

Torsion and detorsion in Gastropoda

Torsion or twisting is a process, during larval development of the gastropods, which rotates the visceropallium anti-clockwise through 180° from its initial position. Therefore the mantle cavity, with its pallial complex, is brought to the front of the body in the adult. Torsion has played the most important role in the evolutionary history of the Gastropods.

Site of Torsion

In the larval gastropods, only the visceral mass undergoes rotation through 180° whereas the head and the foot remain fixed. The actual site of the torsion is the neck, behind the head-foot through which the oesophagus, rectum, aorta, visceral nerve loop and shell muscles pass. Thus actual twisting involves the neck tissue and the structure within it.

Torsion is often confused with the spiral coiling of the visceral mass and shell, but the two are entirely distinct and quite independent.

How Torsion occurs

Torsion can be seen in the embryology of living gastropods.

before torsion the larva is quite symmetrical, the mantle cavity faces backwards and downwards. The alimentary canal is straight and the anus opens posteriorly in the middle line. The shell and the visceral mass, originally saucer-shaped, become first cone shaped and later spirally coiled. The shell lies dorsally and forms a coil on the anterior side. Such a shell is called Exogastric.

The ventral flexure is followed by a lateral torsion, so that the dorsal or exogastric shell becomes ventral or endogastric.

The lateral torsion is probably due to arrest of growth on one side and active extension on the other. Generally the growth of the right side becomes retarded so that the mantle cavity and the pallial complex gradually pass round to the right side. So the anterior side, on account of the greater growth of the visceral sac towards the left,

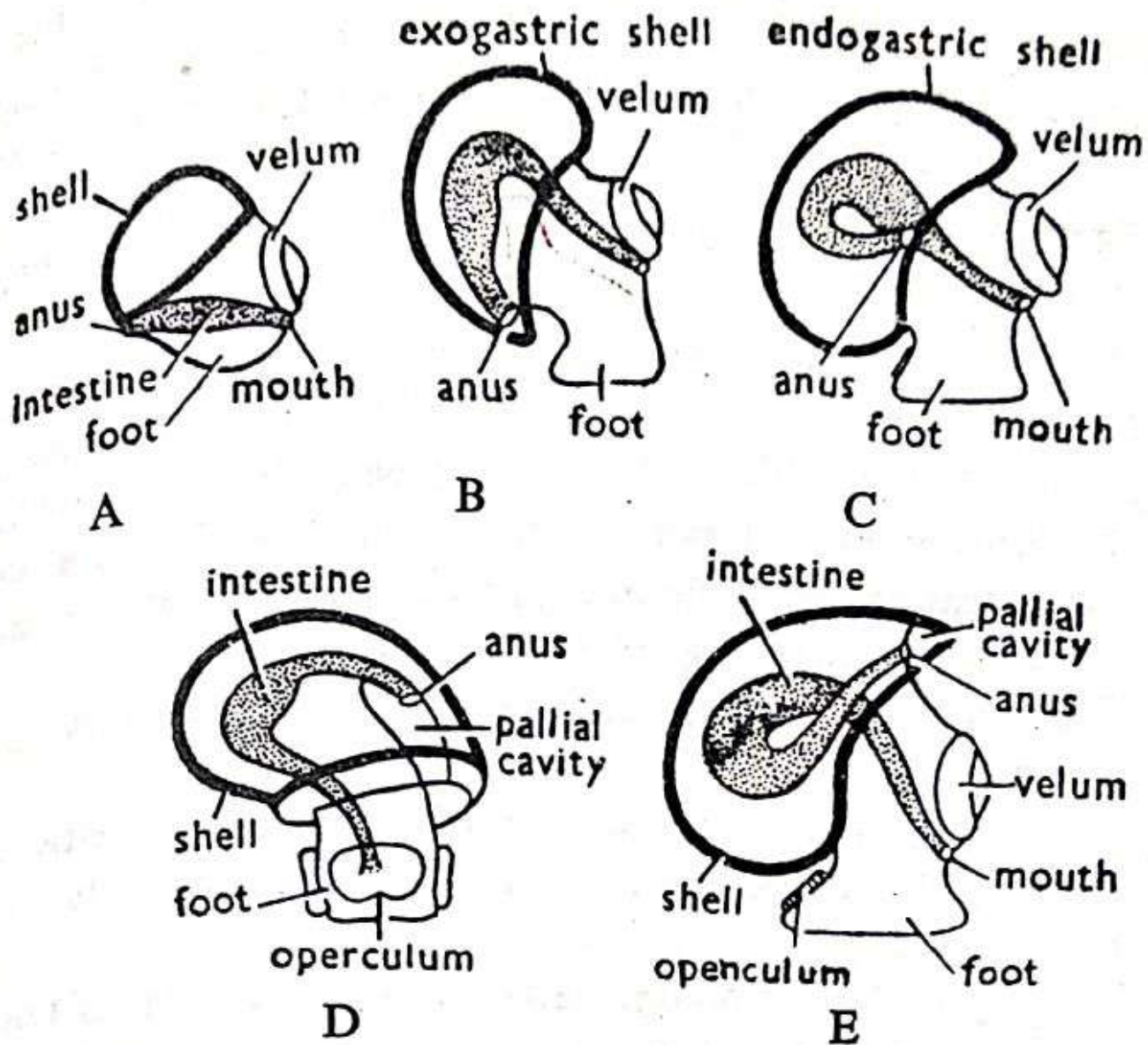


Fig. 16-3. Five successive stages in the development of a gastropod to show occurrence of torsion. **A**—Early veliger larva or pretorsional stage in lateral view. **B**—Larva with ventral flexure and an exogastric shell in lateral view. **C**—Stage showing 90° of lateral anticlockwise torsion. Shell becomes endogastric. Mantle cavity and anus move on to right side. **D**—90° torsion stage in posterior view. **E**—Adult stage with complete or 180° torsion in lateral view.

Effect of Torsion ◦ -

Torsion is a fundamental feature of gastropods and represents their greatest departure from the ancestral molluscan plan. The effects of torsion are not equally evident in all gastropods.

① Displacement of mantle cavity - The mantle cavity was primitively posterior in position. After torsion the mantle cavity opens just behind the head and its associated parts are shifted forwards.

② Changes in relative position - Before torsion the anus, the ctenidia and the renal orifices project backwards, and the auricles lie behind the ventricle. After torsion, the anus, the ctenidia and the renal orifices project forward and the auricles lie in front of the ventricle.

③ Looping of alimentary canal - The digestive tract, which was originally straight from mouth to anus, is thrown into a loop.

④ Chiastoneury ◦ - The long, uncoiled pleuro-visceral nerve connectives become twisted into a figure of 8.

⑤ Endogastric coil ◦ - The coil of the visceral sac and the shell, which primitively was dorsal or exogastric becomes ventral or endogastric, ~~become ven~~ after torsion.

(b) Loss of symmetry and atrophy : — The anus is displaced towards the right side of the pallial cavity so that the original symmetry of the organisation disappears. Another characteristic feature involving symmetry is the reduction or atrophy of the paired parts of the primitively left or topographically right side.

Detorsion

The changes occurring in torsion are to a certain extent reversible, this reversion is known as detorsion. As a result, the pallial complex travels back towards the posterior end along the right side, the ctenidia point backwards, the auricles move behind the ventricle, and the visceral loop becomes untwisted and symmetrical. In this way, a secondary external symmetry is re-established. Torsion must be disadvantageous to adult snails, as many of them have undergone detorsion processes.
