



# Introduction to Embryology

---

## **Dr. Ashok Sahai**

Former Professor and Head, Department of Anatomy,  
King George's Medical University, UP, Lucknow, India

Email: [ashoksahai@yahoo.co.in](mailto:ashoksahai@yahoo.co.in)

Mob: 09415395113 / 09634331084

# General Embryology

---

## **Embryology:**

Processes and events involved from the fertilization up to child birth.

## **Developmental Anatomy:**

Processes involved from fertilization to structural & functional maturity of organs / viscera / systems of human body.

## **Clinical Embryology:**

That knowledge of embryology which is useful in the understanding and management of pregnancy and commonly encountered problems during pregnancy and congenital anomalies.

# General Embryology

---

## **Experimental Embryology:**

- Deals with the laboratory methods employed for normal development to properly understand histogenesis and or organogenesis or to manipulate the developmental process to assess the safety of environmental alterations, drugs, chemicals etc.
- The experiment could be in vivo or in vitro.
- The level of manipulation could be genetic or enzymatic.
- The manipulation could be electrical / magnetic / electromagnetic, environment in and around the embryo / foetus and use of chemicals, & drugs etc.

# Embryology

---

## Why to study embryology:

- to understand and realize the importance of the **complex phenomena** involved in development so as to realize the importance of all the **precautions** required for normal development.
- understand which is **critical period** in development.
- when / why most of the **medicines** should not be given to the mother during pregnancy.
- to determine **moods** of growing child.
- to visualize if growing foetus is healthy or **in distress**.
- for **monitoring the foetus** by ultrasound, other imaging modalities and investigations have become important tools to measure normal development.

# Embryology

---

- with this knowledge new techniques for **prenatal diagnosis** of many diseases & congenital anomalies have developed.
- mechanisms to **prevent birth defects** have developed.
- many **diseases** can be **treated** during developmental process by **medicines**.
- **foetal surgery** has developed on account of understanding clinical embryology.
- **infertile couples are** being **blessed with child** only on account of in-depth understanding of the intricate processes involved in development.
- **Infant mortality** and **morbidity** have reduced.
- Greater realisation of important for a **healthy growth** of the child.

# Some interesting images in embryology

---



## **Fœtus in situ**

The fœtus with head and tail folds.

Amniotic cavity is open. Around is placenta.

### **Can identify:-**

- limb buds,
- somites,
- pericardial bulge,
- developing eye,
- developing ear
- developing nasal cavities.

# Foetal Development

---



**Foetus in amniotic cavity  
umbilical cord and yolk  
sac**

**Can identify developing:-**

- Umbilical cord
- Yolk sac
- Head
- Eye
- Limbs
- Spinal cord
- brain

# Foetus, Placenta and Cord

---



## Can identify

- growing head.
- face
- Eye
- upper limb with palm and fingers
- umbilical cord with blood vessels
- Foetal surface of placenta



## Foetus showing cranial blood vessels

---

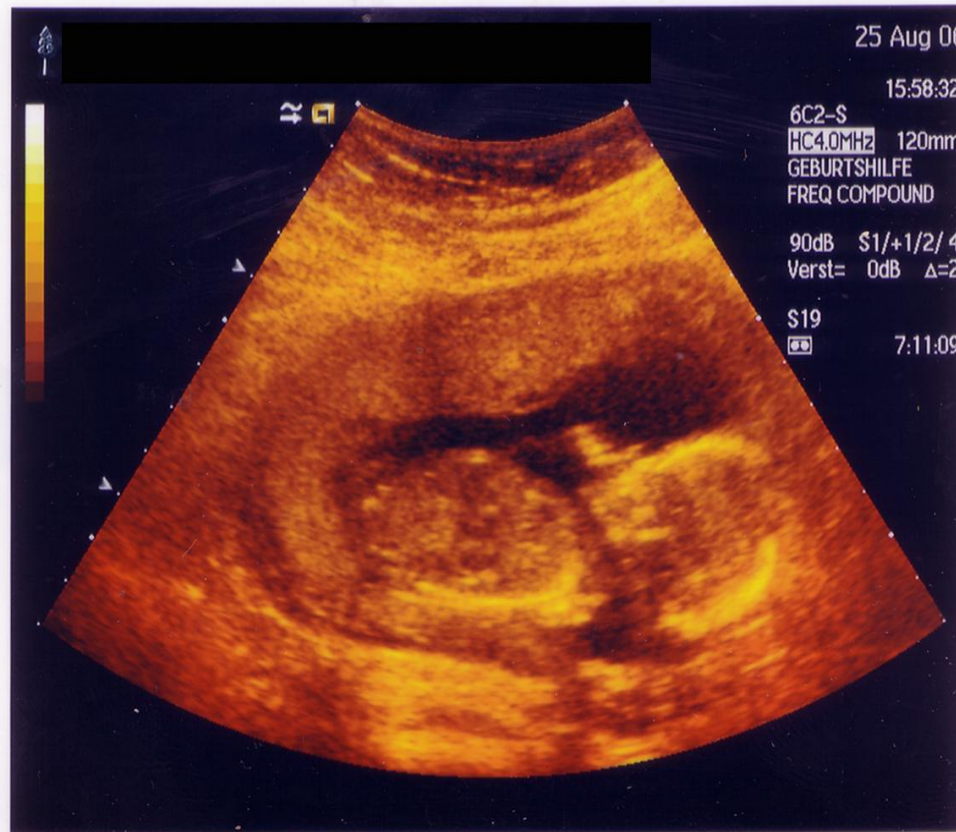


## Fœtus in utero – sucking thumb

---



# Ultrasonography of Uterus



USG of lower abdomen showing uterus in LS with developing foetus.

## Can identify:-

- wall of uterus.
- amniotic cavity.
- head, neck and body of foetus.
- one of the upper limbs

GORDNER & PULBRICK famous twins, born, brought up, grew and got married to separate girls, had normal children.

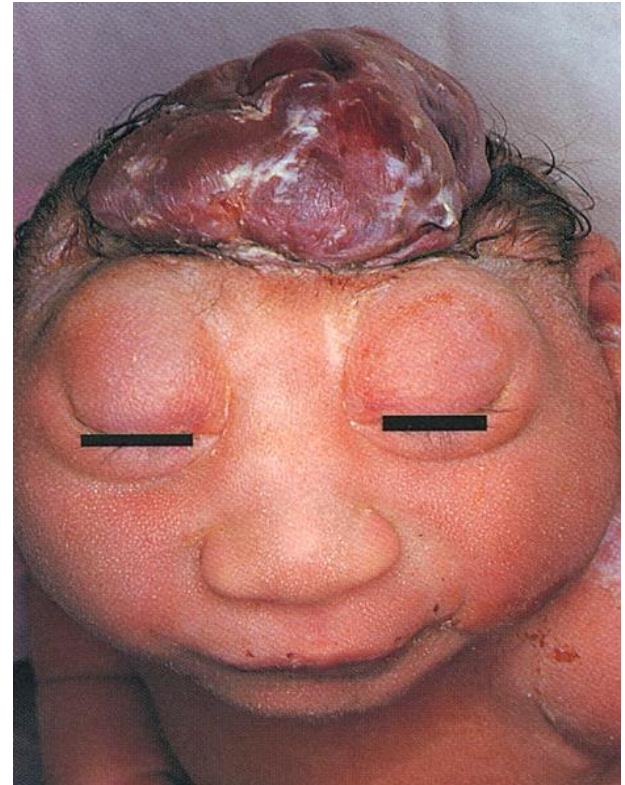
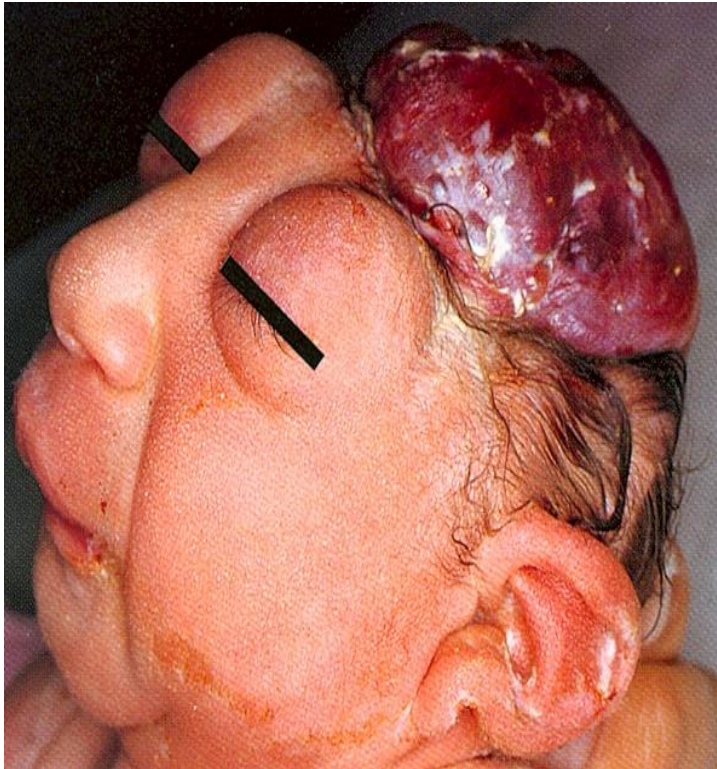
---





## Cranial bones failed to develop

---



## Wide nose and widely separated eyes

---



# Median cleft of the upper lip & palate

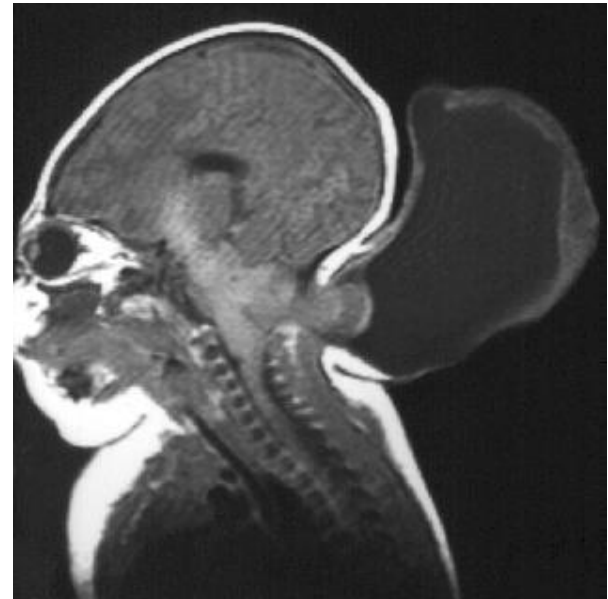
---





# Encephalocoele

---





# Cleidocranial dysostosis

---



- clavicles & associated muscles failed to develop.
- Ossification failure of membranous part of occipital bone (os incae)

# Embryology

---



- Every pregnancy undergoes through millions of physical, mental, nutritional, molecular, enzymatic, genetic and unforeseen challenges before a normal child is born.
- Those who have no knowledge of essentials of embryology drown in uncertainties and start crying aloud.....

**HELP ME GOD**

**But remember**

**God helps those who help themselves**

Therefore as a doctor it is your earnest duty to know essentials of human embryology.

# Embryology

---

## **Teratology:**

Science which deals with the processes involved which interfere with the normal development of the human being and consequences thereof.

- Mental stress.
- Nutrition.
- Medicines.
- Environmental factors: external (around embryo), internal (genetic, enzymatic, signalling, molecular)
- Physical injury.
- Chemical injury.
- Hormonal factors.
- Radiation – X Ray, electro-magnetic, atomic, etc.

# Embryology

---

## Extra corporal development:

- Normal fertilization is also called fertilization **in vivo**.
- Extra-corporal fertilization is also called as fertilization **in vitro**.
- After fertilization the embryo is grafted / transplanted in the Uterus.
- The Uterus could be of same lady to whom the ovum belongs OR of donor lady whose uterus is prepared for transplantation of the embryo.
- If the lady is different she is a Surrogate mother.
- The womb (uterus) is given on **rent**:
  - to bless the couple or
  - earn money

# Embryology

---

- **Gestation period** – The time for which the growing child remains in the uterus from the day of fertilisation to the time of delivery. Normally this period is
  - 280 days or 40 weeks or
  - 10 lunar months.
- **Expected date of delivery (EDD)**: is the most popular clinical assessment, calculated from the LMP (commencement of last menstrual period). It comes to be 09 calendar months + 07 days.
- **Trimesters** – The entire period is divided into 3 trimesters of three months each.
  - 1<sup>st</sup> trimester - 1<sup>st</sup> day of fertilisation to 12<sup>th</sup> wks.
  - 2<sup>nd</sup> trimester – 13<sup>th</sup> wk to 24<sup>th</sup> wk.
  - 3<sup>rd</sup> trimester – 25<sup>th</sup> wk to 36<sup>th</sup> wk or till the time the child is born.

# Embryology

---

Alternatively the gestation period has also been divided into:

- **Embryology:** from day 1<sup>st</sup> to the end of 12<sup>th</sup> week.
- The period of embryology has been further divided as follows:
  - Pre-embryonic Period – 1<sup>st</sup> day to 8<sup>th</sup> wk
  - Embryogenesis Period – 1<sup>st</sup> day to 8<sup>th</sup> wk
  - Organogenesis Period – 4<sup>th</sup> wk to 12<sup>th</sup> wk
- **Foetology:** from 13<sup>th</sup> week to the end of gestation period.

# Embryology

---

**Likewise, the period nearing term (towards the end phase of gestation) to 18 years of age has also been divided as follows:-**

- **Perinatal period** – 28 wks. of gestation to 7 days after birth.
- **Neonatal period** – birth to 1 month.
- **Infant period** – birth to 1 year.
- **Pædiatric age** – birth to 18 years.

# Embryology

---

**Calculation of age of child in the uterus:** Many methods are described some of which are used primarily in research.

- 1. Menstrual age:** from the 1<sup>st</sup> day of the LMP (Last Menstrual Period) to the child birth. This is most widely used in the clinical practice.
- 2. Coital age:** from the day of sexual intercourse which caused fertilization to the child birth.
- 3. Ovulatory age:** from the day of ovulation to the child birth. On the day of ovulation the morning body temperature of the woman falls by 0.5 to 1.0° Celsius.
- 4. Fertilization age:** from the day of fertilization to the child birth. With fertilization the morning body temperature of woman rises by 1.0°.
- 5. Chinese age estimation:** The traditional system of age calculation in china has been to calculate the age of a child from the day of fertilization and therefore the first Birth day of that child was celebrated at age of 3<sup>rd</sup> month after birth.



# Embryology

---

- 6. Age by USG:** The Ultrasonographic parameters are used for age calculation.
- 7. Number of Somites:** In the very early stages of embryo / foetus the age is expressed in terms of number of somites (segments of mesoderm).
- 8. Crown Rump (CR) Length:** Length of the embryo / foetus from the highest point of head to the lowest point of the trunk.
- 9. Crown Heal (CH) Length:** : Length of the embryo / foetus from the highest point of head to the lowest point of the back of heal.

Of these the estimation of **age by LMP** and Ultrasonography are most popular.  
*The former being most reliable.*