

CHAPTER

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# *Management of Snake Bite - An Update*

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## **Introduction**

Nearly 216 species of snake identifiable in India, of which 52 are known poisonous. The major family of snake in India are Elapidae which includes common Cobra (*Naja naja*), king cobra and common krait (*Bungarus cerulus*) viperidae includes Russell's viper, saw called viper (*Echis carinatus*) and pit viper and hydrophidae (the sea snakes). The population of India (Total exceeding 1000 millions) which resides in rural areas around 500 millions and 10% of these population (50 million) are at risk of snake bite any time of life.

The infrastructure of the medical profession in India is this way maldistributed to protect this poor rural population against the snake bite. Scientifically and ethically we, the doctors can not treat the patients of snake bite properly. Moreover the ignorance the people around the snake bite victims, the misbeliefs about snake bite and ignorance of the medical profession also play a large part to care this patients in a proper way.

There are large number of conflicting protocols for dealing with first aid and treatment. In 2004, WHO established a snakebite Treatment Group, whose role was to develop recommendations to reduce mortality according to international norms. A primary recommendation was to establish a single protocol for both first-aid and treatment

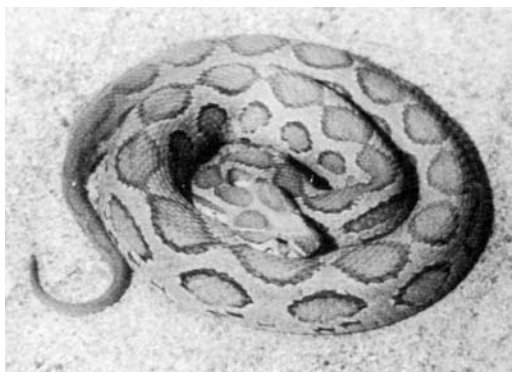
which contained evidence based procedures and was relevant to the Indian context. In July 2006, a National Snakebite Conference was convened, including Indian and International experts. More over publications issued by the WHO Regional Office for South-East Asia, written and edited by David A Warrell in the year 2005 and enduring efforts of the scientist and doctors working in different regions of India is the back bone of these update.

We have treated about 10000 cases of snake bite patients in Medical College Hospitals, Kolkata, Tarakeswer Rural Hospitals And Seba Nursing Home, Tarakeswar, Hooghly, West Bengal, SRI Hospitals, Betai, Nadia, West Bengal since 1987. But about 1000 cases of snake bite we have studied systematically. The result of our study we have presented and published in JAPI and National Critical Care Congress involving small number of cases. The present update has been modified by the result of our study which is yet to be published.

The update includes mainly the first-aid management and treatment of the snake bite victims and the associated complications.

## **First Aid Treatment**

The most commonly used first aid technic is the tourniquet. This despite the weight of research



showing that the technique carries the risk of ischemic damage and increasing the necrotic action of venom, the dangers of neurotoxic blockage and clotting when the tourniquet is released and the ineffectiveness of the technic in retarding venom flow.

A newer technic, which has a popular following, is the pressure Immobilization Method (PIM). This advocates tying elasticated or crepe bandage around the limb including an integral splint, in the same way as for a sprain. This method was developed in Australia in the late 1970's and was advocated as a reliable technic to inhibit venom flow into the system.

Later research, showed that differential pressure was required depending on whether a lower or upper limb was involved, that pressure amounts outside the range could increase the venom flow, that the immobilization of victim had to be immediate and complete – the victim could not walk for more than 10 minutes and that even Emergency Room doctors could not apply the technic correctly. In view of these limitations both tourniquets and PIM are rejected for use in India.

In line with the rest of the world, incision and suction, electrical and cryotherapy, washing the wound and the use of Aspirin for pain relief are contra-indicated.

### Diagnosis and Testing

The use of bite marks to determine whether the biting specy was venomous or non venomous was determined to be useless. Most venomous species are in possession of more than one set of fangs and have other teeth. Many non venomous species leave just two punctures from enlarged teeth, which can appear to be fanglike. The preservation in formalin, of dead species brought to the hospital, for reliable identification, was recognized as valuable.

## Syndromic approach of snake bite

### Syndrome 1

Local envenoming (swelling etc) with bleeding/clotting disturbances = Viperidae

### Syndrome 2

Local envenoming (swelling etc) with bleeding/clotting disturbances, shock or renal failure = Russell's viper (and possibly saw-scaled viper – Echis species – in some areas)

With conjunctival edema (chemosis) and acute pituitary insufficiency = Russell's viper, Burma

With ptosis, external ophthalmoplegia, facial paralysis etc and dark brown urine = Russell's viper, Sri Lanka and South India

### Syndrome 3

Local envenoming (swelling etc) with paralysis = cobra or king cobra

### Syndrome 4

Paralysis with minimal or no local envenoming

Bite on land while sleeping = krait

Bite in the sea = sea snake

### Syndrome 5

Paralysis with dark brown urine and renal failure:

Bite on land (with bleeding/clotting disturbance) = Russell's viper, Sri Lanka/South India

Bite in the sea (no bleeding/clotting disturbances) = sea snake

The 20 minute Whole Blood Clotting Test was adopted as the standard test of coagulopathy. It is simple to carry out and give reliable indication of consumption coagulopathy. Evidence of coagulopathy determines that the biting species is viperine. Neither of the Elapids i.e. cobra or Krait are known to give anti hemostatic symptoms.

For the neurotoxic poisoning the most important criteria is clinically based. Confusion and altered consciousness, ptosis, fasciculation and other neurological manifestation should be monitored.

Edrophonium test followed by neostigmine may be useful.

The PCV which is increased in early part of the snake bite may be due to increased capillary permeability by snake venom and may be an useful guide to fluid therapy. However central venous pressure measurement is mandatory for proper fluid replacement. The platelet count and the other parameters of disseminated intravascular coagulation such as serum fibrinogen level, FDP in urine and abnormal RBC morphology of the peripheral blood film is very important guide for giving ASV and blood and blood products.

Arterial blood gas analysis which is very useful guide for further therapy is most of time contraindicated because of coagulation failure. However pulse oximetry and serum bicarbonate level is a good adjunct to the clinical judgement of acidosis (metabolic in case of renal failure or respiratory in case of neurotoxic poisoning producing respiratory paralysis). Serum electrolytes particularly serum potassium which is usually high indicating a combination of hypercatabolic state, myonecrosis and rhabdomyolysis, renal failure and some times by bad fluid selection.

## What to do if ASV not Available

The treatment of patients should not be stopped when ASV not available. There are plenty of reports available which indicate treating the patients hematologic complications by blood and blood products may improve the patients and cures the patients totally. The neurotoxic poisoning also to be treated by neostigmine (after edrophonium test) and mechanical method of ventilation. Both the above methods are valuable for initial management of the patients sometimes till the ASV unavailable.

## ASV Administration Criteria

ASV is scarce commodity with known accompanying risks of anaphylaxis. It should not thereof be used unless envenomation is established by the appearance of systemic symptoms or severe local symptoms. Several local symptoms are defined as

swelling rapidly crossing joint or involving half the bitten limb, in the absence of a tourniquet. Once the tourniquet has been removed for more than 1 hour, if the swelling continues, this should be viewed as venom generated and not due to the continuing effect of the tourniquet. ASV may well be needed.

### **Anti snake Venom Dose and Administration**

Definitive data which can accurately determine the level of envenomation, e.g ELISA testing; symptomatology is not a useful guide to the level of envenomation. Any ASV regimen adopted is only a best estimate. What is important is that a single protocol is established and adhered to, in order to enable us to gauge result.

The recommended initial dosages are 100 ml of polyvalent ASV for adults and children, is based on published research that Russells Viper injects on average 63 mg of venom. Logic suggests that our initial dose should be calculated to neutralize the average dose of venom injected. This ensures that the majority of victims should be covered by initial dose and keeps the cost of ASV to acceptable level. The range of venom injected is 5 mg-147 mg. The suggestion of total requirement of dosages lies between 100 ml-250 ml. and 100 ml of ASV should be administered over one hour preferably diluted with 100 ml of normal saline. The initial drip rate should be very slow and patients should be watched carefully to have any adverse reaction. The correction of coagulopathy is the most important criteria to continue the ASV treatment. Sometime it happens that hours, days and weeks may pass to have the manifestation of bleeding after the snake bite and the total dose of ASV to be continued till the Coagulopathy is corrected along with blood and blood products- particularly in the Indian context.

### **Adverse Reaction to ASV**

Anaphylaxis and anaphylactoid reaction major hindrance for the treatment of the ASV. For the children and young adults adrenaline is very useful way to counteract the ASV reaction. But

the adrenaline should be given intramuscularly and preferably at the first signs of any of the following:-

Urticaria, itching, fever, shaking chills, nausea, vomiting, diarrhea, abdominal cramps, tachycardia, hypotension, bronchospasm and angio-edema.

However ASV should be discontinued and restarted if reaction is abated. In case of old age we preferably use IV hydrocortisone and H-1& H-2 blockers because of appearance of fatal outcome in old age after giving intramuscular adrenaline.

### **Repeat Dose of ASV**

In case of hemotoxic poisoning repeat dose of ASV is usually required. However after the first dose of bolus ASV for more than one hour it should be repeated after six hours depending on the coagulation profile and may be repeated till the coagulation profile is corrected. In neurotoxic poisoning after the first dose has been given (100 ml of ASV) which neutralizes 120 mg of poison, another dose may be repeated after one hour provided the patients have not improved, or worsened. No further ASV is required usually, but neostigmine and mechanical ventilation should be continued, if needed.

### **Special Situation in snake venom poisoning**

#### **Acute renal failure**

Acute renal failure is very important cause in tropical countries due to snake bite. Usually a multifactorial cause is found such as hypotension, rhabdomyolysis, hemoglobinuria, myoglobinuria and sepsis. Severe and persistent hypotension is the most important cause of renal failure, early correction by fluids and ASV is very important to avoid acute renal failure. In a situation of oliguria where established renal failure has not set in a trial of I.V. mannitol may be used but caution should be made not to produce pulmonary edema. The commonest cause of acute renal failure in this situation is acute tubular necrosis. However about 10% of patients may develop persistent oliguria

for weeks together which indicates acute cortical necrosis- indicating bad prognosis. All patients having persistent oliguria must have a renal biopsy done to prove ACN and a CT scan should be done to differentiate focal from diffuse type of ACN.

### Cardiovascular abnormality

Acute severe persistent hypotension is the commonest problem which has already been discussed in the previous paragraph. Fatal tachyarrhythmias and bradyarrhythmias also pose important problems and can be tackled easily. The development of myocarditis usually responds to ASV therapy.

### Hyperkalemia

Hyperkalemia is a very important emergency for snake bite victims particularly in the presence of renal failure. The traditional I.V. calcium and GIK solution is very important but should be watched closely. If there is no improvement by three hours then urgent dialysis (peritoneal or hemo) should be done.

### Arterial puncture

Arterial puncture should be avoided as far as possible. *Venepuncture* should be done by an expert hand to avoid double puncture which carries a severe complication in a hematotoxic poisoning.

### Central venous pressure monitoring

Central venous pressure should be monitored closely in patients of hypotension and shock. The site of CVP should be antecubital vein and to avoid neck veins (jugular) which carries significant risk. Hospital-made pressure manometer is sufficient for the CVP monitoring which requires very little cost and skill.

### Neurotoxic poisoning

In neurotoxic poisoning most of the time the patients are fully conscious but ptosis and inability to swallow make them speechless and appearance of unconsciousness. Neck muscle is totally paralyzed given appearance of "neck fracture" (broken neck sign). A small number of patients may develop

total areflexia, fixed dilated pupil and no response to painful stimuli; this should not be regarded as permanent brain death; as much as can be done to reverse this situation. However, single breath count, paradoxical respiration, FEV1 & FVC values and capacity to move fluid upwards in a closed tube by closed lips is a very important way to detect early neurotoxicity.

### Acute compartmental syndrome

A very small percentage of patients develop this complication which may require urgent help from the surgical colleague. But the compartmental pressure should be monitored. Styker manometer or better still a hospital-made 22G needle may be introduced (3-4 cm inside the compartment) and connected to a three-way cannula and a manometer.

### Incidence of complication

Incidence of complication was directly proportional to the duration of venom in the blood prior to neutralization by ASV due to late arrival of patient at hospital. The early institution of ASV is beneficial in preventing complications; however, severe systemic envenomation.

### Correlation between bite to needle time and complications.

Bite to needle time	Complicated cases	Uncomplicated Cases	Total
< 6hours	10	26	36
6-24hours	04	03	07
1-3days	04	01	05
> 3 days	02	00	02
<b>Total</b>	20	30	50

### Conclusion and Recommendation

- Snake bite is an important cause of medical emergency and mortality and chronic morbidity particularly in young active people. Real data of mortality and morbidity is still lacking because of absence of reporting and proper epidemiological survey. So to overcome the situation snake bite should be a notifiable disease.



- The poor rural population who are engaged in the production of food and food products having important impact on national economy, this occupational hazard should be recognized in India and preventive measures to be adopted.
- It's shame on our part that despite the fact that snake bite cause more death than many common tropical diseases, but there are fewer paper on this aspect than others.
- It's to be recommended that all the persons engaged in medical, agricultural and pharmaceutical industry should be engaged along with Government and NGO to promote properly designed studies for snake bite in India.
- There are some proposal and planning of training of doctors and other paramedical people for treatment of snake bite in India. They should be familiar with the common problem of snake identification( medically important) and clinical diagnosis and management protocol.
- It is strongly recommended that MCI & API should be brought together to put the snake bite management in Medical curriculum as well as special program and training.
- Community education should be a part of snake bite management plan for future India. Community medical practitioners and those who are engaged in the first aid management of the rural population of India. The persons are at risk of snake bite should be educated about the preventive measures.
- Most of the traditional treatment of snake bite both in south east Asia & western countries have failed to prove beneficial. However it is important to make the population of India to understand by mass education. Delay in hospital admission should be discouraged in any way.
- Management to be directed by diagnosis of type of bite. Identification of dead snake and clinical syndrome especially important.
- A syndromic approach should be followed for proper management.
- Anti snake venom is the only effective treatment. But it's a scarce commodity and should be used only when recommended like severe local reaction or systemic signs of envenomation.

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### References

1. Dr.Ian D Simpson. Management of Snakebite-The National,API WB branch, *update in Medicine*,2006 :88-93.
2. K Narvencar, Correlation Between Timing Of ASV Administration And Complication in Snake Bite, *JAPI*. Vol 54 September 2006.
3. Gudilines For the Clinical Management Of Snake Bites In South- East Asia Region Written and edited by David A Warrell published by WHO, 2005.
4. J Srimannaryan, TK Dutta, A Sahai, S Badrinath. Rational Use of Anti-Snake Venom(ASV): Trial of Various Regimens in Hemotoxic snake Envenomation,*JAPI*.Vol 52 Oct 2004:788-792.
5. HS Bawaskar, Snake Venoms And Antivenoms: Critical Supply Issues. *JAPI*. Vol 52 January 2004:11-13.
6. V paul, S pratibha, KA prahaald Jerry Earail, S Fracis, Francy Lewis, High-Dose Anti- Snake Venom Versus Low- Dose Anti Snake Venom in The treatment Of Poisonous Snake Bites- A Critical Study, *JAPI*.Vol 52 January,2004.