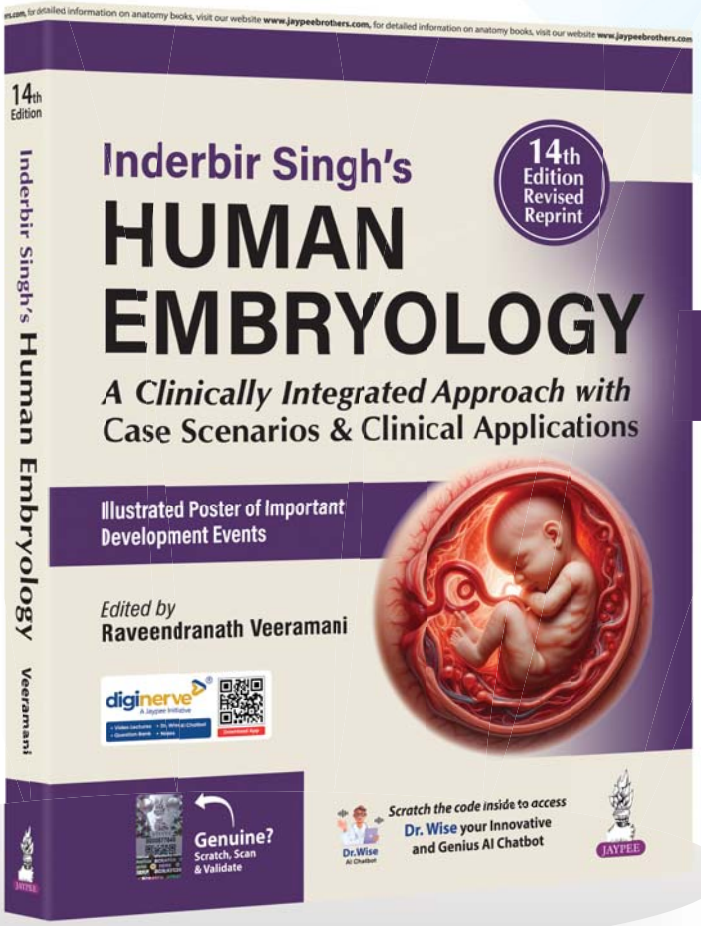

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Revised and updated as per latest CBME curriculum by NMC (2024).

Edited by

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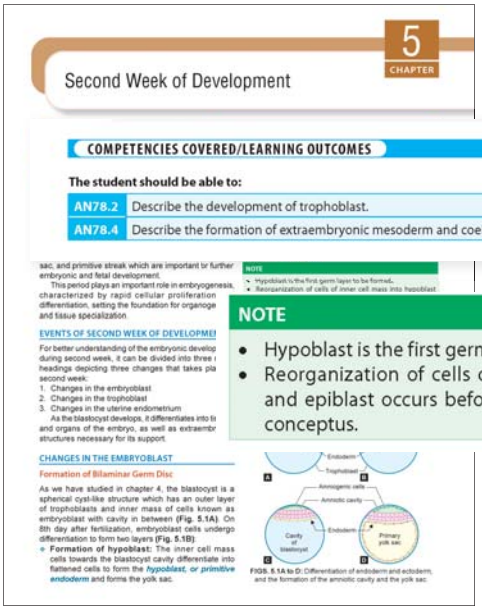


5 CHAPTER

Second Week of Development

COMPETENCIES COVERED/LEARNING OUTCOMES

The student should be able to:

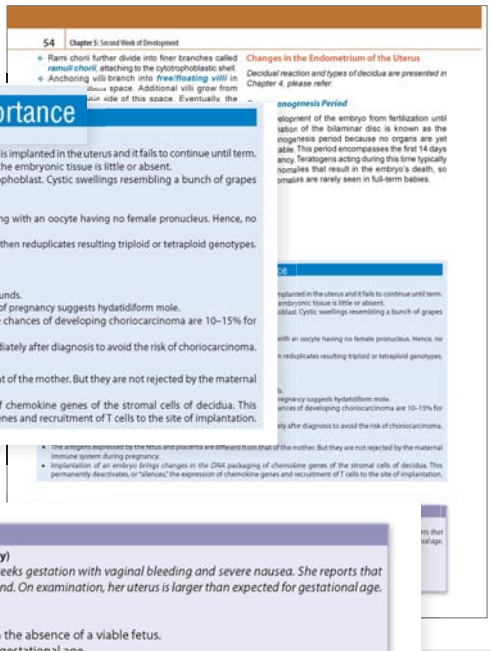
AN78.2	Describe the development of trophoblast.
AN78.4	Describe the formation of extraembryonic mesoderm and coelom, bilaminar germ disc and prochordal plate.

NOTE

- Hypoblast is the first germ layer to be formed.
- Reorganization of cells of inner cell mass into hypoblast and epiblast occurs before completion of implantation of conceptus.

Competencies/Learning Objectives

Notes



54 Chapter 5: Second Week of Development

Changes in the Endometrium of the Uterus

Clinical Importance

Hydatidiform Mole/Molar Pregnancy

- Abnormal form of pregnancy/conceptus where non-viable fertilized egg is implanted in the uterus and it fails to continue until term.
- The trophoblast develops and forms fetal membranes (placenta) but, the embryonic tissue is little or absent.
- In this condition, the embryo dies but there is abnormal growth of trophoblast. Cystic swellings resembling a bunch of grapes that develop from the degenerating and avascular villi.
- **Types:** There are two types of hydatidiform mole:
  1. *Complete mole*: It is caused by a single sperm or two sperms combining with an oocyte having no female pronucleus. Hence, no embryo is seen.
  2. *Partial mole*: A normal oocyte combines with one or two sperm which then reduplicates resulting triploid or tetraploid genotypes. In this condition, a part of embryo is seen.
- **Diagnosis is by:**
  - Ultrasound that shows snowstorm appearance of uterine cavity.
  - Appearance of vesicles in urine. No fetal movements and fetal heart sounds.
  - High levels of human chorionic gonadotropin (hCG) after two months of pregnancy suggests hydatidiform mole.
- Moles can undergo malignant change and form choriocarcinoma. The chances of developing choriocarcinoma are 10–15% for complete moles.
- **Treatment:** Evacuating the contents of uterus by uterine suction immediately after diagnosis to avoid the risk of choriocarcinoma.

Immunological Rejection of Conceptus by the Mother

- The antigens expressed by the fetus and placenta are different from that of the mother. But they are not rejected by the maternal immune system during pregnancy.
- Implantation of an embryo brings changes in the DNA packaging of chemokine genes of the stromal cells of decidua. This permanently deactivates, or "silences," the expression of chemokine genes and recruitment of T cells to the site of implantation.

Clinical Importance

Case Based Learning

Embryological Basis of Hydatidiform Mole (Molar Pregnancy)

Patient details: *A 28-year-old woman, G1P0, presents at 10 weeks gestation with vaginal bleeding and severe nausea. She reports that this pregnancy was a long-awaited event for her and her husband. On examination, her uterus is larger than expected for gestational age. There is no fetal heartbeat on Doppler ultrasound.*

Diagnostic Evaluation

- **Ultrasound:** Characteristic "snowstorm" appearance with the absence of a viable fetus.
- **β-hCG levels:** Elevated β-hCG levels disproportionate to gestational age.
- **Histopathology:** Examination of products of conception reveals hydropic villi with trophoblastic proliferation.

Case Based Learning

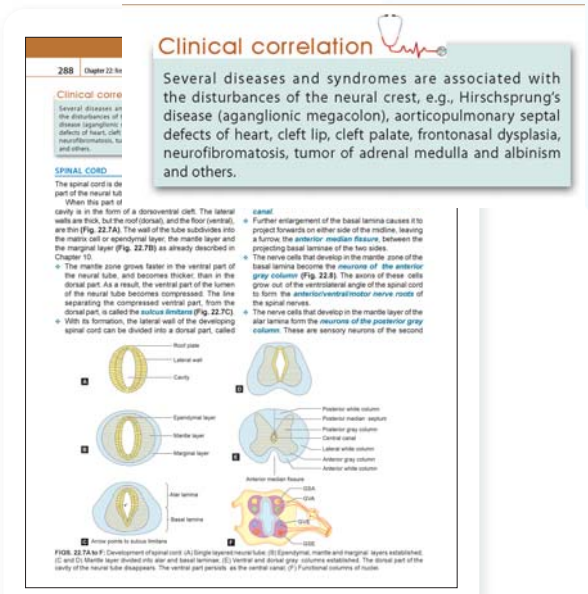
TABLE Subdivisions and adult derivatives of neural tube.

Neural tube subdivisions	*Primary brain vesicles*	*Secondary brain vesicles*	*Parts of adult brain*	*Cavities*
Brain	Prosencephalon (forebrain)	Telencephalon	• Cerebral hemispheres • Cerebral cortex • Corpus striatum • Caudate nucleus • Lentiform nucleus	Lateral ventricles
		Diencephalon	• Thalamus • Hypothalamus • Epithalamus	Third ventricle
	Mesencephalon (midbrain)	Mesencephalon	Midbrain	Cerebral aqueduct
	Rhombencephalon (hindbrain)	Metencephalon	• Pons • Cerebellum	Fourth ventricle
		Myelencephalon	Medulla oblongata	
Spinal cord	Spinal cord	Spinal cord	Spinal cord	Central canal

Tables

SAMPLE PAGES

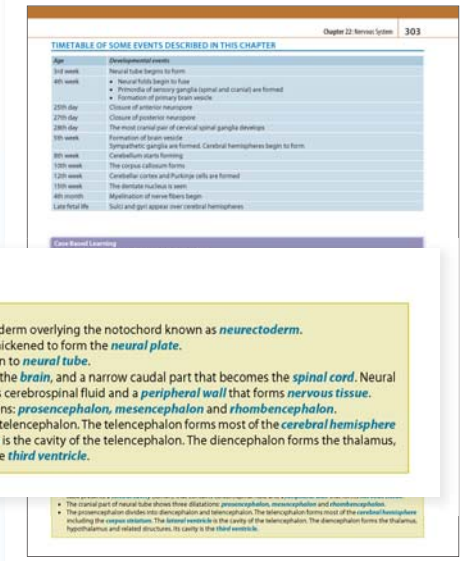
Clinical Correlation



Clinical correlation

Several diseases and syndromes are associated with the disturbances of the neural crest, e.g., Hirschsprung's disease (aganglionic megacolon), aorticopulmonary septal defects of heart, cleft lip, cleft palate, frontonasal dysplasia, neurofibromatosis, tumor of adrenal medulla and albinism and others.

Highlights

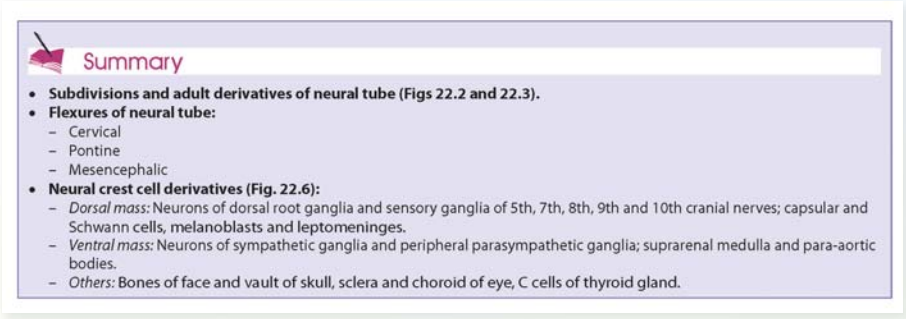


TIMETABLE OF SOME EVENTS DESCRIBED IN THIS CHAPTER

HIGHLIGHTS

- Nervous system develops from the specialized ectoderm overlying the notochord known as ***neurectoderm***.
- Neurectoderm overlying the notochord becomes thickened to form the ***neural plate***.
- Neural plate is converted to ***neural groove***, and then to ***neural tube***.
- Neural tube has an enlarged cranial part that forms the ***brain***, and a narrow caudal part that becomes the ***spinal cord***. Neural tube presents a ***central cavity*** (lumen) that contains cerebrospinal fluid and a ***peripheral wall*** that forms ***nervous tissue***.
- The cranial part of neural tube shows three dilatations: ***prosencephalon, mesencephalon*** and ***rhombencephalon***.
- The prosencephalon divides into diencephalon and telencephalon. The telencephalon forms most of the ***cerebral hemisphere*** including the ***corpus striatum***. The ***lateral ventricle*** is the cavity of the telencephalon. The diencephalon forms the thalamus, hypothalamus and related structures. Its cavity is the ***third ventricle***.

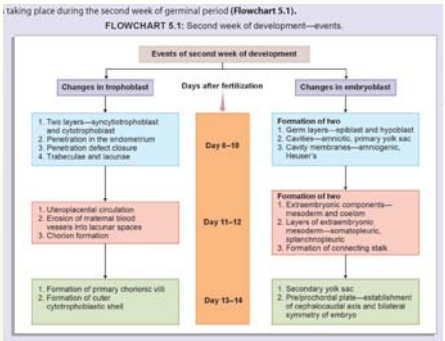
Summary



Summary

- **Subdivisions and adult derivatives of neural tube (Figs 22.2 and 22.3).**
- **Flexures of neural tube:**
  - Cervical
  - Pontine
  - Mesencephalic
- **Neural crest cell derivatives (Fig. 22.6):**
  - *Dorsal mass:* Neurons of dorsal root ganglia and sensory ganglia of 5th, 7th, 8th, 9th and 10th cranial nerves; capsular and Schwann cells, melanoblasts and leptomeninges.
  - *Ventral mass:* Neurons of sympathetic ganglia and peripheral parasympathetic ganglia; suprarenal medulla and para-aortic bodies.
  - *Others:* Bones of face and vault of skull, sclera and choroid of eye, C cells of thyroid gland.

Flow Charts

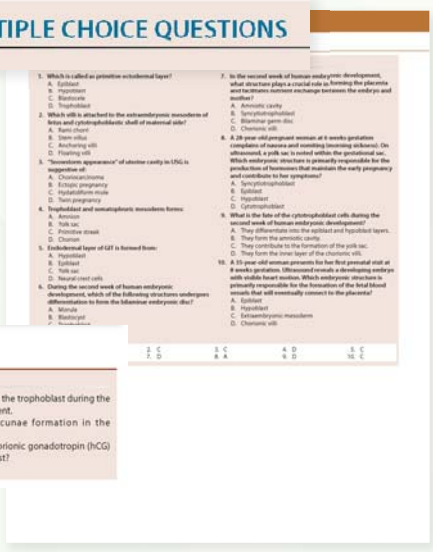


FLOWCHART 5.1: Second week of development—events.

Events of second week of development

Changes in trophoblast | Days after fertilization | Changes in embryoblast

MULTIPLE CHOICE QUESTIONS



REVIEW QUESTIONS

TEST YOUR UNDERSTANDING

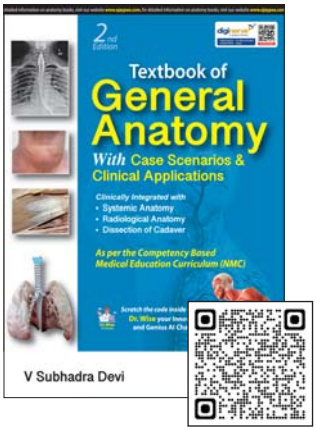
2. What roles do the syncytiotrophoblast and cytotrophoblast play in development?
3. Explain the formation of chorionic villi.
4. Discuss the formation of amniotic cavity and its significance.
5. What is the role of the hypoblast in early embryonic development?
6. Describe the changes that occur in the trophoblast during the second week of human development.
7. What is the significance of lacunae formation in the syncytiotrophoblast?
8. What is the function of human chorionic gonadotropin (hCG) secreted by the syncytiotrophoblast?

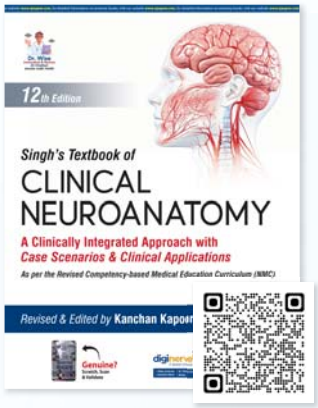
Test Your Understanding

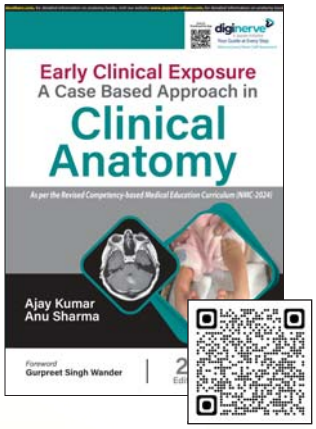
- Review Questions
- Explain Why?(Reasoning Questions
- Multiple Choice Questions

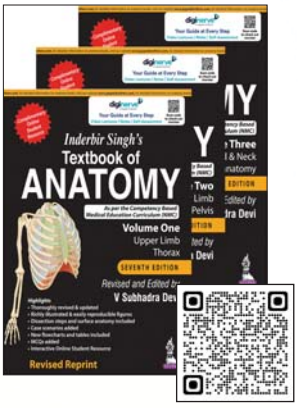
Give at the end of each chapter.

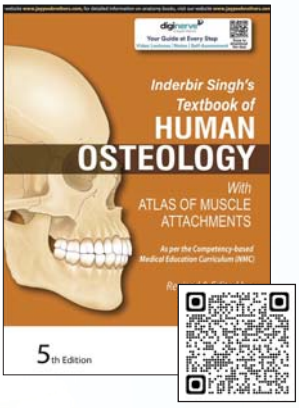
Other Useful Titles

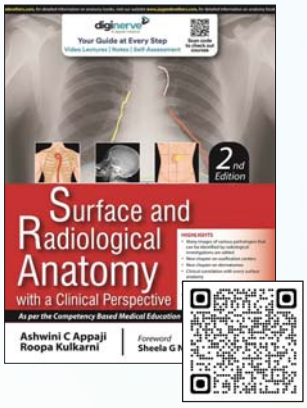


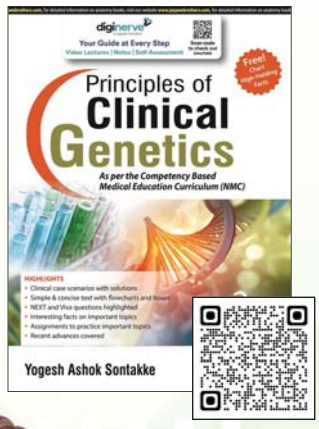


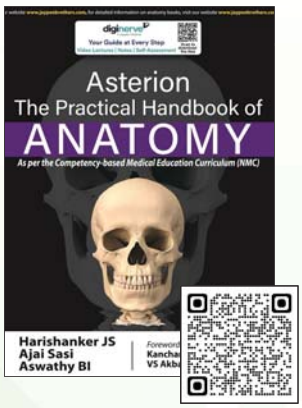


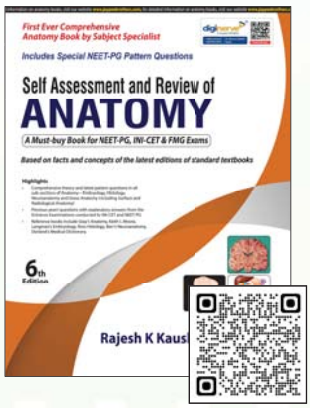












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