Module # 11 – Component # 5

Basic First Aid for Arthropod Envenomation

Objectives

The aim of this chapter is to provide the student with a concise and rational approach to the diagnosis, treatment and patient management of a person who has experienced insect, arachnid or other arthropod envenomation.

Expected Outcomes

- To account for which genus is responsible for neurotoxic spider bites.
- To be able to recognise and distinguish between black and brown button spiders.
- To be able to diagnose and recommend treatment for a neurotoxic spider bite.
- To be able to name three spiders that are known for their cytotoxic envenomation.
- To be able to differentiate the symptoms and treatment for a cytotoxic bite vs. neurotoxic bite.
- To name the one family of scorpions that is considered medically important in South Africa.
- To list eight symptoms of scorpionism.
- To describe three management techniques that must not be applied in the treatment of Buthid envenomation.
- To be able to carry out the safe removal of an imbedded hymenoptera sting.
- To be able to characterise the allergic reactions to insect envenomation.
- To be able to describe the symptoms and treatment of anaphylaxis.
Introduction

Even though it is quite possible to encounter snakes whenever you venture into the field, close encounters are quite rare and the incidence of snake bite even rarer. However due to the far greater diversity and abundance of arthropods, encounters and bites or stings are fairly commonplace. Quite unlike snakes, who will attempt to avoid any form of human contact, many arthropods actively seek out humans.

One of the other phenomena to be aware of is that the behaviour of arthropods is extremely unpredictable, encounters become unavoidable and occasional envenomation is inevitable. It is therefore crucial that all field guides are equipped both mentally and physically to deal with envenomation when it occurs.

As you will recall from our previous discussion on Phylum Arthropoda (animals with jointed legs and an exoskeleton) [Module # 2.] animals under this taxon include:

- Spiders
- Scorpions
- Insects
Spider Bites

Although thousands of spider species have been described for the Southern African Sub-region, very few are potentially harmful or dangerous to human beings. As with venom from snakes, spider bites may also be divided up into Neurotoxic and Cytotoxic. There have been some reports of haemotoxicity from crab spiders, but clinical evidence remain inconclusive.

Neurotoxic Spiders

All local Neurotoxic spiders belong to the Genus *Latrodectus*, and are represented by the “button” or “widow” spiders.

Black Button Spider

There are four local species of this ‘complex’. They may present with a combination of the following characteristics.

- Dark brown to pitch black.
- Body lengths of 8 – 15 mm [± ½ in].
- Juvenile Black button spiders have a red markings on the back of their abdomens that diminishes with age and is absent in adults.
- A spherical abdomen and no ventral markings.

Brown Button Spider

There are two local species of this ‘complex’

- They exhibit a vast colour range from creamy yellow to shades of brown or black.
- The ventral surface shows a prominent red – orange hourglass marking.
- The dorsal surface is covered with an intricate pattern of geometric markings.
- It is these species that are commonly referred to as the “Black or Brown Widow spiders”
Diagnosis of a Neurotoxic spider bite

The Black Button Spider

- The bite mark is often unclear and cannot be found, and diagnosis may be supported by identification of the suspect spider. It is not worth obtaining the specimen at the expense of an additional bite victim.
- There is usually a sharp burning pain at the site of the bite.
- Pain spreads to the regional lymph nodes within 15 minutes and these become affected.
- Within an hour “Latrodectism” sets in. This is characterised by generalised severe muscle pain and cramps involving the abdomen, chest, back and thighs. Tightness may also be experienced in the chest region. The victim may also experience tremors, a rigid abdomen, weak legs leading to a difficulty in walking.
- Victims often sweat profusely, and the face may be swollen and contorted into a painful grimace.
- Other symptoms may include: fever, nausea, vomiting, headache, speech impairment, high blood pressure and irregular heartbeat.

Brown Button Spider

- These are usually associated with a milder form of envenomation.
- Similar symptoms may be apparent, but with a lesser effect.
- The bite site may be characterised by a red spot or localised rash.

Treatment of Neurotoxic spider envenomation

Since the only effective treatment involves the administration of specific Latrodectus spider antivenom, victims should be made as comfortable as possible and REMOVED TO A HOSPITAL IMMEDIATELY for the correct treatment.
Cytotoxic Spiders

There are three medically important cytotoxic envenomating spiders in the Southern African Sub-region. These are the:

- Genus *Cheiracanthium* - sac spiders
- Genus *Loxosceles* - violin spiders
- *Sicarius* species - six eyed crab spiders

**Sac spiders**

- They are straw coloured to greenish with large shiny black mouthparts.
- They are nocturnal and fast moving.
- Victims are usually bitten while asleep and may not even be aware of having been bitten. They have large chelicerae that can penetrate light clothing.

**Symptoms of the bite**

- An irregular lesion with a central bleeding vesicle or pustule usually develops.
- Bite marks may be 4 – 8 mm [¼ in] apart and are often visible.
- The surrounding area is associated with a painful swelling.
- The centre of the wound may become necrotic.
- Other accompanying symptoms include a low grade fever and headache.

**Treatment**

- The majority of lesions heal by themselves, but the ulcerated wound is slow to heal.
- Treatment is directed toward preventing a secondary infection.
- Victims should visit a doctor for advice or minor therapy.

**Violin spiders**

- They are brownish spiders with a small body and a violin shaped mark on their dorsal surface.
- Their legs are long and delicate.
**Symptoms of the bite**

- Most bites occur when the **victim is asleep**, and pain only develops after several hours.
- The bite site is characterised by a swollen lesion which only develops ± 2 hours after the bite has occurred.
- The lesion continues to swell for 3 days and subsides on the fourth, leaving a deep ulcerating wound that may be as long as 10cm [4 in] across.

**Treatment**

- As with the sac spider bite, management of the victim is directed toward preventing secondary infection.
- Victims should also consult a doctor as soon as possible, as a small surgical procedure may prevent the lesion spreading.

**Sicarius spiders (Six eyed crab spider)**

These spiders are **endemic to the semi-arid region of the country**, and are therefore **rarely encountered**, while recorded bites are rarer still. Of the few that have been recorded, bites from this species are associated with severe ulcerating lesions for which there is **no specific treatment**.

**Other spider species**

**Baboon, wandering** and **rain spiders** are able to inflict painful bites which are susceptible to infection. However, specific local or systemic effects have not been described for the region.

If a bite from these spiders is suspected, the administration of an antihistamine is indicated. When in doubt always consult a physician.
Scorpion Stings

There is only one family of scorpions in South Africa that is considered medically important. This is the family *Buthidae*. As already explained in Module # 2, component # 2, dangerous scorpions can mostly be recognised by their combination of thin pincers and thick stings or *telsons*. Buthidae are no exception.

Scorpions in the Genus *Parabuthus* are considered the most dangerous. They are characterised as being yellow, brown or black in colour, and measure between 60 and 150mm [2 ½ - 6 in] in length (including their tail). The most dangerous species is *Parabuthus granulatus*.

**Symptoms of a Buthidae Sting**

- The envenomation is neurotoxic and may be **potentially fatal** to all age groups, but particularly young children and the elderly who have pre-existing heart conditions.
- Stings are **extremely painful** and victims are **typically stung on the feet**.
- The sting puncture wound is usually evident, although due to the extreme pain; the **offending scorpion is often seen**, making identification easier.
- The sting site is also associated with mild **inflammation**.
- The venom acts on body chemistry, causing the **release of adrenaline** and other autonomic nervous system stimulants.
- Other associated symptoms are **numerous and wide ranging**, including: muscular pain, cramps, sensation of vibration, difficulty in swallowing, increased salivation, visual impairment, difficulty in breathing, general weakness, anxiety, restlessness, tremors, drooling, sweating, and increased blood pressure.
- In children similar symptoms are seen, but may be accompanied by **screaming and uncontrollable thrashing and writhing**. The victim may be unable to lie still and difficult to restrain.
- Respiratory failure may develop. This is the most dangerous complication of severe scorpionism.
Management of a Buthid sting

- **Apply crushed ice** to the sting site.
- Paracetamol or aspirin may be given orally to **reduce pain**.
- Immobilise the affected limb and clean the wound.
- **DO NOT** cut into the wound.
- **DO NOT** attempt to suck out the venom.
- **DO NOT** apply a tourniquet.
- **ARRANGE FOR THE IMMEDIATE REMOVAL OF THE VICTIM TO HOSPITAL.**

Other Scorpion Stings

Most other scorpion stings are **relatively harmless**, in that they are no threat to life. They are, however, **severely painful**, but only result in minor inflammation of the affected area. Treat with ice, oral pain killers and clean and dress the wound.

**IF IN ANY DOUBT AS TO WHAT TYPE OF SCORPION IS RESPONSIBLE, MOVE THE VICTIM TO A MEDICAL FACILITY AS A PRECAUTION.**
CLASS INSECTA

As you will recall from our earlier discussion (Module #2, component #7), insects are the most abundant and successful terrestrial animals, and with ±1 000 000 known species, account for more than three quarters of all known animals.

Southern Africa has a particularly rich and varied insect fauna. 27 Orders account for 580 families and ± 80 000 different species. Fortunately only one specific Order concerns us.

When discussing medically important insects, it is important to differentiate between insects as vectors of disease, and insects that present dangers by means of their own envenomation. This section will only deal with the latter group.

Insects introduce their venom into their victim through stings and bites. The ‘bite’, however, is not really a bite at all. People often complain of ‘mosquito bites’ or ‘itchy bites’. The mode of ‘biting’ in these cases is in fact the insect using its stylet / syringe like mouth parts to puncture the skin. Stinging insects on the other hand possess actual stinging apparatus that are situated at the tip of their abdomens. These ‘stingers’ are occasionally true stings in the case of most bees, but may also be the insects’ ovipositor, as in the case of most wasps.
**Order Hymenoptera**

You will remember from Module # 2 that this Order includes the:

- Bees
- Wasps
- Hornets
- Ants

**Characteristics of Hymenoptera stings**

- Stings produce a *sharp, stabbing to burning pain*.

- In wasps, the sting site is visible as a *weal develops*, with a *central whitish ring* around the puncture site. This central ring is also characteristic of most bee stings.

- In most common bee stings, the whole sting apparatus of the insect is often *left protruding* from the victim. The sting head in this case is *slightly barbed* which is why it remains in the skin. The action also results in the bee having its lower abdomen ripped off, *killing the insect* – a minor consolation to the recipient of the sting.

In addition, hymenoptera stings are classed into 3 categories on the basis of the allergic reaction that develops.

1) Immediate – local: Small *localised swelling* around the sting site. ➔ *No allergic reaction*.

2) Immediate – mild generalised: *Large swelling*, not only around the sting site, but also the whole limb is affected. ➔ *mildly allergic reaction*.

3) Immediate – severe generalised: *Major swelling* and *anaphylactic shock / anaphylaxis* (detailed below). ➔ *Severe allergic reaction*. This is potentially fatal.
Management of Hymenoptera stings

Move away from the area in which the victim has been stung. Particular to bee stings, once the bee has stung, it turns around and, using glands on its head, deposits an alarm pheromone on the victim’s skin in the vicinity of the sting site. This attracts all bees in the surrounding area toward the ‘smell’, with the message of “sting here”. It is this phenomenon that accounts for multiple stings on a victim, when they are literally attacked by a swarm.

Examine the wound site and remove any stings still present.

Stylised diagram of a typical bee sting

The sting tip will be embedded in the skin with the venom sac protruding. It is important to remove the sting without squeezing the venom sac. Therefore attempt to scrape the sting out using a knife edge, credit card or long finger nail. Using tweezers often results in squeezing the venom sac thus increasing the amount of envenomation.

- Monitor the victim closely if a severe allergic reaction is suspected, **ARRANGE FOR IMMEDIATE REMOVAL TO HOSPITAL**. If the victim does go into anaphylactic shock, CPR will need to administered.
- If the allergic reaction is not life threatening, apply ice directly to the sting site to alleviate pain and swelling.
- Oral antihistamines may be taken to diminish a mild allergic reaction.
Throat Stings

Due to the associated swelling effect of stings, when they occur in the throat they have the potential to become life threatening. Throat stings may occur either externally or more seriously internally in the actual tracheal tube when bees are accidentally swallowed (normally when the victim has drunk from a soft drink can).

In addition to any allergic reaction, the associated swelling may require emergency endo-tracheal intubation or even a tracheotomy.

Assess the situation quickly. If the victim exhibits signs of breathing difficulty, IMMEDIATELY REMOVE TO HOSPITAL.

Multiple stings

Multiple stings may induce a potentially fatal toxic syndrome due to the cumulative effect of the venom. Either more than 30 wasp or over 200 bee stings (less in children or the elderly) are associated with a high degree of mortality.

Management of a multiple sting victim

- Remove as many of the implanted stings as possible without increasing envenomation by squeezing the venom sacs.
- Support vital functions.
- EVACUATE TO HOSPITAL WITHOUT DELAY

Dead Bees

The actual bee sting is mechanical. What this means is that the sting and the venom remain viable after the bee has died, until the insect becomes desiccated (dried out). Therefore if a person is unfortunate enough to stand on a dead bee they ‘stand’ a reasonable chance of receiving a sting, with all its associated effects.
**Other insect stings and bites**

Many of the **80 000 insect species** resident in Southern Africa have the ability to sting, bite or in some or other way inflict pain on us. They range from the large **Gomphid dragonfly**, capable of giving a nasty mechanical nip, to the **Bombardier beetles** who are prone to spraying noxious chemicals or one of the many **Lepidoptera larvae** who will leave venom containing setae (hair) in the hands of any who would be foolish enough to handle them.

Treatment for bites or stings of these insects includes taking **oral antihistamines** and applying **topical anaesthetic / antiseptic ointment**, salves or sprays. These will usually relieve any symptoms.

Envenomation by insects other than hymenoptera **rarely results in a severe allergic reaction**. However, if such a reaction should result, always consult a doctor as soon as possible.
ANAPHYLAXIS

Anaphylaxis or anaphylactic shock is the condition that develops in some individuals who are hypersensitive to the exposure of certain proteins present in venom. It is a severe potentially fatal Type I allergic reaction. Its onset may be extremely rapid and the course it will take is unpredictable. Its onset is also not dose dependant. One bee sting may be sufficient to elicit the effects in hypersensitive people.

Symptoms of Anaphylaxis

- Development of the condition within 1 – 15 minutes, with rapid progression.
- Victims become uneasy, agitated and complain of palpitations with a throbbing in the ears.
- Victims experience respiratory distress with choking, wheezing and swelling in the throat.
- This may also be accompanied by a combination of nausea, vomiting, abdominal pain, discomfort and diarrhoea.
- The victim may also have a decrease in blood pressure and an irregular heartbeat.
- The condition culminates in cardio-vascular collapse that will result in death if not treated.

TREATMENT

- Early recognition is critical.
- The treatment revolves around administering adrenaline as soon as possible.
- People who are aware of their pre-disposition to the condition may carry the necessary loaded syringe with them at all times. If under emergency conditions, the adrenaline may be injected subcutaneously or intramuscularly.

THE REMOVAL OF THE VICTIM TO A HOSPITAL IS OF PARAMOUNT IMPORTANT, AND MUST BE EFFECTED WITHOUT DELAY.
REFERENCES

The material contained in this and the preceding component was taken from a handbook called:

"The Diagnosis and Treatment of Envenomation in South Africa"

Written by
Drs. L. Schrire; G.J. Muller & L. Pantanowitz

The booklet is produced by:

**South African Vaccine Producers (Pty) Ltd**

1 Modderfontein Road, Edenvale
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Telephone  **011 386 6000** [office hours] or 011 386 6078 [after hours]

The booklet is available from this source for students requiring more medically specific information, but it is not a prerequisite. Expert advice on envenomation is also available from your local Poison Information Centre, one such centre is:

**Unitas Hospital (Pretoria) 0800 111229**