

## “ Percutaneous Nephrolithotomy in Patients with Solitary Kidney – Svims Experience ”

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### **Abstract:**

**Introduction:** Solitary kidney individuals develop renal calculi just as the same as people with two kidneys. This study is about outcomes and complications associated with percutaneous nephrolithotomy in patients with solitary kidney .

**Material and Methods:** Between January 2012 and JULY 2016 , 24 patients with a solitary kidney underwent PCNL at Department of Urology ,SVIMS , Tirupati . Routine laboratory tests including serum creatinine , IVP , CT abdomen plain was performed on all patients. All patients were operated with the classic method of PCNL in prone position with fluoroscopic guidance . Renal function was assessed by serum creatinine and Estimated Glomerular Filtration Rate(calculated using MDRD formula) in preoperative period , post op day 1 and on 3<sup>rd</sup> monthly follow up.

**Results:** Stone clearance was possible in 22 (92%) patients . After the operation, five patients became febrile, three patient developed hematuria and one needed blood transfusion . Mean serum creatinine was found to be 1.90 mg/dl during pre operative period and 1.63 and 1.56 mg/dl on post operative day 1 and at third month following surgery respectively. The mean pre operative EGFR was 47.15 ml/min/1.73 m<sup>2</sup> and 54.78 and 57.23 ml/min/1.73 m<sup>2</sup> during immediate post op period and at 3<sup>rd</sup> month following surgery.

**Conclusion:** PCNL is a safe procedure with high success rate ( >90 % stone clearance) with an acceptable low complication rates . Renal function appears to improve after PCNL in patients with solitary kidney as demonstrated by an improvement in both serum creatinine and EGFR .

**Keywords:** estimated glomerular filtration rate ,percutaneous nephrolithotomy , solitary kidney , serum creatinine .

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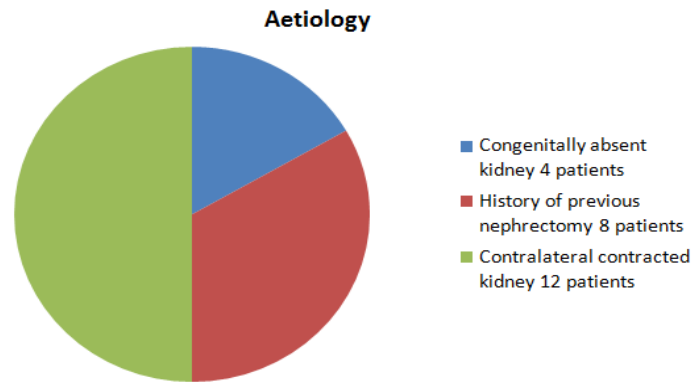
### I. Introduction

Solitary kidney is a condition in which a patient has single functioning kidney instead of two kidneys. Incidence of calculus disease in solitary kidney patients is same as that of general population .This group of patients represent a high risk group as with any inadvertent injury to the remnant kidney may land the patient in a anephric state. PCNL was first introduced in 1976 as a method of treatment for renal calculi<sup>1</sup> .With the advancement of new technology and instruments , PCNL has become the most preferred treatment for patients with large and complex renal calculi<sup>2</sup> . Although technically, PCNL done in general population and solitary kidney patients remain the same, a lot more is at stake if complications occur in later group. The potential risk of uncontrollable hemorrhage requiring angio embolisation or even nephrectomy with subsequent need for renal replacement therapy are possible complications<sup>3</sup> .

In this retrospective study , we evaluated the outcomes of PCNL in patients with solitary kidney in relation with stone clearance rates , complications and renal function at immediate and late post operative period.

### II. Materials & Methods

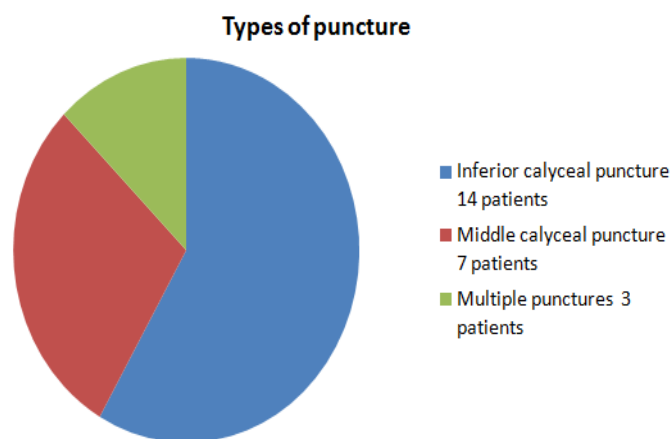
During the study period of January 2012 And July 2016 , a total number of 536 PCNL were done at Department Of Urology ,Sri Venkateswara Institute of Medical Sciences ,TIRUPATI , out of which 24 were done in patients with solitary functioning kidney . (4 patients had congenitally absent kidney 17% , 8 patients has previous history of nephrectomy 33% , other 12 patients were having contralateral contracted kidney 50%)(Fig 1) . Renal function was assessed by DTPA renogram. Routine laboratory tests including serum creatinine were done . Metabolic profile was done in all patients . Plain CT abdomen , IVP , X ray KUB was done in all patients . Stone burden was calculated according to CT abdomen finding  
Fig :1 showing the aetiology of solitary kidney in our study group



After taking informed consent , PCNL was done under General Anaesthesia in all patients. In lithotomy position , a retrograde ureteric catheter was inserted and later patient turned into prone position. For fluoroscopic guidance , RGP was done through available ureteric catheter. Appropriate calyx was entered with the help of PCNL needle . The tract was dilated upto 28 Fr, amplatz sheath placed and 24 Fr WOLF nephroscope introduced. Stones were fragmented using pneumatic lithotripsy ( SWISS LITHOCLAST MASTER) and fragments were removed by using stone grasping forceps. Twenty patients underwent standard PCNL and had both nephrostomy tube and DJ stent in situ. But in four patients , we performed tubeless PCNL .Sr. Creatinine was measured on postoperative day 1 and at third month follow up in all twenty four cases. EGFR was calculated based on MDRD formula . EGFR was also measured during pre operative period , on post op day 1 and at 3 rd month follow up period. Stone clearance was assessed by postoperative x ray KUB and USG Abdomen and plain CT abdomen when required .

### III. Results

The mean age of patients was 43 years( range 16 – 73 years ) and male to female ratio was found to be 3:1 . The mean stone burden was found to be 37.41 mm . Ten patients had a single stone in renal pelvis , four had combined stone in both renal pelvis and inferior calyces, four had isolated stones in inferior calyces and six patients had multiple stones and two patients had associated lower ureteric stone on same side for which those patients underwent URSL in same sitting . Access was achieved in all cases , 14 patients had inferior calyceal puncture , 7 middle calyceal and 3 other patients needed multiple punctures.(Fig 2)



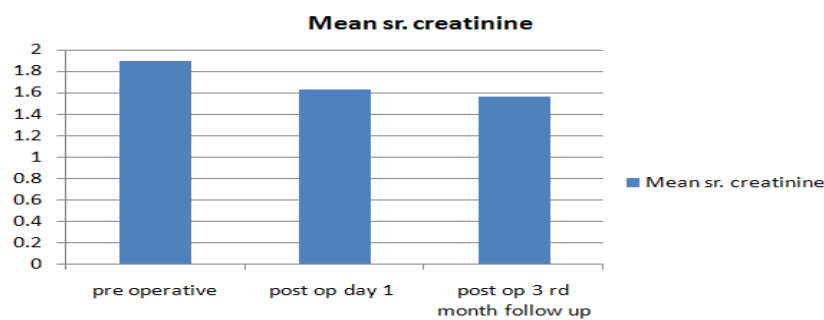
**Fig:2** Types of punctures

The mean operative period is 76 minutes. Four patients underwent totally tubeless PCNL and the rest twenty patients the standard one with both nephrostomy tube and DJ stent in situ .The mean time for nephrostomy tube removal was 3.5 days and mean time for discharge was 4.6 days. Five patients developed fever postoperatively , three patients developed hematuria which later subsided & one patient needed blood transfusion (Table 1 )

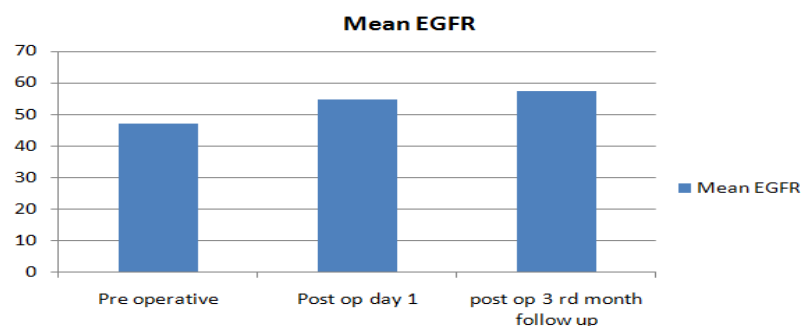
COMPLICATIONS	NO .of patients	Percentage of patients (%)	CLAVIEN DINDO GRADING OF MORBIDITY
Fever	5	20.83%	II
Sepsis	1	4.16%	II
Hemorrhage	3	12.5%	I
Hematuria needing blood transfusion	1	4.16%	II
Residual calculus requiring ESWL	2	8.32%	IIla

**Table:1** Complications occurred in the study group

Complete stone clearance was achieved in 22 patients(92%) . Residual calculus was found in two patients (8%) who undergone ESWL with DJ stent in situ .Mean serum creatinine improved from pre operative value of 1.90 mg/dl to 1.63 on 1 st post op day and at 3 rd moth of follow up it was nearly stabilized at a mean value of 1.56 mg/dl (Fig 3). Estimated Glomerular Filtration Rate improved from a mean of 47.15 to 54.78ml/min/1.73m<sup>2</sup> in pre operative and immediate postoperative period respectively . Mean EGFR at 3 rd month follow up was found to be 57.23ml/min/1.73m<sup>2</sup> (Fig 4)



**3 :** Decreasing Trend Of Mean Serum Creatinine



**Fig 4 :** Increasing trend of mean EGFR

#### IV. Discussion

Presently PCNL is the appropriate treatment option for renal calculi more than 2 cms or failed SWL due to its high stone clearance and less morbidity<sup>2</sup> . Complications due to PCNL are of utmost importance in patients with solitary kidney when compared to normal patients having two well functioning kidneys. One of the most critical complications is uncontrolled hemorrhage that could require angio embolization or even nephrectomy . Blood transfusion is required in 1 % to 11% of patients who undergo PCNL and in 2% to 53% of those with staghorn calculi who undergo PCNL<sup>4,5,6</sup> . Blood transfusion was needed in one patient (4.16%) in our group which is consistent with other previous similar studies. Most of the bleeding cases caused by PCNL are treated conservatively. About 0.8% of the cases may need angio embolization for the treatment of uncontrollable bleeding<sup>7</sup> . Such intractable bleeding was not encountered in our study group. .Stone free rate in our study group

was found to be 92% on par with other small series(65 – 100 %) in published reports regarding PCNL in solitary kidney<sup>3,4,7</sup>.

Canes et al retrospectively assessed the impact of PCNL on the renal function of 81 patients with a solitary kidney<sup>8</sup>. They reported an increase in mean EGFR levels from a preoperative level of 44.9 to 51.5 ml/min/1.73 m<sup>2</sup> one year after operation. Alkman et al showed that renal function stabilized or improved in 90 % of cases at more than 6 months follow up<sup>9</sup>. In the present study, the mean pre operative EGFR was 47.15 ml/min/1.73 m<sup>2</sup> and 54.78 and 57.23 ml/min/1.73 m<sup>2</sup> during immediate postop period and at third month follow up period. Mean serum creatinine was found to be 1.90 mg/dl during pre operative period and 1.63 and 1.56 mg/dl on post operative day 1 and at third month following surgery respectively.

Careful attention during pre operative and intra operative period may reduce complications associated with the PCNL procedure<sup>10</sup>. The main objective of tract formation in solitary kidney during PCNL is to gain adequate access to the collecting system where as minimizing trauma and bleeding. This should be done with minimum tract size and less number of punctures as possible. The main shortcomings of this study are relatively less number of patients, retrospectiveness of the study, short follow up period. These should be answered with randomized control trials involving larger number of patients with longer duration of follow up period for better results.

## V. Conclusion

PCNL is a safe procedure with high success rate (>90 % stone clearance) with an acceptable low complication rates. Renal function appears to improve after PCNL in patients with solitary kidney as demonstrated by an improvement in both serum creatinine and EGFR.

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