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Patterns of acute renal failure in Russell's viper bite patients

TIN-NU-SWE, MYINT-AYE-MU, MYINT-LWIN, TIN-TUN & THEIN-THAN
Clinical Research Unit (Snake-bite) ;
Biochemistry Research Division,
Department of Medical Research

Fifty-two patients with acute renal failure due to Russell's viper bite were studied. 34 patients had oliguric and 18 had non-oliguric types of acute renal failure. There was a higher incidence of complications such as gastrointestinal bleeding, renal angle tenderness and facial oedema in patients with oliguria. These patients also had a higher serum creatinine, fractional excretion of sodium and renal failure index when compared to polyuric patients. Mortality rate was about 32% in patients with oliguria in spite of peritoneal dialysis in 8 patients. No patients in the polyuric group needed dialysis and none died. The difference may be due to more severe renal lesions in patients with oliguric acute renal failure.

INTRODUCTION

Acute renal failure (ARF) is a syndrome of rapid onset of impaired renal function characterised by progressive azotemia and usually oliguria. Consequently oliguria had come to be regarded as a cardinal feature of acute renal failure. But as early as 1943 Shen(1) recognised patients with azotemia in the absence of oliguria. The emphasis since then had been on the quality rather than the quantity of urine passed.

Oliguria is defined as passing of less than 400 ml of urine per 24 hours. Patients who passed more than 400 ml per 24 hours throughout the azotemic period are therefore regarded as having nonoliguric acute renal failure. Anderson et al. (2) in 1977 recognised 54 non-oliguric ARF patients out of 92 patients who met the criteria for acute tubular necrosis. More recently retrospective studies have suggested that nonoliguric ARF may account for 20 to 30% of all cases of ARF (3,4).

Postulations had been made to explain the mechanisms of higher urinary flow. They include (1) interference with renal concentrating ability; (2) maintenance of a high rate of flow through the distal nephrons thereby preventing equilibration of tubular with a hypertonic medullary interstitium and; (3) interference with the formation of an hypertonic medullary interstitium. Toxin related nephropathy appears to be more frequent in nonoliguric ARF. Schrier and associates (3) suggested that decrease in morbidity and mortality in non-

oliguric ARF is due to higher glomerular filtration rate and relative preservation of tubular function. But the degree of renal damage appears to be the essential difference between oliguric and nonoliguric ARF.

Acute renal failure is the most devastating effect of Russell's viper bite in Burma and oliguria had been stressed as the hallmark of ARF in these patients. We therefore undertook a study to establish the clinical and biochemical pattern of ARF in patients with Russell's viper bite. The study period was from 1984 to 1988 during the rice harvesting seasons from October to January each year.

PATIENTS AND METHODS

All patients with Russell's viper envenomation admitted into Tharawaddy Township Hospital during the study period were clinically and biochemically assessed for evidence of renal disturbances. All patients with serum creatinine more than 1.3 mgm and/or oliguria (urine volume less than 400 ml per 24 hours) without obvious pre-renal cause were then studied. In oliguric patients dehydration was corrected, if necessary, after measuring central venous pressure. Patients responding by diuresis were excluded from the study. Twelve apparently healthy subjects were also studied as controls. Urine volume of 400 ml per 24 hours was taken as a dividing line for classifying ARF into oliguric and nonoliguric ARF.

All patients included in the study were thoroughly examined and kept under close observation. Fluid balance charts and other relevant data were accurately recorded. Daily urine and blood samples were collected for biochemical measurements. Venom antigen levels were measured on admission for confirmation of biting snakes. All samples were kept frozen until tested at the Department of Medical Research.

Treatment: All patients received lyophilised monospecific refined freeze dried antivenom for Russell's viper (BPI) 40 ml (intravenous injection within 10 minutes) was given initially and repeated 6 hours later if blood is still non-cottable.

General measures for acute renal failure were instituted for all patients. If oliguria persists after rehydration, if necessary, intravenous frusemide 40-250 mgm and dopamine 2.5ug/kg/hour in 500/ml of isotonic saline infusion was given. None of the patients with nonoliguric ARF received diuretics or any medication known to alter the antidiuretic release and renal response to antidiuretic hormone.

All patients were kept in hosital for a minimum of 5 days. Patients considered for dialysis were referred to the Rangoon General Hospital.

Laboratory Methods: Venom antigen was measured by enzyme linked immunosorbent assay (ELISA). Biochemical analysis was done by standard methods.

RESULTS

A total of 52 patients was studied. 34 patients (41%) had oliguric ARF. In these patients oliguria set in within first 24 to 48 hours after admission into hospital. 18 patients (22%) passed more than 400 ml of urine per 24 hours throughout the azotemic phase of the illness. The mean daily urine volume was 2204 ml in these patients.

Table(1) summarises the clinical features of 34 oliguric ARF and 18 nonoliguric ARF patients. In patients with oliguric ARF there was a significantly higher incidence of gastrointestinal bleeding (21% compared to nil in nonoliguric ARF), renal angle tenderness (32% compared to 6% in nonoliguric ARF), and facial and conjunctival oedema (47% compared to nil in nonoliguric ARF). The incidence of other clinical signs were very similar in the two groups.

Table 1. Clinical features in patients with oliguric and nonoliguric acute renal failure.

Clinical Parameters	Oliguric acute renal failure n = 34	nonoliguric acute renal failure n = 18	P value
Age (years) mean±SD	34±3	36±9	
Sex (M:F)	23:11	16:2	
Time interval between bite and anti-venom (hours).	6±1.2	6±1.1	
Venom antigen (ng/ml) mean±SD	72±5	85±6	NS
Local swelling (no. of cases)	33(97%)	16(89%)	NS
Blister (no. of cases)	4(12%)	Nil	
Necrosis (no. of cases)	2(6%)	Nil	
Regional Lymphadenitis (no. of cases)	27(79%)	11(61%)	NS
Systemic bleeding (no. of cases)			
- Gums	9(26%)	3(17%)	NS
- Gastrointestinal	7(21%)	Nil	<0.05
- Genitourinary	13(38%)	4(22%)	NS
Hypotension (no. of cases)	17(50%)	5(28%)	NS
Renal angle tenderness (no. of cases)	11(32%)	1(6%)	<0.05
Facial & conjunctival oedema (no. of cases)	16(47%)	Nil	<0.01

The mean±SEM of serum creatinine and blood urea nitrogen in control subjects were 1.3mgm/dl and 20.4mg/dl respectively. The biochemical data from the two groups of patients are shown in Table 2. There was a significantly higher blood urea nitrogen and serum creatinine in patients with nonoliguric ARF. Fractional excretion of sodium was 25 ± 16 and 3 ± 1 in oliguric ARF and nonoliguric ARF respectively. Renal failure index (as expressed as the ratio of urinary sodium (mmol/L) and urine/plasma creatinine ratio) was very high, i.e. 42 ± 9 in oliguric ARF and comparatively low i.e. 4 ± 1 in nonoliguric ARF.

Table 2. Severity of renal failure in 34 oliguric and 18 spontaneous nonoliguric patients (mean±SEM)

Index	Oliguric patients n = 34	nonoliguric patients n = 18	P value
Blood urea nitrogen (mg/dl)	136±19	57±6	<0.001
Serum creatinine (mg/dl)	6± 0.8	2±0.2	<0.001
Urine sodium	106±10	78±9	<0.05
Urine/Plasma Creatine	5± 1.2	23±3	<0.001
Fractional excretion of sodium (%)	25±16	3±0.8	<0.001
Renal failure index	42± 9	2±0.4	<0.001

Response to treatment

Eleven patients with oliguric ARF responded to diuretics and dopamine. 8 patients were dialysed. 11 patients died from this group. Mortality rate was about 32%. None of the patients with nonoliguric ARF required dialysis and none died.

DISCUSSION

The incidence of nonoliguric acute renal failure in our series was about 34%. This is a little higher than Meyers' et al.(4) and Singh et al.(5) series (30%) but much lesser than Shen et al.(1) study. Anderson et al (2) reported that toxin related nephropathy is more frequent in nonoliguric acute renal failure. Although the exact mechanism or cause of nonoliguric acute renal failure in Rusell's viper bite victims was not known, we assume that direct renal toxicity due to snake venom might be contributing to this type of acute renal failure. In our series, patients with oliguric acute renal failure showed evidence of more severe renal impairment. Patients were ill and serious complications like gastrointestinal bleeding were more frequent. Biochemical picture also indicated more severe degree of renal failure in these patients. The low FENa in nonoliguric patients indicates that lesser degree of damage done to functional integrity of the tubules. Miller and associates (6) also found that 10% of patients with non-oliguria had FENa of 1%. Renal failure index values of 4 to 10% was reported both in oliguric and non oliguric acute renal failure (7). The mortality rate was 32% in oliguric ARF in spite of peritoneal dialysis done in 8 patients. None needed dialyses or die from non-oliguric ARF. These findings signifies a more severe renal lesion in oliguric ARF and, in a group of patients with ARF resulting from an identical etiology and receiving similar management, supports the view that the essential difference between the two groups is the degree of renal damage. Urine output during the azotemic phase is therefore, an important prognostic factor.

In conclusion, we would like to stress the existence of high output renal failure in patients with Russell's viper bite, and mere absence of oliguria should not exclude renal damage.

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