BITING MECHANISM OF SNAKES
1st part

Classification of snakes

Poisonous snakes belong to three Families on the basis of poison secreted :

- 1. **Elapidae** : Neurotoxic
- 2. **Viperidae** : Vasculotoxic
- 3. **Hydrophidae** : Myotoxic

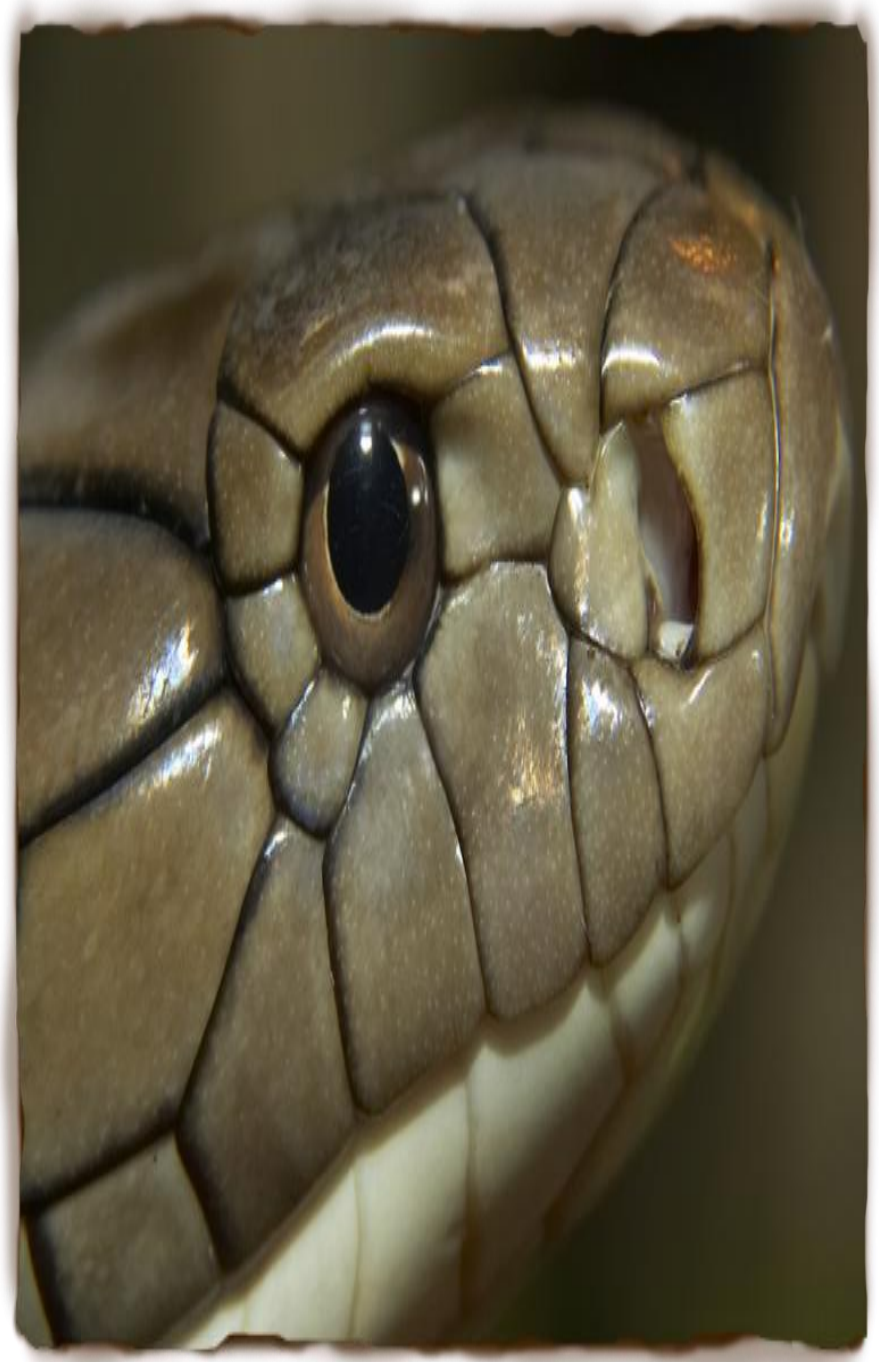
1. ELAPIDAE

examples

- A) Common Cobra / Nag or Kalsap or Naja naja
- B) King Cobra – Raj Nag or Naja hanna or Naja bangarus
- C) Krait : Subgrouped into :
    - a). Common krait or Bangarus caeruleus
    - b). Banded krait or Bangarus fasciatus
    - c). Coral snake
    - d). Tiger snake
    - e). Mambas
    - f). Death adder

Common Cobra / Nag or Kalsap or Naja naja

- Seen through out India, Burma, Srilanka
- Well marked hood
- Single (monocellate) or double spectacle mark



Monocellate Cobra
Naja Naja Kaouthia

1. **Common krait**

Bungarus Caeruleus

Neurotoxic

2. VIPERIDAE

They are grouped into:

- **A). Pitless Vipers** : They are
  - a). Russel ‘s Viper
  - b). Saw-scaled Viper
- **B). Pit Vipers** : They are
  - a). Pit Viper- Crotalidae
  - b). Common Green Pit Viper

1. **Saw scaled viper**
   (carpet viper)

Echis carinatus

Haematotoxic

1. **Russell's viper**

Daboia russelli

Haematotoxic

3. HYDROPHIDAE

- 20 types of sea snakes found in India.
- All are poisonous.
- They are myotoxic.

DIFFERENCES BETWEEN COBRA AND VIPER

TRAITS	COBRA	VIPER
1. Body	Usually long and cylindrical	Usually short and stout with narrow neck
2. Head	Small ,seldom broader than body, usually of same width as that of neck, covered with large scales	Larger and broader than body ,usually wider than the neck , covered with small scales
3.Maxillary bones	They carry other teeth beside the poison fangs	They carry only the poison fangs
4. Eye	It has round pupil	It has vertical pupil
5. Fangs.	Placed little anteriorly , grooved short ,fine and fixed	They are canalised ,long , movable and strong,
6. Eggs	Oviparous	Viviparous
7. Tail	Round	Tapering
8.Venom	Neurotoxic mainly	Haemotoxic usually

Snake Bite and Snake Venom

- When a snake bites, it may excrete venom but this is dependent on the type of snake – venomous or non venomous.
- Snake Venom is a Toxin (Hematotoxin, Neurotoxin, or Cytotoxin)
- It is a varied form of saliva and excreted through a modified parotid salivary gland
  - Located on each side of the skull, behind the eye
  - Produced through a pumping mechanism from a sac that stores the venom, proceeds through a channel, down a tubular fang, hollow in the center to project the venom

SNAKE VENOM

- Snake venoms are
  - A combination of proteins and enzymes
  - 90% protein by dry weight & most of these are enzymes
  - Have 25 different enzymes found in various venoms and 10 of these occur frequently in most venoms
  - Synergistic in effects: different venoms contain different combinations of enzymes causing a more potent effect than any of the individual effects (very similar to drug synergism)

Composition of snake venom

Enzymes-

- phospholipase A2(Lecithinase), 5'-nucleotidase,collaginase,L-aminoacid oxidase, protinases, hyaluronidase,
- **Ach, Phospholipase-b (ellipdae)**
- **Endopeptidases, kininogenase, factor-X, prothrombin activating enzyme (viper)**

Non Enzyme Peptides :

- α- bungarotoxin,β- bungarotoxin,Crotoxin, Crotamine,Cardiotoxin.

Peptide- Pyroglutamyl peptide

Nucleoside-Adenine,Guanine,Inosine.

Lipid-Phospholipid,Cholestrol

Amine-Histamine,Serotonin,Spermin

Metal-Cu,Zn,Ni,Mg.

Difference between poisonous and non-poisonous snakes

Points	Poisonous snakes	Non Poisonous
1. Belly scales	Large : They cover the entire breadth of belly	Small : They never cover
2. Head scales	a) Usually small in vipers b) May be large in pit vipers c) Cobras and Coral snakes where third labial touches the eye and nasal shields d) Kraits ,where there is no pit and the third labial does not touch the nose and eye	Are usually large with exceptions as outlined under poisonous snakes
3. Fangs	Are hollow like hypodermic needle	Short and solid
4. Tail	Compressed	Not markedly compressed
5. Habits	Usually nocturnal	Not so
6. Teeth bite marks	Two fang marks with or without marks of other teeth	Two fang marks with number of small teeth marks

Mechanism of Toxicity of Venom

- The most common types of enzymes are proteolytic, phospholipases and hyaluronidases
  - Proteolytic Enzymes: digestive properties
  - Phospholipases: degrade lipids
  - Hyaluronidases: facilitates venom spread through out the body

SIGNS AND SYMPTOMS

- **A. Elapid Bite:**

  a). Local Features :

  Fang marks

  Burning pain

  Swelling and discoloration

  Serosanguinous discharge

  Local symptoms are milder in comparison to that in Viperine bite.

Systemic features

- **Preparalytic stage:**
- Vomiting
- Headache
- Giddiness
- Weakness and lethargy

- **Paralytic stage:**
- Ptosis.
- Ophthalmoplegia

  Drowsiness
- Convulsion
- Bulbar paralysis
- Respiratory failure
- death

- **B. Viperid bite :**
- **Local features** : Rapid swelling at bite site

  Discoloration

  Blister formation

  Bleeding from bite site

  Pain

- **Systemic features:**

.Generalized bleeding : Epistaxis ,hemoptysis , hemetemesis ,bleeding gums ,hematuria , malena , hemaorrhagic areas over skin and mucosa

.Shock

.Renal failure

C. Hydrophid bite

- **Local features:**

  Local swelling

  Pain

Systemic Features :

Myalgia

Muscle stiffness

Myoglobinuria

Renal failure

Summary of Manifestations

Feature	Cobras	Kraits	Russells Viper	Saw Scaled Viper	Hump Nosed Viper
Local Pain/ Tissue Damage	YES	NO	YES	YES	YES
Ptosis/ Neurological Signs	YES	YES	YES!	NO	NO
Haemostatic abnormalities	NO	NO!	YES	YES	YES
Renal Complications	NO	NO	YES	NO	YES
Response to Neostigmine	YES	NO?	NO?	NO	NO
Response to ASV	YES	YES	YES	YES	NO

	No Envenomation	Mild Envenomation	Moderate Envenomation	Severe Envenomation
Fang marks	+/-	+	+	+
Local reaction: Pain Local edema Erythma Echymosis	 - NO NO NO	 Moderate Minimum (0-15cm) + +/-	 Severe Moderate (15-30cm) + +	 Severe Severe >30cm + +
Symptoms	No	No	Weakness Sweating Syncope Nausea Vomiting Thrombocytopenia	Hypotension Paresthesia Coma Pulm. edema Resp.failure

Factor affecting snake bite toxicity

factor	effect
Body weight	Bigger the size lesser toxicity
Aggravating factor	Predispose to harmful effect of snake venom
Part bitten	Bite on face and trunk are most lethal
Exercise	Poor outcome
Individual sensitivity	Sensitivity of individual to venom modified clinical outcome
Bite characteristic	Type of bite(business or defence),Bite number ,depth, duration of when snake clinges to body,bite through clothes,ammount of venom,condition of fangs,different species & their lethal dose

Prognosis assesment

- Time of bite
- Activity at the time of bite
- First aid action taken since the bite
- Clinical examination
- 20 mn whole Blood Clotting Test

Lab investigations

20 WBCT-Test positive for viperine bite

ELISA Test

Non Specific- Hemogram, S.Creatinine, S.Amylase, CPK, Creatine Phosphokinase,

- ⇑PT, ⇑ FDP & ⇓ Fibrinogen level in viper bite interfer with clotting mechanism.
- ABG, Electrolyte-for systemic manifestion.
- Urine Examination for Proteinuria , Myoglobinuria

- ECG-non specific changes like bradycardia, AV-block.

- EEG-mainly in temporal lobe.60% in Grade-I,31% Grade-II,4% Grade III

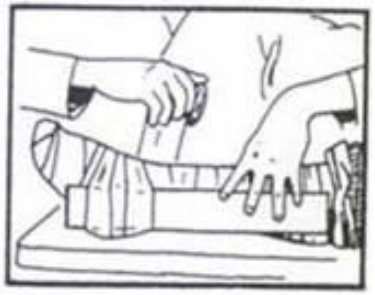
Management

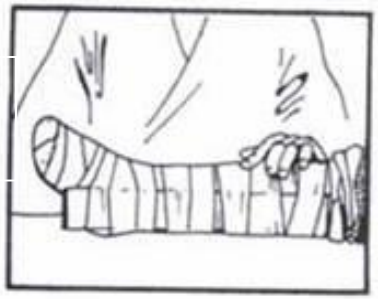
Management

Local

Specific

Supportive





Management

- The first aid being currently recommended is based around the mnemonic: “Do it R.I.G.H.T.”

R =Reassure the patient. 70% of all snakebites are from non-venomous species. Only 50% of bites by venomous species actually envenomate the patient.

I = Immobilise in the same way as a fractured limb. Use bandages or cloth to hold the splints, not to block the blood supply or apply pressure. Do not apply any compression in the form of tight ligatures, they can be dangerous!

G.H. = Get to Hospital Immediately. Traditional remedies have NO PROVEN benefit in treating snakebite.

T = Tell the doctor of any systemic symptoms such as ptosis that manifest on the way to hospital.

First Aid

DOs-

Assurance of patient

Immobilisation

Application of tourniquet????

DON'TS-

Incision

Suction

Application of Ice ,massage or any chemical treatment

Specific treatment
Anti snake Venom

Indication for ASV

- Spontaneous systemic Bleeding
- WBCT > 20 min
- Thrombocytopenia (platelet < 1 lac)
- Shock, paralysis, ARF, Rhabdomyolysis, Hyperkalemia.
- Local swelling involving > ½ of bitten limb
- Rapid extension of swelling

Anti venom Therapy

- Ideally administer with in 4 hr but effective if given with in 24 hrs

  In mild cases-5 vial (50 ml)

  In moderate cases-5 to 10 vial

  In severe cases-10 to 20 vial

Additional infusion containing 5 to 10 vial are infused until progression of swelling ceased and systemic symptoms are disappeared.

- ASV can be administer slow i.v. injection or infusion @ rate of 2ml/min

- AVS dilute 5-10 ml/kg body weight of normal saline or 5% dextrose and infused over 1 hr

- ASV should never given locally at site of snake bite.

Disadvantage of ASV

- Pain at injection site
- Hematoma formation
- Increase intra compartmental pressure

ASV SENSTIVITY IS NOT RECOMMONDED NOW A DAYS

Adverse reaction of ASV

- Seen in 20 % patient

Early anaphylactic reaction-

- Seen with in 10 min to 3 hrs
- Urticaria, diarrhoea, tachycardia, fever, hypotension, etc.

Late Serum Sickness

- 1-12 days
- Fever,nausea,vomiting,diarhoea,artheritis,nephrits,myoglobinuria.etc**.**

Treatment Of Early ASV reaction

- Adrenaline -1:1000 i.m.

  0.5 mg in adult

  0.01 mg/kg in children

  can be repeated every 5 min if necessary

H1 antihistaminic-i.v. 1 mg of CPM

I.V. Hydrocortisone

Treatment Of Late ASV reaction

- 5 days course of oral anti histaminic CPM

  2mg/6hour-adult

  0.25 mg/kg/day in divided dose

Patient who fail to response with in 24 hr

Predinisolone-

5mg/6h in adult

0.7 mg/kg/day in divided dose in children

Supportive therapy

- For Coagulopathy - if not reverse after ASV therapy

  Fresh frozen plasma

  Cryoprecipitate (fibrinogen, Factor VIII),

  Fresh whole blood,

  Platelet concentrate.