



FORCED ALKALINE DIURESIS IN PREVENTING ACUTE KIDNEY INJURY IN VASCULOTOXIC SNAKE BITE.

Medicine

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ABSTRACT

Snakebite is an acute life threatening time limiting medical emergency. It is preventable public health hazard often faced by rural population in tropical and subtropical countries with heavy rainfall and humid climate. Though snakebite is a life-threatening centuries old condition, it was included in the list of neglected tropical diseases by World Health Organization in the year 2009⁽¹⁾. Acute kidney injury is among the common complication after snake bite which is the cause for significant morbidity and mortality.

KEYWORDS

Vasculotoxic snake bite, Acute kidney injury, forced alkaline diuresis

Background:

Snake bite envenomation is a common acute life-threatening medical emergency. Worldwide about 1.2 million to 5.5 million cases of snake bite occurs and about 20 to 94 thousand estimated deaths occurs because of it.⁽²⁾ In India alone about 1300 to 50,000 deaths⁽³⁾ occur because of snake bite, & it is found that Majority of snake bite deaths go unreported, in India only 7.23% cases of snake bite related death gets reported, as many victims go to traditional healers and many deaths occur before reaching hospital.⁽⁴⁾ Survey of 1.1 million homes in 2001–03. The study found 562 deaths (0.47% of total deaths) were assigned to snakebites, mostly in rural areas, and more commonly among males. It is found that 65.7% death occurs because of common Krait, mostly in month of June to September.⁽⁴⁾

Overall about 20% of patients with snake bite, develops acute kidney injury leading to significant morbidity and mortality because of snake bite.⁽⁵⁾ patients Annual snakebite deaths were greatest in the states of Uttar Pradesh (8,700), Andhra Pradesh (5,200), and Bihar (4,500). Other Indian states with high incidence of snakebites cases are Tamil Nadu, West Bengal, Maharashtra and Kerala. Because a large proportion of global totals of snakebites arise from India, global snakebite totals might also be underestimated.⁽⁶⁾

Introduction:

There are about 216 species of snakes identifiable in India, Fortunately only a few of them are known to be of medical importance. The major families of poisonous snakes in India are Elapid which includes common cobra (naja naja), king cobra and common krait which are generally neurotoxic. Viperidae includes Russell's viper Echiscarinatus (saw scaled or carpet viper), and pit viper which are vasculotoxic. Hydrophidae (sea snakes), are myotoxic⁽⁷⁾. Renal lesions have been associated with bites from members of the last 3 families, including the Russell's viper, Echiscarinatus, pit viper. Acute kidney injury is mostly associated with bites of Russell's Viper, [8,9] saw-scaled Viper [10] Puff Adder, [11] Pit Viper, Sea snake [12] and Tiger snake. [13]. AKI and rhabdomyolysis have also been reported following wasp and bee stings. [14,15]. So, the renal injury from the vasculotoxic snake bite is the most significant reason for the morbidity and mortality associated with the snake bite. These renal manifestations have been reported with varying frequency in different studies. Information on the precise incidence in different geographic regions is lacking but obviously varies with the distribution of the viperlike snakes.

VENOMS AND CLINICAL MANIFESTATIONS:

Snake venoms are highly variable and complex mixtures of enzymes, low-molecular-weight polypeptides, glycoproteins, and other constituents. Among the deleterious components are haemorrhagins that promote vascular leakage and cause both local and systemic bleeding. Proteolytic enzymes cause local tissue necrosis, affect the coagulation pathway at various steps, and impair organ function. Hyaluronidases promote the spread of venom through connective tissue. Myocardial depressant factors reduce cardiac output, and bradykinins cause vasodilation and hypotension. Neurotoxins act either pre-or postsynaptically to block transmission at the

neuromuscular junction, causing muscle paralysis. Most snake venoms have multisystem effects on their victims. After a venomous snakebite, the time to symptom onset and clinical presentation can be quite variable and depend on the species involved, the anatomic location of the bite, and the amount of venom injected. Envenomation by most viperids and some elapids with necrotizing venoms cause progressive local pain, swelling, echymosis and (over a period of hours to days) haemorrhagic or serum-filled vesicles and bullae. In serious bites, tissue loss can be significant. Systemic findings are extremely variable and can include tachycardia or bradycardia, hypotension, generalized weakness, changes in taste, mouth numbness, muscle fasciculations, pulmonary edema, renal dysfunction, and spontaneous haemorrhage.⁽²⁾

among systemic manifestations 20 to 40% of cases subsequently develop anuria, oliguria, and acute renal failure. Renal angle tenderness is most important clinical sign for early diagnosis. There is serial rise in blood urea level and serum creatinine with acidosis and hyperkalaemia, tubular damage by Venom itself, interstitial nephritis, haemoglobinuria, hypotension and microthrombi in the kidney contribute to acute tubular necrosis. Acute tubular necrosis and cortical necrosis are the common causes for renal failure in snake bite.⁽¹⁸⁾

Acute interstitial nephritis is also documented as cause for AKI.⁽¹⁹⁾ Another reason for the significant morbidity is coagulation dysfunction because of Venome and its effect on the coagulation cascade.

Simple bedside test 20-minute whole blood clotting test (20 WBCT) if abnormal will give the clue of Impending coagulation dysfunction.

Aim of the study:

To detect the usefulness of forced alkaline diuresis in prevention of Acute Kidney Injury (AKI) in patients of vasculotoxic snake bite.

Study design:

Prospective observational study in patients of vasculotoxic snake bites in the month from April 2017 to July 2017, in government medical college and hospital.

Inclusion criteria:

1. Definitive history of snake bite by presence of fang marks consistent with a snake bite at the alleged site of bite; Identification of snake if possible, either as per patient's history or if a dead snake was brought by the patient.
2. Evidence of local toxicity in form of swelling, cellulitis, gangrene, ecchymosis, blisters, blebs, or bleeding at the site of bite and area proximal to it and the evidence of coagulation disturbances in form of local or systemic bleeding.
3. Patients in whom 20 minutes whole blood clotting test was positive.
4. Patients whose urine sample was positive for RBCs.
5. AKI⁽¹⁷⁾ was defined as an abrupt (within 48 hours) absolute increase in the serum creatinine concentration of ≥ 0.3 mg/dL from baseline value measured after admission in our hospital or

measured elsewhere after the history of snake bite; or a percentage increase in the serum creatinine concentration of $\geq 50\%$ above baseline after snake bite; or urine output less than 0.5 mL/kg per hour for more than 6 hours.

Exclusion criteria:

1. Known case of past renal disease or ultra-sonographic evidence of bilateral small kidney; or patients whose baseline creatinine was more than 1.5 mg on any previous medical records before snake bite. We also excluded the patients who are known cases of diabetes or hypertension or those who have been exposed to the nephrotoxic drugs in last one week depending on the history on previous medical records.

Materials and methods:

A total of 50 patients who were admitted in government medical college and hospital, with a definite history of snakebite were evaluated by history, clinical examination and investigating that includes Bleeding time, clotting time, PT INR, urinary RBCs, serum creatinine, blood urea level, and complete blood count and platelet count.

Those patients who falls in inclusion criteria received alkaline diuresis in treatment along with standard treatment with anti-snake venom.

We have given the patient with Inj. frusemide 20 mg iv bolus followed by Inj sodium bicarbonate 40 meq in 500 ml of normal saline over 30 min. Another 40meq in 500 ml of normal saline over 30min followed by Inj KCL 20meq in 500ml of D5 over 90min.

Patient was under strict monitoring for the urine output and we expected urine output of 3 ml/kg/hr those who did not meet this criterion were loaded with another 20 mg of iv Inj of frusemide.

Those who did not respond, we repeated the cycle thrice. Patient was strictly monitored every 6 hourly for hypokalaemia and hypocalcaemia or hyponatremia.

FAD converts into polyuria and avoid ATN and acute kidney injury.

Table no. 1

Total	50
Asymptomatic	26
Symptomatic	24
Falling in inclusion criteria	8
Forced alkaline diuresis	8
AKI	0

We studied total 50 patients admitted in our hospital with definite history of snake bite, and we noticed that 26 patients i.e. about 52% of the total were asymptomatic who did not require any treatment except observation for 24 hours. Rest 24 patients developed some symptoms of snake envenomation. As this study is related to renal manifestations of vasculotoxic snake bites, we are not commenting on the symptoms of neurotoxic snake bite among these 24. Out of these, a total of 8 patients who are falling in the inclusion criteria for the study had received forced alkaline diuresis 2 or 3 cycles; and it is found that none of the patients who received forced alkaline diuresis developed acute kidney injury shown by rise in serum creatinine level or decreased urine output.

After this significant finding Of the study regarding the usefulness of forced alkaline diuresis we did the comparative study from retrospective data among the total 50 patients admitted in our hospital with definite history of snake bite in the same months of last year.

Table no.2

Total	50
Asymptomatic	32
Symptomatic	18
falling in inclusion criteria	10
Forced alkaline diuresis	0
AKI	2

In this group that we studied, we noticed that out of 50 patients 32 patients i.e. about 64% of the patient did not develop any signs or symptoms of snake envenomation after 24 hours of observation. A total of 18 patient who developed some signs of snake envenomation,

10 patients were falling in the inclusion criteria. These 10 study patient were treated with standard treatment of anti-snake venom and conservative management, but they did not receive forced alkaline diuresis.

At the end of this study of this retrospective data, it was found that 2 patients among 10 i.e. about 20% developed acute kidney injury due to snake bite, in the form of rising creatinine and decreased urine output; and these eventually required haemodialysis for the further management.

RESULT:

Prevalence of acute kidney injury in snake bite patient is 20 %, which was shown by rise in serum creatinine level and decreased urine output. The prevalence of AKI in patients who received forced alkaline diuresis as treatment modality along with anti-snake venom is 0%.

CONCLUSION:

Snake bite induced acute kidney injury can be prevented by using forced alkaline diuresis as effective treatment modality. As the study hasn't taken into consideration the 'Time to hospital' of a patient after the snake bite and the severity of the rhabdomyolysis and tissue necrosis; there is still a need to do this study considering these clinical parameters on larger scale to firmly establish the usefulness of alkaline diuresis in the prevention of acute kidney injury due to snake bite.

Conflicts of interest: Nil.

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