



## URETEROSCOPIC PCNL – OUR EXPERIENCE.

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## ABSTRACT

**Introduction:** PCNL has been associated with morbidity in terms of post-operative pain, bleeding and hospital stay. Various modifications to the conventional PCNL technique have focused on reducing the morbidity. We report our initial experience in Ureteroscopic PCNL with a smaller tract diameter.

**Methods and Patients:** In our study, 50 patients with renal calculi underwent Ureteroscopic PCNL with maximum tract dilatation up to 14Fr. The sheaths used were indigenously designed to facilitate use of Ureteroscope. Excellent visibility was achieved by use of an 8/9.8Fr scope, with adequate channel for irrigant outflow.

**Results:** Complete clearance was achieved in all patients. 22 cases were stented antegrade, while other 28 cases had ureteric catheter in-situ. The average drop in hematocrit was 0.5g. All 50 patients were discharged on the morning of the 2<sup>nd</sup> or 3<sup>rd</sup> post-operative day.

**Conclusion:** With our initial experience we found Ureteroscopic PCNL to be a safer alternative to conventional PCNL in selected group of patients.

**KEYWORDS :** Per cutaneous Nephrolithotomy (PCNL), Renal Calculus, Bleeding, Ureteroscopic PCNL.

## INTRODUCTION:-

Percutaneous Nephrolithotomy has almost replaced conventional open pyelolithotomy over the last decade and is now the procedure of choice for renal calculi more than 1.5 cms. Conventional PCNL is associated with increased morbidity in the form of bleeding, infundibular tear, persistent urine leak, Post-operative pain, increased duration of Hospitalization and all these are attributed to the size of the access tract. Till date there are various evolutions in the access, positioning of the patient, imaging, disintegration of stones and exit strategy following PCNL. Various studies have shown similar clearance rates, reduced bleeding and shorter hospitalization in patients undergoing Mini-PCNL<sup>(1,2)</sup>(U. The aim of our study is to study the outcomes of patients undergoing Ureteroscopic PCNL in our Centre in the last 6 months.

## MATERIALS AND METHODS :-

This study was conducted in the department of Urology from September 2011 to March 2013; Patients who presented with renal calculi of size 1.5 cms to 2.0 cms were included in the study. Patients with concomitant ureteric calculus, pyonephrosis and renal failure were excluded from the study, as they would confound the results. A total of 50 patients underwent Ureteroscopic PCNL with an indigenously designed sheath of 14 Fr size.

The access sheath was indigenously developed in the department of Urology, we used 8/9.8Fr ureteroscope for visualization and pneumatic/laser lithotripsy for fragmentation. This resulted in significant cost-reduction in terms of access sheath procurement, in addition to the reduced morbidity, conferred by the reduced tract size.

Variables assessed were

- Sex
- Age
- Size of calculus
- Location of calculus
- Duration of procedure
- Complications (bleeding, infundibular tear, pelvic perforation and perinephric collection)
- Exit strategy
- Post-operative Hemoglobin drop

- Post-operative pain score
- Duration of hospital stay
- Stent/ureteric catheter removal
- Clearance of calculus.

## RESULTS:-

Data was analysed using SPSS 19.0 Version.

From the data collected, the male to female ratio was almost 1:3 and the side of observing the calculus is almost equal on both the sides. The site of the calculus was predominant in lower and upper poles followed by pelvic stone. 46 patients had complete clearance and 30 patients underwent D J stenting- **Table 1**.

Cross tabulations were generated to see the distribution of the subjects across several combinations. The table below depicts that the majority of subjects who had calculus in the lower, upper poles along with pelvic were males- **Table 2**.

**Stone clearance:** Around 94.6% of males and 84.6% females were observed to have complete clearance. Whereas, stenting is majorly noticed in males than females. With regard to Puncture site, almost equal percentage of males and females were noticed at subcostal and very few in supra costal region. Only one case is observed with combination of both sub and supra costal and that too belongs to male category- **Table 3**.

**Side vs Site of Calculus:** **Table 4** provides a picture about the site of calculus that is tabulated across the side. This is done to show the position of calculus with respect to left or right side. It is witnessed that major proportion of lower, upper and pelvic are in the right side where as the partial staghorn is noted completely on the left side.

**Table 5** is about the distribution of subjects in terms of clearance, stenting and puncture site across side of calculus. With respect to clearance, subjects had better clearance on the right side where as stenting percentage is observed on the left side. In term of puncture site, it is majorly noticed on the right side than that of left.

The continuous variables age, creatinine and prone time in

minutes are binned using visual binning process. The categories are obtained with one sigma standard deviation with the following distribution. Further, cross tabulations are generated across stenting and Age, Creatinine and prone time in minutes. Relating to age, subjects belonging to age group  $\leq 25$  years had stented and slightly major percentage is observed in the age group 26.0 to 50.0 years. Almost same percentage is noticed for above 51 years. In respect of creatinine category, the subjects whose creatinine more than 1.04 have undergone stenting and next to it is subjects with creatinine range of 0.76 to 1.03. With regard to prone time, majority of subjects who underwent stenting their prone time is observed to be above 79 minutes and similar pattern is witnessed with subjects with prone time less than 50 minutes- **Table 6**.

In regard of clearance, subjects pertaining to age groups  $< 25$  and  $> 51$  had complete clearance, whereas subjects whose age group lie between 26 to 50 had a clearance of 88.9%. On the whole, clearance is observed at a better proportion across all age groups. With respect to creatinine, a good proportion of clearance is noticed at all levels of creatinine, indicating that levels of creatinine may not be associated with clearance. Similar feature is noticed with prone time, indicating that varying prone time may not be correlated with the status of clearance- **Table 7**

**Post Op Pain Score:** With a range of 6hrs and 12 hours of observing pain among the subjects, the following distribution is generated to exhibit which category of Age, Prone time, stenting and clearance had a betterment. The numbers revealed the fact that at all categories of the above mentioned parameters were observed to have moderate levels of pain at 12 hours of duration than compared to 6 hours observation. On the whole, it can be understood, the outcome of the experiment conducted can be observable within 12 hours. However, this is noticeable irrespective of age groups prone time categories and having stented and clearance- **Table 8**.

**Post op Complications:** 3 patients had post op fever – Clavien Gr I. 2 patients needed change of antibiotics. 3 patients had hematuria which subsided on its own. There were NO higher grade complications in our series.

#### Summary/inputs:

1. The male to female ratio is observed to be 1:3
2. Predominantly observed site of calculus are lower, upper poles and pelvic and are majorly noticed in males than that of females
3. Almost equal proportion of males and females had clearance, whereas with respect to stenting, major proportion is witnessed in males than that of females.
4. Most common puncture site observed is 'sub' and is with almost equal proportions in both males and females.
5. Subjects whose age is less than 25 years or above 51 years and having creatinine above 1.03 along with prone time greater than 79 minutes indicates a higher chance of getting stented.
6. In terms of clearance, lesser and higher groups had a better response than middle age category, however the response of clearance is almost uniform across different levels of creatinine and prone time.
7. Irrespective of varying categories of age, prone time, stenting and clearance, there is a relative gradual decrease in pain scores from 6 hours to 12 hours period
8. Further, the scores at 6 hours are observed at higher levels of pain, whereas the scores at 12 hours duration are noticed at moderate levels of pain.
9. To observe the impact of uterorenoscopy PCNL in terms of pain, 12 hours duration can be considered as a satisfactory time line. Better observation in gradual decrease of pain can be noticeable within 24 hours of the process of uterorenoscopy PCNL.

#### DISCUSSION:-

Percutaneous Nephrolithotomy (PCNL) has become the standard surgical procedure in the management of renal calculi according to the size, position, shape, and composition of the stones<sup>[3]</sup>. Recently European Association has considered PCNL as first option for large, multiple or inferior calyx stones<sup>[4]</sup>. Open stone surgery has been replaced by PCNL because of its cost effectiveness, lower morbidity, shorter operative time and lower postoperative complications<sup>[5, 6]</sup>. Some patients with history of open stone surgery need PCNL because of renal stone recurrences<sup>[7, 8]</sup>. Percutaneous Nephrolithotomy (PCNL) has become the standard surgical procedure in the management of renal calculi. With widespread use of this technique, its safety in a wide variety of clinical situations such as calyceal diverticulum, Horseshoe kidney, transplanted kidney and in children has been established.<sup>[9]</sup> PCNL is the preferred treatment of choice for large obstructive upper ureteric stones, renal stones  $> 1.5$  cms and lower polar stones  $> 1$ cms, because percutaneous removal has less complications and more effective stone clearance.<sup>[9]</sup> Currently it's the treatment of choice for large, complex and staghorn renal calculi.<sup>[10]</sup>

Mini PERC is defined as Percutaneous Nephrolithotomy achieved through a sheath too small to accommodate a standard rigid Nephroscope. Various studies have shown comparable results in terms of complete stone removal and better results in terms of complications, speedier recovery and decreased hospital stay.<sup>[11]</sup>

Ureteric catheter was left in situ for 28 patients and 22 patients underwent "Double J" stenting. Five studies reported on placement of JJ stents intra-operatively (mean 44.5%, range 0–100%). In our study the mean operative duration was 95 minutes (80-120 Minutes) which is similar in many studies involving Ultra Mini PCNL<sup>[12-21]</sup> Mean operative time and hospital stay was 88.9 min (range 50–270 min) and 1.8 days (range 1–6 days) respectively.

All the patients had Post Procedure Nephrostomy Tube insertion. Most of the Urologists prefer to place a nephrostomy tube after PCNL. It has been shown that nephrostomy tube prevents urinary extravasation, makes the hemostatic process easy and provides an access if a second look procedure is necessary.<sup>[11]</sup> Prospective randomized studies designed to compare standard PCNL vs MINI vs tubeless PCNL confirmed the superiority of tubeless PCNL in terms of reduced post-operative patient discomfort, speedier recovery and shorter hospital stay.<sup>[10]</sup> Significant bleeding and residual stone are the two main concern that could preclude a tubeless PCNL approach.<sup>[10]</sup>

Complete clearance was obtained in 46 patients and 4 patients had clinically Insignificant residual fragments ( $< 3$ mm). SFR was similar to many studies even including Miniperc technique<sup>[22-31]</sup>. The stone clearance rate reported was in the range of 85% to 93%.

The mean operative duration in our study was 95 minutes (80-120 Minutes) which is well within the time mentioned by many authors (40-159 Mins).

**Bleeding:** PCNL is generally accepted as a safe procedure. Hemorrhage is the most frequent complication of this procedure. Excessive bleeding can occur during needle passage, tract dilatation, or nephrostomy (32-34). Similar to our study acute bleeding requiring transfusion has been reported in 3% to 12% of cases (35,36).

#### CONCLUSION:-

With the initial experience at our centre we found Uterorenoscopic PCNL to be a viable and safer alternative to

conventional PCNL in a selected group of patients.

**Conflict of Interest:** None.

**Acknowledgement:** We sincerely acknowledge the patients who agreed to take part in the study.

**Table 1. Demographic and Calculus Characteristics.**

Parameter	Categories	Count	Column N %
Sex	Male	37	74.00%
	Female	13	26.00%
Side	Left	24	48.00%
	Right	26	52.00%

Site of calculus	Lower Pole	15	30.00%
	Upper Pole	11	22.00%
	Mid Pole	3	6.00%
	Pelvic	10	20.00%
	PUJ	8	16.00%
	Partial Staghorn	2	4.00%
	Upper Ureteric Calculus	1	2.00%
Clearance	Yes	46	92.00%
	No	4	8.00%
Stenting	Yes	30	60.00%
	No	20	40.00%

**Table 2: Calculus Characteristics.**

Sex vs Site of calculus			Site of calculus							Total
			Lower Pole	Upper Pole	Mid Pole	Pelvic	Puj	Partial Staghorn	Upper Uterus Cell	
Sex	Male	Count	11	8	2	6	7	2	1	37
		Row%	29.7%	21.6%	5.4%	16.2%	18.9%	5.4%	2.7%	100.0%
		Column %	73.3%	72.7%	66.7%	60.0%	87.5%	100.0%	100.0%	74.0%
	Female	Count	4	3	1	4	1	0	0	13
		Row%	30.8%	23.1%	7.7%	30.8%	7.7%	0.0%	0.0%	100.0%
		Column %	26.7%	27.3%	33.3%	40.0%	12.5%	0.0%	0.0%	26.0%
Total		Count	15	11	3	10	8	2	1	50
		Row%	30.0%	22.0%	6.0%	20.0%	16.0%	4.0%	2.0%	100.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 3: Stone Location, Access, and clearance.**

			Clearance		Stenting		Puncture Site			Total
			Yes	No	Yes	No	Sub	Supra	Sub+Supra	
Sex	Male	Count	35	2	24	13	33	3	1	37
		Row%	94.6%	5.4%	64.9%	35.1%	89.2%	8.1%	2.7%	100.0%
		Column %	76.1%	50.0%	80.0%	65.0%	73.3%	75.0%	100.0%	74.0%
	Female	Count	11	2	6	7	12	1	0	13
		Row%	84.6%	15.4%	46.2%	53.8%	92.3%	7.7%	0.0%	100.0%
		Column %	23.9%	50.0%	20.0%	35.0%	26.7%	25.0%	0.0%	26.0%
Total		Count	46	4	30	20	45	4	1	50
		Row%	92.0%	8.0%	60.0%	40.0%	90.0%	8.0%	2.0%	100.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 4: Side vs Site of Calculus**

			Site of calculus							Total
			Lower Pole	Upper Pole	Mid Pole	Pelvic	Puj	Partial Staghorn	Upper Uterus Cell	
Side	Left	Count	7	4	1	4	5	2	1	24
		Row %	29.2%	16.7%	4.2%	16.7%	20.8%	8.3%	4.2%	100.0%
		Column %	46.7%	36.4%	33.3%	40.0%	62.5%	100.0%	100.0%	48.0%
	Right	Count	8	7	2	6	3	0	0	26
		Row %	30.8%	26.9%	7.7%	23.1%	11.5%	0.0%	0.0%	100.0%
		Column %	53.3%	63.6%	66.7%	60.0%	37.5%	0.0%	0.0%	52.0%
Total		Count	15	11	3	10	8	2	1	50
		Row %	30.0%	22.0%	6.0%	20.0%	16.0%	4.0%	2.0%	100.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 5: Side and stone clearance.**

			Clearance		Stenting		Puncture Site			Total
			Yes	No	Yes	No	Sub	Supra	Sub+Supra	
Side	Left	Count	21	3	17	7	21	2	1	24
		Row %	87.5%	12.5%	70.8%	29.2%	87.5%	8.3%	4.2%	100.0%
		Column %	45.7%	75.0%	56.7%	35.0%	46.7%	50.0%	100.0%	48.0%
	Right	Count	25	1	13	13	24	2	0	26
		Row %	96.2%	3.8%	50.0%	50.0%	92.3%	7.7%	0.0%	100.0%
		Column %	54.3%	25.0%	43.3%	65.0%	53.3%	50.0%	0.0%	52.0%
Total		Count	46	4	30	20	45	4	1	50
		Row %	92.0%	8.0%	60.0%	40.0%	90.0%	8.0%	2.0%	100.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 6: Other parameters and stone clearance.**

			Age			Creatinine			Prone Time in Minutes		
			<= 25.0	26.0 - 50.0	51.0+	<= .75	.76 - 1.03	1.04+	<= 50	51 - 78	79+
Stenting	Yes	Count	5	21	4	6	18	6	8	8	14
		Row %	16.7%	70.0%	13.3%	20.0%	60.0%	20.0%	26.7%	26.7%	46.7%
		Column %	83.3%	58.3%	50.0%	54.5%	58.1%	75.0%	57.1%	38.1%	93.3%
	No	Count	1	15	4	5	13	2	6	13	1
		Row %	5.0%	75.0%	20.0%	25.0%	65.0%	10.0%	30.0%	65.0%	5.0%
		Column %	16.7%	41.7%	50.0%	45.5%	41.9%	25.0%	42.9%	61.9%	6.7%
Total		Count	6	36	8	11	31	8	14	21	15
		Row %	12.0%	72.0%	16.0%	22.0%	62.0%	16.0%	28.0%	42.0%	30.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 7: Other parameters and stone clearance.**

			Age			Creatinine			Prone Time in Minutes		
			<= 25.0	26.0 - 50.0	51.0+	<= .75	.76 - 1.03	1.04+	<= 50	51 - 78	79+
Clearance	Yes	Count	6	32	8	10	28	8	12	19	15
		Row %	13.0%	69.6%	17.4%	21.7%	60.9%	17.4%	26.1%	41.3%	32.6%
		Column %	100.0%	88.9%	100.0%	90.9%	90.3%	100.0%	85.7%	90.5%	100.0%
	No	Count	0	4	0	1	3	0	2	2	0
		Row %	0.0%	100.0%	0.0%	25.0%	75.0%	0.0%	50.0%	50.0%	0.0%
		Column %	0.0%	11.1%	0.0%	9.1%	9.7%	0.0%	14.3%	9.5%	0.0%
Total		Count	6	36	8	11	31	8	14	21	15
		Row %	12.0%	72.0%	16.0%	22.0%	62.0%	16.0%	28.0%	42.0%	30.0%
		Column %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

**Table 8: Post Op Pain score- VAS**

			Pain 6hrs						Pain 12hrs			
			4		5		6		2		3	
			Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Age	<= 25.0	0	0.0%	2	33.3%	4	66.7%	3	50.0%	3	50.0%	
	26.0 - 50.0	0	0.0%	8	22.2%	28	77.8%	15	41.7%	21	58.3%	
	51.0+	1	12.5%	2	25.0%	5	62.5%	3	37.5%	5	62.5%	
Prone Time in Minutes	<= 50	0	0.0%	3	21.4%	11	78.6%	3	21.4%	11	78.6%	
	51 - 78	0	0.0%	5	23.8%	16	76.2%	10	47.6%	11	52.4%	
	79+	1	6.7%	4	26.7%	10	66.7%	8	53.3%	7	46.7%	
Stenting	Yes	1	3.3%	6	20.0%	23	76.7%	11	36.7%	19	63.3%	
	No	0	0.0%	6	30.0%	14	70.0%	10	50.0%	10	50.0%	
Clearance	Yes	1	2.2%	11	23.9%	34	73.9%	18	39.1%	28	60.9%	
	No	0	0.0%	1	25.0%	3	75.0%	3	75.0%	1	25.0%	

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