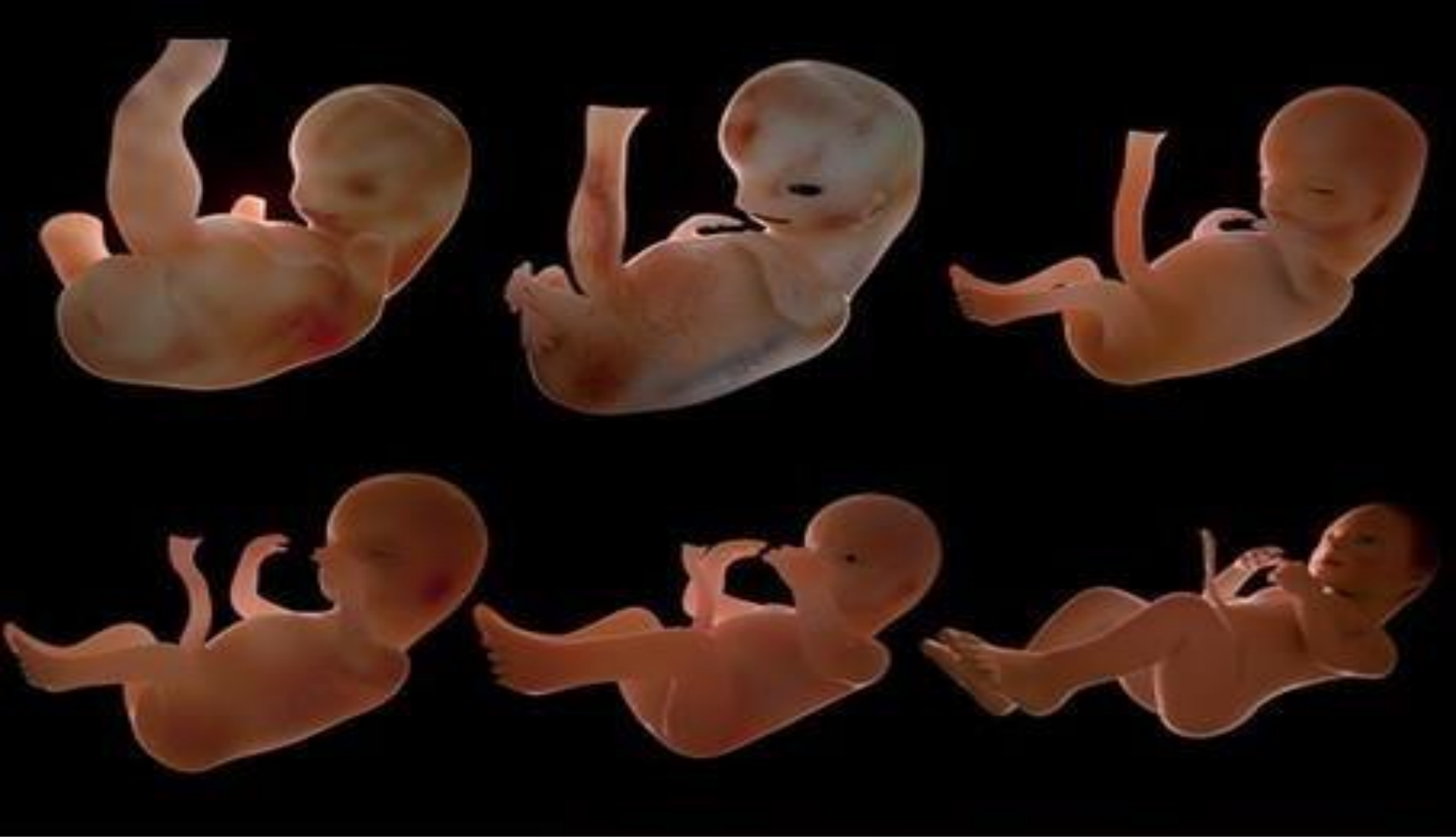


Pre- and perinatal pathology. Perinatal infections.

Pre- and perinatal pathology. Perinatal infections.

I. Microspecimens:

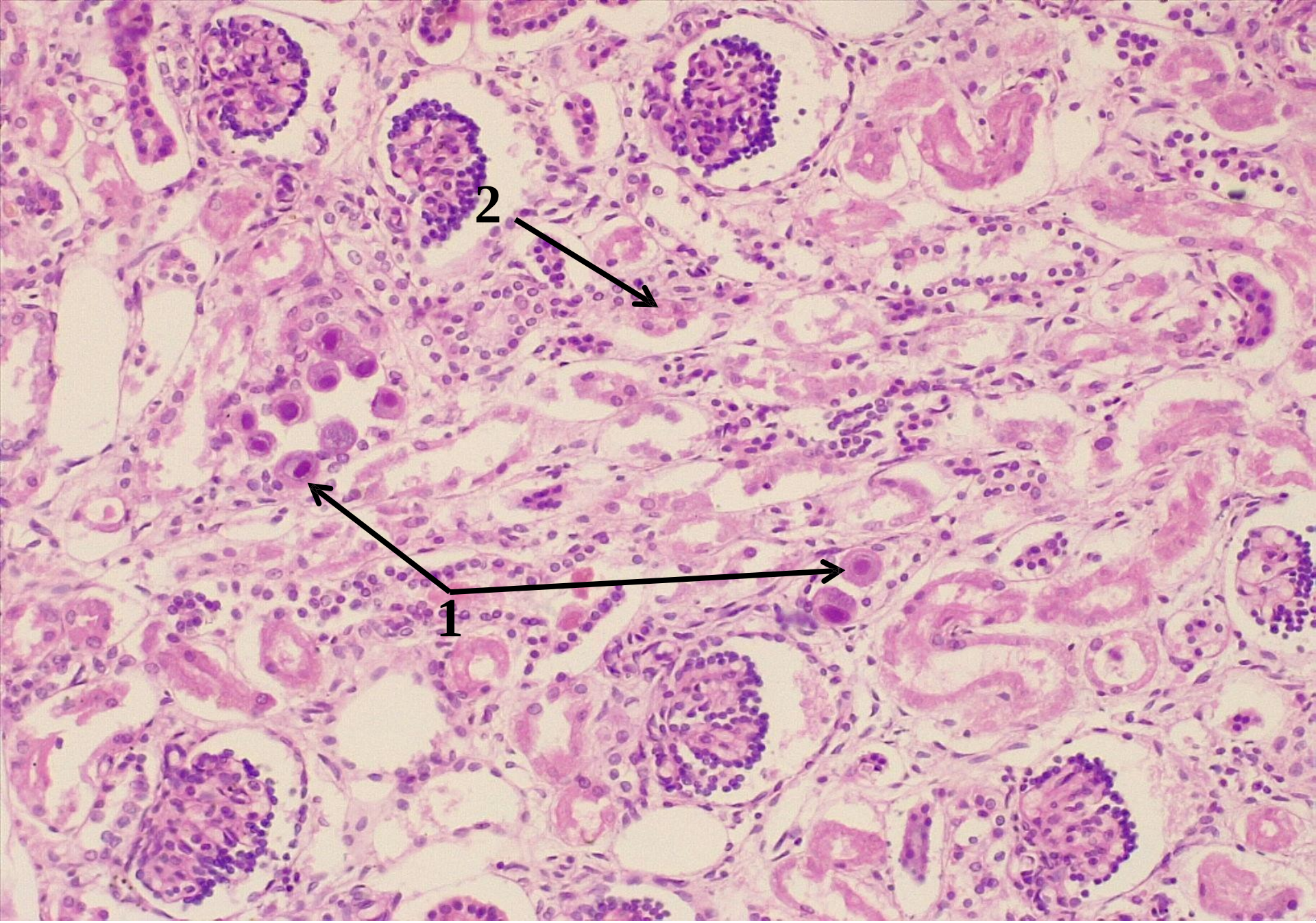
№ 69. Convolute renal tube metamorphosis in cytomegaloviral infection. *(H.E. stain).*

Indications*:*

1. Cytomegaloviral transformation of kidney tubule epithelium.
2. Proteic degeneration of the tubule epithelium.

In the microspecimen at the small objective, renal collecting tubules are detected, in which the epithelial cells are considerably enlarged (3-4 times) in size compared to normal nephrocytes, they have a round or oval shape. This cytomegaloviral metamorphosis can be observed in single tubules or in small groups of tubules. At the big objective in the nuclei of these cells, round, well-defined, dense, intensely colored basophilic inclusions are observed, surrounded by a thin, clear area (halo), which gives the nuclei the appearance of "bird's eye" ("owl's eye"), with a diameter of up to 15 μ. In the cytoplasm of nephrocytes is determined protein / hyaline dystrophy.

Cytomegalovirus (CMV) is a DNA virus, which initially affects the salivary glands, more commonly the parotids. In most cases the infection has a latent, asymptomatic evolution. Under conditions of immunosuppression, develops viremia and hematogenous generalization of the infection with the development of vasculitis in several organs and cytomegaloviral transformation of the vascular endothelium (in the lungs, gastrointestinal tract, brain, adrenal glands, eyes). It is currently the most important opportunistic infection in patients with AIDS or other immunosuppressive conditions. In these patients, is typical, development of necrohemorrhagic encephalitis with the predominant location of the lesions in the subependymal periventricular areas and the involvement of choroid plexuses (ventriculoencephalitis-ependymitis). In newborns, especially in premature infants and in the early postnatal period, there is widespread a severe form of infection. The morphological substrate consists in the cytomegalic metamorphosis of endotheliocytes and epithelial cells from different parenchymal organs. The most serious complications are encephalitis with periventricular necrosis, calcinosis, microcephaly, hydrocephalus.



№ 69. Convolute renal tube metamorphosis in cytomegaloviral infection. *(H.E. stain).*

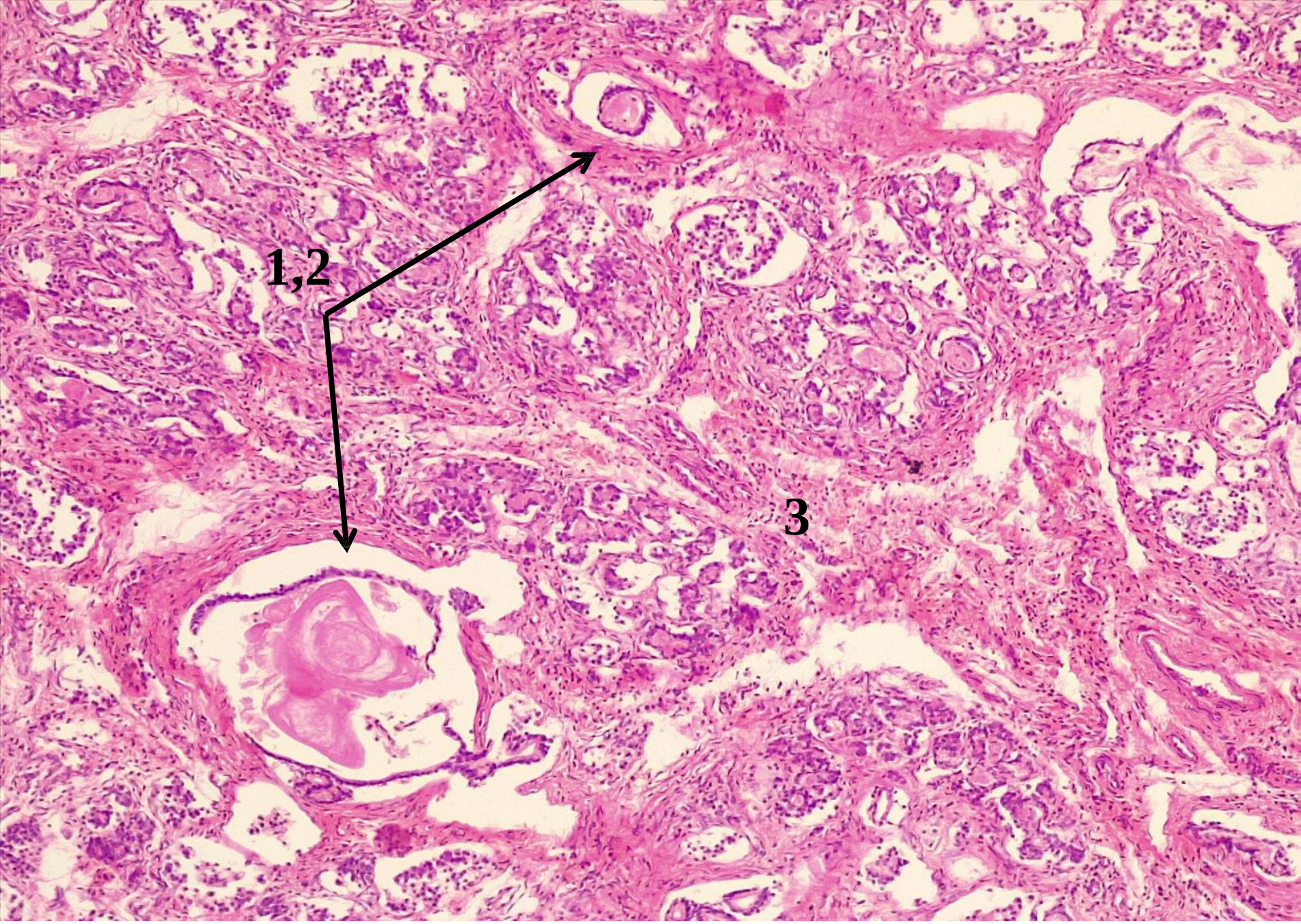
№ 190. Cystic fibrosis of pancreas. *(H.E. stain).*

Indications:

1. Cystically dilated ducts.
2. Eosinophilic condensed content in the lumen of the ducts.
3. Diffuse fibrosis and lymphohistiocytic infiltration of the stroma.

In the microspecimen, the pancreatic ducts of different levels are cystic dilated (duct-ectasia) and deformed. They contain dense eosinophilic, homogeneous secretions, in some places concretions with lamellar structure and calcium salt deposits are seen. Acini are equally dilated and contain condensed secretions. Diffuse periductal, interlobular and intralobular fibrosis with atrophy of acini is determined. In stroma mild lymphohistiocytic infiltration, some Langerhans islands are atrophied, others – with hyperplasia.

Cystic fibrosis of the pancreas is a manifestation of "fibrocystic disease", caused by increased viscosity of secretions of all exocrine glands (cystic fibrosis), most commonly affecting the pancreas, liver, respiratory tract, salivary and sweat glands, but also the lacrimal glands, small intestine, urogenital system. It is an inherited pathology with autosomal-recessive transmission. The mucus becomes viscous, dense, it is difficult to eliminate, which leads to retention of secretions and formation of "plugs" of mucus. It is associated with inflammatory processes, cystic dilation and deformation of the excretory ducts, sclerosis and atrophy of the parenchyma of the affected organs. Clinical manifestations may occur at birth or later in adolescence, and depend on the predominant location of the lesions. Macroscopically the pancreas in cystic fibrosis is reduced in size, has a dense consistency, nodular appearance, on section cysts of variable sizes are seen. It can be complicated by excretory insufficiency, fat absorption disorder, steatorrhea, intestinal obstruction, A avitaminosis, cachexia.



№ 190. Cystic fibrosis of pancreas. *(H.E. stain).*

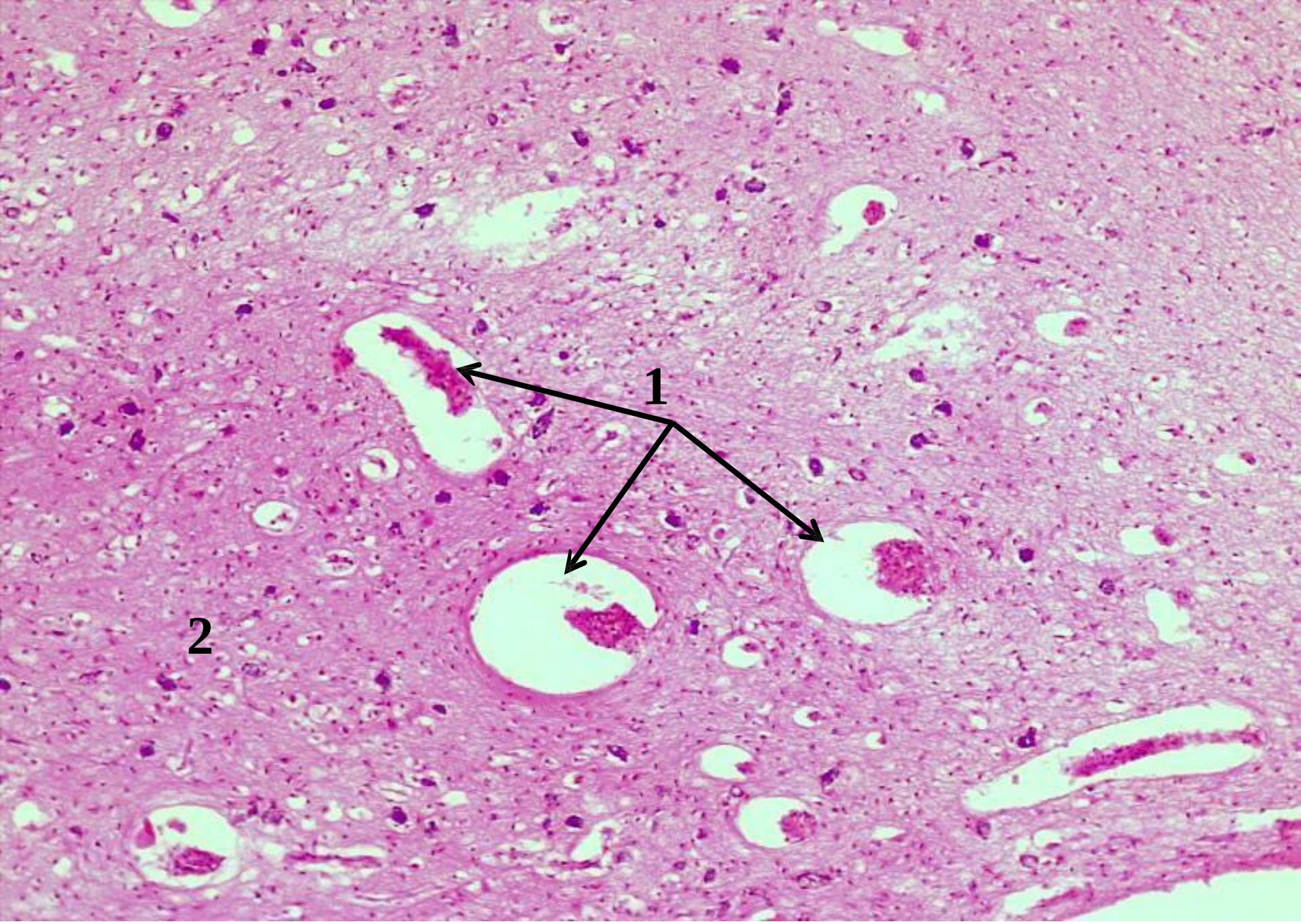
№ 191. Cerebral tissue changes in toxoplasmosis. *(H.E. stain).*

Indications:

1. Small-sized cysts in brain tissue.
2. Edema of adjacent cerebral tissue.

In brain tissue are observed small cystic cavities, containing tissular debris, free or encapsulated trophozoites (toxoplasmas), around macrophage infiltration. Pronounced perivascular and pericellular edema with intensely basophilic colored calcium deposits are seen; in the adjacent areas there are microglial granulomas, foci of necrosis with the thinning of the brain substance, petechial hemorrhages and vasculitis is determined.

Toxoplasmosis is caused by Toxoplasma gondii - an intracellular protozoan, the main source of infection being pets, especially cats and dogs. Contamination occurs through food. In adults it is found primarily in patients with AIDS and other immunodeficiency conditions. In the congenital type, in newborns, intrauterine infection occurs through the transplacental passage of toxoplasma from mother to fetus, it is observed in 30-40% of the number of mothers with toxoplasmosis. It mainly affects the central nervous system, especially the basal nuclei, trunk and eyes. The classic triad being: chorioretinitis, hydrocephalus and intracranial calcifications. The severity of the lesions depends on the period of intrauterine development of the embryo / fetus, in which the contamination occurs. It is developed earlier more severe abnormalities are seen. In cerebral toxoplasmosis, microcephaly, hydrocephalus, multiple cystic cavities, calcifications, abscesses are observed. Ocular complications: microphthalmia, cataracts, calcifications in the retina and vascular membrane is determined. Intrauterine death of the fetus can occur, and in the postnatal period - cachexia, paralysis, mental retardation, blindness, the association of secondary infection with the development of purulent meningoencephalitis are seen.



№ 191. Cerebral tissue changes in toxoplasmosis. *(H.E. stain).*

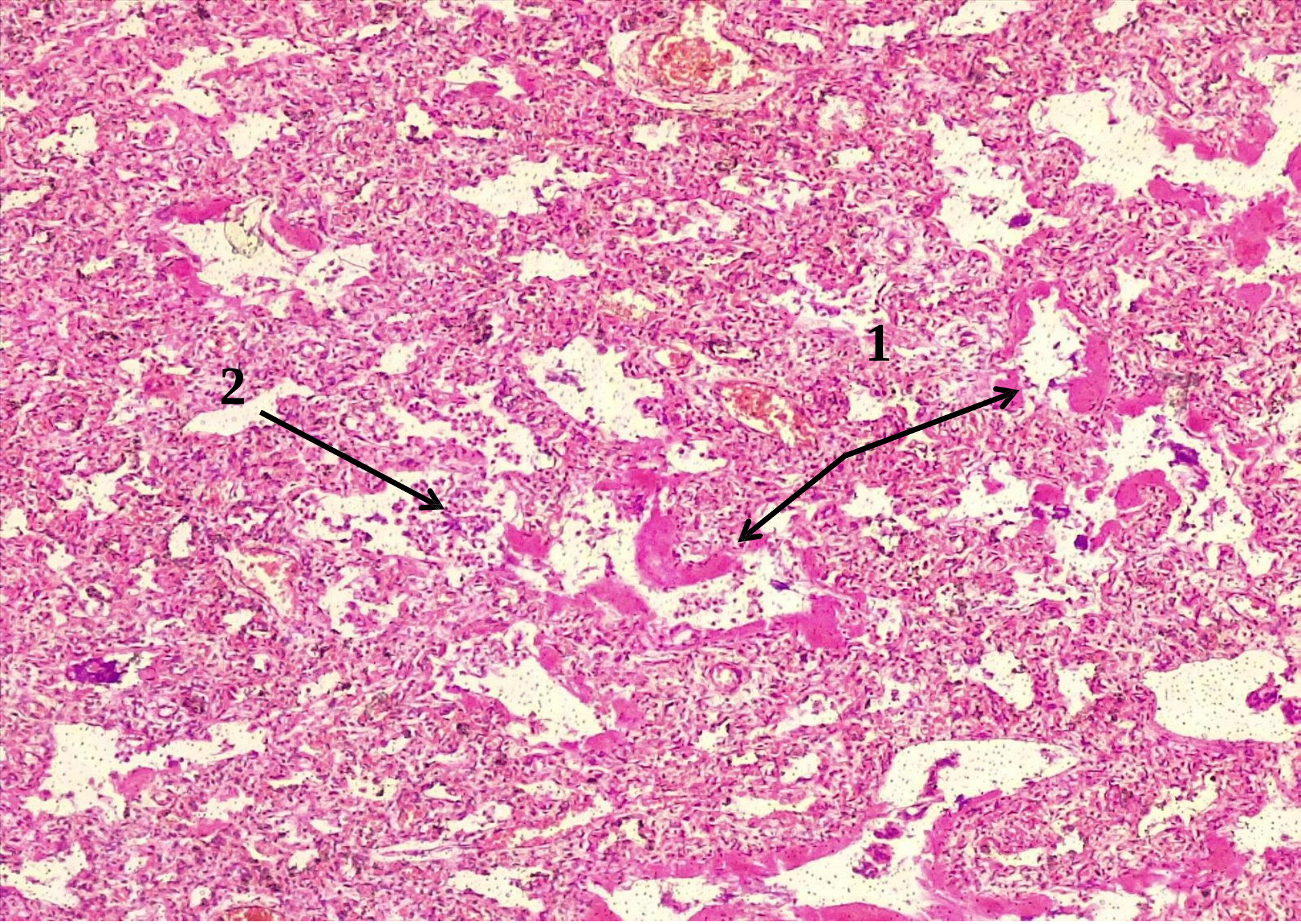
№ 220. Hyaline membranes in lungs. *(H.E. stain).*

Indications:

1. Densified proteic masses in shape of rings that adhere to the walls of the alveoli.
2. Inflammatory exudate in the lumen alveoli and interalveolar septa.

In most alveoli, alveolar ducts and respiratory bronchioles with deposits of protein masses in the form of continuous or fragmented rings are observed. Thickness of alveolar walls is increased, of dense consistency with variable intensely homogeneous, eosinophilic color deposists which lining the walls, called "hyaline membranes“. Some alveoli are dilated, others collapsed (atelectasis), the alveolar septa are thickened, congested, in their thickness and in the lumen of some alveoli weakly pronounced inflammatory exudate is determined.

Hyaline membranes are the most characteristic morphological substrate of Newborn Respiratory Distress Syndrome (NRDS), which is also called Hyaline Membrane Disease and is the most common cause of death among newborns. It is usually found in premature babies. Occurs in ~ 60% of children born at gestational age under 28 weeks and less than 5% of those born after 34 weeks. It is significant that hyaline membranes are never seen in stillborn babies or those who die in the first 5 days after birth. The main pathogenetic mechanism is the inability of the immature lung to produce enough surfactant, which leads to alveolar collapse, atelectasis, hypoxemia and extravasation of plasma proteins. Lesions of the endothelium and alveolar epithelium are observed. As a result of these lesions, hyaline membranes are formed, consisting of plasma proteins rich in fibrin with necrotic and scaly alveolocytes. Hyaline membranes are a barrier to gas exchange and cause acute respiratory failure. The mortality in RDS of the newborn reaches 20-30%.



№ 220. Hyaline membranes in lungs. *(H.E. stain).*

II. Macrospecimens:

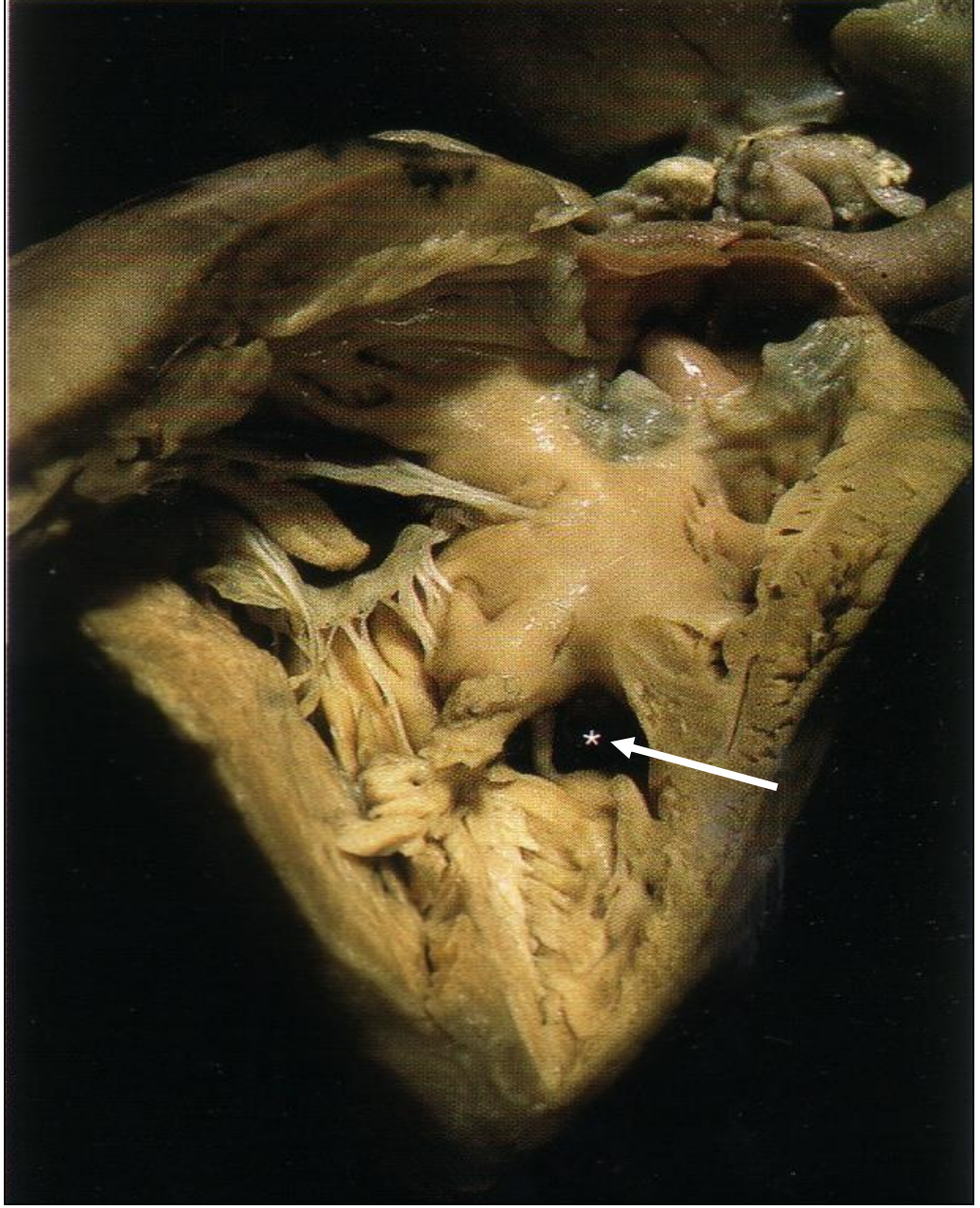
№ 7. Congenital heart anomaly: ventricular septal defect.

In the interventricular septum there is a defect with a diameter of 1.5-2 cm, located in the basal, membranous region, the wall of the left ventricle has a normal thickness. Due to this defect, abnormal communication takes place between the left ventricle and the right ventricle - "left to right shunt". In such abnormalities the pulmonary blood flow increases and no cyanosis and hypoxia (cardiac malformation of the cyanotic or white type) are observed.

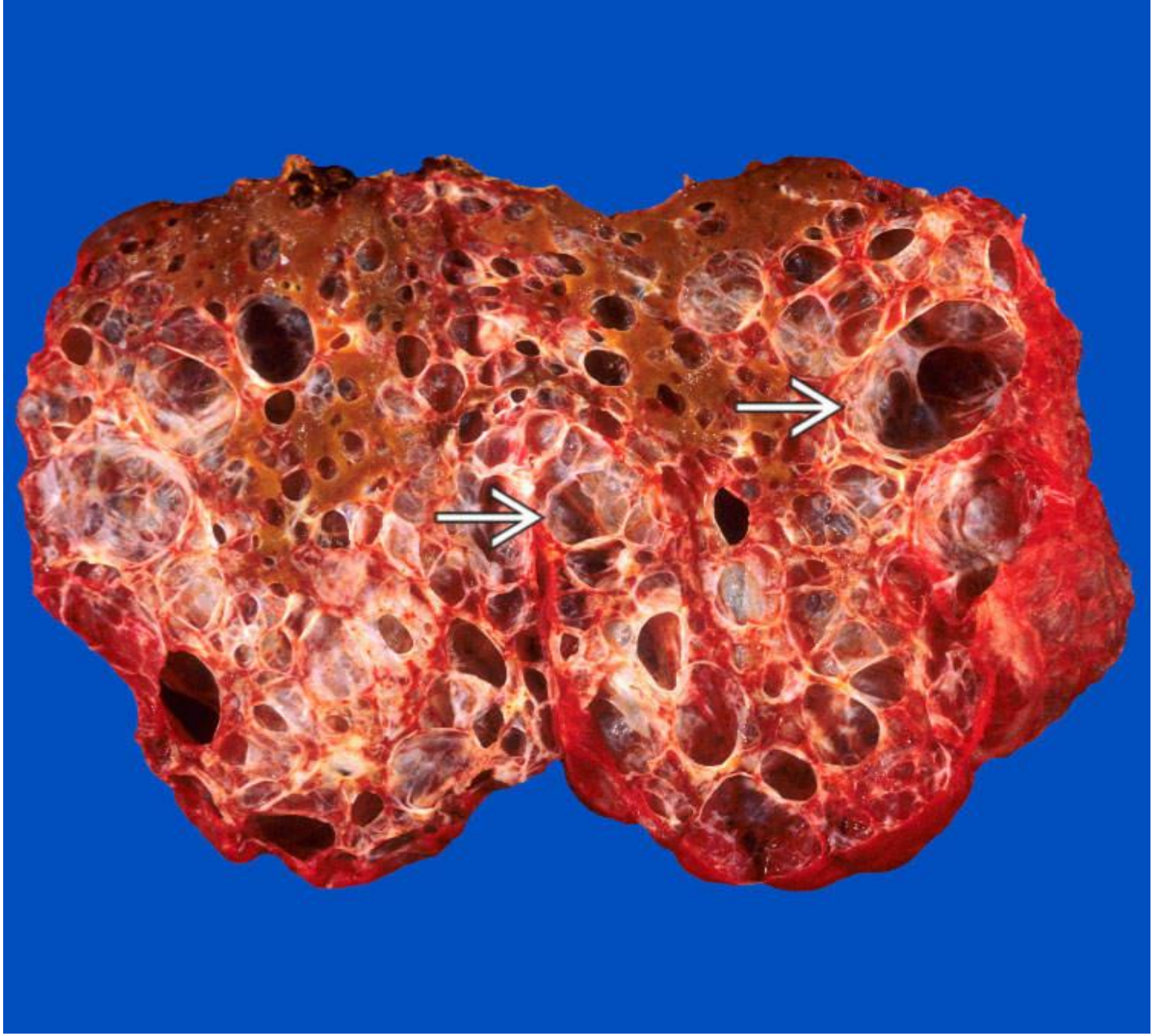
Ventricular septal defects are the most common congenital malformation of the heart (~ 30% of the total number), the usual location being at the level of the membranous, fibroconnective tissue part of the septum. In most cases, the defect closes spontaneously in childhood. Small defects are asymptomatic but may progress clinically. Large defects require early surgical correction to prevent the progression of the "left to right" shunt, which can lead to congestive heart failure. In approximately 70% of cases, ventricular septal defects are associated with other congenital heart malformations.

№ 77. Polycystic liver disease.

In the liver on cut section are present multiple cystic cavities of varying sizes and shapes, the liver parenchyma between cysts is with signs of steatosis. In most cases it is associated with cystic fibrosis of the pancreas, respiratory tract, salivary and sweating glands, being one of the manifestations of "fibrocystic disease" (microspecimen no. 190).



№ 7. Congenital heart anomaly: ventricular septal defect.



№ 77. Polycystic liver disease.

№ 86. Polycystic kidney disease.

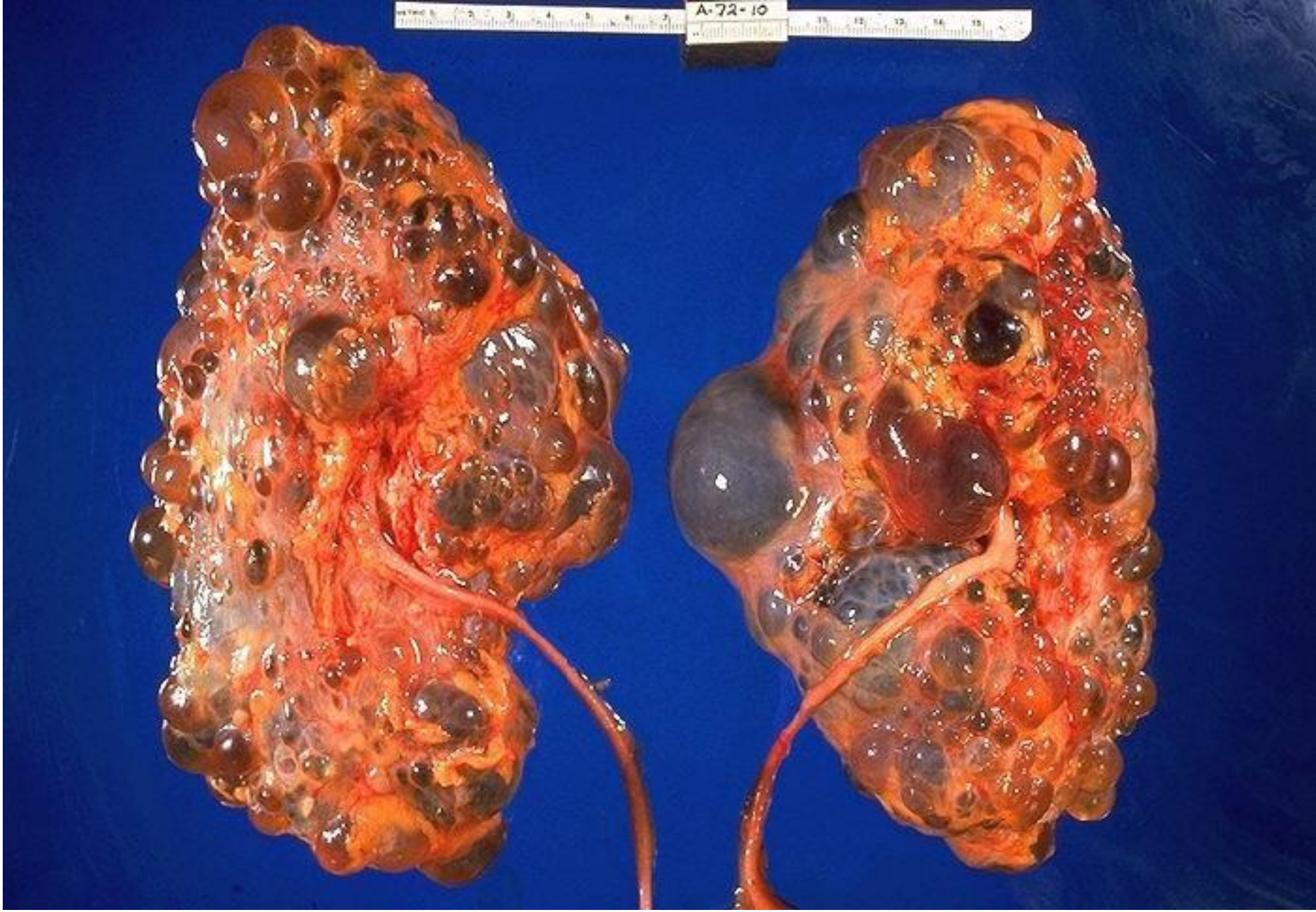
The kidney has a voluminous mass, consisting of round and oval cysts, with sizes ranging from 0.5 cm to 3-4 cm with thin walls, smooth inner surface, clear contents, between cysts there is atrophied renal parenchyma or even absent.

It is the morphological substrate of adult polycystic kidney disease - a condition with autosomal dominant transmission. It has an incidence of 1 in 500-1000 people and is ~ 10% of cases of chronic kidney disease. Cysts can form at any level of the nephron. In some cases it is associated with hepatic and pancreatic cysts. Complications: chronic renal failure, urinary tract infections (pyelonephritis), hypertension (cerebral hemorrhage).

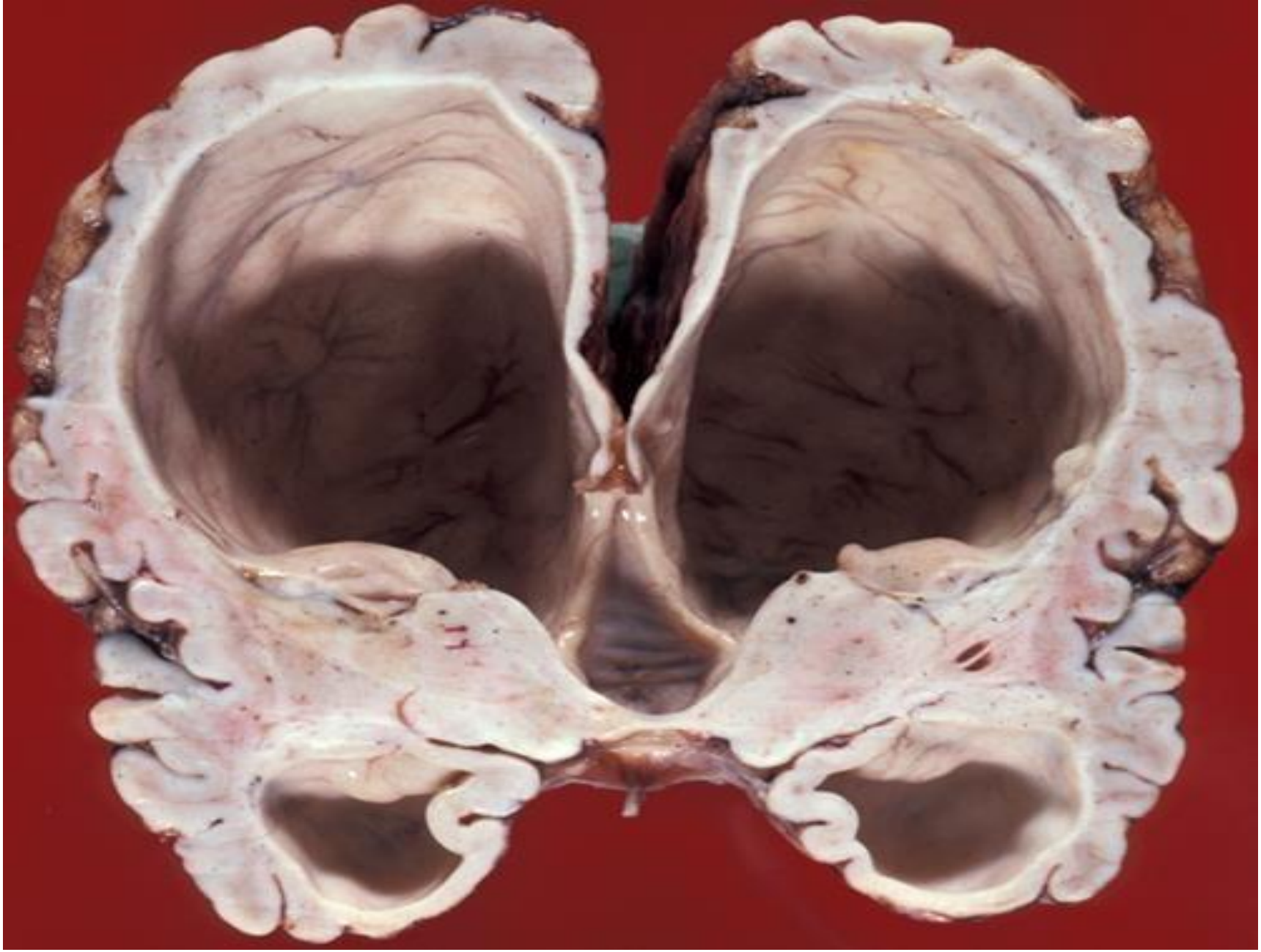
№ 123. Hydrocephalus.

The brain is enlarged, the lateral ventricles considerably dilated, the brain tissue is atrophied by compression.

Hydrocephalus - excessive accumulation of cerebrospinal fluid in the ventricular system - internal hydrocephalus or in the subarachnoid space - external hydrocephalus. The cause of cerebrospinal fluid disorder is stenosis or atresia of foramina of Monro and the Sylvius aqueduct, the median aperture (foramen of Magendie) and lateral aperture (foramina of Luschka).



№ 86. Polycystic kidney disease.



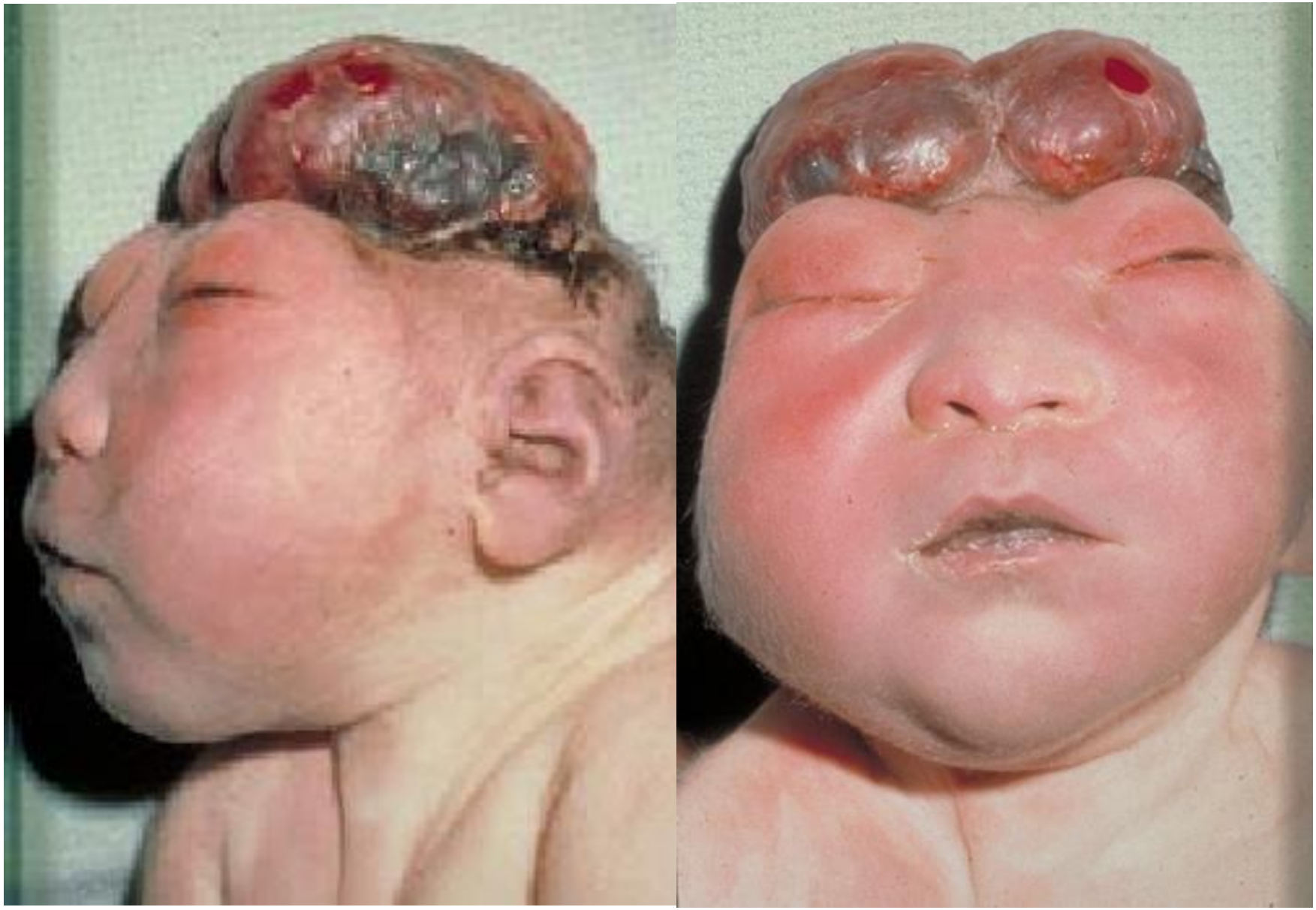
№ 123. Hydrocephalus.

№ 157. Congenital malformation: anencephaly.

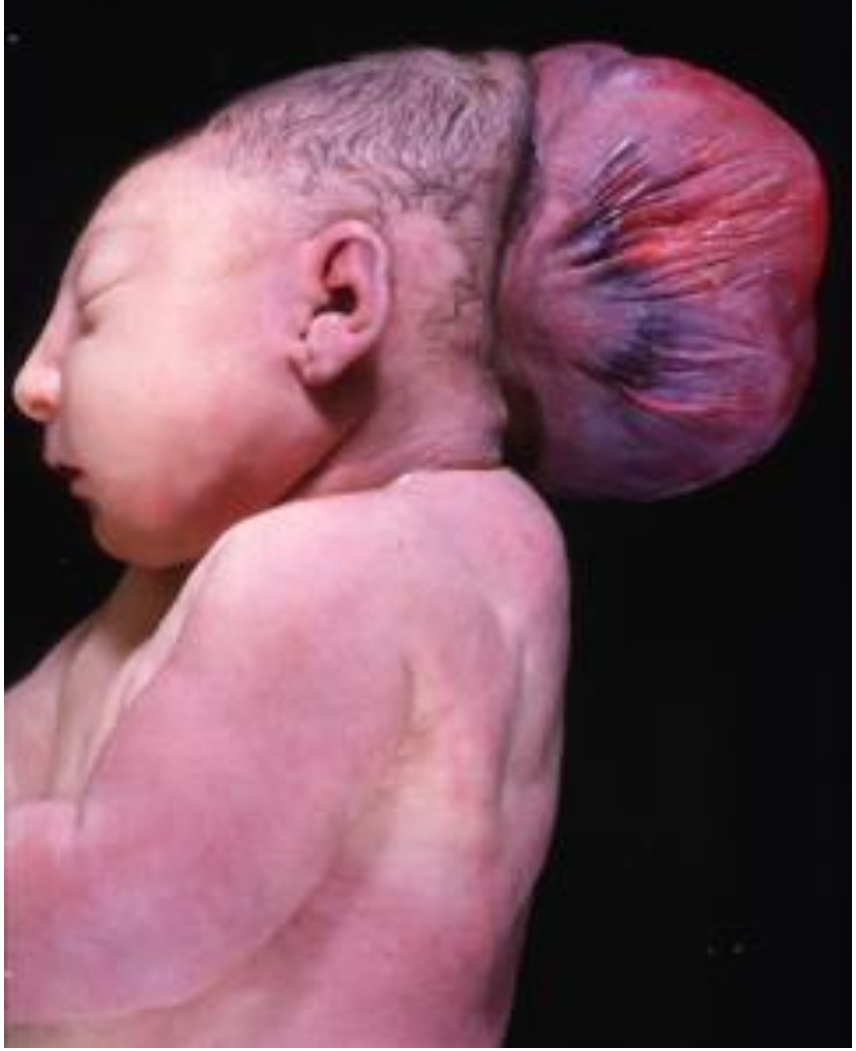
The macrospecimen shows the absence (agenesis) of the brain, associated with acrania - the absence of the bones of the cranial vault.

№ 158. Congenital malformation: encephalocele.

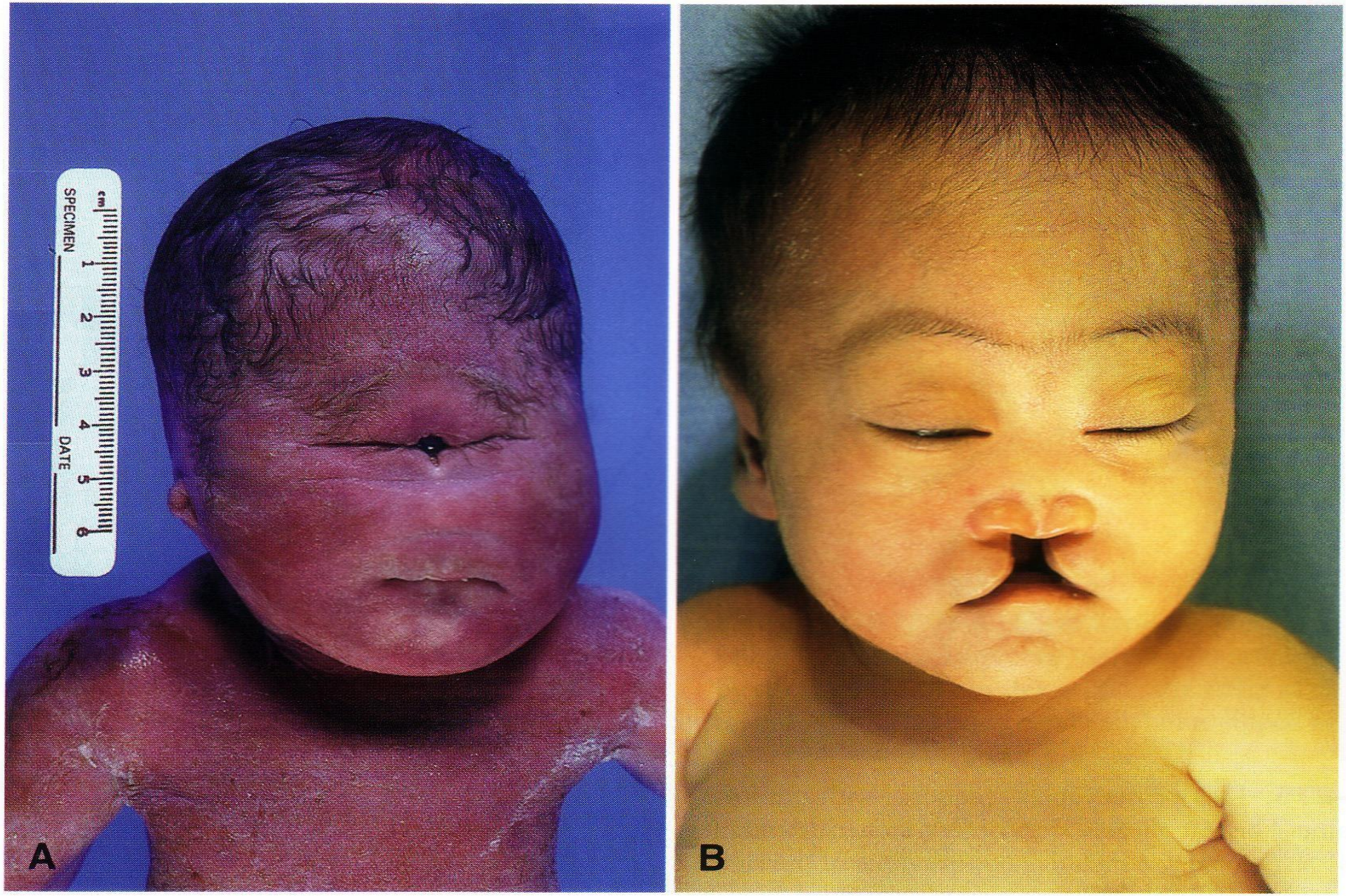
In the macrospecimen there is a subcutaneous cystic formation in the occipital region of the head, which presents an evagination, a herniation of the brain tissue in the subcutaneous space through a defect of the cranial bones. The contents of the hernia sac can be the meninges - meningocele, the brain substance - encephalocele or both components - meningoencephalocele.



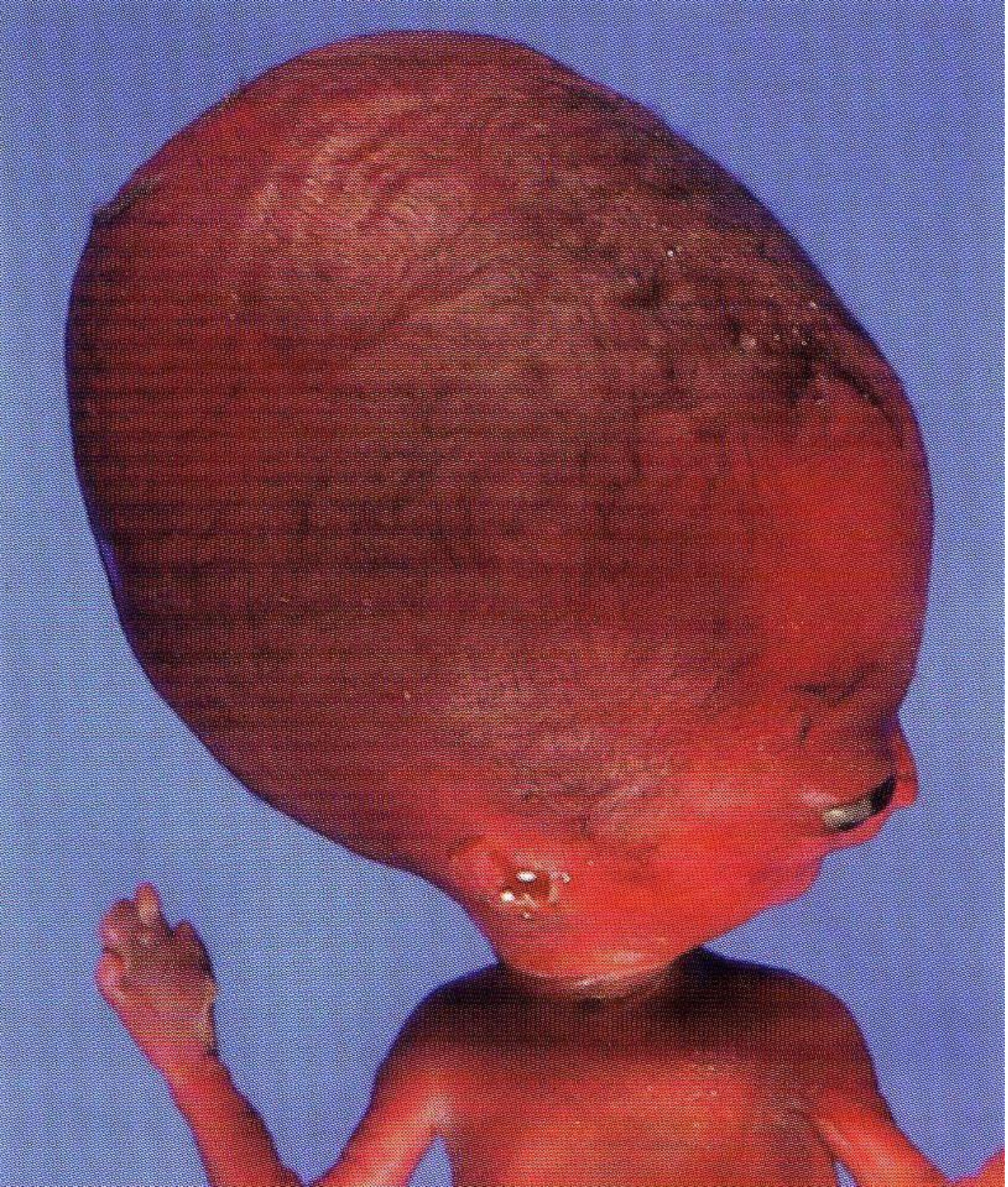
№ 157. Congenital malformation: anencephaly.



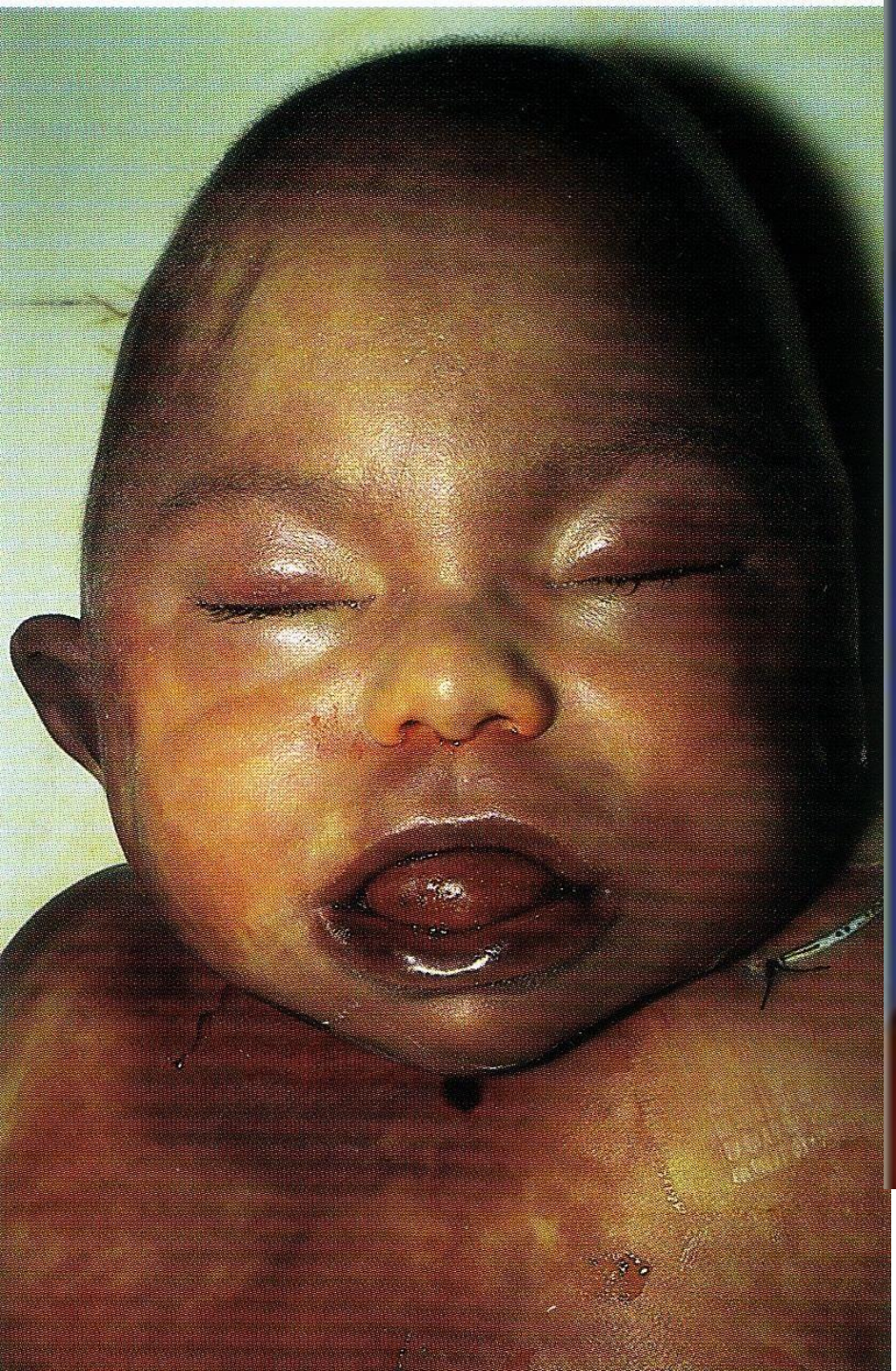
№ 158. Congenital malformation: encephalocele.



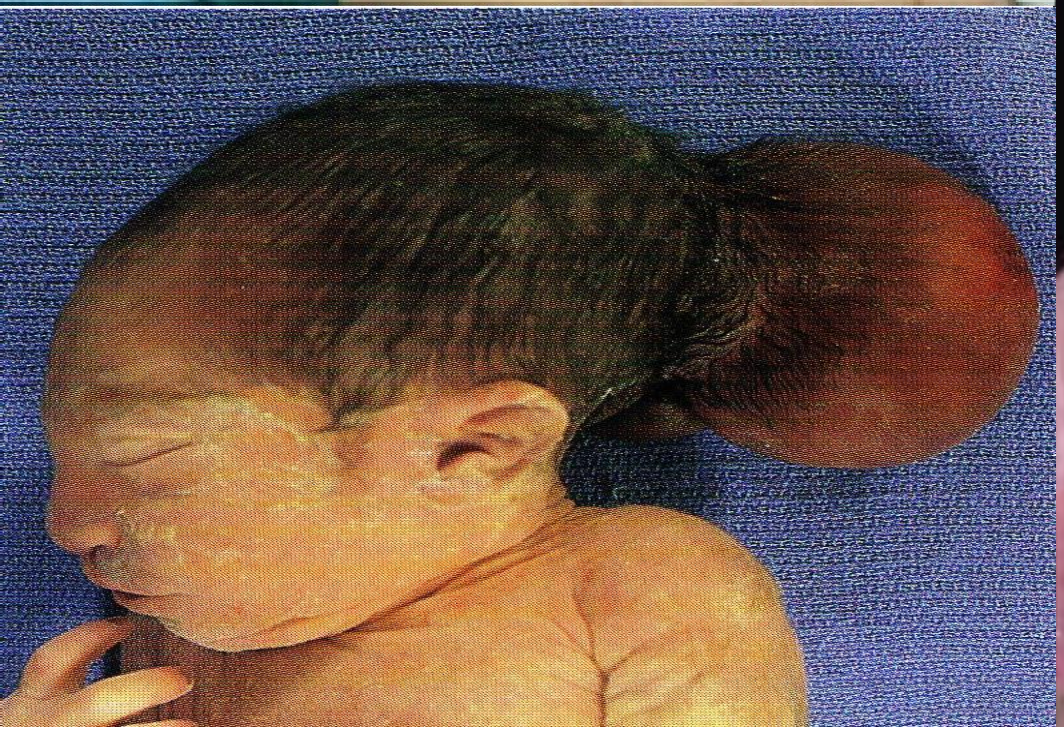
A - Cyclopia, absence of nasal structures, hypotelorism.
B – Cleft lip, the absence of the nasal septum and palate defect.

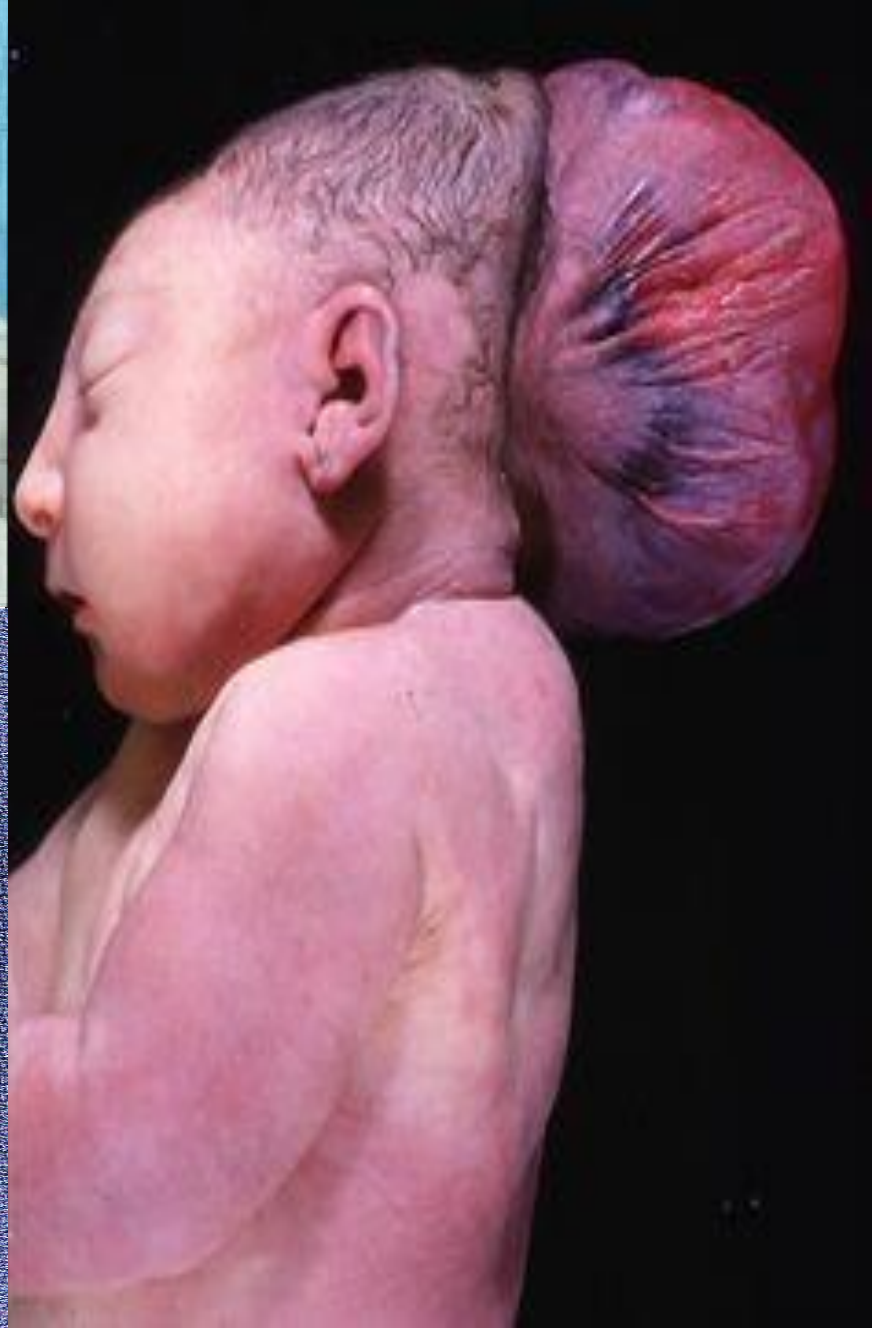


Hydrocephalus, ears hypoplasia, micrognathia.

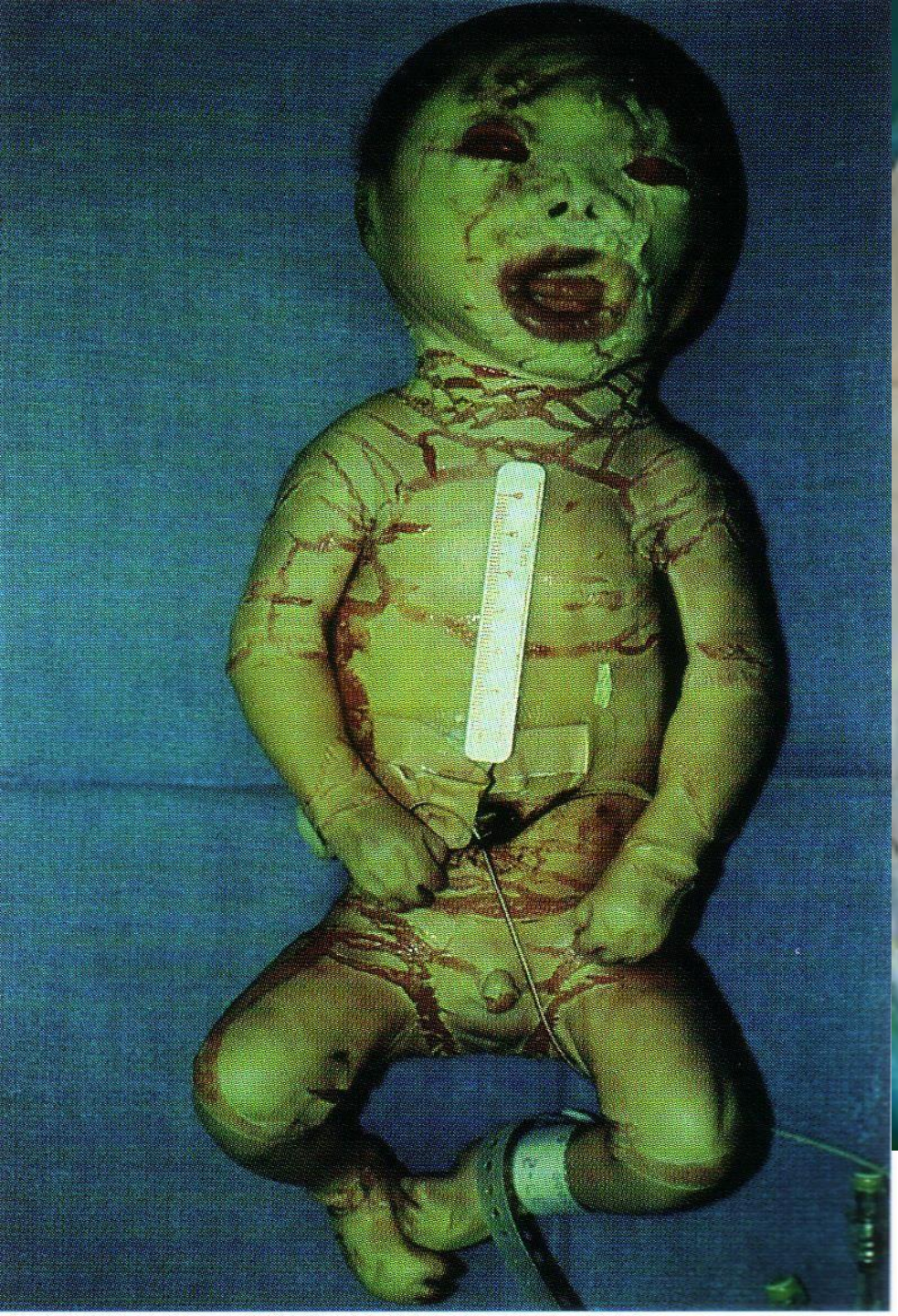


Macroglossia.

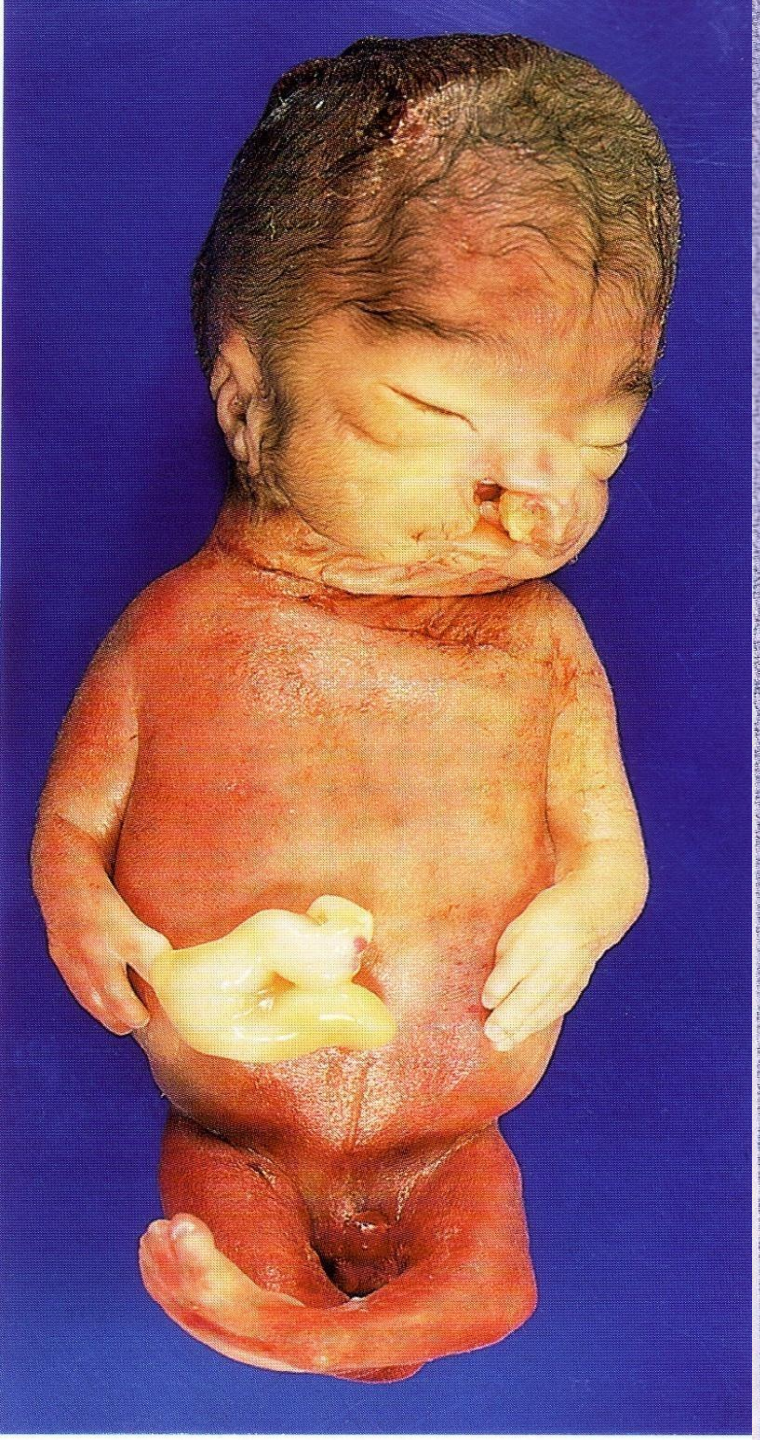


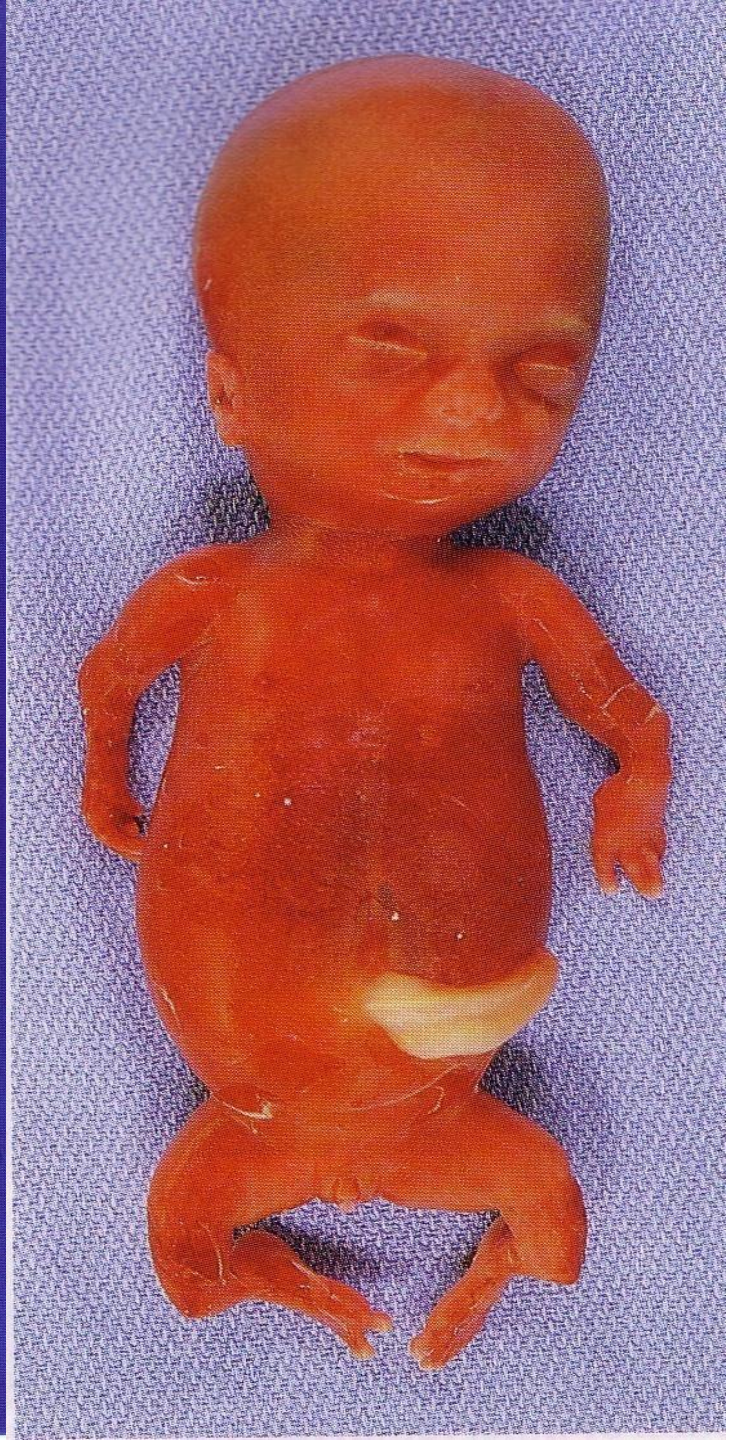


Meningoencephalocele.

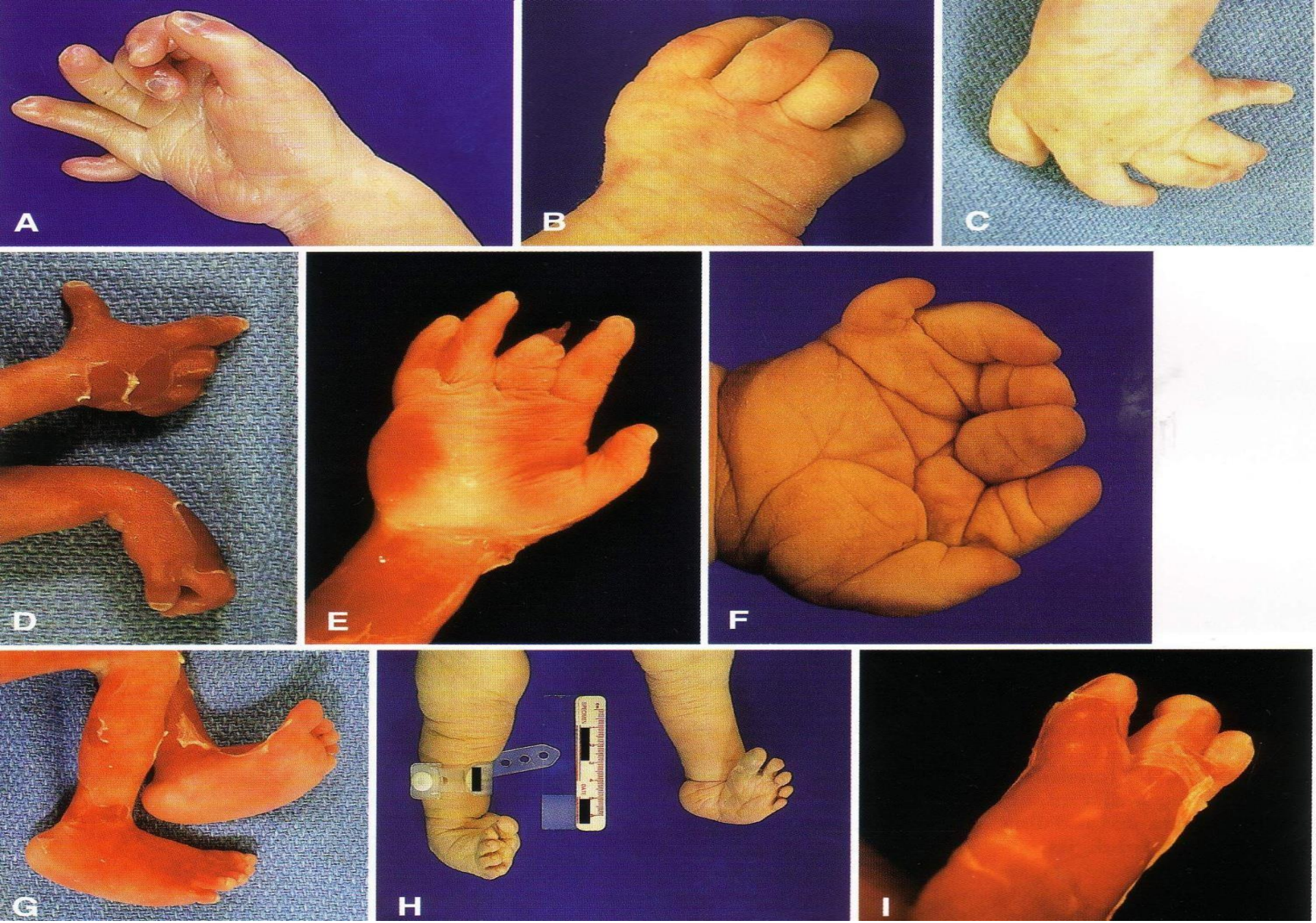


Ichthyosis.



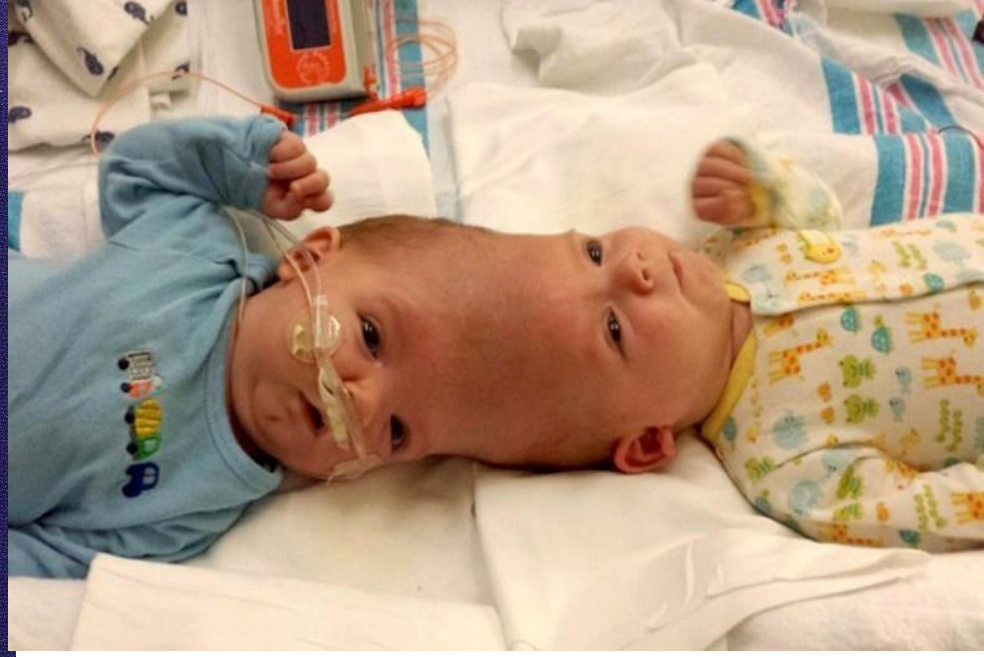


Limb hypoplasia.

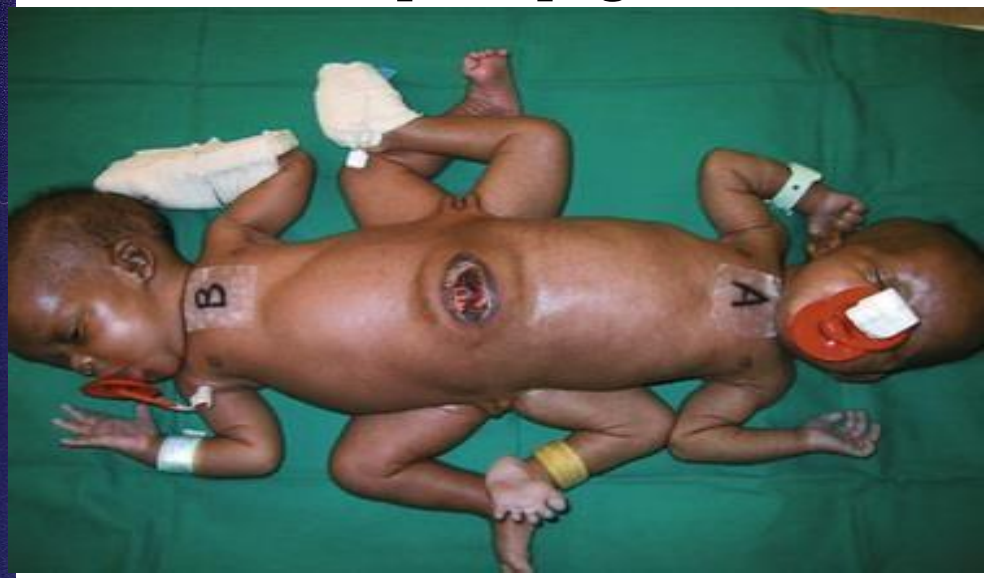


Limb abnormalities.

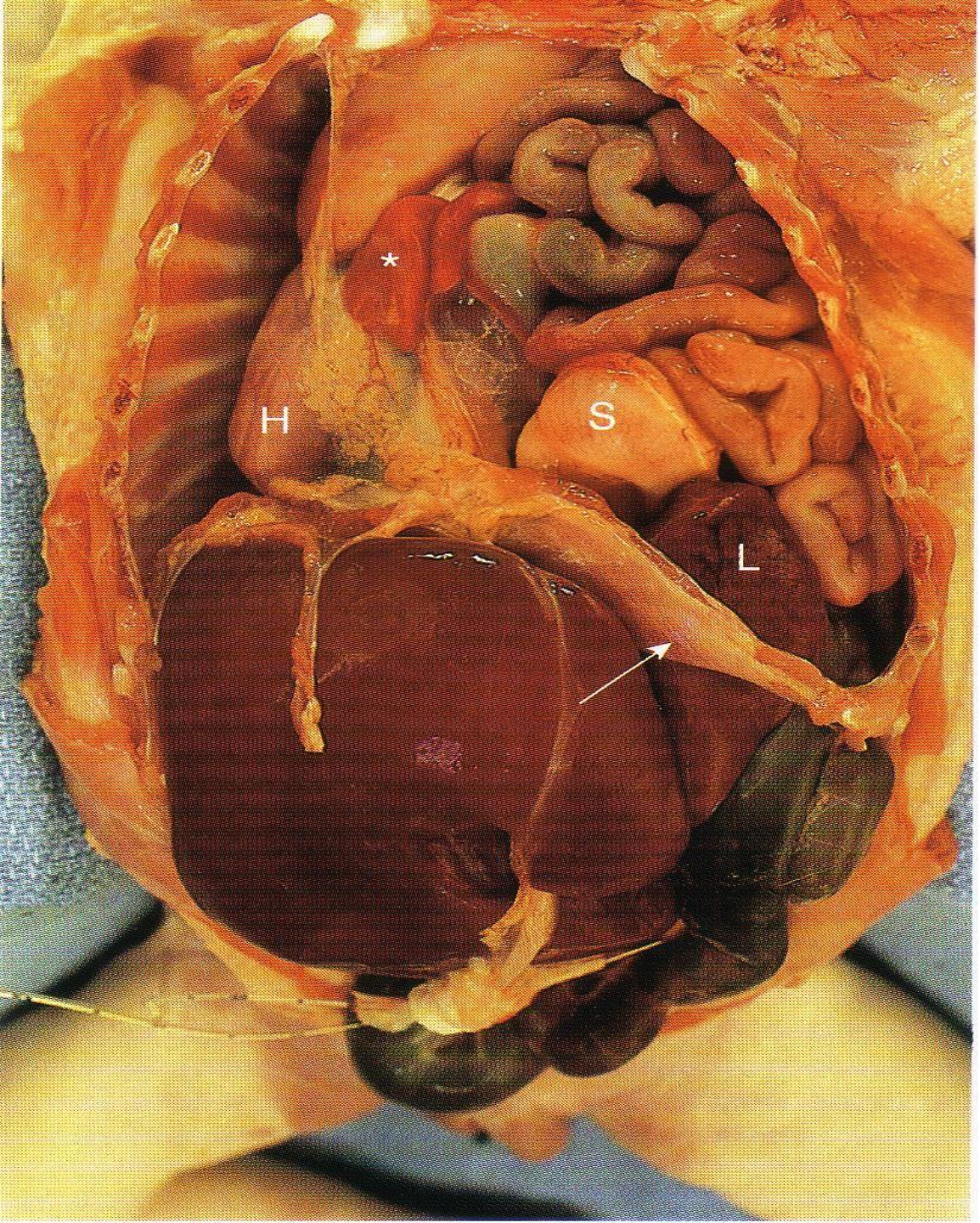
Cephalothoracopagus.



Cephalopagus.

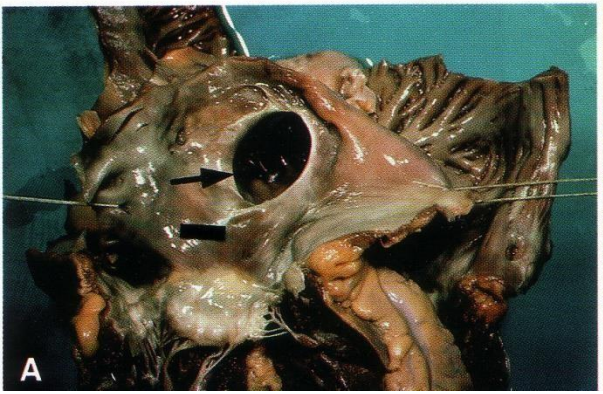


Ischiopagus.

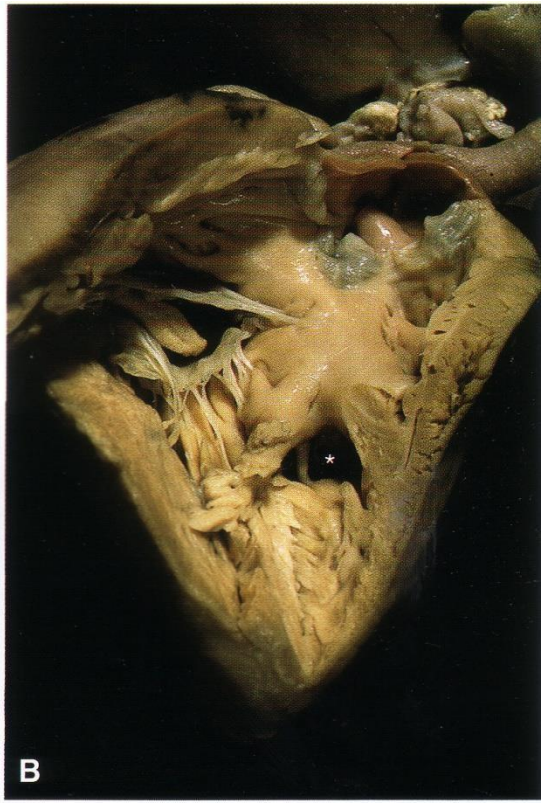


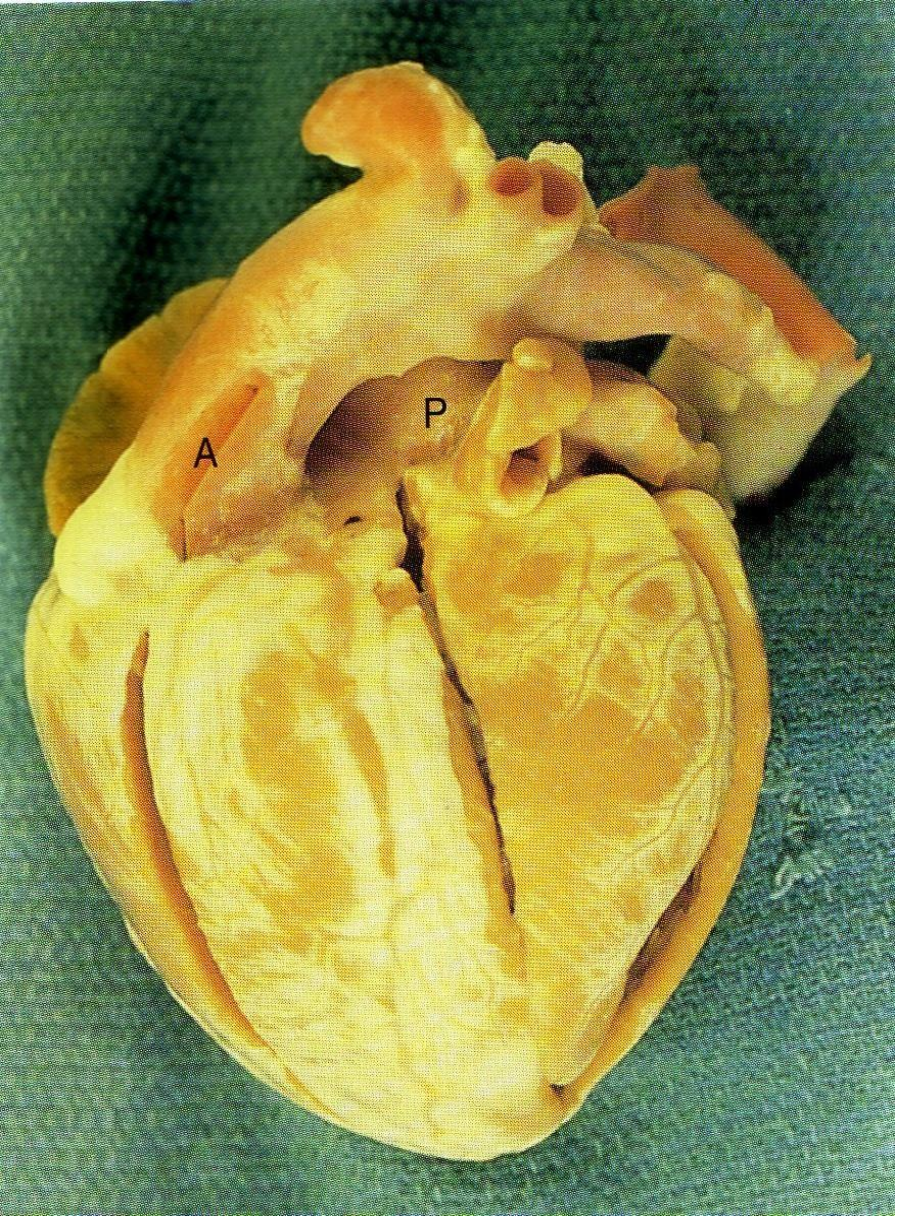
Diaphragmatic hernia.

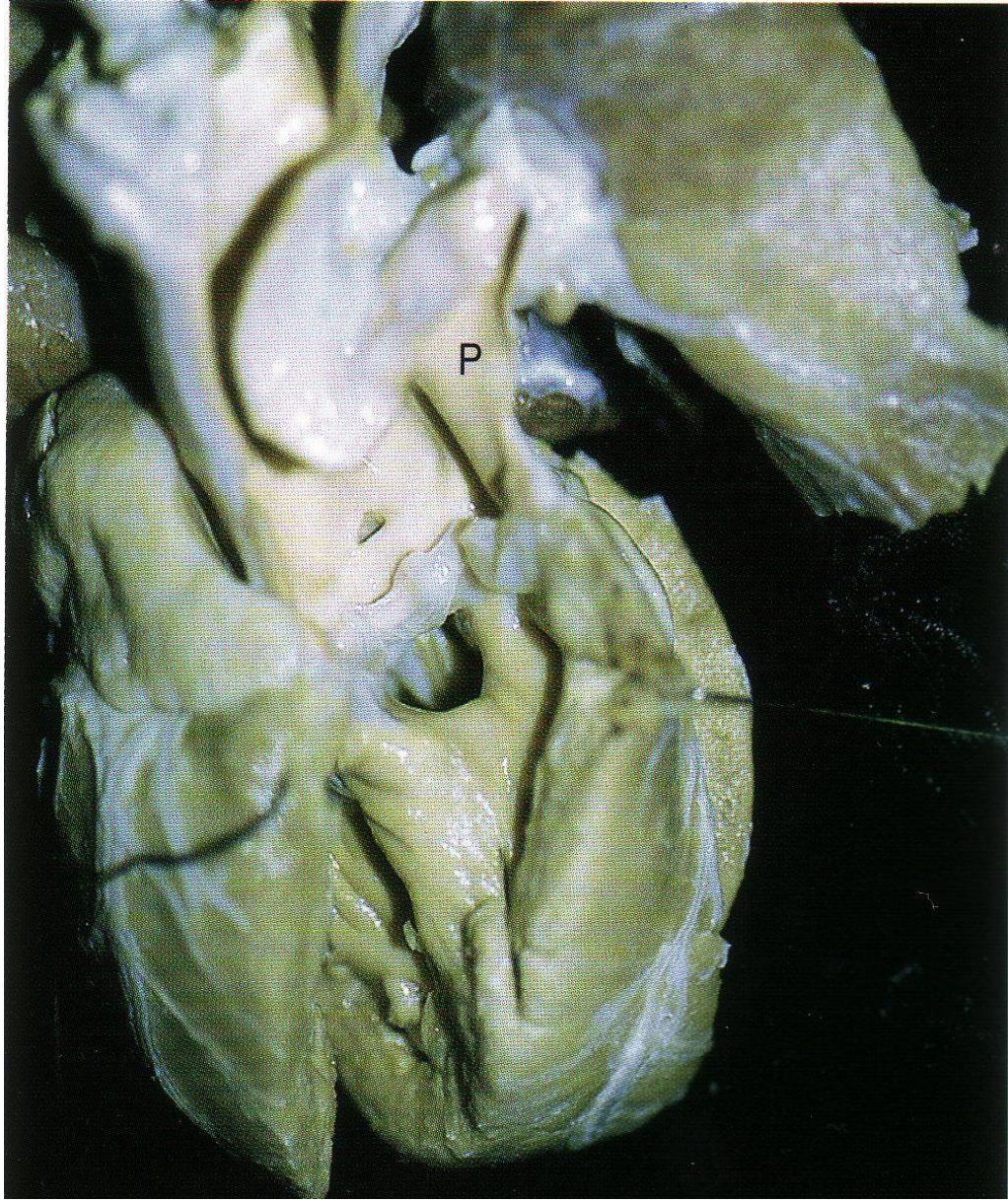
Defect of interatrial septum.



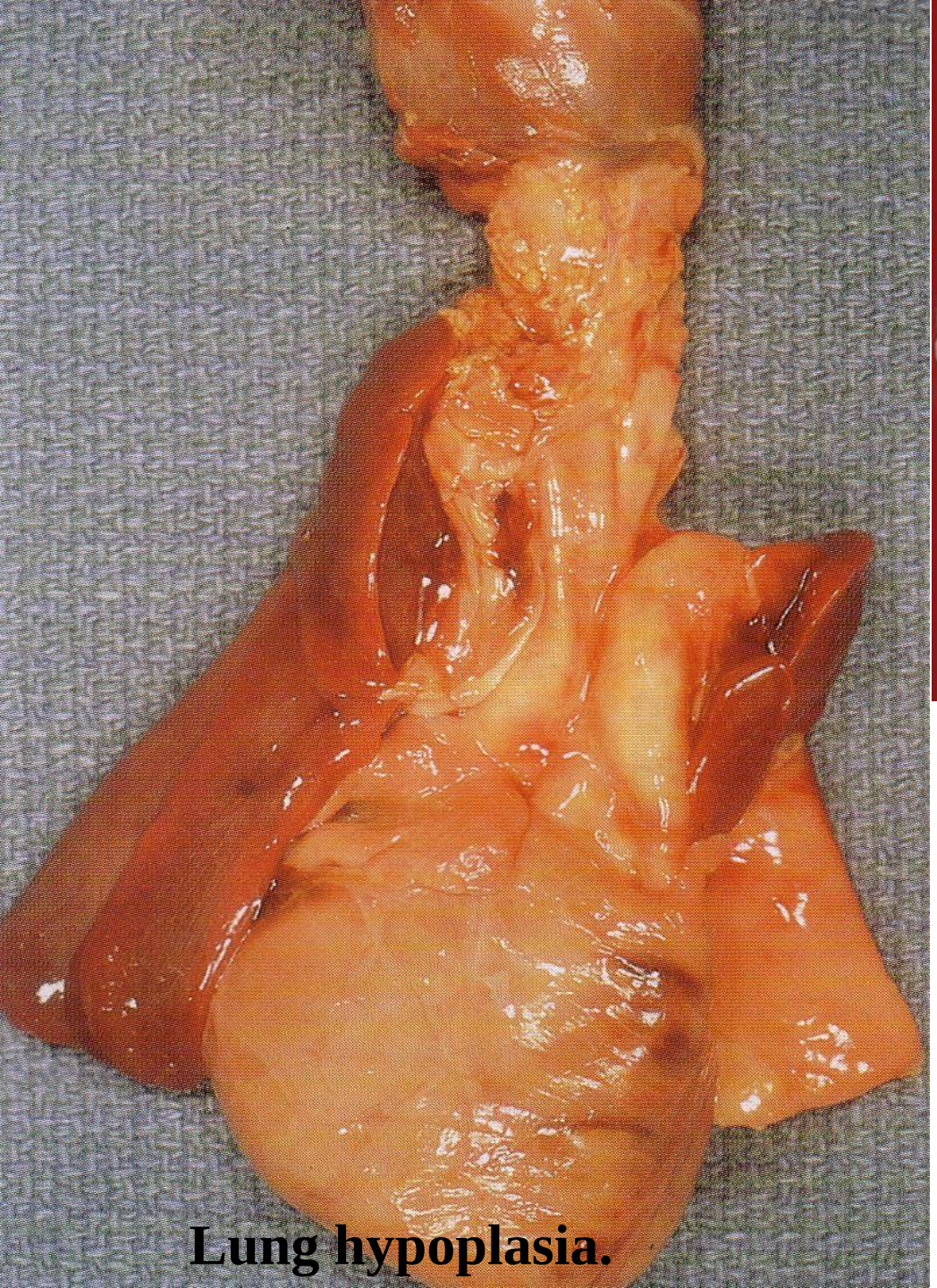
Defect of interventricular septum.



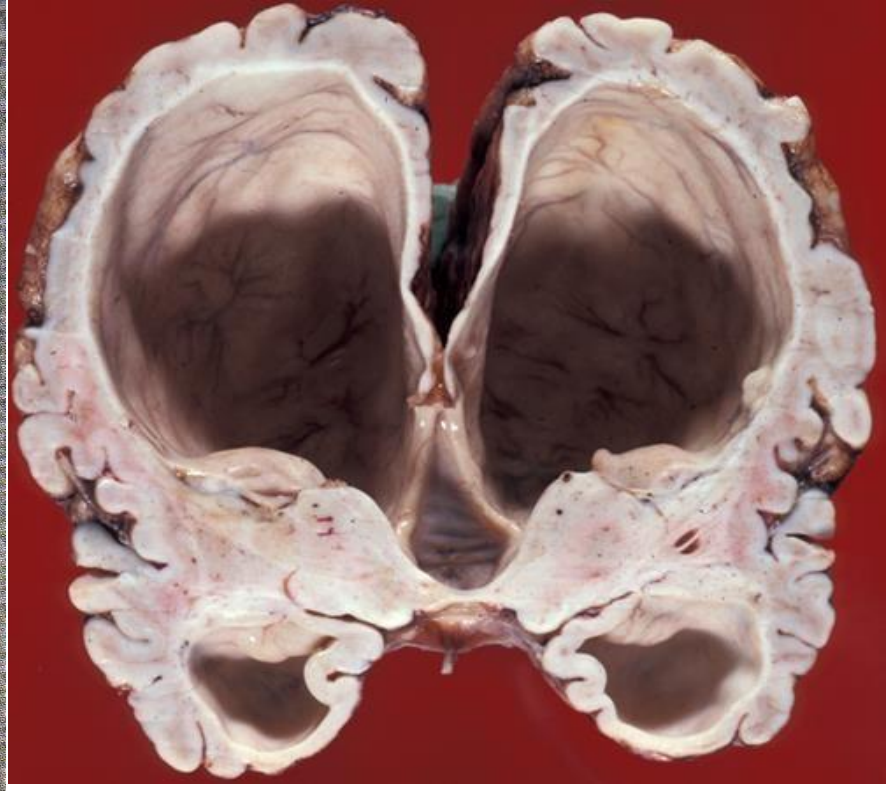




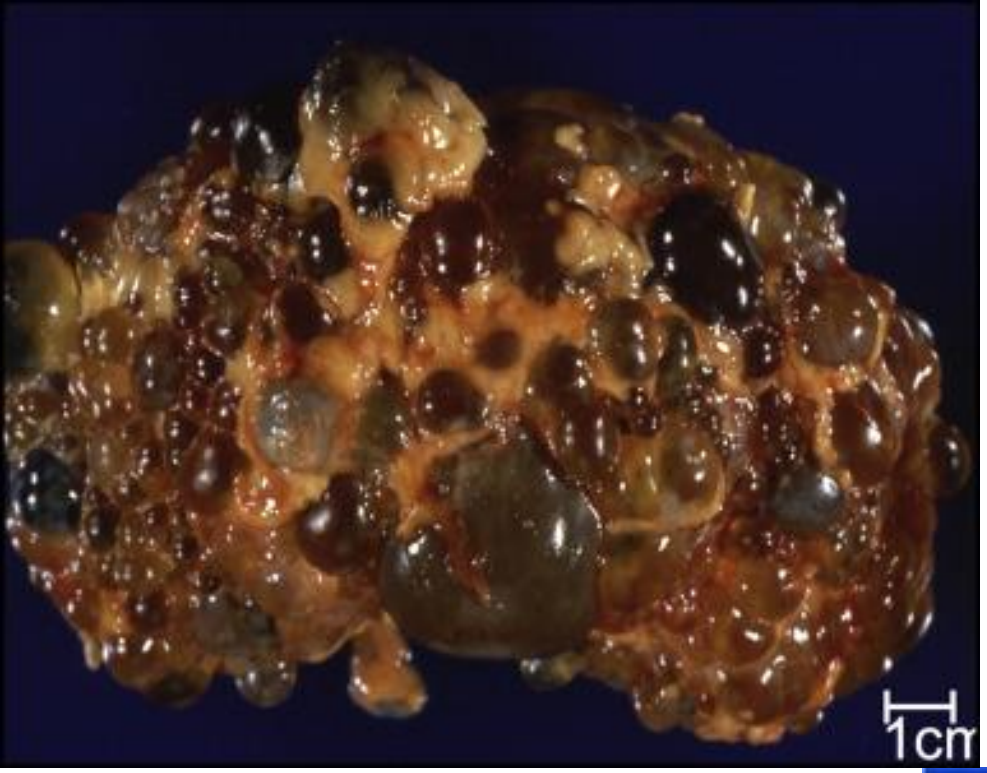
Transposition of great arteries and dextroposition of the aorta.



Lung hypoplasia.

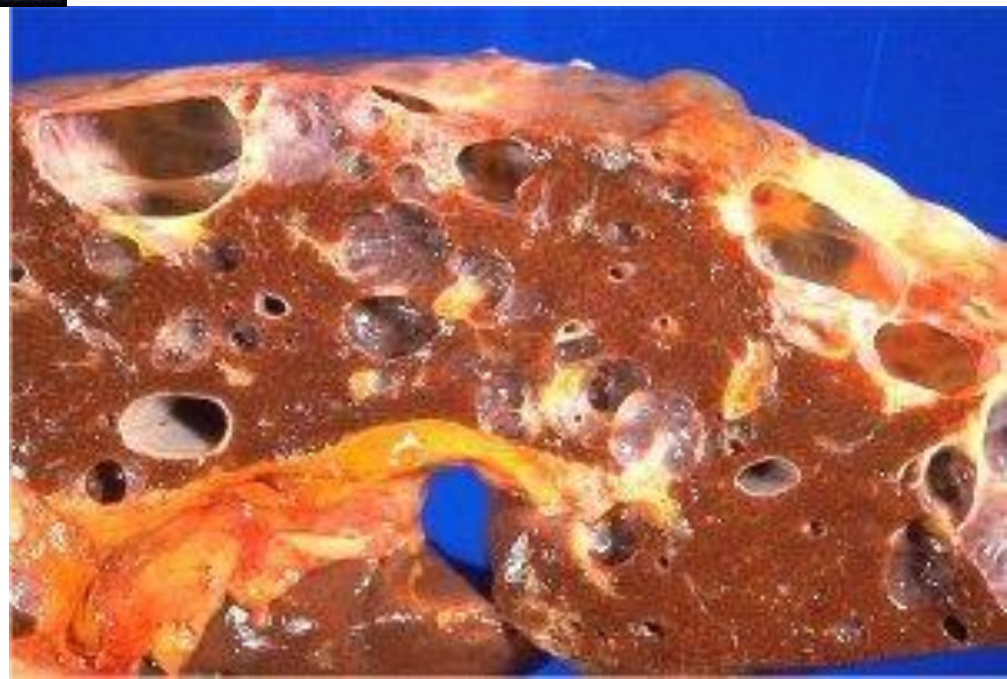


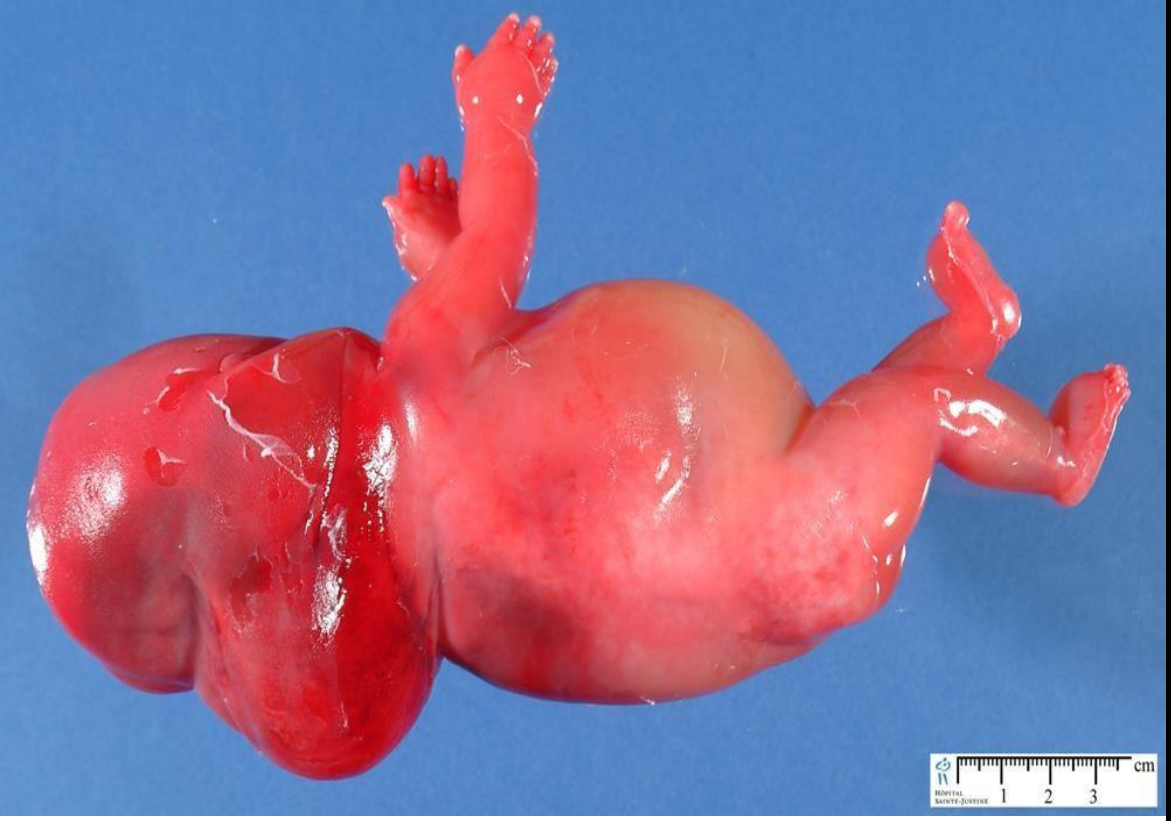
Hydrocephalus.



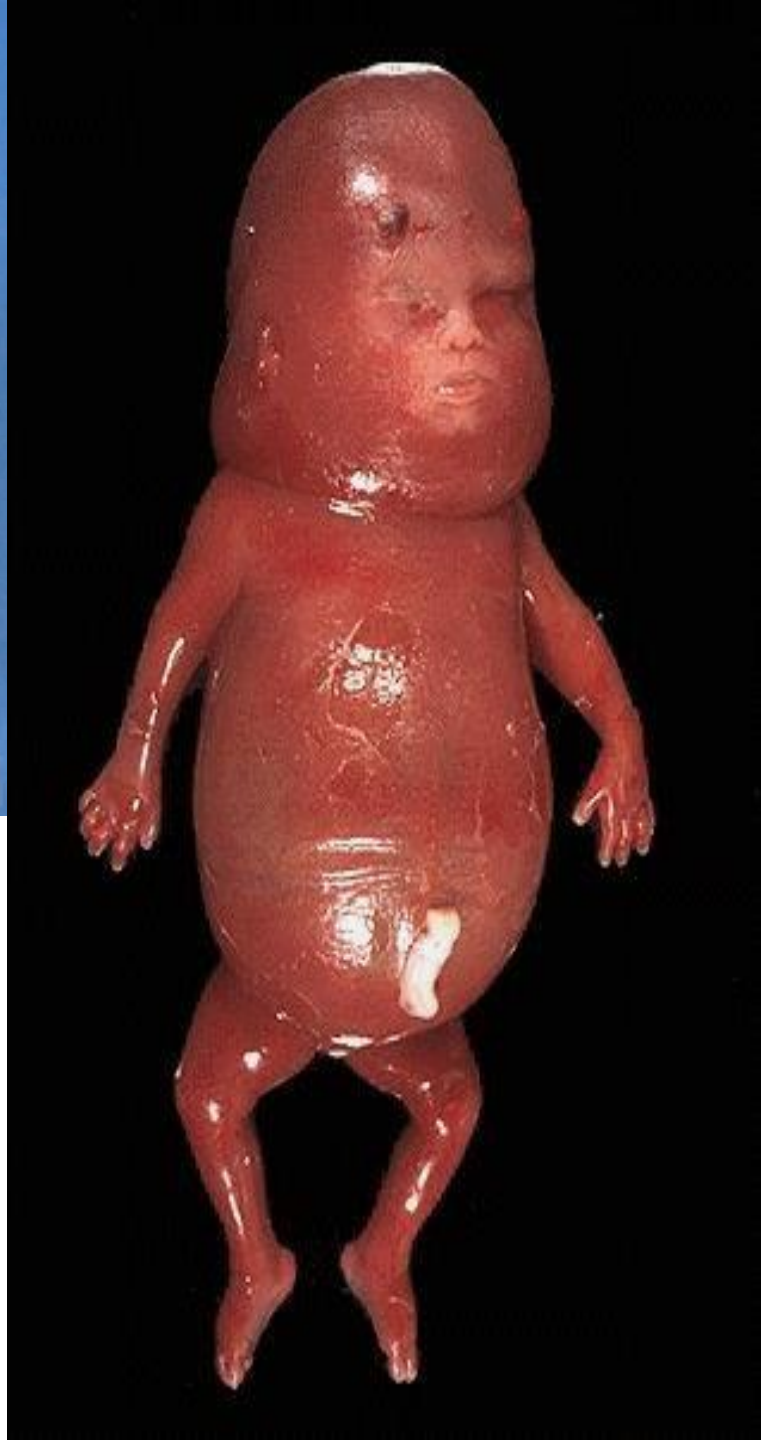
Polycystic liver disease

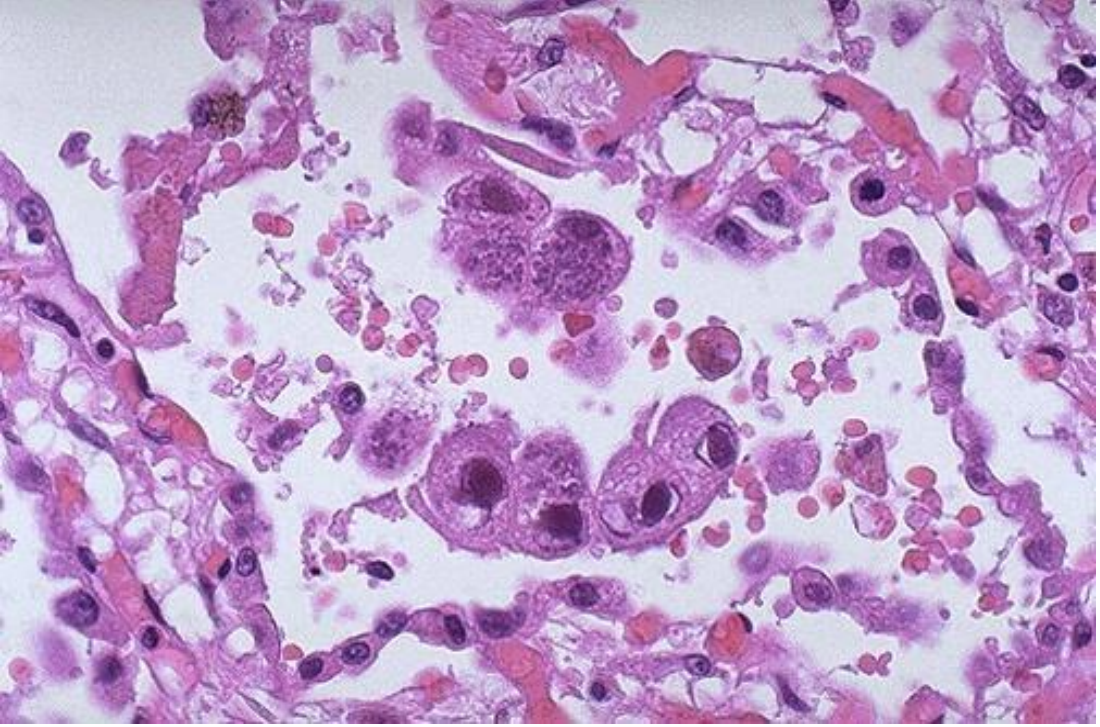
Polycystic kidney disease

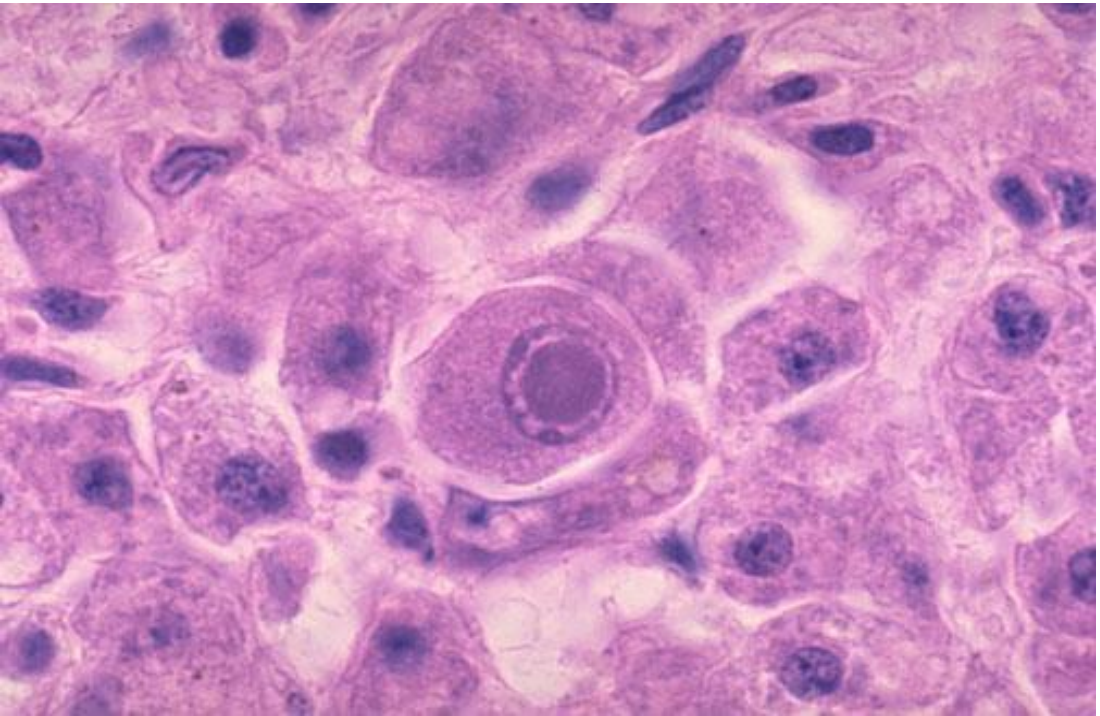




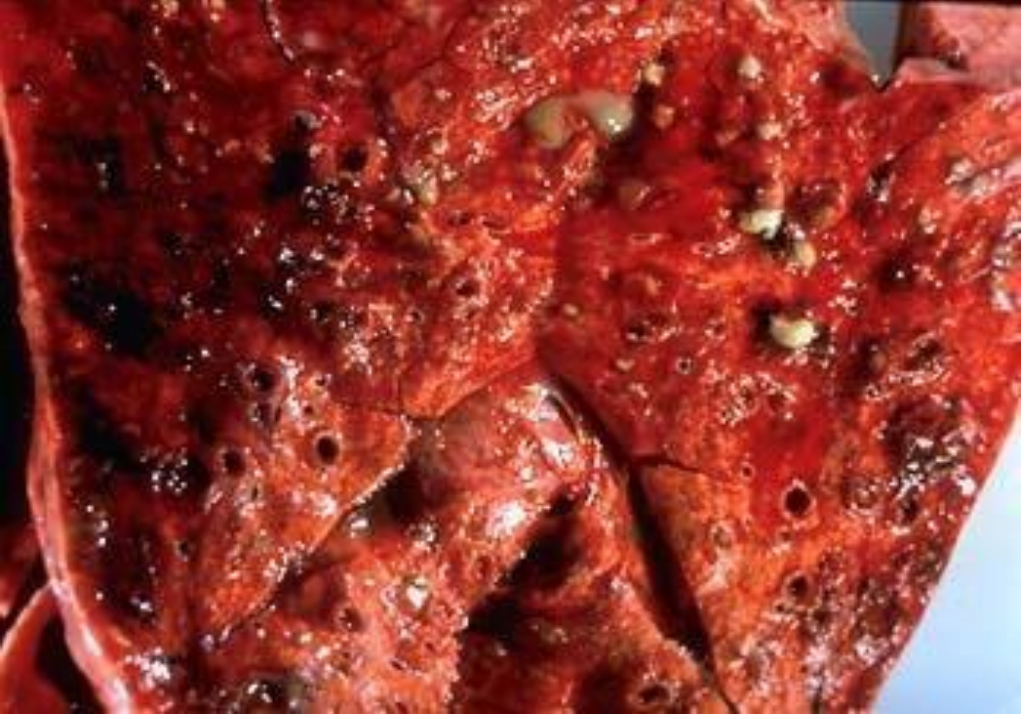
Hemolytic disease of newborn (congenital hydrops).

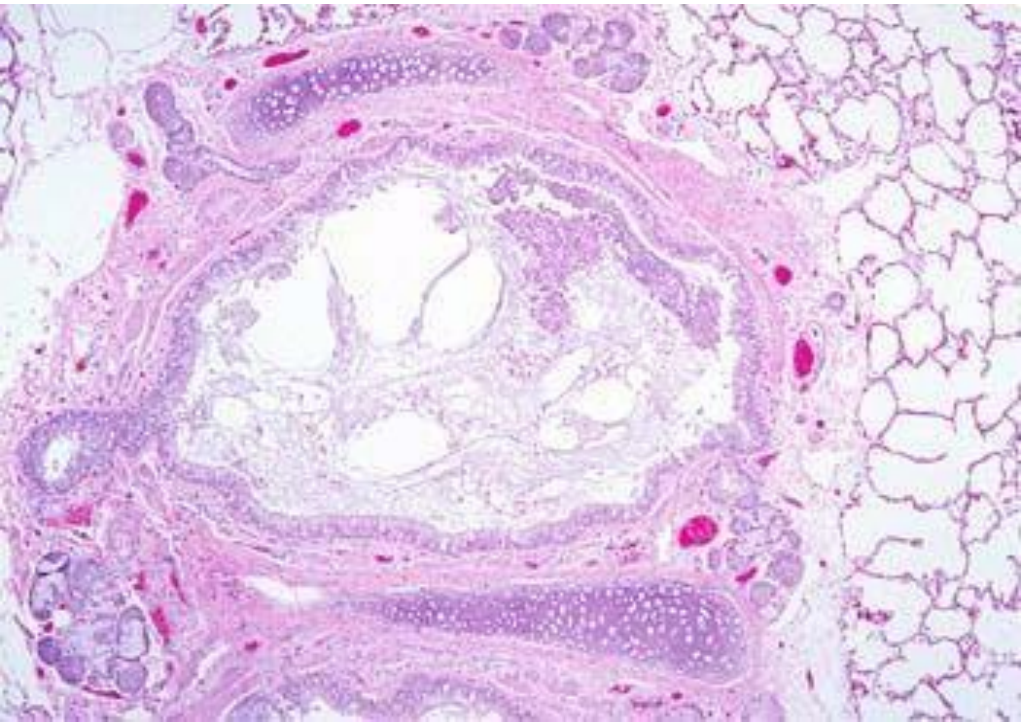




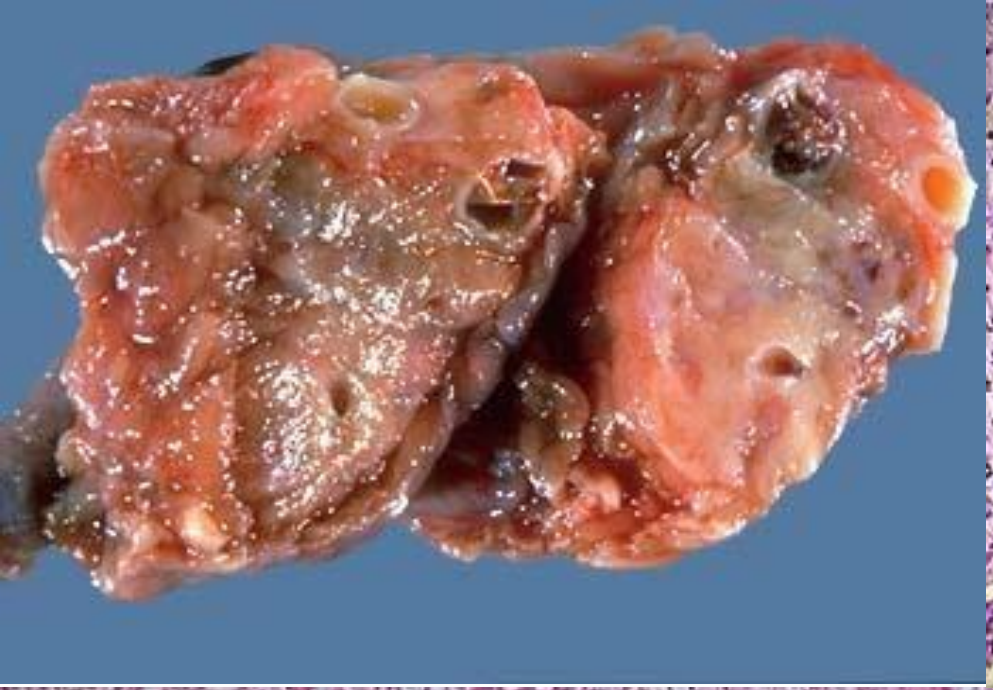


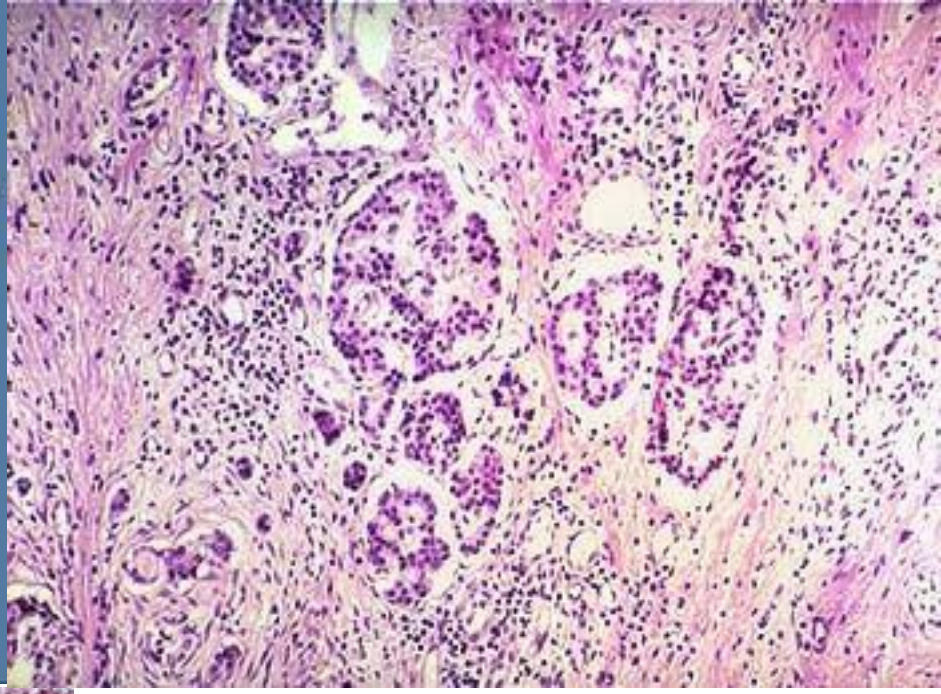
Cytomegalogic reaction of alveolar epithelium and of hepatocytes.

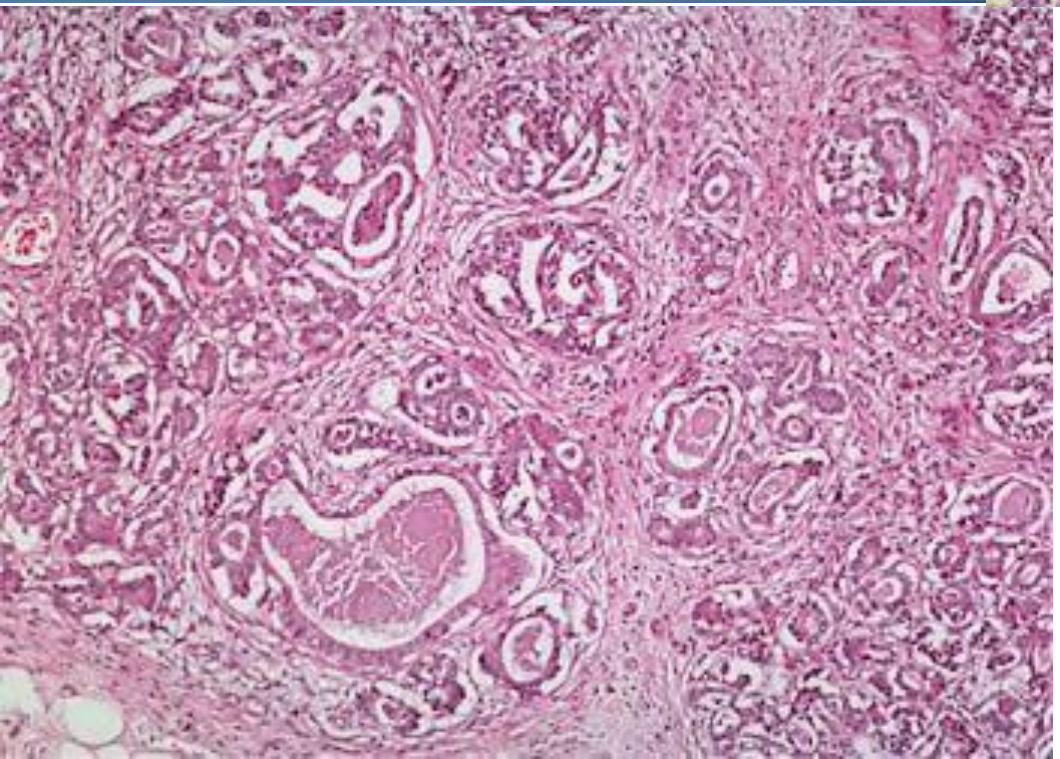




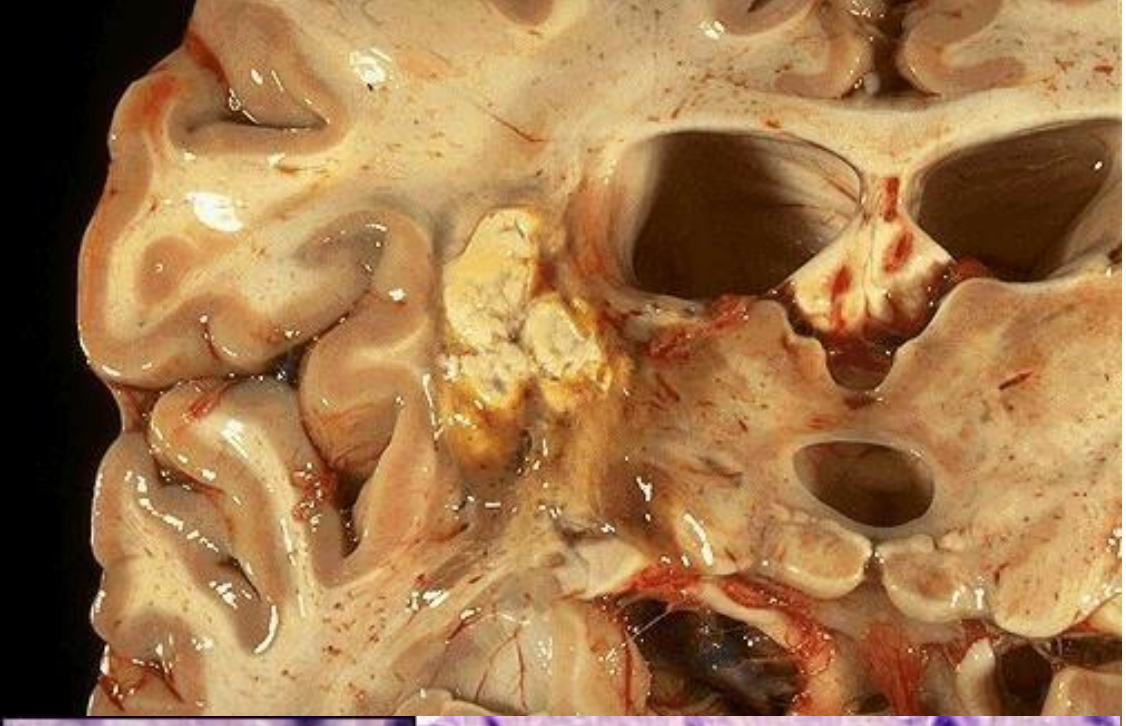
Lung in cystic fibrosis.

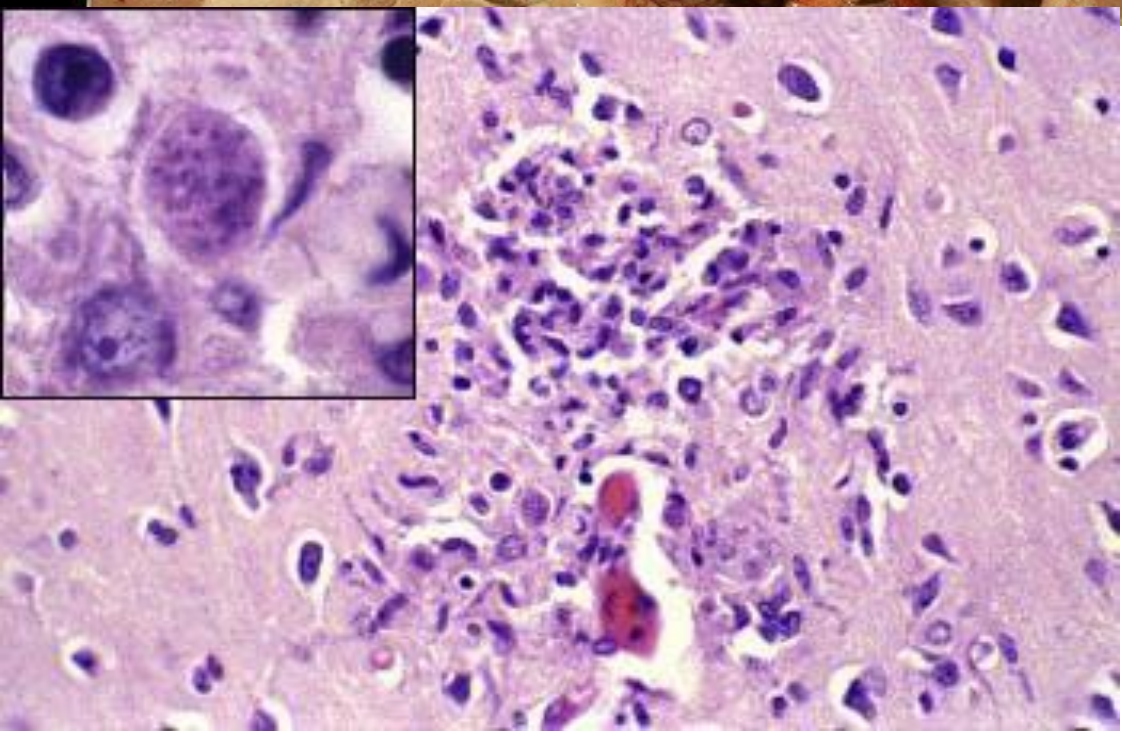






Cystic fibrosis of the pancreas.





Toxoplasmosis,
macro - cerebral abscess,
micro – microglial granuloma
and pseudocyst.

- **Malformations**
  - primary errors of morphogenesis, usually multifactorial
  - e.g. congenital heart defect
- **Disruptions**
  - secondary disruptions of previously normal organ or body region
  - e.g. amniotic bands
- **Deformations**
  - extrinsic disturbance of development by biomechanical forces
  - e.g. uterine constraint
- **Sequence**
  - a pattern of cascade anomalies explained by a single localized initiating event with secondary defects in other organs
  - e.g. Oligohydramnios (Or Potter) Sequence
- **Syndrome**
  - a constellation of developmental abnormalities believed to be pathologically related
  - e.g Turner syndrome

DEFORMATIONS.

Arise later in fetal life, resulting from mechanical factors (uterine constraint between 35th-38th weeks)

-MATERNAL FACTORS: 1st pregnancy, hypopla-
sic uterus, uterus bicornis, leiomyomas

-FETAL/PLACENTAL FACTORS:
oligohydramnios,
several fetuses,abnormal fetal presentation, etc vgr. Potter`s sequence

ORGAN SPECIFIC ANOMALIES

- *AGENESIS*: complete absence of an organ
- ATRESIA: absence of an opening
- *HYPOPLASIA*: incomplete development or under- development of an organ with decreased numbers of cells
- *HYPERPLASIA*: overdevelopment of an organ associated with increased numbers of cells
- *HYPERTROPHY:* increase in size with no change in number of cells
- *DYSPLASIA:* in the context of malformations (*versus* neoplasia) describes an abnormal organization of cells.

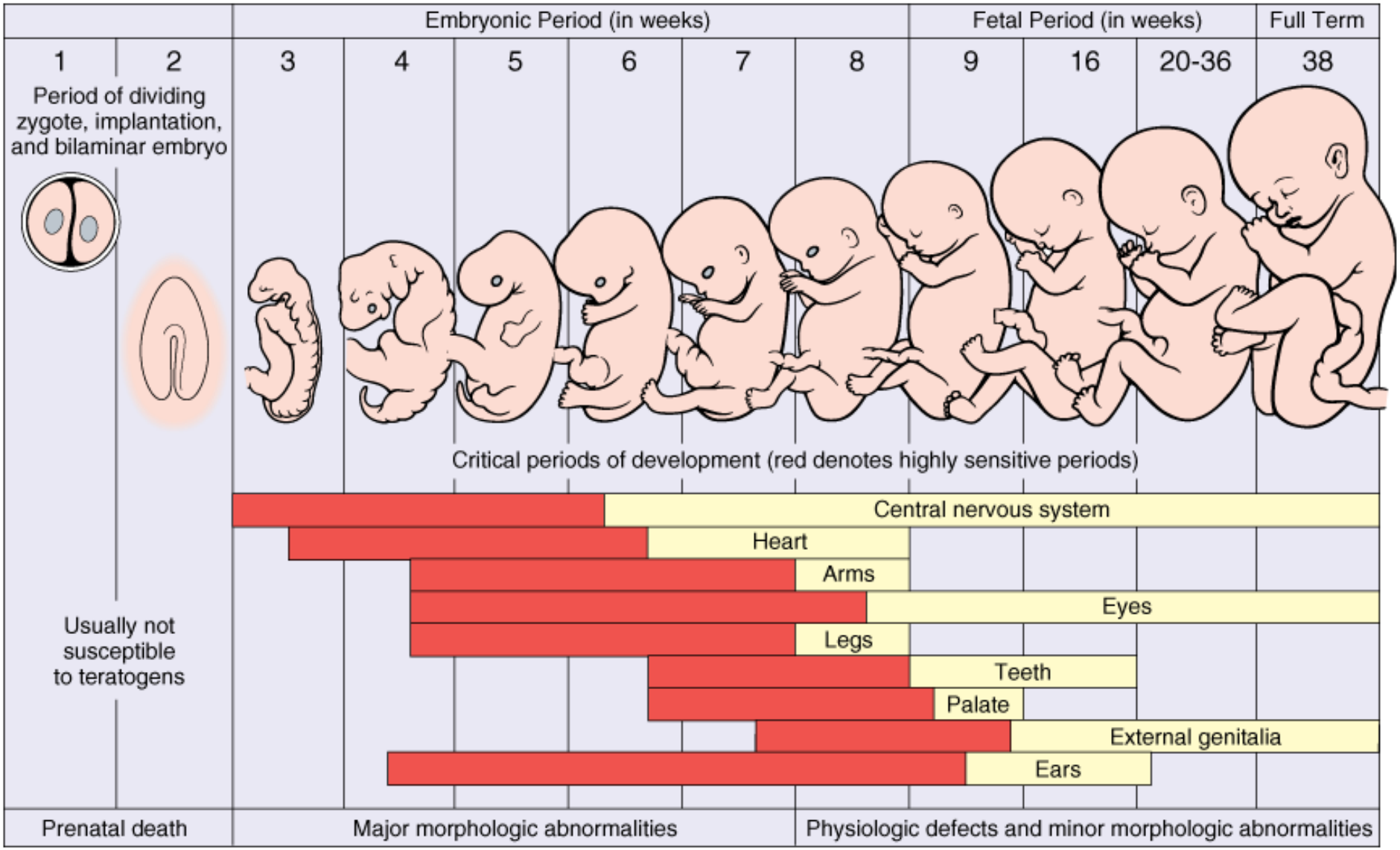
- Only 50-60% of all conceptions advance beyond 20 weeks
- Implantation occurs at day 6-7
- 75% of loses are implantation failures and are not recognized
- Pregnancy loss after implantation is 25-40%

IMPLANTATION AND THE SURVIVAL OF EARLY PREGNANCY

- Embryonic period
  - weeks 1- 8 of pregnancy
  - organogenesis occurs in this period
- Fetal period
  - weeks 9 to 38
  - marked by further growth and maturation

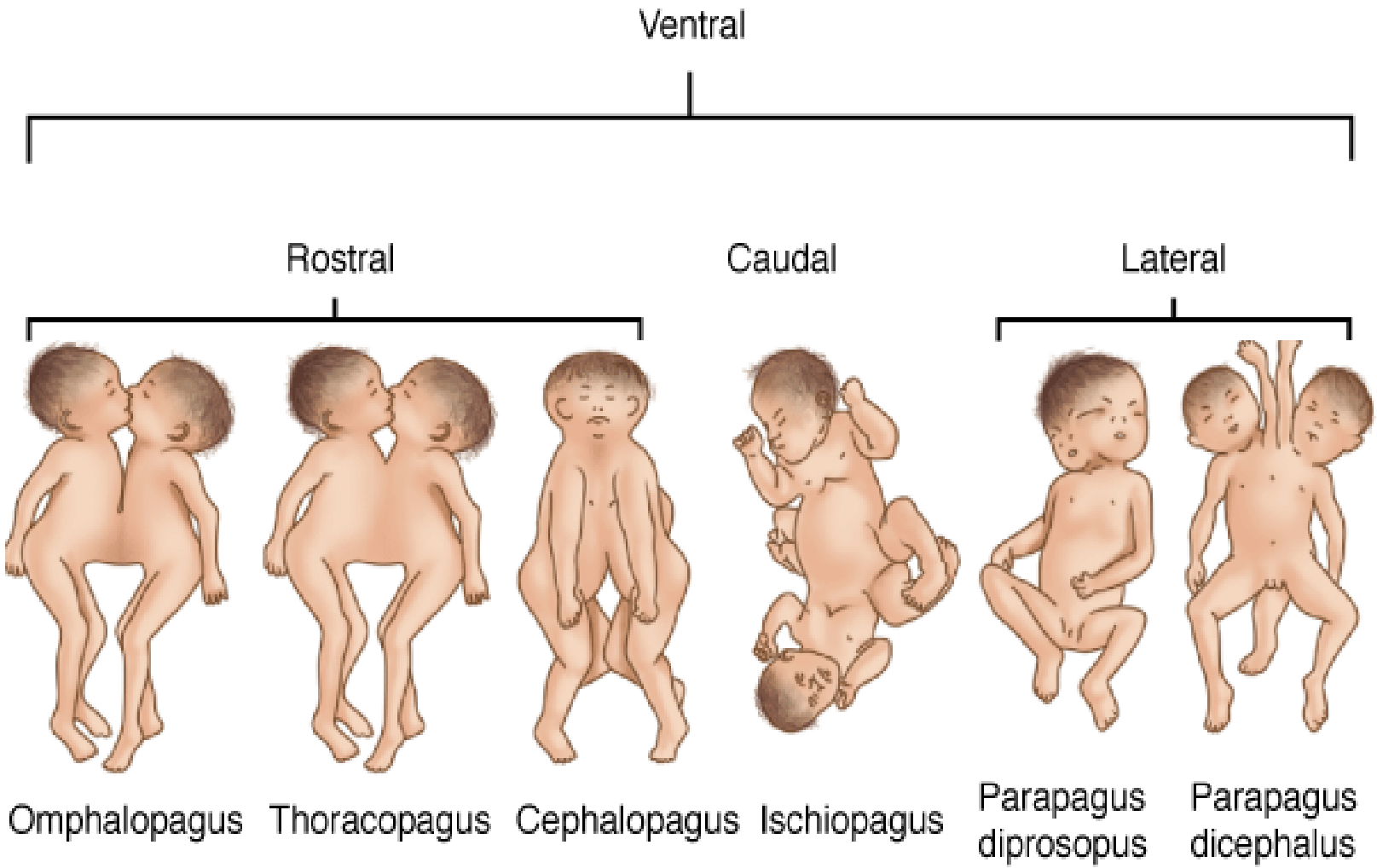
EMBRYONIC DEVELOPMENT

CRITICAL PERIODS OF DEVELOPMENT

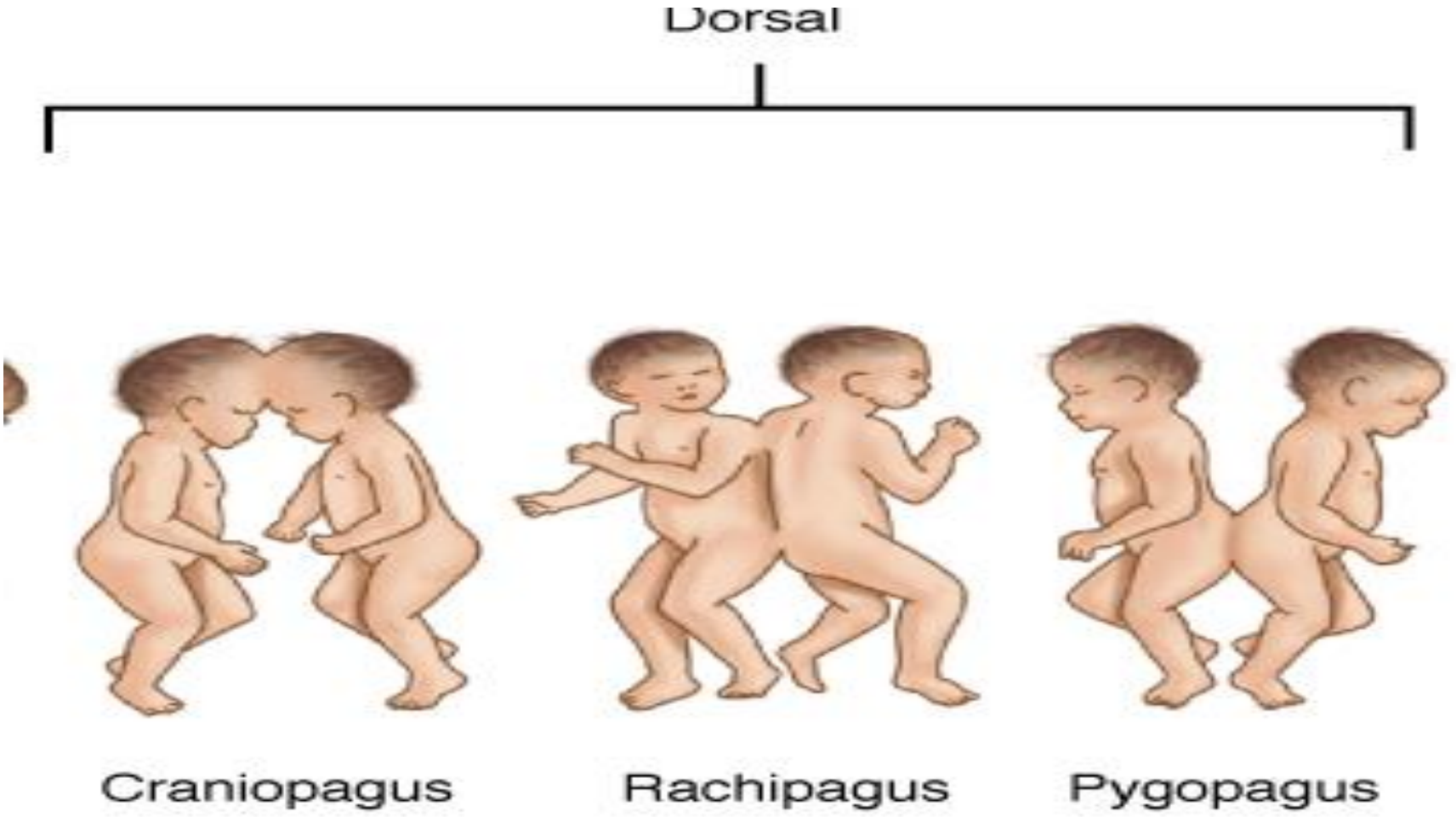


BLASOPATHY

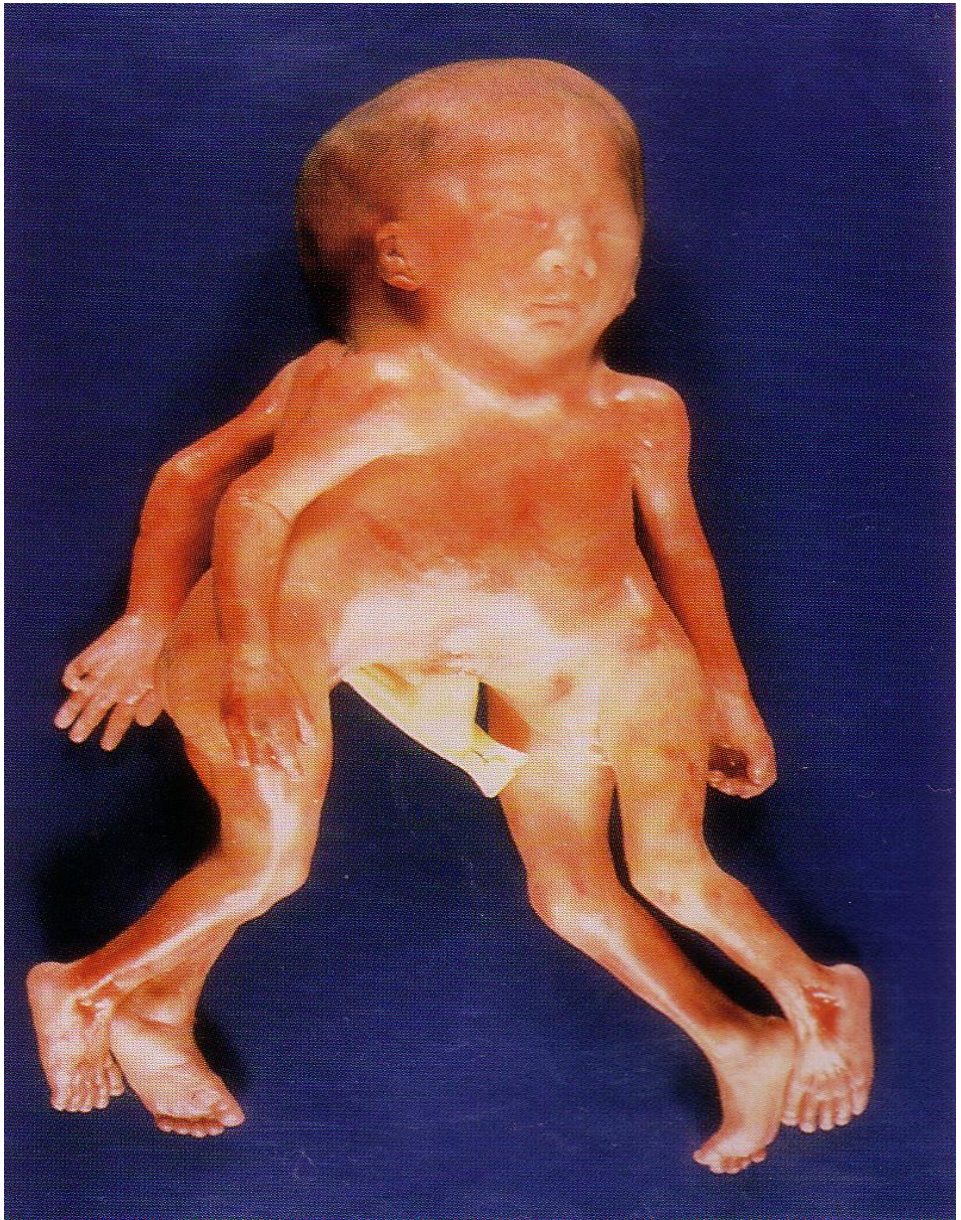
TYPES OF CONJOINED TWINS



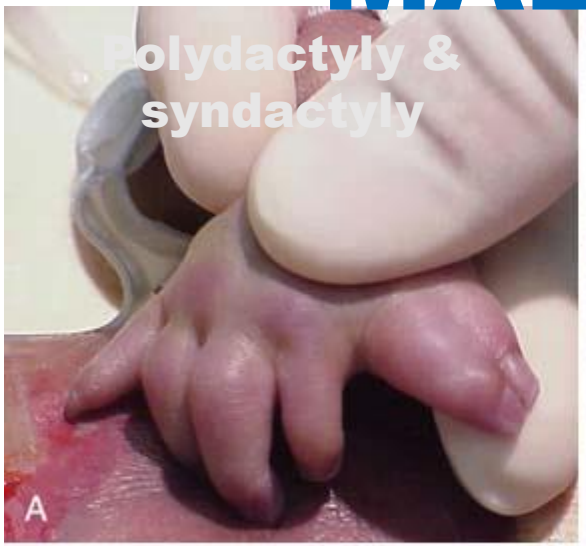
TYPES OF CONJOINED TWINS

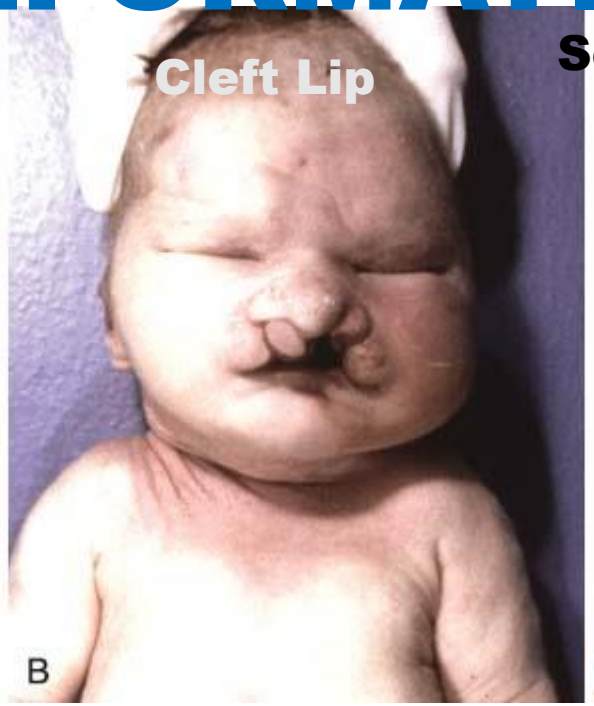


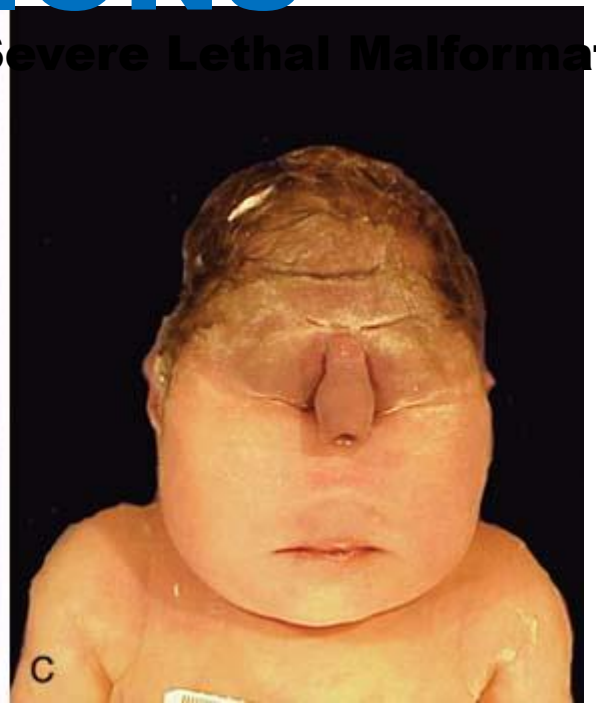
CEPHALOTHORACOPAGUS



MALFORMATIONS







10-1 Malformations. Human malformations can range in severity from the incidental to the lethal. *Polydactyly* (one or more extra digits) and *syndactyly* (fusion of digits), both of which are illustrated in *A,* have little functional consequence when they occur in isolation. Similarly, *cleft lip (B),* with or without associated *cleft palate*, is compatible with life when it occurs as an isolated anomaly; in the present case, however, this child had an underlying *malformation syndrome* (trisomy 13) and expired because of severe cardiac defects. The stillbirth illustrated in *C* represents a severe and essentially lethal malformation, where the midface structures are fused or ill-formed; in almost all cases, this degree of external dysmorphogenesis is associated with severe internal anomalies such as maldevelopment of the brain and cardiac defects. *(Pictures A and C courtesy of Dr. Reade Quinton, and B courtesy of Dr. Beverly Rogers, Department of Pathology, University of Texas Southwestern Medical Center, Dallas, TX.)*

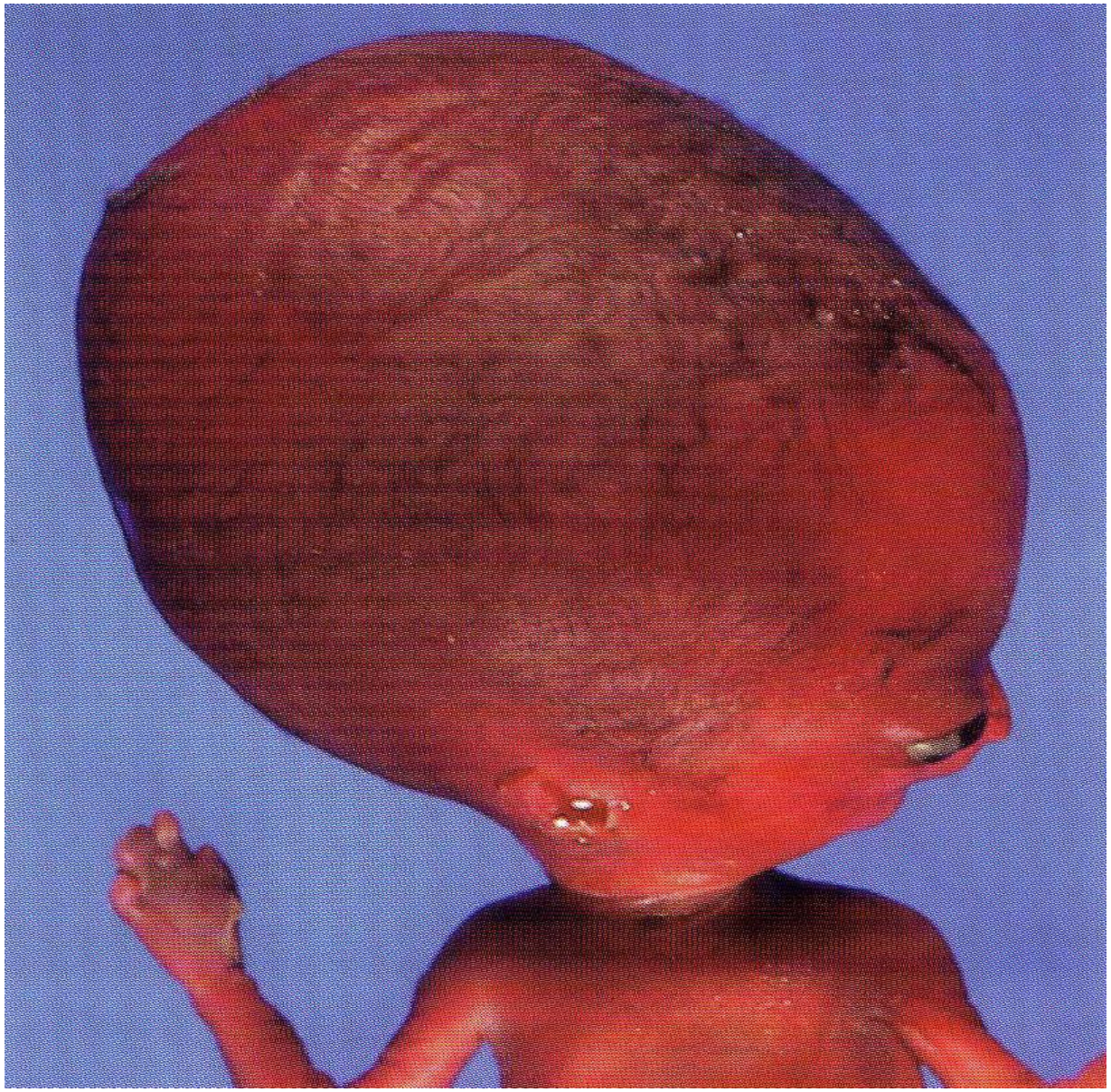
Congenital malformation

ANENCEPHALY

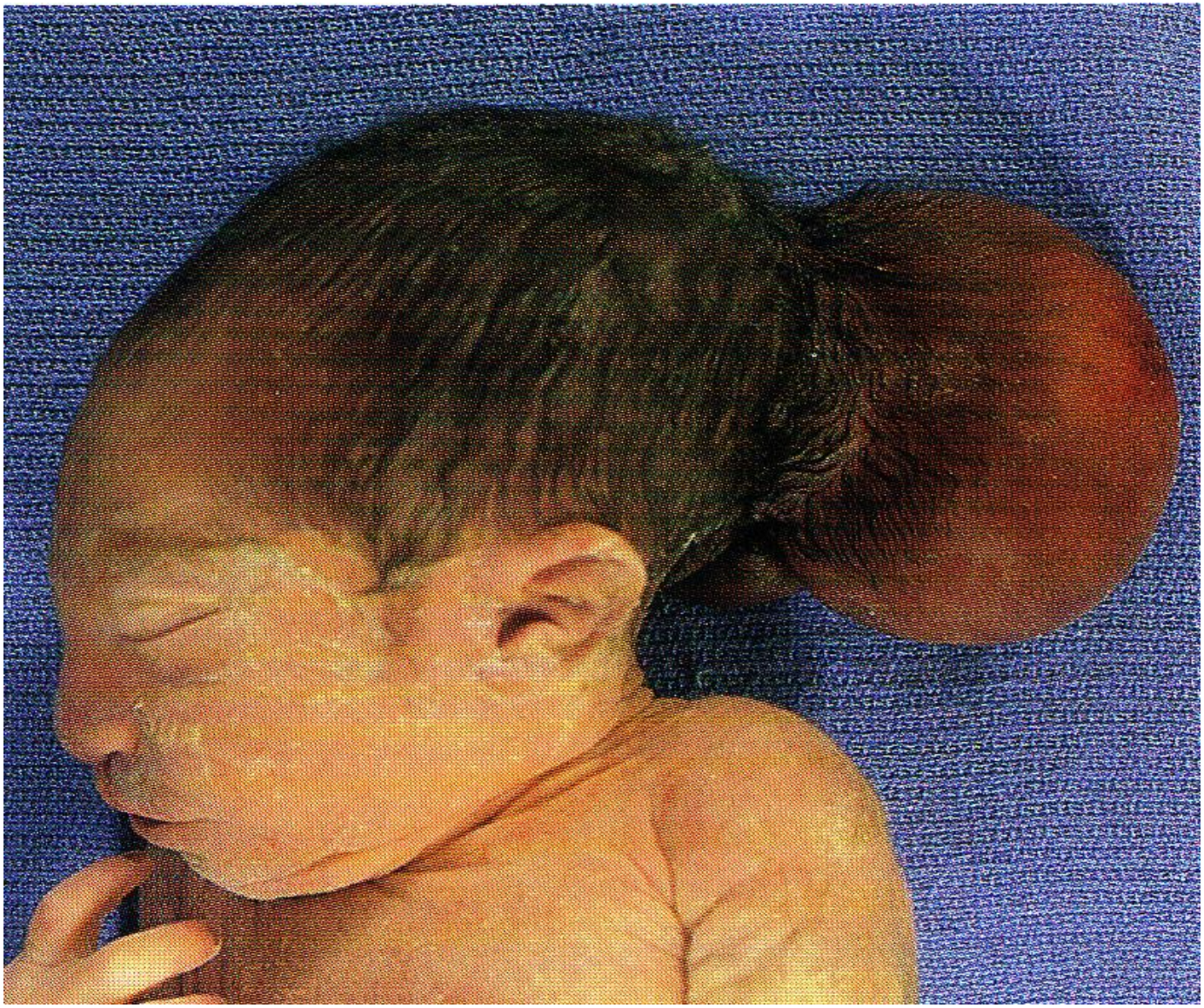
A
cm
1
2
3
4
5
6
SPECIMEN
DATE

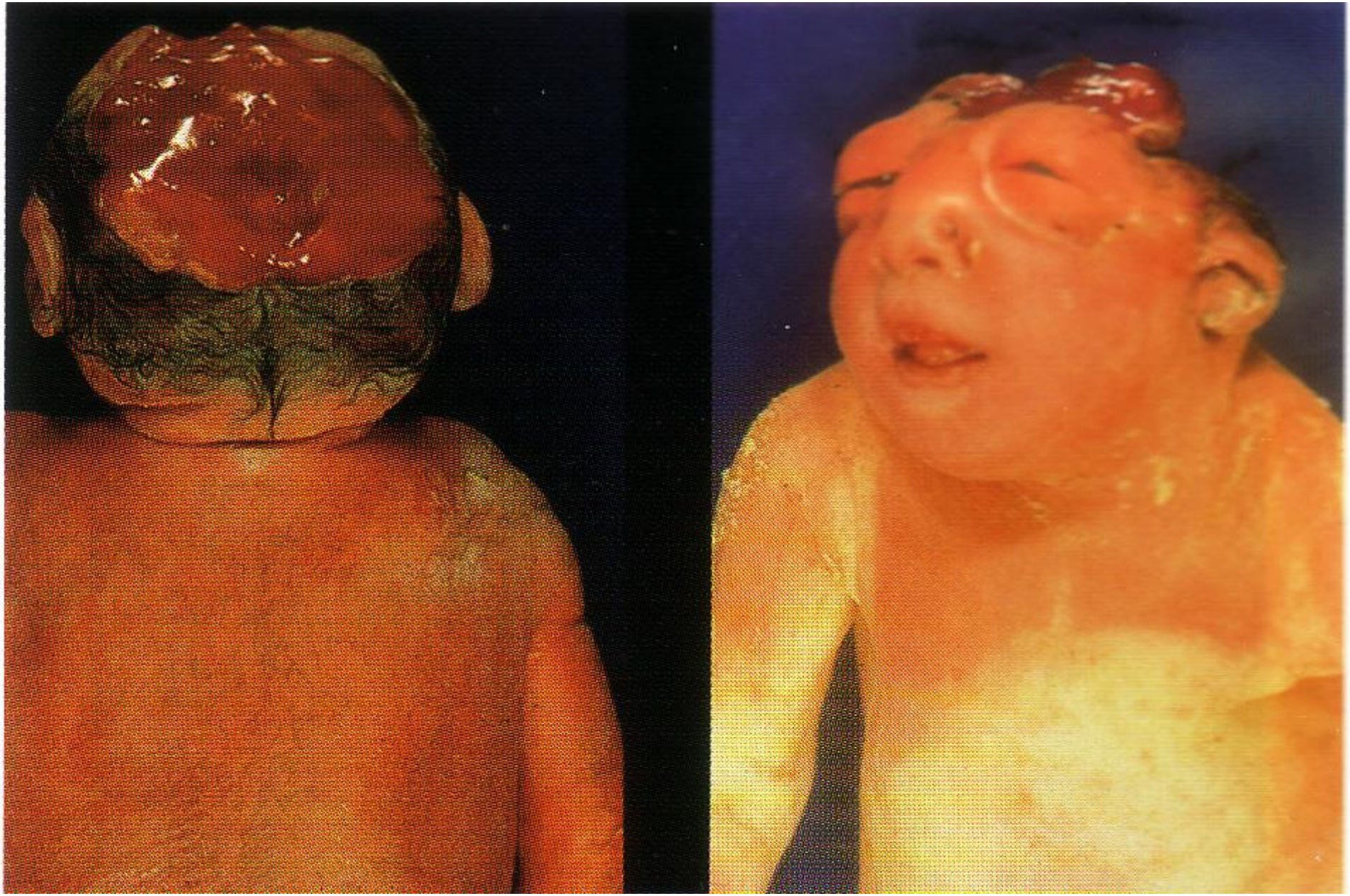
B

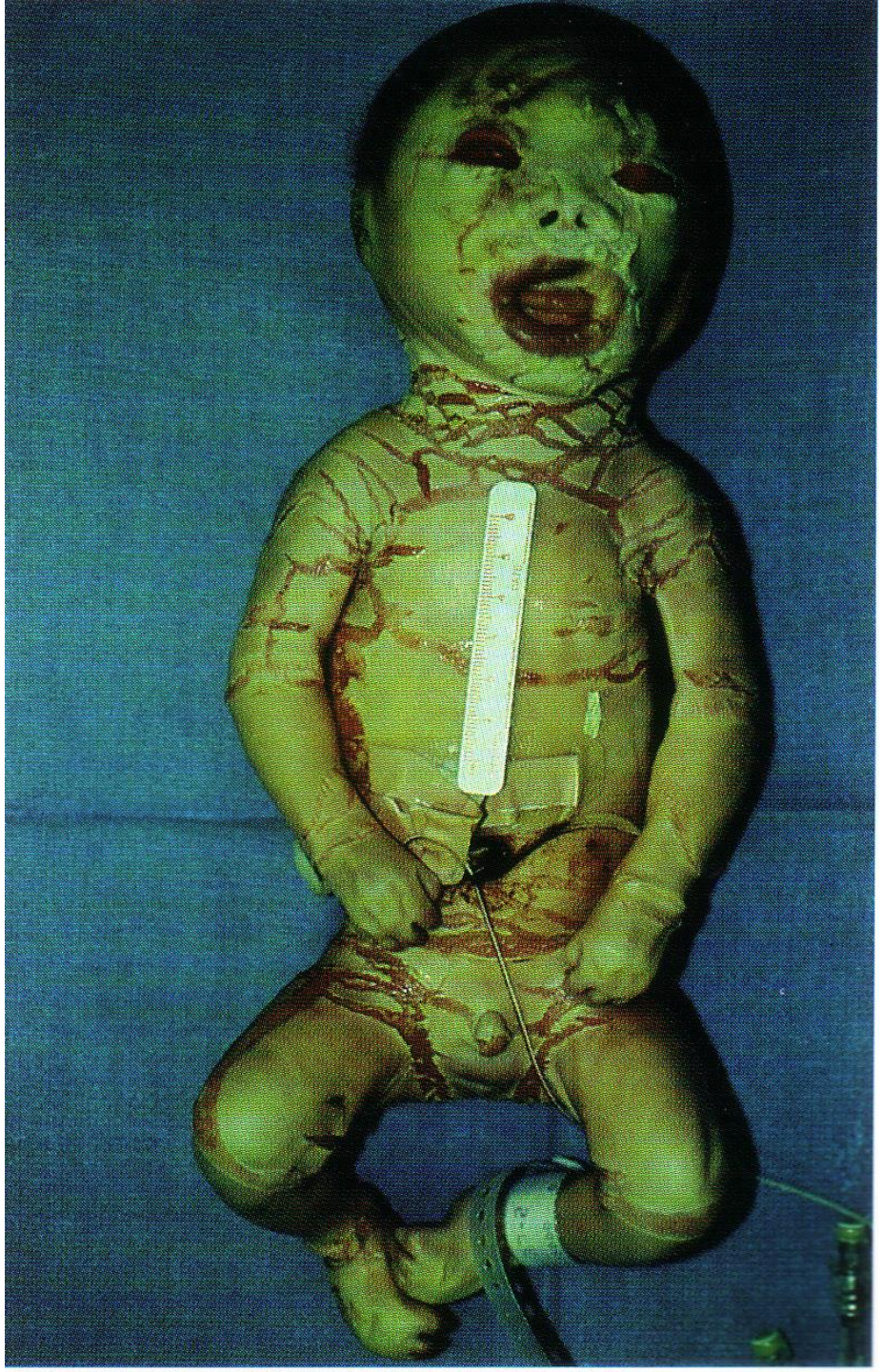
HYDROCEPHALY



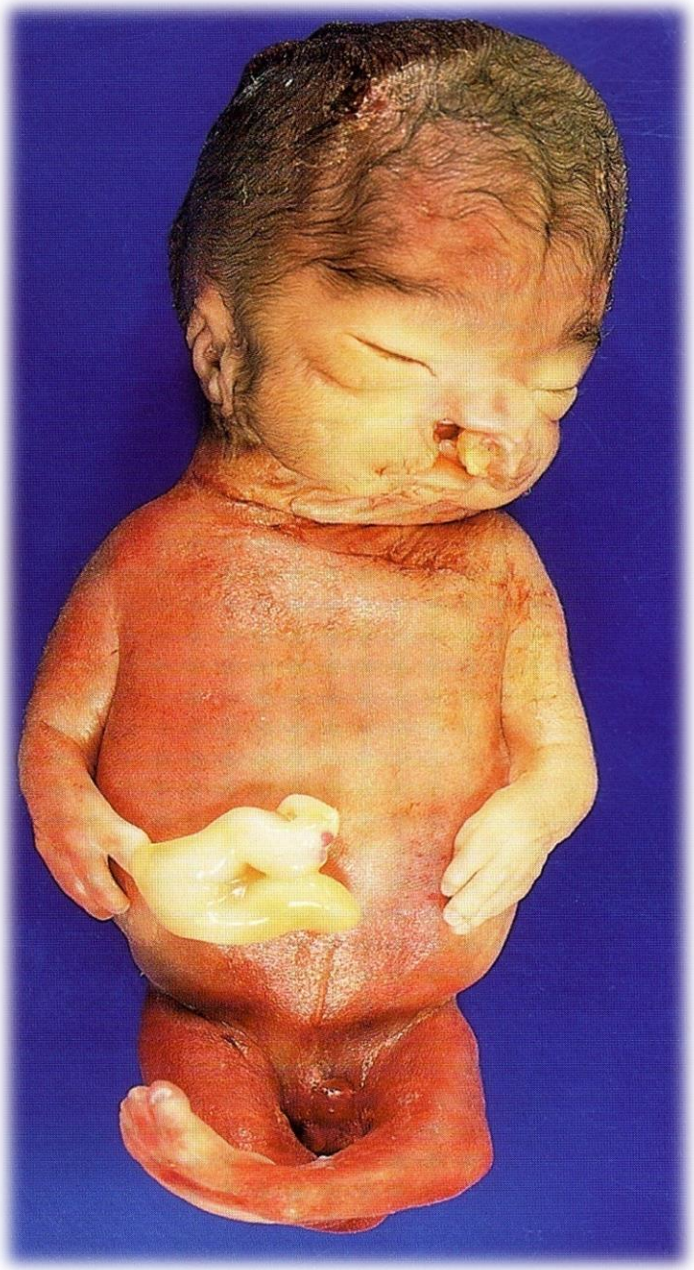
MENINGOENCEFALOCELE

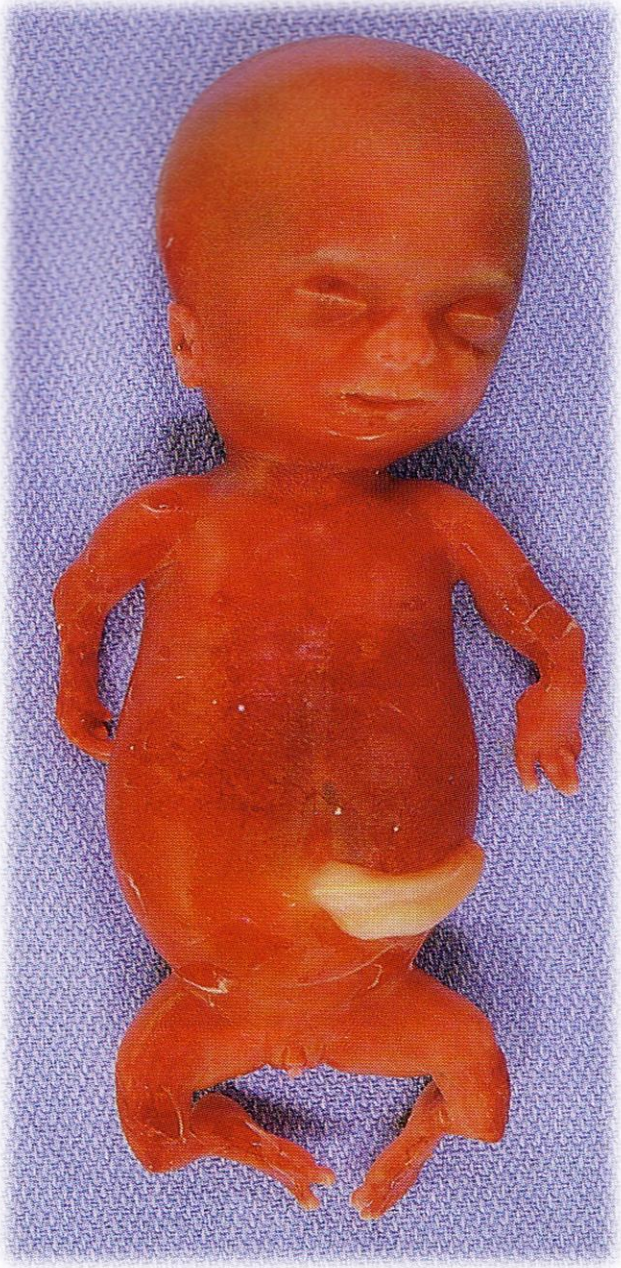




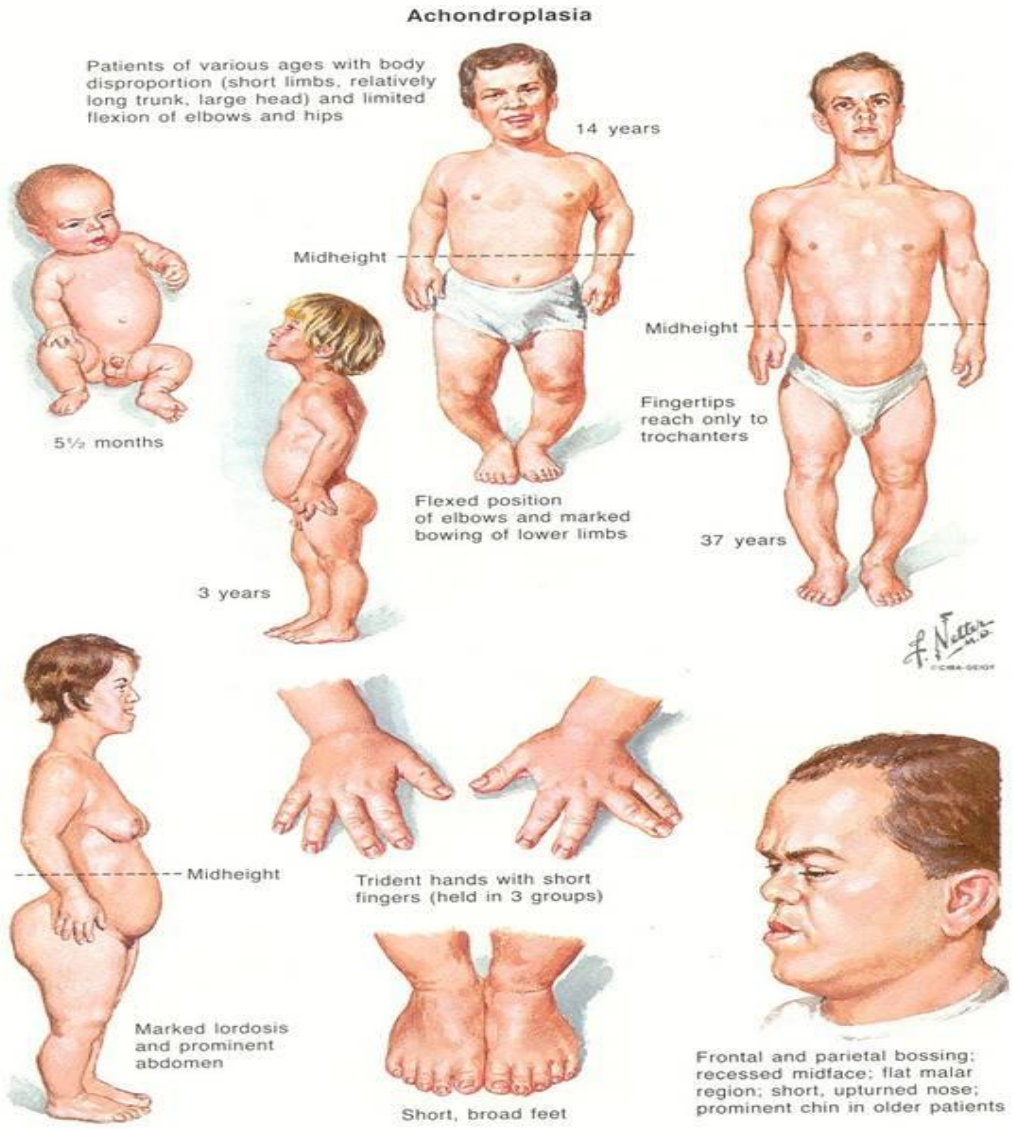


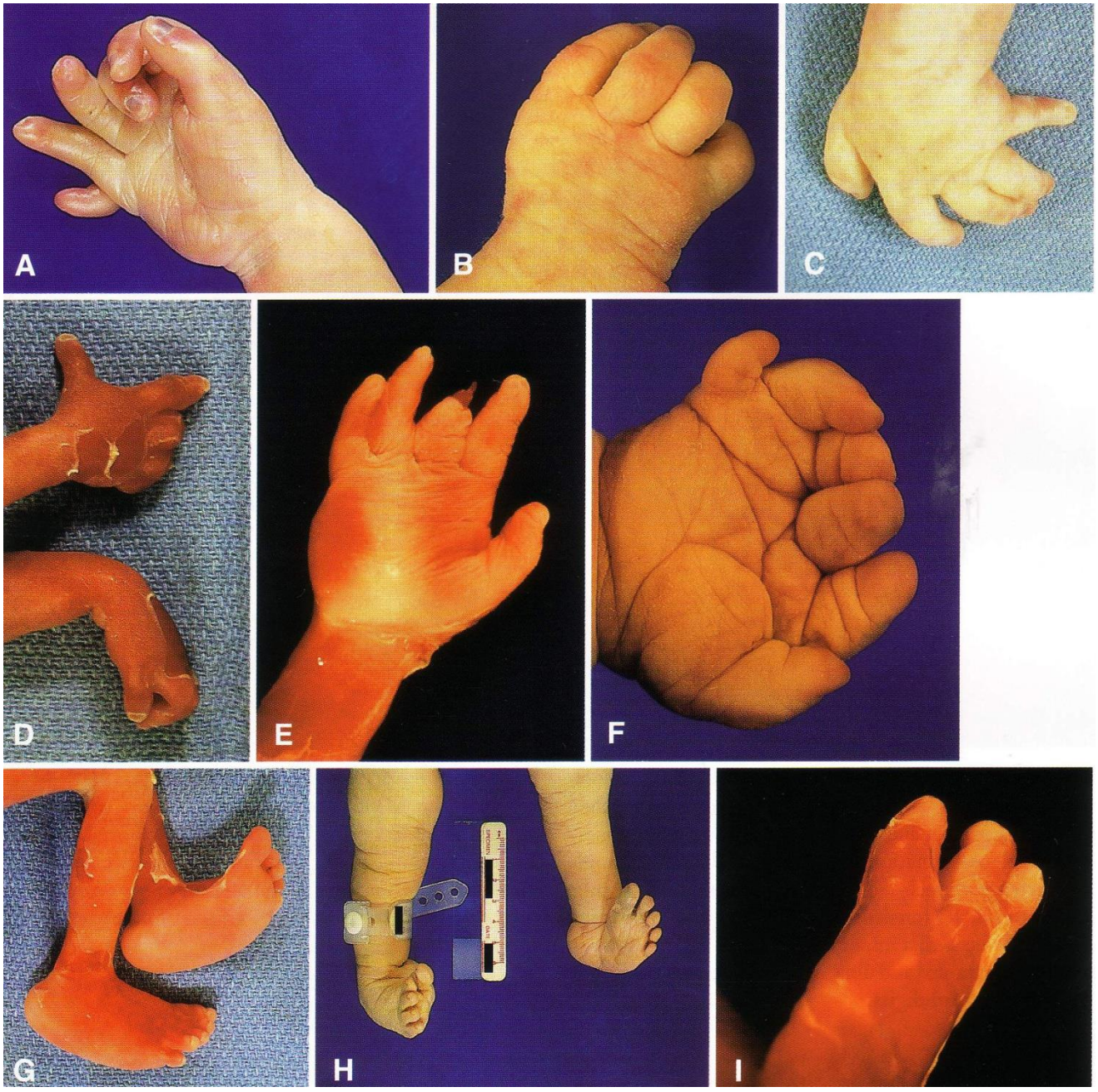
IHTIOSIS





ACHONDROPLASIA




A
B
C
D
E
F
G
H
I

CAUSES OF CONGENITAL MALFORMATIONS

Genetic
- karyotypic aberrations
- single gene mutations

- Environmental
  - infection
  - maternal disease
  - drugs and chemicals
  - irradiation
- Multifactorial
- Unknown

GENETIC CAUSES OF CONGENITAL MALFORMATIONS

A. Chromosomal aberrations are present in about 10-50% of livebirth infants w/some malformation:

1. **Down syndrome(trisomy 21-1/1000 n.b)**
2. **Klinefelter syndrome(47-XXY)**
3. **Turner syndrome(45-X0)**
4. **Patau syndrome(trisomy 13)**

ENVIRONMENTAL

A. Viruses.

CMV intrauterine infection(highest risk in second trimester of pregnancy)

Rubella syndrome(greater risk in 1st eight wks of gestation)→cataracts, persistent ductus arteriosus, tetralogy of Fallot, etc.

B. Drugs/chemicals: alcohol, androgens, anticonvulsivants, etc

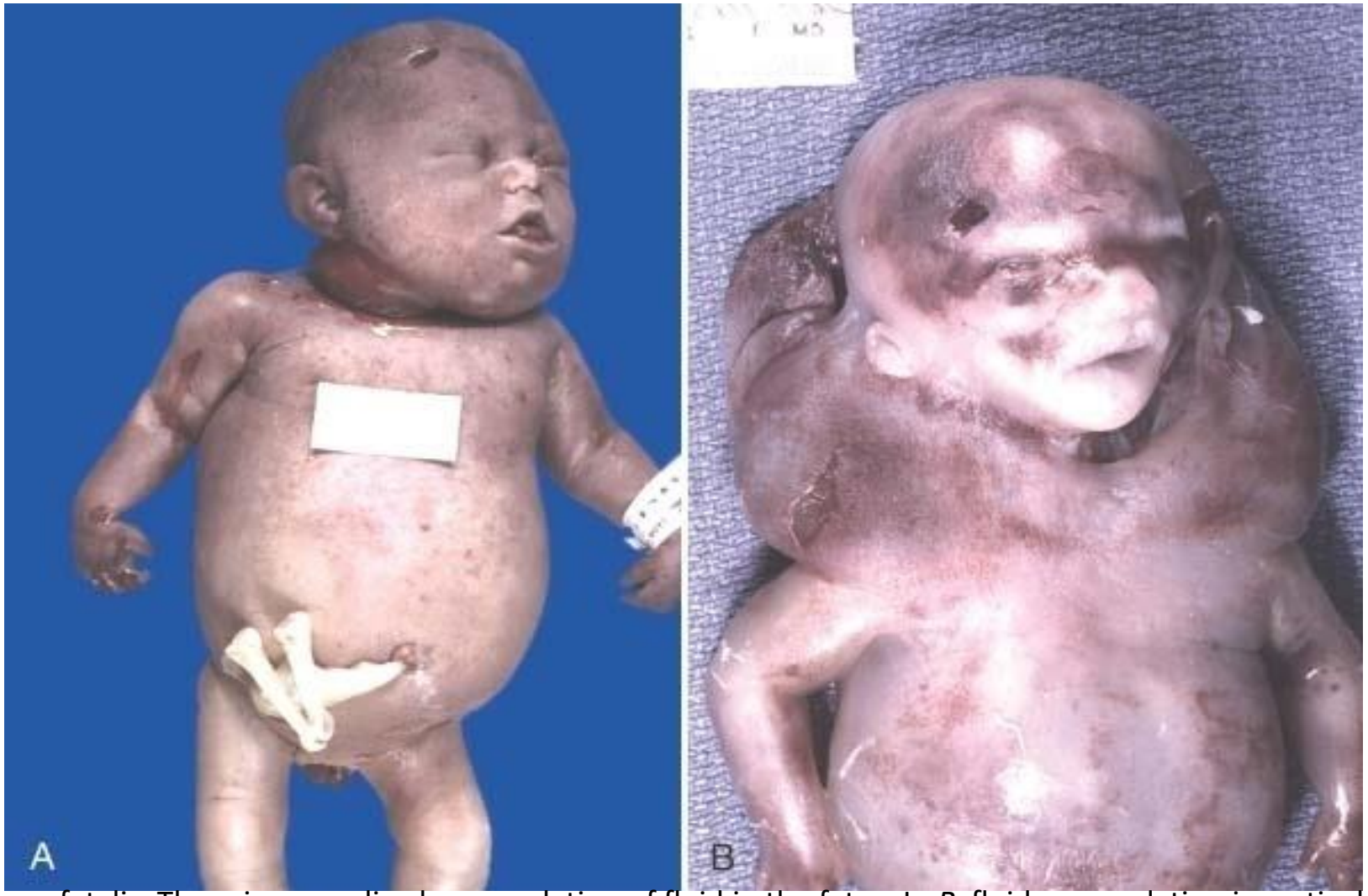
C. Radiation

MULTIFACTORIAL

HYDROPS FETALIS

- Chromosomal abnormalities
  - Turner syndrome with cystic hygromas
  - other
- Cardiovascular with heart failure
  - anemia with high output failure
    - immune hemolytic anemia
    - hereditary hemolytic anemia (α-thalassemia)
    - parvovirus B19 infection
    - twin to twin in utero transfusion
  - congenital heart defects

HYDROPS FETALIS



Hydrops fetalis. There is generalized accumulation of fluid in the fetus. In *B,* fluid accumulation is particularly prominent in the soft tissues of the neck, and this condition has been termed *cystic hygroma*. Cystic hygromas are characteristically seen, but not limited to, constitutional chromosomal anomalies such as 45,X0 karyotypes.

MECHANISMS OF MALFORMATIONS

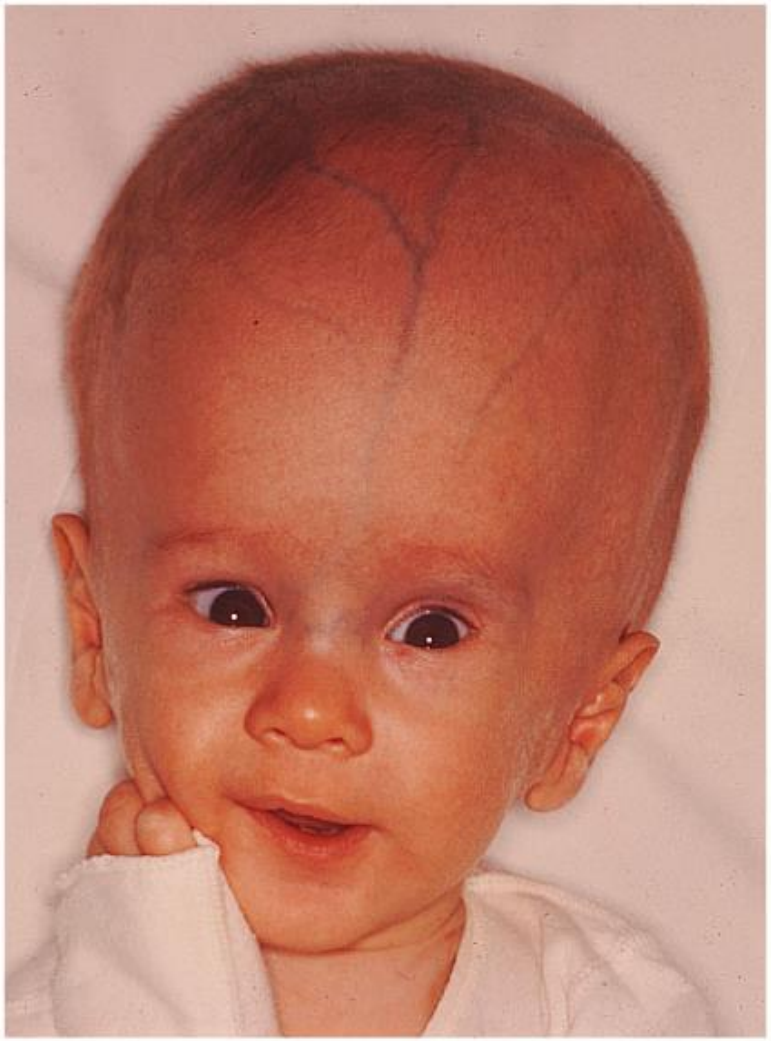
Timming of prenatal teratogenic insult has an important impact on the occurrence and type of malformation produced.
Intrauterine development in humans are divided in 2 phases:

A. Embryonic period(first 9 wks)

B. Fetal period(following wks)

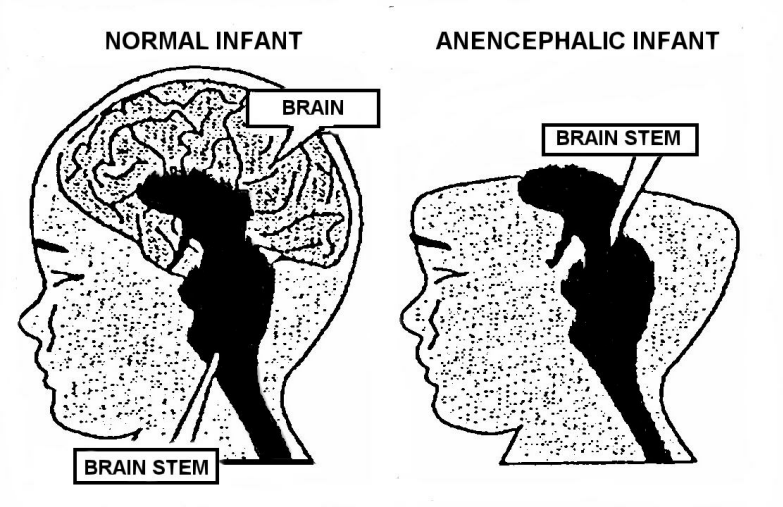
- Congenital malformations
  - Hydrocephalus
  - Neural tube defects
    - Anencephaly – cerebrum and cerebellum are absent
    - Spina bifida – absence of vertebral lamina
- Cerebral palsy – voluntary muscles are poorly controlled
  - Results from damage to the motor cortex

THE CENTRAL NERVOUS SYSTEM THROUGHOUT LIFE

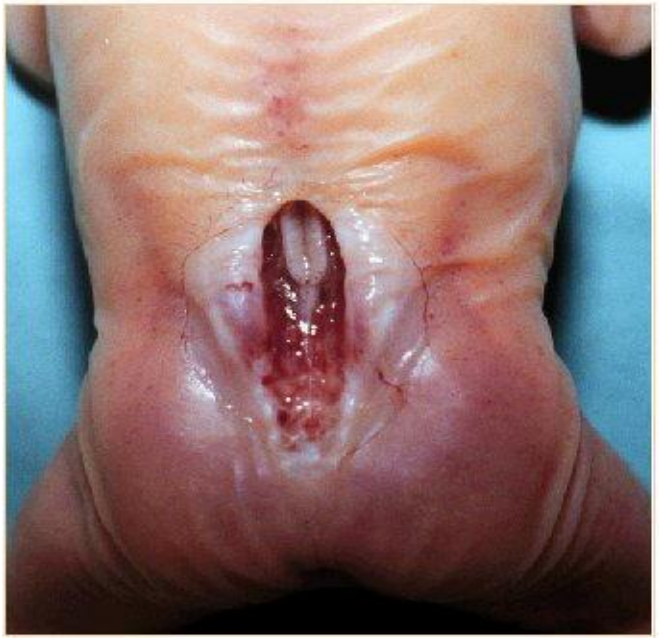


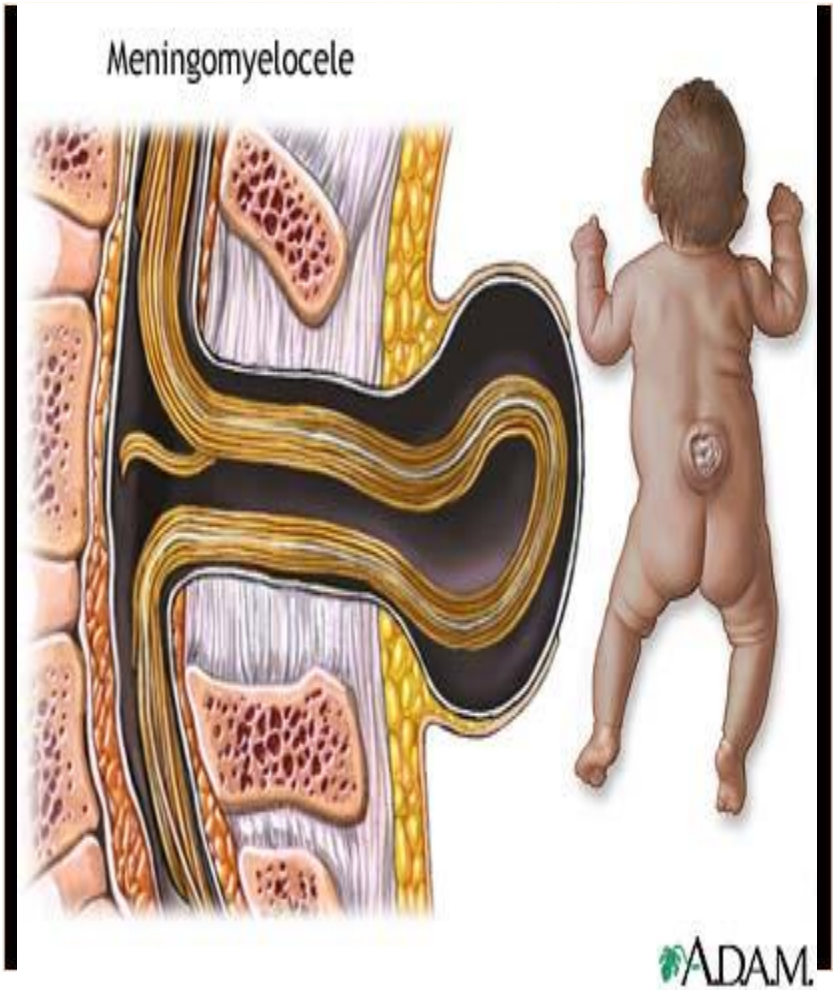
HALUS

ANENCEPHALY



SPINA BIFIDA





- Present in 0.8% of North American and European children
- Most common category of congenital structural malformation
- Commonly divided into noncyanotic (L $\rightarrow$ R) and cyanotic (R $\rightarrow$ L) categories based on direction of shunting

CARDIAC MALFORMATIONS

RELATIVE FREQUENCY OF LESIONS

- Ventricular septal defect 25-30
- Atrial septal defect (secundum) 6-8
- Patent ductus arteriosus 6-8
- Coarctation of aorta 5-7
- Tetralogy of Fallot 5-7
- Pulmonary valve stenosis 5-7
- Aortic valve stenosis 4-7
- Transposition of great arteries 3-5
- Hypoplastic left ventricle 1-3
- Hypoplastic right ventricle 1-3
- Truncus arteriosus 1-2
- Total anomalous pulm venous return 1-2
- Tricuspid atresia 1-2
- Double-outlet right ventricle 1-2
- Others 5-10

NONCYANOTIC CHD (L →R)

- Atrial septal defects (ASD)
- Ventricular septal defects (VSD)
- Patent ductus arteriosus (PDA)
- Obstruction to blood flow
  - Pulmonic stenosis (PS)
  - Aortic stenosis (AS)
  - Aortic coarctation

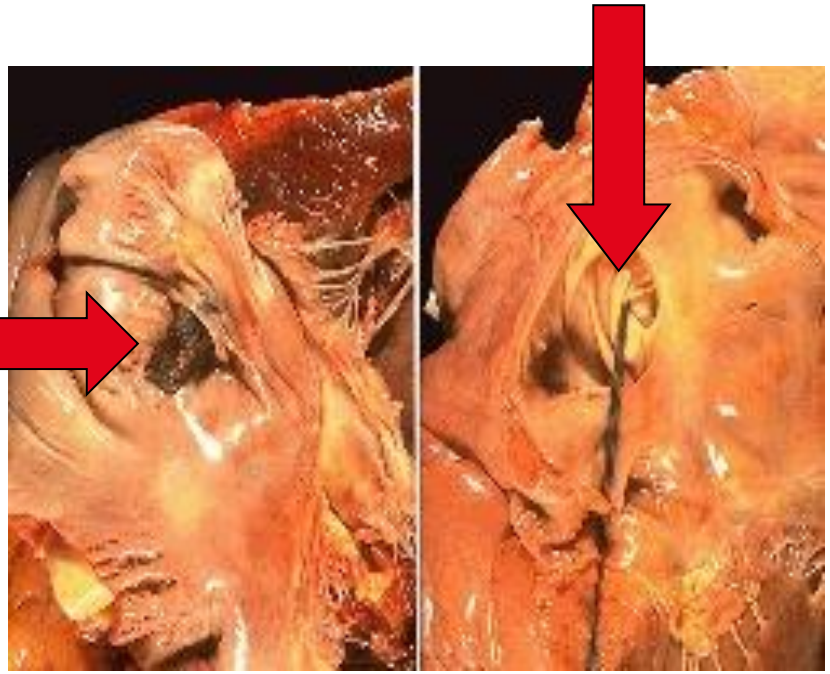
ATRIAL SEPTAL DEFECT

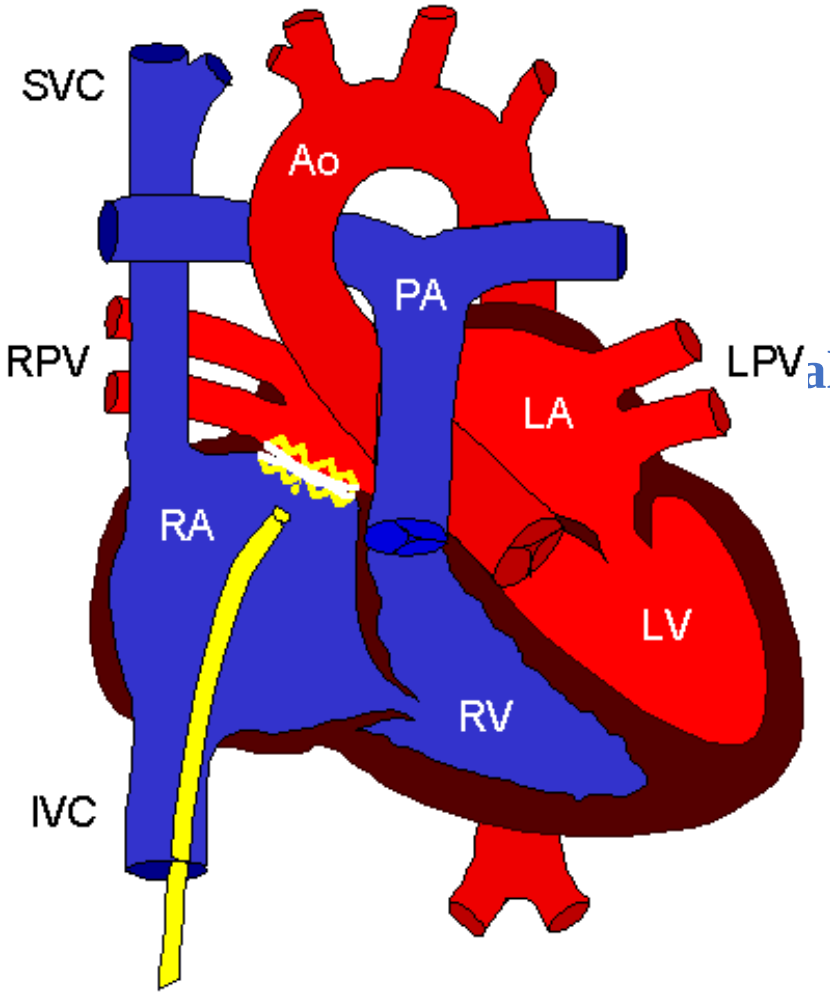
- Most commonly asymptomatic
- Essentials of diagnosis:
  - Right ventricular heave
  - S_2 widely split and usually fixed
  - Grade I-III/VI systolic murmur at the pulmonary area
  - Widely radiating systolic murmur mimicking PPS in infancy
  - Cardiac enlargement on CXR

ATRIAL SEPTAL DEFECT

Atrial septal defect

Thrombus is in Atrial septal defect





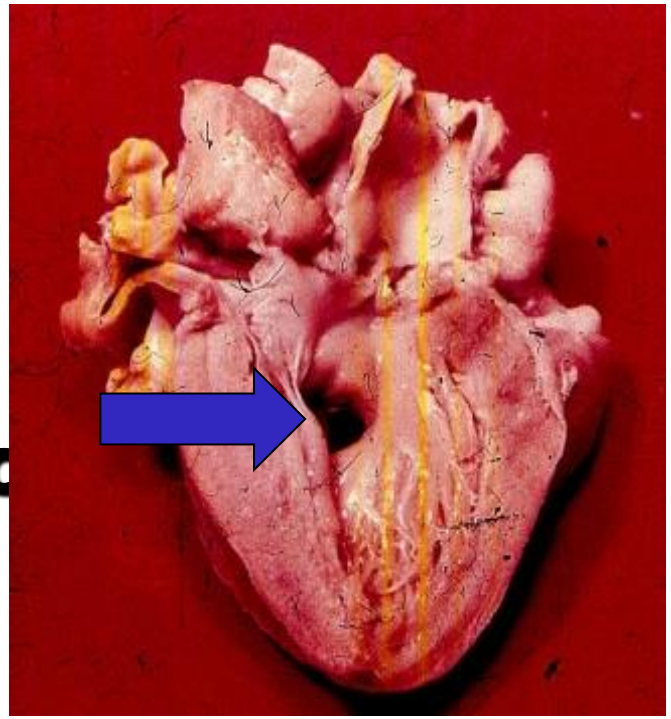
al Septal Defect

VENTRICULAR SEPTAL DEFECT

- Single most common congenital heart malformation, accounting for almost 30% of all CHD
- Defects can occur in both the membranous portion of the septum (most common) and the muscular portion

VENTRICULAR SEPTAL DEFECT

- This is “blue” type of malformation
- Because infant skin is cyanotic

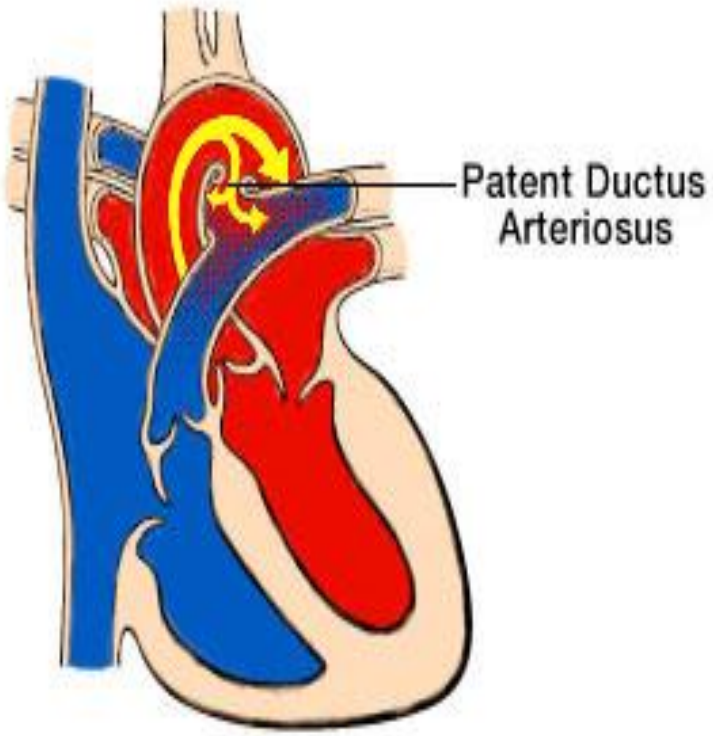


- Three major types
- Small, hemodynamically insignificant
  - Between 80% and 85% of all VSDs
  - < 3 mm in diameter
  - All close spontanously
    - 50% by 2 years
    - 90% by 6 years
    - 10% during school years
  - Muscular close sooner than membranous

VENTRICULAR SEPTAL DEFECT

PATENT DUCTUS ARTERIOSUS

- Persistence of normal fetal vessel joining the pulmonary artery to the aorta
- Closes spontaneously in normal term infants at 3-5 days of age



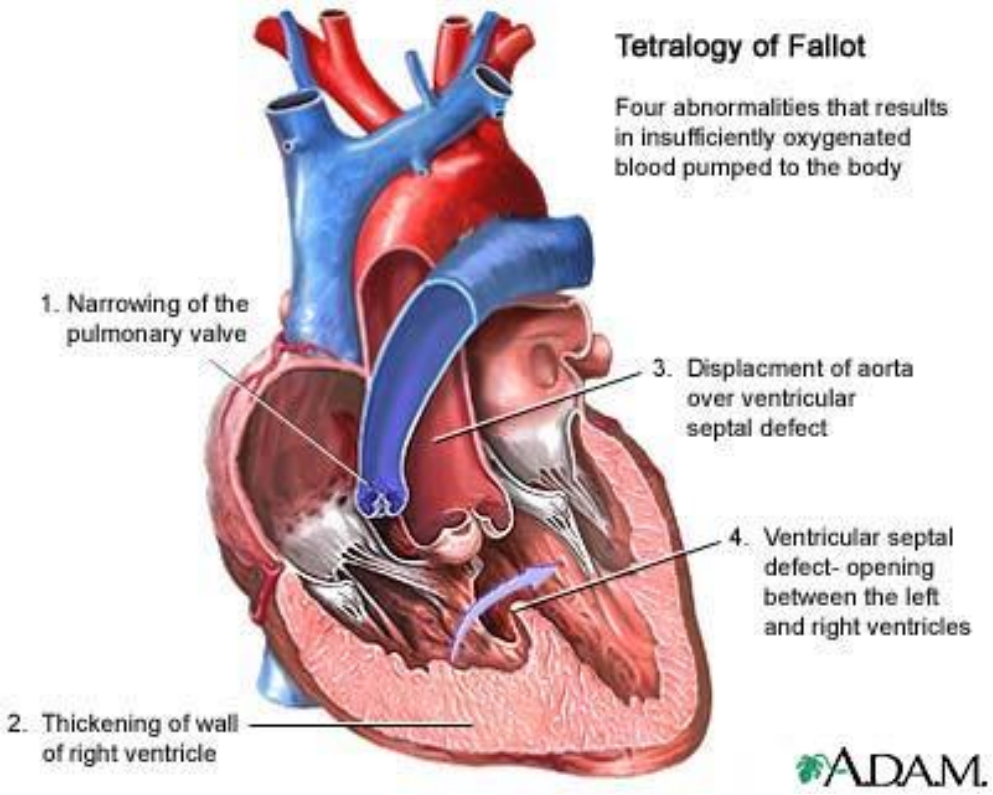
- **T**etralogy of Fallot (TOF)
- **T**ricuspid atresia (TA)
- **T**otal anomalous pulmonary venous return (TAPVR)
- **T**runcus arteriosus
- **T**ransposition of the great vessels
- **H**ypoplastic left heart syndrome (HLH)
- Pulmonary atresia (PA) / critical PS
- Double outlet right ventricle (DORV)

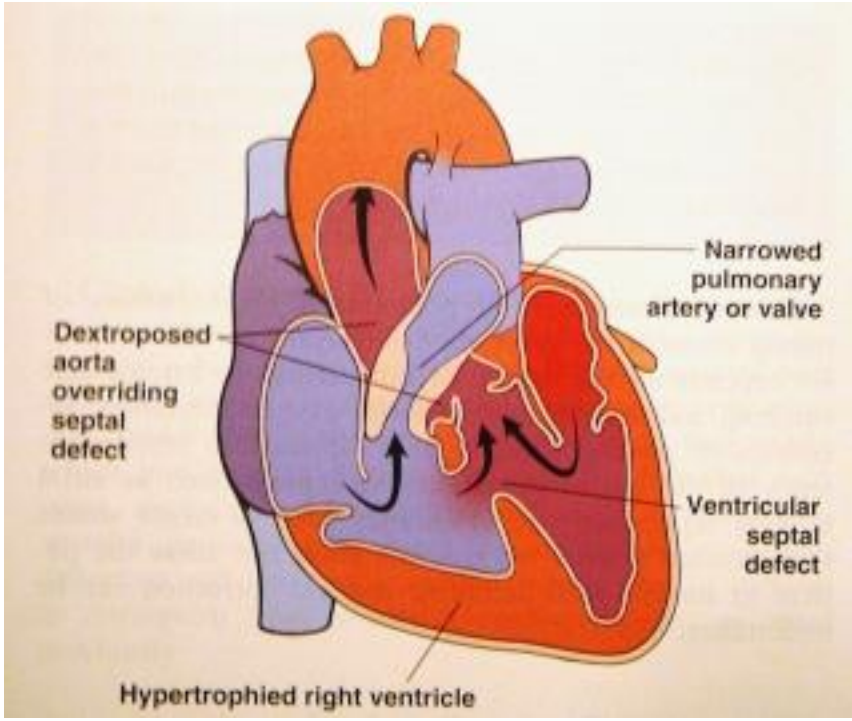
CYANOTIC CHD (R→L)

- **“Cyanosis, especially in the adult, is the result of a small number of cardiac malformations well determined…. One…is much more frequent than the others…. This malformation consists of a true anatomopathologic type represented by the following tetralogy: (1) Stenosis of the pulmonary artery; (2) Interventricular communication; (3) Deviation of the origin of the aorta to the right; and (4) Hypertrophy, almost always concentric in type, of the right ventricle. Failure of obliteration of the foramen ovale may occasionally be added in a wholly accessory manner.”**
  - **Fallot, Ètienne-Louis-Arthur. Contribution to the pathologic anatomy of morbus caeruleus (cardiac cyanosis). *Marseilles Med*. 1888; 25:418-20.**

TETRALOGY OF FALLOT

TETRALOGY OF FALLOT





TETRALOGY OF FALLOT

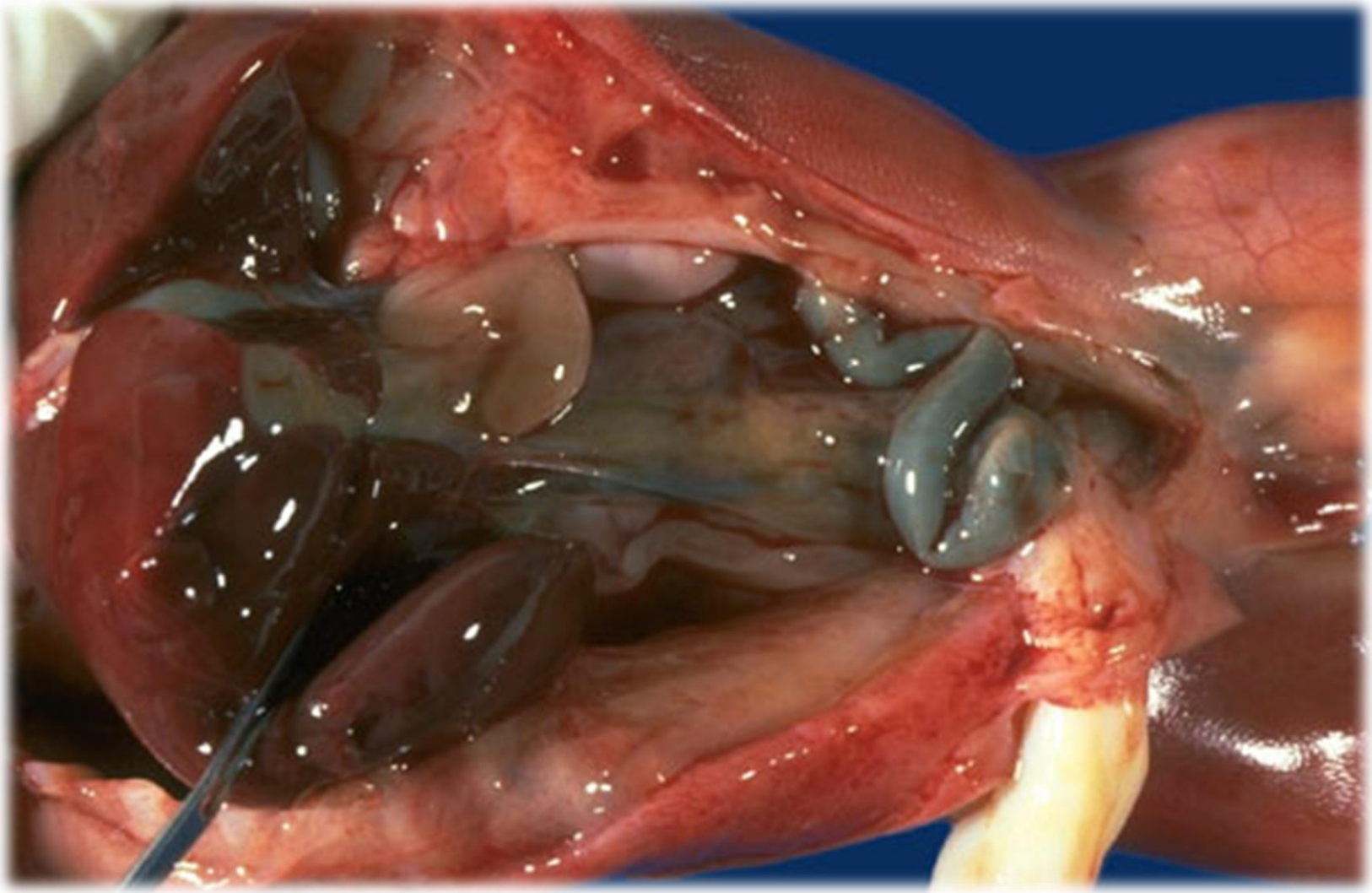
- Most common cyanotic lesion (7 to 10% of all CHD)
- Typical features
  - Cyanosis after the neonatal period
  - Hypoxemic spells during infancy
  - Right-sided aortic arch in 25% of all patients
  - Systlic ejection murmur at the upper LSB

TETRALOGY OF FALLOT

KIDNEY CONGENITAL PATHOLOGY

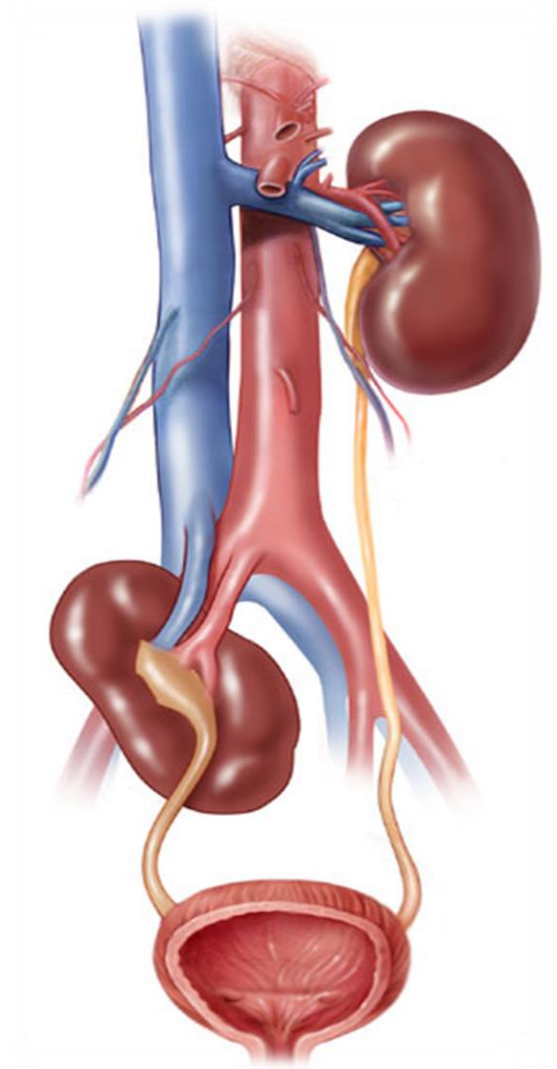
- **AGENESIS**
- **HYPOPLASIA**
- **ECTOPIC**
- **HORSESHOE**

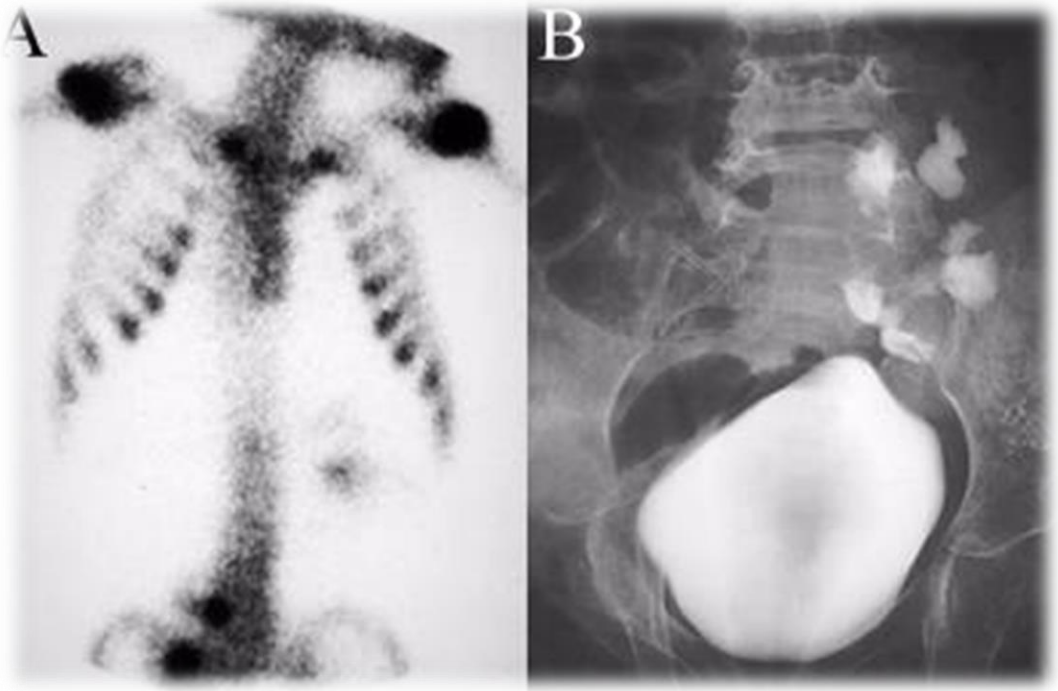
AGENESIS



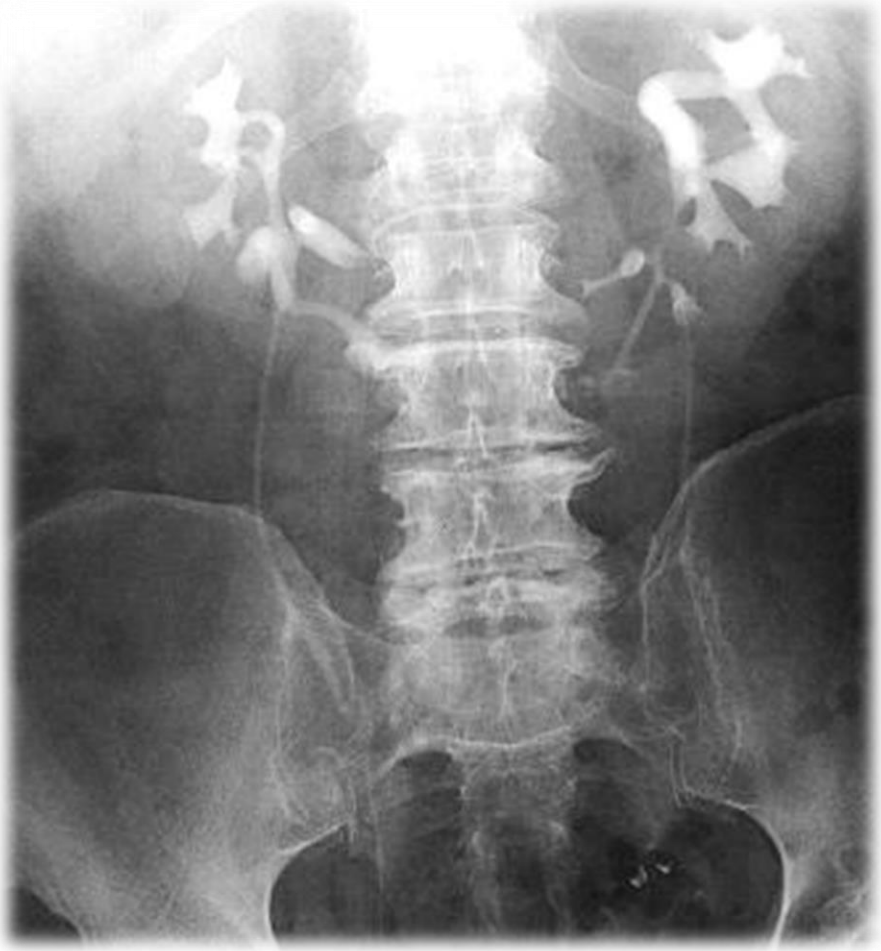
HYPOPLASIA

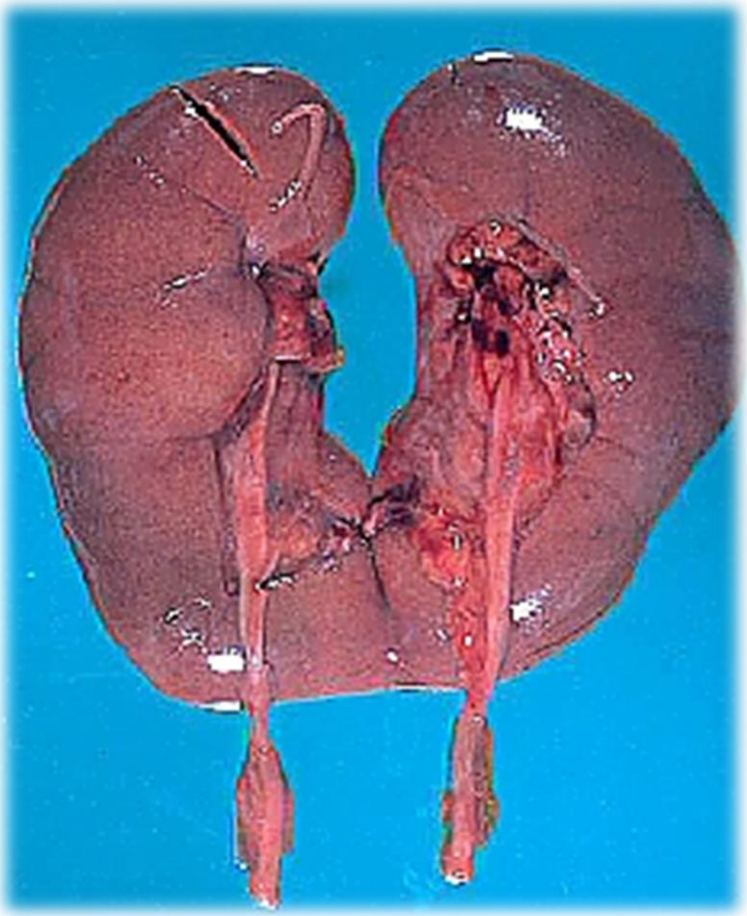
ECTOPIC (usually PELVIC)





HORSESHOE





BIRTH RELATED STRESSORS

- Newborn at risk due to asphyxia
- Newborn with respiratory distress/Transient Tachypnea
- Newborn with meconium aspiration syndrome
- Newborn with persistent pulmonary hypertension
- Newborn with complications due to respiratory therapy
- Newborn with cold stress
- Newborn with hypoglycemia
- Newborn with jaundice
- Newborn with polycythemia
- Newborn with infection

APGAR SCORE AND 28 DAY MORTALITY

- Score may be evaluated at 1 and 5 minutes
- 5 minute scores
  - 0-1, 50% mortality
  - 4, 20% mortality
  - ≥ 7, nearly 0% mortality

PERINATAL PATHOLOGY OF THE FETUS AND NEWBORN

Group of diseases that arise in newborns due to trauma, hypoxia, toxic-metabolic and infectious injury of organs and tissues, as a result of adverse pregnancy or childbirth

BIRTH WEIGHT AND GESTATIONAL AGE

- Appropriate for gestational age (AGA)
  - between 10 and 90th percentile for gestational age
- Small for gestational age (**SGA**) , <10%
- Large for gestational age (**LGA**) , >90%
- **Preterm**
  - born before **37** weeks (<2500 grams)
- **Post-Term**
  - delivered after **42** weeks

PREMATURITY

- Defined as gestational age **< 37** weeks
- Second most common cause of neonatal mortality (after congenital anomalies)
- Risk factors for prematurity
  - Preterm premature rupture of fetal membranes (PPROM)
  - Intrauterine infection
  - Uterine, cervical, and placental abnormalities
  - Multiple gestation

PRETERM (PREMATURE) NEWBORN COMPLICATIONS

- Patent ductus arteriosis
- Apnea
- Intraventricular hemorrhage (IVH)
- Respiratory distress syndrome (RDS)
- Sepsis
- Retinopathy of pre-maturity (ROP)
- Bronchopulmonary dysplasia (BPD)
- Pulmonary interstital emphysema (PIE)
- Posthemorrhagic hydrocephalus

POST TERM INFANT

- Gestation > 42 weeks
- Must determine if EDC is truly post term
- After 42 weeks placenta loses ability to nourish the fetus

LARGE FOR GESTATIONAL AGE CHARACTERISTICS

- LGA weight- Larger than 9 lbs and above the 90th%
- Large body-plump full face
- Body size is proportionate
- Poor motor skills
- Difficulty in regulating behavioral state (arouse to quiet alert state)

POST TERM INFANT CHARACTERISTICS

- Newborn emaciated
- Meconium stained
- Hair and nails long
- Dry peeling skin
- Creases cover soles
- Limited vernix and lanugo

LARGE FOR GESTATIONAL AGE COMMON PROBLEMS

- Birth Trauma-
- Hypoglycemia
- Polcythemia
- Hyperbilirubinemia

1. Clavicular fracture
2. Facial nerve injury
3. Brachial plexus injury
4. Intracranial injury
5. Humeral fracture
6. Lacerations

Birth Injuries
(listed in order of frequency)

CAUSES OF MECHANICAL DAMAGE (NON-CONFORMITY OF PARTURIENT CANAL/GENERATIVE PASSAGE TO FETUS SIZE)

Mother

- Age
- Anomalies of the pelvis (narrow, flat rachitic)
- Exostosis ,trauma fractures pelvis

Fetus

- Giant fetus
- Diabetic Fetopathy
- Multiple pregnancies
- Abnormal location and presentation
- Defects development of(hydrocephalus)
- Prolonged pregnancy

CEPHALOHEMATOMA

- Effusion of blood beneath the pericranium(0,3-0,5% of newborns)
- Increases during the first 2-3 days of life.
- One or both parietal bones, rarely in the occipital and frontal, still less on the temporal bones.
- Capacity from 5 to 150 ml of blood (long duration - liquid)
- The boundaries do not extend beyond the bone that involved.
- The surface of the skin over the tumor was not changed.
- Under CT sometimes observed- broken bones,
  Perhaps the message with epidural hematoma

- From 7-10 days - reduced in size
- Usually disappear in 3-8 weeks.
- With significant hemorrhages of compacted periosteum, hematoma ossified, which leads to distortion or asymmetry of the skull.
- Diff.diagnoz-labor tumor; hemorrhage beneath the aponeurosis; cerebral hernia.
- Complications: anemia, due to considerable blood loss; jaundice , due to progress of hemorrhage resolution, suppuration.

CEPHALOHEMATOMA

- **Damage to the spinal cord** (neck region Caesarian section)
- **Damage to peripheral nerves (paralysis):**
  - facial nerve
  - Brachial plexus (top, bottom, total)

- **Intracranial birth injury (bleeding):**
  - Epidural
  - Subdural (supra, subtentorialnoe)
  - Intraventricular
  - Parenchymatous
  - Subarachnoid

MECHANICAL DAMAGE OF NERVOUS SYSTEM

Damage to peripheral nerves

- ***Paralysis of the facial nerve***
  - Assimmetrical face with eye slits gape, hanging-down of cheeks, displacement of the mouth angle toward the unaffected side .
  - All of these symptoms intensified when the child cry.
- ***Upper brachial plexus paralysis Erba - Dyushena***
  -Damage at the level of C5 - C6
  -Hand and the fingers moving, sometimes-clicking in the shoulder joint.
- ***Lower brachial plexus paralysis Dezherin - Klyumpke***
  - Damage at the level of C7 - Th1
  - Hand passively hanging in the form of seals feet or has the form of "sharp-clawed paws."

Total brachial plexus palsy

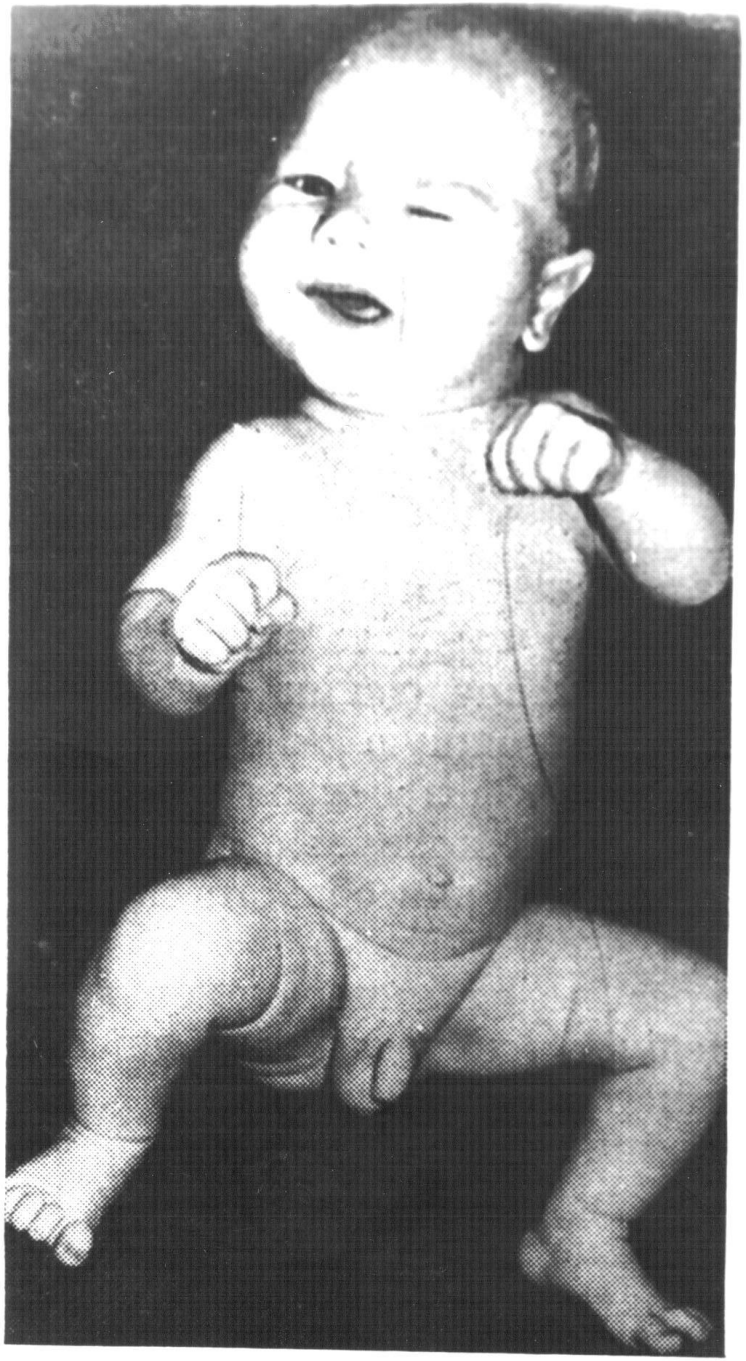


Рис. 18. **Парез мышц лица при пе-**

HYPOXIC PT

- Asphyxia (suffocation) -
- Asphyxia **-** fetal (center.) and post-natal
- ***Hypoxia*** **-** the prolonged repeated limitations of constant O2 supplyleads to excess accumulation in the organism of CO2 and other incompletely oxidized products (80% of all damages to CNS**).**
- Hypoxia -chronic intrauterine

- Pathophysiology:
- Results from cardiopulmonary, respiratory and biochemical factors.
- Due to failure of lung expansion and hypoxia, fetal circulation reoccurs.
- Biochemical: hypoxia causes anaerobic metabolism, rapidly using glycogen supplies.

ASPHYXIA

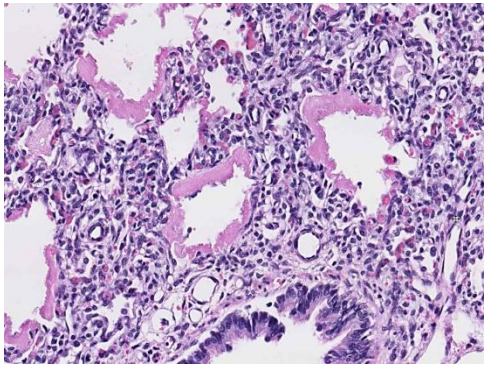
- Risk factors:

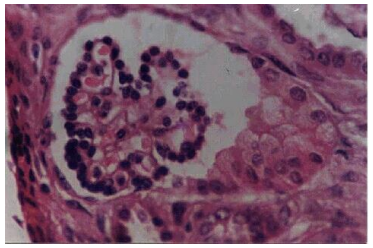
1. Non-reassuring fetal heart rate patterns
2. Difficult birth
3. Fetal Blood Loss
4. Apneic episode that is unresponsive to tactile stimulation
5. Inadequate ventilation
6. Prematurity
7. Structural Lung abnormality
8. Cardiac arrest

ASPHYXIA

ORGAN IMMATURITY

- Lungs
  - alveoli differentiate in 7th month
  - surfactant deficiency
- Kidneys
  - glomerular differentiation is incomplete
- Brain
  - impaired homeostasis of temperature
  - vasomotor control unstable
- Liver
  - inability to conjugate and excrete bilirubin





NEONATAL RESPIRATORY DISTRESS SYNDROME (RDS)

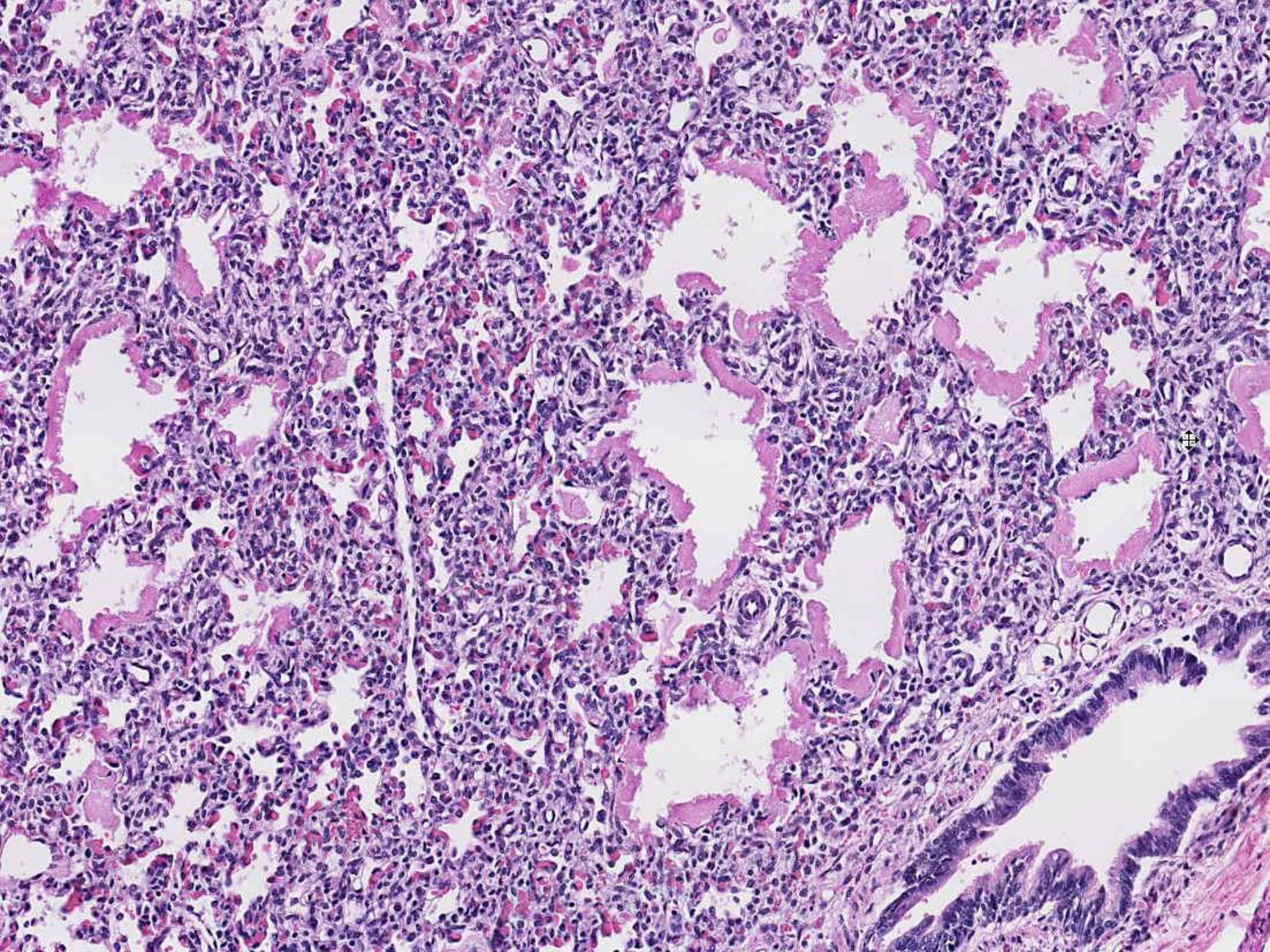
- 60,000 cases / year in USA with 5000 deaths
- Incidence is inversely proportional to gestational age
- The cause is lung immaturity with decreased alveolar surfactant
  - surfactant decreases surface tension
  - first breath is the hardest since lungs must be expanded
  - without surfactant, lungs collapse with each breath

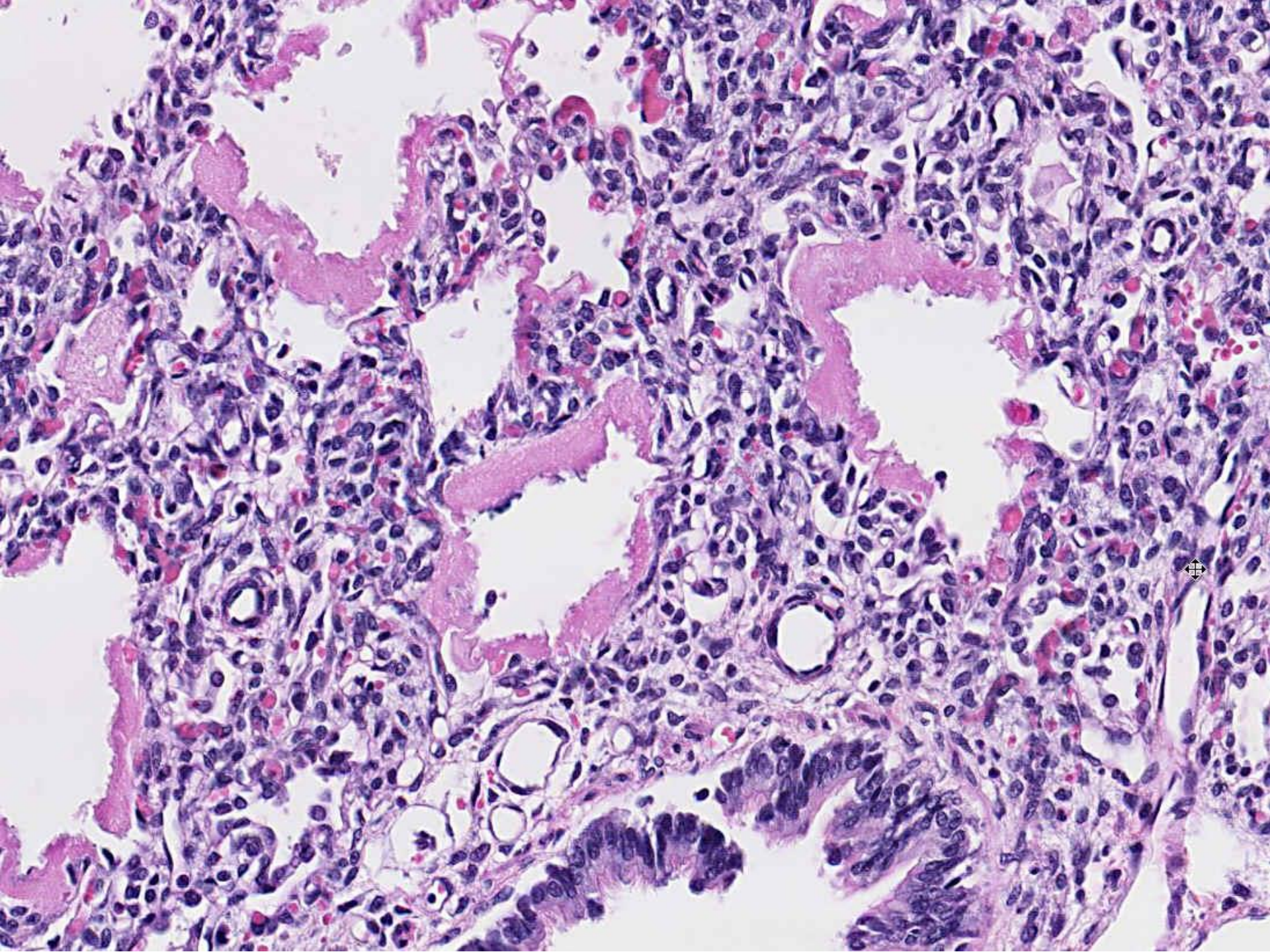
RDS RISK FACTORS

- **1)** Prematurity
  - by far the greatest risk factor
  - affected infants are nearly always premature
- **2)** Maternal diabetes mellitus
  - insulin suppresses surfactant secretion
- **3)** Cesarean delivery
  - normal delivery process stimulates surfactant secretion

RDS PATHOLOGY

- **Gross**
  - solid and airless (no crepitance)
  - sink in water
  - appearance is similar to liver tissue*
- **Microscopic**
  - atelectasis and dilation of alveoli
  - hyaline membranes composed of fibrin and cell debris line alveoli (HMD former name)
  - minimal inflammation





SUDDEN INFANT DEATH SYNDROME

- NIH Definition
  - *sudden death of an infant under 1 year of age which remains unexplained after a thorough case investigation, including performance of a complete autopsy, examination of the death scene, and review of the clinical history*
- Crib death
  - another name based on the fact that most die in their sleep

RISK FACTORS FOR SIDS

- ***Parental***
  - Young maternal age (age <20 years)
  - Maternal smoking during pregnancy
  - Drug abuse in *either* parent, specifically paternal marijuana and maternal opiate, cocaine use
  - Short intergestational intervals
  - Late or no prenatal care
  - Low socioeconomic group
  - African American and American Indian ethnicity (? socioeconomic factors)
- ***Infant***
  - Brain stem abnormalities, associated defective arousal, and cardiorespiratory control
  - Prematurity and/or low birth weight
  - Male sex
  - Product of a multiple birth
  - SIDS in a prior sibling
  - Antecedent respiratory infections
- ***Environment***
  - Prone sleep position
  - Sleeping on a soft surface
  - Hyperthermia
  - Postnatal passive smoking

MORPHOLOGY OF SIDS

- SIDS is a diagnosis of exclusion
- Non-specific autopsy findings
  - Multiple petechiae
  - Pulmonary congestion ± pulmonary edema
  - These may simply be agonal changes as they are found in non-SIDS deaths also
- Subtle changes in brain stem neurons
- Autopsy typically reveals no clear cause of death

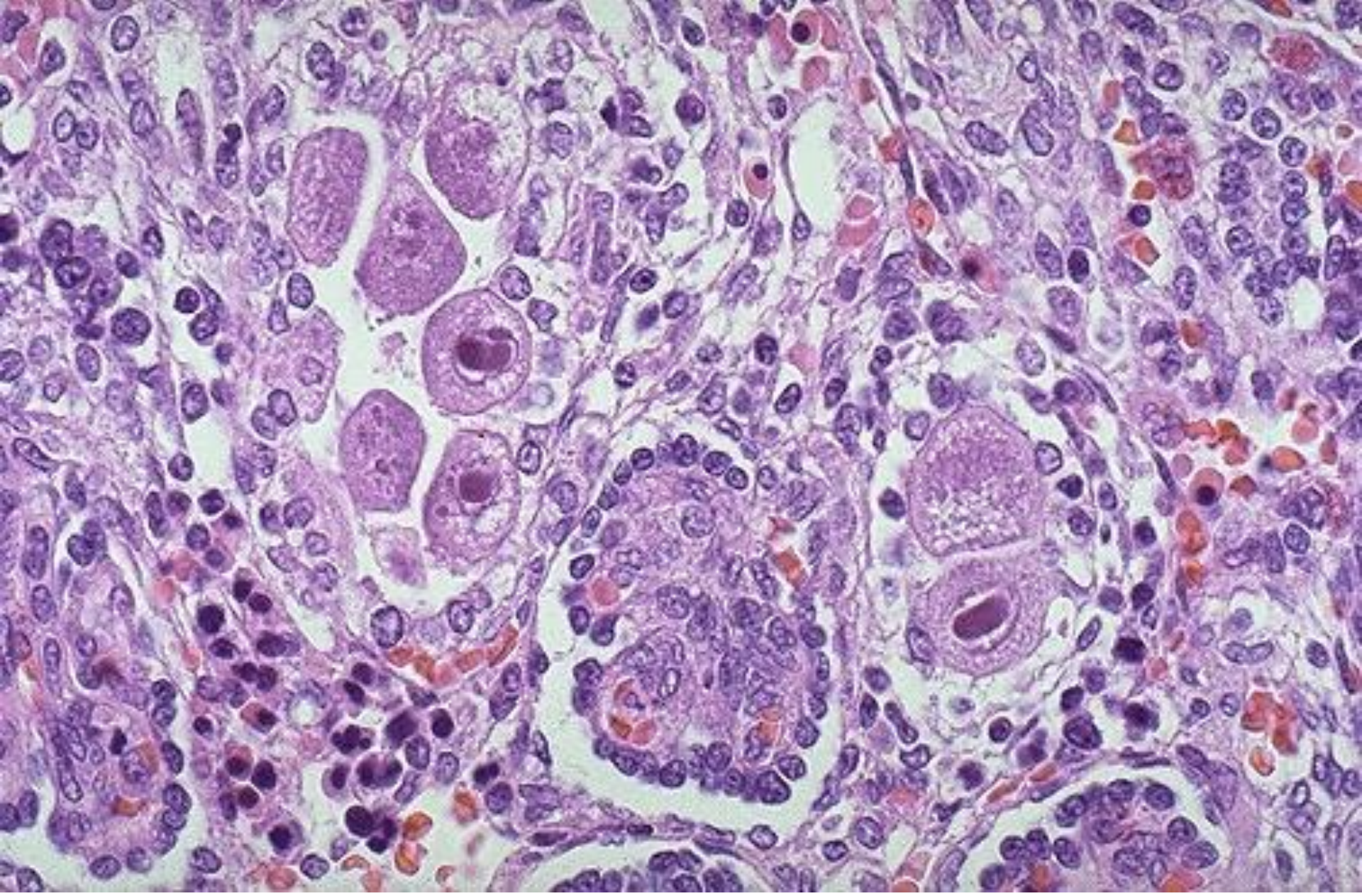
DELIVERY HEMORRHAGES CLASSIFICATION

Obstetric

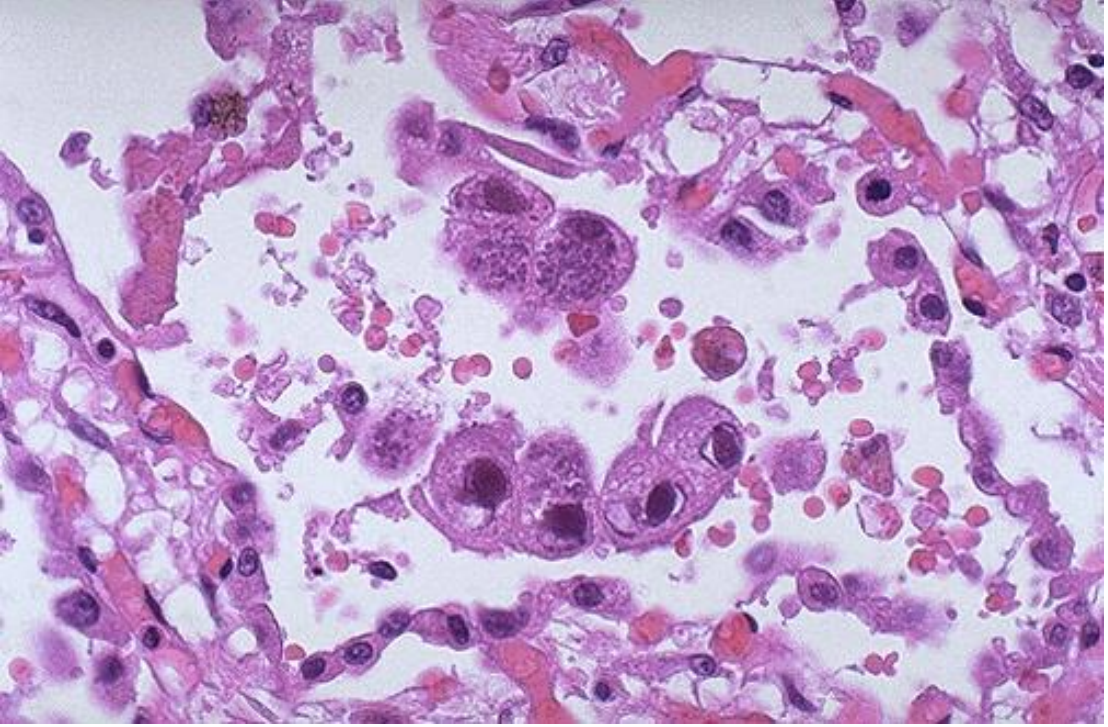
- **Placenta previa**
- **Placental abruption**
- **Uterine rupture**
- **Uterine inversion**
- **Primary Postpartum hemorrhage**
  - **Retained placenta**
  - **Uterine atony**
  - **Vaginal/Cervical lacerations**
  - **Hematomas**
  - **Placenta acreta/increta/percreta**

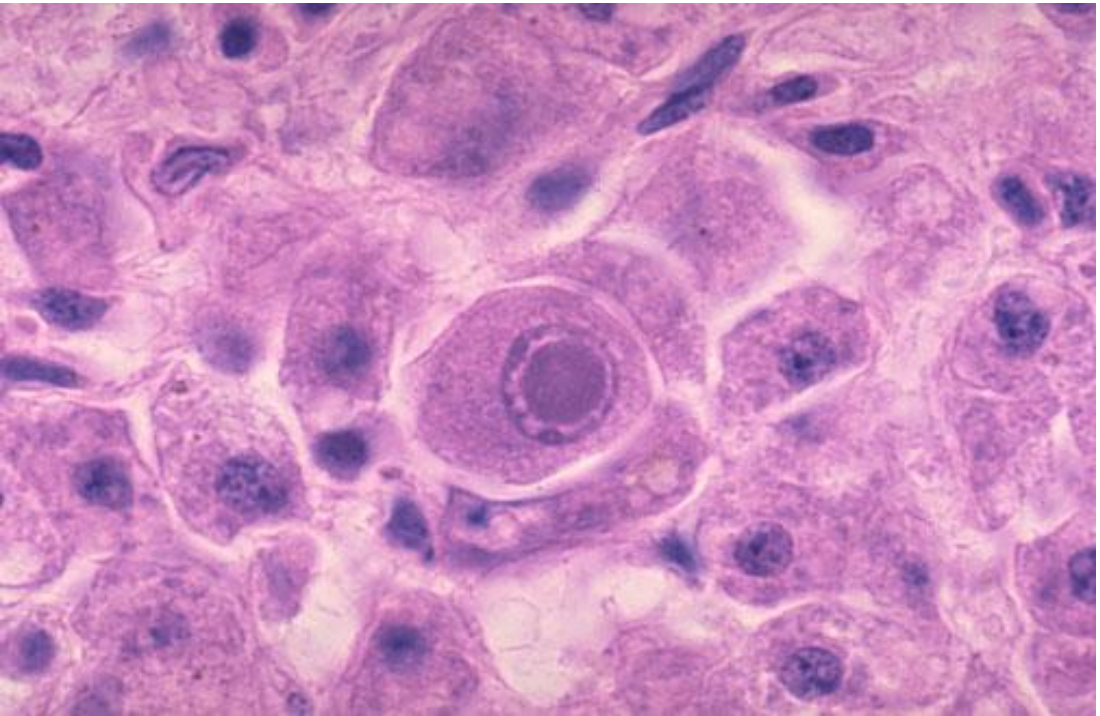
NEONATAL INFECTIONS

- Toxoplasmosis
- Gonorrhea
- Syphilis
- Varicella-zoster
- Hepatitis B virus (HBV)
- Human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS)

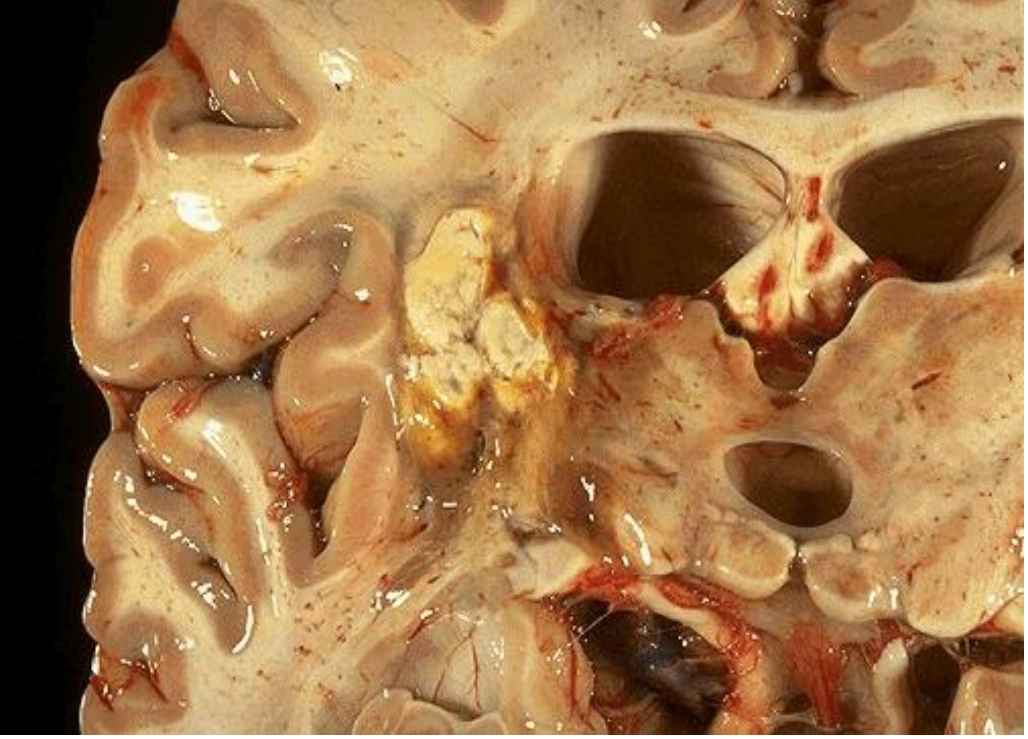


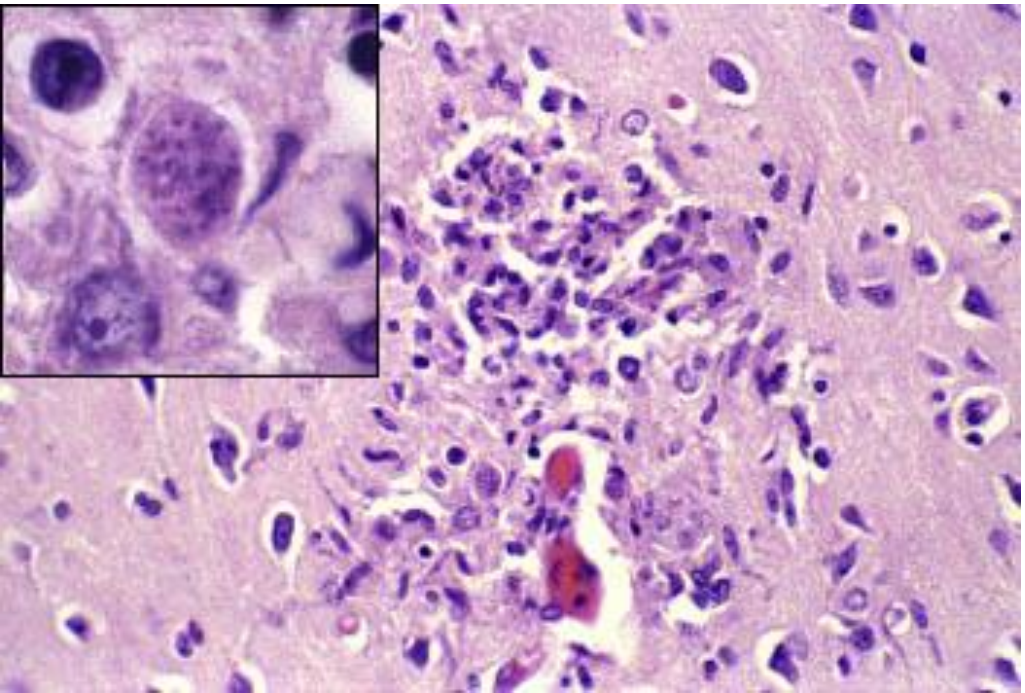
CYTOMEGALIC INJURY OF THE RENAL CONVOLUTE TUBE



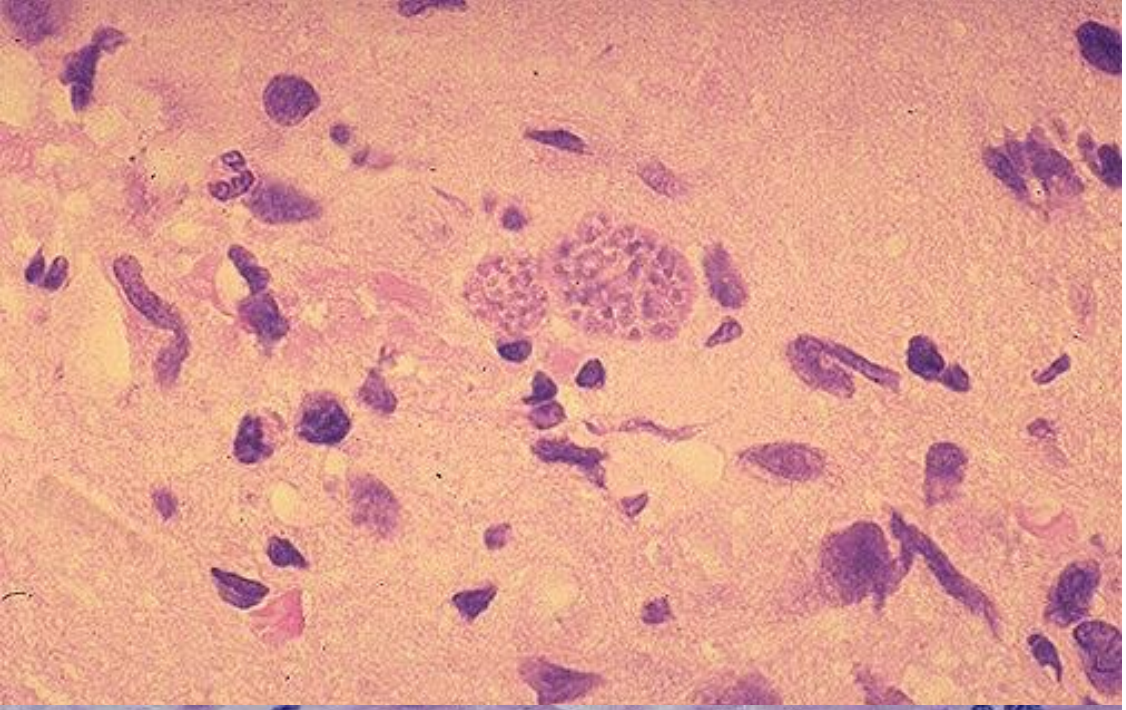


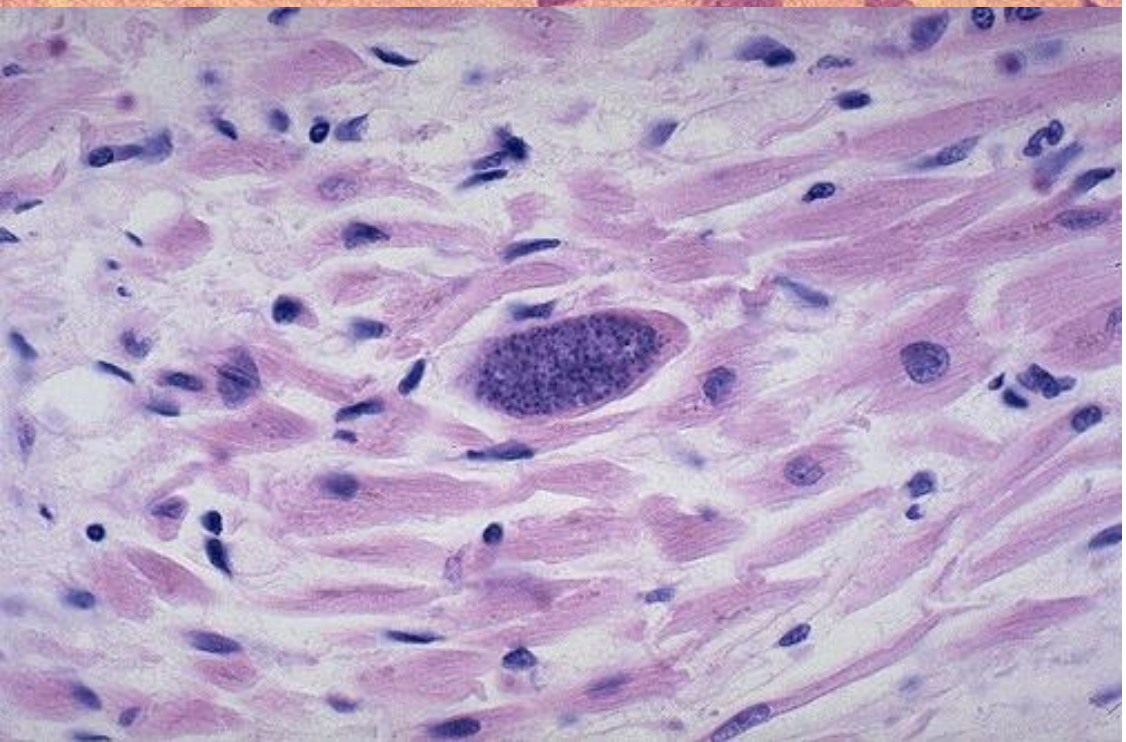
CYTOMEGAIC INJURY OF THE ALVEOLES AND HEPATOCYTES



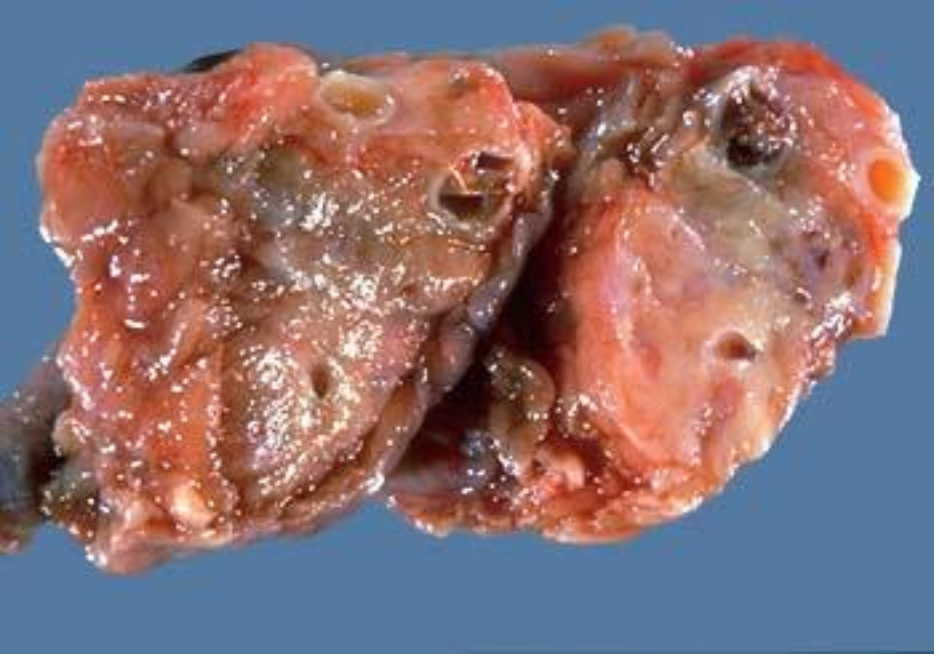


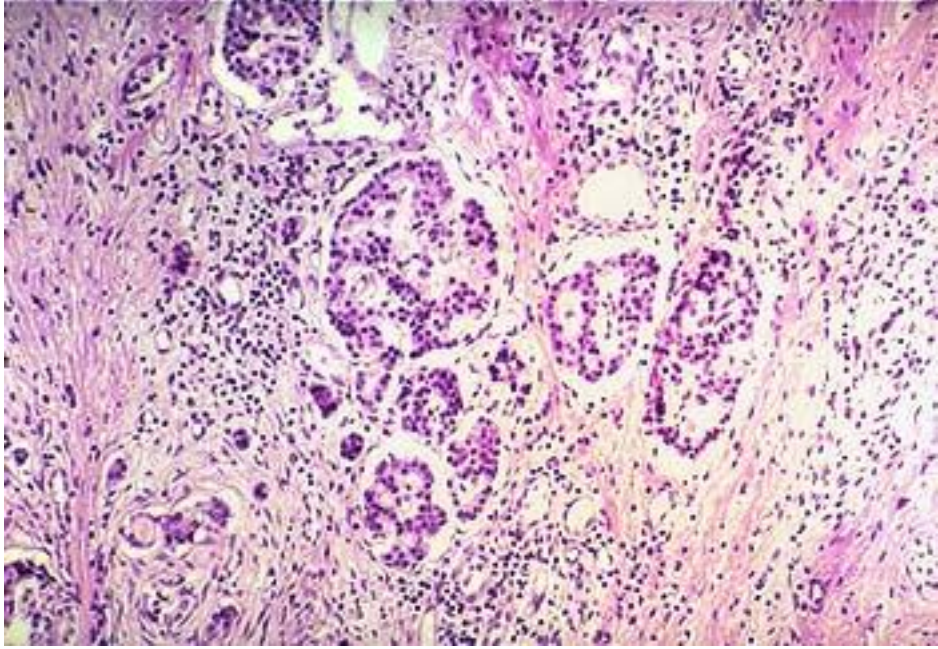
TOXOPLASIS,
MACRO – CEREBRAL ABSCESS,
MICRO –MYCROGLIAL GRANULOMMA
AND PSEUDOCYST

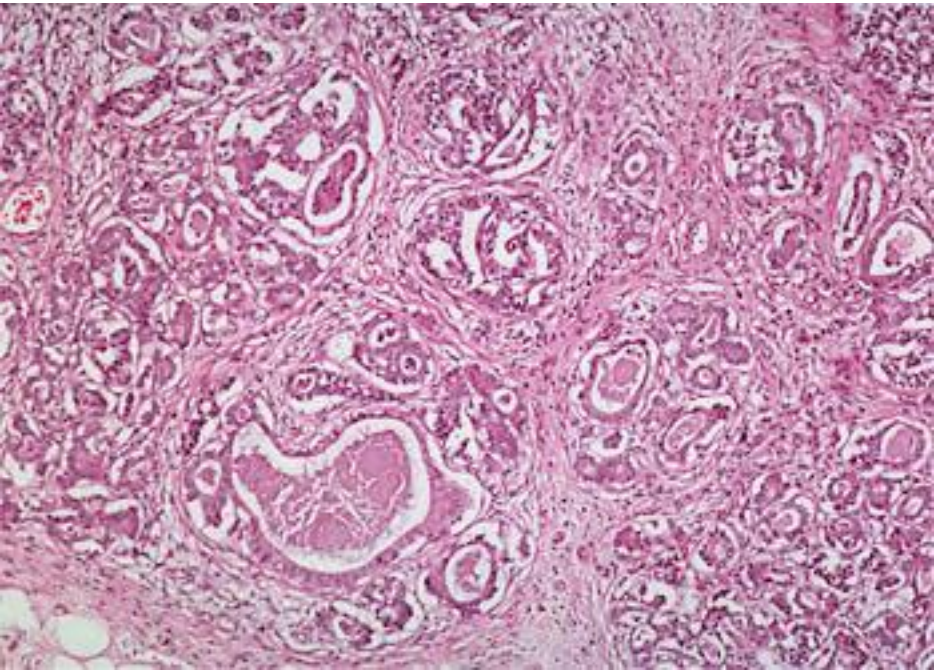




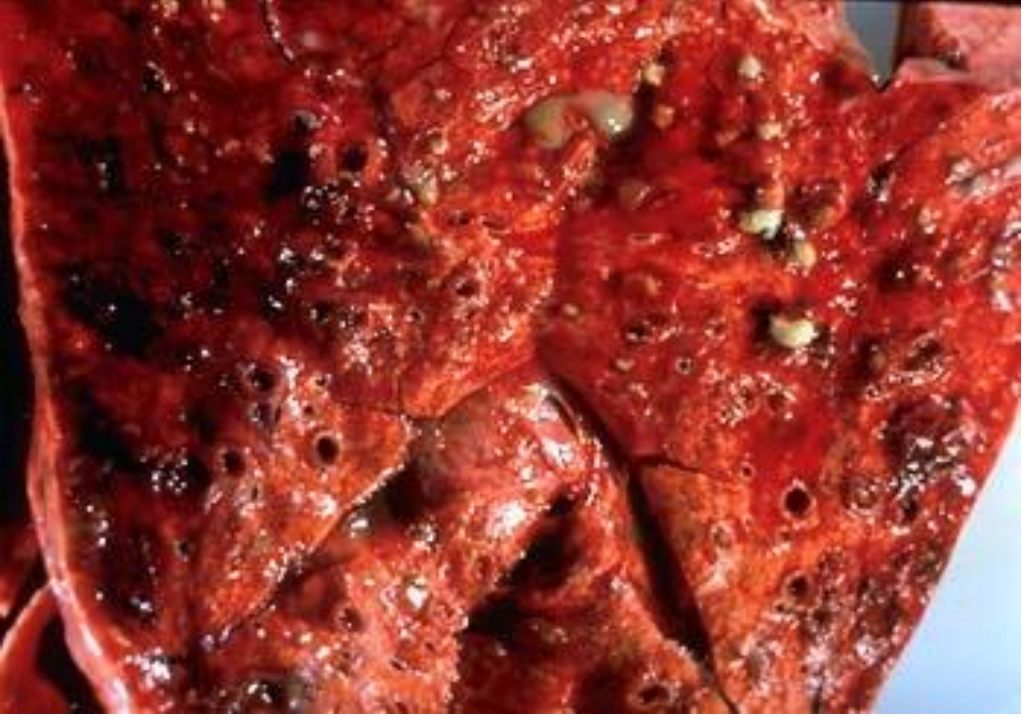
TOXOPLASMOSIS OF THE BRAIN AND MYOCARDIAL TISSUE

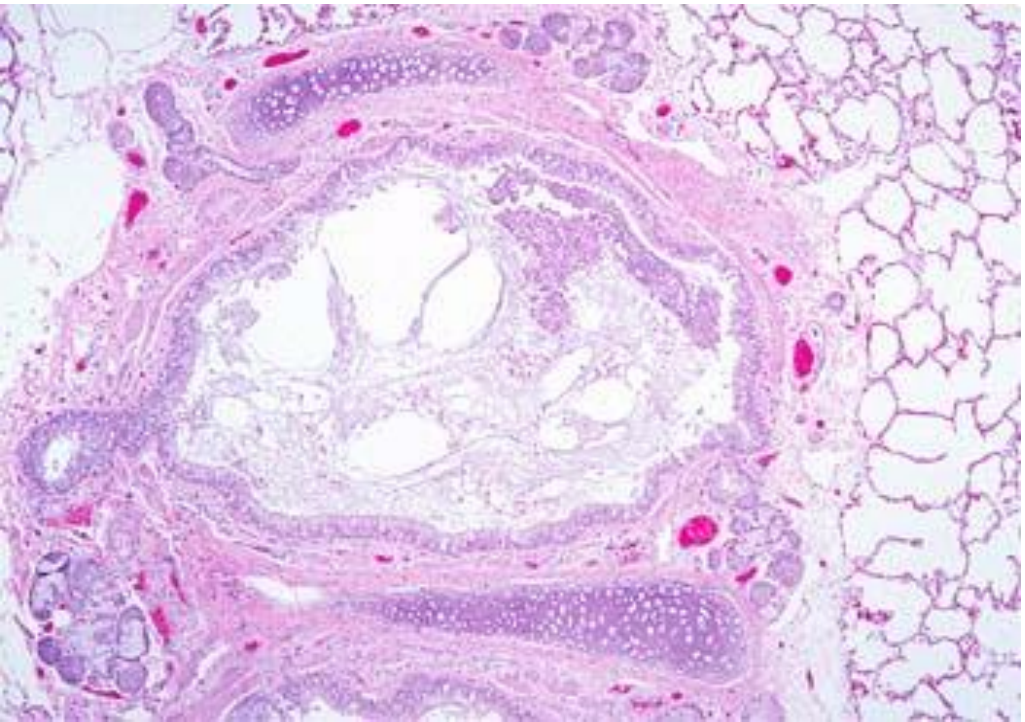




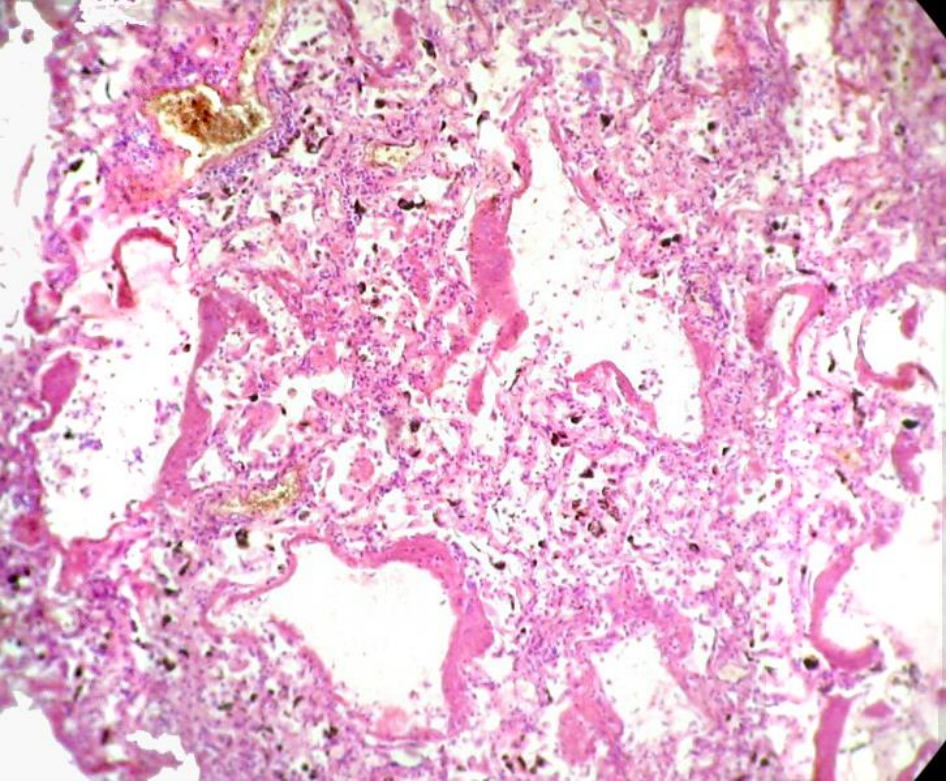


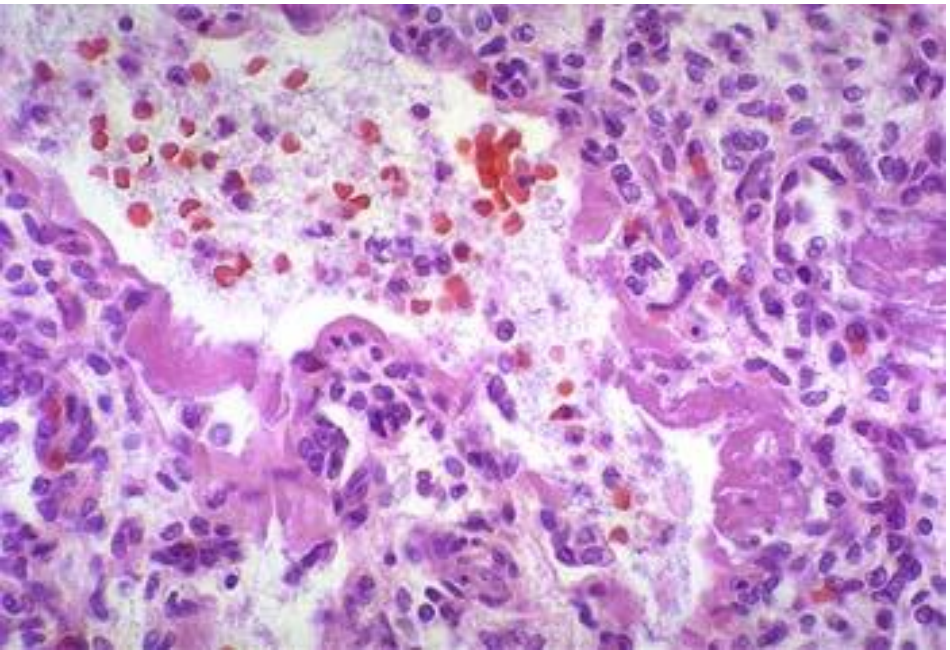
CYSTIC FIBROSIS OF THE PANCREAS





MUCOVISCIDOSIS OF THE LUNG



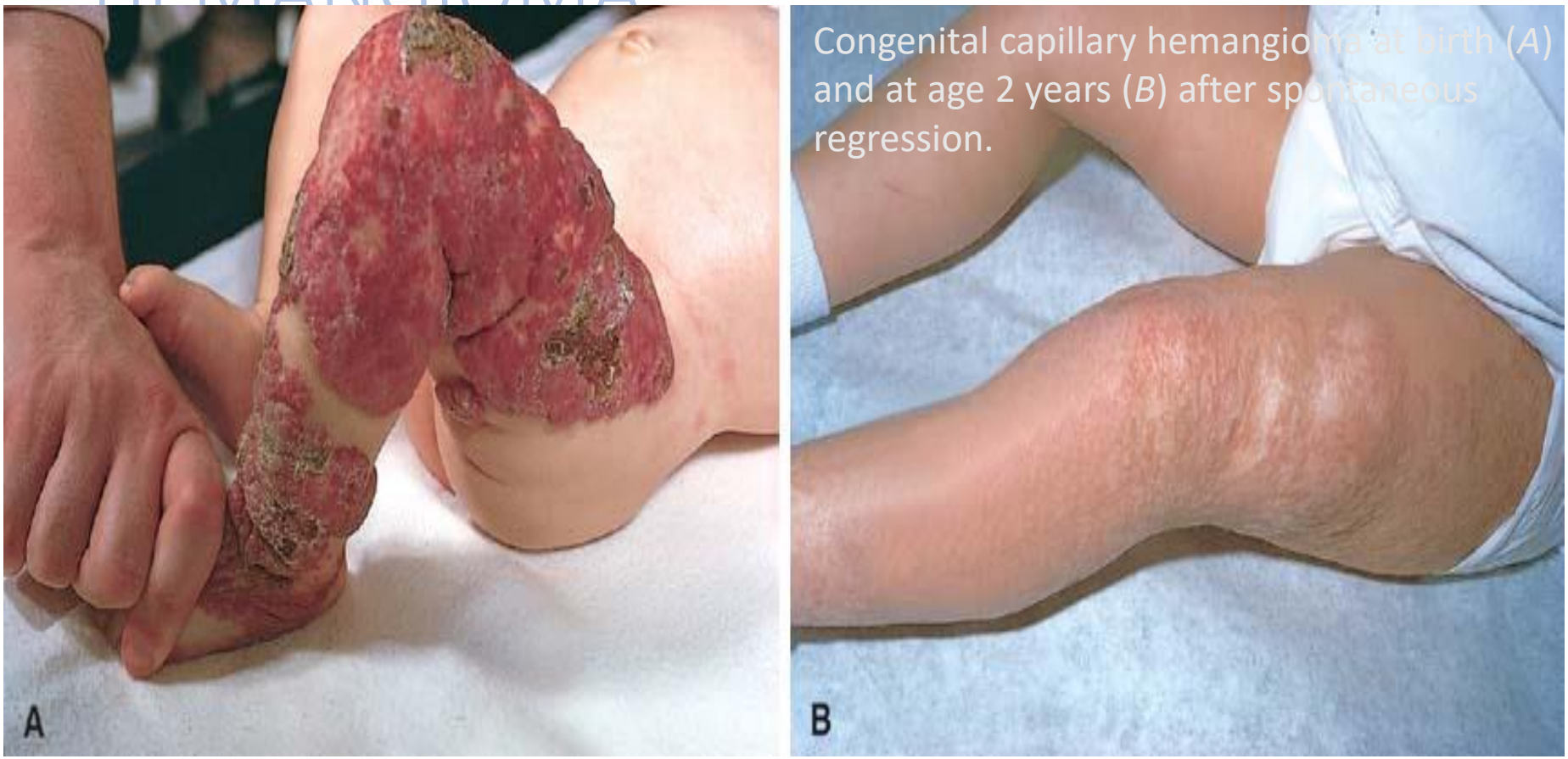


ALVEOLAR WALL HYALINOSIS

TUMORS

- Benign
- Malignant

CONGENITAL CAPILLARY HEMANGIOMA



Congenital capillary hemangioma at birth (*A*) and at age 2 years (*B*) after spontaneous regression.

At birth

At 2 years
After spontaneous regression

TERATOMAS

- Composed of cells derived from more than one germ layer, usually all three
- Sacrococcygeal teratomas
  - most common childhood teratoma
  - frequency 1:20,000 to 1:40,000 live births
  - 4 times more common in boys than girls
- Aproximately 12% are malignant
  - often composed of immature tissue
  - occur in older children

SACROCOCCYGEAL TERATOMA