Author: Catherine Vretta Reviewer: Corey Heitz

Case Title: Snake Bite

# Target Audience: med students, paramedics, residents- primarily Emergency Medicine residents

Primary Learning Objectives: key learning objectives of the scenario

 1. Provides fluid resuscitation in response to vital sign abnormalities

 2. Identifies physical exam findings and patient symptoms as being due to envenomation

 3. Contacts appropriate source(s) for information regarding treatment of envenomation

 4. Initiates Antivenin therapy (polyvalent Crotalidae immune Fab)

Secondary Learning Objectives: detailed technical goals, behavioral goals, didactic points

1. Performs local wound care
2. Provides tetanus update, if indicated
3. Provides pain control in response to patient symptoms
4. Communicates disposition and treatment plan with patient
5. Admits patient to ICU service

Checklist/Sequence of Critical actions

##  1. Initiates fluid resuscitation in response to abnormal vital signs

 2. Provides local wound care

 3. Updates tetanus as indicated

 4. Provides pain control

 5. Treats with antivenin

 6. Communicate disposition and treatment plan with patient

 7. Admits patient to ICU service

Allowed time to perform critical actions

It is anticipated that participant would perform all critical actions in a 20 minute time frame / standard time frame to complete a single oral board case

Environment (if using as a simulation case)

1. Room set-up: standard Emergency Department room
2. Props: intravenous supplies including IV catheters, normal saline, an assortment of narcotic pain medicines, antibiotics, wound care supplies (cleansing solution, gauze pads, bandages), cardiac monitor with pulse oximetry, airway kit, crash cart with defibrillator
3. Distractors: none

## Actors (optional)

1. Roles – patient, nurse
2. Who may play them – other residents, other students, actors
3. Action Role – patient and nursing roles will provide interaction to participant in a simulated oral board case

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**CASE SUMMARY**

**CORE CONTENT AREA**

Environmental – snake bite

**SYNOPSIS OF HISTORY/ Scenario Background**

Some items may be given freely or must be requested as indicated below. It is often helpful to provide the learner with prologue to describe the setting/surrounding of the scenario.

Chief Complaint: 35 year old male complaining of a snake bite

Vital signs: P115 T98.8 BP 98/70 R14

History of present illness: Patient states he accidently stepped on a snake while camping in the woods and was bitten on his lower leg. He states he heard a distinctive rattle sound just prior to being bitten. He is an avid outdoorsman and states he recognized the snake as a rattlesnake. He states this happened approximately one hour ago and he is complaining of nausea and pain to his lower leg. He has had no vomiting.

Given if asked:

Past medical history: Hypertension

Medications: Lisinopril

Allergies: None

Family history: Hypertension

Social history: Non-smoker, social drinker, no street drugs. No recent travel. No sexual partners. Last Td 6 years ago.

**SYNOPSIS OF PHYSICAL**

Initial scenario conditions: Vital signs, initial physical examination, any pertinent patient physiology

Vital signs: P 115 T 98.8 BP 98/70 R14

The physical exam is essentially normal, except for the extremities: Right calf exam reveals visible fang marks anterior midshaft with localized ecchymosis and tenderness. There is swelling to the posterior calf encompassing approximately 50 percent of the lower leg. The right calf measures 36 cm compared to 30 cm on the left lower extremity at the same level. There is no active bleeding at the site. There are good pulses and sensation is intact. There is decreased range of motion with pain limitation. The pulses are normal. Neurologic: normal sensation, motor exam is normal except for right lower extremity which is limited secondary to pain.

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**CRITICAL ACTIONS**

**Scenario branch points/ PLAY OF CASE GUIDELINES**

1. **Critical Action**

Initiates fluid resuscitation in response to abnormal vital signs

Cueing Guideline: Repeat vital signs will worsen if no IV resuscitation is performed. Nurse informs participant that repeat Pulse has increased from 115 to 140 and that Blood pressure is now 76/55 down from 98/70.

1. **Critical Action**

Performs local wound care (cleansing, sterile dressing)

Cueing Guideline: Nurse will ask participant if anything needs to be done with bite site.

1. **Critical Action**

 Provides tetanus in response to out-of-date tetanus.

Cueing Guideline: If participant does not ask tetanus status, nurse will ask the participant if he/she asked. If he/she elicits the tetanus status but does not order a tetanus update, the nurse will ask whether or not 6 years means the patient is up to date.

1. **Critical Action**

Recognizes local and systemic symptoms resulting from snake bite and initiates Antivenin therapy (polyvalent Crotalidae immune Fab)

Cueing Guideline: Nurse will ask participant if any medication needs to be given for snake bites. Participant will be allowed to consult toxicology or medical text. It is assumed that most participants will need some resources given that treatment of venomous snakes is rare; see scoring guidelines for more information.

1. **Critical Action**

Provides pain control

Cueing Guideline: Patient will complain of pain to participant. Patient will then ask participant if something for pain can be given.

1. **Critical Action**

Communicates disposition and treatment plan with patient

Cueing Guideline:Patient will ask the participant what is going to happen. If no disposition decision has been made, nurse will ask participant what the plan is going to be.

1. **Critical Action**

Admission of patient to an ICU service

Cueing Guideline: Admitting physician should ask what level of care they feel the patient should go to.

**SCORING GUIDELINES**

(Critical Action No.)

1. Failure to fluid resuscitate will result in failure of case.

2. Failure to perform wound care will result in a downgrade of case.

3. Failure to update tetanus will result in a failure of case.

4. Failure to give antivenin will result in failure of case. However, participant is not expected to know dose or dosing schedule of antivenin and will be encouraged, even expected to use outside resources for dosing schedule and antivenin selection. Prior knowledge of dose will add to the participants score.

5. Failure to provide pain control will result in a downgrade of case.

6. A need for prompting by the patient to be told what the plan will be will result in a downgrade.

7. Failure to admit patient will result in a downgrade of the case, however participant will be encouraged to use outside resources for disposition and is not expected to know admission criteria or subsequent antivenin dosing schedule. An increased score can be given for suggesting an ICU admission.

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**HISTORY**

**Onset of Symptoms:** One hour ago.

**Background Info:** Patient is a 35 year old male complaining of a snake bite. Patient states he accidently stepped on a snake while camping in the woods and was bitten on his lower leg. He states he heard a distinctive rattle

**Chief Complaint:** I was bitten by a snake about an hour ago. I stepped on it while camping and heard it rattle.

**Past Medical Hx:** Hypertension

**Past Surgical Hx:** None

**Habits:** Smoking: None

ETOH: None

Drugs: None

**Family Medical Hx:** Patient was adopted – no family hx

**Social Hx:** Marital Status: Single

Children: None

Education: High school graduate

Employment: Carpenter

**ROS:** List pertinent positives and negatives: As above otherwise negative

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**PHYSICAL EXAM**

**Patient Name:** James Patient **Age & Sex:** 35 year old male

**General Appearance:** Well-developed, well-nourished male in moderate distress from pain

**Vital Signs:** P 115 T98.8 R14 BP 98/70

**Head:** Normal

**Eyes:** Normal

**Ears:** Normal

**Mouth:** Normal

**Neck:** Normal

**Skin:** R anterior calf reveals ecchymosis and fang marks, warm and dry skin, no active bleeding (If the case is done as a simulation, appropriate moulage should be used. Alternatively, a picture may be used. If no moulage or picture is available, provide a verbal description)

**Chest:** Normal

**Lungs:** Normal

**Heart:** Tachycardic, no extra heart sounds

**Back:** Normal

**Abdomen:** Normal

**Extremities:** Right calf anterior midshaft reveals ecchymosis, fang marks, tenderness to palpation, circumference of 36 cm (left midshaft is 30 cm) good pulses (see above for sim case)

**Rectal:** Normal

**Neurological:** Normal

**Mental Status:** Normal

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**STIMULUS INVENTORY**

#1 Emergency Admitting Form

#2 CBC

#3 BMP

#4 U/A

#5 ABG

#6 Cardiac Enzymes

#7 Toxicology

#8 Debriefing materials

**For Examiner Only**

**LAB DATA & IMAGING RESULTS**

**Stimulus #2 Stimulus #5**

**Complete Blood Count (CBC) Arterial Blood Gas**

WBC 13.4/mm3 pH 7.16

 Hgb 14.6g/dL pCO2 40 mm Hg

 Hct 42.4% pO2 140 mm Hg

 Platelets 249/mm3 O2 Sat100%

Differential

 Segs 64% **Stimulus #6**

 Bands 2% **Cardiac Enzymes**

 Lymphs 19% CPK 780

 Monos 9% Myoglobin 13ng/ml

 Eos 8% Troponin 0.0ng/ml

**Stimulus #3 Stimulus #7**

**Basic Metabolic Profile (BMP) Toxicology**

Na+ 141mEq/L Serum

K+ 5mEq/L Salicylate Neg

CO2 22mEq/L Acetaminophen Neg

Cl- 98mEq/L Tricyclics Neg

Glucose 145mg/dL ETOH mg/dl

BUN 22mg/dL

Creatinine 0.7mg/dL Urine

Cocaine Neg Cannabinoids Neg

**Stimulus #4** PCP Neg

**Urinalysis (U/A)** Amphetamines Neg

Color yellow Opiates Neg

Sp gravity 1.010 Barbiturates Neg

Glucose neg Benzodiazepines Neg

Protein neg

Ketone neg **Verbal Reports**

Leuk. Est. neg pulse ox 99% on RA

Nitrite neg

WBC 0-1

RBC 0-1

**Learner Stimulus #1**

 **ABEM General Hospital**

 **Emergency Admitting Form**

Name: James Patient

Age: 35 years

Sex: Male

Method of Transportation: Private car

Person giving information: Patient

Presenting complaint: Snake bite to lower leg

**Background:** Patient was bitten by a snake approximately one hour ago to right calf. He is complaining of pain to lower leg with swelling. He drove himself directly from his campsite to the emergency department.

**Triage or Initial Vital Signs**

 BP: 98/70

 P: 115

 R: 14

 T : 98.8 rectally

**Learner Stimulus #2**

**Complete Blood Count (CBC)**

WBC 13.4/mm3

 Hgb 14.6g/dL

 Hct 42.4%

 Platelets 249/mm3

Differential

 Segs 64%

 Bands 2%

 Lymphs 19%

 Monos 9%

 Eos 8%

**Learner Stimulus #3**

**Basic Metabolic Profile (BMP)**

Na+ 141mEq/L

K+ 5mEq/L

CO2 22mEq/L

Cl- 98mEq/L

Glucose 145mg/dL

BUN 22mg/dL

Creatinine 0.7mg/dL

**Learner Stimulus #4**

**Urinalysis (U/A)**

Color yellow

Sp gravity 1.010

Glucose neg

Protein neg

Ketone neg

Leuk. Est. neg

Nitrite neg

WBC 0-1

RBC 0-1

**Learner Stimulus #5**

**Arterial Blood Gas**

pH 7.16

pCO2 40 mm Hg

pO2 140 mm Hg

O2 Sat 100%

**Learner Stimulus #6**

**Cardiac Enzymes**

CPK 780

Myoglobin 13 ng/ml

Troponin 0.0 ng/ml

**Learner Stimulus #7**

**Toxicology**

Serum

Salicylate Neg

Acetaminophen Neg

Tricyclics Neg

ETOH <10 mg/dl

Urine

Cocaine Neg

Cannabinoids Neg

PCP Neg

Amphetamines Neg

Opiates Neg

Barbiturates Neg

Benzodiazepines Neg

**Feedback/ Assessment Form**

**Snake Bite**

**Candidate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Examiner \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Critical Actions:**

* Critical Action #1: Initiates fluid resuscitation in response to abnormal vital signs.
* Critical Action #2: Performs local wound care
* Critical Action #3: Provides tetanus update
* Critical Action #4: Initiates Antivenin therapy (polyvalent Crotalidae immune Fab)
* Critical Action #5: Provides Pain control
* Critical Action #6Admission of patient

**Dangerous Actions:** (Performance of one dangerous action results in failure of the case)

* Dangerous Action #1: Provision of local wound care with/without antibiotics without consideration of antivenin therapy
* Dangerous Action #2: Discharge home

**Overall Score:**

* Pass
* Fail

**For Examiner**

Date: Examiner: Examinee(s):

Scoring: In accordance with the Standardized Direct Observational Tool (SDOT)

The learner should be scored (based on level of training) for each item above with one of the following:

 NI = Needs Improvement

 ME = Meets Expectations

 AE = Above Expectations

 NA= Not Assessed

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Critical Actions**  | **NI** | **ME** | **AE** | **NA** | **Category** |
| Initiates IV resuscitation |  |  |  |  | PC, MK, PBL |
| Performs local wound care |  |  |  |  | PC, MK |
| Provides tetanus |  |  |  |  | PC, MK |
| Initiates Antivenin therapy (Crotalidae immune Fab) |  |  |  |  | PC, MK, PBL, SBP |
| Provides pain control |  |  |  |  | PC, MK, PBL |
| Discusses plan with patient |  |  |  |  | ICS |
| Admission of patient |  |  |  |  | PC, MK SBP, ICS |

The score sheet may be used for a variety of learners. For example, in using the case for 4th year medical students, the key teaching points of the case may be the recognition of shock and treatment with appropriate fluid resuscitation. Other items may be marked N/A= not assessed.

Category: One or more of the ACGME Core Competencies as defined in the SDOT

 PC= Patient Care

Compassionate, appropriate, and effective for the treatment of health problems and the promotion of health

 MK= Medical Knowledge

Residents are expected to formulate an appropriate differential diagnosis with special attention to life-threatening conditions, demonstrate the ability to utilize available medical resources effectively, and apply this knowledge to clinical decision making

 PBL= Practice Based Learning & Improvement

Involves investigation and evaluation of their own patient care, appraisal and assimilation of scientific evidence, and improvements in patient care

 ICS= Interpersonal Communication Skills

Results in effective information exchange and teaming with patients, their families, and other health professionals

 P= Professionalism

Manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population

 SBP= Systems Based Practice

Manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value

**Keywords:** Crotalidae, Snakebite, Antivenin, ecchymosis

**References:**

Dart, Richard. "Reptile Bites." *Emergency Medicine: A Comprehensive Study Guide*. Ed. Judith Tintinalli. McGraw-Hill, 2004. 1201-1206.

**Has this work been previously published?** No

**Debriefing Materials:**

Included information can be used after case for discussion, question/answer session, depending on the level of the learner.

**Snake Envenomations**

* Only venomous snakes in North America are pit vipers
	+ Rattlesnakes
	+ Copperheads
	+ Water moccasins
* Presenting signs/symptoms
	+ Fang marks
	+ Local pain and swelling
	+ Pain
	+ Ecchymosis
* Clinical Findings
	+ Hypotension
	+ Coagulopathy
	+ Paresthesias
	+ Changes in taste sensation
* Workup and evaluation
	+ PT/INR, PTT
	+ Complete blood count
	+ Grading:
		- Minimal: local swelling, no systemic signs or laboratory abnormalities
		- Moderate: distant spreading, systemic signs/symptoms (nausea, tachycardia, hypotension, paresthesias, no significant bleeding)
		- Severe: hemorrhage, severe hypotension and cardiovascular collapse
	+ Absence of findings at 12 hours rules out envenomation
		- Approximately 25% of bites are “dry bites”
* Treatment
	+ Local wound care, immobilization of affected extremity *below* heart
	+ Tetanus if indicated
	+ Antivenin (crotalidae polyvalent antibody fragments, CroFab)
		- Equine derived (skin test recommended prior to dosing)
		- Indicated for progressive symptoms, systemic symptoms, coagulopathy
		- Dosing: 10 vials IV initial dose
		- Consult toxicology/poison control
* Disposition
	+ Absence of findings at 12 hours: no envenomation
		- Local wound care, tetanus, discharge
	+ Antivenin administration
		- ICU admission