Management of Crotaline Snakebite in the United States

EAPCCT

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My Thanks To Everyone Who Made This Presentation Possible
The Stats

• NPDS 2010

<table>
<thead>
<tr>
<th>Snake</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copperhead</td>
<td>1428</td>
<td>0</td>
</tr>
<tr>
<td>Cottonmouth</td>
<td>193</td>
<td>0</td>
</tr>
<tr>
<td>Rattlesnake</td>
<td>1252</td>
<td>3</td>
</tr>
<tr>
<td>Unk Crotaline</td>
<td>576</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3449</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>

• 3-5 death/yr in United States
  - CDC Wonder in Clin Toxicol 2009;47:44-47
7 T’s of Snakebite

- Testosterone
- Tequila (alcohol)
- T-shirt
- Truck, usually with gun rack
- Teasing
- Tattoos
- Teeth (missing)
The Three Groups of Crotaline Snakes

- Rattlesnakes
- Cottonmouth snake
- Copperhead Snake
The Snakebite Patient

- Determine bite circumstances
  - Geographic location
  - Wild or captive snake
- 3 types of injury
  - Local injury
    - pain, swelling, ecchymosis, loss of tissue
  - Coagulopathy
    - low platelet count, INR/PT, fibrinogen, in rare cases, spontaneous bleeding
  - Systemic
    - Hypotension, shock, neurological signs
Signs of Local Injury
Monitoring of Local Injury
Natural Course of Envenoming is to Worsen
Effects - Hematologic

- Thrombocytopenia
- Coagulopathy (elevated PT/PTT)
- Low fibrinogen (increased FSP)
- Bleeding
Effects – Systemic

- Hypotension, tachycardia
- Nausea/vomiting
- Diaphoresis
- Metallic taste
- Painful adenopathy
- Neurologic effects with some bites (e.g., mojave and others)

- 27 yo man Western Diamondback bite
  - 1136 Vomiting, severe pain and swelling. Repeatedly hypotensive
  - 1345 BP 90/30
  - 1500 Fasciotomy
  - 1715 Dopamine
  - 1800 Intubation
  - 1930 4 vials Wyeth AV
  - Death 2 days later
Venoms Vary Within A Single Species

Don’t Judge A Snake By Its Phenotype!

Provided by Richard Straight, PhD
Just a Flesh Wound

• A 32 year old man tagging a rattlesnake
  – Glancing blow resulting in a small laceration

• A few minutes later
  – “funny look” and fell to the ground.

• EMS
  – Near respiratory arrest and intubated the patient endotracheally

• Severe coagulopathy, swelling arm to chest
First Aid

- **Recommended**
  - Immobilization

- **Discouraged**
  - Incision and Suction
  - Tourniquets and constriction bands
  - Prolonged ice therapy
  - Electric shock therapy
Treatment

• Supportive Care
  – Position of Limb
  – Local wound care
  – Crystalloid fluids
    • 20 ml/kg of isotonic fluid needed, with ongoing resuscitation as clinically indicated. Multiple liters are need for adult victim.
  – Blood products rarely needed.
  – Tetanus prophylaxis
Elevation of Limb

- Elevate limb once patient has reached a facility with antivenom available.
Production of Fab Antivenom
Crotaline Snakebite Management Algorithm

Figure 1: Unified Treatment Algorithm for the Management of Pit Viper Snakebite in the United States.

Lavonas et al. BMC Emergency Medicine 2011, 11:2
Administration of CroFab

Patient with Indication for CroFab(TM) Administration (Progression)

Establish Initial Control of Envenomation By Administering 4 - 6 Vials of CroFab(TM)

Initial Control Achieved?

Yes

Infuse Additional 2 Vial Doses at 6, 12 and 18 Hours After Initial Control is Achieved

No
Recurrence of Venom Effect

Based on: Seifert et al, 1997²
Late Hematologic Venom Effects are Common in Southwest US

- Ruha, *et. al.* (*Toxicon*, 2010)
  - Followed 66 rattlesnake patients after discharge
    - High risk cohort; 42/66 (64%) had early hematologic venom effects
    - All patients received FabAV
  - Late hematologic venom effects in 21/66 (32%)
    - 5/66 (8%) severe thrombocytopenia or defibrinogenation
    - No late bleeding events
But Late Bleeding is Rare

• 18 cohort studies with 901 patients treated with FabAV
  – 5 medically significant late bleeding events
    • Risk: 0.6% (95% CI: 0.2 – 1.9%)
    • 3 patients transfused; all recovered fully
• 3 published case reports of late bleeding
  – 1 death (ICH)
  – 2 pts receiving transfusions
Crotaline IgG Antivenom Recurrence

- 354 consecutive cases reported to AZ Poison and Drug Information Center
- 31 of 112 cases with coagulopathy or thrombocytopenia received antivenom and repeat sampling.
- 14 of 31 had recurrence
Management of Recurrence

What is the Treatment Threshold?

- Measure Platelets, INR, Fibrinogen within 2-4 days of last CroFab(TM) dose
  - Laboratory results do not meet treatment threshold
    - Continue monitoring until laboratory values show a clear trend toward normal
  - Laboratory results meet treatment threshold.
    - Infuse doses of 2 - 6 vials of CroFab(TM) as needed to cause coagulation assays to begin a definite trend toward normal.
    - Recheck coagulation assays within 24 hrs of CroFab(TM) administration
Summary

• NA snake venoms cause many effects
  – Local
  – Coagulation and platelet
  – Systemic

• Effects are not necessarily species specific

• Antivenom can arrest these effects and allow body to correct and heal injury

• Recurrence is serious concern is several regions

• Envenoming is a dynamic process that requires careful and experienced monitoring and intervention.
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