THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
May, 2023; 3(05), 814-819

Popular Article

Snake envenomation and its clinical management in animals

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https://doi.org/10.5281/zenodo.7969653

Abstract

Animals which were poisoned by snake venom require emergency veterinary attention right away; else, poor care may result in negative outcomes. Toxins in a poisonous snake's bite can produce snakebite envenoming, a condition that can be fatal. Snake venom is an intricate mixture of different compounds, including proteins, peptides, enzymes, non-protein poisons, carbohydrates, lipids, and amines. Protein makes up more than 90% of the dry weight of snake venom. Depending on the extent to which venom is delivered, a venomous snake bite could potentially be characterized as a true bite or a dry bite. In a true bite, the poisonous snake injected a significant amount of venom into the victim, causing either hemotoxic or neurotoxic consequences. Due to the overlap of clinical presentations, clinical signs alone cannot distinguish envenomation syndromes from other medical conditions. A precise diagnosis is made with the help of information from laboratory reports, local knowledge of the many types of snakes, and the pertinent history. To prevent the dissemination of venom to other regions of the body after a snake bite, the animal should be made to immobilize the bitten location. Then polyvalent antivenom should be administered to neutralize the venom. Only polyvalent antivenom is available in India and it is effective against the "big four" snakes.

Introduction

Snake envenomation is one of the well-known deadliest emergency conditions in tropical countries like India. It is a common and important cause of accidental death in livestock. But, exact data on snake bite morbidity and mortality in livestock is not available in our country. Poisoning from snake venom in animals is an emergency condition which requires immediate attention or otherwise delayed and inadequate treatment may lead to untoward consequences.

Snakes are elongated, limbless, carnivorous reptiles come under the order Squamata. It is present all over the continent except at Antarctica. Nearly 300 snake species inhabit the varying parts

of our country, of which more than 60 are venomous, more than 40 are mildly venomous, and about 180 are non-venomous. These species fall under four families – Colubridae, Elapidae, Hydrophiidae, and Viperidae. In India, the term commonly called "big four" in speaking about snakes. The term big four indicates spectacled cobra (*Naja naja*), common krait (*Bungarus caeruleus*), Russell's viper (*Daboia russelii*), and saw-scaled viper (*Echis carinatus*). These four are the major cause for mortality and morbidity of animals due to snake venom. Other than big four, some other species such as Indian monocled cobra (*N. kaouthia*), Wall's krait (*B. walli*), Sind krait (*B. sindanus*), King cobra (*Ophiophagus hannah*), and several species of Pit vipers (*H. hypnale, Protobothrops spp.*) bite also fatal. The present paper deals with details about snake venom and its effects in animals.

Snakes and its venom:

1. Identification of snakes:

During snake bite, we need to differentiate whether it is venomous or non- venomous. In venomous snake, pupils are elliptical in shape, it has two large fangs and triangular head. In non - venomous snake, pupils are round, small hooked tooth and rounded head.

2. Venom composition:

Snake venom is a glandular secretion which is used to immobilize and digest their prey. It is also used as a defensive and a surviving tool to snakes. Modern techniques of "venomics" (proteomics as applied to venoms) such as high-performance liquid chromatography, SDS-PAGE, and mass spectrometry are revealing the enormous complexity of snake venoms (Warrell et al., 2013). Snake venom is a complex mixture of proteins, peptides, non-protein toxins, enzymes, carbohydrates, lipids, amines and other molecules. More than 90% of snake venom (dry weight) is protein. The composition of venom will vary based on age, species and it also may vary between same species too. The pharmacological effects of snake venoms are classified into three main types, hemotoxic, neurotoxic, and cytotoxic (WHO, 2010).

*** Neurotoxic venom** - It harms the brain and nervous system. Ex: Cobra and krait's venom.

*** Hemotoxic venom** - It disrupts blood clotting, thereby impacting the cardiovascular system. It also causes degeneration of organs and tissue damage throughout the body. Ex: Saw scaled viper and Russell's viper's venom.

*** Cytotoxic venom** - It causes severe pain by impairing the tissues on a molecular level. Ex: Indian spectacled cobra

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Published 23.05.2023

*** Myotoxic venom -** It leads to severe and instant muscular paralysis. Ex: Sea snakes

Some of the snake venom produce these impacts as interlinking action and lead the condition to be more fatal to victim. Example: Indian spectacled cobra's venom is potent neurotoxic but one of the factors in its venom act as cytotoxic too.

3. Types of snake bite:

The venomous snake bite can be classified as true bite, dry bite based on amount of venom injected. In true bite the venomous snake injected a quantity of venom into victim and produce its hemotoxic or neurotoxic action. On the other hand, dry bite is the venomous snake bite without envenoming. It can still be painful, and be accompanied by bleeding, inflammation, swelling and/or erythema. Based on signs produced by victim, we can differentiate these both bites (Klaassen, C.D., 2008).

4. Factors contributing to fatal snake bite:

Toxicity due to snake bite generally depends on:

a) Toxicity of venom and quantity of venom injected.

b) Ratio of animal i.e size of the animal and venom injected.

c) Species of snake involved in bite.

d) Location of bite.

e) Species of animal involved. On the basis of body weight, horses are most susceptible, followed by sheep > cattle > goat > dogs > pigs > cats.

f) Prompt availability of appropriate therapy. (Garg, S.K.,2002)

Mechanism of action:

Neurotoxic snake:

Its venom inhibits the release of Ach at the neuronal junction and block the neurotransmission. Venom of cobra act at post synaptic acetylcholine receptors, whereas krait's venom act at pre synaptic acetylcholine receptors and block the neurotransmission.

Hemotoxic snake:

Hemotoxic snake venom proteins with no 'detectable' (known or tested) enzymatic activity inhibit blood coagulation. A number of non-enzymatic anticoagulant proteins are identified and characterized in venom. These proteins inhibit the coagulation process. And also, the presence of procoagulant toxin in venom cause induced coagulopathy.

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Clinical signs:

Neurotoxic snake:

Neurotoxic snake bite causes local signs such as presence of indistinct fang marks, pain and swelling at the site of bite and discoloration noticed. In case of Krait bite the bite is painless with no swelling, but enlargement of lymph node may be seen. And mostly krait bite occurs in night time due to its nocturnal behavior. It may be helpful to differentiate the species. Systemic signs such as nausea, emesis, hypersalivation, respiratory difficulties noticed and paralysis occur in severe cases.

Hemotoxic snake:

Hemotoxic bite majorly causes bleeding and clotting disorders. The toxic factors present in venom are responsible for some local and systemic clinical manifestations such as edema, prolonged bleeding at the site of bite, tissue necrosis, hypotension, acute renal failure and bleeding from recent wounds. Procoagulant toxin in venom cause induced coagulopathy in victim.

Diagnosis:

Clinical signs alone do not differentiate envenomation syndromes with other diseases due to overlapping of clinical manifestations. Local knowledge of snake species and the relevant history, together with information gathered from laboratory reports aid in diagnosis.

*** Based on history:**

As we all know that, diagnosis of disease in veterinary field is mainly based on history told by the patient owner. So, collecting history about the animal in relation with snake bite is important to diagnose and treat the victim.

*** Examination of the fang marks:**

Examining the animal for fang marks gives a clue about the snake bite. If fang marks noticed, differentiation is needed between venomous and non - venomous bite. In venomous snake bite depending on the species, two puncture wounds separated by a distance which ranges from 8mm to 4cm. In case of non-venomous snakes, two rows of small tooth impressions noticed with no specific fang marks due to absence of fangs in non- venomous snakes.

*** Based on clinical signs:**

At the site of bite, the signs such as local swelling, oozing of blood from fang marks, cyanosis, nervous sign or bleeding disorders occur based on species of snake.

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*** 20 mins whole blood clotting test:**

It is one of the useful tests to veterinarians in the field level practice. Collect the blood from vein of a suspected animal in a glass tube and kept undisturbed for 20 minutes. In normal animal, the blood clot will form within 20 minutes, if it is snake bite case, the blood doesn't clot even after 20 minutes. With the help of this simple test, we can able to differentiate the viper and elapids bites. It is ued to test the extent of venom that cause coagulopathy in case of viperidae bites.

Treatment:

After snake bite, animal should be made to immobilize the bitten area to avoid the transmission of venom to other parts. Then to neutralize venom, polyvalent antivenom should be given. In India only polyvalent antivenom is available and it works against big four snakes. But there are some other poisonous snakes present in India, against which this polyvalent antivenom will be ineffective. Polyvalent antivenom should be administered alone in slow intravenous route at the rate of 2 ml /min along with isotonic normal saline or 5% dextrose. The number of anti-snake venom vials based on the severity of envenomation. In general, in veterinary practice use of two vials of Anti snake venom is ideal but the number of vials of anti-snake venom increases in case of severe envenomation. Rapid acting corticosteroids used to control shock, protect against tissue damage, and minimize likelihood of allergic reactions to antivenin. Tetanus antitoxin should be administered to avoid clostridial infection after snake bite. Analgesics used to control severe pain. Broad spectrum antibiotics need to prevent secondary infections. Aminoglycosides are contraindicated in snake bite treatment. The antibiotic therapy should be continued for 5 days. To improve the function of liver, liver tonic should be advised.

Conclusion

Envenomation by snakes is a major public health issue. Neuromuscular weakness and thromboses are among the clinical aftereffects. The recommended therapies are antivenoms produced in horses and sheep, although they can be dangerous and necessitate a precise identification of the snake is required. By making safe and effective antivenoms more widely accessible and available, as well as by promoting knowledge of primary prevention among communities and healthcare professionals, the majority of deaths and significant consequences from snake bites are completely preventable.

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Published 23.05.2023

References

Garg, SK., 2002. In Zootoxins. Veterinary Toxicology, CBS publishers and Distributers 1st Edn New Delhi.

Warrell DA, Gutierrez JM, Calvete JJ, Williams D (2013).New approaches and technologies of venomics to meet the challenge of human envenoming by snakebites in India. Indian J. Med Res.138:38-59

Klaassen, C.D., 2008. Properties and Toxicities of animal Venoms. Toxicology. 7th Edn, McGraw-Hill, New Delhi. Pp. 1093-1098.

Shukla, PC., 2009. Snake bite in animals and its treatment. Pashudhan.; 35(2): 2-4.