

# Pediatric radiology

Radiodiagnostická klinika  
Klinika dětského a dorostového lékařství

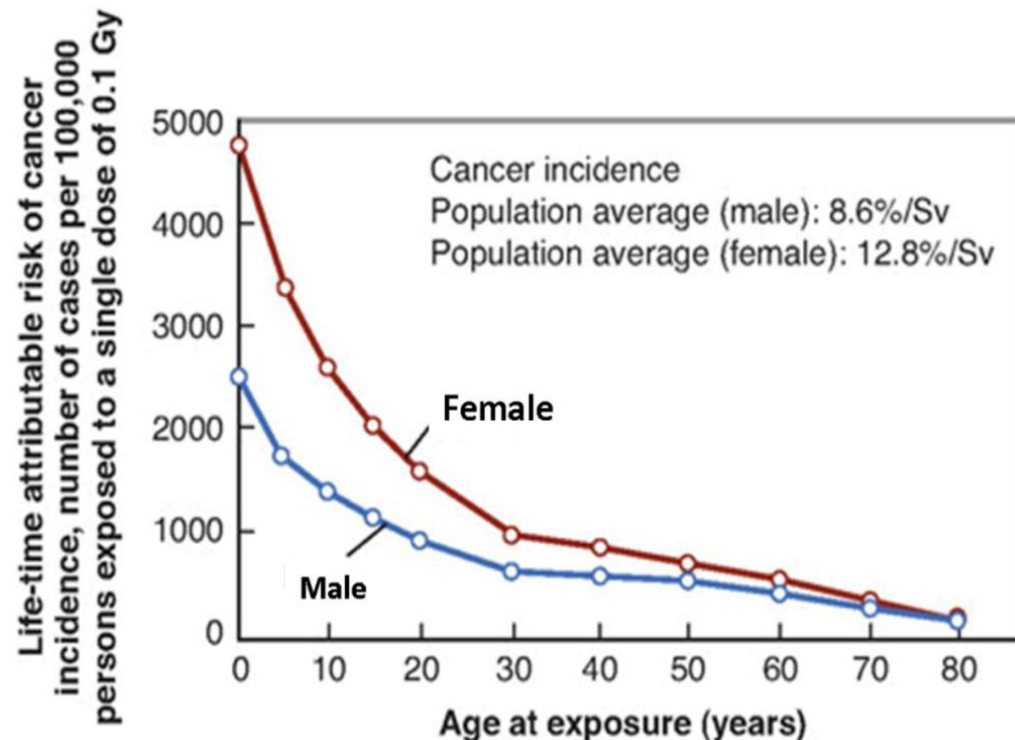
VFN a 1.LF UK VFN

# Child is not a small adult

- Limited **cooperation** and **insight** into the importance of the examination
  - Does not stay without moving
    - MR, CT
- Presence of **parents**
- Different **dif. dig.** (newborn pneumopathy...)
- **Radiosensitivity**

# Radiation dose

- In adult 1 fatal neoplasia per 20Sv
- In children one order of magnitude more
- Examination must always be **justified** (benefit to risk)
- CT
  - **Low-dose CT**
  - **Alternative: US, MR, (fluoroscopy)**
- X-rays are a weak **carcinogen**



# Contrast

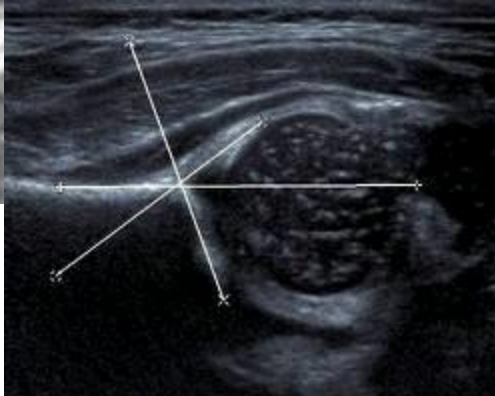
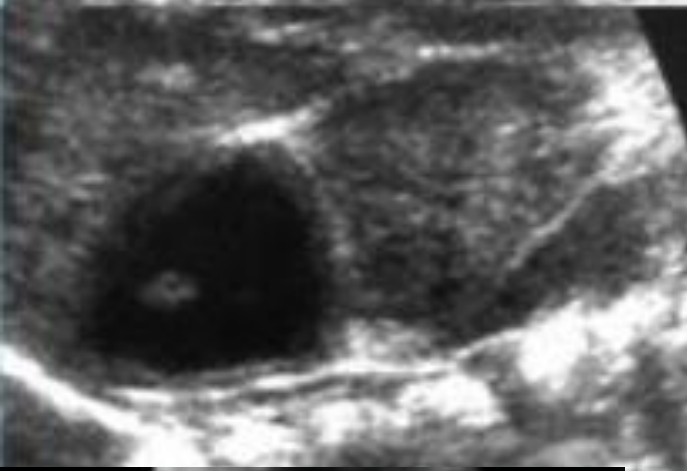
- Fluoroscopy:
  - **Iodine based** c.m. in newborns and small babies
  - **Barium**
    - **Never in susp. perforation, SBO, risk of inspisation**
    - **Never <2 months of age**
- CT:
  - Non-ionic
    - 1 – 2 ml/kg
  - **Contrast nephropathy**
  - **Allergy, preparation**

# Imaging methods

- US: **echogenicity**: an-, hypo-, izo-, hyper-echoic
- Radiograph: **transparency**
- MRI: a-, hypo-, izo-, hyper-**signal**
- CT: **density**: hypo-, izo-, hyper-dense
- Angiography: DSA, interventional
- Interventional radiology

# UZ

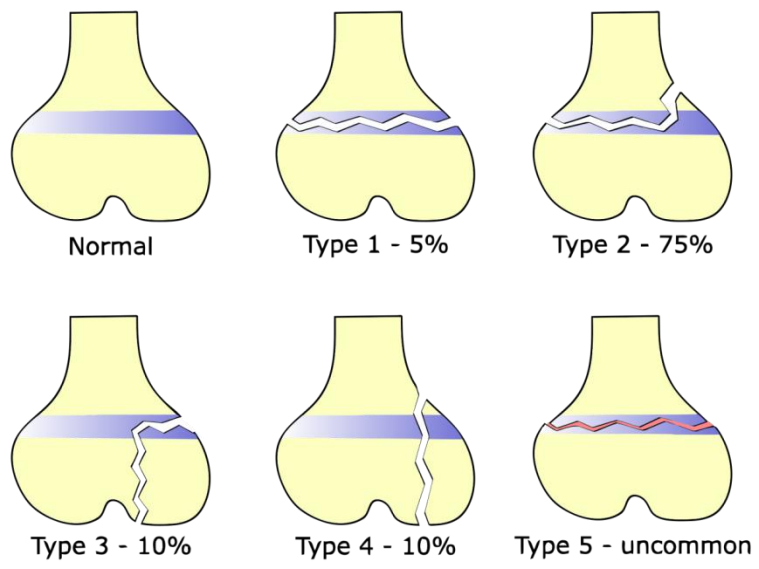
- First-line examination method in many cases
- Often final diagnosis
  - **Pylorostenosis (3mm, 18mm, sign of olive)**
  - Prepyloric membrane
  - Adrenal lesions
  - Ureterocoele
  - Focal liver lesions, bile ducts ...
  - Abdominal tumours
  - **Intussusception**
  - Anorectal malformation
  - (Reflux)
  - Echocardiography
  - **Enteritis, colitis (NEC)**
  - **Appendicitis**
  - Testes – torsion, spermatocoele
  - Even ... SBO, pneumoperitoneum, pneumothorax, pleural fluid, joints, soft tissue, LNN, thyroid ....
  - CN, UC, mesenteric lymphadenopathy
  - **UZ brain in neonates**

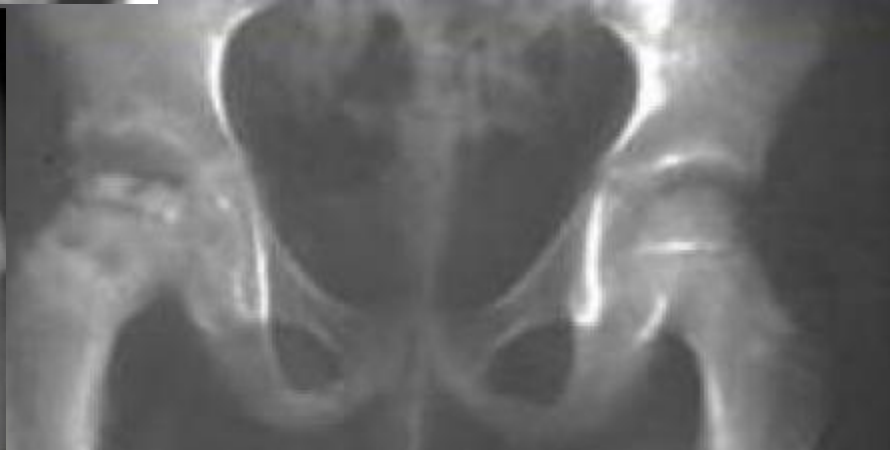
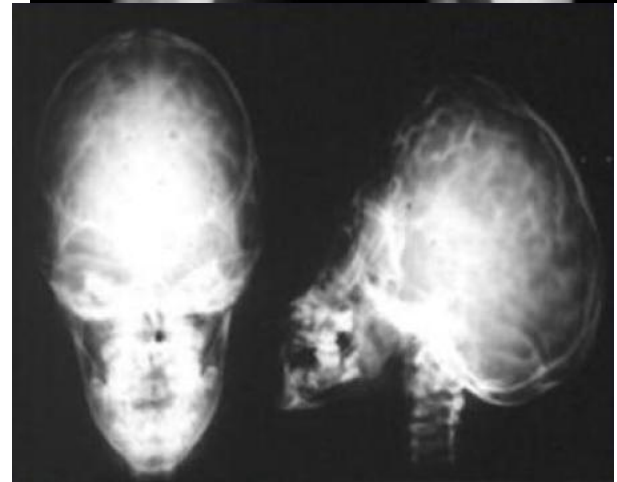


# BONE

- **Greenstick fracture**
- **Epiphyseolysis**
- Bone tumours
- Hip dysplasia
- Cranial sutures
- **Aseptic nekrosis (Perthes, Osgood-Schlatter)**
- CRMO (chronic recurrent multifocal osteomyelitis)
- Scoliosis, m. Scheuermann
- Avitaminosis (**Rachitis**)
- **CAN – skeletal survey**
  - Avulsion, periostosis sec. to subperiost hematomas, multiple fractures (various degrees of healing), epiphyseolyses, avulsion of a bone edge (twisting), spiral fractures
- **Bone age**
- **Birth trauma – fracture of clavicle, femur**
- Systemic diseases – osteogenesis imperfecta, osteopetroza, **dysostosis multiplex (Mukopolysacharidosis)**
- Rheumatological disorders









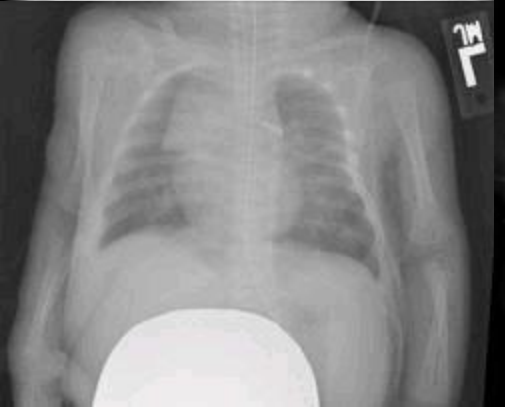
# Abdominal radiograph

- Distribution of gas in bowel loops
- **SBO = distension and air-fluid levels**
  - Horizontal x-ray
- **Meconium ileus** = dry ileus – no air-fluid levels, CF (meconium < 48h)
- Duodenal, jejunal atresia
- Volvulus
- **Pneumoperitoneum**
- **Foreign body**
- Catheter location
- **Nephrogram**
- Necrotizing enterocolitis – gas in portovenous system and bowel wall
- Other organs are also visible on plain radiograph!



# Chest x-ray

- **Newborn pneumopathy**
  - **Transient tachypnea of newborn**
    - Delayed resorption of amniotic fluid
  - **Respiratory distress syndrom (RDS)**
    - Preterm, insufficient amount of surfactant
  - **Bronchopulmonary dysplasia**
    - Toxic O<sub>2</sub> in long term ventilation
- **Congenital lobar emphysema**
- **Sequestration**
- **Pneumonia**
- **Meconium aspiration**
- Diaphragmatic hernia
- **Heart vitia - cardiomegally, hyperemia due to recirculation**
- **Inflammatory changes of lung: lobar / alar pneumonia, pleuropneumonia, bronchopneumonia, atypical pneumonia**
- **Aspiration of foreign body**
- **Asthma**
- **PNO, pneumomediastinum ...**
- Thymus
- **Thymic hyperplasia**
- Lung agenesis, hypoplasia
- **Fluidothorax**



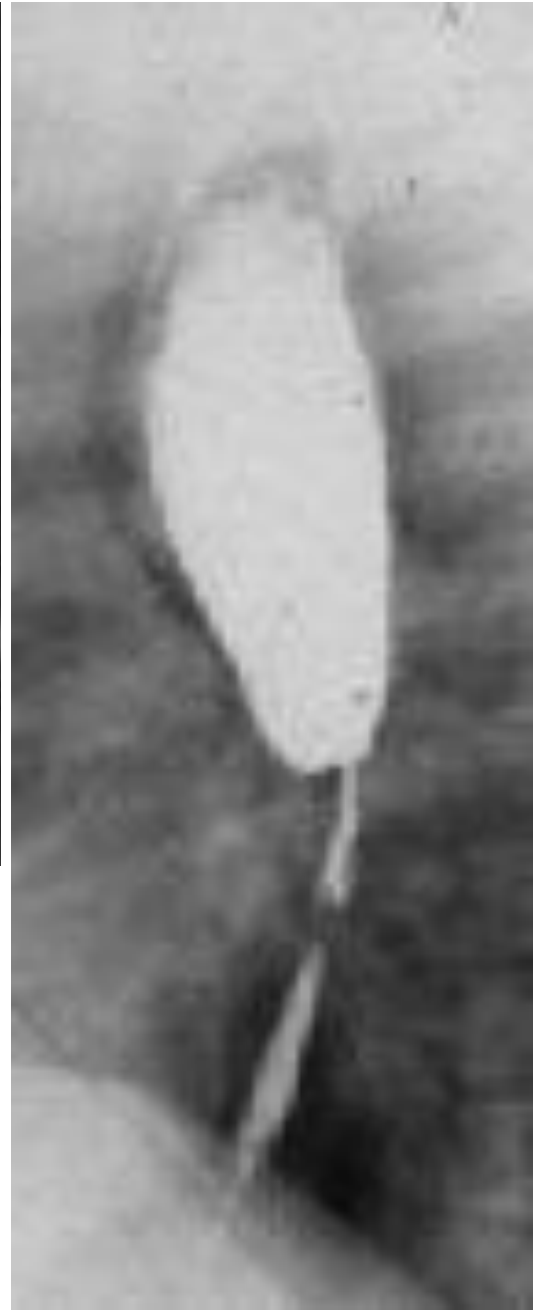
# Other radiographs

- **Semioxial skull** – Waters projection (paranasal sinuses)
  - Development of paranasal sinuses in time
  - **Sinusitis**
    - air-fluid levels, decreased transparency



# Fluoroscopy

- **Esophageal atresia** – usually proximal stump is blind. Gas in the bowel loops = patency of the distal stump
- Fluoroscopy of esophagus – dysphagia, reflux, morphological changes
- **Enteroclysis, SBFT** – now replaced by **MR, CT enterography**
- **Barium enema (irrigography)**
  - M. Hirschsprung, total aganglionicosis
  - Neuronal intestinal dysplasia
- Dilation of stenosed esophagus
- Malrotation
- Desinvagination, meconium plug (usually rectosigmoid, incomplete obstruction), failure to pass meconium
- **Microcolon**



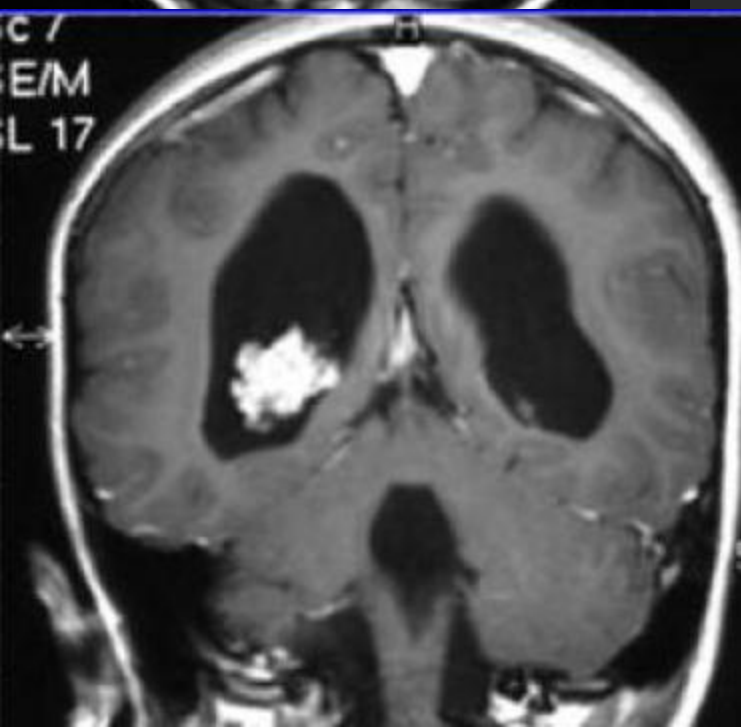
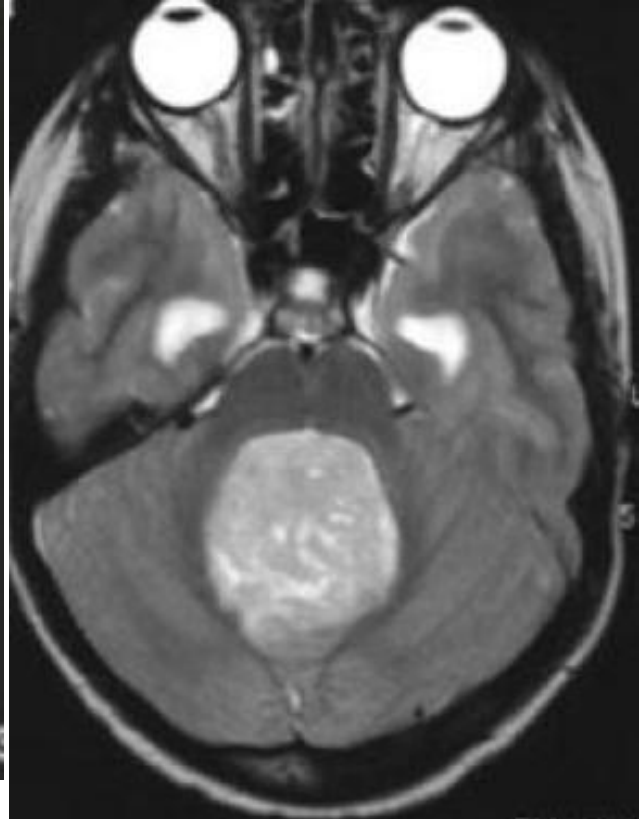
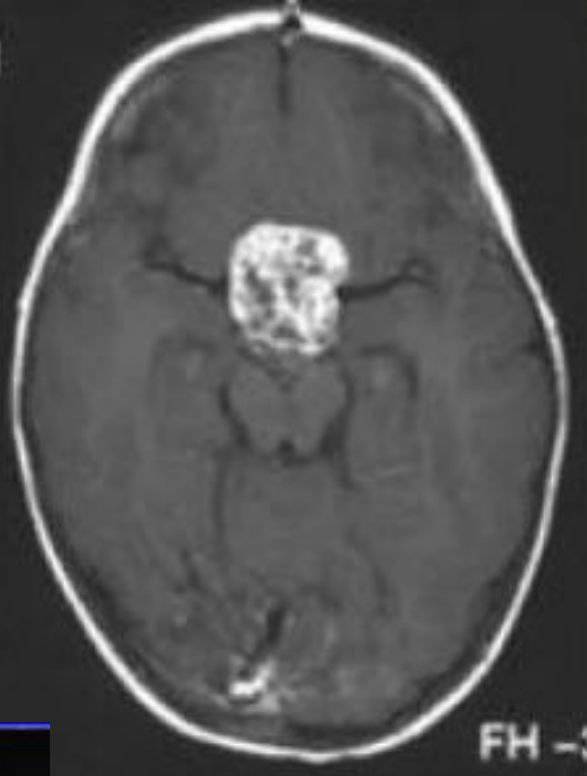
# CT

- **Judicious indication - radiation**
- **Special pediatric protocols**
  - Decreased voltage and amps
- Uncooperative children – assistance of anesthesiologist
- Low dose protocols with iterative reconstruction
- CT can hardly be replaced in
  - **HRCT of lungs**
  - **Acute intracranial hemorrhage - CT of brain**



# MRI

- **No radiation**
- Assistance of an anesthesiologist in small children
  - Long examination
- **MR brain**
- **MR enterography**
- MR abdomen
- MRCP
- **T2W – water is hypersignal (white)**
- **T1W – water has no signal (black)**



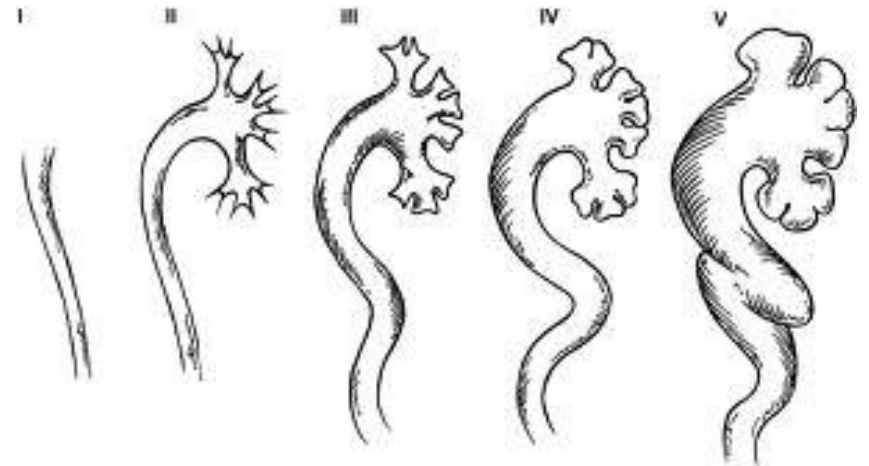
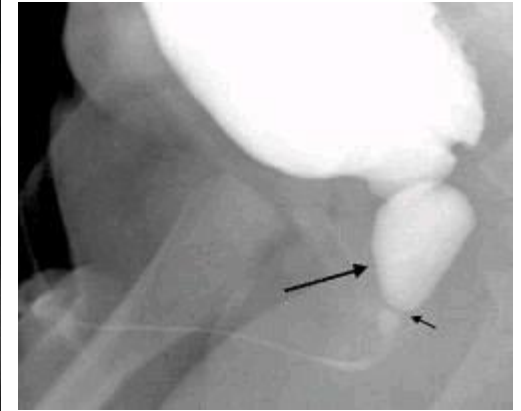
# Brain tumors

- INTRAAXIAL x EXTRAAXIAL
- **Posterior fossa tumours more frequent**
- Pilocytic **astrocytoma**
- other astrocytomas
- **ependymoma**
- **medulloblastoma**
- kraniofaryngeoma
- PNET
- Papiloma of choroidal plexus

# Uroradiology

- **Voiding cystourethrogram**
  - Anomaly of urethra (**valve**, stenosis, diverticulum)
  - Anomaly of bladder (**diverticulum**, persistent urachus)
  - **Ureterocoele**
  - **Vesicoureteral reflux (VUR)**
    - **Passive** – when filling
    - **Active** – when voiding
- **Urolithiasis**
  - **Nephrogram (radiograph) – KUB (kidney-ureter-bladder)**
  - **CT nephrogram**
- **Intravenous (excretory) urography, CT urography**





[http://www.wikiskripta.eu/index.php/Vezikour\\_eter%C3%A1ln%C3%AD\\_reflux](http://www.wikiskripta.eu/index.php/Vezikour_eter%C3%A1ln%C3%AD_reflux)

- [www.mudr.org/web/prednasky](http://www.mudr.org/web/prednasky)