube observed in different studies range from 4-37% [2, 15, 16] while in our study it was found blocked in 21%, with an response to Normal Saline flushing and regular washouts in all of them, but 31% of them have developed dislodgement and both are consistent with the international literature. Memon NA *et al.* [11] and Arshad M *et al.* [14] observed DJ stent encrustation in 17.5%, 2.0% and stent migration in 11.7% and 16.3% respectively. In our study, stent encrustation was seen in 1.8% and stent migration (low not reaching the renal pelvis or slipped in the Urinary bladder) in 3.5% and 1.8 % of cases. Stent encrustation and stone formation was seen more in the patients where stent indwelling period was more than three months as was also observed by other authors [6, 14]. In our study, stents remained in place for maximum of two months despite those with encrustation who had been lost to follow up.

Hence stent monitoring is essential with lot of stress should be paid on the counselling of the patients regarding stents complications and their timely removal. As well, the PCN needs an extra-counseling because of its higher rates of block and dislodgement, and the patient and relative need to be alert to the amount of urine output, ambulation and daily life activities. Moreover, according to our study it is a preferable option for ureteric obstruction due to malignancy. So, overall success rate in PCN and JJ stent is up to 80.6% and 93.8 respectively. Results near to that of Ahmed I [12] 83.0% and 92.0% respectively which is very much comparable to many previous other studies [2, 8, 10]. But Memon NA *et al.* [11] has shown a much higher complication rate of DJ stenting i.e. 79.9%.

Maintaining a stable serum creatinine level and relieving hydronephrosis were the primary goals of upper urinary tract diversion. The baseline mean serum creatinine level was higher in the PCN group than in the stent group ( $6.5 \pm 4.6$  vs.  $2 \pm 2.1$  SD mg/dL,  $p = 0.003$ ). That was found extremely higher than results reported by Chang CH [13] ( $2.96$  vs.  $1.48$  mg/dL,  $p = 0.014$ ).

Quality of life was sought in our patients regarding the procedural impact on the patient's life, not the disease burden (primary or secondary). Three components were targeted; the patient satisfaction (a direct question to the patient or mother about the relief

of the chief complain), return back to school or work, and restoration of the daily life activities. The questions were asked by direct interview with the patient by a phone call. It was known to the author the alternation of the procedural effect with diseases like cancer which has specific type of quality of life questions.

JJ patients were a little more satisfied than those with the PCN by 44.8% to 37.5% respectively regarding the relief of the chief complain. But that was statistically in significant may be because both procedures are initial for the definitive management and the primary pathology is there or because they both improve the patient general condition (remission of septicaemia and biochemical correction). Moreover, return back to work or school was more obvious in patients with JJ than those underwent PCN and that was statistically significant.

As well, Restoration of daily life activities was far better in patients underwent JJ than those underwent PCN by 38.8% to 18.8% respectively P value 0.034. Even though two third of JJ respondents maintained their daily life activities. That was in contrast to a study done by Joshi HB *et al.* [17] who reported that Patients with 'JJ' stents have significantly more irritative urinary symptoms and a high chance of local discomfort than patients with nephrostomy tubes (PCN). However, based on the EuroQol analysis, there is no significant difference in the gross impact on the health-related QoL (Quality of Life) or the utility between these groups indicating no patient preference for either modality of treatment.

## CONCLUSION

Our study concluded that there is scarcity of paediatrics Urology service in Sudan. Most of the patients are of low educational class. Urolithiasis accounts the vast majority cause of obstructive uropathy.

PCN under Ultra-sound guidance is a simple, quick, safe procedure and has higher success rate than JJ stent to relief sepsis and decompress the kidney. But it has a higher complication rates on the long run (Dislodgement and block). Moreover, it was found effective in patients with malignant ureteric obstruction. JJ stent needs better setup and more assisting personnel than JJ stent. Patient quality of life is better than those with PCN regarding restoration of their daily life activities and return back to school or work.

## LIMITATIONS

A major limitation of our study is the sample size of the PCN group. Secondly, the ages and baseline creatinine levels were not completely matched in these two groups, thereby making comparisons difficult. A randomized, double-blind study should be performed in the future to make clear suggestions

regarding choices between an internal stent and a PCN tube.

#### CONFLICT OF INTEREST

The author declares that he has no conflicts of interest related to the subject matter or materials discussed in the manuscript.

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