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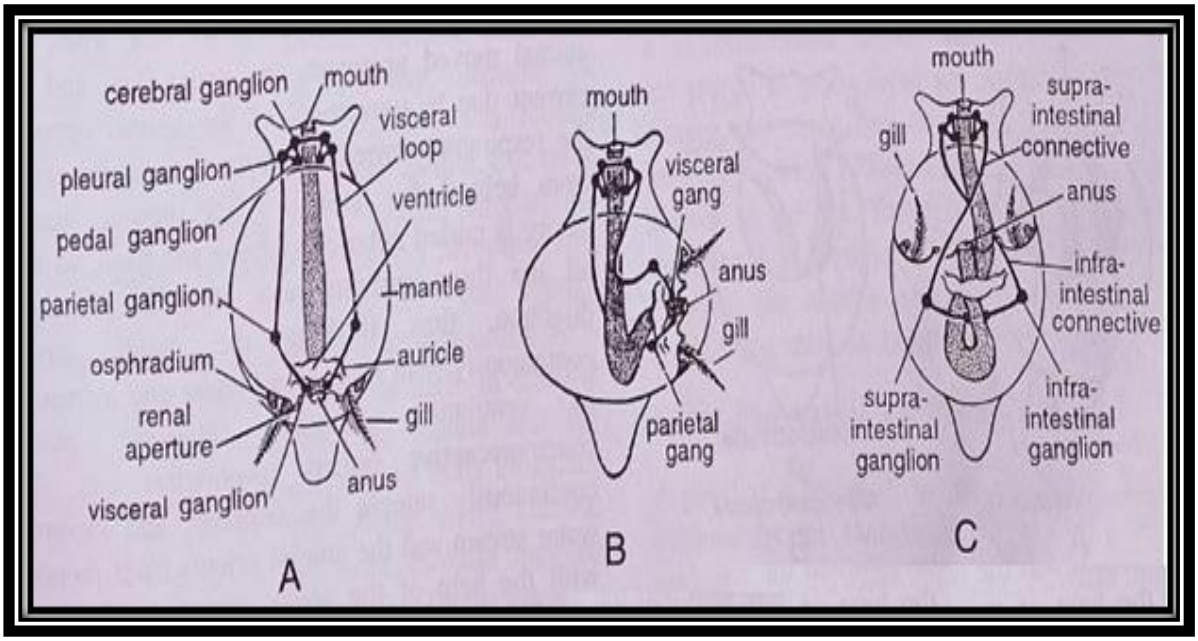
TORSION IN GASTROPODA

Contd.....

Effects of Torsion

Torsion is a fundamental feature of gastropods and represents their greatest departure from the ancestral molluscan plan. Peculiarities of organization of gastropods due to torsion were first realized by **Spengel** (1881).

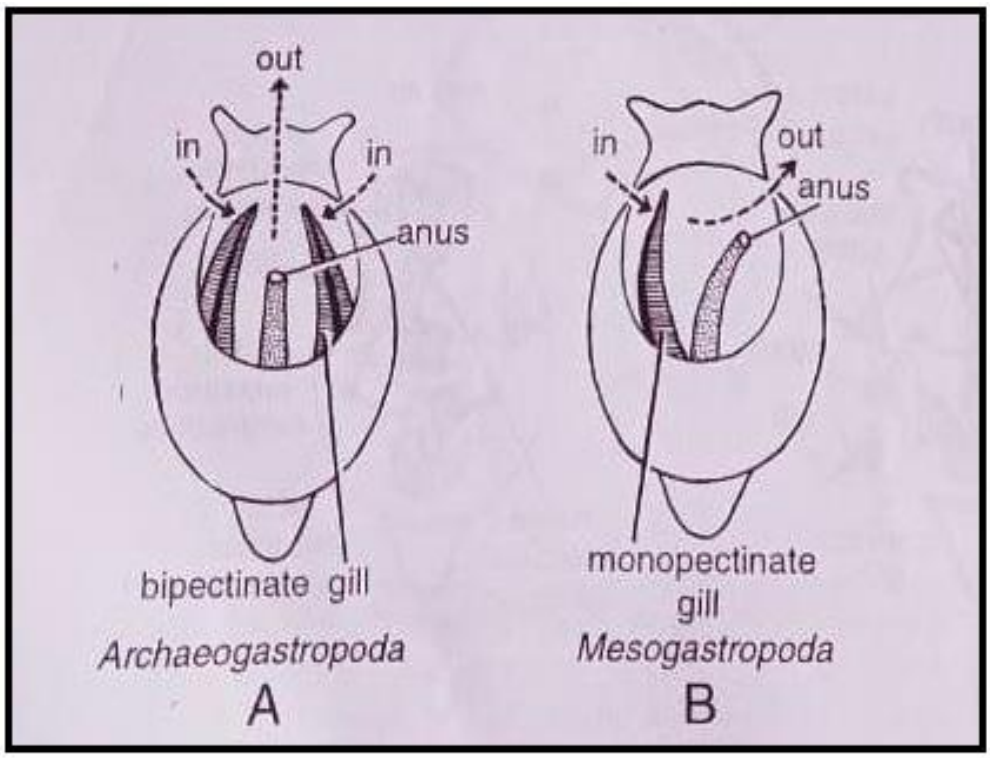
1. **Displacement of mantle cavity.** Mantle cavity was primitively posterior in position. Increase in length of ventral foot, which primitively was very short, tends to remove the mantle cavity and pallial complex away from the head. After torsion the mantle cavity opens just behind the head and its associated parts are shifted forwards.…



Effects of torsion upon position of gills, digestive tract and nervous system. **A**. Hypothetical primitive Stage before torsion. **B.** Intermediate stage showing 90 torsion with mantle cavity and pallial complex displaced to the right side of body. **C.** Final stage showing 180^{o} torsion.

2. **Changes in relative positions.** Before torsion. anus, ctenidia and renal orifices point backwards, and the auricles lie behind ventricle. After torsion, anus, ctenidia and renal orifices project forward, and the auricles lie in front of ventricle. Original posterior face of visceral sac becomes the actual anterior face, so that visceral organs morphologically of the original right side become placed topographically on the left side, and vice versa.
3. **Looping of alimentary canal.** Digestive tract, which was originally straight from mouth to anus, is thrown into a loop.
4. **Chiastoneury.** Long, uncoiled pleuro-visceral nerve connectives become twisted into a figure of 8. Right connective with its ganglion passes over the intestine to become supra-intestinal, while left connective passing underneath the intestine to become infra-intestinal.
5. **Endogastric coil.** Coil of visceral sac and the shell, Which primitively was dorsal or **exogastric,** becomes ventral or **endogastric,** after torsion.
6. **Loss of symmetry and atrophy.** Anus is displaced towards right side of the pallial cavity so that original symmetry of organisation disappears. Another characteristic feature involving asymmetry is reduction or atrophy of the paired parts of primitively left or topographically right side. In primitive Archaeogastropoda or Diotocardia (*Patella, Haliotis, Fissurella,* etc.) maximum symmetry is preserved by retaining two gills, two auricles and two kidneys, but the right kidney serves as a gonoduct. In more specialized Mesogastropoda or Monotocardia (Pila, Buccinum, Littornia, etc.), ctenidium auricle, osphradium, hypobranchial gland and kidney of the topographically right side disappear in dextral forms, but

reverse process occurs in the sinistral forms. Remaining gill may bear one row of filaments (monopectinate gill).



Diagrams to illustrate the loss of symmetry and atrophy due to torsion. The arrows indicate the course of respiratory water currents.

Views on the significance of Torsion in Gastropods :

Torsion is a characteristics feature of gastropods. The significance of such torsion in gastropods is not clear. Several contrasting views are extant on this issue. Some of the views are: ----

1. **Garstang's view**
2. **Morton's view.**

According to **Garstang** (1928), torsion first occurred as a larval mutation of advantage to the larva adapted to pelagic life but of little direct use to the adult. Before torsion, the untwisted swimming larva fell an easy victim to its predators because the posterior mantle cavity could receive the delicate head and velum only after the foot was already inside. After torsion, the mantle cavity became

anterior, so that the sensitive parts i.e., head and velum could withdraw first followed by the foot. Operculum sealed the aperture, the cilia of velum stopped beating, so that larva could fell to the sea bottom and avoid its enemies swimming in the water.

According to **Morton** (1958). main advantage of torsion must be to the adult.

- **Firstly**, torsion promotes stability in the adult by placing bulky mass of animal nearer the substratum.
- **Secondly**, in primitive Molluscs, the mantle cavity containing gill was situated posteriorly, so that when the animal moved upstream, the water-flow and the current due to movement of the animal opposed the respiratory current entering the mantle cavity from behind the animal. After torsion, mantle cavity is curled anteriorly above the head, so that all the three currents now flow in the same direction, thus flushing the mantle cavity continuously with fresh clean water and increasing its ventilation.
- **Thirdly**. anteriorly placed chaemoreceptive organs (osphradia) can also continuously sample the sediment and incurrent water stream and the animal orients itself properly with the help of the sense organs on the head. Once the shell is lost, gills become exposed to the external currents and their anterior position remains of no advantage, so that the mantle cavity and the pallial complex shift back to their original posterior position (detorsion).
