(2) Biting and Feeding Mechanism of Snakes :-

→ 1. FEEDING MECHANISM

- Snakes don't chew their food but swallow the whole. They never use their teeth for cutting and grinding.
- Snakes are carnivorus in feeding habit
- They are capable to swallow the animals larger than their own bodies and in this way they differ from lizard's feeding habit. Snakes don't take even freshly killed animal

→ These are so many structural adaptations which make possible the swallowing of food.

(1) The two rami of lower jaw are loosely connected anteriorly by an elastic ligament which permits lateral expansion.

(2) Low jaw is also loosely attached posterior to the quadrate bones which in turn are loosely attached to skull.

(3) Bones of palate are also movable.

These features allow the mouth to expand several times the diameter of snake itself.

(4) Pectoral girdle is absent

(5) Sternum is absent, so ribs are free ventrally.

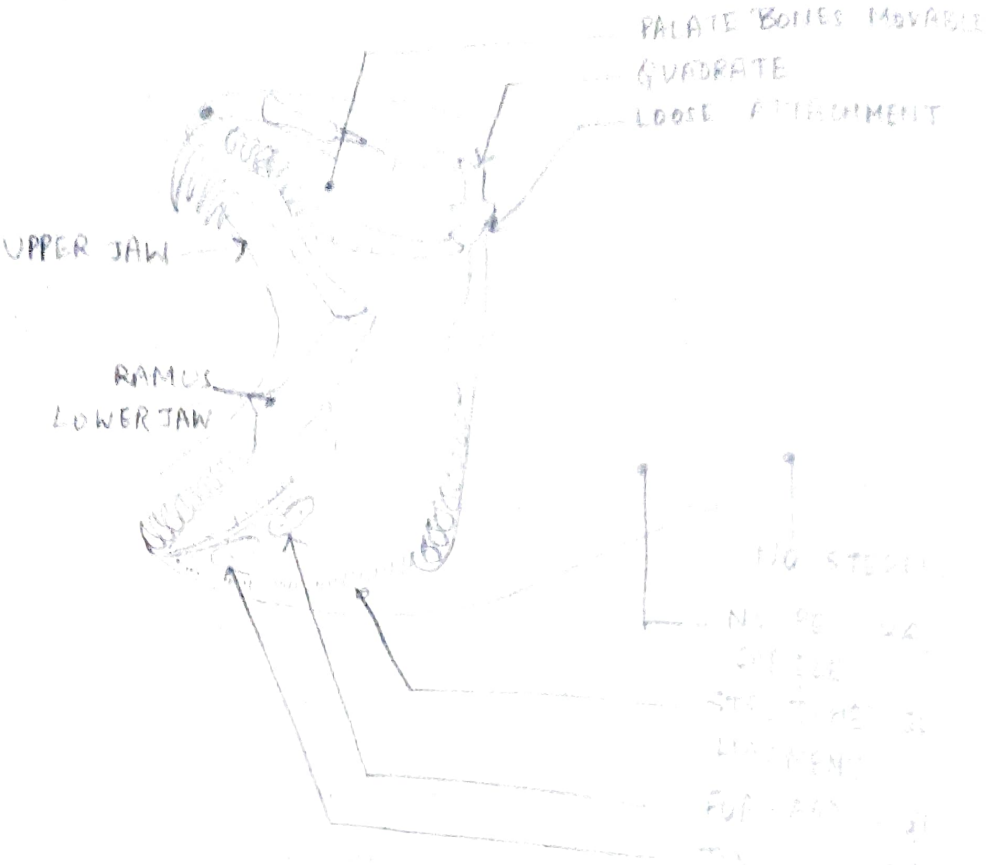
As a reasult, the throat and body are also capable of great distention.

(6) Glottis is located far anterior in floor of mouth, opening just behind the lower front teeth. Thus breating is not interfered while swallowing.

(7) Cartilages of trachea prevent it from being closed so that air passage remains open for breathing while swallowing.

During swallowing, their sharp teeth which curve inward prevent the prey from slipping forward. By moving the two sides of jaw alternately the snake gradually pushes the prey down into its oesophagus through which it passes by peristaltic movement into stomach.

Further digestion takes place by GIT's enzymes.



SNAKE: MECHANISM OF SWALLOWING LARGE

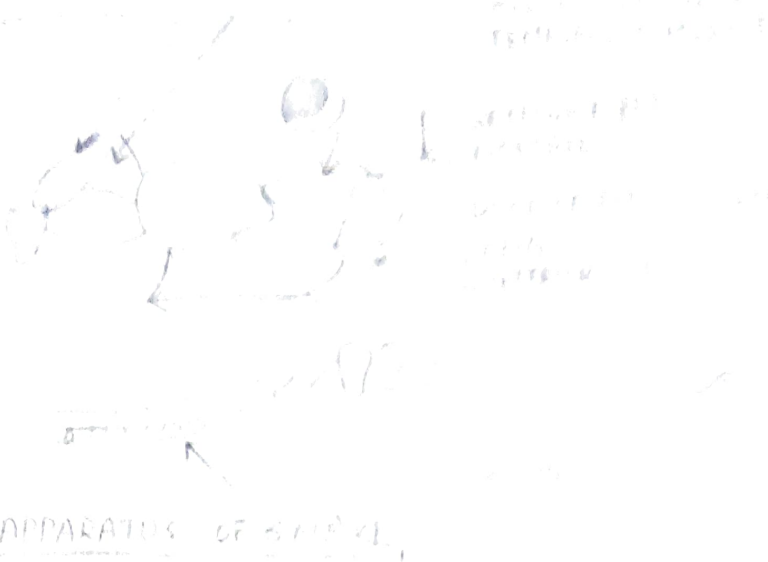
→ POISON APPARATUS

→ All the poisonous snakes have poison apparatus in their head region which are necessarily absent in non-poisonous snakes.

NOTE:- Word poison is used for deadly activated chemical which can be produced artificially. Word venon is used for the same thing which is deadly activated but produced naturally by living organisms.
Here word poison apparatus in snake is misleading but frequently used although it should be used venom appropriately.

→ The poison apparatus consists of
(1) A pair of poison glands
(2) Their ducts.
(3) Fangs.
(4) Muscles.

FIG. ON NEXT PAGE.



POISON APPARATUS OF SNAKE.

PARTS:

(a) Poison Gland –

– These are sac like structure, located one on either inner side of upper jaw, below the eyes and beneath also in position.

– These are modification of parotid gland which is also named superior labial gland.

– This is an example of exocrine gland.

– Glands are held in position with help of ligament.

– Each gland is encapsulated with fibrous tissue and mostly covered by a fan shaped constrictor muscle.

Constrictor muscle is also called as ~~temporal or~~ masseter.

(b) Poison duct – ,

A narrow poison duct leads anteriorly from each poison gland to the base of poison fang to enter its groove or canal. These duct open in pocket of mucous sheath that covers the basal part of fang.

(c) Fang –

Front maxillary teeth are modified into fang. These act as poisonous teeth. Fangs are conical, curved and sharply pointed structure. These are used to insert poison in victim.

These are of following types (On the basis of str. & posn of fang)

(1) Protero glypha

(2) ~~Solengo~~ Soleno glypha

(3) Opisthoglypha. (Opistho – behind).

* Fang

(1) Proteroglypha – (Protes – first, glyph – hollowed)

These fangs are small at front of maxillae and permanently erect i.e. non-movable. Each fang is grooved all along it's anterior face.

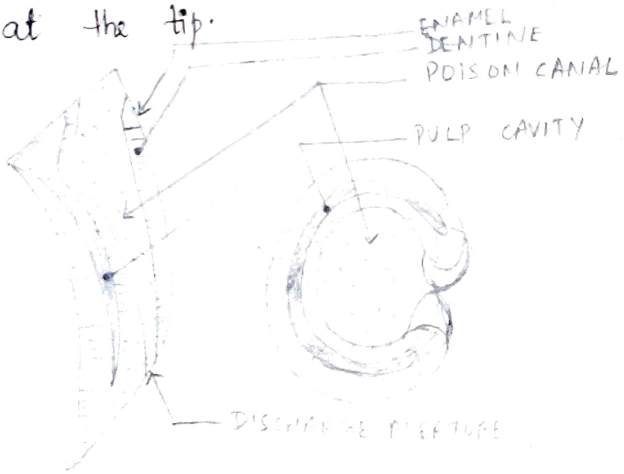
eg. Cobra, Krait, sea snake, coral snake, mamba

FIG: PROTEROGLYPHOUS FANG.

(2) Solenoglypha – (Solen – pipe – hollow internally).

- It is a larger functional fang occure in front of each maxilla.
- It's base is covered on all side by a sheath containing a few reserve and developing fangs.
- These fangs are movable and turned inside to lie close to roof of mouth when it is closed.
- These are capable of vertical movement.
- A hollow poison canal runs through fang opening at the tip.

eg. Viper, rattle snake.



L.S. T.S. ENTIRE GROOVE

FIG: SOLENOGLYPHOUS FANG

(3) ~~Aphi~~ Opisthoglypha – (Opistho – behind).

- Fangs are small, lying at the back of maxillae.
- Each fang is grooved along it's posterior border.
- Fangs are either one or two in number with few smaller teeth in front.

eg. vine snake, cat snake, flying snake, snakes of family Colubridae.

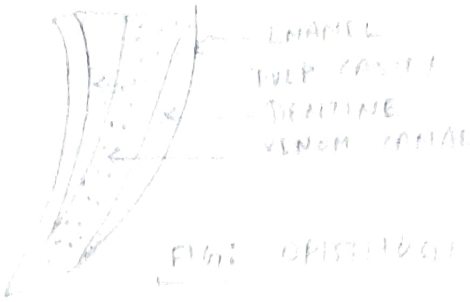


FIG: OPISTHOGLYPHOUS FANG

(d) Muscle -

The poison apparatus is associated with specialised bands of three types of muscles.

(i) Digestive muscle
(ii) Sphenopterygoid / Protector - pterygoid muscle.
(iii) Anterior and posterior temporalis muscle

(i) Digestive muscle -

It is aroused from squamosal ~~muscle~~ bone and is attached to articulation of lower jaw.
- Contraction of these muscles help in opening of mouth by depressing the lower jaw.

(ii) Sphenopterygoid / Protector - pterygoid muscle :-

- It is attached anteriorly to sphenoidal region and posteriorly to dorsal surface of pterygoid.
- It help in pulling the pterygoid forward.

(iii) Anterior and posterior temporalis muscle -

They are attached to the side wall of cranium and lower jaw.
- They help in closing of lower jaw.

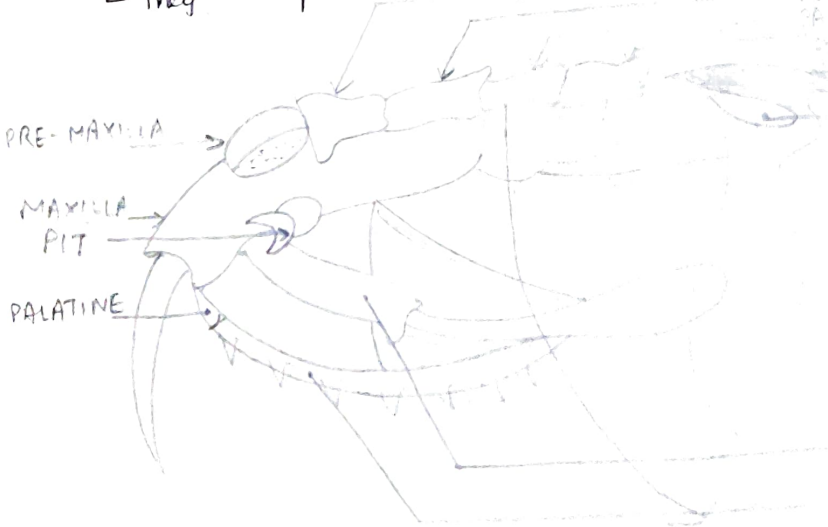


FIG: FULLY OPENED MOUTH OF

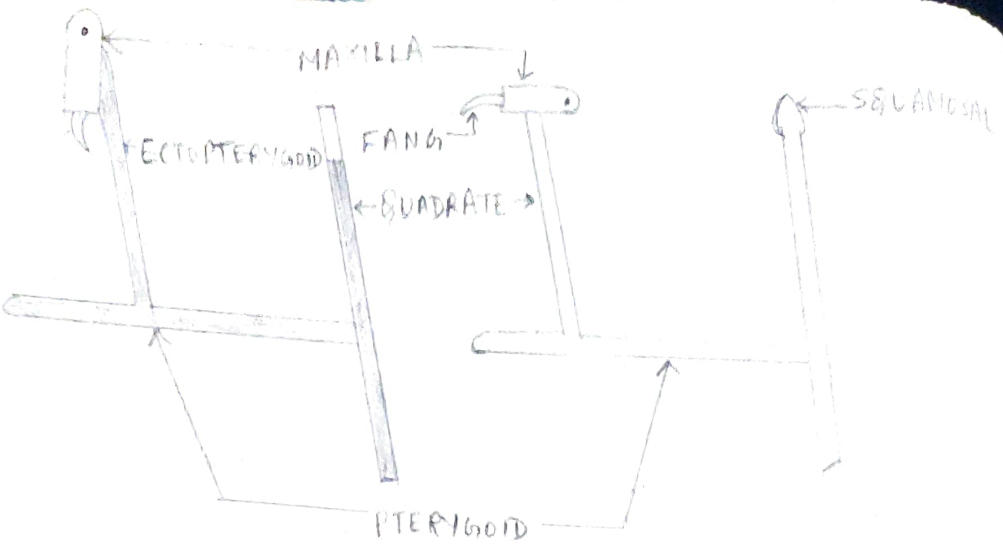


FIG: THE RELATIVE POSN OF PRINCIPLE SKULL BO... TIME OF BITING

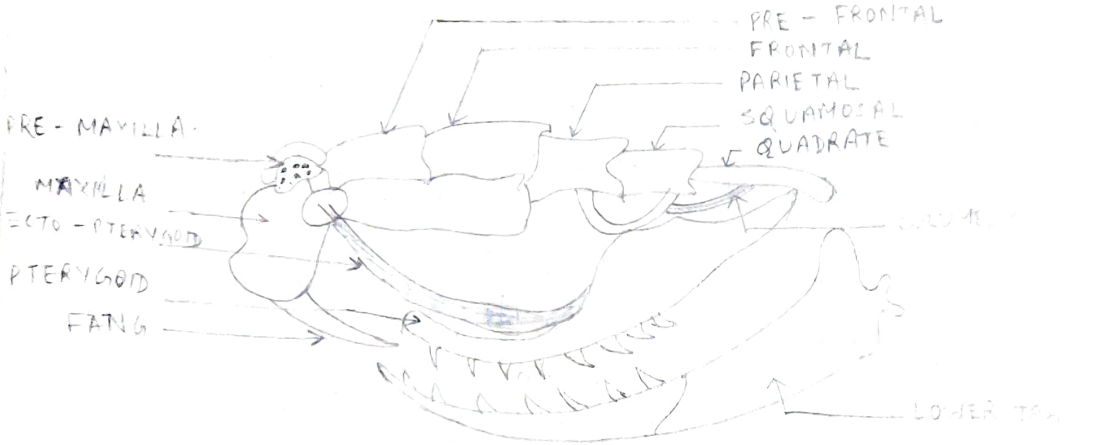


FIG: PARTLY OPENED MOUTH OF A POISONOUS SNAKE

2. → BITING MECHANISM

Skull and jaw bones of poisonous snakes are very flexible. They are movably articulated for making considerable degree of adjustment during biting.

- In cobras, fangs are permanently erect.
- In vipers, large fang lie against roof of mouth.
- BITING is completed in following four steps.
  - (a) Opening of mouth
  - (b) Erection of fang
  - (c) Closing of mouth
  - (d) Injection of venom into victim's body.

(a) Opening of mouth – By the contraction of digastric muscle the mouth is opened due to lowering of mandible.

(b) Erection of fang –

As the mouth opens, lower end of quadrate threats (moves) forward which in turn pushes forward the pterygoid

Contraction of sphenopterygoid muscle also rids forward movement of pterygoid.
- Forward pull of pterygoid in turn pushes the transverse/ ectopterygoid upward.
- This causes the maxilla, bearing fang to rotate through 90° at the hinge joint with lacrimal bone.
- As a result, fang become vertically erect which is most effective position for strike.
- FLOW CHART

Lower end of quadrate (come forward) → pushes → pterygoid (forward)

Contraction of sphenopterygoid → pushes → in → pushes

→ Transverse/ ectopterygoid (upward)

→ Rotates

Fang (raised to 90°)

(c) Closing of mouth -
- Mouth ~~beg~~ holding Body part of victim is closed by contraction of temporalis muscle and relaxation of sphenopterygoid muscle.
- The point of fang is directed backward ~~by~~ while the mouth is closed. At the moment, vertical fang become horizontal
- It takes lesser time to close the mouth than to open it.

(d) Injection of venom -
- During contraction of digastric muscle, the posterior ligament is relaxed and during the rotation of squamosal bone, the fan shaped ligaments are streached to squeeze the wall of gland.
- This make the poison to come out from gland via duct and fang sequentially.

→ Snake Venom
- Primarily venom is evolved in snakes as an aid to capturing and subduing the prey.
- Venom is clear sticky liquid of faint yellow to greenish colour.
- Specific gravity 1.03 to 1.07.

- It is tasteless and acidic and odourless even.
- pH of venom varies from species to species.
  Viper's pH is about 5.8
  Cobra's pH is about 6.6.
- It is proteinous in nature and complex mixture of enzymes and specific toxin.
- It is a good digestive juice.
- ✱ Venom is fatal only when mixed in blood. It can be swallowed and if there is no scratch in GIT (gastro intestinal tract) then of it easily passes out through GIT without giving any harm.
- Venom of cobra is slightly bitter in taste.
- It is thermolabile.
- It is precipitated in reagents like silver nitrate ($AgNO_3$) and potassium permagnet ($KMnO_4$)
- It ~~is~~ dissolves in water and glycerine.

Nature of venom -

(1) Haemotoxic — Mainly destroy blood vascular system
(2) Neurotoxic — Mainly causes neuromuscular problems & paralysis

Most of poisonous snakes contain both but in some any one predominates.

Neurotoxic — Naja, naja (cobra), sea snakes
↓ Causes asphyxiation. Bungarus (krait)
Callophis (coral snake).

Haemotoxic — Viper ~~s~~ russelli (Viper - pitted and non-pitted)
↓ Tissue destruction and haemorrhage Ancistrodon himalayanus

✱ Venom also contain thromboidnase which causes intra-vascular clotting.

→ Effect of venom -

- Degree of virulence of ~~venom~~ venom differ not only in different snake but in the same snake under different circumstances.
- Effect depend upon amount of venom injected.

A. Cobra bite -

- It is neurotoxic.
- Effect is seen within half an hour ($\frac{1}{2}$ h).
- It is most virulent.
- It attack on nerve centres and causes paralysis of muscle, especially respiratory muscle.

symptoms

1. Piercing pain.
2. Burning sensation.
3. Numbness in bitten part
4. Weakness in leg.
5. High pulse rate.
6. Extreme salivation
7. ~~Pulse~~ Speechlessness
8. Dropping of eyelid
9. Contraction pupil (eye remain sensitive to light)
10. Nausea
11. Partial paralysis of tongue and pharynx.

— Ultimate death is due to failure of respiration (asphyxia) or of heart activity.

B. Krait bite — Dangerously poisonous snake, because their bite inject very large quantity of poison (3 times more than cobra) symptoms.

1. Absence of local pain.
2. Swelling.
3. Its venom act as neurotoxically and haematoxically both.
4. Its symptoms are much more similar to that of cobra but there
5. unbearable abdominal pain is found due to internal haemorrhage.
6. Destruction of RBC, paralysis of trunk and limb causes ultimated death.

C. Viper bite — haematoxic mainly.

— It affect circulatory and nervous system both.
Symptoms are observed within quarter of an hour.

Symptoms

1. Local swelling and discolouration of bitten part.
2. Acute burning pain.
3. Necrosis found i.e. oozing out of red fluid from wound due to massive tissue destruction.
4. Dilation of pupil.
5. Increase in pulse rate.
6. Profuse vomiting
7. Inconsciousness.
8. Eyes looses sensitivity for light.

— Death is caused by paralysis of vaso-motor centres and exhaustion from profuse bleeding.

→ Cure of snake bite —

1. First aid treatment

(a) Psychological — Fright should not be otherwise heart-failure can be.

(b) Tourniquet — It should be immediately tied on bitten area towards heart. This delay circulation of poison in body.

(c) Care of wound — Washing with clean water.
Bitten part should be cooled with ice so that blood circulation become slow.

(d) Care of person — Alchoholic beverages should be avoided
Hot milk should be provided

2. Cure of bite
- Antivenom serum or antivenin should be injected.
- In case of cobra, krait, viper bite, the polyvalent serum should be injected preferably in intravenous position as soon as possible after the bite.
- Placcho injection may be given to reassure the patient.

* Venom of Honeybee is used to cure snake bite.