



### Original Research Article

## Renal Function Change in Renal Calculus Disease Undergoing Urological Intervention

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### Abstract

**Background:** Urolithiasis, the third most common urological disease is one of the oldest disease known to mankind affecting both males and female in a proportion of approximately 2:1.<sup>1</sup> It is very frequently seen disease in recent times, with an increasing incidence and prevalence, with a significant economic impact associated with its treatment. Although there are numerous reports about the end results, its effects on renal functions are not well studied quantitatively. Renal dysfunction due to an obstructing renal or urinary tract calculus improves or resolves upon the timely removal by the appropriate method. However, stone-removing procedures may have a negative impact on renal function through direct or indirect mechanisms.<sup>5</sup>

**Aims and Objectives:** To study the renal function changes in patients of renal calculus disease who will undergo Urological Intervention(s), assess the factors that influence the post procedural renal function change (s) following the urological intervention and evaluate the Outcomes of Percutaneous Nephrolithotomy compared to Shock Wave Lithotripsy on renal function changes.

**Materials and Methods:** This is Hospital based descriptive study conducted in Department of Medicine and Urology, RIMS, Imphal during September 2016 to August 2018 amongst patient admitted in the Medicine/ Urology department in the age group of 18 years or more, with renal stone disease for Urological interventions during the study period

**Results:** It was concluded that renal function does not change post urological intervention & that patients presenting with kidney stone disease & renal insufficiency experience higher likelihood of renal function deterioration after treatment of calculus disease. It was also observed comorbidities like hypertension, diabetes or anaemia were not significant predictors or determinants of postoperative renal function deterioration. There was also improvement of hydronephrosis post intervention.

**Keywords:** Renal Functions, Urolithiasis, Nephrolithotomy.

## Introduction

Urinary stone disease or Urolithiasis is one of the oldest diseases known to mankind. It is the third most common urological disease affecting both males and females but more predominant among males in a proportion of approximately 2:1.<sup>1</sup> It is very frequently seen disease in recent times, with an increasing incidence and prevalence, with a significant economic impact associated with its treatment. Patients with kidney stones often have a benign course, but life threatening complications like acute kidney injury and infection can arise. Moreover, the financial burden from medical expenditures and lost productivity is substantial. Epidemiological surveys have been previously reviewed showing that in economically developed countries the prevalence rate ranged between 4% and 20%.<sup>2</sup>

The incidence of kidney stone is highest in the age group of 30-45 years and decreases after the age of 50 years. In India, the "stone belt" occupies some parts of Maharashtra, Gujarat, Punjab, Haryana, Delhi and Rajasthan.<sup>3</sup> In Manipur, the situation is not an exception as the incidence of urolithiasis observed to be high.<sup>4</sup>

The majority of patients with symptomatic kidney stones pass them spontaneously. Those who are not able to do so may be subjected to a number of stone-removing procedures, most commonly, extracorporeal shock wave lithotripsy (ESWL) and ureteroscopy. Percutaneous nephrolithotomy (PCNL) is used to treat patients with large stones, those failing the aforementioned procedures, and those having certain renal and ureteric anatomic abnormalities. In human beings, it can recur in approximately 50% of patients in five years. Meticulous clearance of stones, minimal morbidity, maximal nephron sparing, and slower recurrence rate should be aimed during the treatment plan. In this context ESWL, PCNL technique and minimally invasive surgeries are generally performed instead of open surgery nowadays.<sup>5</sup>

Although there are numerous reports about the end results, its effects on renal functions are not

well studied quantitatively. Renal dysfunction due to an obstructing renal or urinary tract calculus improves or resolves upon the timely removal by the appropriate method. However, stone-removing procedures may have a negative impact on renal function through direct or indirect mechanisms.<sup>5</sup>

Thus, this present study is undertaken with the aim particularly focusing on the renal function changes in patients of renal calculus treated with any urological intervention i.e PCNL, ESWL or any other surgical intervention.

## Aims and Objectives

To study the renal function changes in patients of renal calculus disease who will undergo Urological Intervention(s) and assess the factors that influence the post procedural renal function change(s) following the urological intervention. Also evaluate the outcomes of Percutaneous Nephrolithotomy compared to Shock Wave Lithotripsy on renal function changes.

## Materials and Methods

This is a Hospital based descriptive study conducted in RIMS amongst 123 patients of renal calculi who underwent urological intervention for a period of two years between September, 2016 to August, 2018

**Inclusion Criteria:** Age  $\geq$  18 years and patients of renal calculus disease regardless of sex

**Exclusion Criteria:** End Stage Renal Disease and Active Urinary Tract Infection/ Urosepsis

**Statistical Analysis:** Data were entered in IBM SPSS Statistics 21 for windows (IBM corp. 1995, 2012) and analysed. Descriptive statistics like mean, SD and proportion were used. Chi square test was used to test the significance between proportions.

P value less than 0.05 was considered as a level of significance at Confidence Interval (C.I) of 95 percent.

### Approval of Research Ethics Board

Prior permission was taken from the Research Ethics Board, Regional Institute of Medical Sciences (RIMS), Imphal, before this study was conducted. Informed consent of the participants of the study from all the patients.

### Results & Observations

#### Age & Gender

Majority of the study population belonged to the age group of 30 – 40 years (26.8%). Female patients marginally outnumbered male patients (50.4% vs 49.6%). (Table 1)

**Table 1:** Age & gender wise distribution of study population (n = 123)

Age group	Gender		Total	Percentage
	Male	Female		
18 - 30 years	8	8	13	13 %
30 - 40 years	16	17	33	26.8 %
40 - 50 years	12	13	25	20.3%
50 - 60 years	16	15	31	25.2%
60 years & above	9	9	18	14.7
Total	61(49.6%)	62 (50.4%)	123	100 %

### Religion

77.2% of the patients belonged to the Hindu religion as compared to Muslims and Christians. (Table 2)

**Table 2:** Religion wise distribution of study population (n = 123)

Religion	Frequency	Percentage
Hindu	95	77.2 %
Muslim	12	9.8 %
Christian	16	13 %
Total	123	100 %

### Site of Calculi

Majority of the study population (87.8%) had renal calculi. Both renal and ureter calculi were found in 12.2% patients. (Table 3)

**Table 3:** Site of Calculi (n = 123)

Site	Frequency	Percentage
Renal	108	87.8 %
Renal & Ureter	15	12.2 %
Total	123	100 %

### Site of Renal Calculi

Calyx (55.285%) was the most common site of calculi followed by that of the renal pelvis & staghorn (13% each). (Table 4 and Figure 1)

**Table 4** Site of renal calculi (n = 123)

Site	Frequency	Percentage
Calyx	68	55.28%
Renal Pelvis	16	13%
PelviUretericJunction	8	6.5 %
Staghorn	16	13%
Calyx & Ureter	15	12.22%
Total	123	100 %

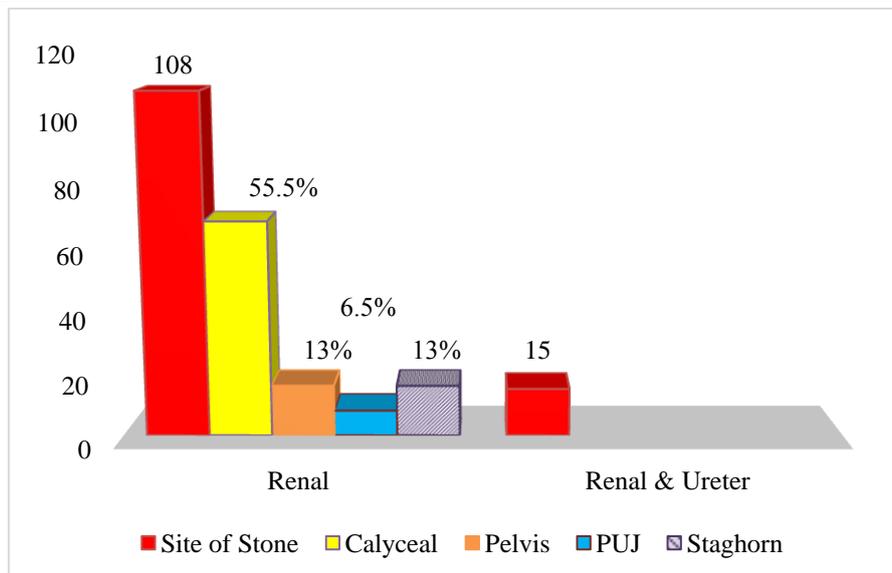


Fig 1. Site of calculi (n=123)

**Comorbidities**

Majority of the study population (93.5%) had anaemia followed by Hypertension (17.9%) and Diabetes Mellitus (4.1%). (Table 5)

Table 5 Comorbidities among study populations (n = 123)

Comorbidity	Frequency	Percentage
Hypertension	22	17.9 %
Diabetes	5	4.1%
Hypertension & Diabetes	5	4.1%
Anaemia	115	93.5%

**Hypertension among Study Population**

Majority of the patients (72.7%) suffering from hypertension were of Stage – I. (Table 6)

Table 6 Hypertension among study populations (n = 22)

Blood pressure category		Systolic BP (mm Hg)	Diastolic BP (mm Hg)		Frequency	Percentage
Elevated		120 – 129	&	< 80	2	9 %
Hypertension	Stage – I	130 – 139	or	80 – 89	16	72.7%
	Stage – II	≥140	or	≥90	4	18.3%
Total					22	100%

**Anaemia among study populations**

Anaemia was marginally more prevalent in female patients (50.44% vs 49.56%). Majority of the patients (65.85%) suffered from moderate Anaemia, 86.2% of females and 53.4% of males. The p value is 0.002. (Table 7)

Table 7 Anaemia among study populations (n = 115)

Anaemia		Gender		Total
		Male	Female	
Mild	Male = 11 – 12.9 g	25	7	32
	Female = 11 – 11.9 g			
Moderate	8 – 10.9 g	31	50	81
Severe	< 8 g	1	1	2
Total		57 (49.56%)	58 (50.44%)	115
$\chi^2 = 14.57$		$df: 3$		$p: 0.002$

**Haematological & Biochemical Parameters**

Majority of the study population had normal parameters except Haemoglobin levels. 10.56% of patients had creatinine above the base line

(>1.4mg%) with a mean of 0.91mg% prior to intervention and 9.8% post intervention with a mean of 1.02mg%. (Table 8, 9)

**Table 8** Haematological & Biochemical Parameters: Pre Intervention (n = 123)

Parameters	Minimum	Maximum	Mean	SD
Haemoglobin (gm%)	8.8	14	10.53	1.03
Random blood sugar (mg%)	84	290	124	34.8
Serum Urea (mg%)	10	60	23.22	11.49
Serum Creatinine(mg%)	0.2	2.2	.91	0.39
Serum Total Protein (gm%)	5.9	7.8	7.06	0.32
Serum Albumin (gm%)	3	4	3.3	0.25
Serum Sodium (mmol/L)	132	150	138.2	4.3
Serum Pottasium (mmol/L)	3.4	5.2	4.1	0.8

**Table 9** Haematological & Biochemical Parameters: Post Intervention (n = 123)

Parameters	Minimum	Maximum	Mean	SD
Haemoglobin (gm%)	8.8	13.4	10.08	0.96
Random blood sugar (mg%)	76	204	130	28.8
Serum Urea (mg%)	11	52	24.78	9.55
Serum Creatinine (mg%)	0.3	2.8	1.02	0.30
Serum Total Protein (gm%)	6.2	7.8	7.26	0.30
Serum Albumin (gm%)	3	4	3.42	0.26
Serum Sodium (mmol/L)	133	148	136.8	4.4
Serum Pottasium (mmol/L)	3.4	5.2	4.1	0.8

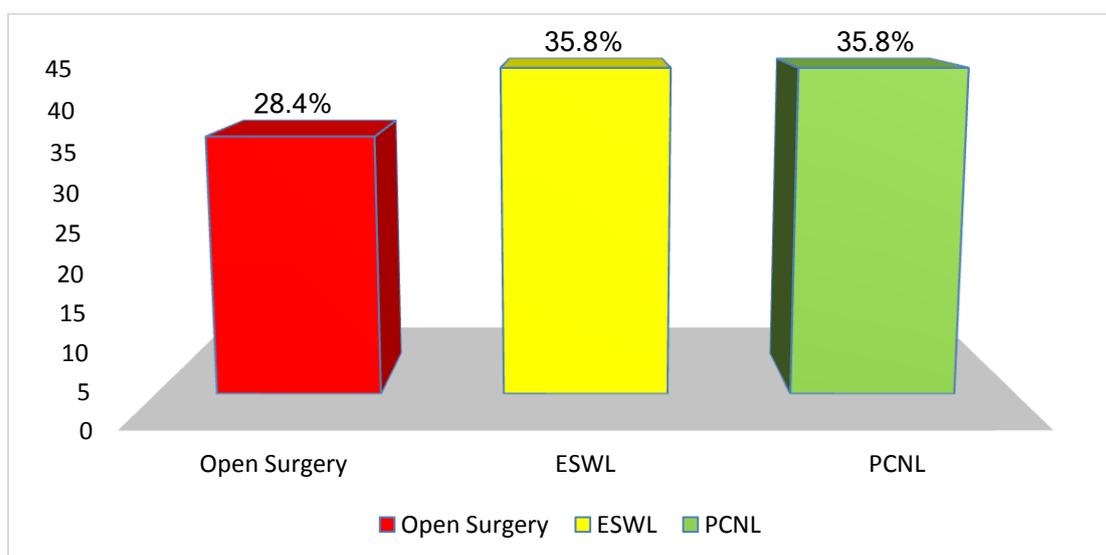
**Type of Intervention**

Majority of the study population underwent ESWL (35.8%) and PCNL (35.8%) for the

treatment of calculi. Open Surgery was conducted on 28.4% of patients. (Table 10 and Figure 2)

**Table 10** Type of intervention (n = 123)

Intervention	Frequency	Percentage
Open Surgery	35	28.4%
ESWL	44	35.8%
PCNL	44	35.8%
Total	123	100%



**Fig 2.** Type of intervention (n = 123)

**Type of open surgery**

Pyelolithotomy (54.28%) was the most common open surgery conducted followed by Ureterolithotomy (20%). (Table 11)

**Table 11** Type of open surgery (n = 35)

Intervention	Frequency	Percentage
Nephrolithotomy	6	17.14%
Pyelolithotomy	19	54.28%
Ureterolithotomy	7	20%
Nephro – Ureterolithotomy	2	5.71%
Pyelo – Ureterolithotomy	1	2.87%
Total	35	100%

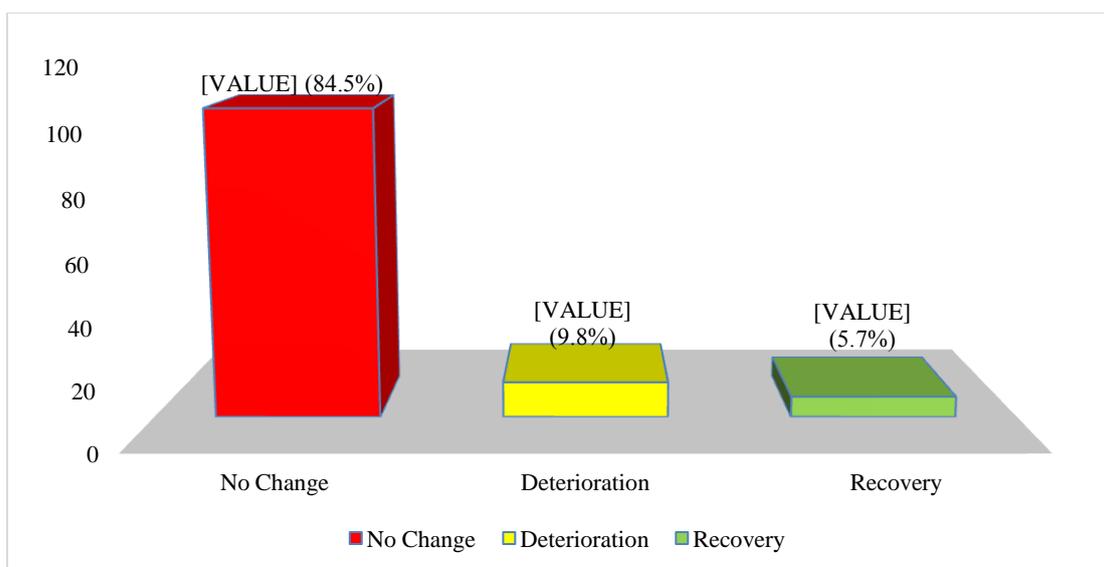
**Renal Function Changes Post Intervention**

Majority of the study population (90.2%) had normal renal function on follow up. 84.5%, 9.8%

and 5.7% patients had no change, deterioration and recovery respectively of renal function. (Table 12 and Figure 3)

**Table 12** Outcome of Renal Function (n = 123)

Renal Function		Frequency	Percentage
Normal	No change	104 (84.5%)	111 90.2%
	Recovery	7 (5.7%)	
Deterioration		13	9.8 %
Total		123	100 %



**Fig 3** Outcome of Renal Function (n = 123)

**Outcome of Renal Function (Pre Intervention Renal Function Status)**

Almost half (46.2%) of patients with deranged renal function had further deterioration of function

post intervention. Only 6 (5.5%) of patients with normal renal function had deterioration of renal function. The findings were statistically significant ( $p = 0.001$ ). (Table 13)

**Table 13** Outcome of renal function: Pre intervention renal function status (n = 123)

Pre intervention		Post intervention		Total
		Deterioration	Recovery /No change	
Renal Function	Deranged	6 (46.2%)	7 (53.8%)	13
	Normal	6 (5.5%)	104 (94.5%)	110
Total		12 (9.8%)	111 (90.2%)	123
		$\chi^2 = 21.8$	$df: 1$	$p: 0.001$

**Outcome of Renal Function (Type of Intervention)**

The number of patients with deterioration of renal function was highest with patients who underwent open surgery (50%). Deterioration of renal

function was also more common in patient who underwent open surgery (17.1%) followed by PCNL (11.4%). The findings were not statistically significant ( $p = 0.078$ ). (Table 14 and Figure 4)

**Table 14** Outcome of Renal Function: Type of intervention (n = 123)

Intervention	Post intervention		Total
	Deterioration	Normal	
Open Surgery	6 (17.1%)	29 (82.9%)	35
ESWL	1 (2.3%)	43(97.7%)	44
PCNL	5(11.4%)	39(88.6%)	44
Total	12 (9.8%)	111 (90.2%)	123
$\chi^2 = 5.097df: 2$		$p: 0.078$	

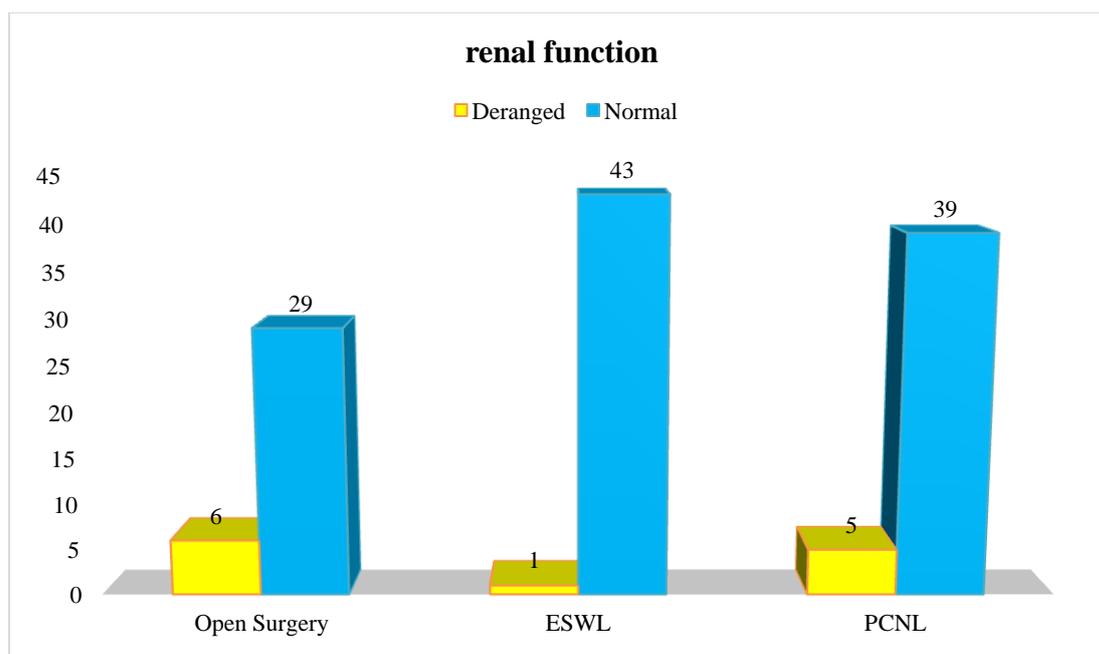
**Outcome of Renal Function (Pre Intervention Renal Function Status)**

Among the patients who had prior renal function derangement, open surgery group had further deterioration of renal function. Among patients

with normal function, PCNL group had the maximum deterioration of renal function. The findings were statistically not significant with  $p$  value of 0.38 & 0.15 respectively. (Table 15)

**Table 15** Outcome of Renal Function: Type of intervention (n = 123)

Pre intervention Renal Function	Intervention	Post intervention		
		Deterioration	Normal	
Deranged	Open Surgery	4	4	8
	ESWL	1	3	4
	PCNL	1	0	1
Total		6	7	13
$\chi^2 = 1.94df: 2 p: 0.38$				
Normal	Open Surgery	2	25	27
	ESWL	0	40	40
	PCNL	4	39	43
Total		6	104	110
$\chi^2 = 3.742df: 2 p: 0.15$				



**Fig 4** Outcome of Renal Function: Type of intervention(n = 123)

**Outcome of Renal Function (Comorbidities)**

Only one patient suffering from hypertension had deterioration of renal function, rest either

recovered or had no change. The findings were not statistically significant ( $p = 0.51$ ). (Table 16 and Figure 5)

**Table 16** Outcome of Renal Function: Comorbidities (n = 123)

Comorbidity	Post intervention		Total
	Deterioration	Normal	
None	11 (9%)	80 (65%)	91
Hypertension	1 (0.8%)	21 (17%)	22
Diabetes	0	5 (4.1%)	5
Hypertension & Diabetes	0	5 (4.1%)	5
Total	12 (9.8%)	111 (90.2%)	123
$\chi^2 = 2.32$			$p: 0.51$

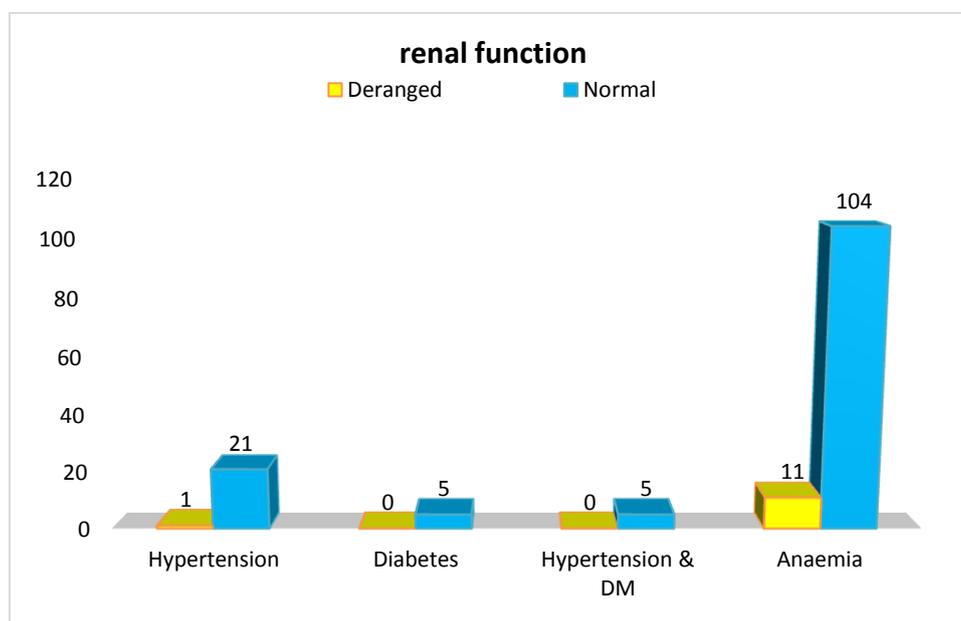
**Outcome of Renal Function (Comorbidity: Anaemia)**

The utmost numbers of patients with deterioration of renal function post intervention was found in

patients with moderate anaemia. Deterioration of renal function was most common in patients with mild anaemia (15.6%). The findings were statistically not significant ( $p = 0.56$ ). (Table 17)

**Table 17** Outcome of Renal Function: Comorbidity: Anaemia (n = 123)

Anaemia	Post intervention		Total
	Deterioration	Normal	
Mild	5 (15.6%)	27 (84.4%)	32
Moderate	6 (7.4%)	75 (92.6%)	81
Severe	0	2 (100%)	2
Absent	1 (12.5%)	7 (87.5%)	8
Total	12 (9.8%)	111 (90.2%)	123
$\chi^2 = 2.04$			$p: 0.56$



**Fig 5.** Outcome of Renal Function (Comorbidities)

**Outcome of renal function (Hydronephrosis)**

87% of patients with hydronephrosis improved post intervention. (Table 18 and Figure 6)

**Table 18** Outcome of Renal Function (Hydronephrosis & Degree of Recovery)

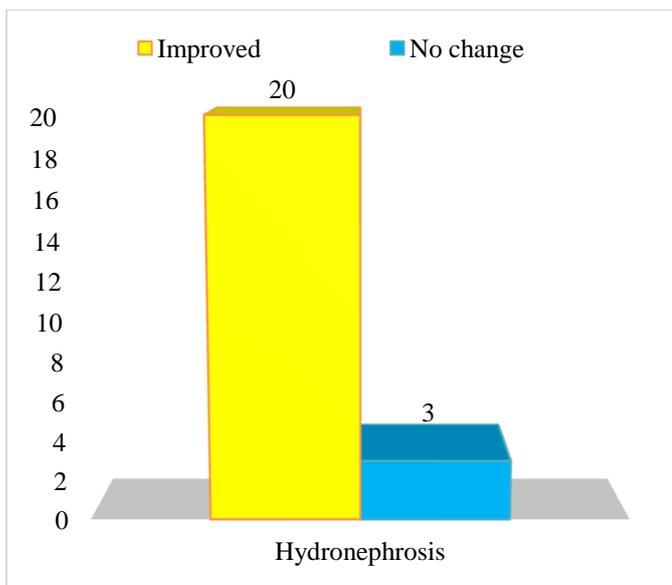
	Improved	No Change	Total
Hydronephrosis	20 (87%)	3 (13%)	23

**Outcome of Renal Function (Degree of Recovery)**

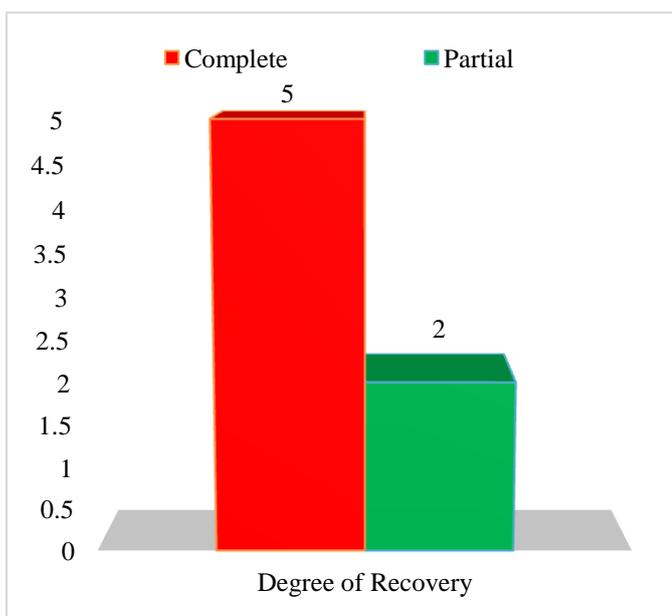
Among patients with deranged renal function prior to intervention, degree of recovery was complete in 71.4% of the patients. (Table 19 and Figure 7)

**Table 19** Outcome of Renal Function: Degree of Recovery (n = 7)

Degree of Recovery	Complete	Partial	Total
	5 (71.4%)	2(28.6%)	7



**Fig 6** Outcome of Renal Function (Hydronephrosis)



**Fig 7** Outcome of Renal Function (Degree of Recovery)

**Results**

123 patients of renal calculi who underwent urological intervention were studied for renal function changes after a period of 4 to 6 weeks post intervention.

61 (49.6%) were males and 62 (50.4%) were females. with mean age of the patients was 44.45 ± 13.95 years (18 – 69 years). The most common age group was of 30 – 40 years (26.8%).

87.8% patients had renal calculi and both renal with ureter calculi were found in 12.2%.

Calyx was the most common site of calculi (55.28%) followed by renal pelvis angstaghorn (13% each).

Majority of the study population, 115 (93.5%) had Anemia with mean level of 10.5 gm±1.03 gm and was marginally more prevalent in female patients. 22% and 4.1% of patients suffered from Hypertension & Diabetes Mellitus respectively. 4.1% had both Hypertension and Diabetes.

10.56% of patients had creatinine above the base line (>1.4mg%) prior to intervention and 9.8% post intervention. The mean creatinine level was 0.91±0.39 and 1.02±0.30 pre intervention and post intervention respectively.

35.8% of patients each underwent ESWL and PCNL. 28.4% underwent open surgery for treatment of calculi.

Pyelolithotomy (54.28%) was the most common open surgery conducted.

Majority of the study population (90.2%) had normal renal function on follow up.

84.5%, 9.8% and 5.7% patients had no change, deterioration and recovery respectively of renal function.

46.2% of patients with deranged renal function had further deterioration of function post intervention. Only 5.5% of patients with normal renal function had deterioration of renal function. The findings were statistically significant (p=0.001).

The number of patients with deterioration of renal function was highest with patients who underwent open surgery (50%). Deterioration of renal function was also more common in patient who

underwent open surgery (17.1%). The findings were not statistically significant ( $p=0.078$ ).

Among the patients who had prior renal function derangement, open surgery group had the maximum deterioration of renal function. Among patients with normal function, PCNL group had the maximum deterioration of renal function. The findings were statistically not significant ( $p=0.38$  and  $0.15$  respectively).

Among patients suffering from hypertension, diabetes or both, only one patient suffering from hypertension had deterioration of renal function, rest either recovered or had no change. The findings were not statistically significant ( $p=0.51$ ). 9.56% of patients suffering from anaemia had deterioration of renal function. The findings were not statistically significant ( $p=0.56$ ).

87% of patients with hydronephrosis improved post intervention.

Among patients with deranged renal function prior to intervention, degree of recovery was complete in 71.4% of the patients.

### Discussion

The study entitled "Renal function change in renal calculus disease undergoing urological intervention" included 123 patients of Renal calculi who underwent urological intervention & was followed up after 4 to 6 weeks during the period of 2 years from September 2016 to August 2018 at RIMS hospital, Imphal.

### Age

Marak et al<sup>3</sup> while studying the prevalence of urolithiasis in rural area of Manipur stated that in India most common age group for renal stones is 30 – 45 years & least common is age > 50 years. It is comparable to the present study where renal calculi incidence was most common in age group of 30 – 40 years (26.8%), except for the least common which is 18 – 30 years age group (13%).

### Gender

Lancina et al<sup>1</sup> while conducting study on risk factors in urolithiasis according to gender and age

of patients concluded that it is more predominant among males in a proportion of approximately 2:1. It does not tally with my study where the male to female ratio is almost 1:1 (0.98:1). It may be due to the different food habits & geographical variability of the study population(s).

### Outcome of Renal Function

Many studies on the effects of PCNL, ESWL and open surgery indicates that renal function is either preserved<sup>14,17,20,23,28,30,33</sup> or often improved<sup>20,23,32,33</sup> after the intervention. It was also inferred that procedure has minimum impact on global kidney function<sup>25</sup> and that there is no significant loss over a long time period.<sup>30</sup> The results are comparable to the present study where majority of the patients had either stable or recovery of renal function, 84.5% & 5.7% respectively, i.e total of 90.2% at the time of follow up. Only 9.8% had deterioration of renal function. This indicates that renal function does not change post urological intervention.

On the contrary, a study conducted by Alexander et al<sup>16</sup> concluded that PCNL & ESWL results in clinically significant long term reduction in renal function. ESWL was also linked with several potentially serious chronic adverse effects.<sup>29</sup> This may be due to the fact that their follow up duration was longer (> 2 years) compared to the present study and also that they had multiple sessions of ESWL compared to single session in the present study. This is also supported by the hypothesis that severity of renal injury caused by SWL is related to numbers of SWL administered.<sup>31</sup>

### Outcome of renal function (Pre intervention renal function status)

The present study demonstrates that almost half (46.2%) of patients with deranged renal function had further deterioration of function post intervention and 53.8% had stable or improvement of function. Only (5.5%) of patients with normal renal function had deterioration of renal function & 94.5% had stable function. The findings were

statistically significant with  $p$  value of 0.001. The results indicate that patients presenting with kidney stone disease & renal insufficiency experience higher likelihood of renal function deterioration after treatment of calculous disease. Number of studies revealed similar results.<sup>22,24,37</sup>

In contrast, a study observed that most patients presenting with calculi & renal impairment experience improvement or stabilization of renal function with only 25% developing further deterioration of function.<sup>23</sup> The possible justification for it could be the long follow up duration with a mean of 51 months in the study as compared to 4 – 6 weeks in the present study which might have given ample time for kidney to recover.

#### **Outcome of renal function (Type of intervention)**

Various studies comparing the effects of PCNL, ESWL and open surgery with each other revealed that all the therapy are equally efficacious for preserving the renal function.<sup>14,33,35,36</sup> ESWL had more effect on renal function in the acute phase but came back to normal by 2 weeks.<sup>14</sup> PCNL had lower morbidity, rapid convalescence and short operative time and hospital stay.<sup>33,34</sup> In the present study, there is no statistical association between outcome of renal function with type of intervention ( $p = 0.078$ ). Deterioration of renal function was more common in patient who underwent open surgery (17.1%). Even in patients with prior renal function derangement, findings were not statistically significant ( $p=0.38$ ). Deterioration of renal function was maximum in open surgery group (4 patients). Among patients with normal function, PCNL group had the maximum deterioration of renal function (3 patients). The findings were statistically not significant with  $p$  value of 0.15. The results suggest that outcome of renal function is not influenced by type of intervention. However, in a comparative study, Aminsharifi et al<sup>18</sup> observed after a mean follow up period of 12.1 months that decrease in the function of kidney was greatest

with the open group. This finding may be attributed to long follow up duration where in late complications of surgery may have contributed to it.

#### **Outcome of Renal Function (Comorbidities)**

Rajesh et al<sup>22</sup> conducted a study on factors predicting outcome in nephrolithiasis associated with renal insufficiency. It was observed that duration of symptomatology ( $p=0.12$ ), coexisting hypertension or diabetes ( $p=0.08$  &  $0.97$ ), solitary kidney status ( $p=0.27$ ), number of tracts used for PCNL ( $p=0.35$ ), presence of residual fragments ( $p=0.6$ ), and calculus recurrence ( $p=0.68$ ) were not significant predictors of postoperative renal function deterioration. It is similar to the present study where anaemia was the most common comorbidity (93.5 %) and deterioration of renal function was most common in patients with mild anaemia (15.6%). 17.9% & 4.1% patients suffered from Hypertension & Diabetes mellitus & 4.1% suffered from both Hypertension & Diabetes. Only 1 patient suffering from Hypertension had deterioration of renal function post intervention, rest either recovered or had no change. The findings were statistically not significant ( $p=0.51$ ). In contrast, Baris et al<sup>23</sup> observed that patient with solitary kidney & those with diabetes & atherosclerosis are at risk for deterioration of renal function. In another study, Fayed et al<sup>24</sup> observed that independent risk factors for poor outcome were elevated preoperative serum creatinine level, diabetes and hypertension. The possible explanation for such a finding could be excellent management of blood pressure and sugar, prior and after the intervention.

#### **Outcome of Renal Function (Hydronephrosis)**

Numerous studies on effects of urological interventions on hydronephrosis shows that it improves post intervention<sup>38,39</sup> There is some morbidity specially after stent insertion, e.g. fever & bacteriuria.<sup>38</sup> PCNL is confirmed to be superior for diversion of hydronephrosis specially in patients with fever.<sup>39</sup> This is well supported in the

present study where 87% of patients with hydronephrosis improved post intervention and 13% had no significant improvement. There was no case of further worsening of existing hydronephrosis. This may be due to the fact that no case of urosepsis was taken in the study nor any developed one.

### Conclusion

The management of kidney stone disease has changed dramatically over the past 25 years, as a result of revolutionary technologic and treatment advances. However, the studies demonstrating increased utilization of these modalities have been predominantly based on its efficacy rather than its impact on the renal functions.

In view of the availability of very few data in the healthcare arena in developing countries like ours, this study and the interpretation of the results can help us to understand the renal function changes after stone removal and the relative importance of different factors that influence the change and, in turn, help us to design effective intervention.

There are significant predictors or determinants of postoperative renal function deterioration. There was also improvement of hydronephrosis post intervention.

There are few limitations of the study viz estimation of serum creatinine & urine examination for estimation of renal function. Estimation of Glomerular Filtration Rate (GFR) or Single Photon Emission CT (SPECT) measurement of Tc – Dimercaptosuccinic Acid (DMSA) uptake by the kidney would have been more ideal for renal function measurement. Follow up period of 4 to 6 weeks was also not ideal.

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