# Preterm infant's major morbidities

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# Preterm newborn

- 22-36 HBD
- 22-24 HBD extremely immature newborn limit of neonatal possibilities
- Mortality 23 hbd- 85%
  24 hbd- 45%
  25 hbd- 21%

# Major morbidities

- Breath disorders
- Patent ductus artesiosus
- Intraventricular haemorrhagies
- Necrotizing enterocolitis
- Infections
- Retinopathy of prematurity

# Morphologic development of lungs

| Stage | Gestational week | Morphologic changes |
|---|---|---|
| Embrional | 4-6 | Formation of infancy airways |
| Paragrandular | 7-16 | Formation of junctive airways |
| Tubular | 17-28 | Formation of respiratory bunch |
| Saccular | 29-35 | Development of gases exchange places |
| Alveolar | 36 | Development of alveoli |

# Main causes of respiratory disorders

- Transient tachypnea of newborn (TTN)
- Respiratory distress syndrome (RDS)
- Congenital pneumoniae
- Pulmonary hemorrhage
- Pneumothorax

# Another

- Congenital anomalies: choanal atresia, laryngotracheal esophageal cleft, lung hypoplasia, pulmonar sequestration, congenital diaphragmatic hernia
- CNS: haemorrage, ischaemic- hypoxic encephalopathy, apnea
- cardiovascular: congenital heart defects, congestive heart failure, persistent pulmonary hypertension of the newborn

# Another causes

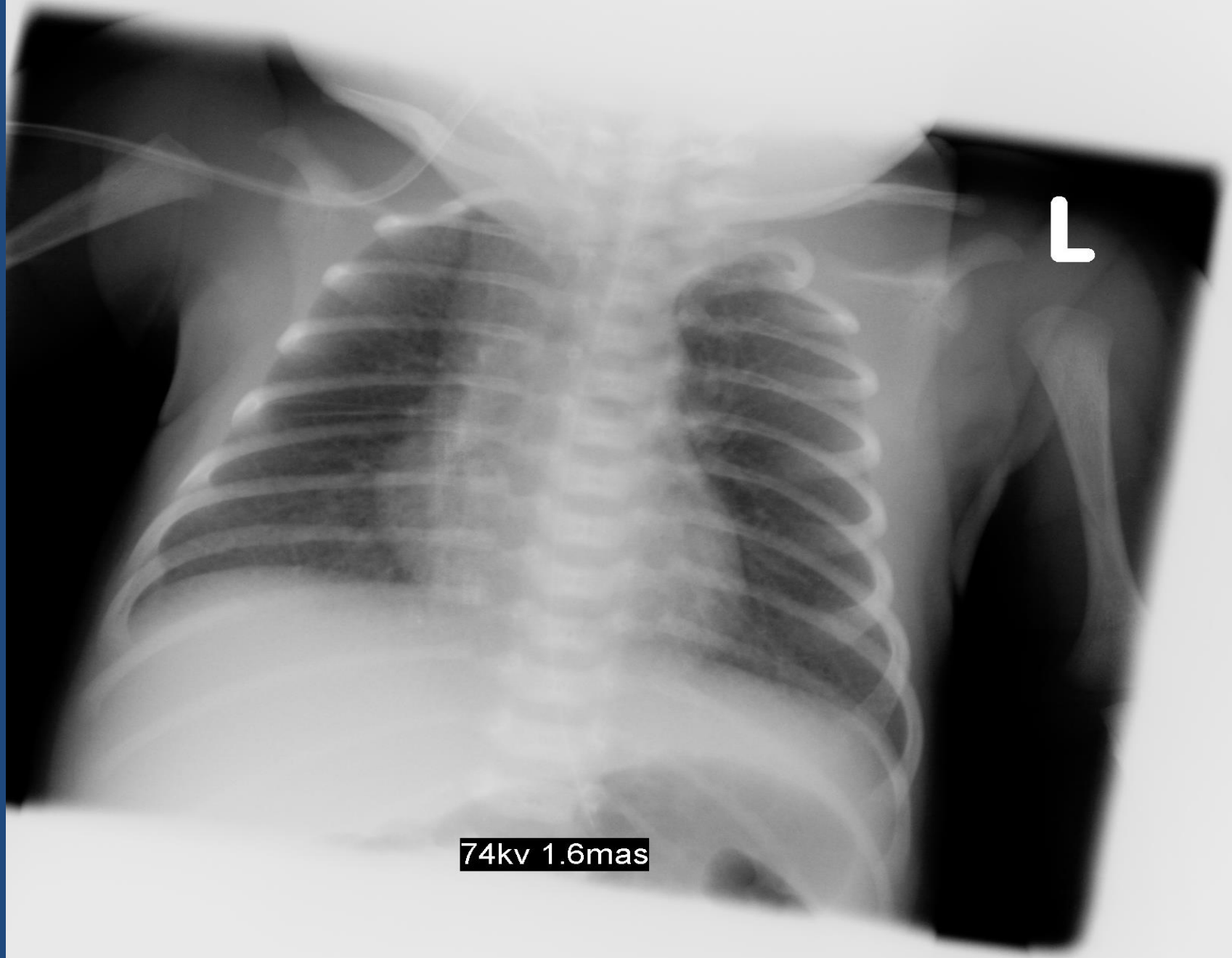
- Sepsis
- Anaemia
- Hypothermia  and hyperthermia
- Hypoglycaemia
- Hypovolemia
- Muscles disorders: myasthenia, muscular dystrophy

# Symptoms of respiratory distress:

- Tachypnea >60’
- Intercostal diaphragmatic and sternal retraction
- Expiratory sounds
- Nasal flaring
- Cyanosis
- Tachycardia
- Apneas
- Abnormal breath sounds: stridor, wheezing, rales

# Transient tachypnea on the newborn (TTN)

- 5% psn term, 15% preterm
- Delayed resorption of lung fluid
- Risk factors: cc, birth asphyxia, fetal polycythemia, infant of diabetic mother, multiple gestation
- Resolve within 3-5 days
- X-ray- hyperexpansion of lung, fluid in minor fissure, prominent pulmonary vascular marking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74kv 1.6mas

# Respiratory distress syndrome (RDS)

- 26-30 Hbd- 70%, 32-37 HBD- 20%, >37 Hbd -5%
- Deficiency of surfactant
- SURFACTANT- lipoprotein – substance which help to expand and prevent to collapse small airspace
- Surfactant is produced by pneumocytes type II since 24 Hbd,

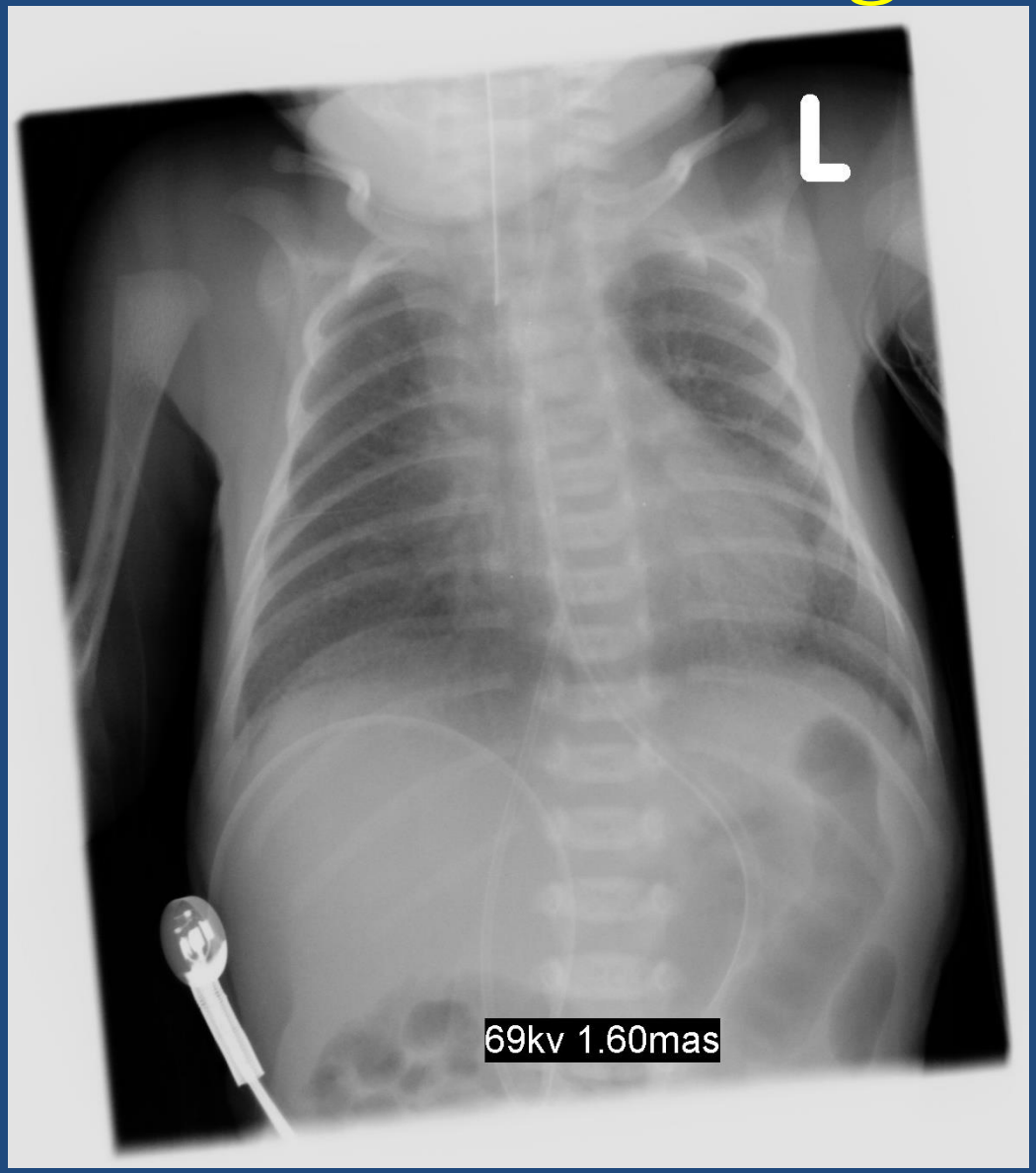

USE ONCE

# Criteria of diagnosis RDS

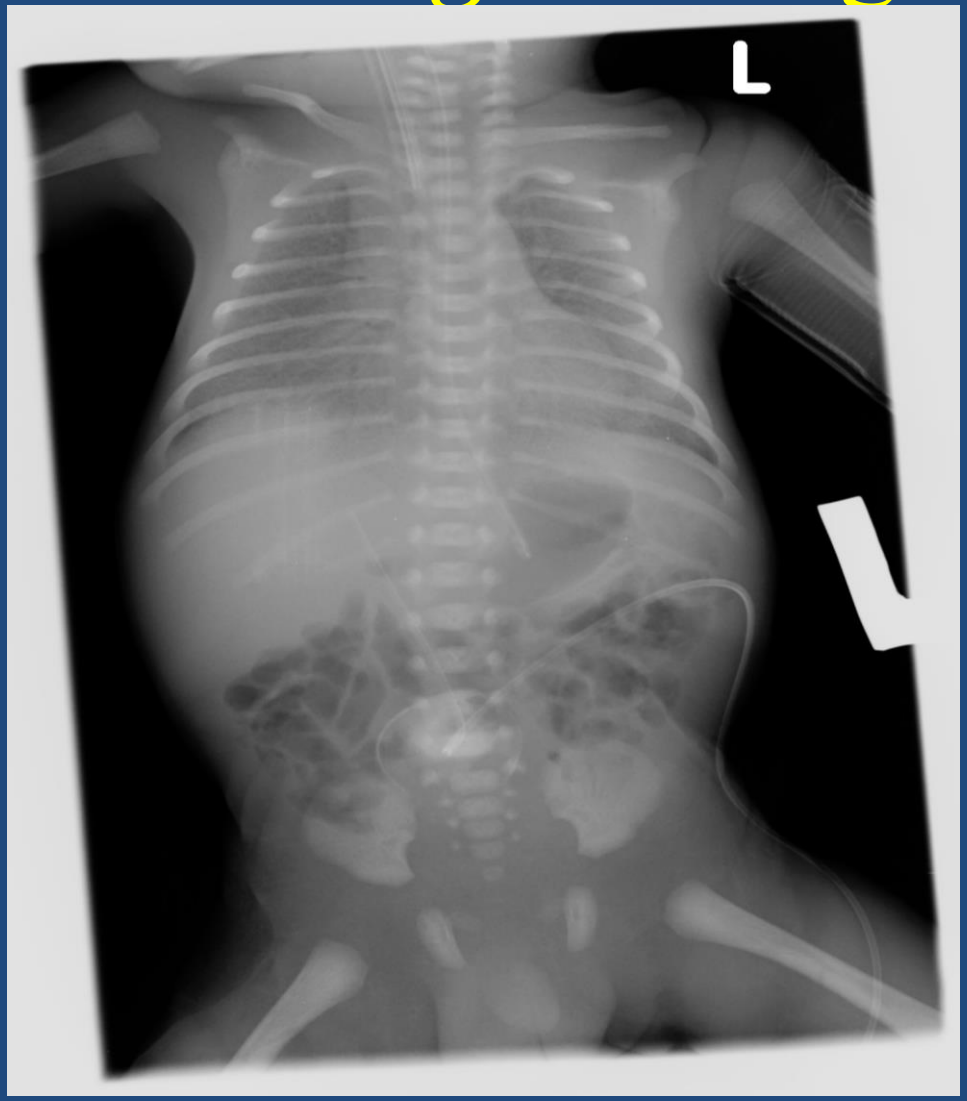
- Clinic: respiratory distress, cyanosis, sat <85%, apneas, tachypnoe, unstable temperature, hypotension, pulmonary edema, peripheral edemas
- Laboratory: hypoxemia, hypercarbnia, acidosis
- Radiologic

# RDS I st- granular image of lungs

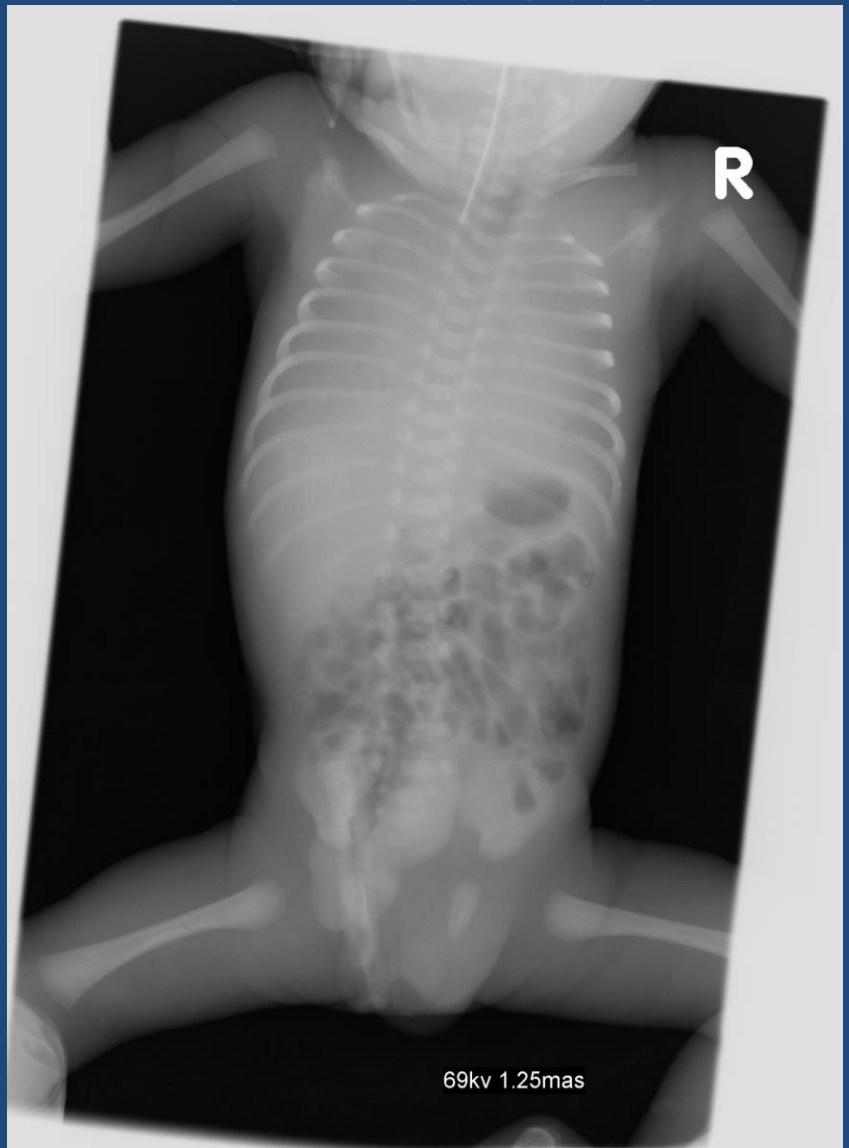
# RDS II st- bronchogram visible



# RDS III st- prominent pulmonary vascular marking “milk glass”



# RDS IV st- with lungs, no heart silhouette



# Surfaktant- indication

- 200 μg/kg intracheal
- Therapeutic- means  R-ray or clinic symptoms
- Next dose – after 12 hours
- <26 HBD when FiO2 >0,3
- <28 when intubated ( but nCPAP first)
- 27-32 when FiO2 >0,4

# Persistant pulmonary hypertension of the newborn PPHN

- High pulmonary circulation resistance and low blood inflow – like in prenatal period
- Severe hypoxemia unproprate to X-ray- of lung changes
- Cyanosis and asphyxia, high FiO2, high parameters of mechanical ventilation

# PPHN- risk factors

- Birth asphyxia
- RDS
- MAS
- Congenital diaphragmatic haernia
- Congenital pneumoniae (GBS)
- Mitral valve atresia, left ventricle failure
- Myocarditis

# PPHN- diagnosis

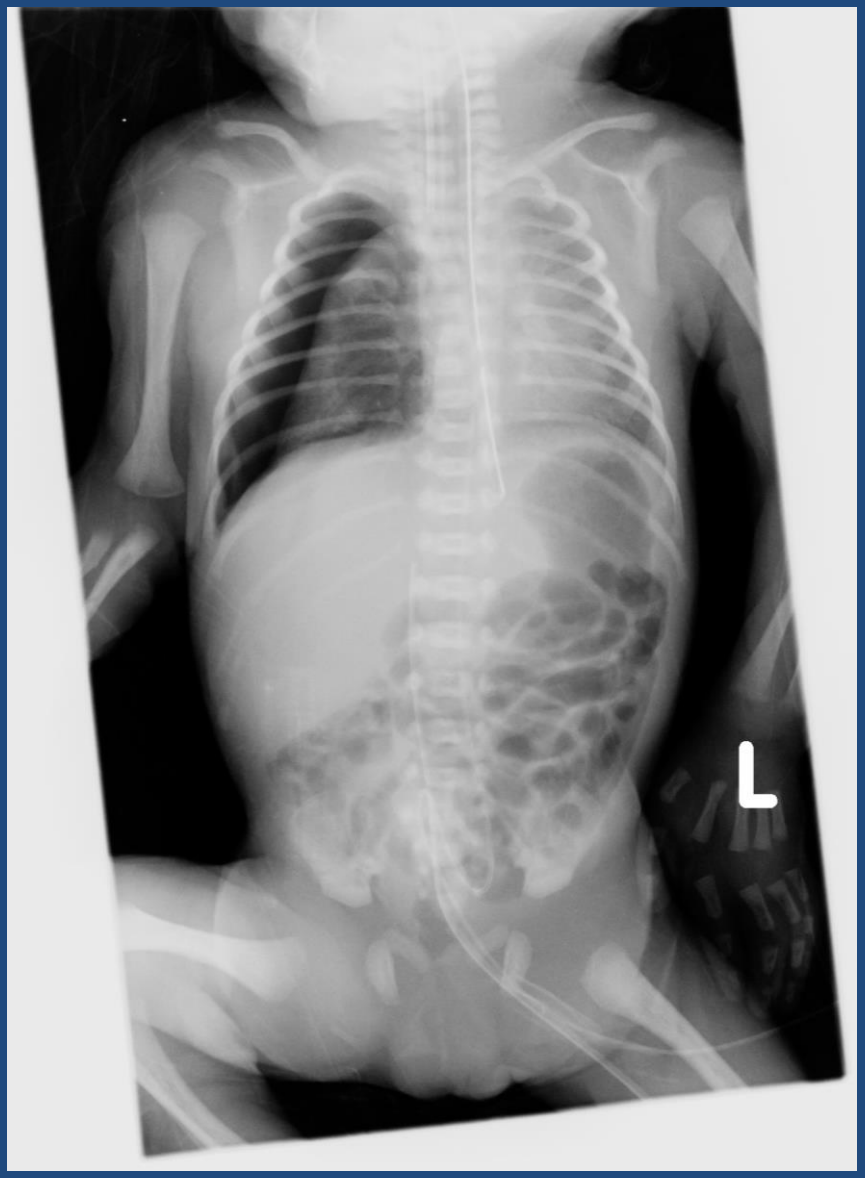
- Pulmonary blood pressure higher than systemic blood pressure
- Right-left flow through PDA and FO
- No congenital heart defects
- Severe asphyxia in spite of FiO2 1,0.

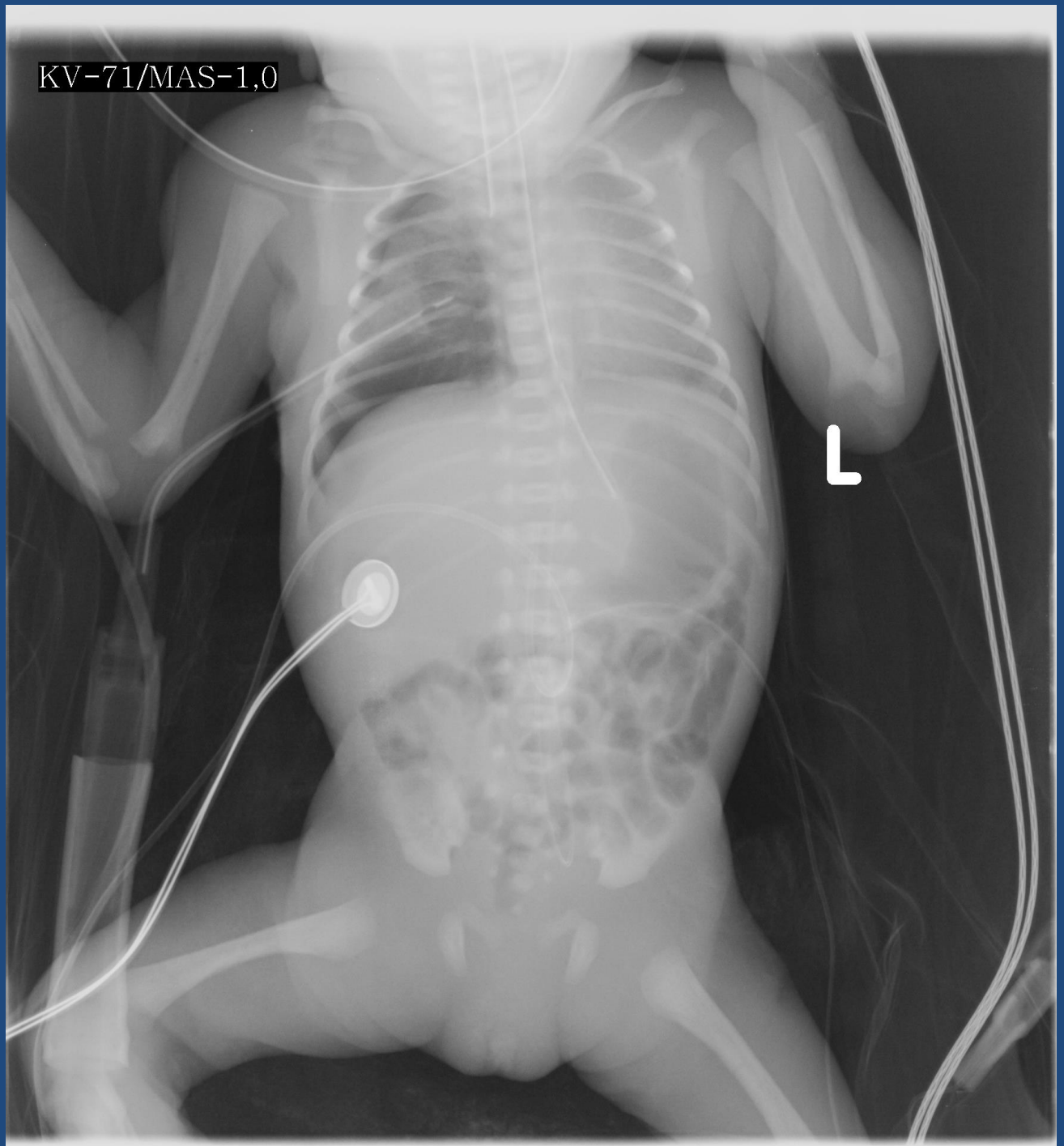
# PPHN- treatment

- Mechanical ventilation – conventional and oscilatory
- Surfaktant ????
- iNO
- Catecholamines
- ECMO

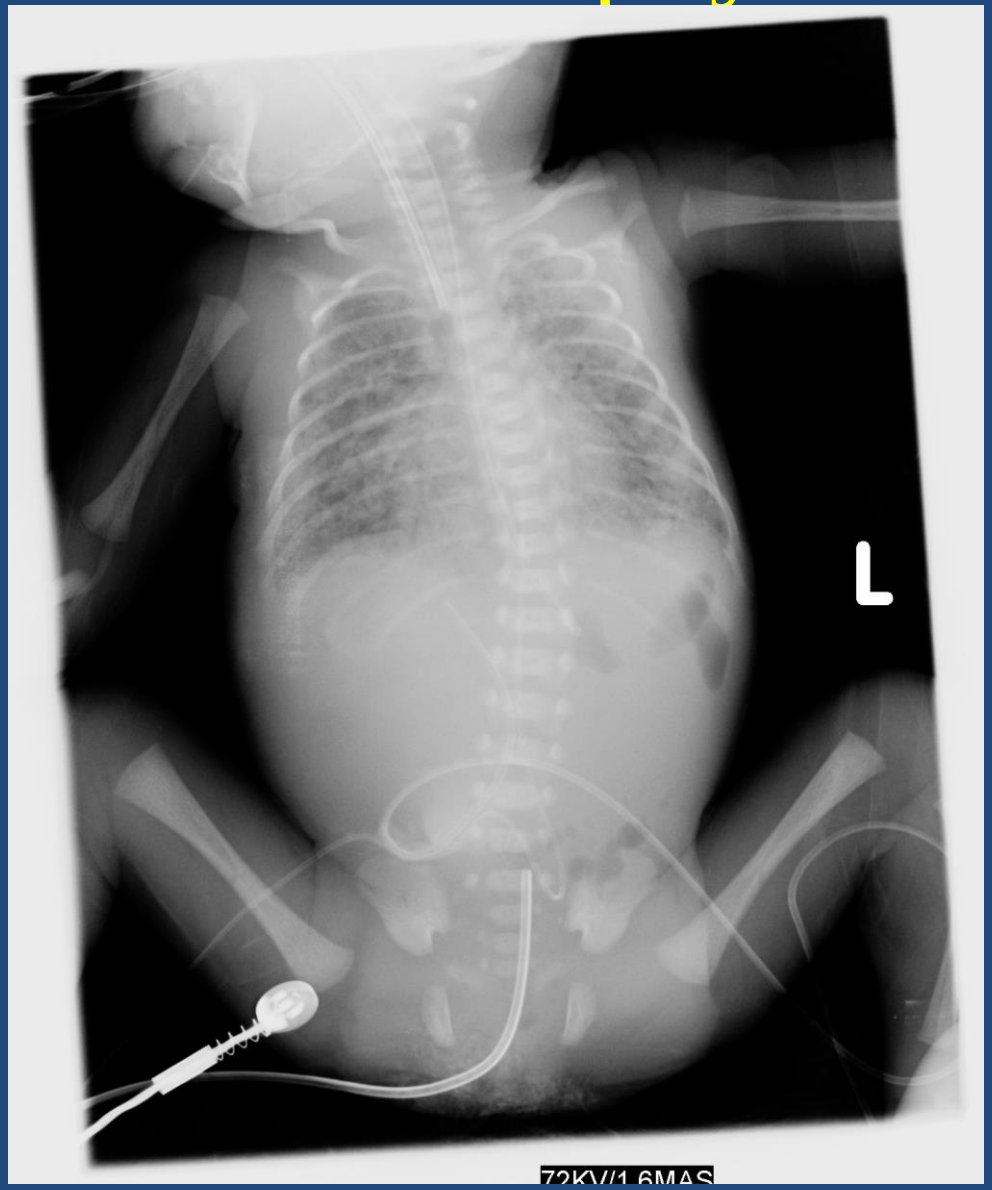
- **Mortality 20-40%**

# Pneumothorax




KV-71/MAS-1,0
L

# Interstitial emphysema



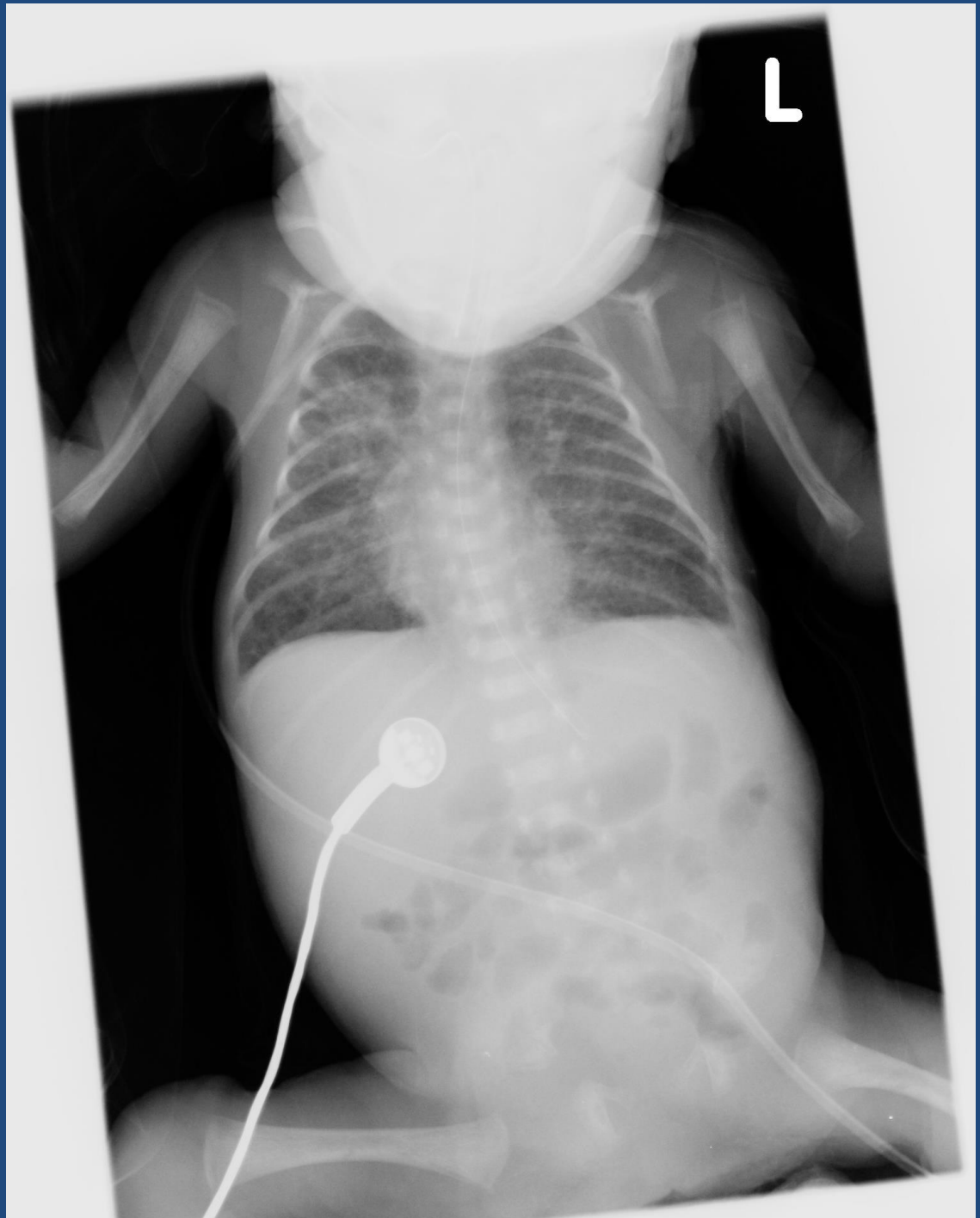
# Bronchopulmonary dysplasia

| | | |
|---|---|---|
| **Fetal age** | **<32 hbd** | **> 32 hbd** |
| **Estimate moment** | **36 hbd or discharge** | **>28 day of life <56 day of life or discharge** |
| **Oxygen require >21 % atleast 28 day of life** | **PLUS** | **PLUS** |
| **Light BPD** | **Breathing with air** | **Breathing with air** |
| **Medium BPD** | **FiO2 <0,3** | **FiO2 <0,3** |
| **Severe BPD** | **FiO2 >0,3 or nCPAP** | **FiO2 >0,3 or nCPAP** |

# Pathogenesis

- Oxygen toxicicty
- Mechanic trauma during MV barotrauma and volumtrauma
- Inflammation
- Energetic deficiency

- Inhibition of proper process of lung alveorisation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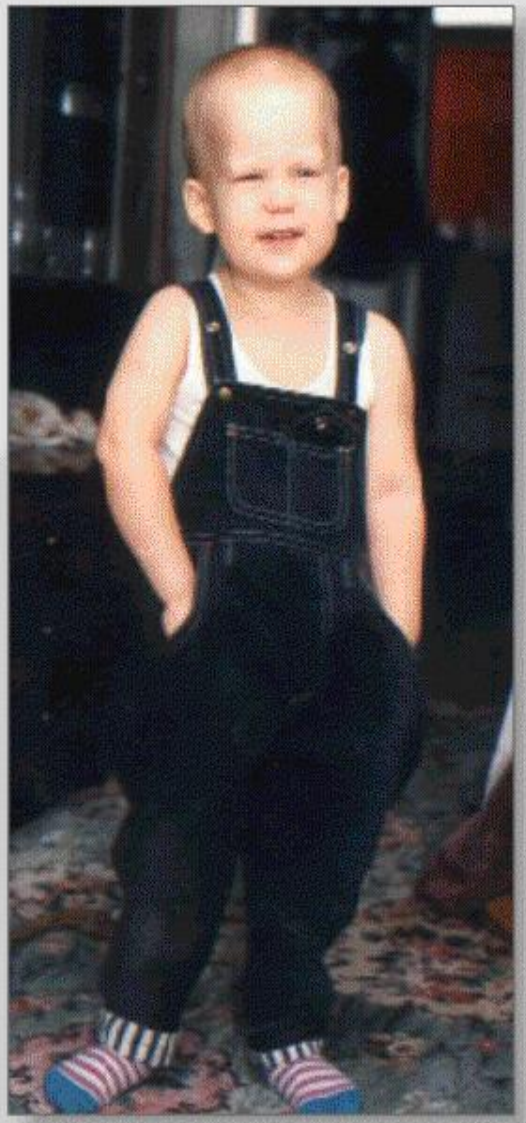
# Symptoms

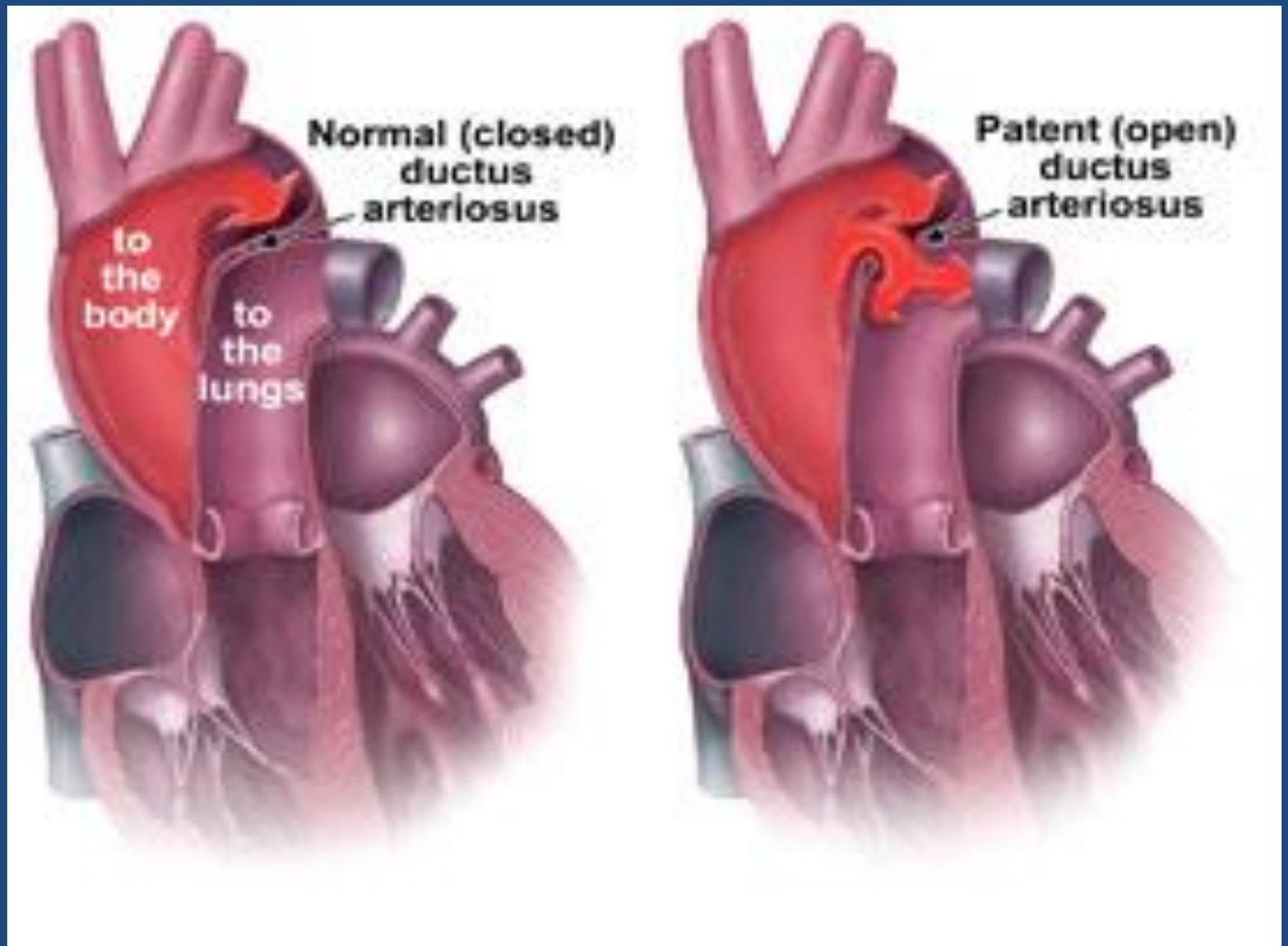
- Breathlessnes,  oxygen therapy require
- Chronic hypercarbnia
- Retraction of stern, diaphragm, intercostal muscles, tachypnoe
- Lots of mucofluid secretion in airways
- Acute episodes of bronchospasm
- Oedemas
- Recurrent pneumonias
- Abnormalities of calcium and phosphorus
- Psychomotor development retardation

# Treatment

- Oxygen- therapy (PaO2 55-70 mmHg)
- High caloric diet (140-160 kcal/kg/d)
- Fluid restriction
- Diuretic drugs
- Steroid therapy
- Sildenafil
- Bronhodilatators, anti-inflammatory
- Blood transfusion (Ht >40%)
- Physical therapy



# Patent ductus artesiosus PDA



# PDA

- 45% in newborns with bw < 1500 g
  100% in newborns with bw <1000 g

- Immaturity of endothelium of DA and inadequate response for vasoconstrictors

- Getting worse primary pathologic changes in immature lungs and extends time of mechanical ventilation

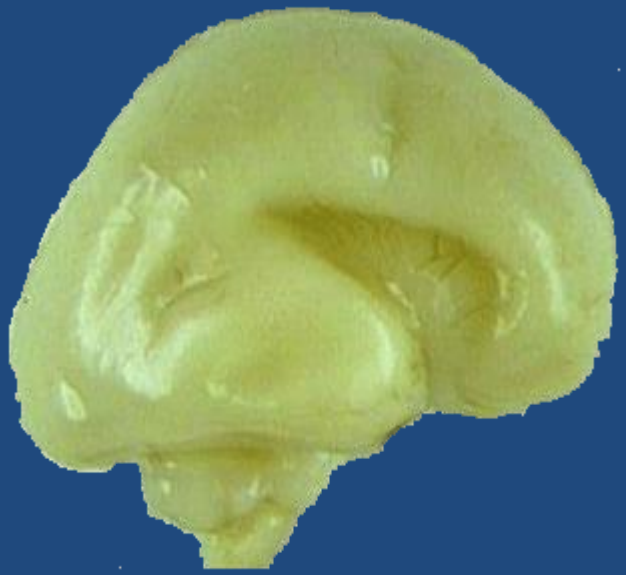
# PDA - concequences

1. Increasing of pulmonary blood flow
2. Decreasing of descending aorta blood flow.
3. Increasininf of resistence in MSA ant renal arteries
4. In diastole- there is back flow from abdominal organs – NEC, renal insufficiency
5. In diastole backflow from brain circulation
6. Insreasing of LV preload – insufficiency of LV
7. Organs perfusion disorders

# Treatment

- In case of significant hemodynamic importance
- Diagnose by echocardiography
- Pharmacological: indomethacin, iuprofen
- Surgical ligation

# Intravetricular hemorrhages IVH



24 hbd • 40 hbd

Gressens, P., Rogido, M., Paindaveine, B., and Sola, A. (2002).
The impact of neonatal intensive care practices on the developing brain. Journal of Pediatrics, 140(6), 646-653

# Classification of IVH –Papile,a

I$^{o}$ - subependymal hemorrhage

II$^{o}$ - intraventricular hemorrhage without lateral ventricular dilation

III$^{o}$ - intraventricular hemorrhage with lateral ventricular dilation

PVH$^{o}$ – periventricular hemorrhage to cerebral tissue- hemorrhagic infarct

# Classificaton intraventricular hemorrhages Volpe'a

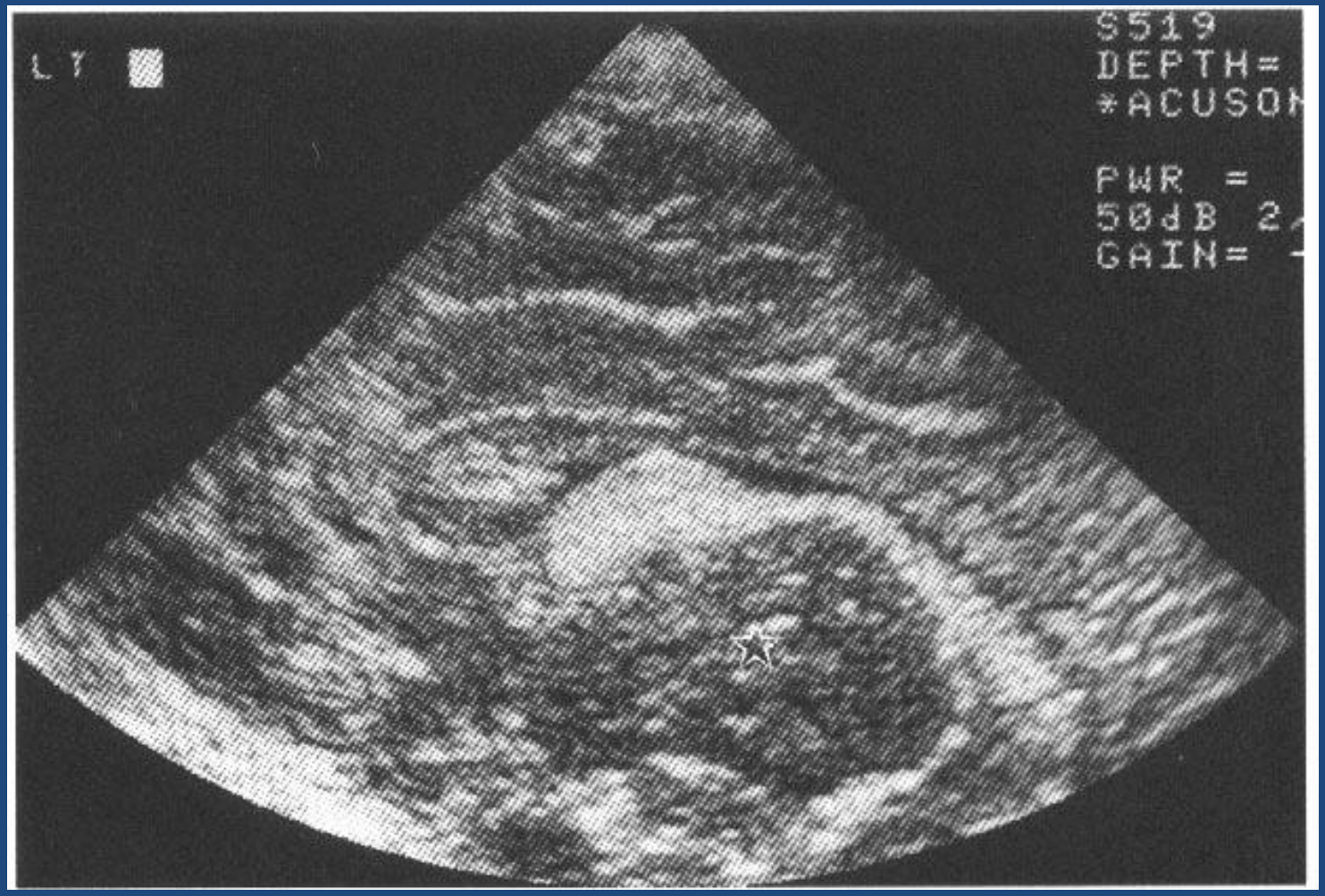
Io – to subependyma

IIo – intraventricular [10-50%]

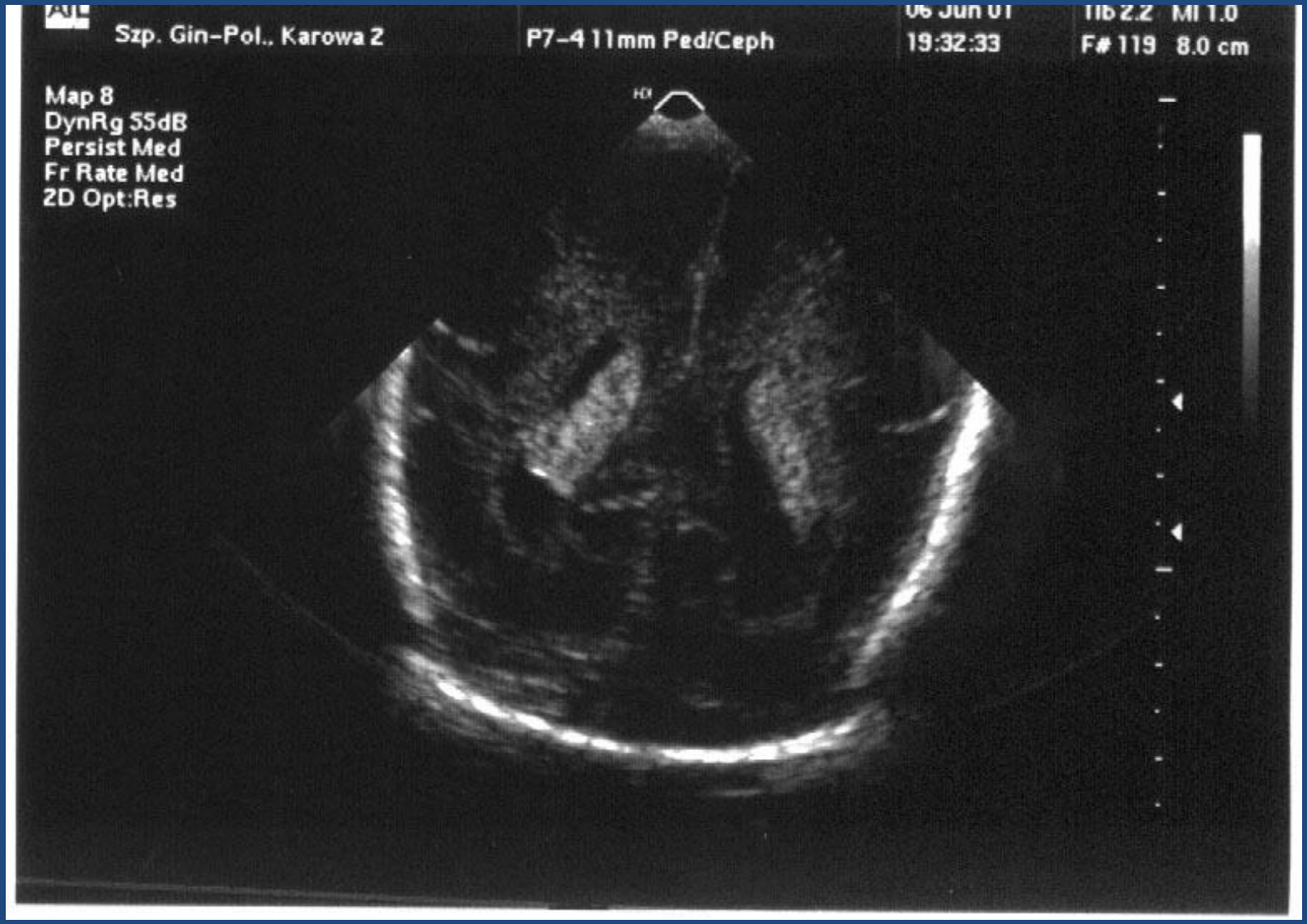
IIIo - intraventricular >50%

IVo - intraventricular + hemorrhagic infarct

# IVH I



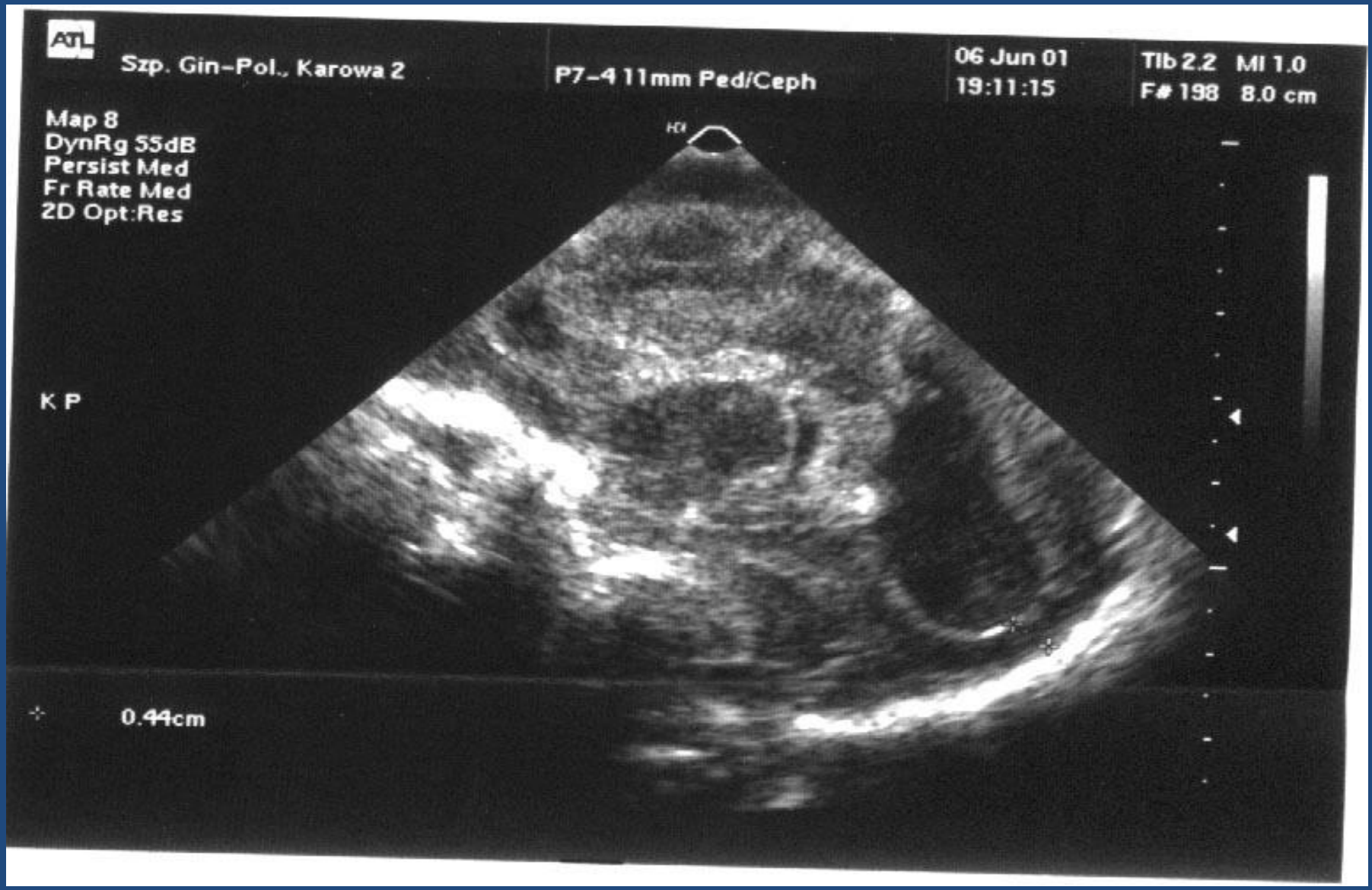
# IVH II


Szp. Gin-Pol., Karowa 2
P7-4 11mm Ped/Ceph
06 Jun 01
19:32:33
TIb 2.2 MI 1.0
F# 119 8.0 cm
Map 8
DynRg 55dB
Persist Med
Fr Rate Med
2D Opt:Res

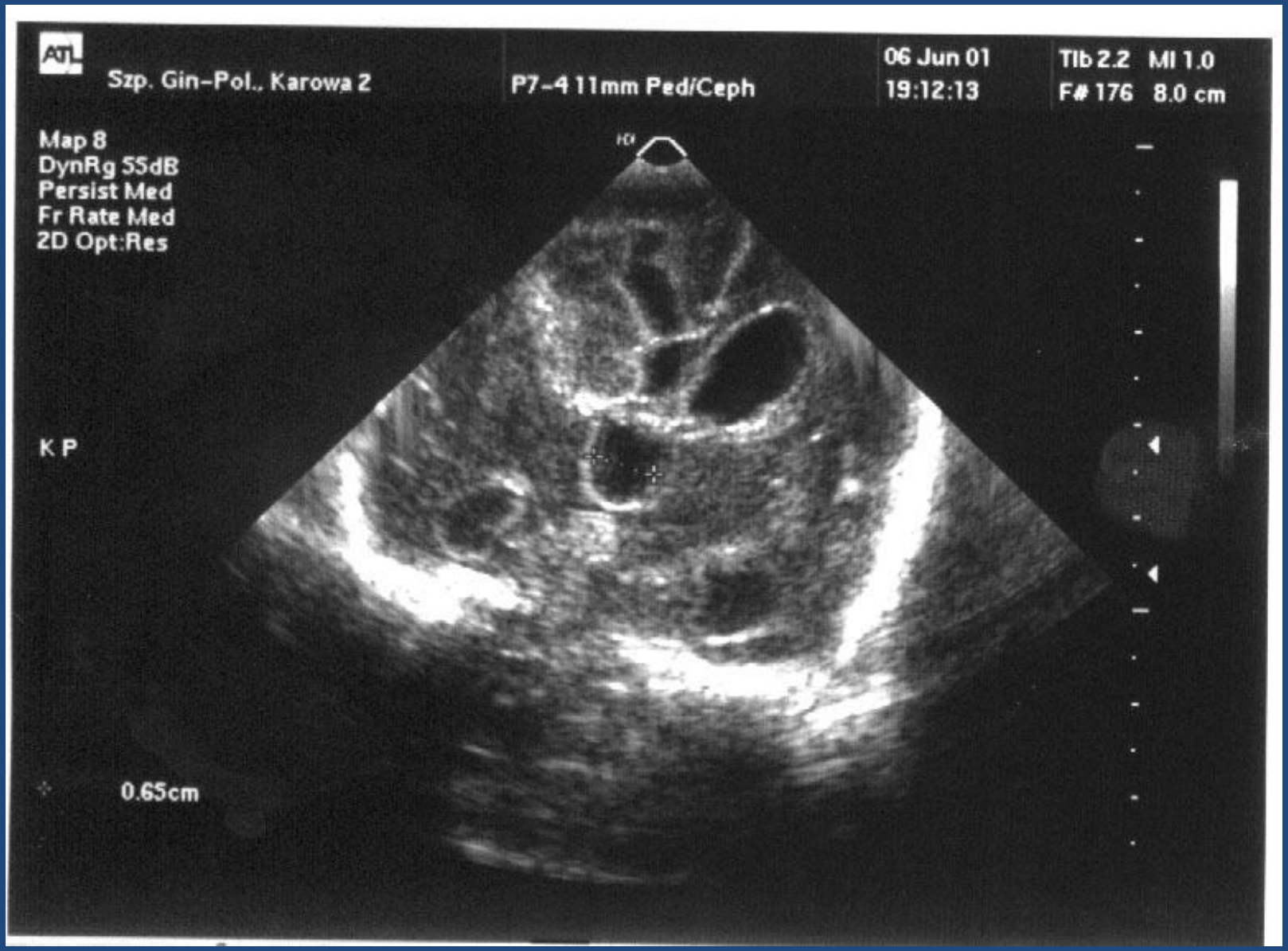
# IVH III


ATL
Szp. Gin-Pol., Karowa 2
P7-4 11mm Ped/Ceph
06 Jun 01
19:49:34
TIb 2.2 MI 1.0
F# 198 8.0 cm
Map 8
DynRg 55dB
Persist Med
Fr Rate Med
2D Opt:Res
K L

# IVH IV


ATL
Szp. Gin-Pol., Karowa 2
P7-4 11mm Ped/Ceph
06 Jun 01
19:11:15
TIb 2.2 MI 1.0
F# 198 8.0 cm
Map 8
DynRg 55dB
Persist Med
Fr Rate Med
2D Opt:Res
K P
0.44cm

# IVH IV

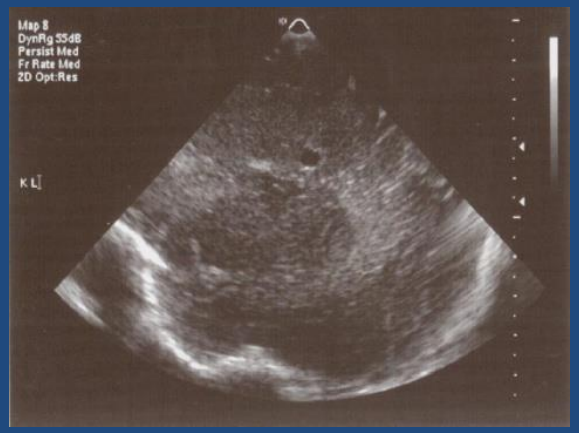

Szp. Gin-Pol., Karowa 2
P7-4 11mm Ped/Ceph
06 Jun 01
19:12:13
TIb 2.2 MI 1.0
F# 176 8.0 cm
Map 8
DynRg 55dB
Persist Med
Fr Rate Med
2D Opt:Res
K P
0.65cm

# Periventricular leukomalacia

necrosis of white matter caused by ischemia

I°


II°




III°


IV°

# Infantile cerebral palsy

Population morbidity: 8%

:

| | |
|---|---|
| 24 – 26 t.c. | 30% |
| 27 – 28 t.c. | 24% |
| 29 – 30 t.c. | 4% |
| 31 –32 t.c. | 1% |

in 61% there was tetraplegy

# NEC necrotizing enterocolitis

- 6-10 % preterm with bw <1500g

- Ischemic and inflammatory necrosis of the bowel primarily affecting premature neonates after initiation of enteral feeding

- Risk factors:
- prematurity
- enzymatic, hormonal, and immunological immaturity of intestines
- enteral feeding,
- bacterial colonization, *(Klebsiella, E.coli, Enterobacter spp, Pseudomonas spp.)*
- ischemia

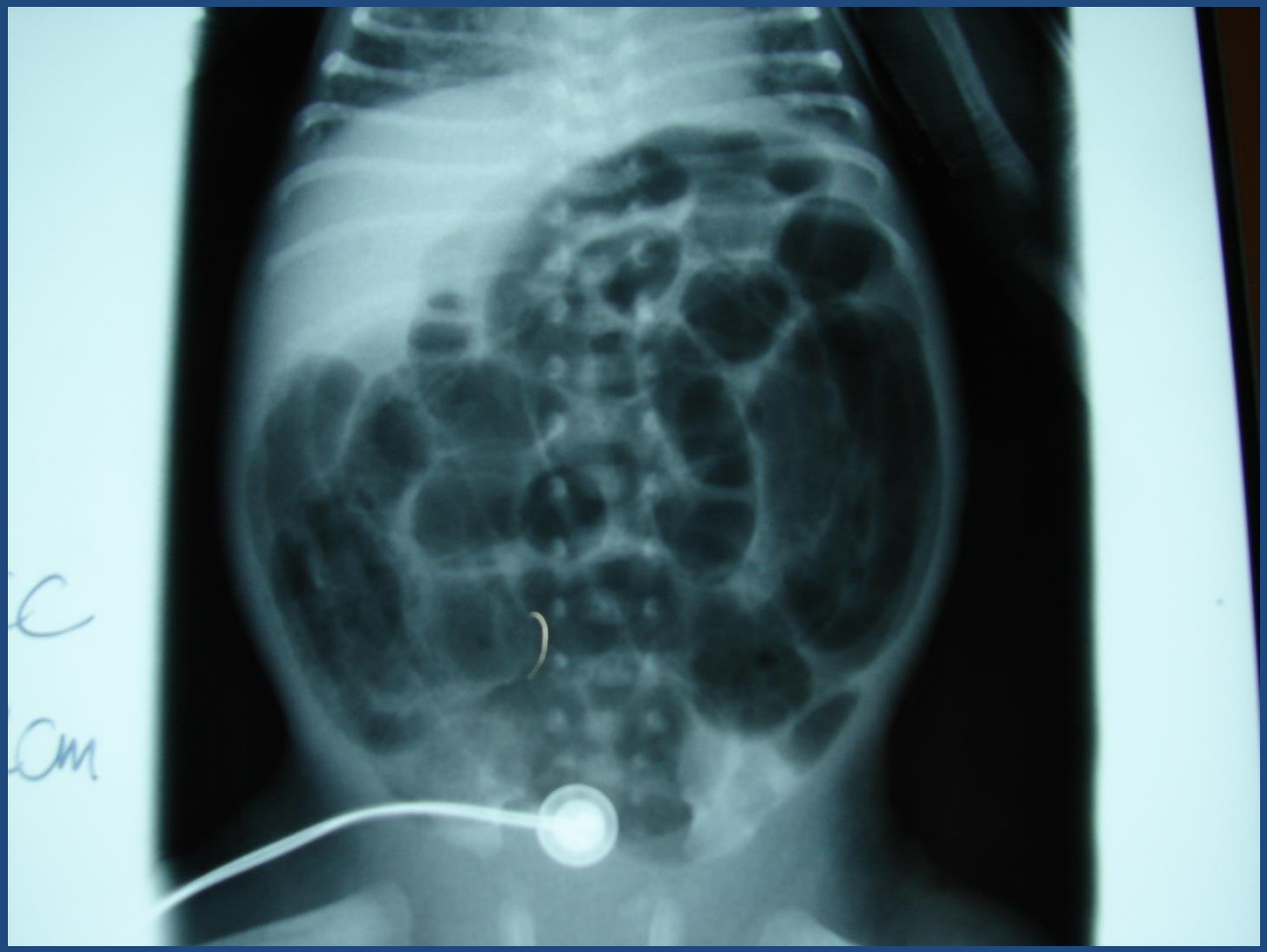
# NEC

- Clinical signs
- Systemic: apneas, bradycardia, letargy, temperature instability, thrombocytopenia, respiratory and metabolic acidosis, hypotension, decrease urine output, respiratory failure

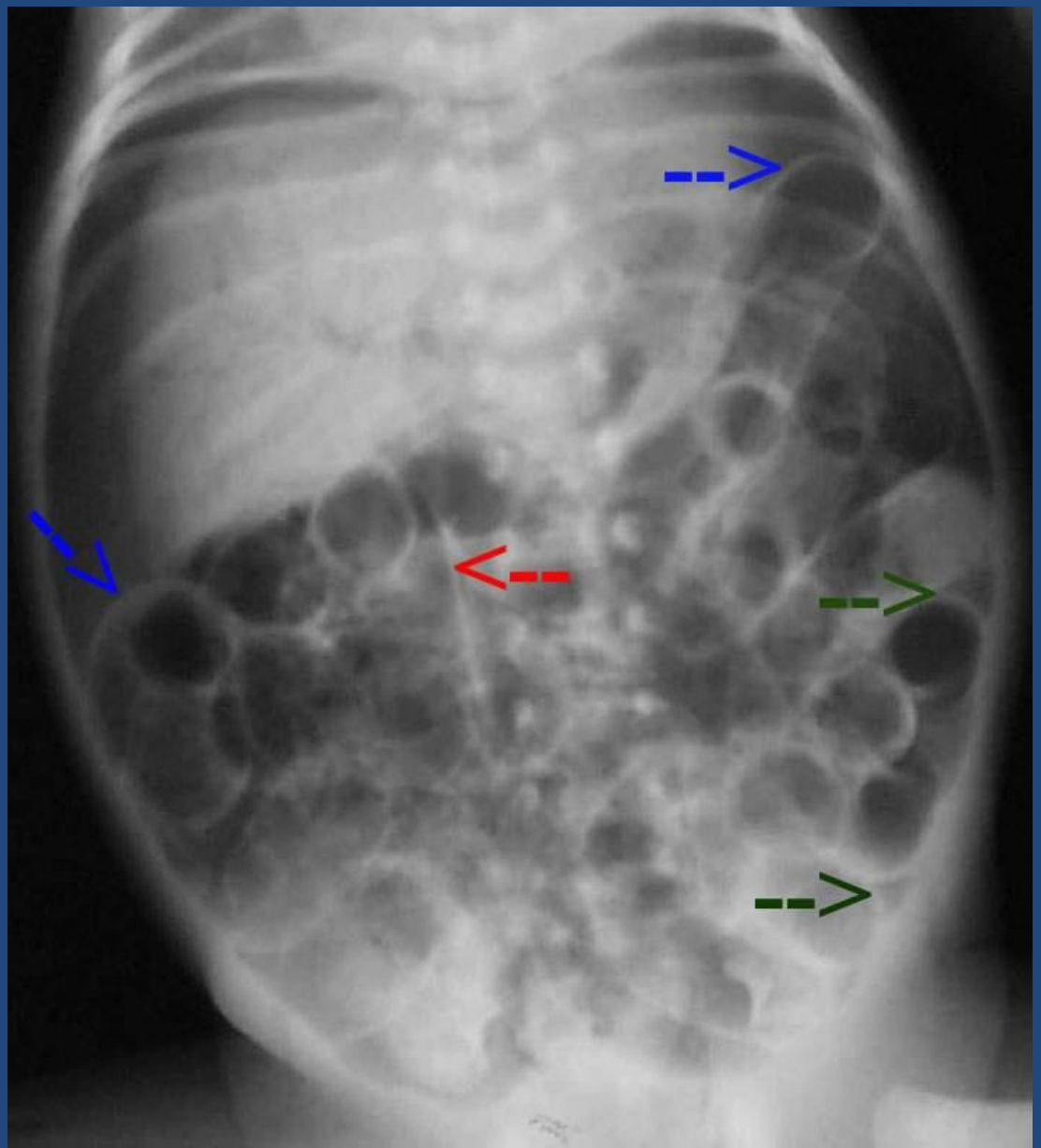
- GI: feeding intolerance, recurrent gastric residuals, abdominal distension, tenderness, absent bowel sounds, abdominal wall edema, indurations and discoloration

# Prominent abdominal distension

# Distension of bowels



# Pneumatosis inerstinalis



# Pneumoperitoneum

# Treatment

- Non-invasive: parenteral nutrition
- Gastric decompression
- Close monitoring of vital signs
- Respiratory and circulation support
- Strict fluid monitoring: intake and urine output, electrolytes
- Antibiotics
- Radiographic studies (even every 6-8 h)

# Surgical management

- Primary drain placement
- Laparotomy

  resection of necrotic segment of bowels

  enterostomy

  Reanastomosis  after 8-12weeks

# ROP- retionopathy of prematurity

- Disorder of the developing retinal vasculature resulting from interruption of normal progression of newly forming retinal vessels.
- Vasoconstriction and obliteration
- Neovascularisation
- Retinal edema
- Retinal haemorrhages
- Fibrosis an traction on, detachment of retina

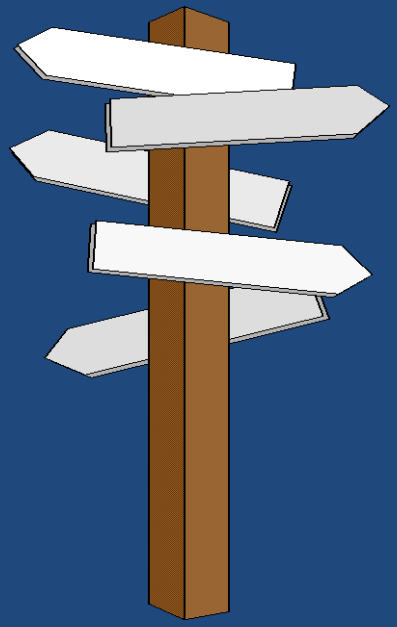
- 5,8% preterm and SGA
- 80% preterm with bw <750g

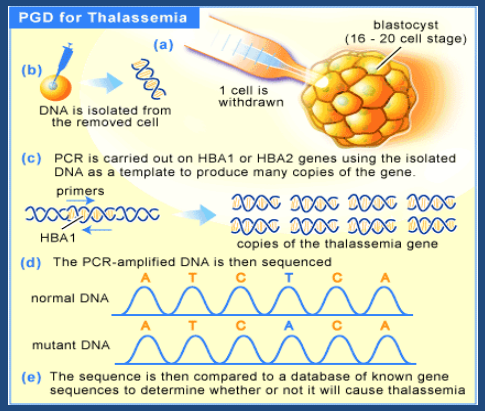
- Ophthalmologic examination 4weeks of life
  next according to suggestion of ophthalmologist
  about 1 year of life

# Ethics problems

- Lethal congenital syndrome (trisomy of 13, 18)
- Congenital malformations with severe prognosis (hydrocephalus, spina bifida)
- Heart defects – poerative, but with high mortality and risk of retardation (HLHS)
- Extremaly premature newborns 22-23 Hbd

# PRENATAL DIAGNOSTICS MAKES DIRECTIONS FOR OBSTETRIC AN NEONATAL ACTIVITIES






# GENETIC TESTINGS

are very important at time of birth!!!!

# STOP !!!!!

**Blood tests**

**Monitoring of vital parameters**

## PALIATIVE CARE

**Special drugs**

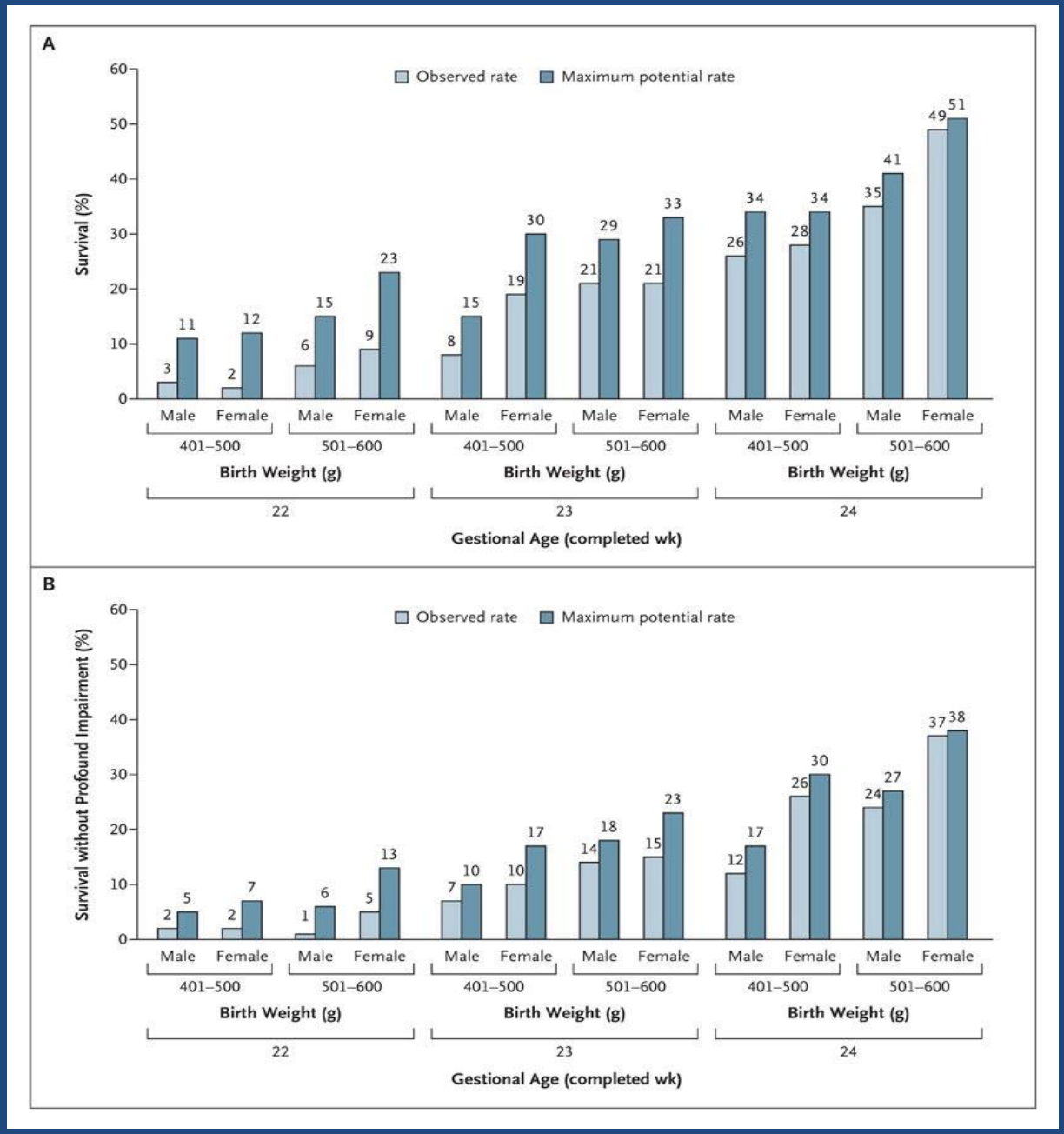
**Mechanical ventilation**

PREMATURITY IS PROBLEMATIC AND EXPENSIVE

22 – 23 hbd-
LIMIT OF MEDICAL  POSSIBILITIES

# What is the limit of resuscitation and saving preterms ?

- 22 Hbd, 500 g BW, vital signs
- Physiological development of lungs :
  23-24 Hbd ( WHO 1997)
- Epidemiology of survivers and development among preterm newborns 23-24 tc (remember about plasticity of immature brain)
- Wrong estimation or valuation of gestational age in US ( Hbd- 4 days, BW  15%)



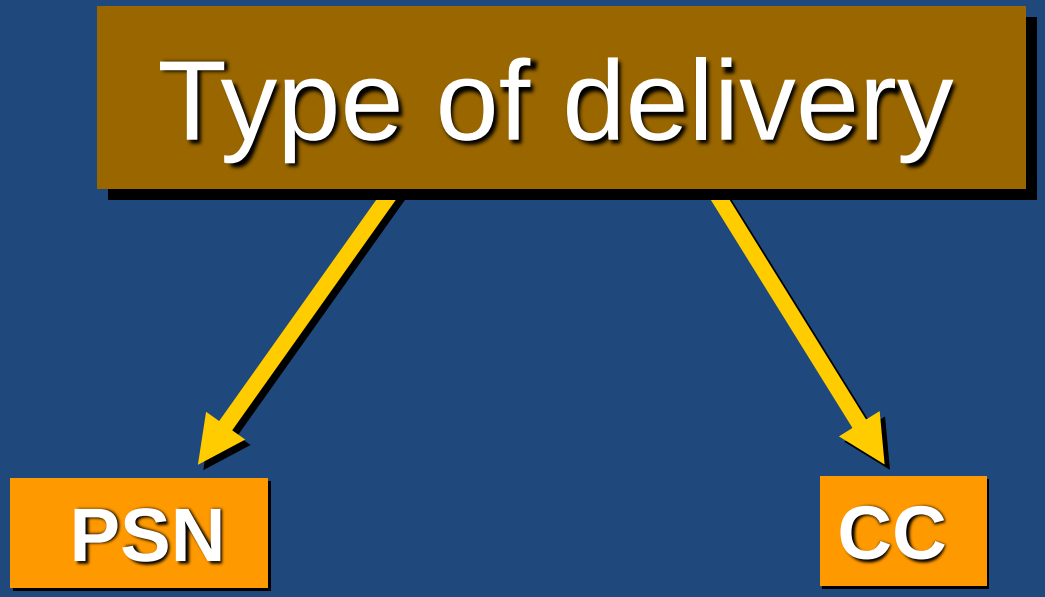

Tyson et al. 2008 NEJM.

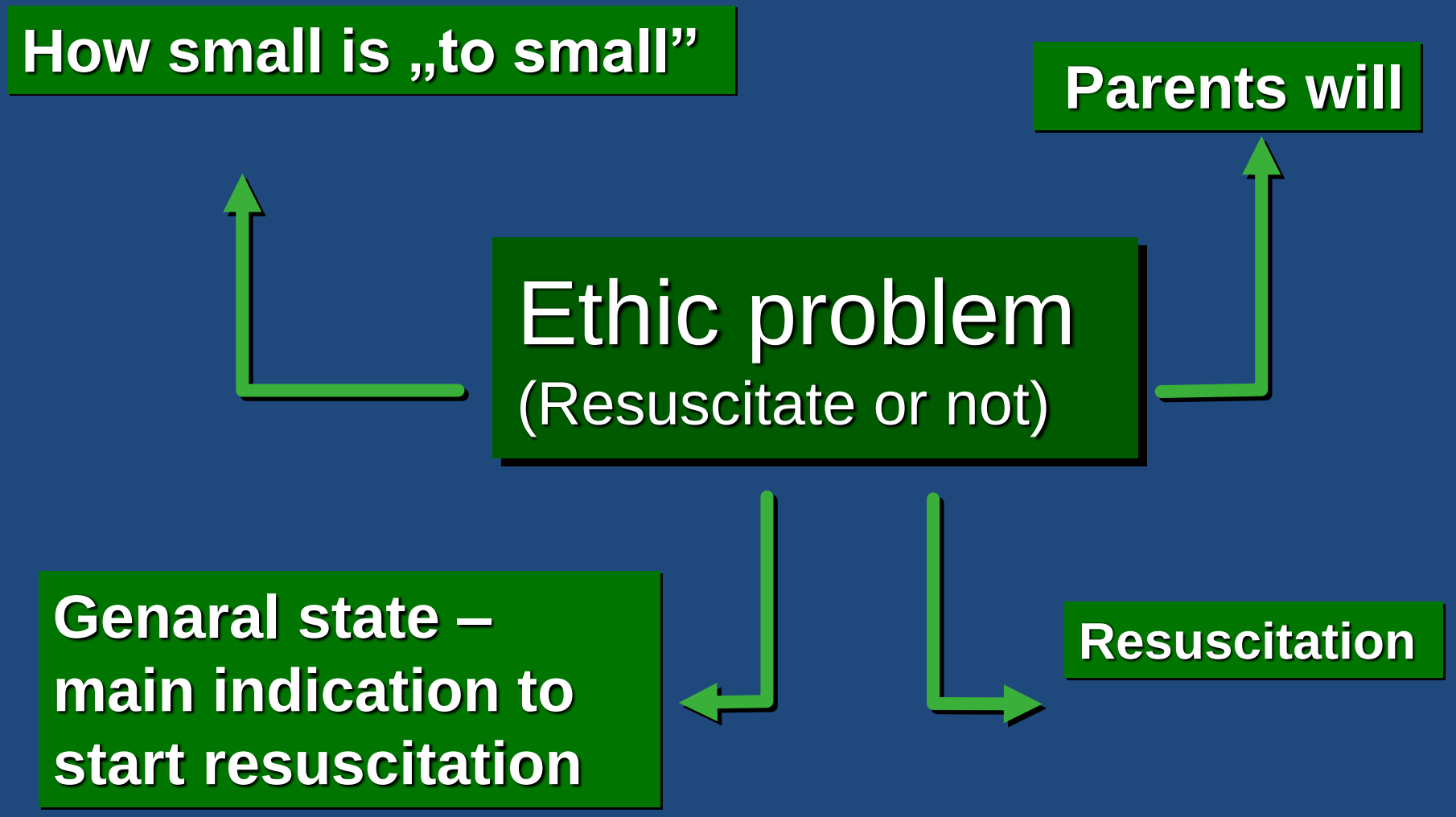
General state and vital signs are most important indication to resuscitation

favorable and adverse prognostic factors

# Prognostic factors

- Favorable
  - female
  - HR>100/min
  - Prenatal steroids
  - Single
  - BW > than expected
- Adverse
  - male
  - Trauma of tissue
  - Lak of prenatal steroids
  - HR<100/min
  - Twins
  - BW <500g


Type of delivery
PSN
CC


How small is „to small”
Parents will
Ethic problem
(Resuscitate or not)
Genaral state – main indication to start resuscitation
Resuscitation

# Ethic problems

**ELBW newborn has all human rights**

**We have to anserw**

- If our treatment is’nt futile therapy?
- Do we should continue this therapy?

- Paliative care?
- Stop futile therapy is not euthanasia

# Thank YOU