



**Research Article**

**PREDICTIVE FACTORS FOR SYSTEMIC INFLAMMATORY RESPONSE SYNDROME FOLLOWING URETEROSCOPIC LITHOTRIPSY IN OBSTRUCTIVE CALCULUS**

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**ABSTRACT**

**Aim:** To investigate & analyse the risk factors for the development of systemic inflammatory response syndrome following ureteroscopic lithotripsy in obstructive ureteric calculus

**Methods:** We prospectively collected data of 156 patients who underwent ureteroscopic lithotripsy at our Department of Urology in Government Kilpauk Medical College Hospital and Government Royapettah hospital from October 2018 to March 2019. Details for the patient, the stone, and the surgical factors that potentially contributed to postoperative infection were extracted and analyzed how the clinical factors affected the incidence of SIRS

**Results:** Thirty-six patients (23.07%) were postoperatively diagnosed with systemic inflammatory response syndrome; of these, 25 patients were diagnosed within 24 h after ureteroscopy. One patient required intensive care unit admission, but no death was reported. SIRS did not necessarily shift to fatal status. SIRS group required a significantly longer time to discharge after URS than the non-SIRS group indicated that post-URS SIRS imposed a physical and economic burden on the patients. Comparison between patients with post-URS SIRS and those without suggested multiple factors associated with post-URS SIRS: female gender, obstructive pyelonephritis, a positive preoperative Urine Culture result and associated diabetes mellitus & chronic kidney disease.

**Conclusion:** Post URS-SIRS requires longer hospital stay with prolonged antibiotic therapy and with increased economic burden. Identifying the patients with risk factors and preoperative counselling may mitigate patient concerns regarding the outcomes and helps in optimising the patient preoperatively

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**INTRODUCTION**

Urosepsis is one of the most serious complications following endoscopic procedures for urolithiasis treatment with septic shock or even death as a catastrophe. Systemic inflammatory response syndrome (SIRS) is a serious condition that is closely associated with urosepsis and has a clear specific diagnostic criteria. Therefore, identifying the risk factors of SIRS in ureteroscopic lithotripsy and prevention of urosepsis may reduce this catastrophic event.

**Aim of the Study**

To investigate risk factors for the development of systemic inflammatory response syndrome (SIRS) following ureteroscopic lithotripsy in patients presenting with obstructive ureteric calculus. The purpose of this study was to analyze preoperative and intraoperative risk factors for post-URS SIRS.

**MATERIALS AND METHODS**

This is a prospective study done in the Department of Urology, Government Kilpauk Medical College & Hospital and Government Royapettah Hospital for a period of 6 months from October 2018 to March 2019. Total number of patients included in this study is 156 with age ranging from 20 to 80 years. Patients with Ureteric calculus associated with renal calculus, associated vesical calculus, associated anatomical abnormality & previous surgeries of genitourinary tract were excluded from this study.

All patients were thoroughly examined with clinical history and complete physical examination on admission. All were subjected to complete hemogram, blood biochemistry, urine culture & sensitivity. Non-contrast computed tomography (NCCT) of KUB was the radiological investigation of choice on admission for all suspected patients with obstructive ureteric calculus.

All patients were given Inj. Cefotaxime 1g iv on the day of surgery and continued through POD1. Patients with positive

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urine culture were started on antibiotics according to culture and sensitivity on admission.

Ureteroscopic lithotripsy was done under spinal anesthesia with patient in lithotomy position. 6/7.5 Fr or 8/9.8 Fr Semirigid Ureteroscope was used. Stone fragmentation was done with pneumatic lithotripsy. At the end of the procedure all patients were stented with 3.8 Fr DJ stent.

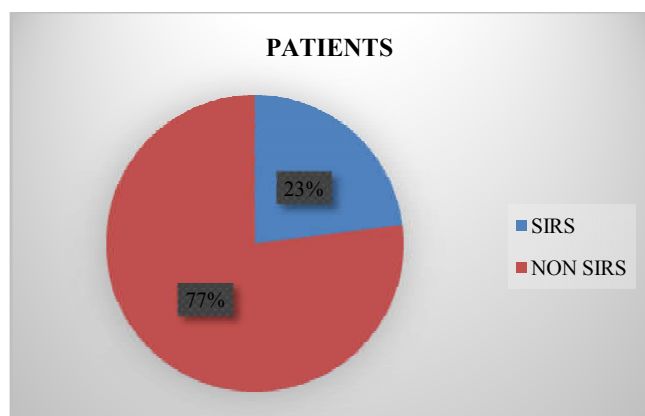
Post – operatively all patients were monitored with temperature, pulse rate, blood pressure, respiratory rate and intake/output charts. All were subjected to complete hemogram, renal function tests, Serum electrolyte evaluation. Stone clearance and stent positioning was documented with both ultrasonogram and Xray KUB

Patients with two or more of the following clinical findings were diagnosed with SIRS

1. Body temperature higher than 38 °C or lower than 36 °C
2. Heart rate higher than 90 beats per minute
3. Respiratory rate higher than 20 breaths per minute
4. White blood cell count higher than 12,000/mm<sup>3</sup> or lower than 4000/mm<sup>3</sup>

## RESULTS AND ANALYSIS

Total number of patients included in this study were 156 and out of these 36 patients (23%) developed SIRS in the postoperative period. Of these 25 patients developed SIRS in less than 24 hours post operatively and >24 hours in 11 patients.



Our study included patients with age group 20 to 80 years. The predominant age group of presentation with obstructive ureteric calculus in our study was 41-50, however SIRS was predominant in the 51-60 years age group.

**Table 1** Age Distribution

Total patients		Patients with sirs	
Age	Distribution	Age	Distribution
21-30	8	21-30	0
31-40	12	31-40	1
41-50	59	41-50	10
51-60	45	51-60	16
61-70	23	61-70	5
71-80	9	71-80	4

In our total study population, males predominated with 91 males and 65 females. In the SIRS group among 36 patients, 24 were female and 12 were male. Gender distribution showed a predilection of female gender to be a risk factor for developing SIRS.

**Table 2** Gender Distribution

	Total patients	Patients with SIRS	
Male	91	Male	12
Female	65	Female	24

The most common comorbidity noted in our total study population and in SIRS group was diabetes mellitus. Patients comorbidities like diabetes, chronic kidney disease, solitary kidney status were significantly positively associated with SIRS post URSL. The distribution of various comorbidities in our study was mention in table 3.

**Table 3** Comorbidities

Comorbidities	No. Of patients	
	Total study population	Sirs group
Diabetes	42	21
Hypertension	31	2
CKD	12	8
Solitary kidney	3	1
Others	11	3
None	57	1

Positive preoperative urine culture was present in 48 patients and out of these 34 patients developed SIRS. About 96% of patients with positive urine culture had SIRS in the post operative period, indicating a high risk. E. coli was the predominant organism isolated in both the total population and the SIRS group followed by Klebsiella, pseudomonas, proteus and others.

**Table 4** Preoperative Urine Culture

Preoperative Urine Culture	Total patients	SIRS group
Positive	48	34
Negative	108	2

**Table 5** Urine Culture – Organisms

Preoperative urine culture	Total patients	Sirs group
E. coli	27	23
Klebsiella	8	5
Pseudomonas	7	4
Proteus	3	1
Others	3	1

Among the patients who developed SIRS, proximal ureteric calculus was associated positively with developing SIRS when compared to the distal ureteric location. However, the laterality, i.e either right or left side did not influence the outcome. Bilateral obstructive calculus was any how associated with increased risk. Similarly, patients with high density stones measure in CT with high Hounsfield Units were also associated with increased risk, however it is not statistically significantly associated.

**Table 6** Stone Characteristics

Stone location	Total patients	Sirs group
Proximal Ureter	54	19
Distal Ureter	89	15
VUJ	13	2
Right side	72	14
Left side	65	10
Bilateral	19	12
Highest HU	+1546	+1546
Lowest HU	+480	+659
Mean HU	+1012	+1100

Patients who were preoperatively stented or diverted with nephrostomy as an emergency procedure before lithotripsy have also been found statistically significant risk factor for URS. This may be attributed to the patient's chronic obstruction with significant urinary tract infection or stent related infections.

**Table 7** Preoperative Intervention

Intervention	Total patients	SIRS group
Preoperative stenting	8	5
Preoperative Nephrostomy	3	1

The mean operative time in SIRS group was 45 mins and 42 mins in Non-SIRS group. Of these patients with both clinically significant and insignificant residual fragments were high risk groups for developing SIRS. See Table 8

**Table 8** Stone Clearance

Stone clearance	Total patients	Sirs group
Complete clearance	109	10
Clinically insignificant residual fragments	34	17
Clinically significant residual fragments	13	9

The statistically significant factor associated with developing SIRS post ureteroscopic lithotripsy in our study are female gender, diabetes, chronic kidney disease, bedridden state, obstructive pyelonephritis, preoperative positive urine culture, preoperative stenting.

**Table 9** Statistically Significant Variables

characteristics	sirs (36)	non-sirs (120)	p value
Gender (m:f)	12:24	79:41	.000522
Diabetes	21	21	.000001
Ckd	8	4	.000191
Bedridden state	6	1	.000057
Obstructive pyelonephritis	18	4	.000001
Preoperative positive urine culutre	34	14	.000052
Preoperative stenting	5	3	.006585

All patients who developed SIRS were initially started on empirical antimicrobial therapy and was changed to antibiotics according to culture and sensitivity later. Supportive treatment in the form of IV fluid replacement, analgesics, antipyretics were given. Only one patient with solitary kidney status and diabetes required ICU management. No death was reported in this series. The mean duration of hospital stay for patients developing SIRs was 5 days in our study.

**DISCUSSION**

Urosepsis accounts for approximately 9 - 31% of all cases of sepsis. A delay in diagnosis and treatment of sepsis can lead to increased morbidity and mortality. Incidence of urosepsis in the world still shows an increasing trend year by year.

The most common cause of urosepsis in urinary tract obstruction is ureteral calculi. Endoscopic surgeries in urinary tract increases the risk. Sepsis is a dreaded postoperative outcome that complicates up to 1% of ureteroscopic operations. In endoscopic urological surgery, bacteriuria is a definite risk factor. A urine culture must therefore be taken prior to such interventions and in case of ABU, pre-operative treatment is recommended.

**Recommended antimicrobial prophylaxis advised in all patients undergoing endourological procedures include**

- ✓ Trimethoprim-sulphamethoxazole
- ✓ Cephalosporin group 2 or 3
- ✓ Aminopenicillin plus a beta-lactamase inhibitor

All patients who develop SIRS, a urine culture and two sets of blood cultures should be taken before starting antimicrobial treatment. Parenteral high dose broad spectrum antimicrobials within the first hour after clinical assumption of sepsis should be administered. Adapt initialemperic antimicrobial therapy on the basis of culture results. Immediate adequate life-support measures should be provided.

**Antimicrobial Recommendation**

Antimicrobials	Daily dose	Duration of therapy
Cefotaxime	2 g t.i.d	7-10 days
Ceftazidime	1-2 g t.i.d	Longer courses are appropriate in patients who have a slow clinical response
Ceftriaxone	1-2 g q.d	
Cefepime	2 g b.i.d	
Piperacillin/tazobactam	4.5 g t.i.d	
Ceftolozane/tazobactam	1.5 g t.i.d	
Ceftazidime/avibactam	2.5 g t.i.d	
Gentamicin*	5 mg/kg q.d	
Amikacin*	15 mg/kg q.d	
Ertapenem	1 g q.d	
Imipenem/cilastatin	0.5 g t.i.d	
Meropenem	1 g t.i.d	

**CONCLUSION**

- ✓ Post URS-SIRS requires longer hospital stay with prolonged antibiotic therapy and with increased economic burden.
- ✓ Identifying the patients with risk factors and preoperative counselling may mitigate patient concerns regarding the outcomes and helps in optimising the patient preoperatively.

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