

Dedicated to
All the animal bites victims.....,

Adapted from,

National Snakebite Management Protocol, Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India, 2008.

Handbook on Treatment guidelines for Snake bite and Scorpion sting Tamil Nadu Health Systems Project, Health and Family Welfare Department Government of Tamil Nadu, Chennai. 2008

Guidelines for the management of snake-bites, World Health Organization.

WHO Guide for pre and post exposure prophylaxis of Rabies

Management of Scorpion Bite: Adapted from HS Bawaskar, MFC bulletin, page 7, aug-sep 2004

Emergency treatment of anaphylactic reactions: Guidelines for healthcare providers, Resuscitation Council, World Health Organization

The information provided in this book is for wider dissemination, and may be used by anyone with due acknowledgement to
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Introduction :

Animals for us are not only useful creatures for a particular job but their role is very important to keep the life cycle uninterrupted. When seventy percent of the population is part of rural India, animals are an integral part of the human life. Animal and human world is absolutely the same and thus animal bites constitutes a very big problem in rural India. Getting prompt and correct treatment for animal bites is fundamental human right of all the rural Indians. This book and kit is prepared to highlight the same and is an attempt to spread right information to sort out this problem.

Of all the bites snake bites are most common and most dangerous bites. The problem of snakebite in India is higher than in any other country.

The World Health Organization (WHO) estimates that between 35,000 and 50,000 Indians die every year of snake bite. Yet in 2008, the government of India's 'National Health Profile' reported a dramatically low 1,400 mortalities. There have never been any real numbers to show just how many people die of snake bites every year.

When data from 2005 is considered, deaths due to snake bites were five per cent of all accidental deaths. Its 0.5 % of all the deaths happened that year. Problem with the snake bite case is that not all the cases reach up to health facilities. People have much more faith on local healers, Zolachhap and Tantrik doing Zaadphuk. Another facet of the problem is that considering the complexity even doctors are not very confident about treating these cases. So such cases are either referred or transferred. Delay in treatment takes the toll of patient's life.

In India 270 types of snakes are found out of which only 40 are poisonous snakes. Half of them are water snakes. Medically important Big FOUR snakes are 1. Krait 2. Cobra 3. Russel's Viper 4. Saw scaled viper

In central India Krait bites are the major problem while vipers are common in souther part of the country. Snake venom is a mixture of enzymes, proteins and is yet a mystery. If the effect of the snake venom on the body is considered snake venom primarily affects the blood (hemotoxic), and the nerves (neurotoxic) or both blood and nerves together. Snake bites by the Big FOUR can be definitely treated through a polyvalent Anti Snake Venom. Bringing patient to the hospital is the major challenge in rural areas because of many reasons. Also major hurdle in the treatment of snake bites is myths about snakes and about the treatment.

Rabies is another big and dangerous problem after snake bites. It spreads due to bites of mammals but not all the mammals. Human infection usually occurs following a transdermal bite or scratch by an infected animal. Transmission may also occur when infectious material, usually saliva, comes in direct contact with the victim's mucosa or with fresh skin lesions. The virus cannot cross intact skin. Very rarely, rabies may occur through inhalation of virus - containing aerosol or via infected organ transplants. In developing countries, dog bites account for over 90% of cases. Wild animals like jackals, fox, or hyena may also be a source of infection.

Rabies is invariably fatal. A diagnosis of rabies can be made on clinical grounds. There are no laboratory tests to diagnose the infection before onset of clinical disease. The essential measures required for the control of rabies are eliminating the diseases in domestic animals like dogs and immune-prophylaxis for humans. Rabies Vaccines (Nerve Tissue Vaccine (NTV), Cell Culture Vaccines (CCV) are required to be used in three situations : Post exposure prophylaxis, pre exposure prophylaxis, and vaccination in those previously vaccinated. Since 1991, WHO has recommended the ID route of administration for rabies pre - and post - exposure prophylaxis. Rabies Immunoglobulin of both Equine (ERIG) and Human (HRIG) is also available. Effective animal vaccines that provide a considerable duration of immunity have been developed and mass parenteral vaccination programmes remain the mainstay of canine rabies control. Dog destruction alone is not effective in rabies control.

Scorpion envenomation is an important public health hazard in tropical and sub-tropical regions. It is said that scorpion stings are 10 times more frequent than snake bites. Envenomation by scorpions can result in a wide range of clinical effects, including, cardiotoxicity, neurotoxicity and respiratory dysfunction. Out of 1500 scorpion species known to exist, about 30 are of medical importance. The Red Scorpions (*Mesobuthus tamulus*) are the most dangerous. Common scorpion stings do not always lead to death but they are very painful and prompt treatment of the same is very essential. Although in developed nations Anti scorpion Venom is available it is not used widely in our country.

Continuous training of all the health care providers in scorpion sting management is necessary. Scorpion stings should be considered amongst notifiable conditions and the gauging the prevalence of the diseases encompass a concrete step towards understanding the problem.

Honeybees and Vortex bites are very frequent complaints and they can be dangerous in some of the cases. Hence one should not be careless towards these bites also. Such bites can lead to anaphylactic shock in an occasional patient and then it would be fatal if not treated promptly. It is desirable to keep the patient under observation for few hours.

Animal bites are major public health problems. Not considering this so increases the gravity of the problem many folds. Jan Swasthya Sahyog has always given due importance to this problem and this kit is the outcome of the same. It would be a great success on our part if with the correct and appropriate treatment even a single life is saved.

Jan Swasthya Sahyog
Ganiyari / Bilaspur

SECTION - I
SNAKE BITES

General

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- Ecological aspects

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Prognosis

The World Health Organization (WHO) estimates that between 35,000 and 50,000 Indians die every year of snake bite. Yet in 2008, the government of India's 'National Health Profile' reported a dramatically low 1,400 mortalities. Apparently six of the worst affected states did not send their death toll figures. There have never been any real numbers to show just how many souls are being taken by snakes every year.

Snake bites contribute to health problem in India and continue to be a major medical concern. Based on the above statistics, it appears that every 10 seconds one individual is envenomed and one among four dies due to snake bite. Many deaths occur before the victim reaches the hospital. Actually up-to-date national data, on the morbidity and mortality due to snakebite is not available. Moreover there is no national snake bite registry in India. So the available statistics is incomplete and not systematically collected.

Epidemiology of snakebite

Snakebite is observed all over the country with a rural / urban ratio of 9:1. They are more common during monsoon and post monsoon seasons. Snakebites are seen often among agricultural workers and among those going to the forest. Many of the susceptible populations are poor living below poverty line, living in rural areas with less access to health care. The male / female ratio among the victims is approximately 3:2. Majority are young and their age is between 25 to 44 years. Most of the bites (90 to 95%) are noticed on the extremities (limbs). The hospital stay varies from 2 to 30 days, with the median being 4 days. The in-hospital mortality varies from 5 to 10%, and the causes are acute renal failure, respiratory failure, sepsis, bleeding and others.

Ecological aspects:

By destroying forests for creating agricultural land, the prey base of the snake (that is frogs and rats) has increased. The rice P elds, which harbour millions of rats attract a lot of snakes. The number of snakes per acre in a rice P eld is abnormally high when compared to the natural population in the forest. Humans go into the P eld every morning and come out in the evening, just the time when snakes are active. Thus, the chance of an encounter between farmer and snake is very high. As more areas are inhabited at the periphery of towns, even there the chances of human / snake interaction increase.

Clinical aspects of Snake Bite

Pathophysiology:

Snake venom is mostly watery in nature. It consists of numerous enzymes, proteins, aminoacids, etc., Some of the enzymes are proteases, collagenases, arginine ester hydrolase, hyaluronidase, phospholipidase, metallo-proteinases, endogenases, autocoids, thrombogenic enzymes, etc., These enzymes also act like toxins on different tissues of the body, and are grouped under neurotoxins, nephrotoxins, hemotoxins, cardiotoxins, cytotoxins etc., resulting in organ dysfunction / destruction. Enormous clinical and experimental works have been published on the pathophysiology of snake bite in relation to different species of snakes.

The quality and quantity of enzymes and other clinical constituents vary with species and subspecies, and the response of the victims to those substances is also variable, thus resulting in dissimilar features in different individuals. For example hyaluronidase allows rapid spread of venom through subcutaneous tissues by disrupting mucopolysaccharides, and phospholipase A2 has esterolytic effect on the red blood cell membrane and causes hemolysis. It also promotes muscle necrosis. Thrombogenic enzymes promote formation of weak fibrin clot, which activates plasmin and results in consumptive coagulopathy and hemorrhagic consequences. Venom of some snakes causes neuromuscular blockade at pre or post synaptic level. In addition to above it causes endothelial cell damage which results in increased vascular permeability. In short, snake venom acts on various parts / systems / organs of the body. Venom also causes endothelial cell damage which results in increased permeability.

Symptoms and signs:

The possibility of survival, even without treatment, is incredibly good in 80-90% of cases. One of the reasons for this is that many snake bites are by nonvenomous snakes. Secondly, a large percentage of venomous snakebites are dry bites i.e., the snake does not always inject venom. Sometimes, it might inject only a tiny quantity of venom. The snake can inject the quantity of venom it wants. This is an entirely voluntary process. Hence, one can never know how much venom was injected except by observing the progression of the symptoms. In other words the recovery in snakebite without even treatment is great. Every traditional healer uses this

fact to his / her advantage and propagates his / her own method to treat snakebite viz., herbal details, “snakestone” or mantra, or plain soda water and most villagers would be happy to go to him.

Also, everyone should remember the systemic action of venom and the extent varies from one snake to another. Complications and outcome due to snakebite may also vary from each other and can't be predicted by any means. Moreover, the status of poisoning cannot be judged by the bite mark, reaction to envenomation, size or the type of snake. Hence, one has to observe for signs and symptoms which may develop within 24 to 48 hours.

The symptoms and signs of Viperine and Elapid envenomation as well as late-onset envenomation are listed below.

General symptoms and signs of Viperine envenomation

Local effects

- ✓ Swelling and local pain with or without erythema or discoloration at the site of bite
- ✓ Tender enlargement of local lymphnodes as large molecular weight Viper venom molecules enter the system via the lymphatics.
- ✓ Effects due to coagulopathy and hemorrhagic consequences
- ✓ Bleeding from the gingival sulci and other orifices.
- ✓ Epistaxis.
- ✓ The skin and mucous membranes may show evidence of petechiae, purpura and ecchymoses.
- ✓ The passing of reddish or dark-brown urine or declining or no urine output.
- ✓ Lateralising neurological symptoms and asymmetrical pupils may be indicative of intra-cranial bleeding.
- ✓ Vomiting.
- ✓ Acute abdominal tenderness which may suggest gastro-intestinal or retro peritoneal bleeding.
- ✓ Hypotension resulting from hypovolaemia or direct vasodilation.
- ✓ Low back pain, indicative of early renal failure or retroperitoneal bleeding.

Other effects

- ✓ Muscle pain indicating rhabdomyolysis.
- ✓ Parotid swelling, conjunctival oedema, sub-conjunctival haemorrhage.

General symptoms and signs of Elapid envenomation**Local effects**

- ✓ Swelling and local pain with or without erythema or discoloration at the site of bite (Cobra).
- ✓ Local necrosis and / or blistering / bullae (Cobra).

Neurotoxic effects

- ✓ Descending paralysis, initially of muscles innervated by the cranial nerves, commencing with ptosis, diplopia, or ophthalmoplegia. The patient complains of difficulty in focusing and the eyelids feel heavy. There may be some involvement of the senses of taste and smell.
- ✓ Problems of vision, breathing and speech.
- ✓ Paralysis of jaw and tongue may lead to upper airway obstruction and aspiration of pooled secretions because of the patient's inability to swallow.
- ✓ Numbness around the lips and mouth, progressing to pooling of secretions, bulbar paralysis and respiratory failure.
- ✓ Hypoxia due to inadequate ventilation can cause cyanosis, altered sensorium and coma. This is a life threatening situation and needs urgent intervention.
- ✓ Paradoxical respiration as a result of the intercostal muscle paralysis is a frequent sign.
- ✓ Krait bites often present in early morning with paralysis that can be mistaken for a stroke.

Other effects

- ✓ Stomach pain which may suggest submucosal haemorrhages in the stomach (Krait).
- ✓ Eye pain and damage due to ejection of venom into the eyes by spitting cobra (as observed in Africa)

[If features of renal failure are noted search for other causes / mechanisms]

Late-onset envenomation

The patient should be kept under close observation for at least 24 hours. Many species, particularly the Krait and the Hump-nosed pit viper are known for the length of time it can take for symptoms to manifest. Often this can take between 6 to 12 hours. Late onset envenoming is a well-documented occurrence. This is also particularly pertinent at the start of the rainy season when snakes generally give birth to their young. Juvenile snakes (young ones), 8-10 inches long, tend to bite the victim lower down on the foot in the hard tissue area, and thus any signs of envenomation can take much longer to appear.

Overlapping symptoms and signs

Russells Viper envenomation can also manifest with neurotoxic features. This can sometimes cause confusion and further work is necessary to establish how wide this might be. Development of neurotoxic features in Russells Viper bite are believed to be pre synaptic or Krait like in nature. It is for this reason that a doubt is expressed over the response of both species to Neostigmine. Clinical aspects and therapeutic response in relation to some of the poisonous snakes in India is provided in following table.

Snakes : Clinical aspects and therapeutic response

Feature	Cobras	Kraits	Russells Viper	Saw Scaled Viper	Hump Nosed Viper
Local Pain/Tissue Damage	YES	NO	YES	YES	YES
Ptosis/ Neurological Signs	YES	YES	YES!	NO	NO
Haemostatic abnormalities	NO	NO!	YES	YES	YES
Renal Complication	NO*	No*	YES	NO*	YES
Response to Neostigmine	YES	NO?	NO?	NOT applicable	NOT applicable
Response to ASV	YES	YES	YES	YES	NO

Criteria for diagnosis

An approach to snakebite is provided in Annexures VIII and IX. The criteria to diagnose poisonous snakebite in a given clinical setting are:

- a. Systemic envenomation in the form of coagulopathy and neurotoxicity.
- b. Local envenomation

Features of local envenomation - are grouped under the mnemonic "PONDS".

- ✓ Pain- pain at the site of bite, swelling and regional lymphnode
- ✓ Oozing- sero / sanguinous oozing from the site of bite
- ✓ Node- development of an enlarged tender lymphnode draining the bitten limb
- ✓ Discoloration- discoloration at the site of bite
- ✓ Swelling – swelling is seen at the site of the bites on the digits (toes and especially fingers); local swelling develops in more than half of the bitten limb immediately (in the absence of the tourniquet) and swelling extends rapidly beyond the site of bite (eg. beyond the wrist or ankle within a few hours of bites on the hands or feet)

Complications and Outcome

Complications in snake envenomation are due to the heterogenous composition of the venom. In addition the quantity and quality of the venom and the response of the individual to the components of venom influence the clinical course, complications and outcome. The complications of venom are observed in various systems viz., the hematological, vascular, renal, respiratory, cardiovascular, endocrine, gastrointestinal, muscular and dermatological system.

In addition to the anti-snake venom, the envenomed individual requires supportive treatment for the complications arising out of snakebite as well as the consequences of the complication. One must also remember to look for complications developing after infusion of Inj. Anti-snake venom and get prepared to treat them also.

The outcome of snakebite depends upon amount of envenomation, bite to needle time, individual's response to envenomation, the complications that develop following snakebite and response to treatment. Till the patient has recovered, one cannot predict the complications and outcome.

Investigations

20 Minutes Whole Blood Clotting Test (20WBCT)

The 20 Minutes Whole Blood Clotting Test (20WBCT) is considered as the most reliable test for coagulation and can be carried out at the bedside without specialised training. It can also be carried out in the most basic settings. It is significantly superior to the 'capillary tube' method of establishing clotting capability and is the preferred method of choice in snakebite. The advantages, requirements and procedure for 20 WBCT are provided in following table:

Advantages	Requirements	Procedure
<ul style="list-style-type: none"> ● The Most ● Reliable test of coagulation. ● Can be carried out, at the bedside. ● Dose not require specialised training. 	<ul style="list-style-type: none"> ● Dry glass test tube (Clean and new) ● 2ml disposable syringe ● Cotton ● Antiseptic solution ● Clean gloves (one pair) ● (The test tube must not have been washed with detergent, as this will inhibit the contact element of the clotting mechanism) 	<ul style="list-style-type: none"> ● Wash hands with soap and water. ● Wear the gloves ● Collect 2ml blood from the peripheral vein of the unaffected limb. ● Remove the needle and pour the blood along the walls of the test tube ● Keep the test tube untouched and unshaken in a safe place near the patient's bedside at ambient temperature for 20 minutes ● Note the time ● After 20 minutes the test tube is gently tilted and if the blood is still liquid then the patient has incoagulable blood

If the 20WBCT is normal in a suspected case of poisonous snakebites, the test should be carried out every 30 minutes from admission for three hours and then hourly after that. If incoagulable blood is discovered, the 6 hourly cycles will then be adopted to test for the requirement of repeat doses of ASV. This is due to the inability of the liver to replace clotting factors under 6 hrs.

Other Useful Tests:

- Clinical test:
 - ✓ PR / BP / RR / Postural Blood Pressure
- Laboratory studies:
 - ✓ Haemoglobin / PCV / Platelet Count/ PT / APTT / FDP / D-Dimer
 - ✓ Peripheral Smear / Blood grouping / Rh typing
 - ✓ Urine Tests for Proteinuria / RBC / Haemoglobinuria / Myoglobinuria
 - ✓ Biochemistry for Serum Creatinine / Urea / Electrolytes / Oxygen Saturation
- Imaging studies :
 - ✓ X-Ray Chest / CT / Ultrasound (whenever required)
- Others
 - ✓ Electrocardiogram
 - ✓ Special investigations depending upon clinical status.
 - ✓ Ocular fundus specialised training examination

Treatment

First aid for snake bite

- **R. = Reassure the patient.**
(70% of all snakebites are from non-venomous species. Only 50% of bites by venomous species actually envenomate the patient)
- **I = Immobilis in the same way** as a fractured limb.
(Use bandages or cloth to hold the splints, not to bolck the blood supply or apply pressure. Do not apply any compression n the form of tight ligatures, they don't work and can be dangerous!)
- **G.H. = Get to Hospital Immediately.**
(Traditional remedies have NO PROVEN benefit in treating snakebite).
- **T=Tell the doctor of any systemic** symptoms such as ptosis that manifest on the way to hspital.

This method will get the victim to the hospital quickly, without recourse to traditional medical approaches which can delay effective treatment.

Guideline :

- Remember principles.
- Address the problems – clinical and social
- Seek help from others when required and
- Inform the patient and / or care givers on the status of illness, clinical course, management, outcome, welfare measures and follow up clearly with empathy.

Principles involved in the management of snake bite

The principles while managing cases of snake bite at any Health Centre are as follows;

- Admit all victims of snake bite & Keep the victims under observation for 24 to 48 hours
- Ask effectively to get the following –
 - a. Ask for the description of the snake, which has bitten the patient. If snake is brought try to identify the snake with the help of snake picture chart.
 - b. Ask for the site of bite and check the site. Never be carried away, by bite marks either for diagnosis or for assessment of severity.

- c. Ask for the time of the bite and correlate with the progression of symptoms and signs due to snakebite provided in page vide supra.
- d. Ask for the details of traditional medicines or household remedies used, as it may sometimes cause confusing symptoms or interfere with other drugs to be administered.
- **Assess the following quickly.**
 - a. Airway, Breathing and Circulation
 - b. Vitals HR, RR, BP and oxygen saturation by Pulse oximetry (if required)
 - c. Chest expansion, and the ability to put out the tongue beyond incisors and counting the numbers at the bed side.
 - d. Site of snake bite along with regional lymphadenitis clinically from head to foot as well as back
 - e. For associated co-morbid illness[es]
 - a. For consuming any medication[s]
 - b. The status of envenomation - local systemic (neurotoxic, hemotoxic, myotoxic) or a combination.
- **Act swiftly**
 - a. Support Airway, Breathing and Circulation
 - b. Start IV line
 - c. Provide supportive measures depending upon the requirements including blood transfusion / components if required.
 - d. Connect to ventilator if there is a need
- **Administer medications meticulously**
 - a. Tetanus Toxoid injection intramuscularly
 - b. Anti snake venom as IV drip if needed -Intramuscular injections should only be given in settings where intravenous access cannot be obtained and / or the victim cannot be transported to a hospital immediately).
 - c. Inotropics as IV drip if required
 - d. Antimicrobials if necessary
 - e. IV fluids as per need

- f. Other supportive medications including medicines to relieve pain (avoid aspirin) as per need.
- **Address to the wound properly**
 - 1. Wound following snake bite may show bite marks with or without laceration.
 - 2. Sometimes venom may penetrate deep and hence deeper tissues may be damaged which may not be visible during initial examination.
 - 3. At the site of bite, bleb or vesicle may develop and end in the form of an ulcer which is a non specific one.
 - 4. Consider the following while managing the wound / ulcer.
 - a. Minimize unnecessary blood loss
 - b. Avoid the formation of a hematoma
 - c. Initiate adequate cleaning with normal saline or tap water, debridement, and edema control
 - d. Remove debris and necrotic tissue, irrigate gently with water / normal saline
 - e. Expose viable tissues, excise eschar after controlling hemotoxic complications
 - f. Use topical antibacterial agents
 - g. Apply dressings after complete debridement.
 - h. Maintain proper wound environment and prevent ischemia.
 - i. Keep the bacterial count as low as possible.
 - j. Facilitate healing of acute wound by applying non adherent dressing to ensure adequate epithelialisation and to prevent contamination of the wound.
 - k. Keep wounds clean and dry.
 - l. Avoid soaking or scrubbing the wound.
 - m. Teach & explain the care of wound to the patients.
 - n. Educate on good personal hygiene and nutrition.
 - o. Control diabetes if identified.

- **Anticipate complications keenly.**
 - a. Examine the victims at regular intervals for alterations in symptoms and signs
 - b. Observe for anti-snake venom related systemic changes and drug toxicity and manage them as described vide infra under treatment for ASV reactions.
- **Ascertain the status** repeatedly and provide supportive measures as these cases of snake bite victims may develop covert signs during hospital stay while on treatment.
- **Amicable interaction with patient** and care givers with empathy is essential in view of the socio clinical aspects of snake bite.
- **Advise on follow up** accordingly in view of the systemic toxicity and the nature of wound following snake bite. Patients may be also motivated to attend the nearest Health centre / Hospital for follow up care. Follow-up checks are required for assessment of long term effects on different organs / systems and for appropriate management wherever required / needed.
- **Arrange for referral** early One should also remember the criteria for referral and provide clear instructions while referring the case.

THIS SHOULD NOT BE DONE

Washing the Wound:

Victims and bystanders have a tendency to wash the wound to remove any venom on the surface. This should not be done as the action of washing increases the flow of venom into system by stimulating the lymphatic system.

Household remedies:

Various forms of household remedies are applied to the site of bite which may enhance absorption of venom.

Incision - Cutting and Suction:

Cutting the site of bite and suctioning incoagulable blood increases the risk of bleeding to death as well as increases the risk of infection. Venom is not cleared or removed from the snakebite site by this method.

Snake stone:

Snake stone is applied to the site of bite saying that it will absorb the venom and falls once the venom is absorbed. This contributes to delay in seeking appropriate health care.

Tourniquets:

Tight tourniquets made of rope, string and cloth, have been followed traditionally to stop venom flow into the body following snakebite. The problems noticed with tourniquets are :

- Risk of ischemia and loss of the limb
- Risk of necrosis
- Risk of massive neurotoxic blockade
- Risk of embolism if used in viper bites.
- Release of tourniquet may lead to hypotension.
- Gives patient a sense of false security, which encourages them to delay their journey to hospital

Thermal methods:

- Cautery treatment is followed in some areas. It is injurious and not beneficial
- Cryotherapy involving the application of ice to the bite was proposed in the 1950's. It was subsequently shown that this method had no benefit and merely increased the necrotic effect of the venom.

Local application of anti-snake venom:

Local application of anti-snake venom has not shown any beneficial effects

Electrical Therapy:

Electric shock therapy for snakebite received a significant amount of press coverage in the 1980's. The theory behind it stated that applying an electric current to the wound denatures the venom. Much of the support for this method came from letters to journals and not scientific papers. It has been demonstrated that the electric shock has no beneficial effect and hence, it has been abandoned as a method of first aid.

Pressure Immobilisation Method (PIM)

Pressure bandages should not be used where there is a risk of local necrosis that is in 4/5 of the medically significant snakes of India. In view of the difficulties encountered at every level, Pressure Immobilisation Method cannot be recommended for use at present.

Anti-snake venom

The goals of pharmacotherapy with injection Anti snake venom (ASV) are to neutralise the venom, reduce morbidity and mortality, and prevent complications. Currently available Anti Snake Venom (ASV) in India is polyvalent i.e., it is effective against all the four common species; Russells Viper (*Daboia russelii*), Common Cobra (*Naja naja*), Common Krait (*Bungarus caeruleus*) and Saw Scaled Viper (*Echis carinatus*). Indian ASV is a F(ab)₂ product derived from horse serum and has a half-life of over 90 hours. Though it is purified, it still can be immunogenic.

ASV is produced in both liquid and lyophilised forms. There is no evidence to suggest which form is more effective and many doctors prefer one over the other based purely on personal choice. Liquid ASV requires a reliable cold chain and refrigeration and has a shelf life of 2 years. Lyophilised ASV, in powder form, requires only to be kept cool and hence, is useful in remote areas where power supply is inconsistent. The details of pre hospital treatment and issues related to ASV may be recorded in the form provided in Annexure IV.

ASV Administration

Criteria

ASV is prepared from animal and hence, it should only be administered when there are definite signs of envenomation. Anti-Snake Venom carries risks of anaphylactic reactions and should not therefore be used unnecessarily. Unbound, free flowing venom, can only be neutralized when it is in the bloodstream or tissue fluid. Also it is a scarce and costly commodity. Hence, ASV may be administered only if a patient develops one or more of the following signs / symptoms.

Systemic envenoming

- Evidence of coagulopathy primarily detected by 20 WBCT or visible spontaneous systemic bleeding, bleeding gums, etc., Further laboratory tests for thrombocytopenia, Hb abnormalities, PCV, peripheral smear etc may provide confirmation, but 20 WBCT is paramount.
- Evidence of neurotoxicity: ptosis, external ophthalmoplegia, muscle paralysis,

Local envenomation

Purely local swelling, even if accompanied by a bite mark from an apparently venomous snake, is not grounds for administering ASV if a tourniquet or tourniquets have been applied. These themselves can cause swelling. Once they have been removed for 1 hour and the swelling continues, then it is unlikely to be as a result of the tourniquet and administration of ASV may be justified.

Dosage

For Neurotoxic / Anti Haemostatic envenomation, 8 to 10 vials of ASV is recommended to be administered as initial dose. Children receive the same ASV dosage as adults, as snakes inject the same amount of venom into adults and children. The ASV is targeted at neutralizing the venom.

Administration

ASV may be administered in two ways over a period of one hour at a constant speed and the patient should be closely monitored for 2 hours:

- Infusion: liquid or reconstituted ASV is diluted in 5-10ml/kg body weight of isotonic saline or glucose and administered as infusion usually.
- Intravenous Injection: Rarely reconstituted or liquid ASV is administered by slow intravenous injection. (2ml / minute). Each vial is 10ml of reconstituted ASV.

Facts to be remembered before/while using of Anti Snake Venom (ASV)

1. ASV is available in a polyvalent form and marketed in liquid or lyophilised preparations in 10ml vial / ampoule.
2. Remember to use and maintain cold chain system for liquid form. Users are informed to ascertain whether the cold chain is maintained.
3. There is no dose adjustment for ASV administration for children.
4. Before administering ASV, health staff should read and check the status of vial or ampoule containing ASV.
5. Elicit history of prior exposure to ASV. If a patient had received ASV earlier and comes back with features of snake envenomation again, he / she has to be considered as a fresh case and treated accordingly. However, care should be taken while administering ASV, since he / she has been sensitised.
6. ASV treatment should not be initiated without adequate agents for managing anaphylaxis or anaphylactoid reaction.
7. Anaphylactic or late serum sickness cannot be determined or prevented by test dose.
8. ASV neutralizes the unbound venom, hence give it early.
9. ASV administration should not be delayed or denied on the grounds of anaphylactic reactions to a deserving case.
10. ASV is required only to those who show definite signs and symptoms of envenomation.
11. ASV should not be pushed as IV bolus or IM directly. ASV has to be administered slowly as IV infusion in normal saline or glucose water over a period of one hour.
12. Local administration of ASV near the site of bite has been proven to be ineffective and painful, and raises the intra-compartmental pressure, particularly in the digits. Hence, it should not be adopted.
13. There is no prophylactic dose of ASV.
14. Total dose requirement cannot be decided on the basis of (WBCT) Whole blood clotting test (or) clinical signs and symptoms.
15. Even if the patient develops reaction(s), the total dose required should be administered slowly after the patient recovers from the reaction(s).
16. There is no other drug of choice other than ASV for the treatment of poisonous snakebite.
17. The patient has to be closely monitored for manifestations of reactions to ASV for atleast 2 hours continuously.
18. No interaction with ASV has been reported.
19. Fetal risk due to ASV has not been established or studied in humans.
20. Safety status for use of ASV during pregnancy has not been established.
21. Timely administration of ASV will not guarantee the recovery or protect the individual from the venom induced toxicity or complications definitely.

ASV Reactions

- Reaction to ASV develop usually within 15 to 30 minutes or within 2 hours. So monitor the case on ASV at 5min. interval for frst 30min. and then at 15min. interval for two hours.
- Sometimes, anaphylaxis (Type I) following ASV may develop rapidly and deteriorate into a life-threatening emergency, and hence anticipate and observe for it in every case. If the correct guidelines are followed, anaphylaxis can be effectively treated.
- Therefore get alert if the patient develops of any reactions to ASV as shown in table.

<ul style="list-style-type: none"> ● Itching (ofter over the scalp) ● Urticaria, even a single spot ● Nausea ● Vomiting ● Abdominal colic/pain ● Diarrhoea ● Tachycardia (PR>120/min) for children refer age specific chart) ● Fall in blood pressure ● Low volume pulse 	<ul style="list-style-type: none"> ● Dry cough ● Bronchospasm/rhonchi ● Stridor (rarely) ● Angio-oedema of lips and mucous ● Fever ● Shaking chills (riogors) ● Sweating ● Cold and clammy skin ● Central cyanosis ● Febrile convulsions (in children) ● Anaphy laxis (Type I)
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Treatment for ASV reactions

- Discontinue ASV
- Maintain IV line
- Administer Inj. Adrenaline 0.5ml of 1:1000 IM, (Adults) / Inj. Adrenaline 0.1ml/Kg body weight of 1:10,000 IM (pediatric dose). (If after 10 to 15 minutes the patient's condition has not improved or is worsening, a second dose of 0.5 ml of Adrenaline IM is given. This can be repeated for a third and final occasion but in the vast majority of reactions 2 doses of Adrenaline will be sufficient).

Adults	*Children (upto 25 kg)
Inject adrenaline 1:1000 intramuscularly : <ul style="list-style-type: none"> ● Weighing < 40 kg give 0.25 ml ● Weighing 40-100 kg give 0.50 ml 	Inject adrenaline 1:10,000 dilute ampoule (1 ml) of adrenaline 1:1000 with 9ml water for injection or normal saline. Inject intramuscularly 1:10,000 adrenaline according to the guide (approximates to 0.1ml/kg). <ul style="list-style-type: none"> ● 1 year (10kg) give 1 ml ● 3 years (15kg) give 1.5ml ● 5 years (20kg) give 2ml ● 8 years (25kg) give 2.5ml ● Children > 25 kg as for small adults

Consider Additional measures:

- Administer Salbutamol or Terbutaline by aerosol or nebuliser (Beta2 agonists) for bronchospasm.
- Antihistamines: Administer both H 1 receptor blockers Inj. Chlorpheniramine maleate 10 -20mg as IV / intramuscularly or Promethazine 0.5 -1mg/kg and H 2 receptor blockers Inj. Ranitidine 1mg/kg or Famotidine 0.4mg/kg or Cimetidine 4mg/kg slowly intravenously.
- The dose of Pheniramine maleate for children is at 0.5mg/kg/day IV or Promethazine HCl can be used at 0.3 -0.5mg/kg IM or 0.2mg/kg of Chlorpheniramine maleate IV, and 2mg/kg of Hydrocortisone IV, antihistamine use in pediatric cases must be deployed with caution.
- Administer Corticosteroids intravenously : Hydrocortisone 2 -6mg/kg or Dexamethasone 0.1 -0.4mg/kg
- Try nebulised Adrenaline (5ml of 1:1000) or 5 mg. Salbutamol in case of laryngeal oedema which often will ease upper airways obstruction. However, do not delay intubation if upper airways obstruction is progressive.
- IV fluids should be given for haemodynamic instability.
- Once the patient has recovered, the ASV can be restarted slowly for 10 - 15minutes, keeping the patient under close observation. Then the normal drip rate should be resumed.

- Monitor vitals and provide supportive measures

Late Serum sickness reactions (delayed hypersensitivity) to ASV

Serum sickness may occur one to two weeks after administration of ASV. Late Serum sickness reactions can be easily treated with an oral steroid such as prednisolone, adults 5mg 6 hourly, paediatric dose 0.7mg/kg/day. (Duration of treatment has to be adjusted with case). Oral H1 Antihistamines provide additional symptomatic relief.

Prevention of ASV Reactions – Prophylactic Regimens

Two prophylactic regimens normally recommended are given below but are not usually followed:

- 100mg of Hydrocortisone and H1 antihistamine (10mg Chlorpheniramine maleate; or 22.5mg IV Pheniramine maleate IV or 25mg Promethazine hydrochloride IM) 5minutes before ASV administration. The dose for children is 0.1-0.3mg/kg of antihistamine IV and 2mg/kg of Hydrocortisone IV. Antihistamine should be used with caution in pediatric patients.
- 0.25-0.3mg Adrenaline 1:1000 given subcutaneously.

If the victim has a known sensitivity to ASV, pre-medication with adrenaline, hydrocortisone and anti-histamine may be advisable, in order to prevent severe reactions.

Clinical issues in Snakebite

Hypotension

Hypotension can have a number of causes, particularly loss of circulating volume due to haemorrhage and vasodilation due to the action of the venom or direct effects on the heart. Test for hypervolemia by examining the blood pressure lying down and sitting up, to establish postural hypotension. Usually crystalloids are used for volume expansion. However, there is no conclusive trial evidence to support a preference for colloids or crystalloids.

In cases where increased generalized capillary permeability has been established, a vasoconstrictor such as dopamine can be used, dose being is 5 -10j /kg/minute in normal saline or glucose solutions as IV drip. The flow rate may be adjusted to maintain blood pressure adequately. Rarely Russell's Viper bites are known to cause acute pituitary and / or adrenal insufficiency. This condition may also contribute to shock. Hence, this entity has to be remembered while dealing with hypotension in snakebite as these cases require long term follow up.

Persistent or Severe bleeding

In the majority of cases the timely use of ASV will stop systemic bleeding. However in some cases the bleeding may continue to a point when further appropriate treatment should be considered. The major point to note is that clotting must be re-established before additional measures are taken. Adding clotting factors, fresh frozen plasma (FFP), cryoprecipitate or whole blood in the presence of un-neutralised venom will increase the amount of degradation products with the accompanying risk to the renal function. Plasmapheresis has been used successfully in such situation.

Renal Failure and ASV

Renal failure is a common complication of Russell's viper bites. The contributory factors are intravascular haemolysis, DIC, direct nephrotoxicity, and hypotension and rhabdomyolysis.

Renal damage can develop very early in cases of Russells Viper bite and even when the patient arrives at hospital soon after the bite, the damage may already have been done. Studies have shown that even when ASV is administered within 1-2 hours after the bite, it is incapable of preventing ARF. Declining renal parameters require referral to a higher centre with access to dialysis. Peritoneal dialysis could be performed in secondary care centres.

Surgical issues

The surgical issues observed in snake bite cases are

- ✓ Ulcer following snakebite
- ✓ Necrosis of the skin and underlying tissues
- ✓ Gangrene of the toes and fingers
- ✓ Debridement of necrotic tissues

- ✓ Compartment syndrome and others.
- ✓ Practitioner while dealing a case of snake bite with one or other surgical issues has been informed to remember the following and keep the patient and the care givers accordingly.
- ✓ Fasciotomy does not remove or reduce any envenomation.
- ✓ Visual impression is an unrealistic guide to estimate the ICP.
- ✓ Tissue injury after compartment syndrome may be disproportionate to the clinical status.

Snake Bite in special situations

ASV Dosage in Victims Requiring Life Saving Surgery

In very rare case of snake bite life saving surgery is required in order to save the victim. An example would be a patient who presents with signs of an intracranial bleed. Before surgery can take place, coagulation must be restored in the victim in order to avoid catastrophic bleeding. In such cases a higher initial dose of ASV is justified (upto 25 vials) solely on the basis of guaranteeing restoration of coagulation after 6 hours.

Victims Who Arrive Late

A frequent problem is victims who arrive late after the bite, often after several days, usually with acute renal failure. Should the clinician administer ASV? The key determining factor is, are there any signs of current venom activity? Venom can only be neutralized, if it is unattached! Perform a 20 WBCT and determine if any coagulopathy is present. If coagulopathy is present, administer ASV. If no coagulopathy is evident, assess the case for evidences for one or other complications and consequences secondary to complication of snake bite. Such cases require appropriate supportive measures.

In the case of neurotoxic envenoming where the victim is having symptoms such as ptosis, respiratory failure etc, it is probably wise to administer one dose of 8-10 vials of ASV to ensure that no unbound venom is present. However, at this stage it is likely that all the venom is bound and patient requires respiratory support.

Snake bites Again!

If a patient has been bitten by a poisonous snake and received ASV earlier and comes back with features of repeat snake bite, he / she may be considered as a fresh case and treated accordingly (Whatever the interval between the snakebite). However, care should be taken while administering ASV, since he / she has been sensitized.

Pregnancy and Lactating woman

There is very little definitive data published on the effects of snakebite during pregnancy. Though spontaneous abortion of the fetus has been reported, this is not the outcome in the majority of cases. It is not clear if venom can pass the placental barrier. Pregnant women are treated in exactly the same way as other victims. The same dosage of ASV is given. The victim should be re-assessed for the impact on the fetus. One should be alert and rule out retro placental clot. The effects of venom and anti-venom on the mother and fetus need further exploration. ASV may be administered to lactating woman if bitten by a poisonous snake and be treated like any other persons. Breast feeding is not contraindicated.

Others:

Even if the patients belong to any of the following category viz., autoimmune disorders, debilitating status, endocrine disorders, Immuno-suppressed status, HIV / AIDS, cancer, asthma and allergic disorders or any other illnesses arrive with features of snake envenomation, they also require ASV in the same manner like any other case of poisonous snake bite.

Management in Primary Health Centre (PHC) and Block PHC

A key objective of these guideline is to enable even the doctors working in Primary Care Institutions as well as private practitioners treat snakebite with confidence. Evidence suggests that doctors are not willing to make use of ASV and other medications, even when equipped, due to lack of confidence and guidelines. The present handbook on guidelines is prepared to suit their needs and outlines how they should proceed within their context and setting. The principles envisaged treating snake bite, its initial evaluation and systemic manifestations following envenomation, and treatment aspects at all Health Centres / Hospitals irrespective of the status - Government or Private are given in following tables.

Referral aspects

The medical officer who is treating the cases of snake bite should take meticulous care to look in to the patient's status and provide first aid as well as supportive measures before referring the case to higher centre / specialist.

Who needs ?	When to refer?	TREATMENT
Patient requiring <ul style="list-style-type: none"> • Respiratory support • Deteriorating neurologic manifestations • Surgical intervention-Necrosis / Fasciotomy • Spontaneous persistent bleeding • Co-morbid diseases • Acute impending kidney failure 	<ul style="list-style-type: none"> • Refer the patient after stabilising the case and after giving injection ASV 	Refer to higher institution having <ul style="list-style-type: none"> • Ventilator • Dialysis facilities • Measures to provide further supportive treatment.

Referral Criteria for Haemotoxic envenomation

Once the ASV is finished and the adverse reaction dealt with the patient should be automatically referred to a higher centre with facilities for blood analysis to determine any systemic bleeding or renal impairment. The 6 hours rule ensures that a six hours window is now available in which to transport the patient.

Referral Criteria for Neurotoxic envenomation

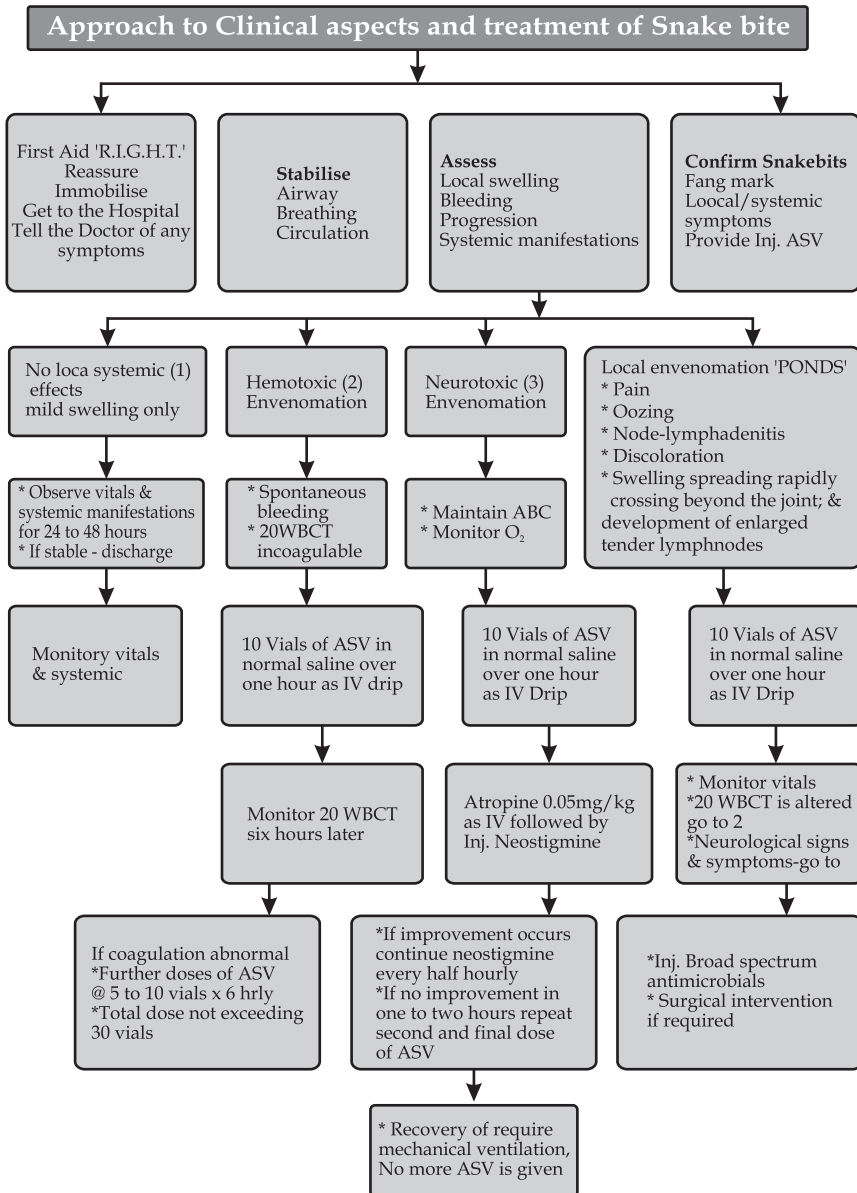
If after one hour from the end of the first dose of ASV, the patient's symptoms have worsened i.e., paralysis has descended further or has not improved at all, a second full dose of ASV is given over one hour. ASV is then completed for this patient.

Instructions while referring

- ✓ Inform the need for referral to the patient and / care giver [family member or the accompanying attendant]
- ✓ Give prior intimation to the receiving center using available communication facilities
- ✓ Arrange for an ambulance
- ✓ Transfer in a vehicle to Secondary Care Hospital or Tertiary Care Hospital where mechanical ventilator and dialysis facilities are available
- ✓ Continue life supporting measures
- ✓ Provide airway support with the help of an accompanying staff
- ✓ Send the referral note with details of treatment given
- ✓ Instruct one staff to accompany the patient during transportation if required.
- ✓ Hand over the referral form with details regarding treatment given
- ✓ Mention the clinical status clearly in the referral form at the time of referral.

Preventive measures and health education

- ✓ Walk at night with sturdy footwear and a torch and use the torch! When walking, walk with a heavy step as snakes can detect vibration and will move away!
- ✓ Carry a stick when grass cutting or picking fruit or vegetables or clearing the base of trees. Use the stick to move the grass or leaves first. Give the snake chance to move away. If collecting grass that has previously been cut and placed in a pile, disturb the grass with the stick before picking the grass up.
- ✓ Keep checking the ground ahead when cutting crops like millet, which are often harvested at head height and concentration is fixed away from the ground.
- ✓ Pay close attention to the leaves and sticks on the ground when wood collecting.
- ✓ Keep animal feed and rubbish away from your house. They attract rats and snakes will follow.
- ✓ Try to avoid sleeping on the ground.
- ✓ Keep plants away from your doors and windows as plants help snakes to climb up and into windows.



SECTION - II
SCORPION STING

General

- Introduction
- Epidemiology
- Eco-biological aspects of scorpion
- Distribution of various species of scorpions
- Socio cultural aspects

Clinical aspects

- Components of venom and mechanisms of action
- Pathophysiology
- Symptoms and signs.
- Criteria for diagnosis
- Differential diagnosis
- Investigations
- Clinical course
- Complications

Treatment

- First aid measures
- Traditional methods
- Principles involved in the management
- Pharmacological aspects of Prazosin

Scorpion sting in special situations**Management at PHC and Block PHC****Referral aspects****Occupational risk, patient education and prevention****Prognosis**

Introduction

Scorpion sting is a life threatening medical emergency. The effect of envenomation is greatest among children below 5 years of age. Adults too can succumb to scorpion sting. Many social and environmental factors contribute to scorpion sting. Hence, it becomes an important public health problem. The epidemiology, presenting features, clinical course, complications, therapeutic response and outcome are variable in different series. However, early recognition and appropriate intervention influence the outcome. Hence, scorpion sting deserves special attention and cases should never be taken lightly.

Though the research on scorpion venom and knowledge on treatment of scorpion sting have advanced, these newer ideas are yet to reach the health care provider and the community. In this context, it is worthwhile to remember Dr.H.S.Bawaskar, a private practitioner from Maharashtra who for the first time in world has introduced the usefulness of alpha blocker in scorpion sting nearly 25 years ago. This has been accepted globally now in the treatment of scorpion sting.

Epidemiology

In general for every case of snakebite, there may be 10 or more numbers of scorpion stings. If that is the case, the number of cases of scorpion sting may run to millions. There is no reliable statistics on the scorpion sting in India. Scorpion sting is under- reported. Published reports are institution based, hence include only serious cases of scorpion sting treated in such institutions. As most of the cases of scorpion sting have mild symptoms, the general practitioners or family physicians or a traditional medical practitioners provide treatment and they never appear in health statistics.

Most deaths due to scorpion bites occur during the first 24 hours of the scorpion sting and are secondary to respiratory and cardiovascular failure. Children and elderly are at great risk of death due to their decreased physiological reserve. Death due to scorpion sting occurs in 25% of children below 5 years, if not treated, whereas only 1% of scorpion stings are lethal to adults.

In India too, deaths due to scorpion sting occurs across the country but do not get due attention. Larger the scorpion population, greater is the number of scorpion sting cases. Scorpion stings are reported more from rural areas and the rural to urban ratio is approximately 3:1. Mostly stings occur between 6 P.M. to mid-night and between 6 A.M. to 12 Noon, which correlate very well with human activity. Scorpion sting occur more in temperate and tropical zones, and more during summer than winter.

Human stinging occurs accidentally, when scorpions are touched, threatened, cornered or disturbed (stepped upon) while in their hiding places. So, people involved in handling construction materials, carpentry works, clearing bushes or house cleaning as well as children playing nearby these areas are susceptible to scorpion sting.

Eco- biological aspects of scorpion

Scorpions are shy creatures and not aggressive by and large. These are nocturnal creatures and hunt for their prey at night. Scorpions hide normally in crevices and burrows during daytime to avoid light. Scorpions are found elsewhere outside the environmental range. e. g. accidentally crawl into luggage, boxes, containers, or shoes, pile of bricks, wooden materials, firewood, etc.

There are about 1500 scorpion species of which 50 are dangerous. In India 86 species of scorpion have been identified. Among them, *Mesobuthus tamulus* and *Palamneus swammer-dami* are important medically. Except *Hemiscorpius* species, all lethal scorpions belong to the family called the *Buthidae*.

Scorpions use their pincers to grasp the prey. It arches its tail over its body and stings into its prey. Thus it injects its venom, sometimes more than once. The venom glands are situated in the tail. The striated muscles in the stings regulate the amount of venom injected. When entire venom is used, it takes several days to replenish venom. Scorpion with large venom sacs such as *Parabuthus* species can even squirt their venom.

Distinguishing features of lethal and nonlethal Scorpion

Structure	Lethal Scorpion	Non lethal scorpion
<ul style="list-style-type: none"> • Sternum Shape • Pincers • Body • Tail 	Triangular Weak looking Thin in an empathetic manner. Thick	Pentagonal Strong and Heavy Thick Thin

Socio cultural aspects

For scorpion sting also, patients are taken for magico religious treatment where mantras are chanted, herbal medicines are applied externally and / or given orally. Since the scorpion sting has mild effects in many, most of them improve with local practices. Hence the community has confidence on the local / traditional practitioner or priest. If the pain continues or symptoms get aggravated or general condition deteriorates and in children if crying or restlessness continues, the patients are brought to the hospital. Thus local practices contribute to delay in health seeking.

Clinical Aspects

Components of Venom and Mechanisms of action

The components of venom are cardiotoxin, hemotoxin, nephrotoxin, neurotoxin, hyaluronidases, phosphodiesterases, phospholipases, glycosaminoglycans, histamine, serotonin, tryptophan and cytokine releasers. Among all, the most potent is the neurotoxin. There are two classes of neurotoxins (long chain & short chain polypeptide) which are heat stable, have a low molecular weight and are responsible for causing cell impairment in nerves, muscles, and the heart by altering sodium and potassium channel permeability. The long chain polypeptide neurotoxin induces continuous, prolonged, repetitive firing of somatic, sympathetic and parasympathetic neurons which results in autonomic, and neuromuscular over excitation symptoms. It also prevents normal nerve impulse transmissions. Further, it results in release of neurotransmitters viz., epinephrine, nor-epinephrine, acetylcholine, glutamate, and aspartate excessively. The short chain polypeptide neurotoxin blocks the potassium channels.

Pathophysiology

The venom is produced by columnar cells of the venom glands. Scorpion venom is water soluble, antigenic and positively charged. It is a heterogenous mixture and this can be easily demonstrated by electrophoresis method. Also, the heterogeneity of the venom explains the variable response to venom as observed in different people. Normally injected venom is between 0.1 to 0.6mg. Generally most lethal scorpions have a lethal dose (LD50) below 1.5mg. The potency varies with species causing mild flu to death within an hour.

Once the venom is injected, it is distributed rapidly into the tissues. If the venom is deposited into a vein, the symptoms develop within 4 to 7 minutes after injection, with a peak concentration in 30 minutes.

Symptoms and signs

Symptoms and signs are influenced by factors related to "3 Ss" viz., scorpion, sting and the status of the patient.

Factors Influencing Symptoms and Signs

Scorpion	Sting	Status of the patient
<ul style="list-style-type: none"> • Species • Age, size and nutritional status • Stinging apparatus (telson) 	<ul style="list-style-type: none"> • Time of sting • Number of stings • Quantity of venom injected (low dose adrenergic, high dose cholinergic) • Depth of the sting Penetration • Site of sting IV/SC/IM • Components of venom 	<ul style="list-style-type: none"> • Age of the patient • Health status • Comorbid conditions • Weight of the victim • Physiological response of the individual • Sensitivity of the system to the neurotransmitters and toxins

Usual signs of scorpion sting are as follows

- ✓ Mydriasis
- ✓ Nystagmus
- ✓ Hyper salivation
- ✓ Dysphagia
- ✓ Restlessness

Usual mode of death is via

- ✓ Venom induced multi organ failure
- ✓ Respiratory failure secondary to
- ✓ Anaphylaxis
- ✓ Broncho constriction
- ✓ Bronchorrhoea
- ✓ Pharyngeal secretion
- ✓ Pulmonary edema
- ✓ Diaphragmatic paralysis

In view of the numerous toxins and enzymes released from the scorpion venom, the clinical signs and symptoms of envenomation may vary at local and at systemic level.

Local Effects at the site of the sting

Nonlethal local effects	Neurotoxic local signs at the site of sting	TREATMENT
<ul style="list-style-type: none"> • Pain • Erythema • Induration • Wheal (Due to activation of kinins and slow releasing substances of venom) 	<ul style="list-style-type: none"> • Local effect of sting • minimal or absent • Tissue necrosis (rare) • Sharp burning pain • Erythema • Local tissue swelling • Ascending hyperesthesia (paresthesia persists for several weeks and the last symptom to resolve) 	<ul style="list-style-type: none"> • Appearance of a macule or papule within first hour • Diameter of the lesion vary with quantity of venom injected • Progress of the lesion to a purpuric of the lesion to a purpuric plaque which will necrose and ulcerate

Systemic signs:

Neurologic signs	Non neurologic systemic signs
<ul style="list-style-type: none"> • Central nervous system signs • Autonomic nervous system signs <ul style="list-style-type: none"> • Sympathetic signs • Parasympathetic signs • Somatonic signs • Cranial nerve signs • Peripheral nervous system signs 	<ul style="list-style-type: none"> • Cardiovascular signs • Respiratory signs • Gastro intestinal signs • Hematological signs • Metabolic signs • Genitourinary signs • Allergic signs • Pregnancy signs

Criteria for diagnosis

Definite confirmatory signs

- ✓ Witnessed sting
- ✓ A dead scorpion
- ✓ Evidence at the site of sting - single puncture mark
- ✓ Local pain – positive tap sign
- ✓ Local and systemic manifestations (Absence of pain or manifestations does not rule out scorpion sting)

Probable scorpion sting

- ✓ Local edema
- ✓ Pin hole bleeding
- ✓ Profuse sweating – Local or generalised

Differential diagnosis

- ✓ Botulism
- ✓ Tetanus
- ✓ Organophosphorus toxicity

Investigations

Haematology

- ✓ Complete Blood Count (CBC)
- ✓ Leukocytosis
- ✓ Hemolysis (variable)
- ✓ Coagulation profile
- ✓ Defibrination [if required]

Blood Chemistry

- ✓ Blood sugar
- ✓ Serum creatinine
- ✓ Serum creatine kinase
- ✓ Serum amylase / lipase
- ✓ Serum aspartate / alanine amino transferase
- ✓ Arterial blood gas (ABG) analysis [if required]

Imaging studies

- ✓ Chest x – ray

Other investigations

- ✓ Electro cardiogram & serial ECG (monitor ST, T & others) during follow up.

Clinical Course

Clinical course of scorpion sting is usually less alarming but in some cases it may progress to maximum severity in about 5 hours to 12 hours and starts subsiding within a day or two. Even if the patient has features of autonomic nervous system manifestations, it may start subsiding by 12 hours after initiating treatment. Tachycardia usually subsides within 24 to 48 hours. Hypertension may last for 4 to 8 hours. Hypotension and bradycardia are encountered usually within 2 hours. Once treatment is started, the signs of recovery begins within 48 or 72 hours. In some cases pulmonary edema may develop within 30 minutes to 3 hours, usually secondary to myocardial dysfunction. Unfortunately some cases of scorpion sting may die within 30 minutes and this may be related to ventricular arrhythmias or non cardiac pulmonary edema due to ARDS. Central nervous system manifestations with or without convulsions may occur within one to two hours in fatal cases.

Complications**Various complication of scorpion sting are:**

- ✓ Respiratory failure
- ✓ Multi organ failure
- ✓ Dilated cardio myopathy
- ✓ Rhabdomyolysis
- ✓ Persistent paresthesia
- ✓ Anti venom anaphylaxis and serum sickness
- ✓ Ankylosis of small joints if sting occurs at a joint
- ✓ Iatrogenic high dose sedative hypnotic respiratory arrest

Treatment

- ✓ The first aid currently recommended is based around the mnemonic 'R.I.G.H.T'

- R = Reassure the patient.
- I = Immobilisation of the limb in the same way as a fractural limb helps to prevent rapid absorption of the venom into the circulation. (cloth to hold the splints, not to block the blood supply or apply pressure. Do not apply any compression in the form of tight ligatures, they don't work and can be dangerous!).
- G.H. = Get to Hospital Immediately. (Traditional remedies have NO PROVEN benefit in treating scorpion sting).
- T = Tell the doctor all that happened from the time of scorpion sting along with symptoms that developed till reaching (or arrival) the hospital.

This method will get the victim to the hospital quickly, without recourse to traditional medical approaches which can delay effective treatment.

What should not be done!

The traditional methods such as application of counter irritants, herbal materials or paste over the site of sting or tight tourniquet (it may intensify local effects of venom), or hot fomentation should be avoided as they may enhance the effects of venom. Also avoid cutting and suction (oral extraction of venom from the site), or cutting and letting out the blood, or washing the wound with chemicals or alcohol or other methods as they facilitate the absorption of toxin. In view of the consequences noticed, these traditional methods have to be discarded.

However, local application of ice bags (one of the traditional methods) to reduce the pain is acceptable for some time if not contraindicated. This method slows down the absorption of venom via vasoconstriction. This is the most effective one during the first 2 hours following the scorpion sting. One should not cause freezing injury, while using ice cubes / bag.

Principles involved in the management of scorpion sting

Admit all victims of scorpion sting & keep the victims under observation for 24 to 48 hrs. (If scorpion is brought try to identify the colour and size of it).

- a) **Ask for the details** of scorpion sting and never be carried away with the sting marks either for diagnosis or for assessment of severity.
 - i. Time of sting
 - ii. Number of stings
 - iii. Nature of the incident
 - iv. Depth of the sting
 - v. Site of envenomation-close to head & torso [results in quicker venom absorption & onset of symptoms in the former]
- b) Ask for the time interval between the sting and arrival at the hospital.
- c) Ask for the details of traditional medicines or household remedies used, as it may sometimes cause confusing symptoms or interfere with other drugs to be administered.
- d) Ask for clinical symptoms and correlate with the progression of symptoms and signs due to scorpion sting

Assess the following quickly.

- a) Airway, Breathing and Circulation
- b) Vitals HR, RR, BP and Pulse oximetry (if required)
- c) Site of sting and the probable route of envenomation -(Intravenous have immediate effects, while subcutaneous and intramuscular routes take several minutes to hours to cause effect)
- d) Chest expansion
- e) Clinically from head to foot as well as back
- f) For associated co-morbid illness[es]
- g) For consuming any medication[s]
- h) Status of envenomation – mild, moderate and severe [in view of neurotoxic, cardiotoxic, hemotoxic, myotoxic or a combination of them]

4] Act swiftly

- a) To support Airway, Breathing and Circulation
- b) To start IV line [fluid for children - refer Annexure II Table No.29]
- c) To provide supportive measures depending upon the requirements
- d) To connect ventilator if there is a need

5] Administer medication meticulously

- a) Tetanus Toxoid injection intramuscularly
- b) Topical anaesthetic agent to the site of sting to decrease paraesthesia.
- c) Injection lignocaine 1% without adrenaline; 2ml as local infiltration (after test dose for lignocaine) (0.1 to 0.2mg/kg body weight for children)
- d) Oral rehydration solution to hydrate the patient if not contraindicated.
- e) Tab. Paracetamol 10mg/kg body weight to reduce pain
- f) Tab. Prazosin [plain 1mg]

Prazosin

Prazosin is an alpha blocker. It counteracts scorpion induced adrenergic cardiovascular effects and reduces pulmonary edema through vasodilatory effect, Usually it is started with small dose using plain tablet (1/2 tablet of 1mg.) but not exceeding 5mg/day. For children the dose preferred is 30 microgram / kg body weight. Though pediatric requirement has not been established, it is started with small dose. Prazosin can be given irrespective of blood pressure, provided there is no hypovolemia.

It should be avoided, if the patient is hypersensitive to prazosin. Always exercise caution if patient has renal insufficiency and hypertension. Users must remember that it interacts with beta blocker and causes hypotension. Also, verapamil may increase serum levels of prazosin and increase patient's sensitivity to prazosin and cause postural hypotension. Interestingly, prazosin decreases the anti-hypertensive effect of clonidine. Safety in pregnancy has not been established. Also, users are informed to follow standard measures while using prazosin.

- ✓ **Prazosin should not be given as prophylactic dose when pain is the only symptom.**
- ✓ Give Prazosin through nasogastric tube, if baby has vomiting.
- ✓ Keep the patient in lying posture for about 3 hours (even while examining the case) in order to prevent 'first dose phenomenon' (hypotension) due to Prazosin.
- ✓ Monitor pulse, BP, and respiration every 30 minutes for 3 hours.
- ✓ Reassess for warmth and return of pain at the site of sting.
- ✓ Continue monitoring of pulse, BP, and respiration every 60 minutes

for next 6 hours.

- ✓ Recheck the same every 4 hours till improvement is visible.
- ✓ Repeat Tab. Prazosin in the same dose at the end of 3 hours according to clinical response and later every 6 hours till extremities are warm, dry and peripheral veins are visible easily.

* Alternative to Tab. Prazosin is Nifedipine, Nitroprusside, Nitroglycerine, Isosorbide di-nitrate, Hydralazine or Angiotensin converting enzyme inhibitors (ACEIs). However, users have to remember the constraints while prescribing such drugs.

Other Medications:

- ✓ Beta-blockers in small doses along with alpha blockers if needed and if not contraindicated.
- ✓ Nitrates if patient has hypertension and myocardial ischemia
- ✓ Inotropics such as digitalis (has little effect), or dobutamine. Avoid Dopamine.
- ✓ Nor-epinephrine as IV drip to correct hypotension refractory to fluid therapy.
- ✓ Antimicrobials if infection is suspected
- ✓ Inj. Atropine (required at times) to counter venom induced parasympathetic effects.
- ✓ Barbiturate and / or benzodiazepine as continuous infusion for severe / excessive motor activity
- ✓ IV fluids as per need.
- ✓ Supportive medications such as sodium nitroprusside (0.3 -0.5 mcg/kg/min with upward titration), or nitroglycerine as per need (usually in pulmonary edema)
- ✓ Though Inj. Morphine is used as a standard therapy for pulmonary edema, it should be avoided in scorpion sting since narcotics worsen dysrhythmias in children

Address to the wound properly

- ✓ Wound following scorpion sting may show sting marks with or without local manifestations.

- Sometimes venom may penetrate deep and hence deeper tissues may be damaged which may not be visible during initial examination (rare).
- At the site of the sting a bleb or vesicle may develop and end in the form of non specific ulcer.
- Consider the following while managing the wound / ulcer (uncommon in scorpion sting).
- Minimize unnecessary blood loss.
- Initiate adequate cleaning with normal saline or tap water, and edema control.
- Remove debris and necrotic tissue, irrigate gently with water / normal
- Apply dressings after complete debridement.
- Maintain proper wound environment and prevent ischemia.
- Keep the bacterial count as low as possible.
- Facilitate healing of acute wound by applying non adherent dressing to ensure adequate epithelialization and to prevent contamination of the wound.
- Keep wounds clean and dry.
- Avoid soaking or scrubbing the wound.
- Teach & explain the care of wound to the patients and / or care givers.
- Educate on good personal hygiene and nutrition.
- Control diabetes if identified.

Anticipate complications keenly.

- a) Examine the victims at regular intervals for alterations in symptoms and signs
- b) Anticipate dysrhythmias during the first 24 to 48 hours after sting
- c) Start tapering prazosin after the clinical improvement begins to manifest
- d) Observe for drug related systemic changes and drug toxicity, and treat them accordingly.

Ascertain the status repeatedly and provide supportive measures, as these cases may develop covert signs during hospital stay while on treatment.

Advise on follow up accordingly in view of the systemic toxicity. Patients may also be motivated to attend to the nearest Health Centre / Hospital for follow up care. Follow-up checks are required for assessment of long term effects on different organs / systems and for appropriate management wherever required / needed.

Arrange for referral early - One should also remember the criteria for referral and provide clear instructions while referring the case.

Scorpion sting in special situations

If patients already suffering from one or other illness(es) with or without medications for the underlying illness, suffers from scorpion sting, these patients have to be treated like any other case of scorpion sting. However, treating doctor has to exercise caution while prescribing and using medications, consider drug interaction, contraindications, absorption, and excretion of the drugs used so as to avoid toxicity.

Also, one has to carefully monitor the status of underlying illness. Pregnant women and lactating women with scorpion sting have to be treated like any other women. Remember to consider the baby in utero by clinical and technological means.

Management in Primary Health Centres (PHC) and Block PHC

The key objective of this guideline is to enable even the doctors working in Primary Care Institutions as well as private practitioners to treat scorpion sting with confidence. Evidences suggest that doctors are not willing to make use of the medications and devices, even when available, due to lack the confidence and guidelines. The present handbook provides guidelines to meet their needs, and outlines how they should proceed within their context and setting.

Referral aspects

The medical officer who is treating the cases of scorpion sting should take meticulous care to look into the patient's status and provide first aid as well as supportive measures before referring the cases to higher centre / specialist(s).

Who needs	When to refer	Where to refer
Patient requiring <ul style="list-style-type: none"> • Respiratory support • Cardiac failure/shock • Surgical intervention • Spontaneous persistent bleeding • Co-morbid diseases • Acute impending kidney failure • Multi-system involvement 	<ul style="list-style-type: none"> • Refer the patient after stabilising the case and after giving Tab. Prazosin and other supportive measures (refer to Annexure VIII and X) 	Refer to higher institution having ventilator and other measures to provide further supportive treatment.

Instructions while referring

- Inform the need for referral to the patient and / care giver [family member or the accompanying attendant]
- Give prior intimation to the receiving center
- Arrange for an ambulance
- Transfer in a vehicle to Secondary Care Hospital or Tertiary Care Hospital where facilities are available for further management
- Continue life support measures
- Provide airway support with the help of an accompanying staff
- Send the referral note with details of treatment given
- Instruct one staff to accompany the patient during transportation if required
- Hand over the referral form (Annexure) with details regarding treatment given
- Mention the clinical status at the time of referral clearly in the referral form

Occupational risk, Patient Education and Prevention

- Occupational risk for scorpion sting is noticed frequently among those handling building materials, fire wood, etc., where scorpions hide.
- Educate the patients and community on how to avoid scorpion and

scorpion sting.

- To check shoes, gloves, clothing and package before use.
- To keep yards free of debris, which serve as places for scorpions to hide.
- To prevent entry of scorpion into home (make sure windows and doors fit tightly).
- Avoid walking barefoot especially at night.
- Encourage biological methods to control scorpion by introducing chicken, ducks, owls etc.,
- Use chemicals such as (organo-phosphates, pyrethrum and chlorinated hydro carbons) which help to control

Prognosis

- Prognosis is related to species of scorpion, the venom injected (amount and components), physiological response of the individual to the venom, and individual's response to pharmacotherapy as well as supporting measures.
- Symptoms generally persist for 24 – 48 hours, if the patient survives without severe toxic effects on cardio respiratory or neurologic systems or multi organ failure.
- Greater the systemic symptoms and poorer the response to therapy, worse is the prognosis.

Medical pitfalls in Snake and Scorpion Bites:

Treating doctor should take adequate care to avoid medical pitfalls as these issues are likely to come up during medical audit. Some of the issues are mentioned here.

- Failure to provide first aid measures immediately when the victims of snake bite / scorpion sting is brought to a health centre / hospital
- Failure to admit the patient and document the findings properly
- Failure to ask and assess the case in detail, and do the needful with the available measures
- Failure to monitor the case who are severely envenomed
- Failure to stabilise the airway and vital signs before specific intervention
- Failure to treat the patient adequately, because of under-estimation of the clinical status
- Failure to observe anticipated complications while under medical care
- Failure to warn the patient and / or the care givers of the potential complications that could happen due to the envenomation and / or during treatment
- Failure to obtain informed consent for interventional procedures
- Failure to arrange for follow up care
- Failure to refer to higher centre or to specialist[s] when such services are likely to benefit the snake bite / scorpion sting victim.
- Failure to provide adequate records / reports while discharging or demand
- Failure to initiate treatment with ASV without adequate agents for managing anaphylaxis or anaphylactoid reaction.
- Failure to inform the patient / care giver(s) on the persistence of pain / lesion or paresthesia at the site of bite / sting for days / weeks even after recovery from the primary illness.

Key points for snakebite and scorpion sting:

* Clinical

- Assess every case thoroughly.
- Treat them confidently and observe vigilantly (at health centre / hospital).
- Detect the status and note down the changes, and act accordingly.
- Anticipate complications and treat them immediately.
- Provide care and support with empathy.
- Create confidence among patients, public and care givers continuously.
- Bring down morbidity and mortality.
- Explain the available welfare measures to the family members of the deceased victims clearly.
- Arrange for follow up programs regularly.

* Community Aspects

- Conduct health education programme so as to promote immediate seeking of health care.
- Eliminate the barriers that cause delay in health care seeking.

* Educational & Research

- Organise teaching and training programs for health care workers.
- Undertake research activities in a planned manner.

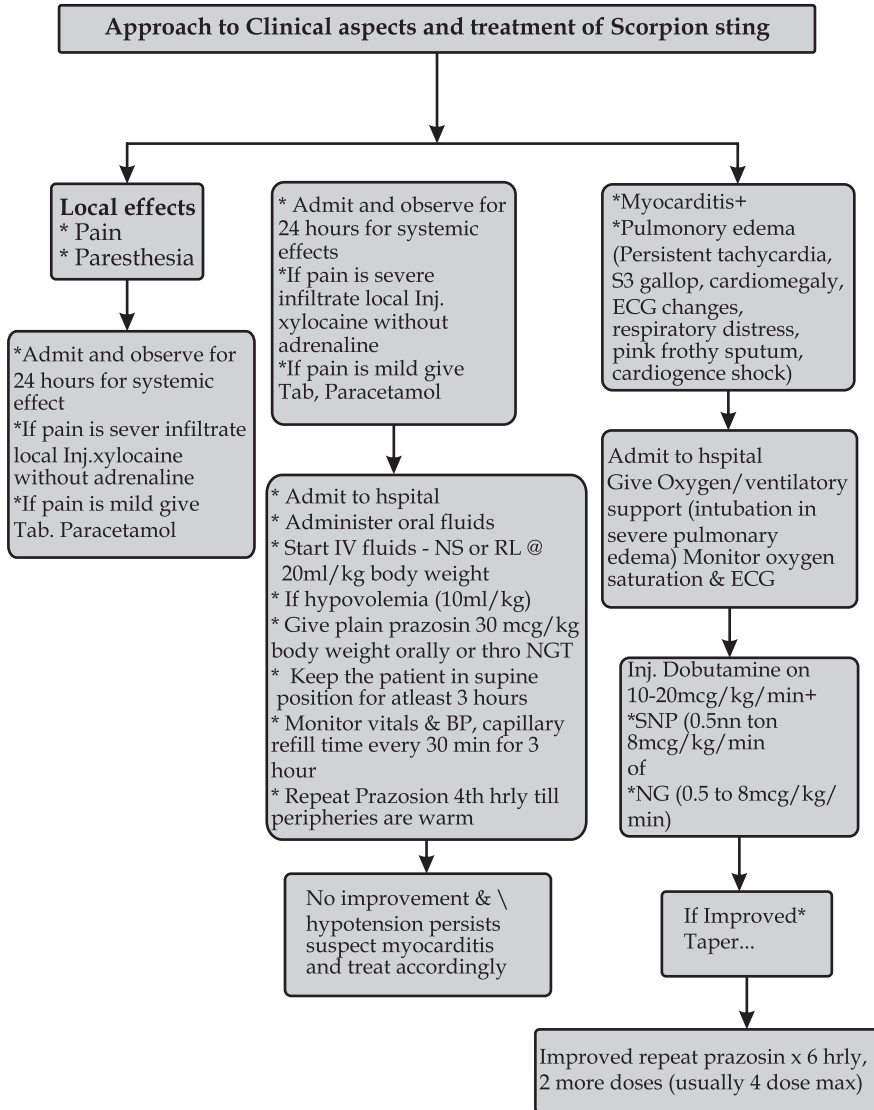
* Administrative Issues

- Arrange for required amount of drugs and devices in health centres / hospitals regularly.
- Maintain records and reports safely.
- Monitor the activities at all levels periodically.

Conclusions :

The ultimate goal is to provide appropriate first aid and treatment at the nearest health centre / hospital at the earliest. Complicated cases have to be referred to higher centre after first aid and supportive measures. Community should receive health education on preventive and curative aspects of snakebite and scorpion sting. Each health centre / hospital irrespective of the status should maintain a registry for snake bite / scorpion sting and initiate research activities in a trans-disciplinary manner. All these joint efforts will bring down the morbidity and mortality. In addition health care institutions should undertake research activities on various aspects of snake bite / scorpion sting, and share the knowledge and experience with others in order to advance further in health care delivery.

Algorithmic Approach to Scorpion Bite



NGT - Nasogastric Tube; IV - Intravenous; NS - Normal Saline;
RL - Ringer Lactate; NG - Nitroglycerine; Sodium Nitroprusside

SECTION - III

DOG BITE AND RABIES

Introduction

Modes of Exposure

Transmission

Animal Reservoirs

Anti-Rabies treatment

Anti Rabies Vaccine

Rabies Immunoglobulin

Counseling

Other Advises

RABIES: A FATAL, BUT PREVENTABLE DISEASE

Rabies is practically a 100% fatal disease. There are only 4 recorded survivors till date who recovered following intensive life support and excellent nursing care.

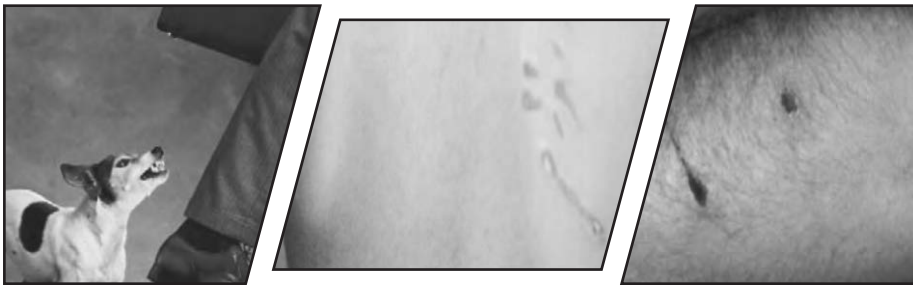
According to World Health Organization (2005) globally each year about 55,000 (24,000 - 90,000) die of rabies of which 20,000 (36% or 2 out of 5 to 6 deaths) are from India alone.

However, rabies is preventable with modern vaccines and sera (immunoglobulins). So the physician must provide correct rabies prophylaxis following exposure failing which he/she may be sued for compensation under Consumer Protection Act.



The most common modes of exposure are:

- ✓ Bite
- ✓ Scratches
- ✓ Lick
- ✓ Drinking raw milk from rabid animal viz., cow, buffalo, etc.



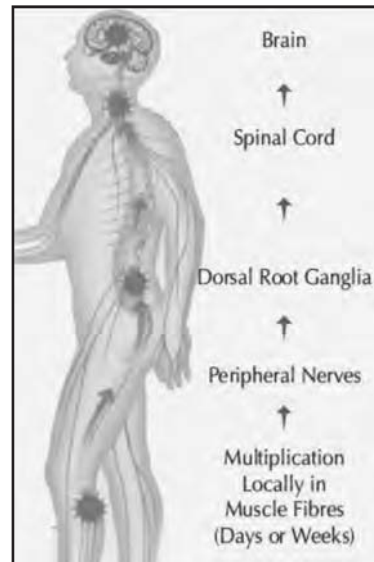
According to new WHO categorization (2005),
Wounds or exposures can be classified into:

- **Category I (No risk)**
 - ✓ Touching or feeding of animals licks on intact skin
- **Category II (Moderate risk)**
 - ✓ Minor scratches or abrasions without bleeding.
 - ✓ Licks on broken skin*.
- **Category III (High risk)**
 - ✓ Wounds with bleeding.
 - ✓ Licks on mucus membrane.
 - ✓ Drinking raw milk of a rabid animal.

Transmission

The rabies virus, bullet shaped is very minute (120 x 80 nanometer; 1 nanometer = One millionth of a millimeter) and seen only through an electron microscope.

The virus is present in the saliva of rabid animals; in the saliva of hydrophobia patients and also in the urine (low titres). Following bite, scratch, lick on broken skin (cuts/abrasions) and on intact mucus membrane the virus enters the body, multiplies locally in the tissues, muscles and enters a nerve (neurotropic) and travels to brain (@ 3 mm per hour) and affects the brainstem function; causes hydrophobia (fear of water), aerophobia (fear of breeze) and photophobia (fear of light) and finally leads to death. The time interval between bite/exposure and onset of hydrophobia (incubation period) is usually between 3 weeks to 3 months; rarely 4 days to 2 years.



ANIMAL RESERVOIRS IN INDIA

The animals responsible for transmission of rabies in India are :

Most commonly (98%)

Dogs and Cats



Sometimes (1%)

Monkeys, Donkeys, Horses Cows,
Buffaloes, Goats, sheep and Pigs

Occasionally (1%)

Wild Animals Mongoose, Foxes,
Jackals, Camels and Elephants

Not Reported

Rodents, Rats and Bandicoots, Squirrel, birds and Bats

Clinical Rabies in Humans:

- ✓ Two Types: Furious (encephalitic, 80% of cases)
Paralytic (dumb, 20% of cases)
- ✓ First clinical symptoms: non-specific, ie, malaise, fever, and headache
- ✓ Parasthesia: pain and abnormal feelings at the wound site are common
- ✓ Acute neurological phase: including throat spasms with inability to swallow, anxiety, confusion, hallucinations, hydrophobia (only document in humans), respiratory spasms with aerophobia, photophobia, and insomnia
- ✓ Coma and deaths.

Observation of Animals for rabies:

Observation of an animal for 10 days (from the day of biting the person) for signs of rabies is applicable only to dogs and cats and not to other domestic or wild animals. The rationale for observation is that if the dog or cat is incubating rabies it will show signs of disease in the next 3-5 days and die subsequently in another 3-5 days.

The signs of rabies in the dog/cat are:

- ✓ Any change in its normal behavior suggesting either undue aggression or depression.
- ✓ Running aimlessly and attacking others without any provocation.
- ✓ Becomes too drowsy and withdraws itself to a corner.
- ✓ Excessive salivation.
- ✓ Change in its voice/bark.
- ✓ Refusal to feed or eating unusual objects like stone, paper, wood, metal pieces, etc.
- ✓ Death of the animal.

Wherever possible the bite victim must be educated about this and advised to watch the animal for 10 days minimum. (And not to kill or abandon the dog or cat).

During this period, however the vaccine/sera treatment must be started as per category of exposure suspecting that the animal is rabid (not to take chances with this 100% fatal disease.) and after Day 5 (from day of bite) in category II exposures and after Day 7 (from day of bite) in category III exposures the treatment may be stopped if the biting animal is alive after 10 days of observation. However, 2 or 3 doses of modern vaccine (including sera already given in these patients will result in partial immunization (wasted / incomplete protection). Hence, it is advisable to give an additional dose of vaccine on Day 21 or 28 and provide a modified pre-exposure regimen benefit in rabies endemic India.

ANTI-RABIES TREATMENT

As rabies is 100% fatal, anti-rabies treatment following animal bite is life saving and provides great relief to bite victims and apprehensive attendants. The Physician must view this seriously and it has 4 components, all of which are equally important.

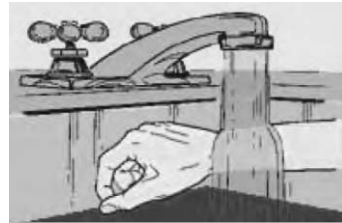
1. Wound care and treatment.
2. Administration of modern vaccine.
3. Administration of Rabies Immunoglobulins (RIGs)/Anti- Rabies Serum.
4. Counselling of patients and attendants.

6.1. WOUND CARE AND TREATMENT

This is often neglected and when done properly greatly reduces the risk of rabies (infection/ death) to the extent of 50 to 70%.

Do

Wash all wounds under running water (or flushing) for at least 10-15 minutes.



Gently clean all wounds with a detergent or any soap available (soaps are viricidal).



Apply any household antiseptic like Dettol, Savlon, and Povidone iodine (preferred).

In extraneous circumstances other alcoholic (>40%) preparations like Rum, Whisky, after-shave lotion may be applied on the wound (s).



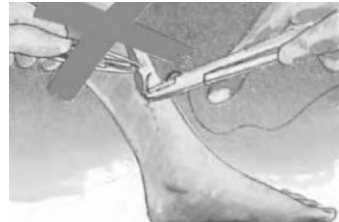
Do not

Bandage or dress the wound (wherever practicable or as far as possible).



Use tincture iodine.

Suture the wound.

**Discourage**

Not to apply any local applicants like turmeric, neem, red chilli, lime, plant juices, coffee powder, coin, etc. as these will act as irritants and propel the virus in the wound deeper to cause nerve infection and resultant rabies encephalitis and death.

**ADMINISTRATION OF MODERN VACCINES**

An early and correct administration of vaccine is life saving. The World Health Organization recommends administration of only the modern vaccines.

Post-Exposure (bite) regimen

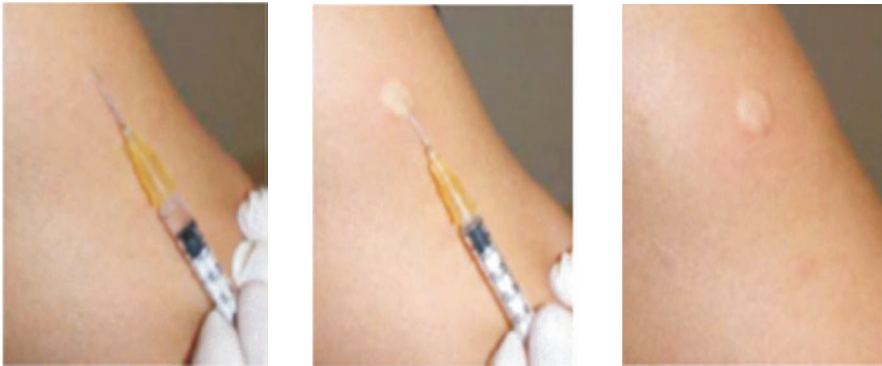
Administer the vaccine on days 0 (day of first dose of vaccine and not day of bite), 3, 7, 14 or 28th day as per the regimen.

Post-Exposure (bite) regimen

Intradermal Administration: The high cost of vaccines by the volume required for the standard Intramuscular route is prohibitive for widespread use in many areas where dog rabies is endemic. For some vaccines, equal immunogenicity has been demonstrated by ID using at least 60% less vaccine than by IM vaccination. Since 1991, WHO has recommended the ID route of administration for rabies pre - and post - exposure prophylaxis. Either the 8 - site or the 2 - site regimen should be used, as recommended the manufacturer. (Rabipur can be used in both the regimen)

The 8 - site ID regimen: Prescribes on day 0, injections of 0.1 ml given at 8 sites (1 in each upper arm, 1 in each lateral thigh, 1 on each side of the suprascapular region, and 1 on each side of the lower quadrant region of the abdomen); on day 7, 1 injection in each upper arm and each lateral thigh; and on each of days 30 and 90, 1 injection in one upper arm. The dose on day 90 may be replaced by 2 ID injections on day 30.

The 2 - site ID regimen: Prescribes 1 injection of 0.1 ml at 2 sites on days 0, 3, 7 and 28.



Intradermal Administration

Never inject the vaccine into the gluteal region as vaccine may be deposited in the fat and not get absorbed resulting in vaccine failure.

ADMINISTRATION OF RABIES IMMUNOGLOBULINS /ANTI-RABIES SERUM

The RIGs or ARS are readymade anti-rabies antibodies, which provide passive immunity and offer immediate protection. Even the best of modern vaccines take 10 to 14 days (or 3 injections minimum on days 0, 3 and 7) to elicit the protective antibody titer (of over 0.5 IU/ml of serum) and thus RIGs/ARS cover this vulnerable short incubation (or window) periods in category III exposures/severe wounds from high-risk category of animal. However, RIGs/ARS alone (without vaccine) should never be used.

Two types of RIGs/ARS are available:

ARS or Equine Rabies Immunoglobulin (ERIG). (300 IU/mL)

Human Rabies Immunoglobulin (HRIG). (150 IU/mL)

Berirab, Berirab-P, Imogamrab, Rabglob and Kamrab are imported and expensive and available only in metros and big cities.

Steps of Use

A skin test though recommended by few, it is not necessary to do it in all cases.

As much as possible of the recommended dose (20 IU/kg of body weight for HRIG or 40 IU/kg of body weight of ERIG) should be carefully instilled (using 26G needle) into the depth of all wounds and also infiltrated around all wounds if anatomically feasible. All wounds should be carefully treated without fail with least traumatization. Any remainder RIG/ARS should be injected intramuscularly into thigh region (or away from vaccine site) in a single dose.

If the volume of RIGs is not sufficient to infiltrate all wounds, it may be diluted using sterile normal saline to a volume sufficient to infiltrate all wounds.

The accompanying modern rabies vaccine dosage shall be given as per schedule.

In conclusion, ARS/HRIG is known to have local viricidal effect and prevents the virus from entering the susceptible nerve cells.

Thus, RIG/ARS is life saving in category III wounds from high-risk animals (as vaccine alone is not protective) and failure to advice/provide RIGs / ARS attracts litigation/ compensation under Consumer Protection Act for deficient/faulty medical service. However, it is advisable to administer ERIG or ARS in an institutional (Nursing Home) facility and not in the practicing chambers/clinics of the doctor.

Failure to use RIG/ARS has been one of the reasons for rabies deaths despite the use of modern rabies vaccines.

Counselling:

Animal bites, rabies exposures are very painful, stressful and due to conflicting messages the patients are very anxious and worried. It is more so in children, pregnant women and hence for every case atleast 5 to 10 minutes must be spent by the doctors to reassure them, alleviate anxiety and fears.

Other advices during vaccination period include:

1. To avoid excessive alcoholic drinks; to restrict smoking.
2. To avoid strenuous physical and mental work.
3. No specific dietary restrictions; however, avoidance of meat and fish may be suggested to some (selectively for too young and old; although it has no rationale, it may ensure better treatment compliance by some)
4. To take bath regularly (except not to wet the wound).
5. To take the prescribed tetanus toxoid, analgesic /anti-inflammatory and antibiotic as per advice.
6. Not to apply any other applicants to wound or any dressing or bandage.
7. To continue other prolonged medications viz. for diabetes, hypertension, asthma, etc.
8. To observe the dog/cat on a daily basis (wherever relevant) for 10 days and on suspicion get a veterinary examination done (wherever feasible) and to inform the doctor.
9. To emphasize the life saving value of anti-rabies treatment and need for compliance for the same
10. A proper counseling and dialogue with the patient and attendants greatly builds the trust and confidence and eliminates possible conflicts.

SECTION - IV

Anaphylactic Shock

Anaphylactic Shock

Definition of anaphylaxis

Anaphylaxis is a severe, life threatening, generalized or systemic hypersensitivity reaction.

This is characterised by rapidly developing life-threatening airway and/or breathing and/or circulation problems usually associated with skin and mucosal changes.

Epidemiology

One of the problems is that anaphylaxis is not always recognized.

Triggers

Anaphylaxis can be triggered by any of a very broad range of triggers, but those most commonly identified include food, drugs and venom.

The relative importance of these varies very considerably with age, with food being particularly important in children and medicinal products being much more common triggers in older people. Virtually any food or class of drug can be implicated, although the classes of foods and drugs responsible for the majority of reactions are well described. Of foods, nuts are the most common cause; muscle relaxants, antibiotics, NSAIDs and aspirin are the most commonly implicated drugs. It is important to note that, in many cases, no cause can be identified. A significant number of cases of anaphylaxis are idiopathic (non-IgE mediated).

Mortality

The overall prognosis of anaphylaxis is good, with a case fatality ratio of less than 1% reported in most population-based studies. Risk of death is, however, increased in those with pre-existing asthma, particularly if the asthma is poorly controlled or in those asthmatics who fail to use, or delay treatment with, adrenaline.

Risk of recurrence

The risk of an individual suffering recurrent anaphylactic reaction appears to be quite substantial, being estimated at approximately 1 in 12 per year.

Time course for fatal anaphylactic reactions

When anaphylaxis is fatal, death usually occurs very soon after contact with the trigger. From a case-series, fatal food reactions cause respiratory arrest typically after 30–35 minutes; **insect stings** cause collapse from shock after 10–15 minutes; and deaths caused by intravenous medication occur most commonly within five minutes. Death never occurred more than six hours after contact with the trigger.

Recognition of Anaphylactic reaction:

A diagnosis of anaphylactic reaction is likely if a patient who is exposed to a trigger (allergen) develops a sudden illness (usually within minutes of exposure) with rapidly progressing skin changes and life-threatening airway and/or breathing and/or circulation problems. The reaction is usually unexpected.

The lack of any consistent clinical manifestation and a range of possible presentations cause diagnostic difficulty. Many patients with a genuine anaphylactic reaction are not given the correct treatment. Patients have been given injections of adrenaline inappropriately for allergic reactions just involving the skin, or for vasovagal reactions or panic attacks. Diagnostic problems have arisen particularly in children. Guidelines for the treatment of an anaphylactic reaction must therefore take into account some inevitable diagnostic errors, with an emphasis on the need for safety.

A single set of criteria will not identify all anaphylactic reactions. There is a range of signs and symptoms, none of which are entirely specific for an anaphylactic reaction; however, certain combinations of signs make the diagnosis of an anaphylactic reaction more likely. When recognising and treating any acutely ill patient, a rational ABCDE approach must be followed and life-threatening problems treated as they are recognized.

Anaphylaxis is likely when all of the following 3 criteria are met: ·

- ✓ Sudden onset and rapid progression of symptoms
- ✓ Life-threatening Airway and/or Breathing and/or Circulation problems
- ✓ Skin and/or mucosal changes (flushing, urticaria, angioedema)

The following supports the diagnosis:

- ✓ Exposure to a known allergen for the patient

Remember:

- ✓ Skin or mucosal changes alone are not a sign of an anaphylactic reaction
- ✓ Skin and mucosal changes can be subtle or absent in up to 20% of reactions (some patients can have only a decrease in blood pressure, i.e., a Circulation problem)
- ✓ There can also be gastrointestinal symptoms (e.g. vomiting, abdominal pain, incontinence)

Sudden onset and rapid progression of symptoms

- ✓ The patient will feel and look unwell.
- ✓ Most reactions occur over several minutes. Rarely, reactions may be slower in onset.
- ✓ The time of onset of an anaphylactic reaction depends on the type of trigger. An intravenous trigger will cause a more rapid onset of reaction than stings which, in turn, tend to cause a more rapid onset than orally ingested triggers.
- ✓ The patient is usually anxious and can experience a “sense of impending doom”.
- ✓ Life-threatening Airway and/or Breathing and/or Circulation problems
- ✓ Patients can have either an A or B or C problem or any combination. Use the ABCDE approach to recognise these.

Airway problems:

- ✓ Airway swelling, e.g., throat and tongue swelling (pharyngeal/laryngeal oedema). The patient has difficulty in breathing and swallowing and feels that the throat is closing up.
- ✓ Hoarse voice.
- ✓ Stridor – this is a high-pitched inspiratory noise caused by upper airway obstruction.

Breathing problems:

- ✓ Shortness of breath – increased respiratory rate.
- ✓ Wheeze.

- ✓ Patient becoming tired.
- ✓ Confusion caused by hypoxia.
- ✓ Cyanosis (appears blue) – this is usually a late sign.
- ✓ Respiratory arrest.

There is a range of presentation from anaphylaxis, through anaphylaxis with predominantly asthmatic features, to a pure acute asthma attack with no other features of anaphylaxis. Anaphylaxis can present as a primary respiratory arrest.

Circulation problems:

- ✓ Signs of shock – pale, clammy.
- ✓ Increased pulse rate (tachycardia).
- ✓ Low blood pressure (hypotension) – feeling faint (dizziness), collapse.
- ✓ Decreased conscious level or loss of consciousness.
- ✓ Anaphylaxis can cause myocardial ischaemia and electrocardiograph (ECG) changes
- ✓ Cardiac Arrest

Circulation problems (often referred to as anaphylactic shock) can be caused by direct myocardial depression, vasodilation and capillary leak, and loss of fluid from the circulation. Bradycardia (a slow pulse) is usually a late feature, often preceding cardiac arrest.

The circulatory effects do not respond, or respond only transiently, to simple measures such as lying the patient down and raising the legs. Patients with anaphylaxis can deteriorate if made to sit up or stand up.

Disability Problems

The above Airway, Breathing and Circulation problems can all alter the patient's neurological status (Disability problems) because of decreased brain perfusion. There may be confusion, agitation and loss of consciousness.

Patients can also have gastro-intestinal symptoms (abdominal pain, incontinence, vomiting).

Skin and/or mucosal changes (Exposure)

These should be assessed as part of the Exposure when using the ABCDE approach.

- ✓ They are often the first feature and present in over 80% of anaphylactic reactions.
- ✓ They can be subtle or dramatic.
- ✓ There may be just skin, just mucosal, or both skin and mucosal changes.
- ✓ There may be erythema – a patchy, or generalised, red rash.
- ✓ There may be urticaria (also called hives, nettle rash, weals or welts), which can appear anywhere on the body. The weals may be pale, pink or red, and may look like nettle stings. They can be different shapes and sizes, and are often surrounded by a red flare. They are usually itchy.
- ✓ Angioedema is similar to urticaria but involves swelling of deeper tissues, most commonly in the eyelids and lips, and sometimes in the mouth and throat.

Although skin changes can be worrying or distressing for patients and those treating them, skin changes without life-threatening airway, breathing or circulation problems do not signify an anaphylactic reaction. Reassuringly, most patients who have skin changes caused by allergy do not go on to develop an anaphylactic reaction.

As the diagnosis of anaphylaxis is not always obvious, all those who treat anaphylaxis must have a systematic approach to the sick patient. In general, the clinical signs of critical illness are similar whatever the underlying process because they reflect failing respiratory, cardiovascular, and neurological systems, i.e., ABCDE problems. Use an ABCDE approach to recognise and treat an anaphylactic reaction. Treat life-threatening problems as you find them. The basic principles of treatment are the same for all age groups.

Treatment of Anaphylactic Shock:**Patient positioning**

All patients should be placed in a comfortable position. The following factors should be considered:

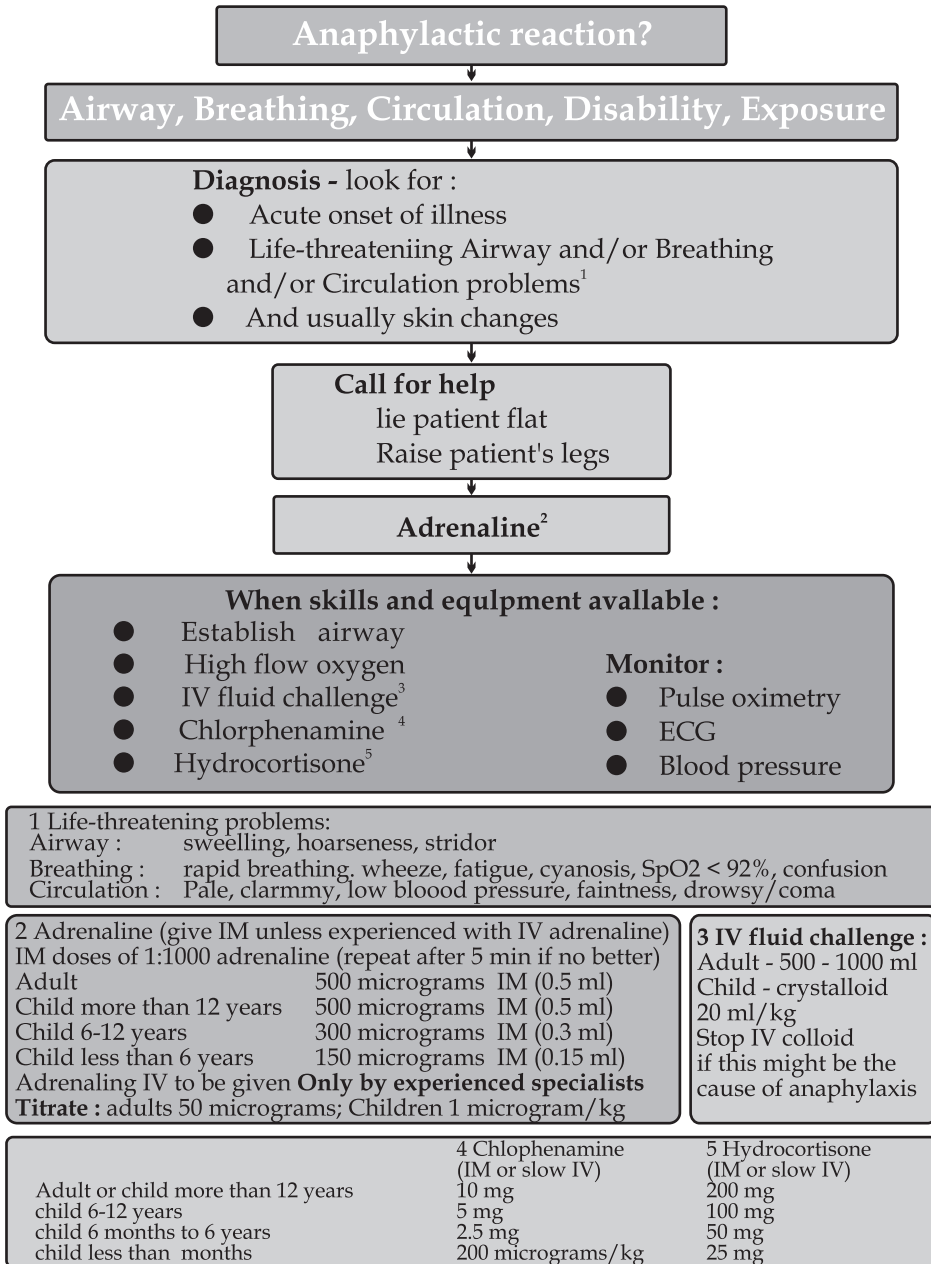
- ✓ Patients with Airway and Breathing problems may prefer to sit up as this will make breathing easier.
- ✓ Lying flat with or without leg elevation is helpful for patients with a low blood pressure (Circulation problem). If the patient feels faint, do not sit or stand them up - this can cause cardiac arrest.
- ✓ Patients who are breathing and unconscious should be placed on their side (recovery position).
- ✓ Pregnant patients should lie on their left side to prevent caval compression.

Remove the trigger if possible

Removing the trigger for an anaphylactic reaction is not always possible.

- ✓ Stop any drug suspected of causing an anaphylactic reaction.
- ✓ Remove the stinger after a bee sting. Early removal is more important than the method of removal.
- ✓ Do not delay definitive treatment if removing the trigger is not feasible.

Anaphylaxis algorithm



SECTION - V
ANNEXURES
(Suggested)

Annexure-1:

Medical audit for snake bite and scorpion sting

Medical audit for snake bite and scorpion sting is an attempt to review each case who was brought alive or dead or died at the health care centre / hospital even after treatment. In general “audit is a quality improvement process that seeks to improve patient care and outcome through systematic review of case against explicit criteria and the implementation of change” [www.nice.org]. The objectives, goals and vision of medical audit are given below:

Objectives

- To determine the probable reasons that might have contributed to death
- To find out the lapses and failures in the management
- To initiate the root cause analysis (RCA)
- To compare the case fatality on monthly basis at different levels

Goals

- To introduce remedial measures at all levels.
- To counsel and guide the affected victim and their family.
- To create awareness among the community.
- To implement preventive strategies so as to reduce mortality and morbidity.

Vision

To provide appropriate care and support for snake bite and scorpion sting cases at all Health Centre / Hospital at all times.

Principles of audit:

- Not to blame each other, but to improve
- Avoid reduplication of cases
- Refrain from false statement / data
- Find out the reasons for lapses / deficiencies
- Provide feed back to members at all levels
- Get suggestions from end users
- Find out ways for improvement and to implement them
- Place the data and resolutions / remedial measures on the web site

Outcome of audit:

- Elicit the lacunae / limitations / variations at inter-regional and inter institutional levels
- Enumerate the needs for requirements
- Eliminate the constraints
- Educate the providers of health care and beneficiaries
- Encourage health care providers to perform better

Annexure-2:

Pre hospital treatment for Snake bite and issues related to ASV

(One for each case)

1. Name: S.No: Date:
2. Age:
3. Medical unit: IPNO:
4. Gender: Male / Female:
5. Hospital:

Details about the snakebite:

1. Time of snake bite _____ am / pm
2. Victim walked home - yes / no
3. Shifted home manually - yes / no
4. If yes, state poisonous / non-poisonous
5. Nature of snake specify - Viper (type)...../ Cobra / Krait / Sea snake / others...
6. Nature of snake specify - Viper...../ Cobra / Krait...../ Sea snake group

Pre hospital treatment:

1. Household medicines given to the patient - yes / no If yes, specify _____
2. Taken to the traditional healer - yes / no. If yes, specify _____
3. Taken to the Local Medical Practitioner - yes / no. If yes, Nature of the first aid given
4. Other traditional practices followed: tourniquet - yes / no cutting and letting the blood out - yes / no applying traditional substances externally -yes / no any other, specify _____

Anatomical site of the bite:

1. Upper limb / lower limb
2. Right side / left side / bilateral
3. Other areas in the body specify _____
4. Multiple sites specify _____

ASV Related:

1. ASV administered – yes / no
2. If yes, Time of starting ASV _____ am / pm
3. Time interval between snakebite to time at which ASV started (21 - 7).....
4. Probable reason for delay in bite to needle time

Travel related

Beliefs and practices of traditional medicine

Failure to recognize symptoms

Sub optimal family support systems

Financial constraints

Any other, specify _____

Test dose for ASV given – yes / no 25 If yes, mention the details of reaction(s):.....

Mention if any prophylactic medications given - yes / no 27 If yes, mention the details of drugs given

Reaction(s) while on ASV – yes / no If yes, describe the nature of reaction to ASV and details of management.....

Time taken to complete first dose of ASV.....

Time interval between starting and completing first dose of ASV (29 - 21).....

Form of ASV used - Lyophilized / liquid form

Name of the manufacturer of ASV _____ Lot No. _____

Batch No. _____ Date of Expiry _____

Mention if any repeat dose of ASV given -yes / no If yes, reasons for repeat dose

Total quantity of ASV given (in ml)

Any others (specify)

Medical Officer Name/Signature/Designation/Seal/Date

Annexure-3:

Reporting/ Referral form for Snake bite / Scorpion sting

(One for referral, second for reporting & third to be retained)

1. O.P.NO..... / I.P.NO.....
2. Date on which snake bite / scorpion sting case attended:
3. Time at which snake bite / scorpion sting case reported to Health Center:
4. Name of the Patient:
5. Address: Father / Mother / Husband / Wife / Son / Daughter of
Door No: Street/ Lane / Ward: Village: Nearest Town / Post Office:
Pincode: Taluk: District: Phone/Mobile No:
6. Sex: Male / Female
7. Age:
8. Nature of snake bite / scorpion sting (describe what type of snake / scorpion):
9. Describe the condition of the patient on arrival Pulse...../min;
Respiration...../ min; BP.....mm of Mercury Clinical status of envenomation
10. Describe the nature of first aid and treatment given:
11. Name and designation of the person who gave first aid:
12. If referred, to other hospital:
 - a. Referral time and date
 - b. Details of the hospital to which referred
 - c. Staff accompanied - yes / no, if yes details.....
 - d. Status of the patient at the time of referral
 - e. Others
13. Any other remarks – mention:
14. Follow up action & outcome:

Annexure-4:**List of drugs and devices to be stocked at health centre**

1. **Dog bite**
 - a. 50 ml syringe- used
 - b. Antiseptic Soap
 - c. Mug for keeping water
 - d. 1 ml syringes
 - e. 3 ml syringes
 - f. Rabipur
 - g. 2-2-2-0-1-1 schedule
 - h. Rabies Immunoglobulin
 - i. Injection Tetanus Toxoid
 - j. Ampiclox/Cefadroxil Capsules
 - k. Ibuprofen tablets
 - l. Paracetamol tablets and syrups
 - m. Xylocaine plain and xylocaine with adrenaline-both
 - n. Syringes 5 ml
 - o. Gauze pieces and pads
 - p. Betadine ointment
 - q. Bandage- 1 , 2 ,4 inch ointment
2. **Snake bite**
 - a. Torch to see eyes
 - b. Crepe bandage
 - c. Splints- parchaali for lower limbs, and upper limbs
 - d. Anti snake venom
 - e. Tourniquet
 - f. Ambu bag-adult and child
 - g. Mask- No. 0,1,2
 - h. Suction facility

3. Scorpion bite

- a. Prazosin tablets
- b. BP instrument
- c. Stethoscope
- d. Injection pethidine
- e. Injection phenargan
- f. Syringes- as above
- g. Nifedipine capsules
- h. Xylocaine injection- plain

4. Bee stings

- a. CPM tablets
- b. Injection avil
- c. Inj dexona
- d. Ibuprofen
- e. Vinegar (4% Acetic Acid)
- f. Soda bicarbonate

Posters for animal bites

1. Steps to ask for dog or other rabid animal bites
2. Steps in wound management or rabid animal bite
3. Steps to ask for suspected poisonous snake bite
4. Steps in managing suspected envenomation
5. Management of scorpion sting wrt to pain
6. Managing envenomation.
7. Bee stings management
Bee sting management- check books, and write