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Snake Envenomation in Small Animal Practice, KZN

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Introduction

Snake bite is a common occurrence in animals in many parts of South Africa. The author examined the records of confirmed and presumed snake bite cases presented to Hillcrest Veterinary Hospital (HVH), KwaZulu-Natal, over a period of 2 years (49 cases) and reviewed the diagnosis and management of these cases. Most snake bite cases occur during the warmer months of the year when snakes reproduce and are most active as reflected in Figure 1.

Fig 1. Seasonal prevalence

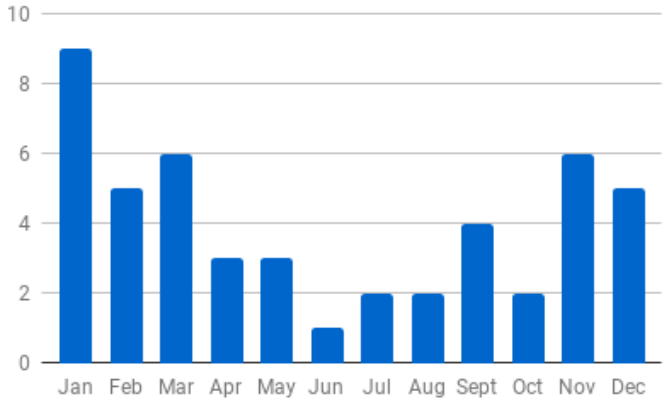

Fig 2. Snakes identified

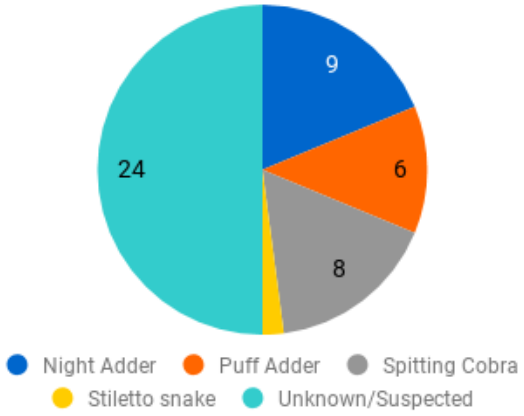

Figure 2 shows the incidence of various snake types identified in the study. Note that in approximately 50% of cases the incident was not observed, and the diagnosis was presumptive. Night adders, which are common residents of suburban gardens in the area of the practice and puff adders and spitting cobras, which are more common in the surrounding semi-urban areas, were responsible for most cases where a snake could be identified.

Snake venom

Snake venom is often categorised as cytotoxic, neurotoxic or coagulopathic, but this is probably an over-simplification as most venoms possess a combination of these actions and can have up to 25 toxic and non-toxic compounds. The venom of elapids (cobras, mambas) consists mainly of neurotoxins, cardiotoxins and haemolytic agents while viperid venom consists of cytolins (that lyse body tissue cells and leukocytes), thrombins and hemorrhagic elements. Colubris (boomslang, vine snake) venom is mainly hemorrhagic.

Coagulopathy (referred to as venom-induced consumptive coagulopathy or VICC) is one of the most important effects of envenomation in many viper, elapid and colubrid bites.

Antivenom

The South African Vaccine Producers (Pty) Ltd manufacture a polyvalent antivenom made out of refined equine serum globulins (antibodies) specific for black mamba, green mamba, Jameson's mamba, Cape cobra, snouted cobra, forest cobra, Gaboon adder, Mozambique spitting cobra, puff adder and rinkhals and also a monovalent antivenom for boomslang. There is no antivenom for vine snake. Note that the manufacturer label states that "the serum is ineffective and should not be used in treatment of bites caused by…, the night adders (Causus spp)…".

Fig 3. Typical presentation after Night Adder bite

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Fig 4. Large area of submandibular skin necrosis subsequent to Puff Adder bite

Antivenom neutralises a fixed amount of venom, therefore the dose of antivenom cannot be set in mg or ml per kg. Antivenom is administered by slow intravenous injection.

Adverse effects are common in humans but seem to be rare in dogs. When they do occur, they are usually mild (urticaria, angio-oedema, vomiting, diarrhoea), but anaphylaxis is possible. The significant cost of antivenom can be a limiting factor in veterinary medicine.

Fig 5. Species/Breed & Gender

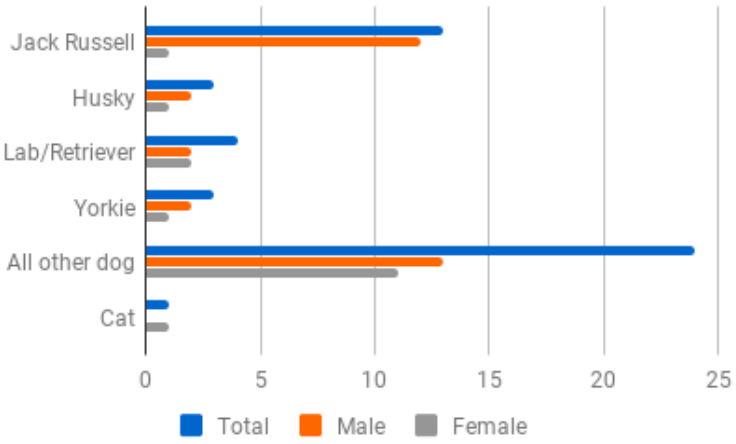
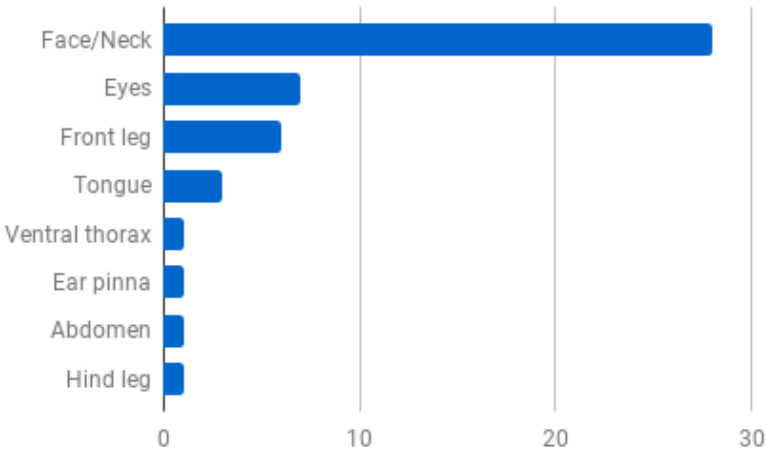


Fig 6. Body area of envenomation



Presentation

The most common presentation in small animal practice is an acute, progressive, soft tissue swelling, often around the face and/or neck that may or may not progress to tissue necrosis, after cytotoxic envenomation (Fig 3&4). However, as stated above, the veterinarian is often presented with the difficulty that a snake was not seen and thus, unlike in human medicine, a presumptive diagnosis has to be made.

Most cases of neurotoxic envenomation probably die before presentation. Systemic absorption of the venom results in pre- or post-synaptic blockade at the neuromuscular junction resulting in generalised weakness, starting with loss of the swallowing reflex, paralysis of the tongue and jaw, progressing to whole body flaccid paralysis (organophosphate toxicity and polyradiculoneuritis probably being the main differentials).

Haemotoxic/ coagulopathic envenomation results in severe bleeding as result of venom haemorrhagins, procoagulant enzymes, activation of clotting factors and DIC with depletion of coagulation factors.

Figure 5 shows the breed and sex prevalence of animals in the study. There was a definite prevalence for male gender and note that there was only one cat. Figure 6 shows the area of the body affected and coincides with other studies where the face and neck were by far most often involved. Humans are most often bitten below the knee.

Treatment

Cytotoxic envenomation - progressive swelling

Most cases need little medical attention, do not require antivenom and will recover without treatment. However, it is important to observe closely for progression of swelling and/or other signs of deterioration such as rising pulse rate, drop in rectal temperature, swelling impinging on the airway, falling haematocrit, the appearance of haemoglobinuria or a positive ISA test.

Most cases should have an intravenous catheter placed and crystalloid fluid administered at maintenance rates. Antibiotics are not necessary, unless there is obvious necrosis, because snake venom has an antibacterial component and studies have shown there are few bacteria in snake mouths. It has been stated that analgesics are not widely used in snake bite cases as pain seem to be minimal (with the exception of spitting cobra bites).

However, all patients in this study appeared to have pain, ranging from minor to severe and it is the author's opinion that all cases should receive opioid analgesia.

Cytotoxic bites in humans are very painful. Drugs that are not recommended (but nevertheless often administered by many veterinarians) are corticosteroids (somewhat controversial, but may worsen muscle weakness, enhance catabolism and cause immunosuppression), non-steroidal anti-inflammatory drugs (may worsen coagulopathy, contra-indicated in volume challenged patients) and antihistamines.

In cases that worsen, volume replacement with whole blood (or synthetic colloid if blood is unavailable) may be needed. Up to half a liter of blood may be present in the swelling after a puff adder bite in a 20kg dog. Upper airway obstruction may require tracheostomy (in cases of severe swelling an ET tube may be needed for this). Critically ill animals should receive intravenous antibiotics.

Intravenous polyvalent antivenom should be administered in cases of confirmed puff adder and other identified snakes confirmed on the list of those covered by antivenom (although a "dry bite" is possible) or progressive swelling in presumptive cases.

Confirmed night adder bites should not be given antivenom as it is ineffective as per the manufacturer. When using antivenom, give as many vials as the owner can afford (but recommend at least 2) up to a maximum of 8 vials. One vial is better than none and will be beneficial even in the late phase of disease.

Night adder bites should not be underestimated. Although the majority of cases rapidly recover, some cases develop variable tissue necrosis and at least one dog at this practice has died from a confirmed night adder bite.

Other treatment modalities which have been investigated in relation to snake bite has been low level laser and photobiostimulation that had a beneficial effect on oedema, hemorrhage and muscle damage caused by Bothrops, a pit viper species endemic to South America.

Neurotoxic envenomation – progressive weakness

Thankfully neurotoxic envenomation appears to be rare, however, as stated above, most cases probably die before presentation. All cases should have an intravenous catheter placed and observed closely. If weakness or reduced respiratory effort is noted, administer iv anaesthetic and place an ET tube.

Manual ventilation with an AMBU bag or closed circuit anaesthetic machine will be needed or ideally a mechanical ventilator needs to be used because ventilation may be required for 6-12 hours before attempting to wean off. Administer as much polyvalent antivenom as the owner can afford. Regular turning and monitoring of temperature is important. In the authors' opinion there is not much point in trying to treat these cases without antivenom or ventilatory support.

Coagulopathic/Haemotoxic envenomation

There are very few reported cases although it is thought that they may be more common than in humans.

The study at Hillcrest Veterinary Hospital included two dogs in unrelated incidents that developed severe bleeding after a suspected (but not confirmed) boomslang bite. One dog rapidly deteriorated and died (no antivenom) while the other dog rapidly recovered after administration of boomslang monovalent antivenom.

As noted above, boomslang monovalent antivenom is available, but a practical problem is the delay between presentation and procuring and administering the antivenom as most practices will not keep stock because it is so very rarely needed. Blood transfusion will likely be necessary.

Venom ophthalmia

The study included 7 dogs that had ocular envenomation from Mozambique spitting cobra. The venom is very caustic and chemosis and variable corneal ulceration can be expected. Uveitis sometimes develops later.

Thorough irrigation is essential (sedation may be needed), followed by topical antibiotics and cortisone (avoid if corneal ulceration), topical atropine (to relieve ocular pain via cycloplegia) and analgesics.

Conclusion

Most snake bite cases in small animal practice will be cytotoxic envenomation and luckily most of these will recover rapidly and uneventfully, even without any treatment (80% of cases in this study). The single biggest practical difficulty is that snake bite, unlike in human medicine, is often a presumptive diagnosis and thus it can be difficult for the veterinarian to advise on the administration of antivenom and give a prognosis.

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MULTIPLE-CHOICE QUESTIONS

QUESTION 1

Regarding snake venom which statement is CORRECT?

a. The venom of Elapid snakes is primarily cytotoxic
b. The venom of Viperid snakes is primarily neurotoxic
c. Most venoms possess a single toxic action
d. Venom-induced consumptive coagulopathy (VICC) is an important effect
e. Vine snake venom is primarily neurotoxic

QUESTION 2

Regarding antivenom which statement is FALSE?

a. Antivenom is produced by the South African Vaccine Producers (Pty) Ltd
b. A polyvalent and monovalent boomslang antivenom is available
c. The polyvalent antivenom is effective against night adder venom
d. The polyvalent antivenom is effective against Mozambique spitting cobra venom
e. The dose of antivenom cannot be stated in mg or ml per kilogram bodyweight

QUESTION 3

The MOST COMMON presentation of snake envenomation in small animal practice is:

a. Acute soft tissue swelling on the face or neck
b. Acute soft tissue swelling on a front or hind leg
c. A large area of necrotic skin
d. Acute flaccid paralysis
e. None of the above

QUESTION 4

Which statement regarding the study at Hillcrest Veterinary Hospital is FALSE?

a. In approximately 50% of cases the diagnosis was presumptive
b. Seasonal prevalence coincided with the warmer months
c. The most common breed presented was the Jack Russell
d. There was a definite prevalence for male gender
e. None of the above

QUESTION 5

Regarding the treatment of cytotoxic envenomation which statement is INCORRECT?

a. Place an iv catheter and administer crystalloid fluids
b. Observe for progressive swelling
c. Do not advise antivenom if the bite happened more than 24 hours ago
d. When antivenom is indicated, one vial is better than none
e. Upper airway obstruction may require tracheostomy

QUESTION 6

Regarding the treatment of neurotoxic envenomation which statement is TRUE?

a. Most cases probably die before presentation
b. Place an iv catheter and observe for weakness or reduced respiratory effort
c. Always administer polyvalent antivenom
d. Manual or mechanical ventilation will be required
e. All of the above

QUESTION 7

Drugs NOT recommended in cases of cytotoxic envenomation do NOT include:

a. Opioid analgesics
b. Corticosteroids
c. Antihistamines
d. Non-steroidal anti-inflammatory drug
e. All of the above

QUESTION 8

Regarding a confirmed night adder bite, which statement is FALSE?

a. Death due to night adder envenomation is possible
b. The majority of cases rapidly recover
c. Some cases develop variable amounts of tissue necrosis
d. Advise antivenom if the owner can afford it
e. None of the above

QUESTION 9

Regarding boomslang envenomation, which statement is INCORRECT?

a. The venom is primarily haemotoxic
b. There are very few reported cases of confirmed boomslang envenomation
c. There is no antivenom available
d. Blood transfusion will likely be needed
e. None of the above

QUESTION 10

Differences in snake envenomation between humans and dogs INCLUDE:

a. Humans are most often bitten below the knee and dogs on the face or neck
b. Cytotoxic bites generally appear to be more painful in humans than in dogs
c. The diagnosis of snake bite in dogs is often presumptive
d. The cost of antivenom is often a significant factor in veterinary medicine
e. All of the above

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