

**Fig 1: 20 Minute Whole Blood Clotting Test (WBCT<sub>20</sub>)<sup>1,2</sup>**

- Warrel, DA (1999). Snake bite in sub-Saharan Africa. *Africa Health*, Vol 21(5), 5-8.
- Chippaux, JP. (2006). Clinic and Treatment of Envenomations (Figure 49). *Snake Venoms and Envenomations* (p. 220). Malabar, Fla.: Krieger Pub.

**IMPORTANT - Materials & Methods:** The WBCT<sub>20</sub> should be taken from every suspected envenomation patient in Africa. The test must be performed in a clean dry, glass tube free of preservatives, soaps, or other contaminants – even plain vacutainers must be precleaned on site. Assess at 20' precisely by use of a binomial system: runs/doesn't run (or liquid/solid). Partial clots & clots that rapidly degrade upon examination count as abnormal. Test against blood from a healthy donor if results seem unlikely in the context presented.

**Collection:** Draw/transfer 2 mL of venous blood, place into a clean/dry glass tube; leave it upright, open, undisturbed for 20 minutes at room temp.

**Test Assessment - Normal:** After exactly 20 minutes, pick up the tube and invert it. If a solid clot is retained, the test indicates normal coagulation.

**Test Assessment - Abnormal:** If clot breaks down quickly upon inversion of the tube or fails to coagulate, the test indicates a coagulopathy.



**Fig 1A:** 2 mL of whole blood is collected by venipuncture and placed in a glass tube to settle.

**Fig 1B:** Solid clot retained upon inversion of the tube at 20' – normal result/no coagulopathy.

**Fig 1C:** Clot degrades rapidly upon inversion at 20' – abnormal result/coagulopathy.

# Snakebite Assessment, Diagnosis, & Treatment Pyramid

## ABC<sub>IV</sub>

### 1° Patient Assessment (Physical Exam, Clinical Exams, Patient History)

- Physical Examination:** Look for local and systemic signs of neuromuscular impairment, abnormal bleeding and soft tissue damage (i.e. oedema/pain, necrosis, blistering, lymphadenopathy, etc.)
  - Clinical Examinations:** Laboratory/diagnostic exams; at minimum a whole-blood coagulation test (WBCT<sub>20</sub>) should be taken from all snakebite patients in sub-Saharan Africa.
- Place all patients without S/S<sub>x</sub> of envenomation under observation for the first 24 hours after the bite. Repeat 1° assessment during observation and proceed accordingly if S/S<sub>x</sub> develop; if patient remains asymptomatic discharge after 24 hours with anti-tetanus vaccine.**

By Jordan Benjamin & Sanda Ashe, Bio-Ken Snake Farm.



### Clinical Severity Score Oedema/Bleeding

	Oedema	Bleeding
Grade 1	Local oedema below wrist/ankle	Local bleeding from bite > 1 hr
Grade 2	Local edema does not pass elbow/knee	Bleeding from old or unrelated cuts/wounds
Grade 3	Oedema extends past major joint (elbow/knee)	Spontaneous bleeding from healthy mucosa (i.e. gingiva)
Grade 4	Extensive oedema does not pass shoulder/hip	Active hematemesis (or other visible internal bleeding)
Grade 5	Extensive oedema beyond the base of the bitten limb	Cerebral (sub-arachnoid) or abdominal hemorrhage

**AND**

- Neurological S/S<sub>x</sub> Absent
- WBCT<sub>20</sub> = Normal
- No Abnormal Bleeding
- Oedema, Pain, Discolouration Present

**AND/OR**

- Neurological S/S<sub>x</sub> = Absent
- WBCT<sub>20</sub> = Abnormal
- Abnormal Bleeding
- Oedema/Pain Variable

- Progressive Neuromuscular S/S<sub>x</sub>
- Ptosis = Pathognomonic
- No Coagulopathy/Bleeding Expected
- Oedema/Pain Variable

- S/S<sub>x</sub> of Venom Ophthalmia
- Recent H<sub>x</sub> of Ocular Envenomation
- AND No Findings Suggestive of Snakebite Envenomation in 1° Assessment

**Signs & Symptoms**

**Syndrome = Oedema/Pain**

- Limited or Extensive Blistering, Necrosis, Discolouration May Be Present
- Severe pain common with this syndrome
- Arrhythmias possible with *Atractaspis*

**Syndrome = Coagulopathy/Bleeding**

- ★ Coagulopathy and/or Abnormal Bleeding (External or Internal) ★
- Early Stages Can Present Without Obvious External Hemorrhage /Late with severe internal hemorrhage

**Syndrome = Neurotoxic**

Characterized by Progression of S/S<sub>x</sub>

- Curare-like [Cobra] and Muscarinic [Mamba] Syndromes Converge at Ptosis/Cranial Nerve Paralysis and Descending Paralysis

**Syndrome = Venom Ophthalmia**

- ★ Pain, Conjunctivitis, Local Inflammation and Discharge, Photosensitivity ★
- Not limited to spitting cobra as venom can project during strikes.

**Syndrome**

**Local Oedema < Grade 3**

**1° Treatment:**

- No antivenom if oedema < 1/2 of the bitten limb
- If confirmed Puff Adder bite to finger or small child, 1x amp of appropriate polyvalent antivenom is generally sufficient.

**Extensive Oedema > Grade 3**

**1° Treatment:**

- 2x ampoules of appropriate polyvalent /trivalent antivenom covering *Bitis* and Spitting Cobras

**Coagulopathy (DIC)/Bleeding**

**1° Treatment:**

- *Echis*: 2x ampoules polyvalent **OR** 1x ampoule monovalent/trivalent
- *Dyspholidus*: 1x amp monovalent
- If unknown species T<sub>x</sub> for *Echis/Bitis*
- Repeat antivenom administration every 3<sup>rd</sup> hour after treatment only if confirmed ext./int. bleeding persists.

**Progressive Neurotoxicity**

**1° Treatment:**

- If species unidentified then treat with initial dose 3x – 4x ampoules of polyvalent antivenom effective against *Naja/Dendroaspis* species in your location (see manual).
  - Neostigmine/atropine, aggressive airway management, and mechanical ventilation if needed
- These bites frequently require a higher initial dose of antivenom (appx. 3-5 amps initial)

**Venom Ophthalmia**

**1° Treatment:**

- Antivenom is not indicated for ocular envenomation.
- Irrigate with copious amounts of water/normal saline as for a chemical exposure. Analgesia drops may facilitate this procedure.

**Primary Treatment (Antivenom)**

**PRETREATMENT with 0.25 mg of Epinephrine subcutaneously will reduce the risk of severe reactions to antivenom therapy.** Treat anaphylactic shock with coadministration of 1:1000 Epinephrine IM (0.15 mg ped/0.3 - 0.5 mg adult) and H1+H2 antihistamines. S/S<sub>x</sub> of mild reaction (dry cough and local pruritus/urticaria) may be managed with antihistamines alone. In either case, continue antihistamine therapy for ≥ 24 hrs to prevent recurrence of S/S<sub>x</sub>. **There are no absolute contraindications for antivenom therapy when it is appropriate.**

- Compartment syndrome very rare even with dramatic oedema; check circulation (cap refill or pulse), sensation, movement (CSMs) distal to bite. CSMs intact → don't operate
- Blisters sterile until opened, avoid aspiration if possible

- Assess for clinical anemia/internal bleeding (Sub-arachnoid, abdominal)
- Transfuse if HCT < 18% (ideally > 1 hr after serum to prevent consumption of clotting factors by circulating venom)
- Suspected Cerebral hemorrhage → Diuretics, Ice, Elevation, Analgesics

- ABC's: Prepare for airway control/manual ventilation → Bag-valve mask (ambu), Oxygen, airway adjuncts
- Neostigmine + Atropine may temporarily reverse symptoms and gain time for antivenom to take effect

- Corneal erosion possible → fluorescein stain/slit lamp exam
- Antibiotic drops if needed

**Secondary Treatments (2° Complications)**

- Gently wash bitten limb with soap/water, clean/dress wounds and treat complications of first aid. Antibiotics can be given for S/S<sub>x</sub> infection but are not always needed. Kinesiotherapy (PT) facilitates faster recovery.
- Give analgesics when needed but do not give NSAIDs/other anti-inflammatories as they may provoke or aggravate bleeding disorders. Paracetamol → Dipyron → Tramadol → Opiates and/or Benzodiazepenes.
- S/S<sub>x</sub> shock, low BP (<90/60), serum or transfusion reactions, dehydration, hematuria, no H<sub>x</sub> urine output ≥ 12-24 hours → Initiate fluid therapy with 500 mL – 1 L of Ringers Lactate or Normal Saline STAT
- Patients with S/S<sub>x</sub> of renal complications that persist/appear after initial fluid therapy can be Foley-cathetered and alternately given 0.9% NS/D5W to maintain urine output until definitive care can be reached.