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FACTORS INFLUENCING THE OCCURRENCE AND PROGNOSIS OF ACUTE INFLAMMATORY DISEASES OF THE KIDNEY

Urology

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ABSTRACT

Background: Inflammation of renal parenchyma and collecting system are usually secondary to microbial infections.Course of the renal inflammation depends on the pathogenic virulence factors, predisposing co morbid illness and conditions in the host, severity of the infectious process, the time of presentation, and the effectiveness of therapy instituted.This study is intended to analyse the various factors that can influence the course and alter the outcome of the inflammatory pathologies of the kidney.**Methods:**Prospective clinical study conducted in 30 patients with features of acute renal inflammation at Tirunelveli Medical College Hospital , Tirunelveli.The risk factors, Clinical manifestations, Laboratory Investigations , Imaging Studies, Therapeutic interventions , Final outcome , Follow up were recorded and analysed with **Statistical Package for the Social Sciences (SPSSP Version 15)** software using Pearson's Chi-Square Test and Fisher's Exact Test with $P < 0.05$ considered to indicate statistical significance**Results:**The predominant risk factor for complicated renal infections in our study was the presence of diabetes. The presence of an altered mental status at presentation, poor glycemic control (increased HbAlc levels) , increased serum creatinine , thrombocytopenia and presence of hydronephrosis at presentation are associated with higher need for nephrectomy in our study. Type of renal lesion at presentation significantly influencesthe therapeuticoption excised and the need for performing nephrectomy.

KEYWORDS

nephrectomy, diabetes, renal inflammation,pyelonephritis

INTRODUCTION

Inflammation of renal parenchyma and collecting system are usually secondary to microbial infections. Interstitial renal inflammation caused predominantly by bacterial infection, is nowadays recognized as a non specifichistopathological change that can occur due to various immunologic, congenital, or toxin induced lesions that develop in the absence of bacterial infection.Urinary Tract infection (UTI) is considered as an inflammatory response of the urothelium to microbial invasion. UTIs exist as one of themost prevalent microbial diseases in the society with a substantial financial burden.1 Spectrum of infectious disease process in the kidney presenting as acute inflammatory lesion commonly encountered in urological practice includeAcute Pyelonephritis,Focal and multifocal bacterial nephritis,Renalcortical abscess, Perinephricabscess,Emphysematous Pyelonephritis and PyonephrosisCourse of the renal inflammation depends on the pathogenic virulence factors , predisposing comorbid illness and conditions in the host , severity of the infectious process the time of presentation, and the effectiveness of therapy instituted. **Urosepsis** occurring as a result of service urinary tract infection is a serious condition that can ultimately lead to septic shock and death.Urosepsisimplies clinically evident severe infection of the urinary tract and/or the male genital tract (e.g. prostate) with features consistent with systemic inflammatory response syndrome.2While severe sepsis has a reported mortality rate of 20 to 42%, urosepsis may be associated with high mortality rates in special patient groups.3 High degree of suspicion on possible occurrence of urosepsis in all cases of presumed acute pyelonephritis is the single most essential factor in making an early diagnosis of complicated renal infection and preventing sepsis. Definitive guidelines for optimal management of acute renal inflammatory lesions have yet to be established. The best treatment strategy must be the one that improves the patient survival, relieves the distressing symptoms and at the same time maximizes renal salvage. Minimal invasive interventions have been advocated nowadays so as to conserve the renal unit This study is intended to analyse the various factors that can influence the course and alter the outcome of the inflammatory pathologies of the kidney.Continuous active monitoring is required in patients with these risk factors which might help in taking timely decision either to preserve the kidney or perform nephrectomy if they fail to respond to the initial conservative management. **AIMS OF THE STUDY:**To analyse the risk factors predisposing the acute inflammatory lesions in kidney.2.To evaluate the factors determining their clinical course – Recovery form disease / Nephrectomy.3.To discuss the management options and factors influencing their success. **MATERIALS AND METHODS:** Study Group : Patients who were admitted with features of acute renal inflammation at Tirunelveli Medical College Hospital , Tirunelveli. Study Design : Prospective Clinical study Period of Study: January 2017 – January 2018.Total number of cases : 30 patientsData Analysed :Risk factors, Clinical manifestations, Laboratory Investigations ,Imaging Studies, Therapeutic interventions , Final outcome , Follow up.Inclusion criteria:Patients presenting with acute onset Flank or Loin Pain , Fever with chills, with or without lower urinary tract symptoms.Radiological evidence of Renal inflammatory pathology.Exclusion criteria :Patients unwilling to undergo intervention as a part of therapy Study Protocol:Diagnosis of renal inflammatory lesions was made by Complete History (which included enquiry on predisposing risk factors), Clinical Examination and confirmed by imaging studies.Patients were admitted and evaluated with Urine analysis, Urine and Blood culture study, Complete Hemogram , Blood sugar and HbAlc (In Diabetics), Renal Function Tests, Liver Function Tests, Blood coagulation profile, relevant additional imaging studies.Managed withHemodynamic support, Fluid and electrolyte management, aggressive sugar control in diabetics, and antibiotics; initially with broad spectrum parenteral (Injn.Cefotaxime 1gm twice daily) then changed according to culture & sensitivity report.All patients were initially subjected to minimal invasive interventions like Percutaneous Nephrostomy (PCN) drainage under ultrasonogram guidance, Placement of Double J(DJ) Stenting, Both percutaneous nephrostomy and DJ stenting, Image guided percutaneous abscess drainage or Open Abscess drainage depending on the type of lesion diagnosed with the intention to conserve the renal unit.The procedures were carried out after obtaining informed consent, explaining the pros and cons of the interventions and the need for strict follow up to the patient and relatives.Patients who did not recover with the medical and minimal invasive interventions were offered additional investigations like percutaneours nephrostomy fluid analysis, follow up CT scan , radioisotope scan and those who showed clinical deterioration , increasing renal parameters and non functional status in isotope scan (less than 15% split renal function) were subjected to Nephrectomy after obtaining cardiac , anaesthetic fitness and correcting any coagulation disorders if present. Definitive Treatment of ComplicatingFactors were also carried out in the patients where the kidney was salvaged.Follow up: Patient were followed with 1 month and 3 months after discharge. Data collection and Statistical analysis:Patients' demographics, medical histories, clinical parameters, biochemical and laboratory variables, types of renal lesions, the relevant therapeutic interventions and condition at discharge were analysed and compared among two groups:Group I - Recovered with Minimal Invasive interventions (16 pts)Group II - - Required Nephrectomy (14pts).Statistical analysis was performed with Statistical Package for the Social Sciences (SPSSP Version 15)

software using Pearson's Chi-Square Test and Fisher's Exact Test with P < 0.05 considered to indicate statistical significance. RESULTS:In our study the mean age of the patients was 46.67 years and minimum and maximum ages were 15 years and 67 years respectively. Female out-numbered male (20:9). There was one transgender patient who was admitted with right perinephric abscess consequent to urethral stenosis following the sex realignment surgery. The renal lesions were more common in the left side in our study than right (16: 13). One of the Patients had bilateral presentation of emphysematous pyelonephritis.The predominant risk factor leading to the complicated renal infections in our study was the presence of diabetes (17 patients; 56.7%). Concomitant diabetes and urinary stones were present in 8 patients (26.75%) most of them landing up with pyonephrosis. Upper tract abnormality in the form of pelvi-ureteric junction obstruction was seen in 2 patients (6.7%) .Presence of lower urinary tract obstruction in the form of urethral stenosis, neurogenic bladder dysfunction with vesicoureteric reflux and non obstructive renal stone were also noted as predisposing risk factor in our patients.The patients were grouped into two for the purpose oanalyzing the statistical analysis of the collected date. Group 1 (16 in number) were the patients whose affected renal unit were conserved by medical and minimally invasive surgical interventions. Group II comprising patients where there was deterioration of clinical condition inspite of these interventions warranting nephrectomy to avoid mortality .The collected data on the various demographic , clinical , biochemical ,imaging variables were compared between both the groups to drive out those factors that had significant association with occurrence of nephrectomy implying poorer outcome of the disease process

TABLE 1: PREDISPOSING RISK FACTORS

	FREQUENCY	PERCENTAGE
DIABETES MELLITUS	17	56.7 %
DM & UROLITHIASIS	8	26.7 %
LOWER TRACT OBSTRUCTION	1	3.3 %
NEUROGENIC DYSFUNCTION	1	3.3 %
PUJ OBSTRUCTION	2	6.7 %
UROLITHIASIS	1	3.3 %
Total	30	100.0 %

TABLE 2: TYPE OF LESION AT PRESENTATION(Based on Imaging Studies)

	Frequency	Percentage
BILATERAL . EPN	1	3.3%
EPN	14	46.7 %
PERINEPHRIC ABSCESS	2	6.7 %
PYONEPHROSIS	10	33.3 %
RENAL ABSCESS	3	10.0 %
Total	30	100.0 %

TABLE 3: THERAPEUTIC INTERVENTIONS

MANAGEMENT	NUMBER (%)	REQUIRED NEPHRECTOMY
MEDICAL MANAGEMENT	2/30 (6.6%)	NIL
PERCUTANEOUS NEPHROSTOMY (PCN)	12/30 (46%)	11
DJ STENTING	7/30 (23.3%)	NIL
PCD & DJ STENTING	4/30 (13.33 %)	1
OPEN DRAINAGE	3/30 (10 %)	2
IMAGEGUIDED ASPIRATION	1/30 (3.3 %)	Nil

TABLE 4: ASSOCIATION OF FACTORS WITH NEPHRECTOMY (DEMOGRAPHIC AND CLINICAL VARIABLES)

	TOTAL NUMBER OF CASES	GROUP I RENAL SALVAGE	GROUP II NEPHRECTO MY	'P' VALUE	SIGNIFICANCE
AGE GROUP I GROUP II GROUP III	6 14 10	2 7 7	4 7 3	0.343	NOT SIGNIFICANT
GENDER MALE FEMALE TRANSGENDER	9 20 1	4 11 1	5 9 0	0.553	NOT SIGNIFICANT
LATERALITY RIGHT LEFT BILATERAL	13 16 1	7 8 1	6 8 0	0.623	NOT SIGNIFICANT
RISK FACTORS 1. DIABETES 2. DM & UROLITHIASIS 3. LOWER TRACT OBSTRUCTION 4. NEUROGENIC DYSFUNCTION 5. PUJ OBSTRUCTION 6. UROLITHIASIS	17 8 1 1 2 1	13 2 1 0 0 0	4 6 0 1 2 1	0.039	SIGNIFICANT
ALTERED SENSORIUM	8	0	8	< 0.001	SIGNIFICANT
HYPOTENSION	9	3	6	0.236	NOT SIGNIFICANT

TABLE 5: ASSOCIATION OF FACTORS WITH NEPHRECTOMY (LABARATORY AND RADIOLOGICAL VARIABLES)

	TOTAL NUMBER OF CASES	GROUP I RENAL SALVAGE	GROUP II NEPHRECTO MY	'P' VALUE	SIGNIFICANCE
INCREASED HBAIc	13	4	9	0.030	SIGNIFICANT
LEUCOCYTOSIS	16	10	6	0.464	NOT SIGNIFICANT
THROMBO-CYTOPENIA	11	0	11	< 0.001	SIGNIFICANT
INCREASED SERUM CREATININE	21	7	14	0.001	SIGNIFICANT
POSITIVE URINE CULTURE	21	13	8	0.236	NOT SIGNIFICANT
POSITIVE BLOOD CULTURE	9	3	6	0.236	NOT SIGNIFICANT
PRESENCE OF HYDRONEPHROSIS	16	4	12	0.001	SIGNIFICANT
TYPE OF LESION PYONEPHROSIS EPN BILATERAL EPN PERINEPHRIC- ABSCESS CORTICAL – ABSCESS	10 14 1 2 3	1 10 1 1 3	9 4 0 1 0	0.012	SIGNIFICANT

DISCUSSION: The severity of the renal infection depends on the virulence factors of the offending agent and the strength of host defence mechanisms. We conducted this study to analyse the host factors that influences the clinical course and the final outcome of acute inflammatory pathology.The various demographic, clinical, biochemical, imaging variables were compared between both the groups to derive out those factors that had significant association with occurrence of nephrectomy implying poorer outcome of the disease process.The patients were categroised in to 3 groups according to their age; Group I ≤ 30 years (6 patients), Group II 31-50 years (14 patients) and Group III ≥ 50 years (10 patients) for statistical analysis. Age Group did not have any significant association with the occurrence of nephrectomy (P value of 0.343) (Table 4).Although females formed the predominant gender group in our study (16 patients) , the gender of the patient showed no statistical significance with the nephrectomy (P value of 0.553) (Table 4).Left sided lesions were more common in our study (16 patients) but the side of the lesion did not have any influence in the progression of the disease to terminate in nephrectomy (Table 4).Diabetes was the predominant predisposing risk factor in our patients in the study (totally 25 patients with 8 of the patients had concomitant urolithiasis). This was in concordance to the various studies available which highlight the role of diabetes in upper tract infections. Studies by Muller et al [4]andJoshi et al [5]showed that diabetes may predispose patients to more severe infections and complications of the upper urinary tract with its inherent capacity to reduce the host immune response. Hoepelman et al [6]and Paterson et al [7] in their studies emphasized the fact that infections in diabetics are more difficult to treat and tend to recur often. Some studies showed that diabetes increases the risk of hospitalization and mortality from infections..[8,9]Only 4 of the 17 patients in the diabetes alone group progressed to nephrectomy (23.5%) but 6 out of the 8 patients (75%) in the concomitant diabetes and urolithiasis group had severe disease process progressing to nephrectomy. This constitutes the reason for significant statistical association of the type of inflammatory lesion in our study to neprectomy occurrence (P value of 0.039) (Table 4).Altered sensorium evidenced by the presence of mental confusion, disorientation and stupor was observed in 8 of our patients (26.66%) as they presented with overwhelming sepsis at the time of admission. Although all these patients recovered their sensorium following resuscitation, antibiotics and minimal invasive procedures their renal units were grossly tampered by the disease process and all these 8 patients (100%) landed up with nephrectomy . In statistical analysis there was significant statistical association with altered sensorium at clinical presentation and nephrectomy (P value of < 0.001) (Table 4) .Hemodynamic instability as evidenced by hypotension with systolic pressure of less than 90mm Hg was present in 9 of the patients (30%) in our study. These patients required resuscitation with the use of intravenous fluids and administration of ionotropic agents.

1,00,000/cubic millimeter as defining criteria of thrombocytopenia in our study. This was present in 11 patients (36.6%) and all had nephrectomy (100%). Statistical analysis showed significant statistical association with occurrence of nephrectomy with the P value of <0.001 . (Table 5) Thrombocytopenia has been considered as a significant poor prognostic factor for emphysematous pyelonephritis in various studies by Falagas et al [13]and Wan et al [14]. Raised serum creatinine level (>2 mg/ deciliter) at initial presentation was present in 21 of the patients (70%) reflecting the security of the infection. Among these patients 14 (66.6%) landed up with nephrectomy. Statistical analysis showed significant association between the raised creatinine level and nephrectomy (P value = 0.001) (Table 5) implicating the fact that patient with acute renal insufficiency had more protracted diseases outcome. Falagas et al [13] showed in his study that raised serum creatinine (2.5mg /dl) at the time of presentation is associated with poor prognosis increasing mortality in emphysematous pyelonephritis.Urine culture was positive in 21 patients (70%) in our study but there was no statistical association of this variable among the nephrectomy group (P value = 0.236) (Table 5). Blood culture was positive in a lesser number of patients; only 9 patients (30%) had significant bacteremia but statistical analysis failed to show any significant associations between bacteremia and nephrectomy (Table 5) . Prior antibiotic usage probably accounted for significant number of patients having negative culture.Hydronephrosis of varying degrees was apparent in 16 patients (53.33%) ; 10 among them was associated with pyonephrosis and 6 with emphysematous pyelonephritis. 12 of these patients had to undergo nephrectomy following failure of initial percutaneous nephrostomy drainage as the PCN fluid analysis and radio isotope scan revealed non functioning renal moiety. Statistical analysis showed significant association between the presence of hydronephrosis and nephrectomy procedure with test of significance P value being 0.001. In the study conducted by Kapoor et al [16] onpredictive factors for the need of nephrectomy in emphysematous pyelonephiritis cases, extensive renal parenchymal destruction of 50% (based on computed tomography) significantly predicated the need for nephrectomy. Presence of hydronephrosis by CT scan classification Huang and Tseng et al. [15]of EPN cases did not have significant association in their study. Our study had higher number of pyonephrotic lesions landing up with nephrectomy and hence the reason for significant association of presence of hydronephrosis andtype of lesion with nephrectomy.Mortality in our study occurred in 3 patients (10%) . One patient with Class III (Huang and Tseng et al[15]) emphysematous pyelonephritis and another patient withpyonephrosisexpired following nephrectomy in the immediate post operative period due to acute respiratory distress syndrome (ARDS). The third patient expired due to myocardial infarction in the follow-up period.The limitations are that our study may not be representative of the general population in view of the small cohort and short duration of the study.

CONCLUSION: Diabetes is the most common predisposing risk factor for renal inflammation. Concomitant presence of diabetes and urolithiasis , presence of an altered mental status at presentation ,poor glycemic control, increased serum creatinine , thrombocytopenia , presence of hydronephrosisand severity of renal lesion at presentation are associated with higher need for nephrectomy in our study

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