



Venomous Snakebite in Mountainous Terrain: Prevention and Management

Jeff J. Boyd MBBS UIAGM, Giancelso Agazzi MD,
Dario Svajda MD, Arthur J. Morgan MBBCh, Silvia
Ferrandis MD, Robert Norris MD

*Official Recommendations of the ICAR
and UIAA MedComs*

“Snakebite in the Mountains”

Wilderness & Environmental Medicine.
2007. Volume 18, Number 3.



Wilderness and Environmental Medicine, **18**, 190–202 (2007)

CONCEPTS

Venomous Snakebite in Mountainous Terrain: Prevention and Management

Jeff J. Boyd, MBBS, UIAGM; Giancelso Agazzi, MD; Dario Svajda, MD; Arthur J. Morgan, MBBCh; Silvia Ferrandis, MD; Robert L. Norris, MD

From the Mineral Springs Hospital, Banff, Canada (Dr Boyd); the Italian Alpine Club Medical Commission, Colzate, Italy (Dr Agazzi); the Mountain Rescue Medical Commission, Požega, Croatia (Dr Svajda); the Mountain Club of South Africa National Rescue Committee, Pretoria, South Africa (Dr Morgan); the Hospital Comarcal del Pallars, Tremp, Spain (Dr Ferrandis); and the Stanford University Medical Center, Stanford, CA (Dr Norris).



Category 1 Continuing Medical Education credit for WMS member physicians is available for this article. Go to <http://wms.org/cme/cme.asp?whatarticle=1831> to access the test questions.

“Snakebite in the Mountains”

Viper bites: treat or ignore?

Review of a series of 99 patients bitten by *Vipera aspis* in an alpine Swiss area

Jacques Petite

Hôpital Régional, Martigny, Switzerland

Summary

In a well defined alpine area of Switzerland (Valais, about 300 000 inhabitants, tourists included) we studied retrospectively over 32 years, 99 patients bitten by vipers (*Vipera aspis*, the likely unique species in this area). The annual incidence was estimated at 3/100 000, as in other European countries. The mortality was 0% for the adults. The patients, 72 adults and 17 children (13 years and less), were classified in four groups: grade 0 no envenomation (8%), grade 1 minimal (42%), grade 2 moderate (40%), and grade 3 severe envenoma-

tion (10%). The 10 patients of grade 3 showed impressive clinical signs and blood abnormalities, as exemplified by our three most severe cases. Only patients of grade 3 must be treated with antivenom and other intensive treatments, but all patients, even grade 1, especially small children, must be observed for several hours.

Key words: viper bites; *Vipera aspis*; Valais; Switzerland



“Snakebite in the Mountains”

Epidemiology

– Viperids

- Old World Vipers

- European asp (*Vipera aspis*)
- Common adder (*Vipera berus*)
- Nose-horned viper (*Vipera ammodytes*)
- Russell’s viper (*Daboia russelii*)
- Saw-scaled viper (*Echis carinatus* & *sochureki*)

- Pit Vipers

- Rattlesnakes (Crotalids)
- Himalayan pit viper (*Gloydius himalayanus*)

– Elapids

- Cobras (eg. *Naja naja*)
- Spitting cobras and Rinkhals (*Hemachatus hemachatus*)

“Snakebite in the Mountains”

– European asp (*Vipera aspis*)



“Snakebite in the Mountains”

– Common adder (*Vipera berus*)



“Snakebite in the Mountains”

– Nose-horned viper (*Vipera ammodytes*)



“Snakebite in the Mountains”

– Russell’s viper (*Daboia russelii*)



“Snakebite in the Mountains”

– Saw-scaled viper (*Echis carinatus* & *sochureki*)



“Snakebite in the Mountains”

– Rattlesnakes (Crotalids)



“Snakebite in the Mountains”

– Himalayan pit viper (*Gloydius himalayanus*)



“Snakebite in the Mountains”

– Cobras (eg. *Naja naja*)



“Snakebite in the Mountains”

– Spitting cobras and Rinkhals (*Hemachatus hemachatus*)





“Snakebite in the Mountains”

Epidemiology - hazard of snakebite

- only 15% of 3000 species dangerous
- pit viper bites - only 80% envenomation
- some elapids - only 20% envenomation
- case fatality rate - 1800's - 5-25%
 - critical medical care - 2.6%
 - antivenom - 0.3%
 - Nepal - 27%

The background of the slide is a black and white photograph. On the left side, there is a close-up of a snake's head, showing its scales and eyes. On the right side, there is a blurred image of a person's face, looking towards the camera.

“Snakebite in the Mountains”

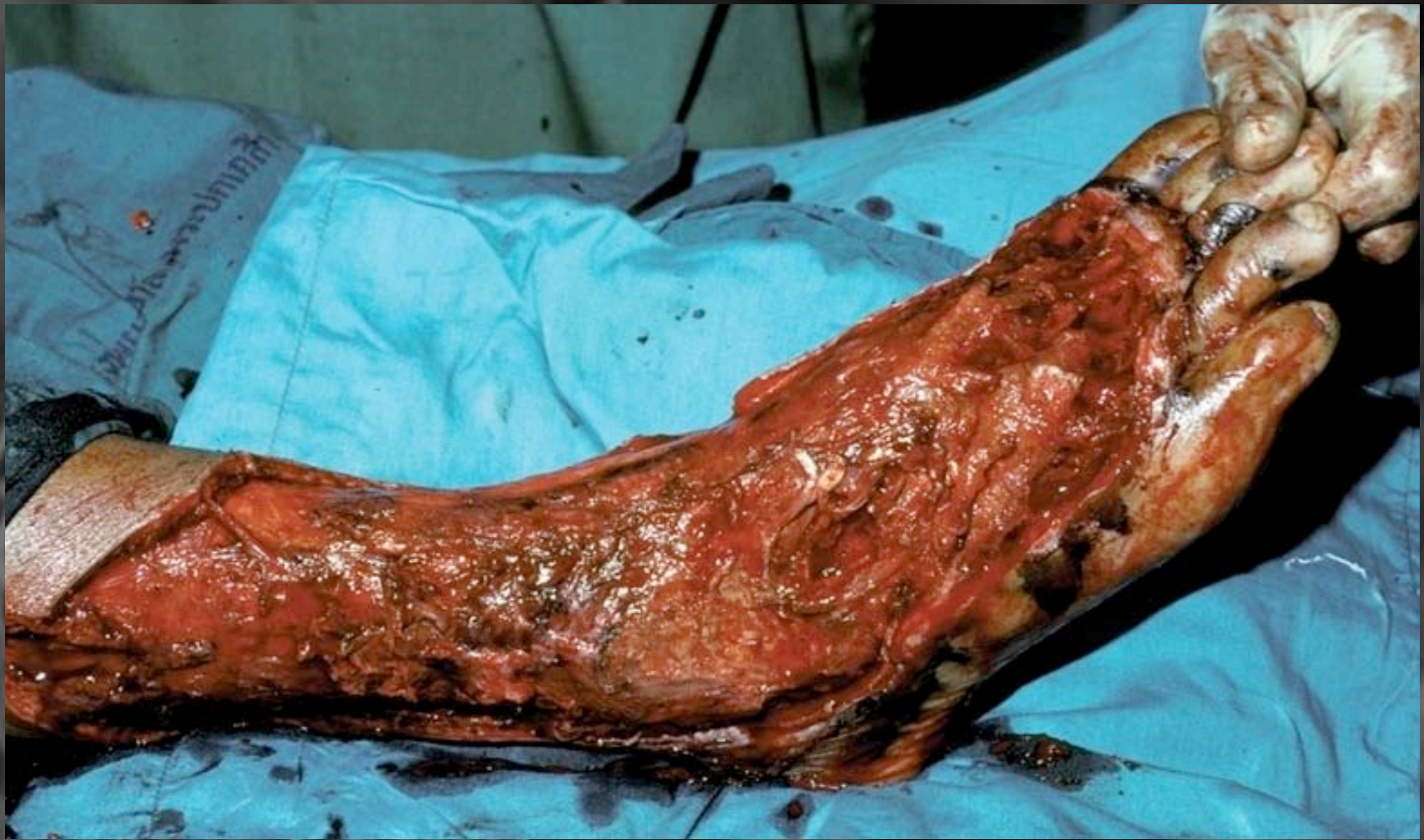
Toxicity and Symptoms/Signs

- **Vipers (cellular and clotting toxins)**
 - Local effects
 - Pain
 - Swelling
 - Bleeding, bruising
 - Tissue destruction
 - Systemic effects
 - Generalized bleeding
 - Shock
 - Cessation breathing
 - Early collapse

“Snakebite in the Mountains”



“Snakebite in the Mountains”





“Snakebite in the Mountains”

Toxicity and Symptoms/Signs

- Elapids (nervous system toxins)
 - Systemic effects
 - Eyelid drooping
 - Difficulty speaking
 - Cessation breathing
 - (Generalized bleeding)
 - Local effects (Cobras)
 - Tissue destruction
 - Spitting cobras & rinkhals
 - Irritation eye
 - Permanent loss vision

“Snakebite in the Mountains”





“Snakebite in the Mountains”

Prevention

- **Prepare**
 - Learn before
 - References & photos
 - Management plans (logistics, antivenom)
- **Clothing**
 - Baggy (“bloused”)
 - Boots/gaitors
 - Gloves



“Snakebite in the Mountains”

Prevention

- Look
 - Ahead
 - Torch/flashlight
 - Care cliffs and water
 - Probe
- Sleeping
 - Closed space
 - Above floor
 - Check bed

A black and white photograph serves as the background for the slide. In the foreground, the head of a snake with a distinct diamond-shaped pattern on its hood is visible on the left side. In the background, the face of a person is partially visible, looking towards the camera with a slight smile.

“Snakebite in the Mountains”

Prevention

- Snakes
 - Leave them alone
 - Dead snakes can envenomate
- If bite
 - ? Need identify
 - Identify safely (strike 1/2 length)
 - Zoom photo
 - Thick bag if killed

“Snakebite in the Mountains”





“Snakebite in the Mountains”

On-Site Treatment - First Aid

- **Safety, Victim Comfort**
- **Basic Life Support**
 - CPR early
 - Prolonged rescue breathing
- **Identify (?)**
- **Evaluate bite**
 - Bite
 - Mark leading edge with time
- **Remove constrictions**
 - Rings, watches, constricting clothing
- **Splint**



“Snakebite in the Mountains”

On-Site Treatment - First Aid

- DO NO HARM
 - NO incisions, excision, heat, cold, electrical shocks, alcohol or stimulants, (no strychnine!)
- No constriction bands or tourniquets
- No mechanical suction
 - Does not extract venom
 - May impair natural oozing of venom
 - May increase tissue damage

“Snakebite in the Mountains”



“Snakebite in the Mountains”



“Snakebite in the Mountains”

On-Site Treatment - First Aid

- **Pressure immobilization**
 - **Elapid bites only**
 - **(Best not true cobras (local toxicity))**
 - **Reduces absorption and toxicity**
 - **Elastic bandage or stretchy clothing**
 - **Fingers/toes up limb, over bite, to top**
 - **Correct pressure (like sprained ankle)**
 - **Splint/sling**
 - **Second wrap over splint**
 - **Leave in place**



“Snakebite in the Mountains”

On-Site Treatment - First Aid

- Pain control
 - Paracetamol/acetaminophen
 - Not aspirin or ibuprofen
- Fluid (Food)
 - Clear fluids
 - Best no solid food
- Logistics
 - Mobilize & transport !EARLY!
 - Expert advice (Poison Centre, Emergency Departments)
 - Adequate team (Rescue breathing hours - days)



“Snakebite in the Mountains”

On-Site Treatment - Advanced Medical

- Monitoring
 - Vital signs
 - ECG and oximetry monitoring
- Intravenous fluids
 - Shock resuscitation
 - Intraosseous access
- Oxygen
- Analgesia
 - Opiates
 - Ketamine
- Advanced life support
 - Shock, anaphylaxis, cardiac dysrhythmias
- Airway intervention
 - RSI & endotracheal intubation



“Snakebite in the Mountains”

On-Site Treatment - Advanced Medical

- Antivenom
 - Field administration (esp. remote/delayed or Elapids)
 - Prepared shock, airway intervention
 - Intravenous or intraosseous
 - No skin pre-testing
- Anticholinesterase Trial
 - Post-synaptic blockers (Cobras, Tiger Snake, ? Others)
 - Neostigmine or edrophonium
 - Preload atropine
- Observation
 - Expert advice
 - Minimum 24 hours if Elapid, even if asymptomatic

“Snakebite in the Mountains”

Conservation

