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Resuscitation Trolley, Emergency Department

SNAKEBITE

FLIPPER CARD



AIRWAY AND VENTILATION IN SNAKEBITE



- V** - Vision of
- E** - Empowering the
- N** - Network
- O** - Of
- M** - Medical Professionals
- S** - Saving lives and limbs



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This Flipper gives you the Guidelines for an Approach to Airway in Snakebite and Basic Ventilation Strategy for Neurotoxic Snakebites

An Approach to Airway Management in the Patient who has been bitten by ANY Snake: AIRWAY MANAGEMENT PROTOCOL

Step One: Monitor, Assess and Manage immediate Life Threats

Immediately place the patient in a position of comfort (for respiratory system/bite site)

If patient is not responsive place patient immediately lateral (on the side in recovery)

Patients with neurotoxic bites are most likely to need escalation to advanced airway management, these patients will need to be treated rapidly.

AIRWAY



Assess the Patency of the Airway Can air move easily?

- Clear any secretions as needed (lateral position or suction if needed – not deep, only mouth)
- Perform Head-Tilt-Chin-Lift or Jaw Thrust if needed
- Consider insertion of a Nasopharyngeal Airway ASAP

PRIOR TO ANY ADVANCED AIRWAY INTERVENTION - OPTIMAL OXYGENATION AND PREPARATION ARE REQUIRED

BREATHING



Assess breathing

- Rate
- Air entry
- Colour
- Effort
- End-tidal CO2 if available
- SPO2

- Assist Ventilation if rate or depth not adequate for age
- Support Oxygenation as needed with increased oxygen (FiO2), or ventilation if required (consider PEEP valve @5-10cmH2O)
- Supported BVM ventilation if work of breathing increased or not present (scope and equipment dependent)
- Attach ET/CO2 to BVM for rapid confirmation of ETT once inserted
- Supplement Oxygen in a stepwise approach to meet patient's needs

Refer to optimization steps later to prepare this patient for Advanced Airway Management

CIRCULATION



Assess Circulation

- Rate
- AVPU/LOC
- Colour
- End Organ Perfusion
- Systolic BP or MAP

- Assess Rate and treat rate issues as required (bradycardia or symptomatic severe tachycardia according to algorithm)
- Be aware that snakebites may present with arrhythmia, conservative management is best
- Assess LOC and consider the need to manage airway long term
- Determine perfusion of the peripheries (colour and the trunk, peripheral and central pulses)
- Check capillary refill (>2seconds concerning)
- Assess MAP (systolic >90mmHg or better MAP >65mmHg as a minimum) Manage life threats to perfusion rapidly

Refer to optimization steps later to prepare this patient for Advanced Airway Management

DISABILITY



Disability

Assess blood sugar, pupils and other neurological deficit

- Rule out common medical reasons for possible decreased LOC
- Document neurological findings and progression (paralysis, weakness, clonus or flaccidity)

EXPOSURE



Exposure

Note any trauma (look for bite marks, wounds, injury, bleeding areas) Note rashes, swelling (mark these areas early)

- Note any injuries or issues and mark any swelling areas or necrotic tissue noted
- Monitor patient temperature and attempt to maintain normothermia
- Hunt for any other possible toxins or exposures

An Approach to Airway Management in the Patient who has been bitten by ANY Snake: AIRWAY MANAGEMENT PROTOCOL

Step Two: Approach to airway management

Indications for Advanced Airway

- Oxygenation
- Ventilation
- Airway protection (NOT GCS BASED)
- Predicted clinical course or need

Not able to maintain with basic manoeuvres

Patient needs to be intubated

Optimise Oxygenation

- Position**
 - Head and torso raised
 - NPA placed, HTCL/JT done
 - Sniffing position
 - Ramp (high BMI / pregnant)
 - Dentures (in for BVM, out for ETT)
- Preoxygenate**
 - Nasal Cannula 15l/min (AP-Ox)
 - BVM or NRB 15l/min Oxygen
 - PEEP 15cmH2O if appropriate (FRC)
- Predict**
 - All emergency airways should be anticipated to be difficult
 - Prepare rescue and surgical options

Consider the PHYSIOLOGY HOP killers (Resuscitate the patient for safer airway management)

- 1. Hypoxia present or not tolerable?**
 - Pre-oxygenation steps done
 - Not able to do pre-ox? DSI
- 2. Hypotension present or not tolerable?**
 - Stop the bleed
 - Fluid bolus/consider blood products (TXA not indicated if bleeding due to snake venom)
 - Push-dose pressor/dirty adrenalin or infusion
 - Choose the appropriate medications (safer options and dosing strategy)
- 5. Current Compensated Metabolic Acidosis (think about case)**
 - If paralytic to be used, continue ventilation post paralytic
 - Consider KOBI (ketamine only intubation)
 - Post intubation ventilation to match physiology (faster than usual)

Optimise environment, team + equipment

- Equipment**
 - Equipment Checklist MIDSOLES (challenge/response)
 - Set monitors to 1-5minute cycle for assessment
 - Ventilator prepared with safe settings for starting vent
 - Attach ETCO2 to the BVM/Vent before intubation
- Team (clear roles and responsibilities)**
 - Brief the team include all plan options
 - Plan A, B, C and D (ready for FONA)
 - Prepare equipment for each plan
- Oxygenation champion appointed and roles planned**
 - When will the attempt be aborted?
 - What are the criteria to move to plan B, C or D?
- Practitioner**
 - Block breathing (breath in for 3 seconds, hold for 3 seconds and out for 3 seconds to calm yourself) and visualise success, plan for failure
 - Correct bed height, cockpit ready, equipment in reach
 - DON'T RUSH (10 seconds for the next 10 minutes)

Medications THINK ABOUT MEDICATIONS CAREFULLY choose something safe for the patient (refer to appropriate dosing on reverse)

- Intra-intubation medications
 - Induction Agent
 - Paralytic (prepare even if not in Plan A)
 - Pressor push dose/infusion
- Post Intubation
 - Analgesia and sedation

Administer the medications
Wait for effect
Place the airway and confirm placement
Start assessment again ABCDE

Post Intubation Checks and Actions

- Confirm ETT placement
 - ETCO2 value and waveform
 - Equal air entry bilaterally, chest rise bilaterally, no sounds over stomach
- Secure ETT in place (take time do this well)
- Connect patient to ventilator ASAP and keep BVM at bedside incase
- Check cuff pressure (20-30cmH2O)
- Pain management and analgesia running/ready
- Place gastric tube, and place inline suction if available
- Plan for blood gas in next 15mins
- Plan for CXR for ETT depth and gastric tube placement (US?)
- Vent alarm plan?

Basic Ventilation strategy for Neurotoxic Snakebites – Dr Christoff Bell and Mr Hugo Minnaar

1. **Recognize Neurotoxicity as Emergency**
2. Prepare for Airway Control and Ventilation
3. Supplemental Oxygen via nasal prongs +/- non rebreather mask for SPO₂ < 94% or HFNO on 100% O₂ and 40 – 60 lpm flow
4. If Hypoventilation / Apnea – start bag-valve-mask (BVM) ventilation with O₂. (If this happens the patient will require intubation and ventilation)

Pre Intubation Checklist (SOAP MEA)

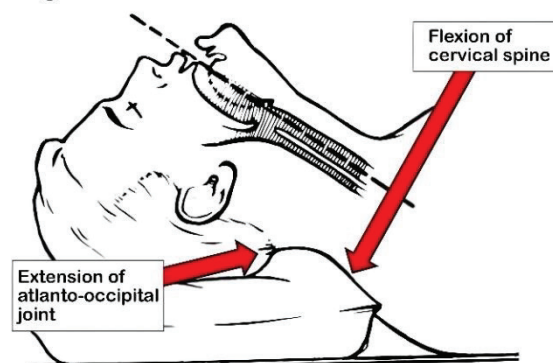
1. **S**uction with yankauer catheter
2. **O**xygen (Mask, NPO₂, HFNO, BVM ventilation)
3. **A**irway Equipment
 - Laryngoscopes with different size blades and video laryngoscope (If available)
 - ETT (2 sizes)
 - Introducer and bougie (if available)
 - Supraglottic airway device
 - Surgical airway equipment
 - Stethoscope
 - Strapping/fixing material ready to secure ET tube
4. **P**harmacy
 - Running IV line + backup IV line for inotropes if needed
 - Medication - sedation, Neuromuscular blocker on standby, Emergency drugs (ie. Adrenaline, Atropine)
 - Draw up drugs and keep it in sequence of administration
5. **M**onitoring Equipment – SpO₂, BP, ECG
6. **E**TCO₂ - if available, **E**levate head 30degrees
7. **A**ssign roles – Airway control (Intubater), assistant, drug administrator, nurse runner

Drugs:

RSI MEDICATION

mg/kg	INDUCTION
1 - 2	Ketamine
0.1 - 0.3	Etomidate
mg/kg	INDUCTION
1 - 2	Suxamethonium - AVOID
1 - 1.2	Rocuronium – only if needed

Sniffing Position



NOTES: NEUROTOXIC BITES ONLY

- ❑ In patients without comorbidities, a basic ventilation setup should be adequate for Neurotoxic Envenomation
- ❑ Neurotoxicity may mimic brain death - be careful to not make this diagnosis prematurely
- ❑ Prolonged ventilation is often required especially in the absence of antivenom administration. Several cases have been recorded of patients requiring ventilation for more than a week
- ❑ The **Snake's Venom** acts as a **Neuromuscular Blocker (NMB)**, mimicking the effects of intravenous neuromuscular blocking agents
- ❑ Avoid **Suxamethonium (Scoline)** due to the risk of prolonged apnea which may result in prolonged ventilation
- ❑ **Additional NMBs** are not necessary for intubation
- ❑ However, if there is a risk of aspiration, a non-depolarizing NMB such as Rocuronium may be used
- ❑ For Post-Intubation Sedation, **Ketamine Infusion** is generally preferred over **(AVOID)** Midazolam and Morphine
- ❑ **AVOID Opioids** as it perpetuates the suppression of the respiratory drive and sedation.

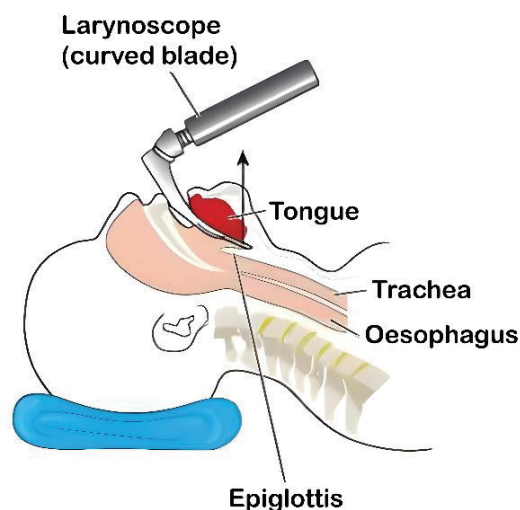
Positioning (rolled up blanket under shoulders works well, “sniffing morning air” position, C-Spine protection should not be a major concern)

1. Difficult Airway anticipated (Examine patient - neck mobility, Mallampati score, teeth concerns, cricothyroid area)
2. Pre-Oxygenation
3. Circulation/ Haemodynamics optimized
4. Consider NG Suction

Intubation Laryngoscopy 2-3 attempts (Consider different size blade or different size ET Tube) → Alternative Airway (LMA, LTA, iGel) → Surgical Airway.

Post intubation

1. Check correct Position of ET Tube (Misting, EtCO₂, Rising O₂ Saturation, Equal Air Entry/Rising Chest bilaterally) and note Depth of ET Tube
2. Blow up Cuff and check Cuff Pressure
3. Secure ET tube
4. Oropharyngeal Airway
5. Ensure correct Ventilation Settings, Ventilator attached and optimized
6. Recheck Vital Signs
7. Ensure adequate Sedation (Ketamine 1-2mg/kg/hour)



Basic Ventilation settings

BASELINE VENTILATOR SETTINGS		MONITOR
Mode	Volume SIMV or Volume A/C	Monitor PIP keep less than 30 cmH2O
FiO2	Start on 1 (100%) and wean rapidly	PaO2 if you have a blood gas, or keep SpO2 > 94%
Tidal Volume	6 - 8 ml/kg	PaCO2 if you have a blood gas or keep EtCO2 35 -45
PEEP	5 cmH2O	PaO2 if you have a blood gas, or keep SpO2 > 94%
I:E	1:2	
Rate	12-16 bpm (adults), 20-25bpm (pediatrics), 25bpm (neonates)	PaCO2 if you have a blood gas or keep EtCO2 35 - 45

- To Manipulate PaO2 change FiO2 or PEEP
- To Manipulate PaCO2 change Rate or Vt (Tidal Volume)
- Basic Weaning:** Monitor the patient's own efforts and wean rapidly if own effort increases i.e, patient produce good own tidal volumes and respiratory rate. Do a **RSBI** (Rapid Shallow Breathing Index) daily.
- RSBI=** Put patient on CPAP with a PEEP of 5 for 5 minutes and read the rate and tidal volume. Divide the rate by the tidal volume in liters i.e 22/0.45 is 48 therefore the patient is ready to be weaned because RSBI is 48 and must be less than 105 to start the weaning process.
- Target before extubation - First wean FiO2 to .4 (40%), then PEEP to 5cmH2O, then rate to 8 bpm before extubating.

Prolonged care in ICU DO FASTHUGSBID daily

– After initial resuscitation and stabilization phase (12 -24 hours):	
F	- Feeding (Start early NG feeding, if no bowel sounds start TPN. Note: Envenomation might affect peristalsis) / Fluids (if good urine output, maintain zero fluid balance)
A	- Analgesia if required / Antibiotics if required
S	- Sedation, reduce or increase
T	- Thromboprophylaxis
H	- Head up position
U	- Ulcer Prophylaxis (Gastric and Pressure Sore/Ulcer prevention)
G	- Glycemic Control
S	- Spontaneous Breathing Trial (RSBI)
B	- Bowel Sounds / Movements
I	- Indwelling catheters and lines (Remove or insert) / Imbalances – Correct electrolytes and fluid imbalances
D	- De-escalation of Drugs

POLYVALENT ANTIVENOM SPECIES



RINKHALS (*Hemachatus haemachatus*)

- **Distribution:** KZN, Mpumalanga, Western Cape, Eastern Cape, Northwest, Limpopo, Free State, Gauteng
- **Colour:** Black, brown or olive with white throat bands or black and yellow/orange body bands with yellow throat bands
- **Length:** 1.0-1.5m
- **Venom:** **Cytotoxic & Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis along with Painful Progressive Swelling



PUFF ADDER (*Bitis arietans*)

- **Distribution:** Throughout South Africa
- **Colour:** Colour varies but has V-shaped markings down the back pointing towards the tail
- **Length:** 0.9-1.2m but up to 1.4m
- **Venom:** **Cytotoxic**
- **Venom Effects:** Mixed Painful Progressive Swelling & Bleeding



GABOON ADDER (*Bitis gabonica*)

- **Distribution:** Coastal Northern KZN
- **Colour:** Various shades of pastel colours with blocks along the back and triangles down the sides
- **Length:** 1.2m can get bigger
- **Venom:** **Cytotoxic**
- **Venom Effects:** Mixed Painful Progressive Swelling & Bleeding



BLACK MAMBA (*Dendroaspis polylepis*)

- **Distribution:** KZN, Mpumalanga, Northern Cape, Northern Coastal parts Eastern Cape, Northwest, Limpopo, Gauteng
- **Colour:** Dark Olive, greyish brown or gunmetal grey
- **Length:** 2.8-3.2m but up to 4.5m
- **Venom:** **Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis with or without minor swelling



GREEN MAMBA (*Dendroaspis angusticeps*)

- **Distribution:** Coastal Bush KZN, Northern Coastal Bush Eastern Cape
- **Colour:** Uniform green with irregular yellow scales
- **Length:** 1.8-2.5m
- **Venom:** **Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis with or without minor swelling



MOZAMBIQUE SPITTING COBRA (*Naja mossambica*)

- **Distribution:** KZN, Mpumalanga, Northern Coastal Bush Eastern Cape, Northwest, Limpopo, Gauteng
- **Colour:** Brown with an orange/salmon belly and black bands on the neck
- **Length:** 1.2-1.6m
- **Venom:** **Cytotoxic**
- **Venom Effects:** Painful Progressive Swelling



CAPE COBRA (*Naja nivea*)

- **Distribution:** Western, Northern and Eastern Cape, Northwest, Free State
- **Colour:** Varied between yellow, brown, black, cream and a speckled phase
- **Length:** 1.4-1.6m
- **Venom:** **Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis



SNOUTED COBRA (*Naja annulifera*)

- **Distribution:** KZN, Mpumalanga, Northwest, Limpopo, Gauteng
- **Colour:** Yellowish brown with a yellow belly, or black and cream bands
- **Length:** 1.8-2.5m
- **Venom:** **Neurotoxic & Cytotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis along with Painful Progressive Swelling



FOREST COBRA (*Naja subfulva*)

- **Distribution:** Northern Coastal Bush KZN, Limpopo along the Pafuri River in KNP to Eastern Soutpansberg Mountains
- **Colour:** Black back half with a yellowish-brown front half
- **Length:** 2-2.7m
- **Venom:** **Neurotoxic & Cytotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis along with Painful Progressive Swelling

MONOVALENT ANTIVENOM SPECIES —



BOOMSLANG (*Dispholidus typus*)

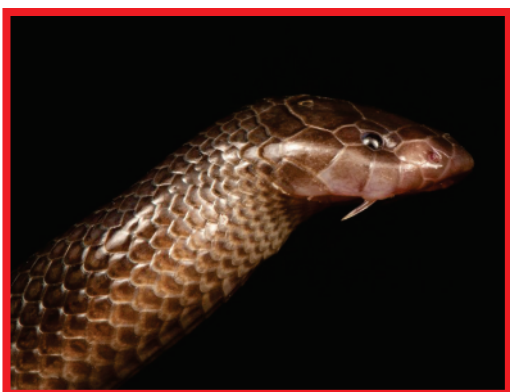
- **Distribution:** Widespread throughout South Africa where tree habitat is found
- **Colour:** Grey, Brown, Green, Red, Blue, Green with Black “bands”, black backs with yellow bellies
- **Length:** 1.5-2.0m
- **Venom:** **Haemotoxic**
- **Venom Effects:** Bleeding

OTHER SPECIES



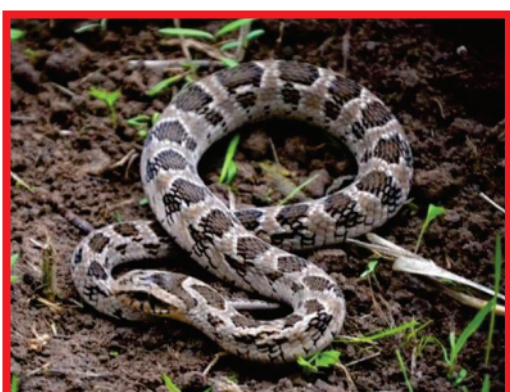
VINE SNAKE (*Thelotornis capensis*)

- **Distribution:** KZN, Mpumalanga, Northwest, Limpopo, Gauteng
- **Colour:** Cryptically coloured resembling a stick
- **Length:** 1.2-1.5m
- **Venom:** **Haemotoxic**
- **Venom Effects:** Bleeding



BIBRON'S STILETTO (*Atractaspis bibronii*)

- **Distribution:** KZN, Mpumalanga, Northern Cape, Northern Coastal Bush Eastern Cape, Northwest, Limpopo, Free State, Gauteng
- **Colour:** Body brown to blackish, belly may be white
- **Length:** 40-60cm, max 98cm.
- **Venom:** **Cytotoxic**
- **Venom effects:** Moderate swelling with potential of causing local tissue necrosis.



COMMON OR RHOMBIC NIGHT ADDER (*Causus rhombeatus*)

- **Distribution:** KZN, Mpumalanga, Western Cape, Eastern Cape, Northwest, Limpopo, Free State, Gauteng
- **Colour:** Dark brown Rhombic markings on the back. Body colour varies from light grey to brown. Characteristic "V" shape marking on the head.
- **Length:** 40-60cm. Max 1m
- **Venom:** **Cytotoxic**
- **Venom effects:** Moderate local swelling and pain.

Photo Credit: Neville's Snake and Reptile Rescue, Eastern Cape.

Even though localized symptoms could seem extreme, there is no antivenom for the treatment of stiletto and night adder bites.

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