A Report from Times of India.

“Fatal Snake bites have become a major public health concern in India, the worst is that it is vastly underreported. The American Society of Tropical Medicine and Hygiene said in India 46,000 people are dying every year from snake bite against the official figure of only 2000.”

Snake bite is a common medical emergency encountered in South Asia.

Snakes especially in India, has been seen as a symbol of life, decorating Lord Shiva and they are worshipped for love, health, virtue, procreation and wisdom. Alternatively it has represented death, diseases, sin and poverty.

It is actually our obsession with snakes that we fear them, worship them and exploit them. But it is our fear of being bitten that is the cause of our obsession.

The principal effects of envenomation are on nervous system, kidneys, heart, blood coagulability, vascular endothelium and locally at the site of bite. The victims are mainly of rural population, who are bitten during field work and when sleeping outdoors.

In Punjab, the majority of victims are the migrant agricultural labour who work in the fields and sleep outdoors especially in the rainy season.

Most snake bite victims reach the traditional healers, who use witch craft. Only the severe snake bites reach the health care facility.

**EPIDEMIOLOGY**

Approximately 3000 species of snakes found worldwide are considered dangerous to humans. In India there are estimated 2,00,000 cases of snake bites every year and 20,000 to 30,000 of deaths in one year. Males suffer twice more than females. 50% bites are dry bites that result in negligible evenomation.

There are more than 200 species of snakes in India. Only 52 are poisonous.

There are 5 families of venomous snakes:

- **Crotalidae** Rattle snake, pit viper
- **Viperidae** Russel’s saw scaled viper
- **Elapidae** Cobra, Krait (Neurotoxic)
- **Hydrophiidae** Sea snake
- **Colubridae**

The most commonly found snakes in North India especially Punjab & Haryana are from elapidae family consisting of Cobras and Krait – which produces neuroparalytic symptom.

The other largest family is Viperidae which includes vipers – comprising of Rattle snake, pit viper causing hematological symptom.
**SNAKE VENOM**

Snake venom is highly modified saliva that is produced by special glands of certain species of snakes. The glands which secrete the zootoxin is a modification of the parotid salivary gland and are situated on each side of head below and behind the eye encapsulated in muscular sheath. The glands have large alveoli in which venom is stored before being conveyed by the duct to the tubular fangs, through which it is injected.

Snake venom is a combination of many different proteins, peptides and enzymes and they are generally not dangerous when ingested. Therefore, technically not grouped in poisons.

**CHEMISTRY**

Snake venom consists of protein, enzymes, substances with cytotoxic effects, neurotoxins, coagulants and anticoagulants. It has acidic pH. Specific gravity is 1.03 and is water soluble.

- Phosphodiesterase A2 causes haemolysis by lysing cell membrane of RBCs.
- Oxidases and proteases are used for digestion.
- Snake venoms vary greatly in their function. Two major classification of toxins found in snake venom include neurotoxins (those which affect nervous system) and cytotoxins, (those that attack cells).

The major examples are:

**NEUROTOXINS**

1. Fasciculins
2. Dendrotoxins
3. α – Neurotoxins

**CYTOTOXINS**

1. Phospholipases
2. Cardiotoxins
3. Haemotoxins

**A–NEUROTOXINS**

This is a large group of toxins app.100. They attack the cholinergic neurons. They mimic the shape of acetylcholine molecule and fit into the receptors, blocking the nerve impulse, thus causing paralysis.

Examples of snake and lethal dose of venom

- King Cobra (Hannatoxins & Cardiotoxins)
- Sea snake (Evabutoxin)
- Krait (α–Bungaratoxin) (0.06gm)
- Cobra (Lobratoxin) (0.12gm)

**HAEMOTOXIN**

The toxin causes haemolysis or destruction of RBCs.

Snake examples are most vipers and Naja genus (Lethal dose of Russel viper is 0.15gm)

**IMMUNITY**

The Hedgehog, the mongoose, the honey badger, the secretary bird and few other birds feeding on snakes are known to be immune to dose of snake venom. The pig owing to its subcutaneous layer of fat is often bitten without ill effect.

**Among humans**, the acquisition of human immunity against snake venom is one of the oldest forms of vaccinology known till date. Many humans have attempted to inoculate themselves with snake venom in order to achieve immunity.

The present goal is to develop DNA based vaccine for Eastern hemisphere using the genes that encode the venom with an electroporation device for DNA delivery(1). If successful (1,2), some of the 1,00,000 people that die each year from snake bites in the eastern hemisphere of earth will be saved.

**REGIONAL VENOM SPECIFICITY**

Even when the physiological action appears identical, serum injection or graduated direct inoculations, confer immunity towards one species or allied species only.

In India, the serum prepared with the venom of Naja Tripudians has been found to be without effect on the venom of two species of Kraits, Bungarus and Vipers Dabio Russell’s. Hence, antivenom snake bite treatment must be matched for the type of envenomation that has occurred. That’s the reason that Anti-snake venoms are polyvalent.

**DIAGNOSIS OF SNAKE BITE**

**Venomous and Non-venomous**

The definitive diagnosis of snake poisoning is positive identification of snakebite and clinical manifestations of envenomation.

The signs and symptoms of envenomation are the focus of diagnosis.

**Systemic signs of Venomous bites**

Day time or observed snake bites bring fear impending dooms,
Snake Envenomation

emotional lability, fainting tachycardia and cold clammy skin.

In North India – Punjab & Haryana – most prevalent snakes are Cobra and Krait. Hence the symptoms are neuroparalytic.

In Punjab, most of krait bites occur mostly at night time and are not observed. They are unprovoked bites to the innocent and the most common timing is between mid night and early morning. It is astonishing that out of 5 or 6 sleeping people, any one of them may become an innocent victim of snake bite.

We treated a mother and her baby both bitten by a snake in sleep and the baby became more serious probably because of weight of baby and amount of venom injected during snake bite. Mostly the victims are sleeping in small crowded tube wells made in fields. But few of our patients were sleeping on beds in houses, when snake got into the folds of bed sheets.

It is postulated that probably it is the frustration of male krait who is looking for a mate early morning leading to unprovoked bites.

The victim often complains of abdominal pain, hyperaesthesia of abdominal skin, drowsiness, inability to get up in the morning, ptosis or may develop respiratory and bulbar paralysis in a short span of time.

Krait bite usually leaves no distinct fang marks. In absence of history and patients denial to history of snake bite, it is the physician’s strong clinical acumen to diagnose a case of snake bite. The diagnosis can often be missed and mislead, when patient complains of severe abdominal pain and vomiting.

**CLINICAL FEATURES**

In a study at Sidhu Hospital, Doraha the site of bite was peripheral limbs (94%) and central in 6% cases. It was observed that bites in central area i.e. nape of neck and abdomen were more dangerous as compared to peripheral bites. The symptoms were more severe and higher dose of Anti-snake venom (ASV) was required.

**VENOMOUS ELAPID BITE – KRAIT, COBRA**

*Local features*

There are very indistinct fang marks. Burning mild pain, swelling, inflammation and mild serosanguinous discharge.

*Systemic features*

Krait and Cobra are neurotoxic.

The early symptoms are abdominal pain, vomiting and hyperaesthesia of abdominal skin, headache, and when paralytic stage sets in Ptosis, Ophthalmoplegia, drowsiness, dysarthria, dysphagia, bulbar paralysis, flaccid paralysis of whole body, followed by respiratory failure, hypoxia and convulsions.

Cardiac depression/heartogenic and vasogenic shock. Systolic cardiac arrest with Cobra envenomation.

**VIPERIDAE BITES**

With Viperidae bites – The primary local clinical findings emerge with in 30 to 60 minutes CROTALINE envenomation includes presence of more fang marks, pain, oedema, erythema, blister formation or ecchymosis of the bite site and adjacent tissues occasionally might be noted.

Lymphocytosis, tender regional lymphadenopathy, ecchymosis might appear over the bite site.

Systemic manifestations include nausea, vomiting, perioral paraesthesia, tingling of finger tips and toes. Fasciculations, subjective complaints of rubbery, metallic taste are frequent.

Generalised bleeding manifestations, epistaxis, haemoptysis, bleeding gums, haematuria, purpuric spots

Rattle snakes can result in consumptive coagulopathy manifested by hypofibrinogenemia, prolonged PT/INR, and thrombocytopenia.

Increase in capillary membrane permeability, resulting in loss of electrolytes, albumin and RBCs, manifested clinically as oedema and erythema, hypovolemic shock and metabolic acidosis.

Renal failure secondary to hypotension, hemolysis, consumptive coagulopathy.

Severe rattlesnake envenomation can be associated with increased compartment pressures(3). The local reaction to envenomation manifesting with marked swelling, tenderness, tenseness, and pain(4). Compartment syndrome in patients with rattlesnake envenomation is caused by myonecrosis, caused increased compartment pressures(5).

Surgical intervention with fasciotomy may be required if the compartment pressure fails to reduce over 4 hrs treatment with ASV(6,7).

**HYDROPHID BITE (SEA SNAKE – MYOTOXIC)**

Local features are minimal swelling and pain.

Systemic features are myalgia, myoglobinuria, renal tubular necrosis.

**MANAGEMENT OF SNAKE BITE PATIENT**

- **Local**
- **Specific**
- **Supportive**

First aid is required and it is important to tie a tourniquet between wound and heart. Tourniquet pressure should be adequate to occlude the venous and lymphatic vessels and not too tight to occlude the arterial vessel.

One of our patients had ischaemic gangrene of arm because
of too tight tourniquet.

- Immobilise the affected limb, Reassure the patient.
- Clean with normal saline.

There is no need to give incision or suction. The bullae of viper bite may be left intact.

Transport the patient to a nearest medical facility.

The paramedical personnel should focus treatment on support of airway/breathing, circulation, administration of O₂.

The practical problems are arrival delays, lack of history of snake bite; clinical features are confusing to the layman. There are excellent outcomes with early proper treatment and ventilatory support if the patient reaches the hospital in time.

IN HOSPITAL

Aggressive management is required. After establishing airway breathing, endotracheal intubation and ventilation if required, Circulation and I/V access. A quick detail history is taken, and complete physical examination is done with special attention paid to cardiovascular, pulmonary and neurological systems.

Lab test sent with complete blood counts, and coagulation profile, electrolytes, RFT and urine analysis. Tetanus prophylaxis should be administered.

Krait (neuroparalytic) snake bite patient need ventilatory care within 3-6 hrs of bite. They require frequent ABG monitoring and electrolyte corrections.

SPECIFIC TREATMENT

1. ASV – Anti Snake Venom should be started immediately after testing for hypersensitivity.

2. Mechanical ventilation

The use of ASV in adequate dose is the mainstay of hospital treatment. WHO protocol of 20 vials of ASV given stat during admission followed by another 10 vials during second hour and 5 vials given in next 12 hrs, till the patient is on mechanical ventilatory support.

For respiratory failure, the average consumption ranged from 25 to 50 vials of ASV.

The Anti Snake Venom Used in India is Polyvalent. It is an immunoglobulin purified from the serum or plasma of horse or sheep that has been immunized with the venom of multiple species of snake.

The polyvalent ASV is effective against Cobra, Krait, Russel’s viper and saw scaled viper.

ASV is indicated only if the patient is symptomatic. Asymptomatic patient needs to be observed for 24 hrs and specific treatment with ASV is not required.

The best effect of ASV are observed with in 4 hrs of bite, hence the loading dose of ASV is given initially.

The subsequent repeat doses, depends on persistent respiratory paralysis, deteriorating cardiovascular, neurotoxic signs or continuing consumptive coagulopathy.

Hypersensitivity to ASV should be treated at the earliest sign and ASV administration must be temporarily suspended.

Adrenaline 0.1% solution in 1:1000 dilution for s/c administration.

I/V hydrocortisone, I/V fluids and I/V adrenaline should be given.

Mechanical ventilation is required at the earliest sign of respiratory distress or bulbar paralysis

Immediate intubation, ventilation should not be delayed, as delay can cause aspiration, hypoxia, pneumonia and cardiac arrest.

Even small portable ventilators and ambuing can save the day if facilities are not available. Ambuing helps a lot during transportation.

Supportive care is required with IV fluids antibiotics, steroids. FFP and fresh blood if required.

MESSAGE

- Snake bite may be a nonvenomous or dry bite.
- Not all require ASV.
- Krait bites should be suspected in acute onset of neuroparalysis even without the history.
- ASV is the main stay of treatment along with mechanical ventilation in neuroparalytic snake bites.

REFERENCES


