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ORIGINAL RESEARCH

Effect of PCNL on renal function, predictors for renal function deterioration

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Abstract
Present study tried to check for effect of PCNL on renal function, predictors for renal function deterioration and share our experience for use of long term DJ stents for patients who are very high risk surgical candidates. Data of patients with renal and upper ureter stone disease along with CKD was collected. The eGFR for them was calculated by MDRD equation. Urinary diversion was considered for patients presenting with hydroureteronephrosis, pyonephrosis, or fever. These patient were discharged once after settlement of sepsis and symptoms for serum creatinine to settle and then called again for definitive management. The nadir level generally reached over 2 to 3 weeks was taken as the baseline creatinine to measure preop eGFR. Patients were then classified into different CKD stages based on preop eGFR. General patient characteristics, comorbidities, stone location and burden, preop diversion, preop dialysis, post op complication were recorded. Complications were graded according to clavien dindo scoring system. Mean preop GFR was 37.95 and 27.95 respectively in PCNL and long term stent group. Mean post op GFR was 38.46 and 28.16 respectively in PCNL and long term stent group.Stone free rates and stone recurrence rates are higher in this group of patients due to several reasons. Meaning by they will be needing further interventions in future also and with its associated complications. Long Term Double J stents with prophylactic antibiotics provide a feasible option for patients who are very high risk for surgery or who refuse for it.
Keywords: GFR, hydroureteronephrosis, pyonephrosis, renal function.

Introduction
The chronic kidney disease (CKD) is defined by Workgroup of the U.S. National Kidney Foundation, Kidney Disease Outcomes Quality Initiative (K/DOQI) Advisory Board as sustained kidney injury longer than 3 months resulting in a GFR of less than 60 mL/min/1.73 m2 [1]. The classification of CKD was updated in 2012 by KDIGO [2,3]. The prevalence renal stone in patients with CKD is 1.7%-18% and among patients requiring maintenance hemodialysis it is around 3.2% [4]. Percutaneous nephrolithotomy (PCNL)is the preferredtreatment of large renal calculi [5]. The effects of PCNL on renal function in CKD patients have been studied in several studies with some demonstratingimprovement of renal function while others report a decline in renal function [6,7]. We in our study try to check for effect of PCNL on renal function, predictors for renal function deterioration and share our experience for use of long term DJ stents for patients who are very high risk surgical candidates .

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Materials and Methods

The study was retrospective analytical study performed at a tertiary care centre in north western rajasthan. Data of patients with renal and upper ureter stone disease alongwith CKD was collected. The eGFR for them was calculated by MDRD equation. Urinary diversion was considered for patients presenting with hydroureteronephrosis, pyonephrosis, or fever. These patient were discharged once after settlement of sepsis and symptoms for serum creatinine to settleand then called again for definitive management. The nadir level generally reached over 2 to 3 weeks was taken as the baseline creatinine to measure preop eGFR. Patients were then classified into different CKD stages based on preop eGFR. General patient characteristics, comorbidities, stone location and burden, preop diversion, preop dialysis, post op complication were recorded. Complications were graded according to clavien dindo scoring system.

MDRD Equation

$$eGFR\ (ml/min/1.73m^2) = 186 * [P_{Cr}(mg/dl)^{-1.154} * [Age]^{-0.203} * 0.742\ (If\ Female) * 1.210\ (If\ African\ American)$$

CKD stage	GFR(ml/min)
1	>90
2	60-90
3a	45-60
3b	30-45
4	15-30
5	<15

Clavien DIndo Grade	Definition
1	Any deviation from normal post operative course. Allowed drugs are antiemetics, antipyeretics, analgesics, diuretics, electrolytes. Wound infection opened at bedside.
2	Requiring drugs other than allowed for grade 1 complications, Blood transfusion, TPN
3 **3a** **3b**	Requiring surgical, endoscopic or radiological Intervention Intervention not under GA Intervention under GA
4 **4a** **4b**	Life threatening complications requiring ICU Mx Single organ dysfunction (include dialysis) Multi organ dysfunction
5	Death

Work up for patients included routine blood chemistries, urine routine and culture, Xray KUB, noncontrast computed tomography(NCCT) KUB, Arterial blood gas when indicated and preanaesthetic evaluation.After nephrologic and cardiopulmonary clearance and informed consent about procedure its complication and potential need for post op dialysis patients were taken for surgery. Standard 24 Fr prone PCNL was done under spinal anaethesia. Retrograde access was established by placement of ureteric catheter. Puncture was done under fluoroscopic guidance by air or contrast pyelogram. After placement of

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guidewire track was dilated till 26 Fr by serial alken dilators and amplatz sheath introduced. Pneumatic lithotripters were used to broke down stones. Stone clearance was confirmed nephroscopically and fluoroscopically. Exit strategy included both, placement of a 5.5 Fr double J stent and a 20 FR nephrostomy. Xray of KUB and chest if indicated were done on post op day one. Nephrostomy was then removed.

Patients who were at very high cardiopulmonary risk for anaesthesia and surgery and who didn't give consent for surgery or hemodialysis were managed by placement of longterm double DJ stent retrograde or antegrade.

Patients were followed up and those were included who had at least 1 year follow up data. Serum creatinine at 1 year was noted and eGFR calculated and called as post op eGFR.

Data was tabularised and IBM SPSS version 20 was used for statistical analysis. Descriptive analysis was used for defining basic patient characteristics as mean and standard deviation or frequencies and percentages based on type of variables.Multinomial logistic regression was used for multivariate analysis and to predict factors responsible for CKD stage migration (Stable, improvement, deterioration) postop. Mixed design ANOVA was used for comparison of outcome between PCNL and lonf term stent group.

Results

No of patients		117
Age range		22-76
Mean Age (SD)		49.4(11.7)
Male/Female		77/40
Comorbidities	HTN	50(42.7%)
	DM	28(23.9%)
	CAD	24(20.5%)
Site of Calculus	Pelvic	45(38.5%)
	Upper ureteric	27(23.1%)
	Calyceal	15(12.8%)
	Staghorn	30(25.6%)
Size of calculus mean (SD)		322.7 (254.4)
Pre op diversion		74(63.2%)
Pre op dialysis		21(17.9%)
Management (PCNL/Long term stent)		98/19,
PCNL No. of tracts	1	73
	2	18
	3	5
	4	1
Complications Clavien Dindo	0	71
	1	4
	2	15
	3	3
	4	4

CKD stages	No of patients (pre op)	No of patients (post op)
2		8
3a	31	25
3b	49	56
4	34	27
5	3	

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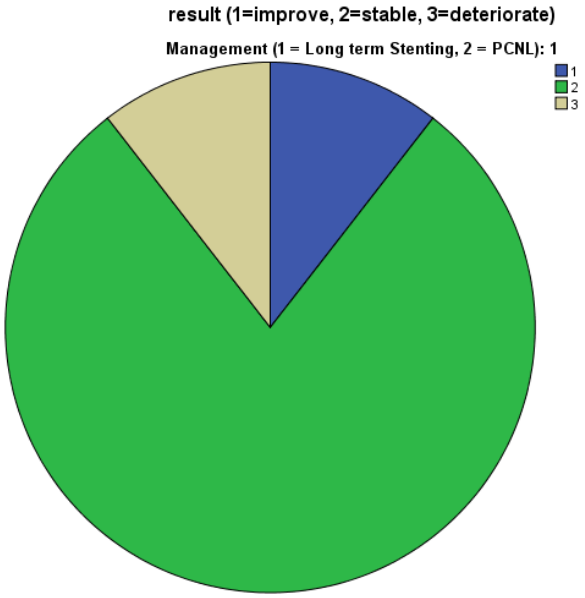
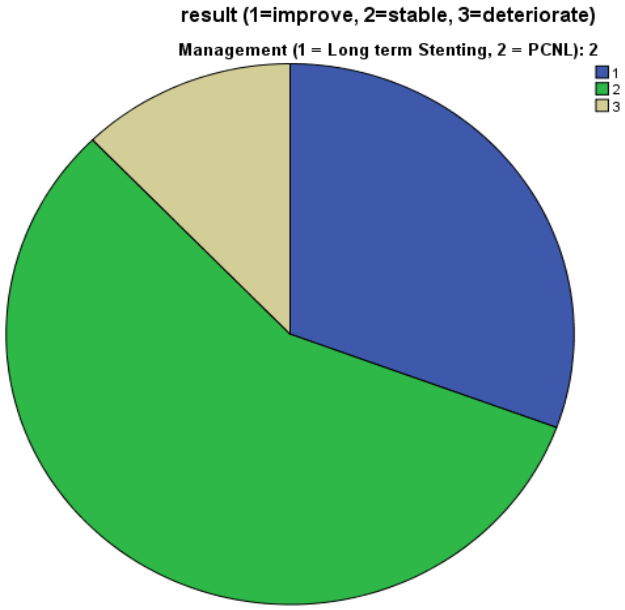
CKD stage	PCNL group	Long term stent group
Improvement	30(30.6)	2(10.5)
Stable	56(57.1)	15(78.9)
Deterioration	12(12.2)	2(10.5)





The patients were divided in different CKD categories based on preop GFR and post op eGFR. And they were divided in three groups based on CKD stage improvement, remaining same and deterioration post PCNL to identify the factors responsible for them. CKD stage improvement was seen in Preop GFR and hypertension were the two factors which were statistically significant to predict CKD stage improvement (OR=0.874, P=0.006 and OR=0.018, P=0.005 respectively). While preop GFR was the only statistically significant factor to predict CKD stage remaining the same post PCNL (OR=0.914, P= 0.048).

Mean preop GFR was 37.95 and 27.95 respectively in PCNL and long term stent group. Mean post op GFR was 38.46 and 28.16 respectively in PCNL and long term stent group. Paired t test was run to see the difference in the pre op and post op mean GFRs for both the

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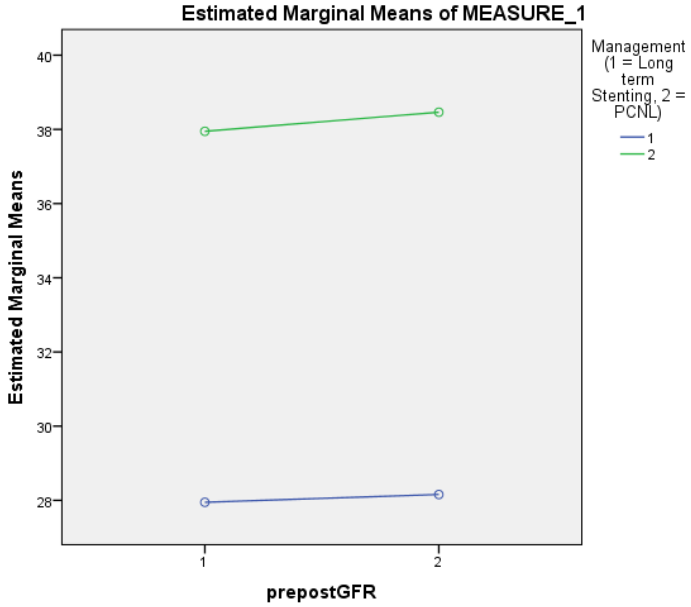
management groups and it was found to be non significant (P=0.606 for PCNL group, P=0.912 for long term stent group)



We also compared the results of PCNL and longterm stenting groups though the groups were not even by number and characteristics also. And although PCNL is a well established management of such cases, Long term stenting also showed modest improvement and more importantly very less deterioration. There was statistically significant difference between the PCNL and long term stenting groups as far as effect on eGFR is concerned (P=0.001).

Discussions

The effect, PCNL has on renal function is an important issue because of the association between urolithiasis and CKD [8, 9, 10, 11] and high recurrence rates and the need for repeat surgery.

Complication rate in our study was 26.5%. Blood transfusion rate specifically was 15.3 %. In other studies this has been between 20% to 36%[12,13]. This high rate of transfusion is because of higher prevalence of anaemia and coagulopathy in CKD patients. They are also more susceptible to infection. They are at high risk for electrolyte imbalances and fluid overload. Depending on the duration and severity of CKD, secondary hyperparathyroidism, renal osteodystrophy, altered lipid profile, and cardiomyopathy are added problems. Patients with CKD are thus at a high risk for any form of anesthesia and surgery.[14]

Several studies have demonstrated varying effects of PCNL on renal functional outcomes in CKD patients. Kuzgunbay et al. reviewed 19 of 300 patients who had renal insufficiency defined by them as serum creatinine more than 1.4 [15]. In those 19 patients undergoing PCNL 75% had either stable or improved renal function and 25% experienced a decrease in overall renal function. Mean follow up period was 51 months. In our study 87.7 % of CKD patients had their CKD stage stable or improved after PCNL while rest deteriorated.

Studies have also tried to find the factors predicting renal function deterioration post PCNL in CKD patients. Akman et al in their experience on 177 CKD patients undergoing PCNL found diabetes , postop complications and hypertension as statistically significant predictors of renal function deterioration[16]. In our study absence of hypertension and low pre op eGFR were found to be statistical significant predictor of improvement of renal function defined here by improvement in CKD stage(P=0.005 and P=0.006 respectively).

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We could not found any study which had used long term stenting as a treatment option for patients with renal or upper ureteric calculus with CKD who are at very high risk for surgery or otherwise deferred surgery for some reason.

Stone free rates and stone recurrence rates are higher in this group of patients due to several reasons. Meaning by they will be needing further interventions in future also and with its associated complications. Long Term Double J stents with prophylactic antibiotics provide a feasible option for patients who are very high risk for surgery or who refuse for it.

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